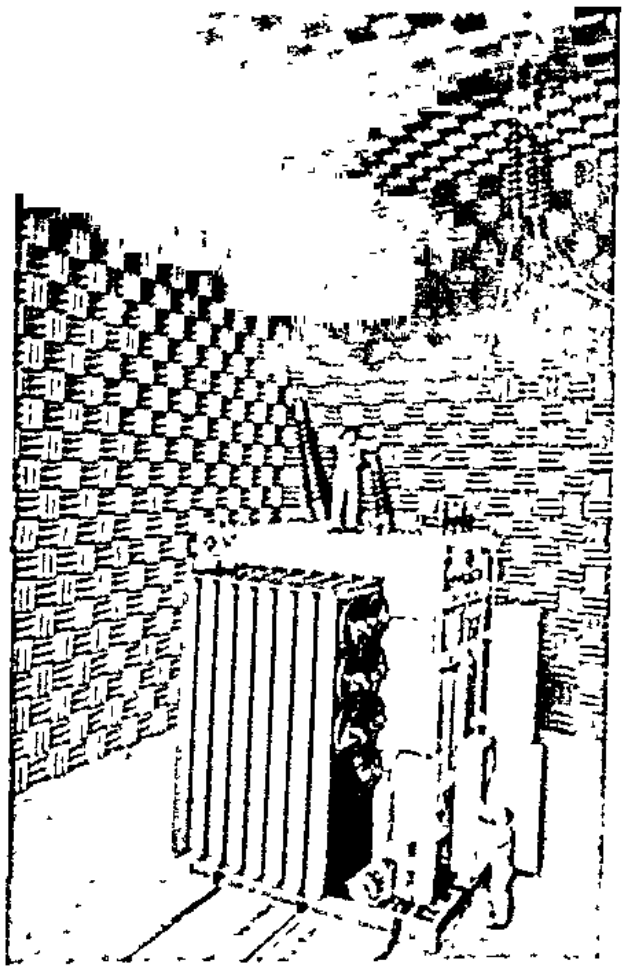
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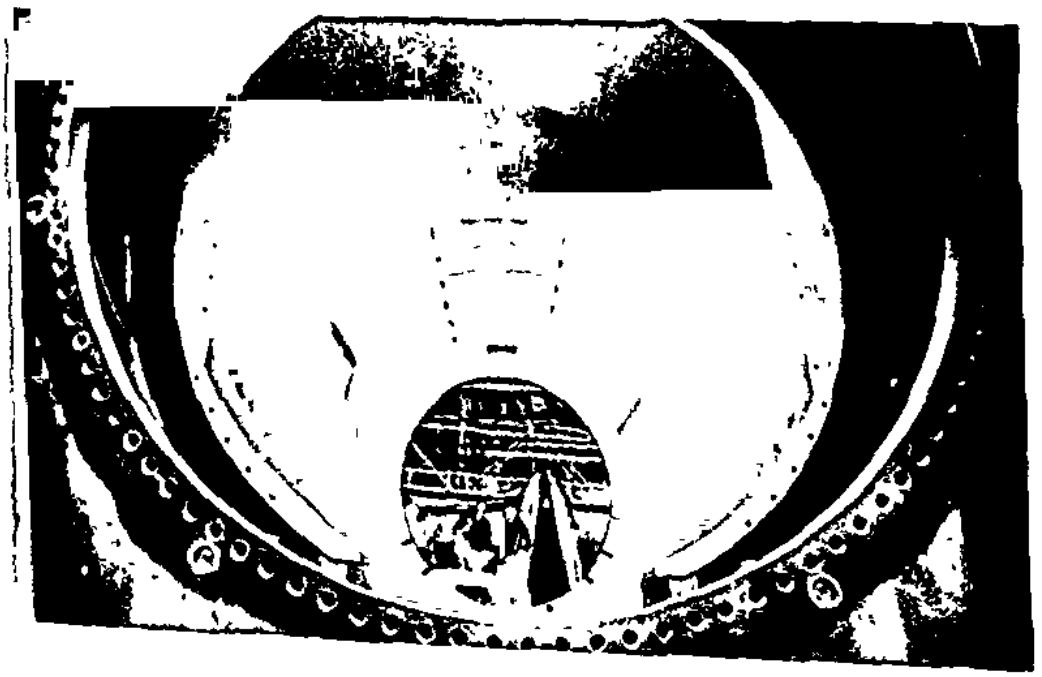


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(LEFT) Anechoic vault of 231,000 cubic feet for making sound measurements on large transformers (*Westinghouse*).(RIGHT)Housing for a 3600-rpm turbine generator (*Westinghouse*)

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Table of Contents

Editorial Advisory Board	VII
Editorial Staff	VIII
Consulting Editors	VIII
Key to Names of Contributors	1
Contributors	15
Index	103

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	JVW	John Van Wazer
	JVZ	John V Ziemba
	JWB	Joseph W. Barker
	JWC	Joseph W Chamberlain
	JWE	John W Evans
	JWF	Jackson W. Foster
	JWG	John W Gowen
	JWH	Joel W Hedgpeth
	JWJ	John W James
	JWL	J W Lynn
	JWMD	Jesse W M Dumond
	JWP	J W Petit
	JWS	John W Saunders, Jr
	JWST	John W Stewart
	JWW	James W Warwick
	JWWE	John W Wells
	JWWI	J Walter Wilson
	JWWN	J W Wentworth
K	KA	Kenji Atoda
	KAR	Karl Arnstein
	KAE	Krafft A Ehricke
	KAJ	Kenneth A Johnson
	KAP	Keats A Pullen, Jr
	KB	Kenneth Bullington
	KBR	Klaus Brodersen
	KBC	Kenneth B Cumberland
	KBR	Kenneth B Raper
	KCDH	Kenneth C D Hickman
	KCP	Kenneth C Parkes
	KDK	Karl D Kryter
	KDR	Kenneth D Roeder
	KE	Katherine Esau
	KEB	Kenneth E Bell
	KEBU	K E Bullen
	KES	Karl E Schoenherr
	KFL	Karl F Lagler
	KFM	Kirtley F Mather
	KFME	Karl F Meyer
	KGC	Kenneth G Clark
	KGS	K G Stone
	KGW	Kenneth G Weckel
	KH	Kotora Hatai
	KHE	Keith Henney
	KHM	K H Mann
	KJB	Konrad J Buettner
	KK	Kumar Krishna
	KKC	K K Cowart
	KKT	Karl K Turekian
	KKW	K Klaus Wyrtki
	KL	Karl Lang
	KLE	Kornelius Lems
	KLC	K L Chow
	KLD	Kenneth L Duke
	KM	K Muhlethaler
	KNO	Kenneth N Ogle
	KRB	Kenneth A Burchard
	KRP	Keith R Porter
	KRS	Karl R Spangenberg
	KS	Keith Sheard
	KSK	Kaiser S Kunz
	KUS	Karl U Smith
	KVK	Karl V Krombein
	KVM	Kenneth V Manning
	KWB	K W Bagnall
	KWJ	K W Johnson
	KWK	K W Kreitlow
	KWKL	Kenneth W Kirby
	KWP	Ken W Perkins
	KYT	K Y Tang
	KZM	Karl Z Morgan
L	LA	LeRoy Apker
	LAB	Leslie A Bryan
	LAF	Leo A Flexser
	LAR	Lorrin A. Riggs
	LB	Lane Barksdale
	LBR	Louis Brand
	LBA	Leslie B Arey
	LBC	Lealtyn B Clapp
	LBH	L B Holthuis
	LBL	Luna B Leopold
	LBLO	Lewis B Lockwood
	LBS	Laurence B Siegfried
	LBSL	Louis B Slichter
	LCCO	La Mont C Cole
	LCR	L C Robertson
	LCS	L C Stuart
	LD	Louis Dienes
	LDB	Leonard D Baver
	LDF	Luis de Florez
	LDH	Leanor D Haley
	LDK	Lewis D Kaplan
	LDM	Leslie D McGraw
	LEA	L E Abbott
	LEAN	Lloyd E Antonides
	LEC	Lyle E Craine
	LECU	Lee E. Cuckler
	LEK	Lawrence E Kinsler
	LES	Lloyd E Slater
	LFA	Lyle F Albright
	LFC	Laurence F Cleveland
	LFCS	L F Curtiss
	LFD	Lawrence F Dahl
	LFS	Lauren F Sargent
	LG	Louis Gordon
	LGO	Leonard Goland
	LGH	L G Hoxton
	LGW	L G Weeks
	LHA	Lawrence H Aller
	LHG	Lester H Germer
	LHR	Louis H Roddis, Jr
	LID	L I Davis
	LIM	Lawrence I Miller
	LJB	Louis J Battan
	LJH	Lawrence J Heidt
	LJK	Leonard J Koch
	LJO	Leonard J Obery
	LJW	Lemen J Wells
	LK	Louis Kaplan
	LKL	L K Lee
	LL	Leon Lapidus
	LLA	Louis Landweber
	LLB	Leo L Beranek
	LLL	L L Langley
	LLN	Lewis L Nettleton
	LLS	Louis L Shmidman
	LLSL	Laurence L Sloss
	LMB	L M Black
	LMBE	L M Beidler
	LMBL	Leonard M Blumenthal
	LMG	L M Graves
	LMH	Lindsay M Hobbs
	LMK	Lyman M Kells
	LMT	Lewis M Turner
	LN	Leo Nedelsky
	LNK	Lloyd N Krause
	LNM	Leslie N McClellan
	LOB	Lawrence O Brockway
	LP	Lynn Poole
	LPC	L P Clements
	LPE	Lewis P Emerson
	LPH	Louis P Harrison
	LPHU	Lloyd P Hunter
	LPHY	Lee P Hynes
	LPL	Louis P Ledoux
	LRD	Lee R Dice
	LRW	L R Wilson
	LS	Louis Schmerling
	LSB	Lawrence S. Brown

J.E.SC.	J E. Scott, Jr.
J.E T.	John E. Tyler
J.E.V.	Joseph E Varner
J.E.W.	J. E. Woodall
J.E.WE.	J E. Webb
J.F.B.	Joseph F. Bunnett
J F.C.	James F. Crow
J.F.CO	James F. Connors
J.F.F.	James F. Ferry
J.F.H.	John Francis Hahn
J.F.M.	John F. McCrea
J.F.MA.	Jose F. Maldonado
J.F.MO.	J. F. Moser, Jr.
J.F.S.	Joseph F Sebald
J.F.T.S	J. F. T. Spencer
J.F T.SA.	J F. T. Saur
J.G C.	Jule G Charney
J G H.	J. G. Harrar
J.G.HO.	James G Horsfall
J.G.P.	June G Pattullo
J.G.S	J G Steele
J.G T.	Joseph G Tarboux
J.G.TR.	John G Truxal
J G.TU.	John G Trump
J.G W.	J G Woodroof
J.H.	J Halpern
J.H.B.	J Harlen Bretz
J.H.C	Joseph H Camin
J H CE.	J Harold Clarke
J.H.CL.	John H Clarke
J.H.D	John H Davis
J.H H	Joel H. Hildebrand
J.H J.	J Harlan Johnson
J H.M.	J Hoover Mackin
J H MI	John H Miller
J.H N.	John H Nair
J.H.NE	J H. Nelson
J.H R.	J H Rushton
J H RY	John H Ryther
J.H S	James H Schulman
J.H SI	John H Sillsker
J.H.SM	Joseph H Simons
J H ST	J H Stoeckeler
J H T	James Herbert Taylor
J H V.D	John H Van Dyke
J I E	John I Ewing
J I K	Joseph I Karash
J J A.	Joseph J Alkoma
J J.A.M	John J A McLaughlin
J J.C	J J Christensen
J J.CO	Joseph J Cormish
J.J.D	James J Dowd
J J E.	John J Egan
J.J G	J J Galloway
J.J GI	James Jerome Gibson
J J.K	Joseph J Katz
J J.M	John J McKetta
J.J R	James J Ryan
J J.RO	J J Robillard
J J.S.	J J Shomon
J J SC	J J Schule, Jr
J K.	Joseph Kaplan
J.KA.	Joseph Kaye
J.KG	Jerome Kagan
J K.R.	J K. Roberts
J K.M P.	John K. M. Peake
J.L.	Joseph Lenn
J.LY	John Lyman
J L.B	J Laurens Barnard
J.L.D	J. L. Doob
J.L.G	John L. Gardiner
J L.GG.	James L. Gregg
J L.GR.	Jesse L. Greenstein
J L.G F	James L. G. Fitzpatrick
J.L K.	J Laurence Kulp
J L.L.	Jay L Lush
J L.M.	Joseph L Melnick
J L R.	Joseph L Reid
J.L.S.	J. L Stokes
J.L.SA.	J. L. Sannella
J.L.SH.	J Lowen Shearer
J.L.T.	James L. Tuck
J.L.W.	J L. Walsh
J.L.WE.	James L Weaver
J.M.	Jane Meiklejohn
J.MA.	Jack Major
J.ME.	Josef Meixner
J.MH.	Joseph Mahler
J.MI	Jacob Millman
J MN.	Joseph Manuele
J.MR.	John Markus
J.MZ.	J. Meszar
J.M AU.	James M Austin
J.M.B	John M. Barstow
J.M.C.	J M. Clayton, Jr.
J.M HU.	John M. Hunt
J M.K.	John M Kays
J.M KA.	J M. Kay
J.M.KE	Joseph M Keller
J.M O	Jane M Oppenheimer
J.M S	Jay M. Savage
J.M T	Julian M Tobias
J M W	J Marvin Weller
J M WA	J M. Wallace
J M WO	John M Woods
J.N.	Jerome Namias
J N C	John N Couch
J O.B	J Oscar Blew, Jr
J.O C	John O Corliss
J O CU	J O Culbertson
J.O E	John O Edwards
J O.H	Joseph O Hirschfelder
J.O K.	John O Kraehenbuehl
J O W	Jacob O Ware
J P	Jane Philpott
J P C	John P Comstock
J P CR.	John P. Craven
J.P D H	J P Den Hartog
J P F	John P Flynn
J P H	John P Hagen
J P.HA	J P Harding
J P P	Joseph P Porter
J P R	John P Richmond
J P.S	J P Scott
J P T	John P Tully
J R	John Rodgers
J R A	John Ray Anderson
J R.AR	James R Arnold
J R B	James R Bright
J R.BA	James R Balsley, Jr
J R.D M	J R D McCormick
J R F	J R Fulks
J R M	Joan R Marsden
J R.R	John R Ragazzini
J R RA	John R Raper
J R S	J R Sutherland
J R SE	John R Sellars
J.R.V	J R Vallentyne
J R W	James R Wall
J R WH	John R Whinnery
J R Y	James R Young
J R Z	Jerrold R Zacharias
J S	Jack Schubert
J SE	Josephine Semmes
J ST	John Sterner
J S.B	Jerome S Bruner
J S BU	J S Butz, Jr.
J S F	J Sutherland Frame
J S H	J Sanford Hart
J S M	Jack S McCormick
J S MT	J S Mertle
J S R	Jay S Rosenblatt
J S.RO	J S Robertson
J.S T.	John S Thomsen
J S V	James S Vanick
J T A	J T Adams

	JTC	John T. Curtis
	JTG	Joseph T. Gregory
	JTL	John T Lucker
	JTM	John T. Middleton
	JTP	John T. Presley
	JTW	J Tuzo Wilson
	JTY	John T. Yoke, III
	JVW	John Van Wazer
	JVZ	John V Ziemba
	JWB	Joseph W Barker
	JWC	Joseph W Chamberlain
	JWE	John W Evans
	JWF	Jackson W. Foster
	JWG	John W Gowen
	JWH	Joel W Hedgpeth
	JWJ	John W. James
	JWL	J W Lynn
	JWMD	Jesse W M Dumond
	JWP	J W Pette
	JWS	John W Saunders, Jr
	JWST	John W Stewart
	JWW	James W Warwick
	JWWE	John W Wells
	JWWI	J Walter Wilson
	JWWN	J W Wentworth
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	KAR	Karl Arnstein
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	KBR	Klaus Brodersen
	KBC	Kenneth B Cumberland
	KBR	Kenneth B Raper
	KCDH	Kenneth C D Hickman
	KCP	Kenneth C Parkes
	KDK	Karl D Kryter
	KDR	Kenneth D Roeder
	KE	Katherine Esau
	KEB	Kenneth E Bell
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	KES	Karl E Schoenherr
	KFL	Karl F Lagler
	KFM	Kirtley F Mather
	KFME	Karl F Meyer
	KGC	Kenneth G Clark
	KGS	K G Stone
	KGW	Kenneth G Weckel
	KH	Kotora Hatai
	KHE	Keith Henney
	KHM	K H Mann
	KJB	Konrad J Buettner
	KK	Kumar Krishna
	KKC	K K Cowart
	KKT	Karl K Turekian
	KKW	K Klaus Wyrtki
	KL	Karl Lang
	KLE	Kornelius Lems
	KLC	K L Chow
	KLD	Kenneth L Duke
	KM	K Muhlethaler
	KNO	Kenneth N Ogle
	KRB	Kenneth A Burchard
	KRP	Keith R Porter
	KRS	Karl R Spangenberg
	KS	Keith Sheard
	KSK	Kaiser S Kunz
	KUS	Karl U Smith
	KVK	Karl V Krombein
	KVM	Kenneth V Manning
	KWB	K W Bagnall
	KWJ	K W Johnson
	KWK	K W Kreitlow
	KWKI	Kenneth W Kirby
	KWP	Ken W Perkins
	KYT	K Y Tang
	KZM	Karl Z Morgan
L	LA	LeRoy Apker
	LAB	Leslie A Bryan
	LAF	Leo A Flexser
	LAR	Lorrin A Riggs
	LB	Lane Barksdale
	LBR	Louis Brand
	LBA	Leslie B Arey
	LBC	Leallyn B Clapp
	LBH	L B Holthuis
	LBL	Luna B Leopold
	LBLO	Lewis B Lockwood
	LBS	Laurence B Siegfried
	LBSL	Louis B Slichter
	LCCO	La Mont C Cole
	LCR	L C Robertson
	LCS	L. C Stuart
	LD	Louis Dienes
	LDB	Leonard D Baver
	LDF	Luis de Florez
	LDH	Leanor D Haley
	LDK	Lewis D Kaplan
	LDM	Leslie D McGraw
	LEA	L E Abbott
	LEAN	Lloyd E Antonides
	LEC	Lyle E Craine
	LECU	Lee E Cuckler
	LEK	Lawrence E Kinsler
	LES	Lloyd E. Slater
	LFA	Lyle F Albright
	LFC	Laurence F Cleveland
	LFCS	L F Curtiss
	LFD	Lawrence F Dahl
	LFS	Lauren F Sargent
	LG	Louis Gordon
	LGO	Leonard Goland
	LGH	L G Hoxton
	LGW	L G Weeks
	LHA	Lawrence H Aller
	LHG	Lester H Germer
	LHR	Louis H Roddis, Jr
	LID	L I Davis
	LIM	Lawrence I Miller
	LJB	Louis J Battan
	LJH	Lawrence J Heidt
	LJK	Leonard J Koch
	LJO	Leonard J Obery
	LJW	Lemen J Wells
	LK	Louis Kaplan
	LKL	L K Lee
	LL	Leon Lapidus
	LLA	Louis Landweber
	LLB	Leo L Beranek
	LLL	L L Langley
	LLN	Lewis L Nettleton
	LLS	Louis L Shmidman
	LLSL	Laurence L Sloss
	LMB	L M Black
	LMBE	L M Beidler
	LMBL	Leonard M Blumenthal
	LMG	L M Graves
	LMH	Lindsay M Hobbs
	LMK	Lyman M Kells
	LMT	Lewis M Turner
	LN	Leo Nedelsky
	LNK	Lloyd N Krause
	LNM	Leslie N McClellan
	LOB	Lawrence O Brockway
	LP	Lynn Poole
	LPC	L P Clements
	LPE	Lewis P Emerson
	LPH	Louis P Harrison
	LPHU	Lloyd P Hunter
	LPHY	Lee P Hynes
	LPL	Louis P Ledoux
	LRD	Lee R Dice
	LRW	L R Wilson
	LS	Louis Schmerling
	LSB	Lawrence S Brown

L.S I	Leonard S Inskip
L.S L.	L Sigfred Linderoth, Jr
L.S.M.	L. S McClung
L S.R.	Lewis S Ramsdell
L S.RE	Louis S. Renzoni
L S ST.	Leon S Stone
L T	Leonard Trauberman
L TR	Laurens Troost
L T R	L. T. Rosenberg
L.T W.	Lincoln T. Work
L.V.B.	L. V. Bewley
L.V H	L. V. Heilbrunn
L V N.	Leyton V. Nelson
L.V.W	L. Valentine Worthington
L.W.S.	Louis W. Sipley

M

M A B	M. A Bredig
M A C.	Marvin A Chernow
M A.L.	Max A. Lauffer
M.A M	Milton A. Miller
M B	Michael Bever
M.BR	Mead Bradner
M.BU.	Milton Burton
M B.M.	M B Moore
M B MC	Mary B McCann
M B S.	Milner B Schaefer
M C.	Mark Cole
M.C C.	M. C Chang
M C M	M C McQuarrie
M C MC	Malcolm C McKenna
M D	Michael Doudoroff
M.DR	Max Dresden
M D F	Milan D Fiske
M D H	M D. Harsh
M D HA	Menelaus D Hassialis
M D P	M David Potter
M.D R	Marvin D Rausch
M D RO	Mary D Rogick
M D.T	Morgan D Thomas
M E R	Mary E. Rawles
M E W.	Morley E. Wilson
M F	Maxwell Finland
M F O	M F Ohman
M G	Maxwell Gensamer
M GO	McChesney Goodall
M GR	Martin Greenspan
M G F	Mars G Fontana
M G G	Max G Gergel
M G K	Maurice G Knott
M G M	M G Mellon
M H	Max Herzberger
M H E.	M Hans Elias
M H H	McAllister H Hull
M H P	M H Protter
M J A	Marling J Ankeny
M J AB	Malcolm J Abzug
M J K	Milan J Kopac
M.J M	Montrose J Moses
M J U.	Marvin J Udy
M J.W	Marvin J Weinstein
M K.	Marshall Kay
M KI	Martin Kilpatrick
M K.W	Michael K Wilkinson
M L	Max Leva
M L.B	Milton L. Blanc
M L.H.	M L Hurni
M L N	Mark L. Nichols
M L.S	Murrell L. Salutsky
M L.T.	M L Thompson
M M.	Morris Muskat
M M.B	M M Brooke
M M M	Maynard M Miller
M P	Michael Perch
M R H	Milton R Hales
M R.J S	M R J Salton
M S	Martin Saidla
M SI	Marshall Sittig
M SO	Mott Souders, Jr
M S.K	M S Knebelman
M.S.M	Max S Marshall
M.T.	Morris Tager
M W.J.	Martin W. Johnson
M W.M.	Margaret W Mayall
M W.P S	M W P. Strandberg

N

N A	Nelle Ammons
N A.B	Neil A. Benfer
N.B.	Norbert Bikales
N.BO.	Nestor Bohonos
N B.M	N. B Marshall
N.E A	Neal E Artz
N.E.N	Norman E. Nelson
N E.S.	N E Steenrod
N F B	N. Fabritius Buchwald
N.H.B	Norman H Boke
N H N	Norman H Nachtrieb
N J	Nathan Jacobson
N J G	Nicholas J Giarman
N K.	Norman Kharasch
N K E.	N. K Ellis
N K M	N Karle Mottet
N M	Neal MacCoull
N R.	Nicholas Rashevsky
N S F.	N. S Fisk
N S G	Newell S Gingrich
N S.J	N S Jones
N T C	N T Coleman
N T S	Nelson T. Spratt, Jr
N W D	Norman W Desroster
N W K	Norman W Kempf
N W R	Norris W Rakestraw

O

O B	Oliver Bowles
O B W	Owen B Weeks
O D	O Degarmo
O D D	Oliver D Diller
O D R	Oscar D Ratnoff
O E N	Olin E Nelsen
O H	Olga Hartman
O H G	O H Gish
O H M	Orval H Mowrer
O L	O Lowenstein
O N A	Oscar N Allen
O S	Oscar Skolholt
O S T	Olive S Tattersall
O T	Oswald Tippo
O W B	Orlan W Boston
O W R	Oscar W Richards

P

P A A	Paul A Allee
P A M	Paul A Moody
P A S	P A Sheppard
P A SI	Paul A Siple
P A V	Paul A Vestal
P B	Paul Bender
P BY	Perry Byerly
P B B	Paul B Barton, Jr
P B BE	Paul B Beeson
P B C	Philip B Cowles
P B H	Peter B Hukill
P B S	Paul B Sears
P C	Phil Carroll
P C H	Perry C Holt
P C S	Peter C Sandretto
P D	Paul Delahey
P D S	P D Strausbaugh
P D V M	Paul D V Manning
P E C	Preston E Cloud, Jr
P E D	Paul E Damon
P FR	Philip Franklin
P F C	Philip F Clapp
P F CL	Wallace Clark (Mrs) (Pearl F Clark)
P G	Philip Garman
P GR	Peter Gray
P G B	Peter G Bergman

	PGK	P. G Klemens
	PGKA	Peter G Kappus
	PGR	Placidus G Reischman
	PH.	Philip Handler
	PHB	Paul H. Black
	PHG	Philip H. Groggins
	PHK.	P. H Knowlton
	PHO.	Philip H Osberg
	PHS	Philip H Smith
	PHT.	Paul H Tracy
	PJK	Philip J Klass
	PJW	Peter J Walsh
	PK	Paul Kheger
	PKU	P Kusch
	PL	Philip Levine
	PLA.	Philip L. Alger
	PLB	Paul L Boisvert
	PLM	Percy L Myer
	PM	Preston McGrain
	PME	Peveril Meigs
	PMS	Philip M Stehle
	PR	Philip Rudnick
	PRE	Paul R Erlich
	PRF.	Paul R Fields
	PRG	Paul R Gross
	PS	Philippe Shubik
	PT	Paul Tabor
	PTA.	Paul T Allsman
	PTY	Paul Thomas Young
	PVDK.	P Van de Kamp
	PWE	Paul Weaver
	PWO	Philip Worchel
	PWB	P W Bridgman
	PWF	Peter W Frank
	PWS	Paul W Schmidt
Q	QCA.	Quincy C Ayres
	QNM	Quentin N. Myrvik
	QVW	Quentin Van Winkle
R	RA	Roger Adams
	RAB	Ross A Beaumont
	RABO	Rush A Bowman
	RABU.	Ralph A Burton
	RAD	Richard A Deno
	RAF	Russell A. Fisher
	RAFR	Ronald A Freeman
	RAGR.	Reed A Gray
	RAJ	Richard A Johnson
	RAM	Robert A McCleary
	RAR.	Robert A Ragotzkie
	RAS	Richard A Scott
	RAST	R. A Stirton
	RAV	Romeo A Vidone
	RB	Robert Barer
	RBA.	R B Alderfer
	RBC	Robert B Carlin
	RBD	Robert B Dienst
	RBG	Robert B Greenblatt
	RBH	Rolla B Hill
	RBP	Robert B Platt
	RBS	Richard B Setlow
	RCE	Robert C Elderfield
	RCF	Robert C Fellinger
	RCFU	R C Fuson
	RCK	Ralph C Kennedy
	RCL.	Richard C Lord
	RCM	Raymond C Moore
	RCME	Robert C Mellors
	RCP	Russell C Putnam
	RCT	Robert C Truax
	RDC	Robert D Chellis
	RDD	Raymond D Douglass
	RDE	Robley D Evans
	RDEA	Robert D'E Atkinson
	RDM	Reginald D Manwell
	RDP	Roland D Parks
	RDRU	Rogers D Rusk
	RDW	Robert D Waldron
	RE	Ralph Emerson
	REB	Ralph E Bennett
	REBI	R E Billingham
	REBO	Ray E Bolz
	REC.	Ralph E Crabill, Jr.
	RECL.	Ralph E Clarridge
	RED	Richard E Dougherty
	REF	Robert E Forster
	REG	R. E Greenfield
	REGR.	Ralph E. Grim
	REH.	R E. Hungate
	REM	Roy E. Morse
	REMC.	Richard E McCrosky
	REP	Raymond E Peck
	RES.	R E. Snodgrass
	RESP	Ray E Sprenkle
	REST	Robert E Stevenson
	RET.	Roy E Thoma
	RETR.	R E. Treybal
	REZ	Raymond E Zirkle
	RF	Russell Franks
	RFO.	Richard Ford
	RFB	Robert F. Black
	RFC.	Richard F Chandler
	RFD	R. F Davis
	RFDI	Robert F. Dill
	RFF	Richard Foster Flint
	RFFR	Raymond F Fremed
	RFG	Robert G Goddu
	RFGU.	Raymond F Guy
	RFN	Ross F Nigrelli
	RFO	R F Olszewski
	RFP	Richard F Post
	RFR	Reed F Riley
	RFSH	R F S Hearmon
	RG	Richard Glicksman
	RGB	Richard G Bader
	RGBD	R G Beard
	RGBE	Robert G Benedict
	RGBO	Richard G Bowman
	RGH	R G Herb
	RGL.	Robert G Larsen
	RGN	Robert G Neuhauser
	RGP	Robert G Parr
	RGSH	R G S Hudson
	RGZ	Richard G Zweifel
	RH	Richard Hazen
	RHA	Ross H Arnett, Jr
	RHB	Reinhard H Beutner
	RHBI	R H Bing
	RHC	Robert H Cannon, Jr
	RHD	Richard H Dalitz
	RHDE	Robert H Denison
	RHDO	Robert H Dodds
	RHF.	Richard H Foote
	RHFO	Richard H Forsythe
	RHG	R. H Gigg
	RHH	R H Haskins
	RHL.	Ralph H Leubbers
	RHLU	R H Lush
	RHT	Richard H Tedford
	RHW	Robert H Whittaker
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Bartels, Prof Jerome *Professor of Mechanical Engineering, Polytechnic Institute of Brooklyn.* CARNOT CYCLE; REFRIGERATION CYCLE; THERMODYNAMIC CYCLE, other articles in mechanical POWER

Barth, Prof Tom F. W *Professor of Mineralogy, University of Oslo, Norway* METAMORPHIC ROCKS; METAMORPHISM; related articles in metamorphic petrology.

Barton, Dr Paul B, Jr *Geologist, U.S. Geological Survey.* ORE DEPOSITS, GEOCHEMISTRY OF (in part).

Basolo, Prof Fred. *Department of Chemistry, Northwestern University* COMPLEX COMPOUNDS, COORDINATION CHEMISTRY.

Batchelder, Howard R *Consulting Chemical Engineer, Battelle Memorial Institute* FUEL.

Bateman, Dr John Burraston *Deputy Scientific Attaché, American Embassy, London, England* CELL MEMBRANES AND MONOLAYERS

Bates, Dr Charles C *Environmental Systems Coordinator, Development Analysis Group, Office of the Chief of Naval Operations* DELTA (in part).

Battan, Prof Louis J *Professor of Meteorology and Associate Director, Institute of Atmospheric Physics, University of Arizona* LIGHTNING, THUNDER

Baumeister, Theodore *Consulting Engineer, Professor Emeritus of Mechanical Engineering, Marks' Mechanical Engineers' Handbook* POWER PLANT, VALVE, VAPOR POWER

Bayer, Dr Leonard D *Director, Experiment Station, Hawaiian Sugar Planters' Association* SORGHUM (in part), SUGAR BEET, SUGAR CANE (in part), SUGAR CROPS

Bayley, Dr Stanley Thomas *Division of Applied Biology, National Research Council of Canada* CELL WALLS IN PLANTS

Beachell, William A *Agricultural Marketing Service, Grain Division, U.S Department of Agriculture* PEA (in part)

Bear, Dean Richard S *College of Sciences and Humanities, Iowa State University* CYTOLOGY (MOLECULAR BASIS)

Beard, Robert Gordon *Instructor in Biology, Swarthmore College* HEMATOPOIESIS (in part)

Bearden, Prof J A *Johns Hopkins University* ATOMIC CONSTANTS (in part), X-UNIT

Beaumont, Dr Arthur Bishop *Professor emeritus of Agronomy, University of Massachusetts* BUCKWHEAT, RAPE, SUNFLOWER

Beaumont, Prof Ross A *Professor of Mathematics, University of Washington* DETERMINANT, EQUATIONS, THEORY OF, MATRIX THEORY, other articles in mathematics

Beaver, Wallace W *Director of Research and Development, Brush Beryllium Company* BERYLLIUM ALLOYS, BERYLLIUM METALLURGY

Bechtol, Dr Charles O *Division of Orthopedic Surgery, University of California Medical School* BONE (BIOPHYSICS), PROSTHESIS

Beck, Dr Charles B *Assistant Professor of Botany, University of Michigan* LEPIDODENDRALES

Becken, Eugene Duane *Vice-President, Operations Engineering, RCA Communications, Inc* TELEGRAPHY (in part)

Becker, Dr Donald Eugene *Department of Animal Science, University of Illinois* SWINE PRODUCTION.

Becker, Prof Elery R *Professor of Parasitology, Arizona State University* SPOROZOA, articles on related taxonomic groups

Beckhorn, Dr Edward John *Director of Research, Wallerstein Company* ENZYME (INDUSTRIAL PRODUCTION)

Baer, Dr Donald R. *Jackson Laboratory, Organic Chemicals Department E I. du Pont de Nemours and Company* ALICYCLIC HYDROCARBON.

Bagnall, Dr. Kenneth Winfield. *Research Chemist, United Kingdom Atomic Energy Authority.* POLONIUM.

Bailey, Dr Reeve M *Professor of Zoology, University of Michigan.* PISCES (ZOOLOGY); articles on related taxonomic groups

Bain, Prof. George W. *Amherst College, Department of Geology.* MINERAL RESOURCE AREAS.

Baird, Dr Donald. *Assistant Curator of Vertebrate Paleontology, Princeton University* MESOSAURIA

Baker, Dr. Edward W *Entomology Research Division, Agricultural Research Service, U S Department of Agriculture* TROMBIDIFORMES

Baker, Prof William Kaufman *Professor of Zoology, University of Chicago.* MUTATION

Baldwin, Prof William Marsh, Jr *Case Institute of Technology* PLASTIC DEFORMATION OF METAL.

Ball, Dr. C Olin. *Department of Food Science, Rutgers University.* FOOD ENGINEERING (in part).

Ballard, Prof William Whitney *Zoology Department, Dartmouth College* ESOPHAGUS, PHARYNX

Balsley, Dr James R *Chief, Geophysics Branch, U S Geological Survey* AEROMAGNETIC SURVEYING

Banks, Dr Harlan P *Professor of Botany, Cornell University* HYENIALES, PSEUDOBORNIALES

Barer, Dr Robert *University Demonstrator in Human Anatomy, Oxford University, England* MICROSCOPE, INTERFERENCE, MICROSCOPE, PHASE CONTRAST

Barghoorn, Prof Elso S *Department of Biology, Harvard University* CORDAITALES, NOEGGERATHIALES, PETRIFACTION

Barker, Prof H A *Department of Biochemistry, University of California* BACTERIAL METABOLISM (in part), PROPIONIBACTERIACEAE

Barker, Dr Joseph W *Chairman of the Board (retired), Research Corporation* ENGINEERING

Barksdale, Prof Lane *Department of Microbiology, New York University College of Medicine* DIPHTHERIA

Barnard, Dr J. Laurens *Director of Zoology, Beaunette Foundation* AMPHIPODA, GAMMARIDEA

Barnes, Dr Harold *Senior Principal Scientific Officer, The Scottish Marine Biological Association, Scotland* UNDERWATER TELEVISION

Barnes, Prof Ralph M *Professor of Engineering and Production Management, University of California at Los Angeles* INDUSTRIAL ENGINEERING

Barnett, Dr Roy N *Associate Clinical Professor of Pathology, Yale University School of Medicine* HERNIA, KIDNEY DISORDERS, REPRODUCTIVE SYSTEM DISORDERS, URINARY BLADDER DISORDERS

Barrington, Prof Ernest James William *Department of Zoology, The University, Nottingham, England* FEEDING MECHANISMS AND DIGESTION.

Barry, Dr. Alexander *Professor of Anatomy, Department of Anatomy, University of Michigan* CARDIOVASCULAR SYSTEM (in part)

Barstow, John MacDonald *Bell Telephone Laboratories, Inc* CLOSED-CIRCUIT TELEVISION

Beutner, Dr R. H. *College of Osteopathic Medicine and Surgery, Iowa* BIOELECTRIC MODEL

Bever, Dr Michael Berliner *Professor of Metallurgy, Massachusetts Institute of Technology* METALLOGRAPHY

Beverton, Raymond John Heaphy *Ministry of Agriculture, Fisheries and Food, England* SEA WATER FERTILITY (in part).

Bewley, Loyal V. *Dean of College of Engineering, Lehigh University* SYNCHRONOUS MOTOR; TRANSIENT, ELECTRIC; other articles on electric motors

Bicknell, Prof Joseph. *Associate Professor of Aeronautics and Astronautics, Massachusetts Institute of Technology* AERODYNAMIC FORCE

Biermann, David J *Vice-President, Hartzell Propeller, Inc* PROPELLER, AIR

Bigeleisen, Dr Jacob *Brookhaven National Laboratory.* DEUTERIUM

Bikales, Dr Norbert M *Research Chemist, American Cyanamid Company* CYANOETHYLATION

Billingham, Dr Rupert Everett *Professor of Zoology, University of Pennsylvania* INTEGUMENT (in part)

Billings, Dr Bruce Hadley *Baird-Atomic, Inc; Harvard College Observatory* CRYSTAL OPTICS, INTERFERENCE OF WAVES, POLARIZED LIGHT, other articles in physical optics

Billings, Dr W D *Professor of Botany, Duke University* ECOLOGY, PHYSIOLOGICAL

Billington, Dr Douglas Sheldon *Director, Solid State Division, Oak Ridge National Laboratory* RADIATION DAMAGE (INANIMATE MATERIALS)

Billmeyer, Dr Fred W, Jr *Polychemicals Department, E I du Pont de Nemours and Company, Inc* SCATTERING (ELECTROMAGNETIC RADIATION), ULTRAVIOLET RADIATION

Bing, Prof R H. *Department of Mathematics, University of Wisconsin* SET THEORY

Birkhoff, Garrett *Professor of Pure and Applied Mathematics, Harvard University* BOOLEAN ALGEBRA, LATTICE (MATHEMATICS)

Bishop, Dr David W *Research Professor of Embryology, Carnegie Institution of Washington* FERTILIZATION

Black, Dr Harold S *Member of Technical Staff, Bell Telephone Laboratories, Inc* AMPLITUDE MODULATION FREQUENCY MODULATION, PULSE MODULATION, other articles in communications

Black, Dr John D *Professor of Zoology, Missouri Teachers College* Series of articles in zoology

Black, Dr L M *Department of Botany, University of Illinois* PLANT VIRUS

Black, Prof Paul H *Department of Mechanical Engineering, Ohio University* MACHINE KEY, ROPE, TOLERANCE, other articles in machine design

Black, Prof Robert F *Department of Geology, University of Wisconsin* FROST ACTION, PERMAFROST

Blair, Dr John E *Head, Department of Bacteriology, Hospital for Joint Diseases, New York* CAFFKYA TETRAGENA, STAPHYLOCOCCUS

Blair, Dr W Frank *Professor of Zoology, University of Texas* COMMUNITY CLASSIFICATION

Blake, David K *Consultant, General Electric Company* ELECTRIC DISTRIBUTION SYSTEMS

Blanc, Milton L *Chief, Climatological Investigations Branch, Office of Climatology, U.S Weather Bureau* AGRICULTURAL METEOROLOGY (in part), GROWING SEASON

Beerstecher, Prof Ernest, Jr *Professor of Biochemistry, School of Dentistry, University of Texas* PETROLEUM MICROBIOLOGY.

Beeson, Dr. Paul Bruce. *Professor of Medicine, Yale University.* CYSTITIS, ENDOCARDITIS, FEVER; other articles in medical science.

Beidler, Prof. Lloyd M. *Professor of Physiology, Florida State University* CHEMORECEPTION.

Beistline, Dean Earl Hoover. *Dean, School of Mines, University of Alaska.* MINING, PLACER

Belfort, Dr. Alan Michael. *Research chemist, American Viscose Corporation.* MANNAN (in part).

Bell, Kenneth E. *Vice-President and Technical Director (retired), A. C Lawrence Leather Company* LEATHER AND FUR PROCESSING

Bell, Prof W Charles *Professor of Geology, University of Texas* CAMBRIAN.

Bender, Prof Paul J *Professor of Chemistry, University of Wisconsin* ACTIVITY (THERMODYNAMICS), FREE ENERGY, THERMODYNAMICS (CHEMICAL), other articles in chemical thermodynamics

Benedetti-Pichler, Dr A A *Queens College* CHEMICAL MICROSCOPY, QUALITATIVE CHEMICAL ANALYSIS, SPOT-TEST ANALYSIS

Benedict, Dr Robert Glenn *In Charge, New Products and Reactions Exploration Investigations, Fermentation Laboratory* POLYMYXIN

Benfer, Neil A *Earth Sciences Editor, McGraw-Hill Encyclopedia of Science and Technology* INDEX FOSSIL, SEA STATE, SEA WATER (in part)

Benner, Dr Frank C *National Research Corporation* VACUUM FUSION

Bennett, Dr H Stanley *Department of Anatomy, University of Washington* CELL (BIOLOGICAL)—in part

Bennett, Dr Ralph E *Head Department of Microbial Biochemistry, Squibb Institute for Medical Research* PENICILLIN, TETRACYCLINE, other articles on antibiotics and on vitamins (coauthored)

Benton, Prof George Stock *Professor of Meteorology, Johns Hopkins University* HYDROMETEOROLOGY

Beranek, Dr Leo Leroy *Presdent, Bolt, Beranek and Newman, Inc* SOUND, WAVE MOTION

Berg, Dr Clyde *Manager, Design Division, Union Oil Company of California* SOLIDS PUMP

Berger, Dr France B *Director of Planning and Requirements, GPL Division, General Precision, Inc* DOPPLER RADAR

Bergeron, Prof Tor *Meteorologiska Institutionen, Sweden* METEOROLOGY (in part)

Bergmann, Prof Peter G *Professor of Physics, Syracuse University* CLOCK PARADOX, FOURTH DIMENSION, RELATIVITY SPACE-TIME

Bernhardt, Carl Peter *Executive Assistant, Industrial Electronics Department, Westinghouse Electric Corporation* DIELECTRIC HEATING, INDUCTION HEATING

Bernheimer, Dr Allen W. *New York University* LEUKOCIDIN

Bernstein, Dr Robert Isaac. *Associate Director, Electronics Research Laboratories, Columbia University* RADAR, MOVING-TARGET INDICATION, other articles on radar

Berson, Prof Jerome A *Professor of Chemistry, University of Southern California* ORGANIC REACTION MECHANISM

Bethe, Prof. Hans Albrecht *Laboratory of Nuclear Studies, Cornell University* MATHEMATICAL PHYSICS; THEORETICAL PHYSICS

Boswell, Dr Victor R *Horticulturist, U.S. Department of Agriculture* MELON GROWING; articles on various melons

Botset, Prof Holbrook G *Professor of Petroleum Engineering, University of Pittsburgh* PHOTOCLINOMETER

Bouton, George M *Bell Telephone Laboratories, Inc.* SOLDERING

Bovell, Carlton Rowland *Assistant Professor of Life Sciences, University of California, Riverside* METHANOMONADACEAE (in part).

Bowden, W C. *Vice-President* (retired), *Ledoux and Company.* ASSAYING (in part).

Bower, Frank H *Engineering coordinator, Sylvania Semiconductor Division* THERMISTOR

Bowles, Oliver *Consultant in Mining Engineering.* QUARRYING; STONE AND STONE PRODUCTS

Bowman, Dean Harry Lake *Drexel Institute of Technology.* STRUCTURAL ANALYSIS, STRUCTURAL DEFLECTION, TRUSS.

Bowman, Rush A *Consulting Engineer* COMPARATOR, GAGES, OPTICAL FLAT.

Bowman, Richard George *Technical Assistant to the President, Republic Aviation Corporation* AIRCRAFT; STREAMLINING; TAIL ASSEMBLY.

Bowman, Dr Thomas E *Associate Curator, Division of Marine Invertebrates, Smithsonian Institution* FLABELLIFERA; HYPERIDEA, PERACARIDA

Boyden, Prof Edward Allen *Department of Anatomy, University of Washington School of Medicine* GALLBLADDER

Bozorth, Dr Richard Milton *Research Physicist, Bell Telephone Laboratories, Inc* FERRITE, MAGNETIC MATERIALS, other articles on magnetic materials

Bradley, Charles Byron *Johns Manville Research Center* INSULATION, HEAT

Bradley, Dr William Frank *Chemist, Illinois Geological Survey* ASBESTOS, SEPIOLITE, SERPENTINE

Bradner, Mead *Manager, Research and Development, The Foxboro Company.* FLOW MEASUREMENT (in part)

Bradsher, Dr Charles Kilgo *Professor of Chemistry, Duke University* AROMATIC HYDROCARBON, BENZENE, FRIEDEL-CRAFTS REACTION, other articles on aromatic hydrocarbons

Brand, Dr Louis M D. *Anderson Professor of Mathematics, University of Houston* BARICENTRIC CALCULUS, MATRIX CALCULUS, PROGRESSION (MATHEMATICS), other articles in mathematics

Branson, Dr Carl C *School of Geology and Oklahoma Geological Survey, University of Oklahoma* BLACK SHALE, REDBED

Brattstrom, Dr Bayard H *Assistant Professor of Biology, Orange County State College, California* LEPIDOSAURIA

Braun, Dr Werner *Professor of Bacteriology, Institute of Microbiology, Rutgers University* BACTERIAL GENETICS

Bredig, Dr Max A *Associate Director, Chemistry Division, Oak Ridge National Laboratory* FUSED-SALT PHASE EQUILIBRIA (in part)

Breger, Dr Irving Arthur *U.S Geological Survey* ASPHALT AND ASPHALTITE (in part), GILSONITE, OIL SHALE, other articles in petroleum geology

Breit, Prof Gregory *Professor of Physics, Yale University* SCATTERING EXPERIMENTS, NUCLEAR

Breiz, Prof J Harlen *Department of Geology, University of Chicago* CAVE; KARST TOPOGRAPHY.

Bricker, Prof. Clark E *Department of Chemistry, Princeton University* TITRATION, VOLUMETRIC ANALYSIS; other articles on volumetric analysis

Blankenship, Dr. Forrest F. *Reactor Chemistry Division, Oak Ridge National Laboratory.* FUSED-SALT PHASE EQUILIBRIA (in part).

Blaser, H Weston. *Associate Professor of Botany, University of Washington* BARK; PERIDERM; PITH.

Blatt, Dr. Frank J. *Associate Professor of Physics, Michigan State University* BOLTZMANN TRANSPORT EQUATION; FREE-ELECTRON THEORY OF METALS; HALL EFFECT, other articles in solid-state physics.

Blew, J. Oscar, Jr *Head of Section on Preservative Treatment, U.S. Forest Products Laboratory.* WOOD PRESERVATION

Blizard, Everitt P *Director, Neutron Physics Division, Oak Ridge National Laboratory* RADIATION SHIELDING

Blum, Dr William *National Bureau of Standards (retired)* ELECTROPLATING OF METALS

Blumenstock, Dr. David L. *Climatologist, U S Weather Bureau,* CLIMATIC PREDICTION, CLIMATOLOGY

Blumenthal, Prof. Leonard M. *Professor of Mathematics, University of Missouri* ANALYTIC GEOMETRY, LOGIC; PROJECTIVE GEOMETRY; other articles in geometry

Boardman, Dr. Horace P *Professor emeritus of Civil Engineering, University of Nevada* SNOW GAGE, SNOW SURVEYING

Boast, Dr Warren B *Head, Department of Electrical Engineering, Iowa State University.* ILLUMINATION, LIGHT AMPLIFIER; LIGHT PANEL, LUMINAIRE

Bocciarelli, Carlo V *Associate Director of Research, Philco Corporation* PARAMETRIC AMPLIFIER

Bochner, Dr Salomon. *Henry Burchard Fine Professor of Mathematics, Princeton University* MATHEMATICS

Boden, Dr Brian Peter *Assistant Research Biologist, Scripps Institution of Oceanography, University of California* EUPHAUSIACEA

Bodian, Dr David *Professor and Director, Department of Anatomy, Johns Hopkins University School of Medicine* NERVOUS SYSTEM (in part).

Boell, Prof Edgar John *Department of Zoology, Yale University* ANIMAL GROWTH

Bohonos, Dr Nestor *Lederle Laboratories Division, American Cyanamid Company* CHLORTETRACYCLINE

Boisvert, Dr Paul L *Research Associate, Director of Disease Laboratory, Yale School of Medicine, Attending Pediatrician, Grace–New Haven Community Hospital* LANCEFIELD DIFFERENTIATION SCHEME, RHEUMATIC FEVER, STREPTOCOCCUS, other articles in medical science

Boke, Dr Norman H *Professor of Plant Sciences, University of Oklahoma.* EPIDERMIS, PLANT, MERISTEM, APICAL, SCLERENCHYMA

Bolz, Dr Ray E *Head of Mechanical Engineering Department, Case Institute of Technology* NUTATION (ASTRONOMY AND MECHANICS), POINSOT'S METHOD, PRECESSION, RIGID-BODY DYNAMICS

Bondurant, Donald C *U S Army Engineers Division, Missouri River (Sediment Investigations Section).* REVETMENT (in part)

Booker, Dr Henry G *School of Electrical Engineering, Cornell University* IONOSPHERE

Borcherdt, E R. *Borcherdt & Smith Mining Consultants* MINING, UNDERGROUND.

Borthwick, Dr. Harry Alfred *Crops Research Division, U.S Department of Agriculture.* PHOTOPERIODISM IN PLANTS

Boston, Orlan William *Professor emeritus, College of Engineering, University of Michigan* MACHINABILITY (METALS)

Brown, Lawrence C. *Contract Administrator, Grumman Aircraft Engineering Corporation* BALLISTIC MISSILE; GUIDED MISSILE

Brownell, Dr Go[illegible]
eral Hospital.
[illegible]
NIQUES; RADIO-[illegible]

Broyer, Theodore Clarence *Vice-Chairman of Department of Soils and Plant Nutrition, University of California* FERTILIZING (in part), HYDROPONICS, PLANT, MINERAL NUTRITION OF; PLANT, MINERALS ESSENTIAL TO

Bruhn, Prof Hjalmar D *Agricultural Engineering Department, University of Wisconsin.* AGRICULTURAL SOIL AND CROP PRACTICES (in part)

Bruner, Prof Jerome Seymour *Professor of Psychology, Harvard University* ABNORMAL BEHAVIOR, FREUDIANISM PERSONALITY THEORY, other articles on neuroses (all co-authored).

Bryan, Prof Leslie Aulls *Director, Institute of Aviation; Professor of Management, University of Illinois* AIR TRANSPORTATION, AVIATION

Bryson, Prof Arthur Earl, Jr *Harvard University* EULER'S MOMENTUM THEOREM, FLUID-FLOW PRINCIPLES; KARMAN VORTEX STREET, other articles in fluid mechanics

Buchwald, Dr Niels Fabritius *Professor in Plant Pathology, The Royal Veterinary and Agricultural College, Copenhagen, Denmark* FUNGI IMPERFECTI, articles on related taxonomic groups

Buck, Dr Dudley A *Department of Electrical Engineering, Massachusetts Institute of Technology* CRYOTRON

Buckley, Donald J. *Senior Research Associate, Esso Research and Engineering Company* COHESION (PHYSICS)—in part

Budlong, A L *Secretary and General Manager, American Radio Relay League, Inc* AMATEUR RADIO

Buechner, Prof William Weber *Professor of Physics, Massachusetts Institute of Technology* BARN (UNIT), NUCLEAR RADIATION, NUCLEAR REACTION, SPALLATION REACTION

Buettner, Dr Konrad J K *Department of Meteorology and Climatology, University of Washington* BIOCLIMATOLOGY

Bullen, Prof Keith Edward *Professor of Applied Mathematics, University of Sydney, Australia* EARTH INTERIOR

Bullington, Kenneth *Transmission Systems Engineer, Bell Telephone Laboratories, Inc.* RADIO-WAVE PROPAGATION

Bullock, Prof Theodore H *Department of Zoology, University of California* HEART (GANGLIONIC PACEMAKER), HEMICHORDATE, articles on related taxonomic groups

Bunker, Brig General William B *United States Army* HELICOPTER

Bunnett, Dr Joseph F *Professor of Chemistry, Brown University* SUBSTITUTION REACTION, other articles on organic reaction mechanisms

Burbidge, Dr E. Margaret *Associate Professor, Yerkes Observatory, University of Chicago* ELEMENTS AND NUCLIDES (ORIGIN)

Burchard, Kenneth R *Assistant Dean, School of Printing Management, Carnegie Institute of Technology.* PRINTING IN COLOR

Burrows, Prof William *Professor of Microbiology, University of Chicago* CHOLERA VIBRIO

Burtner, Prof Evert *Associate Professor (emeritus) of Naval Architecture and Marine Engineering, Massachusetts Institute of Technology* MARINE ENGINE

Burton, Dr Milton *Professor of Chemistry, Director, Radiation Project, University of Notre Dame* RADIATION CHEMISTRY

Burton, Dr Ralph A *Manager, Tribomechanics Section, Southwest Research Institute* ICE POINT, TEMPERATURE, THERMAL EXPANSION

Brickley, Robert L *Manager, Quality Assurance Department, Semiconductor Department, Westinghouse Electric Corporation.* ANALYSIS OF VARIANCE.

Bridgman, Prof. Percy Williams *Harvard University (retired)* HIGH-PRESSURE PHYSICS, SCIENCE; SCIENTIFIC METHODS; other articles on logic

Brigham, Harry Straight. *Executive Vice-President, Divilyn Drilling Corporation* OIL AND GAS WELLS (in part).

Bright, Prof. James Rieser *Graduate School of Business Administration, Harvard University.* AUTOMATION

Brimm, Dr Eugene O *Assistant Manager, Research Linde Company, Division of Union Carbide Corporation.* METAL CARBONYL

Brindley, Dr. George W *Professor of Solid State Technology in and Head of Department of Ceramic Technology, Pennsylvania State University* APOPHYLLITE, TALC

Brinton, Dr. Edward *Scripps Institution of Oceanography* SEA WATER FERTILITY (in part)

Brockway, Prof. Lawrence O *Chemistry Department, University of Michigan* ELECTRON DIFFRACTION (in part)

Brodersen, Prof Dr Klaus *Professor of Inorganic and Analytical Chemistry, University of Tubingen, Germany* MERCURY (ELEMENT).

Brodhag, Dr Alex Edgar, Jr *Research Chemist, Union Carbide Chemicals Company* FURFURAL, SCHIFF BASE

Brodsky, Prof William A *Professor of Experimental Medicine, University of Louisville School of Medicine* OSMOREGULATORY MECHANISMS

Broecker, Prof Wallace S *Department of Geology, Columbia University* LOW-LEVEL COUNTING, RADIOCARBON DATING

Brombacher, Dr William George *Mechanical Engineer, National Bureau of Standards* ACCELERATION MEASUREMENT, AIRCRAFT INSTRUMENTATION, TIME-INTERVAL MEASUREMENT, other instrumentation articles

Bronfenbrenner, Urie *Professor of Child Development and Family Relationships, Cornell University* INTELLIGENCE

Brooke, Dr M M *Chief, Microbiology Section, Communicable Disease Center, U S Public Health Service, Associate Professor of Parasitology, Emory University College of Medicine* PROTOMASTIGIDA, TRYPANOSOMATIDAE

Brooks, Dr Reid M *Professor, Department of Pomology, University of California* FRUIT (BOTANY)—in part

Brooks, Stanley Nelson *Research Agronomist, Crops Research Division, Agricultural Research Service, U S Department of Agriculture* HOP

Brouwer, Prof Dirk *Director, Observatory, Yale University* ANTIGRAVITY, GRAVITATION, GRAVITY

Brower, Prof William B, Jr *Department of Aeronautical Engineering Rensselaer Polytechnic Institute* ELECTROLYTIC TANK

Brown, Prof Frank Arthur, Jr *Morrison Professor of Biology, Northwestern University* PERIODICITY IN ORGANISMS, SIPUNCULOIDEA

Brown, Prof Frederick C *Department of Physics, University of Illinois* COLOR CENTERS, PHOTOLYSIS (PHOTOCHEMISTRY)

Brown, Dr Harold *Director, Lawrence Radiation Laboratory, Livermore, California* NUCLEAR EXPLOSION

Brown, Prof Harold W *College of Physicians and Surgeons, Columbia University* STRONGYLOIDEA

Brown, Dr Henry. *Research Director, Udylite Research Corporation* CADMIUM

Carson, Robert William *Product Engineering* CLADDING, METAL INSPECTION, MAGNETIC.

Carter, Archie Newton *President, Carter, Krueger, and Associates, Inc* TRANSPORTATION ENGINEERING; TRAFFIC ENGINEERING, PAVEMENT; HIGHWAY ENGINEERING

Carter, Dr George S *Fellow of Corpus Christi College; Lecturer in Zoology, Cambridge University, England* MACROEVOLUTION

Carter, Prof Herbert E *Department of Chemistry and Chemical Engineering, University of Illinois* CETYL ALCOHOL; GLYCOLIPID; LIPID—all in part, other articles on lipids (co-authored).

Caspari, Dr Ernest W. *Department of Biology, University of Rochester.* MATERNAL INFLUENCE, CYTOPLASMIC INHERITANCE

Caspers, Prof Dr Hubert *Head, Hydrobiological Department, Zoologisches Staatsinstitut, Germany* BLACK SEA.

Cave, Dr Genille C B *Department of Chemistry, McGill University, Canada* FORENSIC CHEMISTRY

Chace, Dr Fenner Albert, Jr *Curator, Division of Marine Invertebrates, Smithsonian Institution* DECAPODA (CRUSTACEA)

Chamberlain, Dr Joseph W *Associate Professor, Yerkes Observatory, University of Chicago* AURORA.

Chandler, Richard F *Mechanical Engineer, Air Force Missile Development Center, Holloman Air Force Base, New Mexico* SHADOWGRAPH OF FLUID FLOW

Chaney, Dr Ralph W *Department of Paleontology, University of California* PALEOBOTANY (in part).

Chang, Prof M C *Department of Biology, Boston University* REPRODUCTIVE SYSTEM (in part)

Chao, Dr Edward C T *U S Geological Survey* GYPSUM, other articles on sulfate and related minerals

Chapman, Prof Carleton A *Professor of Geology, University of Illinois* IGNEOUS ROCKS, MAGMA, PETROGRAPHIC PROVINCE, series of articles in igneous petrology

Chapman, Dr Sydney *Advisory Scientific Director, Geophysical Institute, University of Alaska, Member of Research Staff, High Altitude Observatory, Boulder, Colorado* GEOMAGNETIC STORM, GEOMAGNETIC VARIATIONS, TRANSIENT, GEOMAGNETISM

Charlton, Dr Ernest E *Research Engineer (retired)* X-RAY TUBE

Charney, Prof Jule G *Department of Meteorology, Massachusetts Institute of Technology* WEATHER (FORECASTING AND PREDICTION)—in part

Chase, Prof Herman Burleigh *Biology Department, Brown University* HAIR

Cheadle, Prof Vernon Irvin *Professor of Botany, University of California* MERISTEM, LATERAL, PERICYCLE, PHLOEM, XYLEM

Cheetham, Dr Alan H *Instructor in Geology, Louisiana State University* CENOZOIC, articles on related divisions of geologic time (co-authored)

Chellis, Robert Dunning *Structural Engineer, Stone and Webster Engineering Corporation* CAISSON FOUNDATION, FOUNDATIONS, PILE FOUNDATIONS, related articles in civil engineering

Chen, Dr Shih-Yuan *Chief, Aerothermodynamics Unit, Aero-Space Division, Boeing Airplane Company* THERMAL STRESS, AEROTHERMODYNAMICS, HYPERSONIC FLIGHT

Chenault, Roy Lee *Chief Research Engineer, Oil Well Supply Division, U.S Steel Corporation* OIL AND GAS FIELD EXPLOITATION.

Chernow, Dr Marvin A *Clinical Instructor, Pathology, Yale School of Medicine, Associate Pathologist, Norwalk Hospital* HEART DISORDERS

Chew, Frank *Research Assistant Professor, The Marine Laboratory, University of Miami* GULF OF MEXICO

Burwell, Prof. Robert L , Jr. *Professor of Chemistry, Northwestern University* CATALYSIS.

Busch, Prof. Daryle H *Department of Chemistry, Ohio State University* CHEMICAL STRUCTURES; NONSTOICHIOMETRIC COMPOUNDS, SOLID-STATE CHEMISTRY

Butler, Prof. Elmer Grimshaw *Henry Fairfield Osborn Professor of Biology, Princeton University.* REGENERATION (BIOLOGY).

Butts, Prof. Allison *Professor emeritus of Metallurgy, Lehigh University.* COPPER

Butz, J S , Jr. *'Aviation Week.'* FUSELAGE

Byerly, Prof. Perry *Director of Seismographic Stations, Professor of Seismology, University of California.* EARTHQUAKE

C

Cable, Prof Raymond Millard *Professor of Zoology, Department of Biological Sciences, Purdue University.* CERCARIA, DIGENEA

Cady, Dr Gilbert Haven *Head emeritus of Coal Division, Illinois State Geological Survey* COAL, LIGNITE, PEAT.

Cain, Prof Stanley A *Charles Lathrop Pack Professor of Conservation and Chairman of Conservation Department, University of Michigan.* CLIMAX PLANT FORMATIONS, CONSERVATION OF RESOURCES

Caley, Prof Earle Radcliffe *Department of Chemistry, Ohio State University* CHEMICAL DATING, ARCHEOLOGICAL CHEMISTRY

Calhoun, Dr John C , Jr *Vice-Chancellor for Engineering, Texas A & M College System* OIL AND GAS STORAGE, PETROLEUM SECONDARY RECOVERY

Callaway, Dr Joseph *Division of Physical Science, University of California* BAND THEORY OF SOLIDS, BRILLOUIN ZONE, COHESION (PHYSICS)—in part, other articles on band structure in solids

Cambel, Dr Ali Bulent *Professor and Chairman of Mechanical Engineering, Northwestern University* GAS DYNAMICS

Cameron, Donald B *Manager, Sales Engineering, Union Carbide Consumer Products Company* SOLION

Camilli, Guglielmo C *Supervisor, Advance Development Engineering, General Electric Company* INDUCTION COIL

Camin, Dr Joseph H *Department of Zoology, University of Maryland* MESOSTIGMATA, ONYCHOPALPIDA

Cammack, R L *Manager, Plant Services Department, Westinghouse Corporation* JIG, FIXTURE, AND DIE DESIGN

Camp, Prof Charles Lewis *Department of Paleontology, University of California* ICHTHYOPTERYGIA, ICHTHYOSAURIA

Cannon, Prof Robert Hamilton, Jr *Departments of Aeronautical and Electrical Engineering, Stanford University* AUTOPILOT, GYROSCOPE, articles on navigation instruments and guidance systems.

Carew, Dr John *Professor of Horticulture, Michigan State University* VEGETABLE GROWING, series of articles on edible plants

Carlin, Dr Robert B *Becker Professor of Organic Chemistry, Carnegie Institute of Technology* PHENOL, other articles on phenols

Carpenter, Dr Charles M *University of California School of Medicine* GONORRHEA, GRAM-NEGATIVE DIPLOCOCCI, MENINGOCOCCUS

Carpenter, Prof Frank Morton *Department of Biology, Harvard University* INSECTA FOSSILS

Carritt, Dr. Dayton Ernest *Massachusetts Institute of Technology and Woods Hole Oceanographic Institution* SEA WATER (in part)

Carroll, Phil *Consulting Industrial Engineer* WAGE INCENTIVES

Clausen, Dr Harry J *Research Fellowship Review Branch, Division of Research Grants, National Institutes of Health* PINEAL BODY.

Clausen, Dr Gerard E *Arcrods Company, Sparrows Point, Maryland* WELDING AND CUTTING OF METALS

Clayton, James Monroe *Electrical Engineer, Westinghouse Electric Corporation* ELECTRIC PROTECTIVE DEVICES; GROUNDING, ELECTRICAL

Clayton, Dr Richard K *Senior Biophysicist, Oak Ridge National Laboratory* BACTERIAL MOTILITY.

Clemence, Dr Gerald M *Scientific Director, U S Naval Observatory* ASTRONOMICAL COORDINATE SYSTEMS; CALENDAR; TIME, other articles on astronomy

Clemens, William A *Research Assistant, Department of Paleontology, University of California* PANTOTHERIA, other articles on fossil mammals

Clement, Prof Anthony C *Department of Biology, Emory University* CELL LINEAGE.

Clements, Dr Leo P *Creighton University School of Medicine* RESPIRATORY SYSTEM (in part)

Clements, Dr Thomas *Head, Department of Geology, University of Southern California* DESERT EROSION FEATURES, DUNE (in part), PLAYA

Clench, Dr William James *Curator of Mollusks, Museum of Comparative Zoology, Harvard University.* MOLLUSCA, articles on related taxonomic groups

Cleveland, Prof Laurence Fuller *Associate Professor of Electrical Engineering, Northeastern University.* DIRECT-CURRENT MOTOR, DYNAMIC BRAKING

Cloud, Dr. Preston E., Jr *U S Geological Survey* CORAL REEF, REEF, other articles on types of reef

Cobban, Dr William Aubrey *Geologist, U.S Geological Survey* CRETACEOUS, MESOZOIC

Cobine, Dr James Dillon *General Electric Research Laboratory.* GAS TUBE, THYRATRON, VOLTAGE-REGULATOR TUBE

Cochran, David *General Electric Company* JET PROPULSION, PROPULSION

Cochrane, Prof John D *Assistant Professor, Department of Oceanography, Texas A & M College* SEA WATER (in part).

Code, Prof Charles Frederick *Mayo Foundation and Mayo Clinic* DIGESTIVE SYSTEM (in part)

Coggeshall, Dr Ivan S *Manager, Technical Operations Services, American Institute of Electrical Engineers* TELEGRAPHY (in part)

Cohart, Prof Edward Maurice. *Department of Public Health, Yale University School of Medicine* PUBLIC HEALTH

Cohen, Charles A *Research Associate, Esso Research and Engineering Company* ADDITION REACTION, DIENE, UNSATURATED HYDROCARBONS, other articles on unsaturated hydrocarbons

Cole, Prof LaMont C *Department of Zoology, Cornell University* POPULATION DYNAMICS

Cole, Marc *Senior Chemist, Production and Development, Hoffmann-LaRoche, Inc* VITAMIN B_6 (in part).

Cole, Dr W Storrs *Professor of Geology and Chairman of Department, Cornell University* NUMMULITES

Coleal, Ernest *Chief, Engineering Section, Experimental Track Branch, Air Force Flight Test Center, Edwards Air Force Base, California* ROCKET-SLED TESTING

Coleman, Dr Donald G *Chief, Research Publications and Information, Forest Products Laboratory, U.S Department of Agriculture* WOOD FIBER PRODUCTS

Chickering, Dr. Arthur Merton *Professor emeritus, Albion College.* ARANEAE

Childberg, Guy Lewis *Outside Plant Engineer, American Telephone and Telegraph Company* TELEPHONE SYSTEMS CONSTRUCTION.

Chilton, Dr St. John P. *Department of Botany, Louisiana State University.* SUGAR CANE, RICE (both in part)

Chitwood, Dr. Benjamin Goodwin. *Laboratory of Comparative Biology, Kaiser Foundation Research Institute* NEMATODA.

Chow, Dr. Kao Liang. *Department of Physiology, University of Chicago.* SENSORY LEARNING

Christ, Dr C. L *Physicist, U.S. Geological Survey.* BORACITE, BORATE MINERALS

Christensen, Dr. Clyde M *Professor of Plant Pathology, University of Minnesota* PLANT DISEASE (in part).

Christensen, Dr J J *Institute of Agriculture, University of Minnesota* BARLEY, CORN, FLAX, WHEAT—all in part

Chute, Challoner Richard *General Aniline and Film Corporation, Central Research Laboratory* FIBER, NATURAL, TEXTILE CHEMISTRY

Clapp, Prof Leallyn B *Chemistry Department, Brown University* AMINE, OXIME, other articles on organonitrogen compounds

Clapp, Philip Fanshawe *U S Department of Commerce, Weather Bureau* WEATHER, WEATHER MAP

Clark, Prof George L *Research Professor of Analytical Chemistry, University of Illinois* X-RAY(S), PHYSICAL NATURE OF, X-RAY OPTICS

Clark, Dr Kenneth G *Fertilizer Investigations Research Branch, Soil and Water Conservation Research Division, Agricultural Research Service, U S Department of Agriculture* FERTILIZER

Clark, Dr Sam Lillard *Professor of Anatomy and Head of Department, Vanderbilt University Medical School* NERVOUS SYSTEM (in part)

Clark, Sydney P, Jr *Geophysicist, Carnegie Institution of Washington* EARTH (HEAT FLOW)

Clark, Pearl F (Mrs Wallace) *Honorary Director, Wallace Clark Center of International Management, New York University* GANTT CHART

Clark, Dr Walter *Head, Applied Photography Division, Research Laboratories, Eastman Kodak Company* CAMERA, PHOTOGRAPHY, PHOTOGRAPHY, COLOR, other articles on photography

Clark, William Petzold *Wall Colmonoy Corporation* METAL COATINGS (in part)

Clarke, Ellen *Columbia Organic Chemical Company* HALOFORM REACTION, HALOGENATED HYDROCARBON (in part)

Clarke, Dr George Leonard *Associate Professor of Zoology, Harvard University, and Marine Biologist, Woods Hole Oceanographic Institution* MICRORADIOGRAPHY (in part), RADIOGRAPHY, SEA WATER (in part)

Clarke, Dr J Harold *Horticulturist, Clarke Nursery Long Beach, Washington* FRUIT GROWING (SMALL) series of articles on fruits

Clarke, John H *Engineering Design Supervisor Air Conditioning and Power, Visking Company, Division of Union Carbide Corporation* VENTILATION

Clarridge, Ralph Ernest *Manager, Measurements Laboratory, General Electric Company* LEVEL MEASUREMENT TEMPERATURE MEASUREMENT, WEIGHT MEASUREMENT, articles on various measuring instruments

Clausen, Dr Harry J *Research Fellowship Review Branch, Division of Research Grants, National Institutes of Health* PINEAL BODY

Claussen, Dr Gerard E. *Arcrods Company, Sparrows Point, Maryland* WELDING AND CUTTING OF METALS

Clayton, James Monroe *Electrical Engineer, Westinghouse Electric Corporation* ELECTRIC PROTECTIVE DEVICES; GROUNDING, ELECTRICAL

Clayton, Dr Richard K *Senior Biophysicist, Oak Ridge National Laboratory* BACTERIAL MOTILITY

Clemence, Dr Gerald M *Scientific Director, U.S. Naval Observatory* ASTRONOMICAL COORDINATE SYSTEMS, CALENDAR; TIME; other articles on astronomy.

Clemens, William A *Research Assistant, Department of Paleontology, University of California* PANTOTHERIA; other articles on fossil mammals

Clement, Prof Anthony C. *Department of Biology, Emory University* CELL LINEAGE.

Clements, Dr Leo P *Creighton University School of Medicine* RESPIRATORY SYSTEM (in part)

Clements, Dr Thomas *Head, Department of Geology, University of Southern California* DESERT EROSION FEATURES, DUNE (in part), PLAYA

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Cobban, Dr William Aubrey *Geologist, U S Geological Survey.* CRETACEOUS, MESOZOIC

Cobine, Dr James Dillon *General Electric Research Laboratory* GAS TUBE, THYRATRON, VOLTAGE-REGULATOR TUBE

Cochran, David *General Electric Company* JET PROPULSION, PROPULSION

Cochrane, Prof John D *Assistant Professor, Department of Oceanography, Texas A & M College* SEA WATER (in part)

Code, Prof. Charles Frederick *Mayo Foundation and Mayo Clinic* DIGESTIVE SYSTEM (in part)

Coggeshall, Dr Ivan S *Manager, Technical Operations Services, American Institute of Electrical Engineers* TELEGRAPHY (in part)

Cohart, Prof Edward Maurice *Department of Public Health, Yale University School of Medicine* PUBLIC HEALTH

Cohen, Charles A *Research Associate, Esso Research and Engineering Company* ADDITION REACTION, DIENE, UNSATURATED HYDROCARBONS, other articles on unsaturated hydrocarbons

Cole, Prof LaMont C *Department of Zoology, Cornell University* POPULATION DYNAMICS.

Cole, Marc *Senior Chemist, Production and Development, Hoffmann-LaRoche, Inc* VITAMIN B_6 (in part)

Cole, Dr W Storrs *Professor of Geology and Chairman of Department, Cornell University* NUMMULITES

Coleal, Ernest. *Chief, Engineering Section, Experimental Track Branch, Air Force Flight Test Center, Edwards Air Force Base, California* ROCKET-SLED TESTING

Coleman, Dr Donald G *Chief, Research Publications and Information, Forest Products Laboratory, U S Department of Agriculture* WOOD FIBER PRODUCTS

Coleman, Prof. Nathaniel Terry. *Soils Department, North Carolina State College* SOIL (in part).

Comings, Dean Edward Walter. *School of Engineering, University of Delaware.* AUTOCLAVE; HIGH-PRESSURE PROCESSSES

Comstock, John Paul *Naval Architect (retired).* SHIPBUILDING.

Condon, Prof. E U. *Wayman Crow Professor of Physics, Washington University.* ADHESION, MOLECULAR; ISOTOPIC SPIN.

Conklin, Groff *Senior Researcher, Scientific Investigative Group, Bell System Science Series* Series of miscellaneous articles.

Conner, Dr. Herbert W. *William Wrigley Jr. Company.* FOOD MANUFACTURING (in part)

Connors, James F. *Head, Section B, 10 x 10 Foot Supersonic Wind Tunnel Branch, Propulsion Aerodynamics Division, National Aeronautics and Space Administration.* DIFFUSER; SUPERSONIC DIFFUSER (both in part)

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Coons, Dr George Herbert *Collaborator, Agriculture Research Service, U S Department of Agriculture* SUGAR BEET (in part)

Copeland, Prof D. Eugene *Chairman, Zoology Department, Tulane University* SWIM BLADDER

Copenhaver, Prof. W M *Professor of Anatomy, College of Physicians and Surgeons, Columbia University* CARDIOVASCULAR SYSTEM (in part)

Corben, Dr Herbert Charles *Ramo-Wooldridge* CENTRODE, DYNAMICS, KINEMATICS, MOTION.

Core, Dr Earl L *Chairman, Department of Biology, West Virginia University* HERBARIUM, PLANT KEYS, PLANT NAMES, other articles in botany

Corey, Horace Edmund, Jr *Transmission Maintenance and Coordination Engineer, American Telephone and Telegraph Company* TELEPHONE SERVICE (in part)

Corliss, Dr John O *Associate Professor of Zoology, University of Illinois* CILIOPHORA, articles on related taxonomic groups

Corliss, William *Flight Propulsion Laboratory, General Electric Company* NUCLEAR AIRCRAFT PROPULSION (in part), NUCLEAR ROCKET.

Cornish, Dr Joseph Jenkins, III *Aerophysics Department, Mississippi State University* BOUNDARY-LAYER FLOW

Corson, Almon J *Consulting Engineer, Instrument Department, General Electric* POTENTIOMETER (VOLTAGE MEASUREMENT), VOLTAGE MEASUREMENT (in part), VOLTMETER

Cotton, Irwin W *Retired* THERMOSTAT

Couch, Prof. John N *Kenan Professor of Botany, University of North Carolina* ACTINOPLANACEAE

Coulombre, Dr Alfred J *Department of Anatomy, Yale University School of Medicine* EYE (in part)

Court, Dr Arnold. *Forest Service, U S. Department of Agriculture* AIR TEMPERATURE; FROST, TEMPERATURE INVERSION; other articles in meteorology.

Cowart, Vice-Admiral Kenneth Keith *Engineer-in-Chief, U.S Coast Guard (Retired).* MARINE ENGINEERING; MARINE MACHINERY (in part); SHIP PROPULSION.

Cowles, Prof Philip B. *Professor of Microbiology, Yale University School of Medicine* BACTERIA, LYSOGENIC, BACTERIOPHAGE; COLIPHAGE, other articles in medical microbiology

Cox, Dr Charles S *Scripps Institution of Oceanography* WAVE (CAPILLARY); WAVE (INTERVAL).

Cox, Dr. Everett Franklin. *Manager of Research, Whirlpool Corporation* ATMOSPHERIC ACOUSTICS.

Cox, Dr Gertrude M. *Head, Statistics Research Division, The Research Triangle Institute* EXPERIMENT.

Coxeter, Prof. H S M. *Professor of Mathematics, University of Toronto* POLYTOPES, REGULAR

Crabill, Dr Ralph Edwin. *Division of Insects, United States National Museum* CHILOPODA, MYRIAPODA; PAUROPODA; SYMPHYLA

Crafts, Prof Alden S *Department of Botany, University of California* DEFOLIANT, HERBICIDE; SOIL STERILIZATION.

Craig, Prof Homer Vincent *Research Specialist, Boeing Airplane Company, Professor of Mathematics, University of Texas.* GEOMETRY, RIEMANNIAN; GRADIENT OF A SCALAR, GREEN'S THEOREM, other articles in mathematics

Craine, Prof Lyle E *Department of Conservation, School of Natural Resources, University of Michigan* LAND USE PLANNING

Cramer, Prof Dr Friedrich D *Professor of Organic Chemistry, Technical University, Darmstadt, Germany* CLATHRATE COMPOUNDS

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Craven, Dr John Penna *Chief Scientist, Special Projects Office, U.S Bureau of Weapons* HYDROFOIL CRAFT

Crentz, William L *Assistant to Chief, Division of Bituminous Coal, U.S Bureau of Mines* MINING OPERATING FACILITIES (in part)

Creson, William K *Consulting Engineer, Ross Gear and Tool Company, Inc* ACKERMAN STEERING, AUTOMOTIVE STEERING, STEERING, POWER.

Crittenden, Dr Charles V *Earth Sciences Editor, McGraw-Hill Encyclopedia of Science and Technology* AIR, CYCLONE, ISOSTASY, NORTH AMERICA (in part)

Crockford, Prof H D *Department of Chemistry, University of North Carolina* HYDROGEN ION (in part)

Croneis, Dr Carey. *Provost and Harry Carothers Wiess Professor of Geology, Rice Institute.* ANNELIDA FOSSILS.

Crouse, William H *Editor-in-Chief, McGraw-Hill Encyclopedia of Science and Technology* AUTOMOTIVE SUSPENSION, JOINT (MECHANICAL), SOLAR HEATING; VOLTAGE REGULATOR, AUTOMOTIVE

Crow, Prof James F *Professor of Medical Genetics, University of Wisconsin.* EUGENICS, HARDY-WEINBERG FORMULA, HETEROSIS, HUMAN GENETICS (in part).

Crowell, Dr Sears *Associate Professor of Zoology, Indiana University* HYDROIDA, HYDROZOA, articles on related taxonomic groups

Cubberley, Adrian H *Product Development Coordinator, Plastics and Coal Chemicals Division, Allied Chemical Corporation* NITRATES (in part).

Coleman, Prof. Nathaniel Terry. *Soils Department, North Carolina State College.* SOIL (in part).

Comings, Dean Edward Walter *School of Engineering, University of Delaware* AUTOCLAVE; HIGH-PRESSURE PROCESSSES

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Cooley, Dr William E *Research Chemist, Procter & Gamble Company* GOLD; NICKEL; SILVER, ZINC

Coons, Dr. George Herbert *Collaborator, Agriculture Research Service, U S Department of Agriculture* SUGAR BEET (in part)

Copeland, Prof D. Eugene *Chairman, Zoology Department, Tulane University.* SWIM BLADDER

Copenhaver, Prof W M *Professor of Anatomy, College of Physicians and Surgeons, Columbia University* CARDIOVASCULAR SYSTEM (in part).

Corben, Dr Herbert Charles *Ramo-Wooldridge* CENTRODE, DYNAMICS, KINEMATICS, MOTION

Core, Dr Earl L. *Chairman, Department of Biology, West Virginia University* HERBARIUM; PLANT KEYS, PLANT NAMES, other articles in botany

Corey, Horace Edmund, Jr *Transmission Maintenance and Coordination Engineer, American Telephone and Telegraph Company* TELEPHONE SERVICE (in part)

Corliss, Dr John O *Associate Professor of Zoology, University of Illinois* CILIOPHORA, articles on related taxonomic groups

Corliss, William *Flight Propulsion Laboratory, General Electric Company* NUCLEAR AIRCRAFT PROPULSION (in part), NUCLEAR ROCKET

Cornish, Dr Joseph Jenkins, III *Aerophysics Department, Mississippi State University* BOUNDARY-LAYER FLOW

Corson, Almon J *Consulting Engineer, Instrument Department, General Electric* POTENTIOMETER (VOLTAGE MEASUREMENT), VOLTAGE MEASUREMENT (in part), VOLTMETER

Cotton, Irwin W. *Retired* THERMOSTAT

Couch, Prof John N *Kenan Professor of Botany, University of North Carolina* ACTINOPLANACEAE

Coulombre, Dr Alfred J. *Department of Anatomy, Yale University School of Medicine* EYE (in part)

Dapples, Prof. Edward C. *Department of Geology, Northwestern University* AUTHIGENIC MINERALS; DIAGENESIS.

Daugherty, Prof. Robert Long *Professor emeritus of Mechanical and Hydraulic Engineering, California Institute of Technology* FLOW OF FLUIDS

Davis, Dr. Charles C *Associate Professor, Department of Biology, Western Reserve University.* MONSTRILLOIDA.

Davis, Dr Charles Moler. *Professor of Geography and Chairman of Department of Geography, University of Michigan* FOREST VEGETATION; VEGETATION ZONES (WORLD); other articles in physical geography

Davis, D Dwight. *Curator of Vertebrate Anatomy, Chicago Natural History Museum* MAMMALIA; articles on related taxonomic groups

Davis, Dr David E. *Department of Zoology, Pennsylvania State University* ECOLOGIC INTERACTIONS

Davis, Dr H Chandler. *Associate Editor, 'Mathematical Reviews'* MATHEMATICAL NOTATION, CONTEMPORARY (in part).

Davis, Dr Hallowell Director of Research, *Central Institute for the Deaf* HEARING AID

Davis, Dr John H *Professor of Botany, University of Florida* MANGROVE SWAMP

Davis, Major General Leighton *Commander, Air Force Missile Test Center, Patrick Air Force Base, Florida* ARMAMENT, AIR

Davis, Rowland F *Products Planning Engineer, American Telephone and Telegraph Company* INTERCOMMUNICATING SYSTEM, TELEPHONE, other articles on telephones

Deacon, Dr George E. R *Director, National Institute of Oceanography, Surrey, England* ANTARCTIC OCEAN

De Cicco, Dr John *De Paul University* GEOMETRY, NONEUCLIDEAN

de Florez, Admiral Luis *Consulting Engineer* HUMAN ENGINEERING

DeGarmo, Dr Oliver *Monsanto Chemical Company,* PESTICIDES (in part)

Dekeyser, Prof Dr Willy Clement, *University of Ghent, Belgium.* COORDINATION NUMBER, CRYSTAL STRUCTURE, CRYSTALLOGRAPHY, other articles in crytallography

Dekker, Dr A J *Professor of Electrical Engineering, University of Minnesota Institute of Technology* FIELD EMISSION, SECONDARY EMISSION, THERMIONIC EMISSION, other articles on electronic properties of solids

Delahay, Prof Paul *Boyd Professor of Chemistry, Louisiana State University* COULOMETER, ELECTROLYSIS, OVERVOLTAGE; other articles in physical chemistry

de Launay, Dr Jules *Head of Cryogenics Branch, Naval Research Laboratory* HYSTERESIS, THERMAL, LATTICE VIBRATIONS, PHONON, SPECIFIC HEAT OF SOLIDS.

Delevoryas, Prof Theodore *Assistant Professor of Botany, Yale University* CYCADEOIDALES

de Montmollin, Dr. Fernand *Hoffmann-LaRoche Inc. (retired)* THIAMINE (in part)

Den Hartog, Prof Jacob P *Department of Mechanical Engineering, Massachusetts Institute of Technology* BRIDGE VIBRATION, MECHANICAL VIBRATION, SHAFT BALANCING.

Denison, Dr Robert H *Curator of Fossil Fishes, Chicago Natural History Museum* OSTEOSTRACI; articles on related fossil groups

Denny-Brown, Dr Derek E. *Professor of Neurology, Harvard University Medical School.* ELECTROMYOGRAM

Cubicciotti, Dr. Daniel. *Research Chemist, Stanford Research Institute* HAFNIUM; ZIRCONIUM.

Cuckler, Lee E *Robertshaw-Fulton Controls Company, Aeronautical and Instrument Division.* MOISTURE-CONTENT MEASUREMENT.

Culbertson, Dr Joseph O *Leader, Industrial Crops Investigations, Crops Research Division, U.S. Department of Agriculture.* FLAX (in part).

Cumberland, Dr. Kenneth B *Professor of Geography, University of Auckland, New Zealand* AUSTRALIA AND NEW ZEALAND

Cumming, Donald C. *Headquarters of Manufacturing Laboratory, Westinghouse Electric Corporation.* ASSEMBLY METHODS

Cummins, Prof Harold *Professor of Anatomy and Assistant Dean, School of Medicine, Tulane University.* EPIDERMAL RIDGES, INTEGUMENTARY PATTERNS

Cunningham, Prof Burris B *Department of Chemistry and Radiation Laboratory, University of California* CURIUM, METALLOACID ELEMENTS, PERIODIC TABLE; TRANSITION ELEMENTS

Curdts, E B. *Director of Engineering, James G Biddle Company* FREQUENCY MEASUREMENT (in part).

Currie, Ronald I *Senior Scientific Officer of National Institute of Oceanography, England* SEA WATER FERTILITY (in part)

Curtin, Dr Charles B *Life Sciences Editor, McGraw-Hill Encyclopedia of Science and Technology* DENTITION, MYIASIS, SENSE ORGAN, series of articles in animal taxonomy

Curtis, Prof John T *University of Wisconsin* CLIMAX COMMUNITY

Curtiss, Prof C F *Professor of Chemistry, University of Wisconsin* GAS (in part)

Curtiss, Dr Leon F *National Bureau of Standards* CURIE, RAD, RADIOACTIVITY STANDARDS, ROENTGEN UNIT

Czarnecki, Edwin Gregory *Department Manager, Structures Technology Department, Aero-Space Division, Boeing Airplane Company* SPACECRAFT STRUCTURE

D

Dachille, Dr Frank *Research Associate in Geochemistry, Pennsylvania State University* HIGH-PRESSURE PHENOMENA (in part)

Dahl, Dr Lawrence F *Assistant Professor of Chemistry, University of Wisconsin* X-RAY DIFFRACTION (in part)

Dale, Prof Dr Walter Max *Head, Department of Biochemistry, Christie Hospital, Manchester, England* RADIATION BIOCHEMISTRY

Dalitz, Prof Richard H. *Physics Department and Enrico Fermi Institute for Nuclear Studies, University of Chicago* HYPERON, MESON, STRANGE PARTICLE, other articles on elementary particles

Dalton, Dr Albert J *National Cancer Institute* GOLGI COMPONENT.

Damon, Dr Paul Edward *Geology Department, University of Arizona* ATMOSPHERE, GEOCHEMISTRY OF, TERRESTRIAL NUCLEAR REACTIONS

Dan, Dr Jean C *Lecturer in Embryology, Ochanomizu University, Tokyo, Japan* INVERTEBRATE EMBRYOLOGY

Dana, Alan Standish *Consulting Engineer for The Kerite Company* INSULATION, ELECTRIC (in part)

Dana, Dr Samuel Trask *Dean emeritus, School of Natural Resources, University of Michigan* FOREST AND FORESTRY

Daniels, Prof. Farrington *Professor emeritus of Chemistry, University of Wisconsin* CHAIN REACTION, CHEMICAL, HALF-LIFE (in part), KINETICS (CHEMICAL), PHYSICAL CHEMISTRY

Donn, Prof William L *Department of Geology, Brooklyn College* SEICHE

Doob, Prof Joseph Leo *Professor of Mathematics, University of Illinois* STOCHASTIC PROCESS.

Dorcus, Prof Roy Melvin *University of California at Los Angeles* HYPNOSIS.

Dorf, Prof Erling *Professor of Geology, Princeton University* PALEOBOTANY (in part); PETRIFIED FORESTS

Dorfman, Dr Ralph I *Director of Laboratories, Worcester Foundation for Experimental Biology* BILE ACID, DIGITOXIGENIN; PROGESTERONE, other articles on adrenal cortex steroids

Dornfeld, Dr Ernst John *Chairman, Department of Zoology, Oregon State College* CELL (BIOLOGICAL)—in part.

Dossel, Dr William Edward *Assistant Professor of Anatomy, University of North Carolina School of Medicine.* PARATHYROID GLAND (in part)

Doudoroff, Prof Michael *Professor of Bacteriology, University of California* CARBOHYDRATE METABOLISM, KREBS CYCLE, other articles on phosphate compounds in metabolism

Dougherty, Dr Ellsworth C. *University of California School of Medicine* CAPRELLIDEA.

Dougherty, Richard Erwin *Consulting Engineer* RAILROAD ENGINEERING

Douglas, Donald W, Jr *President, Douglas Aircraft Company, Inc* AIRCRAFT TESTING

Douglas, Prof Howard C *Department of Microbiology, University of Washington* HYPHOMICROBIALES, MICROCOCCACEAE; NEISSERIACEAE

Douglass, Prof Raymond Donald *Professor of Mathematics, Massachusetts Institute of Technology.* NOMOGRAPH

Dowd, James J *Chief, Mining and Preparation Section, U.S Bureau of Mines* MINING, STRIP

Doyle, Edwin S *National Canners Association Research Laboratory* FOOD ENGINEERING (in part)

Draper, Dr Arthur L *Assistant Professor of Chemistry, Texas Technological College* ADSORPTION, ELECTROSTATIC PRECIPITATOR, SURFACE PHENOMENON—all in part

Dresden, Prof Max *Department of Physics, Northwestern University* BOLTZMANN STATISTICS, KINETIC THEORY OF MATTER, STATISTICAL MECHANICS, other articles on statistical physics.

Droessler, Dr Earl G *Program Director for Atmospheric Sciences, National Science Foundation* NAVAL METEOROLOGY

Duckworth, Prof Henry Edmison *Department of Physics, McMaster University, Canada* BINDING ENERGY, NUCLEAR (in part), ISOTOPE, other articles on atomic and nuclear physics

Duke, Dr Kenneth L *Associate Professor of Anatomy, Duke University Medical Center* OVARY (in part)

Duley, Dr Frank L. *Colorado State University, Fort Collins, Advisor in Soils, University of Peshawar, West Pakistan.* SOIL (in part)

DuMond, Prof Jesse William Monroe *California Institute of Technology* COMPTON EFFECT

Dunbar, Dr Carl O. *Professor emeritus of Paleontology and Stratigraphy, Yale University* FOSSIL; PALEONTOLOGY, PERMIAN, other articles on fossils

Duncan, Charles Clifford *Assistant Vice-President, American Telephone and Telegraph Company* PRIVACY SYSTEMS (SCRAMBLING), TELEPHONE SERVICE (in part); TELEPHOTOGRAPHY

Duncan, Dr Helen *U.S. Geological Survey, U.S. National Museum* BRYOZOA FOSSILS

Deno, Dr Richard A. *Professor of Pharmacognosy, University of Michigan.* PHARMACOGNOSY, PHARMACY.

Derge, Prof. Gerhard *Carnegie Institute of Technology* FERROALLOY; STEEL MANUFACTURE

Derosier, Dr. Norman. *Department of Horticulture, Purdue University* FOOD MANUFACTURING (in part).

DeTar, Prof. DeLos F *Department of Chemistry, Florida State University.* RESONANCE (MOLECULAR STRUCTURE).

De Vaucouleurs, Prof Gerard H *Associate Professor of Astronomy, University of Texas* JUPITER; MARS; PLANET; other articles in astronomy

DeVaney, Dr. Fred D. *Director of Metallurgy and Research, Pickands, Mather, and Company.* MAGNETIC SEPARATION METHODS.

DeVore, Dr George W. *Department of Geology, Florida State University* AMPHIBOLE; PYROXENE, articles on related minerals

Dexter, Dr Theodore Henry *Research Supervisor, Inorganic Chemistry, Hooker Chemical Corporation Research Center* HYDRAZINE

Diaz, Prof. Joaquin Basilio *Research Professor, Institute for Fluid Dynamics and Applied Mathematics, University of Maryland.* DIFFERENTIAL EQUATION.

Dice, Dr Lee R *Professor emeritus of Zoology, University of Michigan* ECOLOGY, HUMAN.

Dick, Prof B G *Assistant Professor of Physics, University of Utah* INSULATOR, ELECTRIC, IONIC CRYSTALS, MADELUNG CONSTANT

Dieke, Prof G H *Chairman, Department of Physics, Johns Hopkins University* ELECTROOPTICS; FARADAY EFFECT, KERR EFFECT, MAGNETOOPTICS, ZEEMAN EFFECT (in part).

Dienes, Dr Louis L *Massachusetts General Hospital, Boston* PLEUROPNEUMONIALIKE ORGANISM

Dienst, Prof Robert Barton *Chairman, Department of Medical Microbiology and Public Health, Medical College of Georgia.* GRANULOMA INGUINALE (in part)

Dietrich, Prof Dr Gunter Otto *Director, Institute of Oceanography, University of Kiel, Germany* ATLANTIC OCEAN, OCEAN CURRENTS (in part)

Dietz, Dr Robert Sinclair *U S Navy Electronics Laboratory, San Diego* BATHYSCAPH, CONTINENTAL SHELF AND SLOPE

Dill, Robert Floyd *Marine Geologist, Sea Floor Studies Section, U.S Navy Electronics Laboratory, San Diego.* SCUBA, SKIN DIVING, UNDERWATER PHOTOGRAPHY (in part)

Diller, Dr Oliver Daniel *Chairman, Department of Forestry, Ohio Agricultural Experiment Station* FOREST CONSERVATION

Dinsmore, Ray Putnam *Vice-President, Research and Development, Goodyear Tire and Rubber Company* RUBBER

Dinsmore, Commander Robertson Pickett *International Ice Patrol, U.S Coast Guard.* ICEBERG

Dodds, Robert Hungerford *Project Engineer, Gibbs and Hill, Inc* PHOTOGRAMMETRY, SURVEYING, TOPOGRAPHIC SURVEYING AND MAPPING, other articles in civil engineering

Dodson, Dr. Edward O *Department of Biology, University of Ottawa, Canada* PROTECTIVE COLORATION, SEXUAL DIMORPHISM

Dollear, Frank Gilbert *Head, Industrial Oils Investigations, Southern Utilization Research and Development Division, U S Department of Agriculture* BUTTER; FAT AND OIL, EDIBLE (both in part), MARGARINE

Dommasch, Daniel Otto *President, Dodco, Inc.* AIRCRAFT INSTRUMENT PANEL (in part); FLIGHT CHARACTERISTICS

Eide, Prof Carl J *Professor of Plant Pathology, University of Minnesota.* PLANT DISEASE (in part); TURNIP

Eidensohn, Samuel *Chief Project Engineer, Industrial Division, Electric Storage Battery Company* DRY CELL, NUCLEAR BATTERY, WET CELL; other articles on batteries

Einset, Dr John *Professor of Pomology, Cornell University* GRAPE CULTURE (in part)

Elderfield, Prof Robert Cooley *Department of Chemistry, University of Michigan* CARBANION; CARBONIUM ION; ORGANIC CHEMISTRY

Elias, Dr M Hans *Department of Anatomy, Chicago Medical School* LIVER (in part).

Elhassen, Prof Arnt *University of Oslo, Norway.* METEOROLOGY (in part)

Ellis, Dr Nathan Kent *Assistant Director, Purdue University Experiment Station* TOMATO

Ellison, Prof Samuel P., Jr *Professor of Geology, Chairman of Department of Geology, University of Texas* CONODONT

Eltgroth, George V *Patent Counsel, Industrial Electronics Division, General Electric Company* PATENT

Ely, F G *Research and Development Division, Babcock and Wilcox Company* BOILER WATER, STEAM BOILER, WATER-TUBE BOILER, other articles on steam power

Emerson, Lewis P *Engineer in Charge of Flow Measurement, Foxboro Company* FLOW MEASUREMENT (in part).

Emerson, Prof Ralph, *Department of Botany, University of California* PHYCOMYCETES

Emerson, Dr William Keith *American Museum of Natural History, New York* SCAPHOPODA

Emmel, Dr Victor M *Associate Professor of Anatomy, University of Rochester School of Medicine and Dentistry* DIGESTIVE SYSTEM (in part)

Engelhart, R W *Parker Rust Proof Company, Detroit* METAL COATINGS (in part)

English, Prof Van H *Professor of Geography, Dartmouth College* EQUINOX, GEOGRAPHY, MATHEMATICAL, INTERNATIONAL DATE LINE, other articles in physical geography

Engström, Prof Arne *Head, Department Medical Physics, Karolinska Institute, Stockholm, Sweden* MICROSCOPE, X-RAY

Epstein, Prof Samuel *California Institute of Technology* GEOLOGIC THERMOMETRY (in part)

Epstein, Samuel *Technical Adviser, Bethlehem Steel Company* STEEL

Epstein, Dr Samuel S *Chief Chemist and Vice-President, Kirsch Beverages, Inc., and NO-CAL Corporation* FOOD MANUFACTURING (in part)

Erdélyi, Prof A *Professor of Mathematics, California Institute of Technology* ELLIPTIC FUNCTION AND INTEGRAL, SPHERICAL HARMONICS

Ericson, David Barnard *Lamont Geological Observatory* MARINE SEDIMENTS (in part)

Eriksson, Dr Erik *International Meteorological Institute, Stockholm, Sweden* ATMOSPHERIC CHEMISTRY

Esau, Prof Katherine *Professor of Botany, University of California* PLANT ORGANS, SECRETORY STRUCTURES, PLANT, VASCULAR BUNDLES, other articles in plant anatomy

Essig, Prof E O *Department of Entomology, University of California* THYSANOPTERA, articles on related taxonomic groups

Duncombe, Dr. Raynor Lockwood *U S Naval Observatory* CELESTIAL MECHANICS; ORBITAL MOTION, PERTURBATION (ASTRONOMY), other articles in celestial mechanics.

Dunegan, John Clymer. *Agricultural Consultant.* CHERRY; PEACH, PLUM (all in part).

Dunkle, Dr. David H *U S. National Museum, Smithsonian Institution* PLACODERMI; articles on related fossil groups

Dunlop, Charles A *Consultant; Professional Engineer* OIL AND GAS WELLS (in part).

Dunn, Dr Hugh K *Member Technical Staff, Bell Telephone Laboratories, Inc.* MASKING (SOUND); PHONETICS; PSYCHOACOUSTICS, VOCODER

Dunn, Dr J Avery *Sales Manager, Atlantic Gelatin, Division of General Foods Corporation* GELATIN

Duntley, Dr Seibert Quimby *Visibility Laboratory, Scripps Institution of Oceanography, University of California* SEA WATER (in part)

E

Eardley, Dean Armand John *College of Mines and Mineral Industries, University of Utah* CORDILLERAN BELT, MOUNTAIN SYSTEMS, TECTONIC PATTERNS

Ebert, Prof James David *Director, Department of Embryology, Carnegie Institution of Washington* HEMATOPOIESIS (in part)

Eckart, Prof Carl *University of California at La Jolla* SEA WATER (in part)

Eckels, Prof Arthur R *Department of Electrical Engineering, University of Vermont* COMMUTATION, SLIP RINGS (in part), WINDINGS (ELECTRIC MACHINERY), other articles in electrical engineering

Eckhardt, Dr E. A *Vice-President (retired), Gulf Research and Development Company* GEOPHYSICAL EXPLORATION, PROSPECTING, PETROLEUM (in part)

Economou, George A *Staff Engineer, Perkin-Elmer Corporation* OPTICAL TRACKING INSTRUMENTS

Eddy, Dr Samuel *Department of Zoology, University of Minnesota* LIMNOLOGY

Edgerton, Prof Harold E *Massachusetts Institute of Technology* STROBOSCOPIC PHOTOGRAPHY, UNDERWATER PHOTOGRAPHY (in part)

Edwards, Prof John O *Associate Professor of Chemistry, Brown University* IRON

Edwards, Dr Russell K *Associate Professor of Chemistry, Illinois Institute of Technology* CARBIDE, NITRIDE, OXIDE

Egan, John Joseph *Marketing Research Division, Union Carbide Metals Company* IRON ALLOYS (in part)

Eggers, Dr Alfred J, Jr *Chief, Vehicle-Environment Division, Ames Research Center, National Aeronautics and Space Administration* NOSE CONE, REENTRY

Eggertsen, Dr Frank Thomas *Research Chemist, Shell Development Company* GAS ANALYSIS, GAS CHROMATOGRAPHY

Egler, Dr Frank E *Consultant in Vegetation Science* PLANT GEOGRAPHY

Ehricke, Krafft A *Director, Centaur-Spacecraft Program, Convair-Astronautics.* ELECTROMAGNETIC PROPULSION, ION PROPULSION, MAGNETOGAS DYNAMICS, SOLAR ENGINE

Ehrlich, Dr. John *Laboratory Director in Antibiotic Research, Parke, Davis, and Company* CHLORAMPHENICOL

Ehrlich, Dr. Paul R. *Assistant Professor of Biological Sciences and Curator of the Entomological Collections, Stanford University* LEPIDOPTERA.

Ferguson, Eugene S *Curator, Division of Mechanical and Civil Engineering, U.S. National Museum, Smithsonian Institution* CAM MECHANISM; FOUR-BAR LINKAGE; VELOCITY ANALYSIS; other articles in machine design

Ferguson Wood, Edward James *Division of Fisheries and Oceanography, Commonwealth Scientific and Industrial Research Organization, Australia* MARINE MICROBIOLOGY.

Ferris, Gordon F. *Natural History Museum, Stanford University* ANOPLURA, ENTOMOLOGY, ECONOMIC; INSECTA; MALLOPHAGA

Ferry, Dr James F. *Life Sciences Editor, McGraw-Hill Encyclopedia of Science and Technology.* CLASSIFICATION, BIOLOGICAL; EGG (FOWL); PLANT RESPIRATION, WILLOW

Feshbach, Prof Herman *Department of Physics, Massachusetts Institute of Technology.* PERTURBATION (MATHEMATICS).

Fields, Paul R. *Senior Chemist, Argonne National Laboratory, Illinois* NOBELIUM

Filmer, Dr Robert S *New Jersey Agricultural Experiment Station, Rutgers University* BEE AND BEEKEEPING (in part).

Finberg, Alfred J. *Consultant in Food Technology* FOOD MANUFACTURING (in part)

Fink, Donald Glen *Research Division, Philco Corporation* TELEVISION STANDARDS

Finland, Dr Maxwell *Harvard University Medical School and Boston City Hospital* PNEUMOCOCCUS, PNEUMONIA.

Fisher, Prof Russell Arden. *Professor of Physics, Northwestern University.* DEGREE OF FREEDOM (MECHANICS); EULER'S EQUATIONS OF MOTION, KINETICS (CLASSICAL MECHANICS).

Fisher, Dr W Allan *Manager of Research, Dyestuffs and Pigments, National Aniline Division, Allied Chemical Corporation.* DIAZOTIZATION

Fisk, Prof Nelson S *Department of Civil Engineering, Columbia University.* CENTROIDS OF AREA AND LINES; EQUILIBRIUM OF FORCES, STATISTICS, other articles in civil engineering

Fiske, Dr Milan D *General Electric Research Laboratory* MEISSNER EFFECT, SUPERCONDUCTIVITY

FitzPatrick, Dean James L G *Professor of Mechanical Technology, Staten Island Community College* ORNITHOPTER.

Fleminger, Dr Abraham *Research Biologist, Scripps Institution of Oceanography* BRANCHIURA, LERNAEOPODOIDA, NOTODELPHYOIDA.

Fletcher, Prof Harvey *Physics Department, Brigham Young University* ACOUSTICS, FLETCHER-MUNSON CONTOURS; PHYSIOLOGICAL ACOUSTICS

Flexser, Dr Leo A *Director of Chemical Production, Hoffmann-LaRoche Inc* RIBOFLAVIN (in part)

Flint, Prof Richard Foster *Professor of Geology, Yale University* GLACIAL EPOCH; PLEISTOCENE, QUATERNARY, RECENT

Flood, James E *Solid-Liquid Separation Consultant, E. I du Pont de Nemours and Company* CENTRIFUGATION

Flynn, John P *Associate Professor of Psychology, Laboratory of Applied Biodynamics, Yale University* ELECTROENCEPHALOGRAPHY, NEUROPHYSIOLOGY; PSYCHOGALVANIC RESPONSE.

Foley, Francis B *Consulting Metallurgist, International Nickel Company* STAINLESS STEEL

Fontana, Prof Mars Guy *Chairman, Department of Metallurgical Engineering, Ohio State University* CORROSION (in part)

Foote, Dr Richard Herbert. *Entomology Research Division, Agricultural Research Service, U.S. Department of Agriculture.* DIPTERA.

Etherington, Harold *Manager, Nuclear Power Department, Allis-Chalmers Manufacturing Company* NUCLEAR ENGINEERING

Ettenberg, Eugene M *Lecturer, Graphic Arts, Columbia University* TYPE (PRINTING).

Evans, Prof F. Gaynor *Department of Anatomy, University of Michigan School of Medicine.* SKELETAL SYSTEM (in part).

Evans, Prof. Francis C. *Professor of Zoology, University of Michigan* POPULATION DISPERSION.

Evans, Dr John W. *Director, Sacramento Peak Observatory, Geophysics Research Directorate, U.S. Air Force.* SUN; series of related articles.

Evans, Prof. Robley D. *Department of Physics, Massachusetts Institute of Technology* ALPHA RAYS; HALF-LIFE (in part); RADIOACTIVITY.

Evans, Dr. Theodore W. *Shell Development Company* PETROCHEMICAL (in part).

Everetts, John, Jr. *Consulting Engineer, Charles S Leopold, Inc., Engineers.* DEHUMIDIFIER, PSYCHROMETRICS.

Everitt, Dean William Littell *Dean of Engineering, University of Illinois* COMMUNICATIONS, ELECTRICAL.

Ewing, Dr. John I *Research Geophysicist, Lamont Geological Observatory* SUBMARINE TOPOGRAPHY (in part)

Ewing, Dr. Maurice *Higgins Professor of Geology, Columbia University; Director, Lamont Geological Observatory* SUBMARINE TOPOGRAPHY (in part)

Eyring, Prof Henry *University of Utah* RHEOLOGY

F

Failla, Dr Gioacchino *Director, Radiological Research Laboratory, Columbia University* NUCLEAR RADIATION (BIOLOGY)—in part, RADIOLOGY.

Fairbank, Prof William M *Professor of Physics, Stanford University* SUPERFLUIDITY

Fan, Prof H Y *Physics Department, Purdue University* CYCLOTRON RESONANCE EXPERIMENTS, SEMICONDUCTOR, articles in solid-state physics

Fankhauser, Prof Gerhard *Department of Biology, Princeton University.* ANDROGENESIS, EMBRYOGENESIS, GYNOGENESIS, MEROGONY

Fankuchen, Prof I *Polytechnic Institute of Brooklyn* X-RAY CRYSTALLOGRAPHY

Fawcett, Prof Don Wayne *Hersey Professor of Anatomy, Harvard Medical School* CELL-SURFACE DIFFERENTIATION, MITOCHONDRIA

Feldman, Cyrus *Supervisor, Spectrochemical and X-ray Analysis, Oak Ridge National Laboratory* FLAME PHOTOMETRY, SPECTROCHEMICAL ANALYSIS

Fell, Dr Howard Barraclough *Associate Professor of Zoology, Victoria University of Wellington, New Zealand* ECHINODERMATA, articles on related taxonomic groups

Feller, Prof William *Princeton University* COMBINATION AND PERMUTATION, DISTRIBUTION (PROBABILITY), PROBABILITY

Fellers, Dr Carl R. *Food Consultant* FOOD ENGINEERING (in part)

Fellinger, Robert Cecil *Associate Professor of Mechanical Engineering, Iowa State University of Science and Technology* BELT DRIVE, GEAR; PULLEY; other articles in machine design

Felver, Prof. Richard Irving *Designer, Carnegie Institute of Technology.* PRODUCT DESIGN; PRODUCTION ENGINEERING

Ferguson, Dr Edward, Jr. *Head, Department of Biology, Lincoln University* PLATYCOPA, articles on related taxonomic groups

Frey, Prof David G *Department of Zoology, Indiana University* FRESH-WATER ECOSYSTEM.

Fried, Dr Sherman *Staff Member, Lawrence Radiation Laboratory, University of California* AMERICIUM; NEPTUNIUM; RHENIUM; other articles on chemical elements

Friedman, Harold Leo. *Research Chemist, International Business Machines Research Center* WATER

Fries, Dr Erik F. B *Associate Professor of Biology, City College of New York* CHROMATOPHORE

Fritz, Dr Sigmund *U.S. Weather Bureau* INSOLATION; METEOROLOGICAL USE OF SATELLITES

Frondel, Prof Clifford *Department of Mineralogy, Harvard University* GARNET, RADIOACTIVE MINERALS, SILICATE MINERALS, articles on related minerals

Fry, Francis John. *Associate Professor of Electrical Engineering, University of Illinois* BIOLOGICAL EFFECTS OF SOUND WAVES (in part)

Fry, Prof Frederick Ernest Joseph *Department of Zoology, University of Toronto, Canada.* RESPIRATORY SYSTEM (in part).

Fry, Prof W J *Research Professor, Head, Biophysical Research Laboratory, University of Illinois* BIOLOGICAL EFFECTS OF SOUND WAVES (in part)

Fulks, Joe Robert *U.S. Weather Bureau.* ATMOSPHERIC ADIABATIC CHANGE, FOG; PRECIPITATION (METEOROLOGY), other articles in meteorology

Fuller, Prof Dudley D *Department of Mechanical Engineering, Columbia University* BEARINGS, ANTIFRICTIONAL.

Fuller, Prof Harry James. *Professor of Botany, University of Illinois* CHLOROPHYTA, EUGLENOPHYTA.

Fung, Dr Yuan-cheng B *Professor of Engineering, California Institute of Technology* AEROELASTICITY, FLUTTER, AERONAUTICAL.

Furnish, Prof William M *Professor and Chairman, Department of Geology, State University of Iowa* CEPHALOPODA FOSSILS (in part)

Furnival, Dr George M *Yale University School of Forestry* FOREST MENSURATION

Fuson, Prof R C *Department of Chemistry, University of Illinois* VINYLOGY

G

Galloway, Prof Jesse J *Professor emeritus of Geology and Paleontology, Indiana University* STROMATOPOROIDEA

Galloway, Dr William J *Bolt, Beranek and Newman, Inc* AIRCRAFT NOISE, NOISE CONTROL (in part), MUFFLER, other articles in acoustics

Gardiner, Dr John L *Animal Disease & Parasite Research Division, U.S Department of Agriculture* SPIRUROIDEA

Gardiner, Dr William Cecil *Manager, Electrochemicals Section, Development Department, Chemicals Division, Olin Mathieson Chemical Corporation* NITROGEN FIXATION

Gardner, Dr Frank Easter *Horticulturist, Agricultural Research Service, U S Department of Agriculture* GRAPEFRUIT, LEMON, ORANGE, other articles on fruits.

Gardner, Prof Victor Ray *Professor (retired) of Pomology, Rutgers University* AGRICULTURAL SCIENCE, PLANT.

Garman, Dr Philip *Connecticut Agricultural Experiment Station* ODONATA

Garrett, Prof Alfred B *Department of Chemistry, Ohio State University* CHEMISTRY, ELEMENTS (CHEMICAL), SALT (CHEMICAL)

Garrett, Dr Frederic Daugherty *Department of Anatomy, University of Miami School of Medicine* THYMUS GLAND

Ford, Dr. Richard. *Department of Legal Medicine, Harvard University* FORENSIC MEDICINE

Forster, Dr. Robert E. *Department of Physiology, Graduate School of Medicine, University of Pennsylvania.* RESPIRATION.

Forsythe, Dr. Richard H. *Head, Department of Poultry Husbandry, Iowa State University.* EGG PROCESSING; FOOD MANUFACTURING (in part).

Fortune, Dr. W B *Executive Director of Control, Eli Lilly and Company.* PHARMACEUTICALS TESTING.

Foster, Prof Jackson W. *Professor of Bacteriology, University of Texas.* BACTERIAL METABOLISM (in part), BACTERIAL PHYSIOLOGY; articles on microbiological methods and on fermentation of organic acids

Fox, Dr. Irving *School of Tropical Medicine, University of Puerto Rico* SIPHONAPTERA

Frame, Prof J Sutherland. *Professor of Mathematics, Michigan State University* ANGLE, GEOMETRY, EUCLIDEAN, SURFACE AND SOLID OF REVOLUTION; other articles in mathematics

Frank, Prof. Bernard *Professor of Watershed Management, Colorado State University* WATER CONSERVATION

Frank, Dr Peter W *Associate Professor of Biology, University of Oregon* SPECIES POPULATION

Franklin, Prof Philip *Professor of Mathematics, Massachusetts Institute of Technology* SERIES

Franks, Russell Minor *Marketing Research Division, Union Carbide Metals Company* IRON ALLOYS (in part)

Frary, Dr Francis Cowles *Consulting Engineer, Alcoa Research Laboratories* ALUMINUM

Frear, Dr Donald E H *Department of Agricultural Biochemistry, Pennsylvania State University* FUMIGANT

Frebold, Dr Prof Hans *Senior Research Paleontologist, Geological Survey of Canada* JURASSIC

Freedman, Dr Daniel X *Department of Psychiatry, Director of Psychopharmacology Laboratory, Yale School of Medicine* PSYCHIC ENERGIZER, PSYCHOPHARMACOLOGIC DRUGS, PSYCHOTOMIMETIC DRUG, TRANQUILIZER

Freedman, Steven Irwin *Instructor, Mechanical Engineering Department, Massachusetts Institute of Technology* ISENTROPIC FLOW (in part)

Freeman, Prof Ralph Leslie *Professor of Mechanical Engineering, Iowa State University* CASTING, ROLLING, METAL, SHEET METAL FORMING, other articles on metal working

Freeman, Reino S *Research Fellow and Associate Professor, University of Toronto, Canada* CYCLOPHYLLIDEA, articles on related taxonomic groups.

Freeman, Ronald A *Supervising Airport Engineer with Seelye, Stevenson, Value, and Knecht, Consulting Engineers, New York* AIRPORT ENGINEERING, RUNWAY, AIRPORT

Freiser, Dr Henry. *Professor of Chemistry, University of Arizona* EXTRACTION (in part)

Fremed, Raymond F *Associate Editor, 'Chemical Engineering'* HEAT EXCHANGER

French, Dr David W *Associate Professor, Department of Plant Pathology and Botany, University of Minnesota* TREE (in part), WOOD DECAY.

Fretter, Prof William B *Department of Physics, University of California* CLOUD CHAMBER; GEIGER-MÜLLER COUNTER; IONIZATION CHAMBER; articles on particle detectors

Freundt, Dr E A *Statens Seruminstitut, Copenhagen, Denmark.* BACTEROIDACEAE; MYCOPLASMATALES

Gigg, Dr Roy *Chemistry Division, National Institute for Medical Research, London, England.* LIPID; other articles on lipids.

Gilbert, Dr. Edgar N *Research Mathematician, Bell Telephone Laboratories, Inc.* INFORMATION THEORY.

Giletti, Prof Bruno John *Department of Geology, Brown University* OCEAN CURRENTS (in part).

Gilliland, Prof. Edwin R *Department of Chemical Engineering, Massachusetts Institute of Technology* DISTILLATION.

Gingrich, Prof Newell S *Professor of Physics, University of Missouri* MECHANICS, CLASSICAL.

Ginzton, Prof Edward Leonard. *Stanford University* AMPLITUDE-MODULATION DETECTOR; AMPLITUDE MODULATOR, other articles on modulators and detectors

Gish, Oliver Holmes *Assistant Director (retired) of Department Terrestrial Magnetism, Carnegie Institute of Washington.* ELECTROJET, UPPER AIR, TERRESTRIAL ELECTRICITY.

Guttings, William Norton *Standards Development and Training Course Specialist, General Electric Company* FUSE, ELECTRIC, SWITCH, ELECTRIC, related articles on electrical components.

Glasford, Prof Glenn M *Professor of Electrical Engineering, Syracuse University* MULTIVIBRATOR, SAW-TOOTH WAVE, TIME-DELAY CIRCUITS, other articles on electronic circuits.

Glass, Prof Bentley *Professor of Biology, Johns Hopkins University* HUMAN GENETICS (in part)

Glicksman, Dr Richard *Semiconductor and Materials Division, Radio Corporation of America* ELECTRODE POTENTIAL.

Glock, Dr Waldo S *Professor and Chairman, Tree-Ring Research Laboratory and Department of Geology, MacAlester College* DENDROCHRONOLOGY, TREE-RING HYDROLOGY

Gluckstern, Robert L. *Associate Professor of Physics, Yale University* RELATIVISTIC ELECTRODYNAMICS

Goddard, Prof David R *Division of Biology, University of Pennsylvania* PLANT FERMENTATION

Goddu, Dr Robert Fenno *Senior Research Chemist, Hercules Powder Company* FLUORIMETRIC ANALYSIS, POLARIMETRIC ANALYSIS, SPECTROPHOTOMETRIC ANALYSIS, other articles on chemical analysis

Godman, Robert R *Assistant Division Chief, Propulsion Aerodynamics Division, National Aeronautics and Space Administration, Lewis Research Center, Cleveland.* WIND TUNNEL INSTRUMENTATION

Goebel, Prof Charles J *Department of Physics and Astronomy, University of Rochester* ELEMENTARY PARTICLE, PARITY (QUANTUM MECHANICS), SYMMETRY LAWS (PHYSICS), other articles on elementary particles

Goetzel, Dr Claus G *College of Engineering, New York University* POWDER METALLURGY

Goland, Leonard *Vice-President, Research and Development, Kellett Aircraft Corporation* AUTOGIRO

Goldberg, Prof Edward David. *University of California at La Jolla* HYDROSPHERE, HYDROSPHERE, GEOCHEMISTRY OF, SEA WATER (in part)

Goldblith, Prof Samuel Abraham *Acting Head, Department of Food Technology and Professor of Food Technology, Massachusetts Institute of Technology* FOOD ENGINEERING (in part)

Goldich, Dr Samuel S *U.S Geological Survey* BAUXITE; LATERITE

Gonser, Dr Bruce W *Battelle Memorial Institute, Columbus* METAL COATINGS (in part), TIN ALLOYS, TIN METALLURGY

Good, Dr. Irving John *Deputy Chief Scientific Officer, Admiralty Research Laboratory, Middlesex, England* MONTE CARLO METHOD

Gaudin, Prof. Antoine M *Massachusetts Institute of Technology.* FLOTATION.

Gaylord, Prof. Charles N. *Chairman, Department of Civil Engineering, University of Virginia* ARCH; BRIDGE (in part); CIVIL ENGINEERING, other articles in civil engineering.

Gaylord, W. M., Jr. *National Carbon Company, Division of Union Carbide Corporation* GRAPHITE (in part).

Geldard, Prof. Frank Arthur. *Professor of Psychology and Chairman of Department of Psychology, University of Virginia* PAIN, CUTANEOUS; TEMPERATURE SENSES; TOUCH; other articles on somesthesis.

Gemmill, Arthur Vernon *Senior Associate Editor, 'Food Engineering,' McGraw-Hill Publishing Company.* FOOD ENGINEERING (in part).

Gensemer, Prof Maxwell *Howe Professor of Metallurgy, Columbia University.* METAL, MECHANICAL PROPERTIES OF.

Gensler, Prof. Walter J. *Department of Chemistry, Boston University.* HETEROCYCLIC COMPOUNDS, INDOLE; QUINOLINE; related articles

Gergel, Max G *Columbia Organic Chemicals Company* FREON, HALOFORM REACTION (in part), HALOGENATED HYDROCARBON (in part)

Gerjuoy, Dr Edward *John Jay Hopkins Laboratory for Pure and Applied Science, General Atomic Division of General Dynamics Corporation* QUANTUM MECHANICS, QUANTUM THEORY, NONRELATIVISTIC, QUANTUM THEORY, RELATIVISTIC, other articles in quantum physics

Gerlach, Dr Arch C. *Chief, Map Division and Chair of Geography, Library of Congress* GLOBE, TERRESTRIAL.

Germer, Dr Lester H *Research Physicist, Bell Telephone Laboratories, Inc* ELECTRON DIFFRACTION (in part)

Gersh, Prof Isidore. *Department of Anatomy, University of Chicago.* BLOOD (in part), CONNECTIVE TISSUE; EPITHELIUM, HISTOLOGY.

Gershoff, Dr. Stanley Norton. *Department of Nutrition, Harvard School of Public Health* VITAMIN, series of articles on individual vitamins.

Gertsch, Dr Willis John *Curator, Department of Entomology, American Museum of Natural History, New York* AMBLYPYGI, PALPIGRADI, PEDIPALPI, UROPYGI

Gerwe, Dr Elmer G *Head, Biological Control Laboratories, Eli Lilly and Company* BIOASSAY (in part)

Giarman, Prof Nicholas J *Professor of Pharmacology, Yale University School of Medicine* CHEMOTHERAPY, series of articles on synthetic antibacterial agents

Gibbons-Fly, Walter *Technical Advisor, Cinerama, Inc* CINEMATOGRAPHY

Gibson, Dr James J *Professor of Psychology, Cornell University* PERCEPTION

Gibson, Dr. John Egan *Professor of Electrical Engineering, Purdue University.* ELECTROMAGNET, MAGNET WIRE, MAGNETIC CIRCUITS, SOLENOID (ELECTRICAL)

Gibson, Dr. T *Lecturer in Bacteriology, School of Agriculture, Edinburgh, Scotland.* BACILLACEA

Giedt, Prof Warren H *Department of Mechanical Engineering, University of California* CONDUCTION (HEAT)—in part; CONVECTION (HEAT).

Giese, Prof. Arthur Charles. *Department of Biological Sciences, Stanford University.* INFRARED RADIATION (BIOLOGY), ULTRAVIOLET RADIATION (BIOLOGY).

Greenfield, Robert Edman *Vice-President, Manufacturing (retired), A E. Staley Manufacturing Company* SOYBEAN (in part).

Greensfelder, Dr Bernard S. *Director of Oil Research, Shell Development Company* AROMATIZATION, CRACKING; DEPOLYMERIZATION.

Greenspan, Martin *National Bureau of Standards.* DAMPING; FORCED OSCILLATION, IMPEDANCE, MECHANICAL, LISSAJOUS FIGURES

Greenstein, Prof Jesse L *Mount Wilson and Palomar Observatories, California Institute of Technology* MAGNITUDE, STELLAR, STAR, series of articles on various stars

Greep, Dr Roy Orval *Dean and Professor of Anatomy, Harvard School of Dental Medicine* DIGESTIVE SYSTEM (in part).

Gregg, Prof James L *Professor of Metallurgical Engineering, Cornell University* ALLOY, HEAT-TREATMENT (METALS AND ALLOYS)—in part

Gregory, Dr Alfred Thorne *Consulting Engineer* AIRCRAFT ENGINE PERFORMANCE

Gregory, Prof Joseph T *Associate Professor and Curator of Vertebrate Paleontology, Peabody Museum, Yale University* CROCODILIA FOSSILS, DINOSAUR, articles on related fossil groups

Grey, Dr David S *Polaroid Corporation* MICROSCOPE, REFLECTING (in part)

Griffin, Dr Donald R *Professor of Zoology, Harvard University* MIGRATORY BEHAVIOR

Griggs, Prof David T *Institute of Geophysics, University of California* ROCK MECHANICS

Grim, Dr Ralph E *Department of Geology, University of Illinois* CLAY, CLAY MINERALS, articles on related minerals (all co-authored)

Grinstead, Dr Robert R *Project Leader, Research Department, Dow Chemical Company* IODINE (in part)

Grobstein, Prof Clifford *Department of Biological Sciences, Stanford University* ANIMAL MORPHOGENESIS

Groggins, Philip Herbimer *Senior Scientific Advisor, Chemical Division Food Machinery and Chemical Corporation* AMINATION, HYDROGENATION HYDROLYTIC PROCESSES, articles on other unit processes

Gross, Prof Paul Randolph *Associate Professor of Biology, New York University* CELL ORGANIZATION

Gross, William H *Dow Metal Products Company, Division of Dow Chemical Company* MAGNESIUM

Groves, Dr Gordon W *Instituto de Geofisica, Universidad Nacional de Mexico* TIDE

Gruen, Dr Dieter M *Argonne National Laboratory* MAGNETOCHEMISTRY

Grundfest, Prof Harry *Professor of Neurology, College of Physicians and Surgeons, Columbia University* ELECTRIC ORGAN (BIOLOGY), EPHAPTIC TRANSMISSION SYNAPTIC TRANSMISSION

Grüneberg, Prof Hans *Professor of Genetics, University of London* EXPRESSIVITY, GENE, PENETRANCE, GENE, PLEIOTROPISM

Guirard, Dr Beverly Marie *Department of Biochemistry, University of California* BIOASSAY (in part)

Guise, Prof Cedric Hall, *Professor emeritus of Forestry, Cornell University* FORESTRY, FARM

Gulbransen, Dr Earl Alfred *Westinghouse Research Laboratories* CORROSION (in part)

Gunckel, Prof James E *Department of Botany, Rutgers University* BUDDING, GRAFTING OF PLANTS, STEM (BOTANY)—in part, STEM CUTTINGS

Goodall, Prof. McChesney, Jr *Assistant Director of Research, University of Tennessee Memorial Research Center and Hospital* AVIATION MEDICINE, DECOMPRESSION ILLNESS; SPACE BIOLOGY; WEIGHTLESSNESS

Goodchild, Dr. Chauncey G. *Professor of Biology, Chairman of Department, Emory University* PLATYHELMINTHES.

Goodheart, Prof Clarence Francis *Chairman, Department of Electrical Engineering, Union College.* CIRCUIT, ELECTRIC, OPEN CIRCUIT; PARALLEL CIRCUIT, POTENTIOMETER (VARIABLE RESISTOR).

Goodman, Bernard. *Associate Professor of Physics, University of Missouri.* FIELD THEORY, CLASSICAL, FRAME OF REFERENCE, STATICS IN SPACE, other articles in classical mechanics

Goodnight, Dr Clarence James *Department of Biological Sciences, Purdue University* PHALANGIDA

Goody, Prof Richard Mead *Harvard University* AIR GLOW, ATMOSPHERE, related articles in meteorology

Gordon, Dr Isabella *Crustacea Section, British Museum of Natural History, London, England* MALACOSTRACA, articles on related taxonomic groups

Gordon, Prof Louis *Department of Chemistry and Chemical Engineering, Case Institute of Technology* FLOCCULATION, PRECIPITATION (CHEMISTRY), SUPERSATURATION, VOLATILIZATION

Gordon, Dr Saul *Staff Specialist for Chemistry, Pyrotechnics Laboratory, Picatinny Arsenal* THERMOANALYSIS

Gordon, Dr William Edwin *Research Chemist, Arthur D Little, Inc, Cambridge, Massachusetts* EXPLOSION AND EXPLOSIVE, FIRE EXTINGUISHER, FLAME, series of related articles

Goss, Prof Harold *Professor of Animal Husbandry, University of California at Davis* ANIMAL-FEED COMPOSITION

Gossner, Mrs Simone Daro *Astronomer, U S Naval Observatory, Washington, D C* ECLIPSE, ASTRONOMICAL, OCCULTATION, TRANSIT (ASTRONOMY)

Gowen, Prof John W *Genetics Department, Iowa State University* SEX-INFLUENCED INHERITANCE

Graham, George K *National Broadcasting Company, New York* TELEVISION CAMERA, TELEVISION STUDIO

Grandelis, Doris Dida *'Petroleum Week'* PETROLEUM GEOLOGY

Granick, S *Associate Professor, The Rockefeller Institute* CHLOROPHYLL

Grau, Dr Frederick V *Agronomist, Consultant to Hercules* VETCH

Graumann, Dr Hugo O *Chief, Forage and Range Research Branch, Crops Research Division, Agricultural Research Service, U S Department of Agriculture* ALFALFA

Graves, Dr Arthur Harmount *Consultant in Genetics, Connecticut Agricultural Experiment Station, Curator emeritus, Brooklyn Botanic Gardens* TREE (in part), series of articles on various trees

Graves, Prof Lawrence Murray *Professor of Mathematics, University of Chicago* INFINITY, INTEGRATION, REAL VARIABLE

Gray, Dr Peter *Head, Department of Biological Sciences and Professor of Zoology, University of Pittsburgh* MICROTECHNIQUE

Gray, Dr Reed A *Research Plant Physiologist, Stauffer Chemical Company* GIBBERELLIN

Greenberg, Prof David M *Department of Biochemistry, University of California School of Medicine* PROTEIN METABOLISM

Greenblatt, Dr Robert Benjamin *Medical College of Georgia* GRANULOMA INGUINALE (in part)

Greenfield, Robert Edman *Vice-President, Manufacturing (retired), A. E. Staley Manufacturing Company* SOYBEAN (in part).

Greensfelder, Dr Bernard S *Director of Oil Research, Shell Development Company* AROMATIZATION, CRACKING, DEPOLYMERIZATION

Greenspan, Martin *National Bureau of Standards* DAMPING, FORCED OSCILLATION, IMPEDANCE, MECHANICAL; LISSAJOUS FIGURES

Greenstein, Prof Jesse L. *Mount Wilson and Palomar Observatories, California Institute of Technology* MAGNITUDE, STELLAR, STAR, series of articles on various stars

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Grey, Dr David S *Polaroid Corporation* MICROSCOPE, REFLECTING (in part)

Griffin, Dr Donald R *Professor of Zoology, Harvard University* MIGRATORY BEHAVIOR

Griggs, Prof David T *Institute of Geophysics, University of California* ROCK MECHANICS

Grim, Dr Ralph E *Department of Geology, University of Illinois* CLAY CLAY MINERALS, articles on related minerals (all co-authored)

Grinstead, Dr Robert R *Project Leader, Research Department, Dow Chemical Company* IODINE (in part)

Grobstein, Prof Clifford *Department of Biological Sciences, Stanford University* ANIMAL MORPHOGENESIS

Groggins, Philip Herkimer *Senior Scientific Advisor, Chemical Division Food Machinery and Chemical Corporation* AMINATION, HYDROGENATION, HYDROLYTIC PROCESSES, articles on other unit processes

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Gruen, Dr Dieter M. *Argonne National Laboratory* MAGNETOCHEMISTRY

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Grünebero, Prof Hans *Professor of Genetics, University of London* EXPRESSIVITY, GENE, PENETRANCE, GENE; PLEIOTROPISM

Guirard, Dr Beverly Marie *Department of Biochemistry, University of California* BIOASSAY (in part)

Guise, Prof Cedric Hax, *Professor emeritus of Forestry, Cornell University* FORESTRY, FARM

Gulbransen, Dr Earl Alfred *Westinghouse Research Laboratories* CORROSION (in part)

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Goodheart, Prof. Clarence Francis *Chairman, Department of Electrical Engineering, Union College* CIRCUIT, ELECTRIC; OPEN CIRCUIT, PARALLEL CIRCUIT, POTENTIOMETER (VARIABLE RESISTOR).

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Goody, Prof Richard Mead *Harvard University* AIR GLOW, ATMOSPHERE, related articles in meteorology

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Gordon, Dr Saul *Staff Specialist for Chemistry, Pyrotechnics Laboratory, Picatinny Arsenal* THERMOANALYSIS

Gordon, Dr William Edwin *Research Chemist, Arthur D Little, Inc., Cambridge, Massachusetts* EXPLOSION AND EXPLOSIVE, FIRE EXTINGUISHER; FLAME, series of related articles

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Gossner, Mrs Simone Daro *Astronomer, U S. Naval Observatory, Washington, D C* ECLIPSE, ASTRONOMICAL, OCCULTATION, TRANSIT (ASTRONOMY)

Gowen, Prof John W *Genetics Department, Iowa State University* SEX-INFLUENCED INHERITANCE

Graham, George K *National Broadcasting Company, New York* TELEVISION CAMERA, TELEVISION STUDIO

Grandelis, Doris Dida *'Petroleum Week'* PETROLEUM GEOLOGY

Granick, S *Associate Professor, The Rockefeller Institute* CHLOROPHYLL

Grau, Dr Frederick V *Agronomist, Consultant to Hercules* VETCH

Graumann, Dr Hugo O. *Chief, Forage and Range Research Branch, Crops Research Division, Agricultural Research Service, U S Department of Agriculture* ALFALFA

Graves, Dr. Arthur Harmount *Consultant in Genetics, Connecticut Agricultural Experiment Station; Curator emeritus, Brooklyn Botanic Gardens* TREE (in part), series of articles on various trees

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Gray, Dr Peter. *Head, Department of Biological Sciences and Professor of Zoology, University of Pittsburgh* MICROTECHNIQUE

Gray, Dr. Reed A *Research Plant Physiologist, Stauffer Chemical Company* GIBBERELLIN.

Greenberg, Prof David M *Department of Biochemistry, University of California School of Medicine* PROTEIN METABOLISM.

Greenblatt, Dr Robert Benjamin *Medical College of Georgia* GRANULOMA INGUINALE (in part)

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Hamilton, Dr. Howard L. *Professor of Zoology, Iowa State University* COELOM, METAMERISM, EMBRYONIC; NEURULATION; PRIMITIVE GUT

Hammell, Dr Edward Frederic. *Group Leader, Los Alamos Scientific Laboratory* CRYOGENIC ENGINEERING; CRYOGENICS; LIQUEFACTION OF GASES; LOW-TEMPERATURE THERMOMETRY.

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Hand, Dr Cadet. *Department of Zoology, University of California* COELENTERATA; CORALLIMORPHARIA, PTYCHODACTIARIA; RADIATA

Handler, Prof Philip *Department of Biochemistry, Duke University* NITROGEN EXCRETION

Hansen, Dr Arthur Gene. *Associate Professor of Mechanical Engineering, University of Michigan* DYNAMIC SIMILARITY; STREAMLINE FLOW, STREAMLINING (in part)

Hanson, Allen Louis *Associate Professor of Chemistry, St Olaf College, Minnesota* Series of articles on various topics in chemistry

Hanson, Frederick H *Research Associate, The Upjohn Company* ERYTHROMYCIN

Harary, Prof Frank *Department of Mathematics, University of Michigan* GRAPH THEORY

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Harding, Dr John Philip *Principal Scientific Officer, British Museum of Natural History, London* CLADOCERA

Harford, Edward Frederick. *Chemical Engineer, Industrial and Biochemicals Department, E I du Pont de Nemours and Company* ANTIFREEZE MIXTURE

Hargis, Dr William J, Jr *Laboratory Director and Professor of Marine Science, Virginia Fisheries Laboratory and The College of William and Mary* ASPIDOGASTREA, MONOGENEA; TREMATODA

Harker, Dr Robert Ian. *Research Petrologist, Johns-Manville Research Center, New Jersey* CALCITE; other articles on carbonate minerals

Harleman, Dr Donald Robert F. *Associate Professor of Hydraulics, Massachusetts Institute of Technology* HYDRAULIC ANALOG TABLE, RIPPLE TANK, WAVE MOTION IN LIQUIDS, other articles in hydraulics

Harned, Roger Lee *Research Microbiologist, Commercial Solvents Corporation* CYCLOSERINE

Harrar, Dr J George. *Vice-President, The Rockefeller Foundation* BANANA, PLANT DISEASE CONTROL (both in part)

Harris, Dr Cyril Manton [illegible] *tics research), Departme* [illegible] *University* ABSORPTION [illegible] NOISE CONTROL IN BUIL[illegible]

Harris, Dr Forest K *National Bureau of Standards.* CURRENT BALANCE; GALVANOMETER (in part)

Harris, Dr Harry *Reader in Biochemical Genetics, University of London, England* HUMAN GENETICS (in part)

Harrison, Dr George R *Dean, School of Science, Massachusetts Institute of Technology* DIFFRACTION GRATING

Gunkler, Dr. Albert Arthur *Director Bromine Research, Dow Chemical Company.* BROMINE, HALOGEN ELEMENTS

Gurney, Dr. Ashley B. *Entomology Research Division, U S. Department of Agriculture* PSOCOPTERA, ZORAPTERA

Guy, Raymond F *Senior Staff Engineer, National Broadcasting Company.* RADIO; TELEVISION; related articles on radio and television.

H

Haddock, Prof. Fred T *Department of Astronomy and Department of Electrical Engineering, University of Michigan.* RADIO ASTRONOMY; RADIO TELESCOPE

Hader, Rodney N *Editor, 'Journal of Agricultural and Food Chemistry,' American Chemical Society.* AGRICULTURAL CHEMISTRY.

Hadler, Jacques B. *Head, Ship Powering Division, David Taylor Model Basin, Washington, D C.* TOWING TANK

Hadley, Dr Elbert Hamilton *Professor of Chemistry, Southern Illinois University* Series of articles in organic chemistry

Hadorn, Prof. Dr Ernst. *Professor of Zoology and Comparative Anatomy, University of Zürich, Switzerland* GENE ACTION (in part).

Haensel, Dr. Vladimir *Director of Process Research Department, Universal Oil Products Company* REFORMING (PETROLEUM REFINING)

Hagen, Dr John Peter *Director, Office for United Nations Conferences, National Aeronautics and Space Administration* BALLISTICS, EXTERIOR, SATELLITE, ARTIFICIAL, SPACE STATION, other articles in engineering and physics

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Haley, Prof Leanor Davison *Assistant Professor, Department of Microbiology, Yale University, Director, Microbiology Laboratories, Yale—New Haven Medical Center* MYCOLOGY, MEDICAL, other articles on mycotic infections

Hall, Dr Carl William. *Department of Agricultural Engineering, Michigan State University* AGRICULTURAL SOIL AND CROP PRACTICES (in part)

Hall, Dr. Edmund K *Professor of Anatomy, School of Medicine, University of Louisville* EAR

Hall, Dr Richard P *Professor of Biology, New York University* PROTOZOA, articles on related taxonomic groups

Halpern, Dr J *Associate Professor of Chemistry, University of British Columbia* GOLD METALLURGY, SILVER METALLURGY

Halvorson, Dr Harlyn O *Department of Bacteriology, University of Wisconsin.* BACTERIAL ENDOSPORES

Halvorson, Prof H Orin *Director, School of Life Sciences, University of Illinois* FOOD PRESERVATION

Hamer, Dr. Walter J *Chief, Electrochemistry Section, National Bureau of Standards* ELECTROMOTIVE FORCE (CELLS), other articles in electrochemistry

Haynes, David Oliphant *Consulting Industrial Engineer* BULK-HANDLING MACHINES, CONVEYING MACHINES; INDUSTRIAL TRUCKS, other articles in industrial engineering

Haynes, Dr William Clarence, *Principal Bacteriologist, ARS Culture Collection, Northern Utilization Research and Development Division, U.S Department of Agriculture* PSEUDOMONADACEAE, PSEUDOMONADALES, PSEUDOMONADINEAE

Hazen, Prof David C. *Forrestal Research Center, Princeton University* AIRPLANE, KITE

Hazen, Richard *Partner, Hazen and Sawyer, New York.* RESERVOIR, WATER SUPPLY ENGINEERING, WATER TREATMENT

Hazen, Ronald McKean *Consultant* AIRCRAFT ENGINE, AIRCRAFT ENGINE, RECIPROCATING

Hearmon, R F S *Officer-In-Charge, Physics Section, Forest Products Research Laboratory, England* ANELASTICITY, ELASTICITY, PLASTICITY

Hecht, Prof Hans H *Department of Medicine, University of Utah College of Medicine* ELECTROCARDIOGRAPHY, ELECTROPHYSIOLOGY (HEART), PHONOCARDIOGRAPHY, VECTORCARDIOGRAPHY

Hedberg, Dr Hollis D *Department of Geology, Princeton University* PROSPECTING, PETROLEUM (in part)

Hedgpeth, Prof Joel W *College of the Pacific, Pacific Marine Station, Dillon Beach, California* PALAEOISOPUS, PYCNOGONIDA

Heezen, Dr Bruce C *Lamont Geological Observatory, Columbia University* MARINE SEDIMENTS, OCEAN CURRENTS, SUBMARINE TOPOGRAPHY (all in part) TURBIDITY CURRENT

Heidt, Prof Lawrence J *Department of Chemistry, Massachusetts Institute of Technology* PHOTOCHEMISTRY

Heilbrunn, Dr L V *Department of Zoology, University of Pennsylvania* CENTRIFUGATION

Heimsch, Dr Charles *Professor and Chairman, Department of Botany, Miami University* ROOT (BOTANY)—in part

Heinrich, Prof E William *Mineralogical Laboratory, University of Michigan* MICA, PETROLOGY, ROCK, series of related articles

Heiskanen, Dr Weikko A *Institute of Geodesy, Ohio State University, Finnish Geodetic Institute, Helsinki, Finland* GEODESY, POLAR WANDERING, TERRESTRIAL FORCE FIELDS, TERRESTRIAL GRAVITATION

Hela, Prof Ilmo *Director, Institute of Marine Research, Finland* BALTIC SEA

Helmers, Dr Carl J *Assistant Manager, Process Development Division, Research and Development Department, Phillips Petroleum Company* CARBON BLACK

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Harrison, Henry Turner *Director of Meteorology, United Air Lines Operating Base, Stapleton Airfield, Denver* AEROLOGY, AERONAUTICAL METEOROLOGY

Harrison, Louis P *Chief, Technical Investigations, U. S. Weather Bureau* AIR PRESSURE, ATMOSPHERIC HIGH, ATMOSPHERIC LOW, ISOBAR

Harrow, Dr Benjamin *Formerly, Department of Chemistry, College of City of New York* DISEASE (in part).

Harsh, M Duffield *Engineering Leader, Electron Tube Division, Radio Corporation of America* CATHODE-RAY TUBE; STORAGE TUBE

Harsha, Wayne V *Editor, 'The Inland and American Printer and Lithographer'* COMPOSITION (TYPE)

Hart, Dr Helen *Department of Plant Pathology and Botany, University of Minnesota* PLANT DISEASE CONTROL (in part)

Hart, Dr. Jackson Sanford *Head, Animal Physiology Section, Division of Applied Biology, National Research Council, Canada* THERMOREGULATION

Hartman, Dr Olga *Allan Hancock Foundation, University of Southern California* ANNELIDA, ARCHIANNELIDA, POLYCHAETA

Hartman, Dr Willard D *Associate Professor of Zoology, Curator of Invertebrate Zoology, Peabody Museum of Natural History, Yale University* PORIFERA, articles on related taxonomic groups

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Hartung, Dr Walter H *Professor of Pharmaceutical Chemistry, Medical College of Virginia* PHARMACEUTICAL CHEMISTRY

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Hasche, Dr R L *Hasche Engineering Company, Johnson City, Tennessee* FUEL GAS SUPPLEMENTS

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Haynes, Dr William Clarence. *Principal Bacteriologist, A.R.S. Culture Collection, Northern Utilization Research and Development Division, U.S. Department of Agriculture* PSEUDOMONADACEAE; PSEUDOMONADALES; PSEUDOMONADINEAE.

Hazen, Prof. David C. *Forrestal Research Center, Princeton University* AIRPLANE; KITE

Hazen, Richard *Partner, Hazen and Sawyer, New York.* RESERVOIR; WATER SUPPLY ENGINEERING; WATER TREATMENT

Hazen, Ronald McKean. *Consultant.* AIRCRAFT ENGINE, AIRCRAFT ENGINE, RECIPROCATING.

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Hedberg, Dr. Hollis D. *Department of Geology, Princeton University* PROSPECTING, PETROLEUM (in part)

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Henderson, Edward P. *Associate Curator, Division of Mineralogy and Petrology, U.S. National Museum, Smithsonian Institution* METEORITE; TEKTITE

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Henke, Prof. Burton L. *Physics Department, Pomona College, California* MICRORADIOGRAPHY (in part)

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Hobby, Dr. Gladys L. *Director, Veterans Administration Special Research Laboratory, Veterans Administration Hospital, East Orange, New Jersey* ANTIBIOTIC; VIOMYCIN

Hoch, Fred W. *President, Fred W. Hoch Associates, Inc., Graphic Arts Methods and Management Consultant* PRINTING PRESS

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Hochwalt, Dr. Carroll Alonzo *Vice-President, Monsanto Chemical Company* INSECTICIDE, MITICIDE; PESTICIDE (all in part)

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Hoffman, Dr. Brian Francis *Professor of Physiology, State University of New York Medical Center* CARDIOVASCULAR SYSTEM (in part)

Hoffman, Richard Lawrence *Professor of Biology, Radford College* DIPLOPODA

Hoffman, Dr. Robert Michael *Senior Research Associate, Nylon Technical Division, Textile Research Laboratory, E. I. du Pont de Nemours and Company, Inc.* FIBER, MAN-MADE

Hoffmann, Dr. Friedrich Wilhelm *Chemical Corps, Chemical Warfare Laboratories, Army Chemical Center, Maryland* ORGANOARSENIC COMPOUND; ORGANOPHOSPHORUS COMPOUND.

Hogan, Dr. C. Lester *General Manager, Semiconductor Products Division, Motorola, Inc.* FERRIMAGNETIC GARNETS, FERRITE DEVICES, GYRATOR, VARISTOR

Hogg, Helen Sawyer *Professor of Astronomy, University of Toronto, Research Associate, David Dunlap Observatory, Canada* STAR CLOUDS, STAR CLUSTERS, HYADES, PLEIADES

Holland, Prof. Heinrich Dieter *Department of Geology, Princeton University* LITHOSPHERE, LITHOSPHERE, GEOCHEMISTRY OF

Hollinshead, Prof. W. Henry *Professor of Anatomy, Mayo Foundation, University of Minnesota; Head of Section of Anatomy, Mayo Clinic* AORTIC BODY, CAROTID BODY

Hollowell, Dr. Eugene A. *Crops Research Division, A.R.S., U.S. Department of Agriculture* CLOVER (in part)

Holt, Dr. Perry C. *Associate Professor of Zoology, Department of Biology, Virginia Polytechnic Institute* OLIGOCHAETA.

Holthuis, Dr. Lipke B. *Curator, Division of Crustacea, Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands* HOPLOCARIDA, STOMATOPODA

Hood, Prof. George J. *Professor emeritus of Engineering Drawing, University of Kansas* DESCRIPTIVE GEOMETRY

Hoover, John Edgar *Director, Federal Bureau of Investigation* FINGERPRINT

Horsfall, Dr. James G. *Director, Connecticut Agricultural Experiment Station* FUNGISTAT AND FUNGICIDE (in part)

Hörstadius, Prof. Sven *Professor of Zoology, University of Uppsala Sweden* NEURAL CREST

Hotchkiss, Grosvenor *Coordinating Engineer, Western Union Telegraph Company* TELEGRAPHY (in part), TELEX

Hough, Richard R. *Vice-President, Ohio Bell Telephone Company* TELEPHONE SERVICE (in part); TELEVISION NETWORKS

Houghton, Prof. Henry G *Professor of Meteorology, Head of the Department of Meteorology, Massachusetts Institute of Technology.* WEATHER MODIFICATION

Howard, Dr. Walter E *Specialist in Vertebrate Ecology, University of California* RODENTICIDE

Howe, Prof. Carl E. *Chairman, Department of Physics, Oberlin College* ANGULAR FREQUENCY, CENTRIFUGAL FORCE, CENTRIPETAL FORCE, ROTATIONAL MOTION

Howell, Dr Benjamin F, Jr *Head, Department of Geophysics and Geochemistry, Pennsylvania State University* EARTH; GEOPHYSICS (in part).

Howells, Dr T. A. *Senior Research Associate, Institute of Paper Chemistry* FLAMEPROOFING

Howells, Prof W. W *Peabody Museum, Harvard University* ANTHROPOLOGY, PHYSICAL, FOSSIL MAN, other articles on forms of fossil man

Hoxton, Prof Llewellyn Griffith *Professor emeritus of Physics, University of Virginia* JOULE'S LAW, THERMOELECTRICITY

Hrones, Dr John Anthony *Vice-President for Academic Affairs, Case Institute of Technology* CONTROL SYSTEMS, SYSTEMS ENGINEERING (in part)

Hudson, Dr Robert George Spencer *Iveagh Research Fellow, Department of Geology, Trinity College, Republic of Ireland* SPHAERACTINOIDEA

Hughes, Prof Vernon Willard *Physics Department, Yale University* POSITRONIUM

Hukill, Dr Peter Biggs *Instructor in Pathology, Yale University School of Medicine* LEUKEMIA, LEUKOPENIA

Hulbary, Dr Robert L *Professor of Botany, University of Iowa* COLLENCHYMA, PARENCHYMA

Hulbert, Walter C *Head, Planting and Fertilizing Equipment and Practices Investigations, A R S, U S Department of Agriculture* FERTILIZING (in part)

Hull, McAllister H, Jr *Assistant Professor of Physics, Sloane Physics Laboratory, Yale University* ELECTRON CAPTURE, SELECTION RULES (PHYSICS), other articles in mathematical and theoretical physics

Humes, Dr Arthur Grover *Professor of Biology, Boston University* RHYNCHOCOELA

Hungate, Prof Robert E *University of California* BACTERIA

Hunt, Dr John M *Head of Geochemical Research, Jersey Production Research Company, Tulsa, Oklahoma* PETROLEUM (ORIGIN)

Hunter, Eugene M *Manager, General Engineering, Electric Utility Engineering Section, General Electric Company* LIGHTNING AND SURGE PROTECTION, LIGHTNING ARRESTER LIGHTNING ROD

Hunter, Dr Lloyd P *Director of Component Engineering, International Business Machines Corporation* JUNCTION DIODE, JUNCTION TRANSISTOR, other articles on diodes

Hurd, Dr Dallas T *Manager, Advance Engineering, L M C Department, General Electric Company* HYDRIDE, METAL

Hurlbut, Prof Cornelius S *Professor of Mineralogy, Harvard University* Series of articles on individual minerals from several mineral groups

Hurni, Melvin L *Manager, Operations Research and Synthesis Consulting Service, General Electric Company* OPERATIONS RESEARCH

Hutcherson, Dr Irving Lee *Dental Consultant, University of Virginia Hospital* DENTISTRY (in part)

Hutchinson, Prof F. W. *University of California* AIR CONDITIONING, COMFORT CONTROL; series of related articles.

Hutner, Dr Seymour Herbert. *Haskins Laboratories, New York* ANTIBACTERIAL AGENTS (in part)

Hyde, Dr Earl K *Lawrence Radiation Laboratory, University of California* ASTATINE; FRANCIUM; RADON

Hyman, Dr Herbert H *Senior Chemist, Argonne National Laboratory.* SOLVENT.

Hynes, Lee Powers *Consulting Engineer* HEATING, ELECTRIC.

Ingerson, Prof F. Earl *Geology Department, University of Texas* GEOLOGIC THERMOMETRY (in part)

Ingram, William Truitt *Consulting Engineer* AIR POLLUTION CONTROL, SEWAGE COLLECTION SYSTEMS; SEWAGE TREATMENT, other articles in sanitary engineering

Inman, Douglas Lamar *Associate Professor of Marine Geology, Scripps Institution of Oceanography, University of California.* SHORE PROCESSES

Inskip, Leonard Seeley *Protection Engineer, Bell Telephone Laboratories, Inc* COMMUNICATIONS SYSTEMS PROTECTION

Isbin, Prof Herbert S *Department of Chemical Engineering, University of Minnesota* REACTOR, NUCLEAR (CLASSIFICATION)

Itano, Dr Harvey Akio *National Institutes of Health* HEMOGLOBIN

J

Jacobs, Dr Woodrow C *Director of Climatology, U.S Air Force, Headquarters Air Weather Service, Scott Air Force Base, Illinois* AGRICULTURAL METEOROLOGY (in part), CLIMATIC CHANGE; CONTINENTALITY, WEATHER AND CLIMATE, OCEAN-METEOROLOGICAL RELATIONS

Jacobson, A Walter *Assistant Chief Engineer, Bristol Company* RECORDING INSTRUMENTS, GRAPHIC

Jacobson, Prof Nathan *Yale University* RING THEORY

Jakobi, Dr Prof Hans *Professor of Animal Physiology, University of Parana, Brazil* ANASPIDACEA, BATHYNELLACEA, EUMALOCOSTRACA SYNCARIDA

James, Dr Arthur Montague *Reader in Physical Chemistry, Department of Chemistry, Chelsea College of Science and Technology, London, England* CELL-SURFACE IONIZATION

James, Gideon T *Museum of Paleontology, University of California* CETACEA FOSSILS, HYDRACOIDEA FOSSILS, articles on related fossil groups

James, John William *Vice-President, Research, McDonnell and Miller Inc* STEAM HEATING

James, Robert Sloan *Chief, Branch of Electrical-Mechanical Testing, U.S Bureau of Mines.* MINING OPERATING FACILITIES (in part)

Jen, Dr C K *Physicist, Applied Physics Laboratory, Johns Hopkins University* CAVITY RESONATOR; MICROWAVE, MICROWAVE OPTICS WAVE GUIDE

Jenkins, David S *Former Director, Office of Saline Water, U.S Department of the Interior; Consulting Engineer* SALINE WATER RECLAMATION

Jenkins, Prof Francis Arthur *Department of Physics, University of California* ATOMIC STRUCTURE AND SPECTRA, DIFFRACTION, ZEEMAN EFFECT (in part), articles in atomic physics and physical optics

Jensen, Dr Hans Laurits *Head of Department of Bacteriology, State Laboratory for Soil and Crop Research, Lyngby, Denmark* AZOTOBACTERACEAE, CORYNEBACTERIACEAE, MYCOBACTERIACEAE

Jette, Dr Eric *Staff Consultant, Research Administration Department, Union Carbide Corporation* METALLURGY

Joesting, Dr. Henry R. *Staff Geophysicist, U S Geological Survey* PROSPECTING

Johnson, David S *Acting Chief, Meteorological Satellite Section, U S Weather Bureau* METEOROLOGICAL ROCKETS.

Johnson, Prof Frank Harris *Professor of Biology, Princeton University* CELL (PRESSURE-TEMPERATURE EFFECTS).

Johnson, George Brooks *Assistant Chief Engineer, Newport News Shipbuilding and Dry Dock Company* MARINE MACHINERY (in part)

Johnson, Dr Howard W *Agricultural Research Service, U.S Department of Agriculture, Mississippi Agricultural Experiment Station, Delta Branch Experiment Station* SOYBEAN (in part).

Johnson, Dr. Iver J. *Research Director, Caladino Farm Seeds, Inc.* GRAIN CROPS; articles on major grains (co-authored).

Johnson, Dr J Harlan *Professor emeritus of Geology, Colorado School of Mines.* ALGAE FOSSILS, articles on related fossil groups.

Johnson, K W President, K W Johnson and Company, Inc., Chemical Engineer DYNAMICAL ANALOGIES; SHOCK ISOLATION, articles on vibration.

Johnson, Kenneth A. *Assistant Professor of Physics, Department of Physics and Laboratory of Nuclear Science, Massachusetts Institute of Technology* QUANTUM ELECTRODYNAMICS, QUANTUM FIELD THEORY.

Johnson, Dr Martin W *Scripps Institution of Oceanography, University of California* CALANOIDA, COPEPODA

Johnson, Dr Richard A *Associate Professor of Electrical Engineering, Syracuse University* FILTER, ELECTRIC (in part)

Johnson, Prof Walter Curtis *Professor and Chairman, Department of Electrical Engineering, Princeton University* TRANSMISSION THEORY AND METHODS

Johnson, Wendell E *Chief, Engineering Division, Missouri River Division, Corps of Engineers, Omaha, Nebraska* REVETMENT (in part), RIVER ENGINEERING

Johnston, Francis J *Assistant Professor of Chemistry, University of Georgia* Series of articles on various topics in chemistry

Johnson, Dr Ivan D A *Mayo Clinic* DIGESTIVE SYSTEM (in part)

Johnston, Dr. James D *Supervisor, Chemical Research, Ethyl Corporation* LEAD (in part)

Jominy, Walter E *Chrysler Corporation* SURFACE HARDENING OF STEEL

Jones, Dr Daniel J *Professor of Geology, University of Utah* MICROPALEONTOLOGY, PROTISTA, articles on related fossil groups

Jones, Dr E Ruffin *Professor of Biology, University of Florida* TURBELLARIA, articles on related taxonomic groups

Jones, Dr Norman Sumner. *Senior Lecturer, Marine Biological Station, University of Liverpool, England* CUMACEA

Joseph, Prof Thomas Leonard *University of Minnesota School of Mines and Metallurgy* IRON (EXTRACTION FROM ORE)

Jost, Prof Alfred *Laboratory of Comparative Physiology, Faculty of Sciences, University of Paris* REPRODUCTIVE SYSTEM (in part)

Judd, Dr Deane Brewster *Photometry and Colorimetry Section, National Bureau of Standards* COLORIMETRY, FILTER, COLOR

Judd, William R *Staff Consultant on Geotechnics and Arctic Logistics, The RAND Corporation* ENGINEERING GEOLOGY (in part).

Judson, Prof. Sheldon *Associate Professor of Geology, Princeton University* FALL LINE, FLUVIAL EROSION LANDFORMS

Just, Dr Theodore *Chicago Natural History Museum.* FLOWER (BOTANY)—in part

Juve, Arthur E *Director Technical Services Research, B F. Goodrich Research Center* RUBBER PRODUCTS

Kagan, Dr. Jerome *Chairman, Department of Psychology, Fels Research Institute.* BEHAVIOR, ONTOGENY OF (in part).

Källén, Dr Bengt A J *Department of Embryology, University of Lund, Sweden* NERVOUS SYSTEM (in part)

Kallmann, Dr Franz J *Professor of Psychiatry, Columbia University, Chief of Psychiatric Research (Medical Genetics), New York State Psychiatric Institute* HUMAN GENETICS (in part).

Känzig, Dr Werner *General Electric Research Laboratory* BARIUM TITANATE, FERROELECTRICS; PIEZOELECTRICITY, PYROELECTRICITY

Kaplan, Prof Joseph *Department of Physics, University of California.* GEOPHYSICS (in part)

Kaplan, Dr Lewis David *Department of Meteorology, Massachusetts Institute of Technology* GREENHOUSE EFFECT, TERRESTRIAL, HEAT BALANCE, TERRESTRIAL ATMOSPHERIC, RADIATION, TERRESTRIAL (in part).

Kaplan, Dr Louis *Senior Chemist, Argonne National Laboratory* HYDROGEN, TRITIUM

Kappus, Peter G *Flight Propulsion Division, General Electric Company* TURBOFAN, TURBOPROP

Kaprelian, Edward K *Deputy Director of Research, U.S Army Research and Development Laboratory* GUN SIGHTS, PERISCOPE, RANGEFINDER, OPTICAL

Karash, Joseph I *Corporate Staff Manufacturing Engineer, Reliance Electric and Engineering Company* TOOLING

Katz, Dr Joseph J *Senior Chemist, Argonne National Laboratory* HYDROGEN FLUORIDE, INORGANIC CHEMISTRY

Katznelson, Dr Harry, *Director, Research Branch, Microbiology Research Institute, Canada* NITROGEN CYCLE

Kauzmann, Dr Walter *Professor of Chemistry, Princeton University* QUANTUM CHEMISTRY

Kay, Prof John Menzies *Professor of Nuclear Power, University of London, England* FLUID-FLOW PROPERTIES

Kay, Prof Marshall *Professor of Geology, Columbia University* GEOSYNCLINE, ORDOVICIAN, PALEOCLIMATOLOGY, PALEOGEOGRAPHY

Kaye, Prof Joseph *Department of Mechanical Engineering, Massachusetts Institute of Technology* ISENTROPIC FLOW (in part)

Kays, Prof John M *Associate Professor of Animal Husbandry, University of Connecticut* HORSE PRODUCTION, MULE PRODUCTION

Keast, David N *Bolt, Beranek and Neuman, Inc* MICROPHONICS, NOISE MEASUREMENT

Keen, Dr A Myra. *Assistant Professor of Paleontology and Curator of Malacology, Stanford University* PELECYPODA FOSSILS

Keffer, Prof Frederic *Professor of Physics, University of Pittsburgh* FERROMAGNETISM, PARAMAGNETISM (both in part), other articles in magnetism (co-authored)

Keller, Dr Joseph M *Professor of Physics, Iowa State University* HARMONIC MOTION, HARMONIC OSCILLATOR, PENDULUM, series of related articles.

Keller, Prof Walter D *Professor of Geology, University of Missouri* EROSION, WEATHERING PROCESSES

Kellogg, Prof. Herbert Humphrey. *Professor of Extractive Metallurgy, Henry Krumb School of Mines, Columbia University.* HYDROMETALLURGY; PYROMETALLURGY; PYROMETALLURGY, NONFERROUS

Kells, Prof Lyman M. *Professor emeritus, U.S. Naval Academy.* TRIGONOMETRY, PLANE; TRIGONOMETRY, SPHERICAL; other articles in trigonometry

Kelsey, Dr Francis O *Medical Officer, New Drug Branch, Food and Drug Administration* PITUITARY GLAND (in part).

Kempf, Norman W *Chocolate Manufacturing Consultant, Walter Baker Division, General Foods Corporation.* COCOA POWDER AND CHOCOLATE

Kendeigh, Dr S Charles *University of Illinois* BIOME, COMMUNITY

Kennedy, Dr Donald *Department of Biological Sciences, Stanford University* PHOTORECEPTION (in part).

Kennedy, Prof Ralph Craig *Adjunct Professor of Electrical Engineering, New York University; Development Engineer, National Broadcasting Company* TELEVISION SCANNING.

Kensler, Prof Charles J *Chairman, Department of Pharmacology and Experimental Therapeutics, Boston University School of Medicine* PHARMACOLOGY

Kent, Dr George C, Jr *Professor of Zoology, Louisiana State University.* ADRENAL GLAND, PITUITARY GLAND, THYROID GLAND (all in part)

Kerchner, Prof Russell Marion *Head, Department of Electrical Engineering, Kansas State University* ALTERNATING-CURRENT CIRCUIT THEORY (in part).

Kerr, S Logan *Consulting Engineer* WATER HAMMER

Kerr, Dr William J *University of California Hospital (retired)* SYMBALLOPHONE.

Kesling, Prof Robert Vernon *Professor of Geology and Curator of Micropaleontology, University of Michigan* MYODOCOPA (in part), OSTRACODA (in part), PALEOCOPA, PODOCOPA (in part)

Ketchum, Dr Bostwick H *Woods Hole Oceanographic Institution* SEA WATER (in part)

Kharasch, Prof Norman *Professor of Chemistry, University of Southern California* Series of articles on organosulfur compounds

Kiff, Ben W *Research Chemist, Union Carbide Chemicals Company* ACROLEIN, GLYCEROL, PENTAERYTHRITOL

Killeffer, David H *Consultant* MOLYBDENUM

Kilpatrick, Prof Martin *Illinois Institute of Technology* SCANDIUM

Kimbark, Dr Edward Wilson *Dean, School of Engineering, Seattle University* NEPER, TRANSMISSION LINES

King, Dr Donald West. *Yale University School of Medicine* MALNUTRITION, METABOLIC DISORDERS

King, Prof Thomas B *Massachusetts Institute of Technology. Department of Metallurgy* VACUUM METALLURGY

King, Dr. Thomas Henry *Department of Plant Pathology and Botany, University of Minnesota* PEA, STRAWBERRY (both in part)

Kingery, Donald Samuel *Director, Health and Safety Research and Testing Center, U.S Bureau of Mines* MINING OPERATING FACILITIES (in part)

Kinnard, Dr Isaac Fern. *Mgr Engineer (retired), Instrument Department, General Electric Company* ELECTRICAL MEASUREMENTS (in part); INSTRUMENT TRANSFORMER; other articles on electrical instrumentation

Kinnier, Prof Henry Lee *University of Virginia* COMPOSITE BEAM

Kinsler, Prof. Lawrence Edward *Professor of Physics, U.S Naval Postgraduate School* RESONANCE (ACOUSTICS AND MECHANICS), TUNING FORK, VIBRATION, VIBRATION PICKUP.

Kinsman, Blair. *Chesapeake Bay Institute, Johns Hopkins University* RIVER TIDES, TIDAL BORE

Kiplinger, Prof D C *Horticulture and Forestry Department, Ohio State University* FLORICULTURE.

Kirby, Dr Kenneth W. *Research Chemist, Penick and Ford, Ltd., Inc* PECTIN (in part).

Kirkpatrick, Dr Sidney Dale. *Consulting Editor, Chemical Engineering Series, McGraw-Hill Book Company* CHEMICAL ENGINEERING

Kirschner, Prof Stanley *Department of Chemistry, Wayne State University, Michigan* SELENIUM, SULFUR; TELLURIUM.

Kirshenbaum, Dr Isidor *Research Associate, Esso Research and Engineering Company* HEAVY WATER

Klarmann, Dr Emil G *Vice-President and Director of Technical Services, Lehn and Fink, Inc., Lecturer, Department of Dermatology and Syphilology, New York University* BIOASSAY (in part)

Klass, Philip J *Avionics Editor, 'Aviation Week'.* ELECTRONIC COUNTERMEASURES, MOLECULAR ELECTRONICS, PASSIVE RADAR

Klein, Prof David H *Assistant Professor of Chemistry, Los Angeles State College* NUCLEATION (in part)

Klemens, Dr Paul Gustav *Westinghouse Research Laboratories, Pittsburgh* CONDUCTION (HEAT)—in part, UNKLAPP PROCESS

Klick, Dr Clifford Coover *Head, Luminescence Section, U S Naval Research Laboratory* ELECTROLUMINESCENCE, LUMINESCENCE, other articles on luminescence and in theoretical physics (all co-authored)

Klieger, Paul *Manager, Field Research Section, Research and Development Laboratory, Portland Cement Association* CONCRETE

Kline, Dr Hibberd Van Buren, Jr *Professor and Chairman, Department of Geography, University of Pittsburgh* AFRICA

Klock, Dr Harold Francis *Electrical Engineering Department, Case Institute of Technology* AMPLIFIER, DISTORTION (ELECTRONIC CIRCUITS), FEEDBACK CIRCUIT, other articles on electronic circuits

Knappen, Dr Russell S *Vice-President, Foster Associates, Inc.* OIL AND GAS FIELD DEVELOPMENT, PETROLEUM ENGINEERING

Knauss, Dr John A *Scripps Institution of Oceanography, University of California* OCEAN CURRENTS (in part)

Knaysi, Dr George *New York State College of Agriculture, Cornell University* ACID-FAST STAIN, GRAM'S STAIN, STAIN (MICROBIOLOGICAL)

Knebelman, Prof Morris S *Professor of Mathematics, Washington State University* COORDINATE SYSTEMS, GRAPHICAL, GEOMETRY, DIFFERENTIAL

Knight, Dr C Arthur *Professor of Virology and Research Biochemist, Virus Laboratory, University of California* VIRUS

Knight, Dr Samuel Bradley *Professor of Chemistry, University of North Carolina.* HYDROGEN ION (in part)

Knoerr, Alvin W. *Editor, 'Engineering and Mining Journal'* METAL AND MINING PROCESSING

Knopf, Dr Eleanora Bliss *Research Associate, School of Mineral Sciences, Stanford University* CLEAVAGE, ROCK, PETROFABRIC ANALYSIS; SCHISTOSITY, ROCK, STRUCTURAL PETROLOGY

Knowles, Hugh S. *Director of Research, Industrial Research Products, Inc.* LOUDSPEAKER.

Knowlton, P. Holland *Large Steam Turbine Generator Department, General Electric Company.* STEAM TURBINE; TURBINE.

Koch, Leonard J. *Deputy Director, Reactor Engineering Division, Argonne National Laboratory.* ELECTROMAGNETIC PUMPS; REACTOR, NUCLEAR

Kochendorfer, Fred D. *Head, Planetary Flight Systems, National Aeronautics and Space Administration* NOZZLE.

Koczy, Prof Friedrich. *Professor of Marine Sciences, The Marine Laboratory, University of Miami.* OCEANOGRAPHY (in part).

Koerker, Frederick William. *Technical Expert, The Dow Chemical Company* CHLORINE

Kohl, Arthur L. *Chief Chemical Engineer, Research Division, The FLUOR Corporation, Ltd* HUMIDIFICATION, STRIPPING.

Kohls, Glen M. *Sanitarian Director, U.S Public Health Service, Rocky Mountain Laboratory, Montana* IXODIDES.

Komai, Dr. Taku *Professor emeritus, Kyoto University, Japan* CTENOPHORA; articles on related taxonomic groups

Konigsbert, Dr Irwin R *University of Colorado School of Medicine* PANCREAS (in part)

Konzo, Prof Seichi *Mechanical Engineering Department, University of Illinois* REGISTER, AIR, WARM AIR HEATING SYSTEM

Kopac, Prof M J *Department of Biology, New York University* MICROMANIPULATION.

Kopal, Prof. Zdeněk *Head, Department of Astronomy, University of Manchester, England* BINARY STARS

Kornemann, Henry C *Assistant Manager, Engineering Laboratory, Linde Company* ATMOSPHERIC GASES, PRODUCTION OF

Kott, Dr Maurice G *Director, Division of Mental Retardation, Department Institutions and Agencies, State of New Jersey* CRETINISM, MENTAL DEFICIENCY, MONGOLIAN IDIOCY, PHENYLPYRUVIC OLIGOPHRENIA

Kotter, Dr F Ralph *Physicist, National Bureau of Standards* CAPACITANCE BOX, CAPACITANCE MEASUREMENT

Kraehenbuehl, Prof John Otto *Professor emeritus of Engineering, University of Illinois* ARC LAMP, INCANDESCENT LAMP, INFRARED LAMP, PHOTOFLASH LAMP

Krause, Lloyd N *Aeronautical Research Scientist, Instruments, National Aeronautics and Space Administration, Lewis Research Center* PITOT TUBE

Krefeld, Prof William J *Professor of Civil Engineering, Columbia University* LOADING, TRANSVERSE, STRESS AND STRAIN, STRUCTURAL CONNECTIONS, other articles in civil engineering

Kreitlow, Dr Kermit William *Principal Plant Pathologist, Crops Research Division, A.R.S., U.S Department of Agriculture, Beltsville, Maryland.* CLOVER, GRASS CROPS (both in part)

Kret, David B *Project Engineer, Semiconductor Division, Motorola, Inc* PHOTOELECTRIC DEVICES

Krishna, Kumar *Department of Zoology, University of Chicago* SOCIAL INSECTS

Krombein, Dr Karl V. *Insect Identification and Parasite Introduction Branch, Entomology Research Division, U.S Department of Agriculture.* HYMENOPTERA.

Krumbein, Dr. William C *Department of Geology, Northwestern University.* FACIES (GEOLOGY)

Krusen, Dr Frank Hammond. *Senior Consultant, Section of Physical Medicine and Rehabilitation, The Mayo Clinic* THERMOTHERAPY (in part).

Krynine, Prof Dimitri P. *Consultant, Engineering Geology (in part)*

Kryter, Dr Karl D *Research Psychologist, Bolt, Beranek and Newman, Inc* Ear protectors; Noise control (in part), Phon; other articles in acoustics

Kuhn, Dr. Wayne E. *Texaco, Inc* Dewaxing (petroleum); Wax, petroleum.

Kuiper, Prof. Gerard P. *Director, Yerkes Observatory, University of Chicago* Apogee, Moon; Perigee, Phase (astronomy).

Kullas, Albert J *Manager of Technical Development, The Martin Company* Wing structure.

Kullerud, Dr Gunnar *Geochemist, Geophysical Laboratory, Carnegie Institution of Washington* Sulfide phase equilibria.

Kulp, Dr J Laurence *Professor of Geochemistry, Columbia University* Cosmochemistry, Geochemistry; Geochronometry, Geological time scale, Rock (age determination)

Kummel, Prof Bernhard *Museum of Comparative Zoology, Harvard University* Triassic.

Kunin, Dr Robert *Rohm and Haas Company* Ion-permeable membrane (in part)

Kunkel, Prof Henry G *The Rockefeller Institute* Blood (in part)

Kunz, Dr Kaiser S *Research Professor of Electrical Engineering, New Mexico State University* Curve fitting, Extrapolation, Graphic methods, Interpolation

Kupchan, Prof S. Morris *Associate Professor of Pharmaceutical Chemistry, University of Wisconsin* Alkaloid, articles on various alkaloids

Kurtz, Stewart S, Jr *Sun Oil Company* Oil analysis

Kusch, Prof Polykarp *Department of Physics, Columbia University* Electron spin, Molecular beams, other articles in atomic and molecular physics

Lackey, Prof James B *Professor of Sanitary Science, Department of Civil Engineering, University of Florida* Mastigophora, articles on related taxonomic groups.

Ladd, Dr Harry S *U.S Geological Survey* Atoll, Paleoecology

Lagler, Prof Karl Frank *Department of Fisheries, University of Michigan* Fisheries conservation

Lamanna, Dr Carl *Scientific Director, Naval Biological Laboratory, University of California* Antibacterial agents (*in part*)

Lamar, John E *Geologist, Illinois State Geological Survey* Sand

Landauer, Dr Walter *Professor of Genetics, University of Connecticut* Phenocopies

Landes, Dr Hugh Stevenson *Assistant Professor of Electrical Engineering, University of Virginia* Reciprocity, principle of

Landshoff, Dr. Rolf K M *Lockheed Missiles and Space Division* Cosmic electrodynamics; Magnetohydrodynamics

Landweber, Prof Louis. *Professor of Mechanics and Hydraulics, State University of Iowa* Hydrodynamics, Hydrokinematics, Hydrokinetics

Lane, James Arthur *Oak Ridge National Laboratory* Nuclear fuels, Nuclear power

Lang, Dr Prof Karl G. H *Director of the Department of Invertebrates, Swedish State Museum of Natural History, Stockholm* Harpacticoida; Tanaidacea.

Langley, Dr Leroy Lester. *Professor of Physiology, University of Alabama Medical Center* Digestive system (in part)

Lankton, Clark S, Jr. *Aircraft Nuclear Propulsion Department, General Electric Company* NUCLEAR AIRCRAFT PROPULSION (in part)

Lapedes, Daniel N. *Life Sciences Editor, McGraw-Hill Encyclopedia of Science and Technology* INFECTION; PATHOGEN, articles on several enzymes

Lapidus, Prof Leon *Department of Chemical Engineering, Princeton University.* CHEMICAL PROCESS CONTROL

Laport, Edmund Abner. *Director, Communications Engineering, Radio Corporation of America* AMPLITUDE-MODULATION RADIO, FREQUENCY-MODULATION RADIO

Lapple, Charles E *Senior Scientist, Stanford Research Institute* DUST AND MIST COLLECTION, PARTICLE PROPERTIES.

Larsen, Prof. Edwin Merritt. *Department of Chemistry, University of Wisconsin* INDIUM, NIOBIUM, TANTALUM, THALLIUM

Larsen, Dr. Helge *Professor of Biochemistry, The Technical University of Norway* BRINE, MICROBIOLOGY OF

Larsen, Dr Robert Gordon *Manager and Director of Research, Thornton Research Centre, Shell Research, Ltd., Chester, England.* LUBRICANT

Lass, Dr. Harry *Research Specialist Jet Propulsion Laboratory, California Institute of Technology* CALCULUS OF TENSORS, CALCULUS OF VECTORS

Lauffer, Prof Max A *Professor of Biophysics, Dean of the Division of Natural Sciences, University of Pittsburgh* BIOPHYSICS

Laves, Prof Dr Fritz Henning *Eidgenoessisch Technische Hochschule und Universitaet Zuerich, Institut Fuer Kristallographie and Petrographie, Zurich, Switzerland* FELDSPAR, articles on related minerals

Lawler, Frank K *Editor-in-Chief, 'Food Engineering'* FOOD ENGINEERING, FOOD MANUFACTURING (both in part), FOOD TECHNOLOGY

Lawroski, Dr. Stephen *Director, Chemical Engineering Division, Argonne National Laboratory* NUCLEAR FUELS REPROCESSING, RADIOCHEMICAL LABORATORY

Lawther, Dr Harry Preston, Jr *General Engineering Department (retired), Southwestern Bell Telephone Company* CROSSTALK

Layzer, Prof David *Professor of Astronomy, Harvard University* COSMOGONY, COSMOLOGY, STELLAR EVOLUTION, other articles in astronomy

Lazarus, Prof David. *Professor of Physics, University of Illinois* DIFFUSION IN SOLIDS

Leadon, Dr Bernard M *Senior Staff Scientist, Convair* SKIN FRICTION

Ledingham, Dr George Aleck *Director, Prairie Regional Laboratory, Saskatoon, Canada* 2,3-BUTANEDIOL

Ledoux, Louis P *Ledoux and Company, New Jersey* ASSAYING (in part)

Lee, Sir Harold Eugene *Vice-President, The Bunker Hill Company* LEAD METALLURGY

Lee, L. K *Manager, Product Engineering Department, Space Technology Laboratories, Inc* PRINTED CIRCUIT

Lehmer, Prof Derrick Henry *University of California* NUMBER SYSTEMS

Lehninger, Dr A L *Johns Hopkins University School of Medicine* CELL (BIOLOGICAL)—in part.

Lehrman, Prof Daniel S *Institute of Animal Behavior, Rutgers University* REPRODUCTIVE BEHAVIOR

Lein, Dr Joseph. *Director, Microbiological Research, Assistant Director of Laboratories, Bristol Laboratories* KANAMYCIN

Lems, Dr Kornelius *Assistant Professor of Biological Sciences, Goucher College, Baltimore* ISLAND FAUNAS AND FLORAS, POPULATION DISPERSAL, SUCCESSION, ECOLOGICAL, other articles in ecology.

Leontis, Dr Thomas Ernest *The Dow Metal Products Company, Division of the Dow Chemical Company* MAGNESIUM ALLOYS

Leopold, Prof A. Carl *Professor of Physiology of Horticultural Crops, Purdue University* PLANT HORMONES

Leopold, Prof A Starker *University of California* BIOGEOGRAPHY

Leopold, Dr Luna Bergere *Chief Hydraulic Engineer, U S Geological Survey* STREAM AGING, STREAM TRANSPORT AND DEPOSITION, SURFACE WATER, SWAMP, MARSH, AND BOG

LeFage, Dr Wilbur R *Chairman, Department of Electrical Engineering, Syracuse University* CHOKE (FILTER), FILTER, ELECTRIC (in part), NOISE FILTER, RADIO, SUPPRESSOR

Lerch, William *Consultant, Portland Cement Association* AIR-ENTRAINING PORTLAND CEMENT, CEMENT, PORTLAND CEMENT

Lettau, Dr Heinz Helmot *Professor of Meteorology and Civil Engineering, University of Wisconsin* MICROMETEOROLOGY

Leva, Max *Consulting Chemical Engineer* GAS ABSORPTION OPERATIONS

Levasheff, V V *Inorganic Section Group Leader, American Potash and Chemical Corporation* BORON (in part)

Levine, Dr Philip *Director, Division of Immunohematology, Ortho Research Foundation, Raritan, New Jersey.* BLOOD GROUPS

Levitt, Dr I M *Director, The Fels Planetarium of the Franklin Institute* PLANETARIUM

Lewis, Dr Bernard *Combustion and Explosives Research, Inc* COMBUSTION

Lewis, Prof Edward B Professor of Biology, California Institute *of Technology* ALLELE, PSEUDOALLELES

Lewis, Frank D *Engineer, General Radio Company* FREQUENCY COUNTER, FREQUENCY MEASUREMENTS (in part), PIEZOELECTRIC CRYSTAL, WAVELENGTH MEASUREMENT

Lewis, Dr James C *Research Chemist, Western Regional Laboratory, U S Department of Agriculture* SUBTILIN

Lewis, Dr Willard Deming *Director of Research, Communications Systems, Bell Telephone Laboratories, Inc* SWITCHING THEORY

Ley, Dr h c Willy *Fairleigh Dickinson University* BALLISTICS, INTERIOR

Li, Dr C C *Professor of Biometry, Graduate School of Public Health, University of Pittsburgh* BIOMETRICS, HUMAN GENETICS (in part), POPULATION GENETICS

Li, Prof Choh Hao Director, *Hormone Research Laboratory, University of California* PANCREAS (in part), THYROID GLAND (in part), articles on various hormones

Libby, Prof Willard Frank. *Formerly, member of Atomic Energy Commission, presently, Department of Chemistry, University of California* RADIOACTIVE FALLOUT

Liddicoat, Richard Thomas, Jr *Director, Gemological Institute of America* GEM, GEM CUTTING, series of articles on various gems

Liedholm, George Edward *Department Head, Oil Process Engineering, Shell Development Company* ISOMERIZATION

Lill, Gordon G *Office of Naval Research* MOHO (MOHOROVICIC DISCONTINUITY)

Liller, Dr William *Professor of Astronomy, Harvard University* COAL SACK, GALAXY, THE, INTERSTELLAR MATTER NEBULA

Limpel, Eugene J *Director, Electrical Research, A O. Smith Corporation.* FLASH WELDING; RESISTANCE WELDING; SPOT WELDING

Lin, Dr Shao-Chi *Principal Research Scientist, AVCO-Everett Research Laboratory* SHOCK WAVE, SONIC BARRIER; SONIC BOOM; WAVE MOTION IN FLUIDS.

Lindenmaier, Dr Werner A. *Manufacturing Chemist, Hoffmann-LaRoche, Inc* ASCORBIC ACID (in part)

Linder, Fil dr. Folke *Flicklåroverket, Hälsingborg, Sweden* ANOSTRACA; BRANCHIOPODA; CONCHOSTRACA, NOTOSTRACA.

Linderoth, L Sigfred, Jr. *Director of Engineering, Central Research and Engineering Division, Continental Can Company, Inc.* FLYWHEEL; SPRING (MECHANICAL), WELDED JOINT; other articles in machine design.

Linford, Prof. Henry B. *Professor of Chemical Engineering, Columbia University.* ELECTROMETALLURGY.

Linsley, Prof E. Gorton *Department of Entomology and Parasitology, University of California.* ANIMAL SYSTEMATICS, SPECIES CONCEPT, TYPE METHOD, other articles in animal systematics

Lippert, Thomas W. *Director of Marketing, Titanium Metals Corporation of America* TITANIUM METALLURGY

Little, Elbert L, Jr *Dendrologist, U S Forest Service, U S Department of Agriculture* DENDROLOGY

Lobo, Walter E. *Consulting Chemical Engineer* TUBE-STILL HEATER.

Lochhead, Dr Allan Grant *Microbiology Research Institute, Canada Department of Agriculture* SOIL MICROBIOLOGY, SOIL MICROORGANISMS, other articles in soil microbiology

Lockhart, Dr Ernest E *Scientific Director, Coffee Brewing Institute* COFFEE (in part).

Lockwood, Dr Lewis B *Assistant Director, Biosynthesis Laboratory, Miles Chemical Company* ACETOBACTER SUBOXYDANS FERMENTATION, VINEGAR

Loewenstein, Dr Werner R *Associate Professor of Physiology, College of Physicians and Surgeons, Columbia University* *MECHANORECEPTORS*

Lohrie, Ben *President, Plasmakote Corporation* METAL COATINGS (in part).

Long, Prof Franklin A. *Department of Chemistry, Cornell University* ACID AND BASE

Longwell, Dr Chester Ray *Geologist, U S Geological Survey* DIASTROPHISM, GEOLOGY

Lord, Prof Richard C *Spectroscopy Laboratory, Massachusetts Institute of Technology* INFRARED RADIATION, INFRARED SPECTROSCOPY, RAMAN EFFECT, other articles in optics

Lorenz, Prof Edward N *Department of Meteorology, Massachusetts Institute of Technology* WEATHER (FORECASTING AND PREDICTION)—in part

Loughlin, James E *Manager, Technical Service, National Aniline Division, Allied Chemical Corporation* DYEING, TEXTILE PRINTING

Lovell, Wheeler G *Research and Development Department, Ethyl Corporation* ANTIKNOCK AGENTS

Lowan, Prof. Arnold N *Chairman, Physics Department, Yeshiva University, Brooklyn e,* EXPONENT, LOGARITHM, NUMERICAL ANALYSIS

Lowell, Prof. Wayne Russell *Department of Geology, Indiana University* Series of articles on apatite and pyromorphite minerals.

Lowenstam, Dr Heinz A *Geological Sciences, California Institute of Technology* PALEOECOLOGY (GEOCHEMICAL ASPECTS)

Lowenstein, Prof Otto Egon *Professor of Zoology and Comparative Physiology, The University, Birmingham, England* EQUILIBRIUM, BIOLOGICAL; TAXIS

Lowenthal, Dr David *Research Associate, American Geographical Society.* WEST INDIES.

Lucker, John Thomas *Animal Disease and Parasite Research Division, Agricultural Research Service, U.S. Department of Agriculture Parasitological Laboratory, Beltsville, Maryland* ASCARIDOIDEA; articles on related taxonomic groups

Ludlam, Dr Frank Henry. *Department of Meteorology, Imperial College, London, England* CLOUD

Ludvik, Dr George F. *Group Leader, Insecticide Application Research, Organic Chemicals Division, Monsanto Chemical Company* INSECTICIDE, MITICIDE (both in part).

Leubbers, Dr. Ralph H *Professor of Chemical Engineering, University of Missouri* HEAT TRANSFER.

Lundy, Clarence A *Office Engineer, Mechanical Department, New York Central Railroad System.* LOCOMOTIVE

Lush, Prof Jay L *Professor of Animal Husbandry, Iowa State University* BREEDING (ANIMAL).

Lush, Prof R H *Dairying, The University of Tennessee* CATTLE PRODUCTION, DAIRY

Luttrell, Dr E S *Head, Department of Plant Pathology, Georgia Experiment Station, University of Georgia* GRAPE CULTURE (in part)

Luzadder, Prof Warren J *Professor of Engineering Graphics, Purdue University* BOLT, NUT, SCREW THREADS, WASHER

Lyman, Dr Charles Peirson *Research Associate, Museum of Comparative Zoology and Harvard University Medical School* HIBERNATION (in part)

Lyman, Dr John *Oceanographer, National Science Foundation.* MEDITERRANEAN SEA, OCEANS AND SEAS, SEA, SEA WATER (in part)

Lynn, Dr John W *Research Group Leader, Union Carbide Chemicals Company* ALCOHOL, BUTANOL, METHANOL; PROPANOL

Lynn, Dr William Gardner. *Professor of Biology, The Catholic University of America* THYROID GLAND (in part)

Lyon, Dr Waldo K. *Head, Submarine and Arctic Research Branch, U S Navy Electronics Laboratory* SEA ICE.

Lyons, Prof Walter *Manager, Station Facilities (Equipment and Systems Design), Radio Corporation of America Communications, Inc* RADIO RECEIVER, RADIO TRANSMITTER, series of related articles

M

Mabey, Charles A *Manager, Patent Department, The Bristol Company* WATTMETER

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Macdonald, Dr Gordon Andrew *Senior Professor of Geology and Geophysics, University of Hawaii, Volcanologist, Hawaii Institute of Geophysics* AMYGDULE, PUMICE; VOLCANO, VOLCANOLOGY

Macfadyen, Amyan *Lecturer in Zoology, University College of Swansea, Wales* BIOMASS; BIOLOGICAL PRODUCTIVITY, ECOLOGICAL SYSTEMS, ENERGY IN; FOOD CHAIN

MacInnes, Dr Duncan Artur. *The Rockefeller Institute.* ELECTROCHEMISTRY, ELECTROLYTIC CONDUCTANCE, TRANSFERENCE NUMBER

MacIntosh, Robert M *Manager, Tin Research Institute, Inc.* TIN

Mackey, Prof. George W *Professor of Mathematics, Harvard University.* OPERATOR THEORY.

Mackin, Prof. J. Hoover. *Department of Geology, University of Washington* GEOMORPHOLOGY.

MacNeille, Dr. Stephen Mann *Director of Research, American Optical Company.* OPTICAL FIBERS.

Maddock, Dr. Alfred Gavin *Cambridge University, England;* PROTACTINIUM

Mahler, Joseph *Research Physicist, American Optical Company Research Center.* VECTOGRAPH

Major, Dr Jack. *Department of Botany, University of California at Davis* PLANT COMMUNITY

Makulec, Alfred *Product Planning and Application Specialist, Large Lamp Department, General Electric Company* FLUORESCENT LAMP; PROJECTOR (LIGHT); articles on various types of lamps

Maldonado, Dr. José F. *Associate Professor of Parasitology, Puerto Rico School of Medicine, San Juan* Series of articles in medical parasitology.

Malone, Dr Thomas Francis *Director of Research, Travelers Insurance Company* INDUSTRIAL METEOROLOGY

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Manchester, Prof. Curtis Alexander *University of Hawaii* EAST INDIES, PACIFIC ISLANDS.

Mann, Dr Kenneth Henry *Department of Zoology, University of Reading, Berkshire, England* ARHYNCHOBDELLAE, HIRUDINEA, RHYNCHOBDELLAE

Mann, Dr Robert Wellesley *Professor of Mechanical Engineering, Massachusetts Institute of Technology* ENVIRONMENTAL TEST, MINIATURIZATION OF EQUIPMENT, RELIABILITY OF EQUIPMENT, other articles in systems engineering

Manning, Dr Kenneth Verne *Associate Professor of Physics, Pennsylvania State University* INDUCTION, ELECTROMAGNETIC; MAGNETIC FIELD, articles in electromagnetism and magnetism

Manning, Dr Paul D V *Professor of Chemical Engineering, California Institute of Technology* MONOSODIUM GLUTAMATE

Manson, Dr John Alexander *Section Head, Central Research Laboratories, Air Reduction Company, Inc* POLYMER PROPERTIES, POLYMERIZATION, other articles on polymers (all in part)

Manuele, Joseph *Director of Quality Control, Westinghouse Electric Corporation, Pittsburgh* CONTROL CHART, INSPECTION AND TESTING, QUALITY CONTROL

Manuelidis, Elias E *Associate Professor of Pathology, Yale University School of Medicine* NERVOUS SYSTEM DISORDERS

Manwell, Prof Reginald Dickinson *Department of Zoology, Syracuse University* ACNIDOSPORIDEA, HAEMOSPORIDIIDA HAPLOSPORIDIA, SARCOSPORIDIA

Mapes, Charles M *Assistant Chief Engineer, American Telephone and Telegraph Company* TELEPHONE SERVICE (in part), TELEPHONY

Marcus, Prof Dr. Ernst *Department of Zoology, Faculty of Philosophy, University of São Paulo, Brazil* EUTARDIGRADA, HETEROTARDIGRADA, TARDIGRADA

Margenau, Prof. Henry *Yale University* INTERMOLECULAR FORCES; PROBABILITY IN PHYSICS

Marian, Dr. Joseph E *Forest Products Laboratory, University of California* WOOD FINISHING

Marinsky, Prof Jacob A *Professor of Chemistry, University of Buffalo* ION EXCHANGE

Markert, Prof. Clement L. *Department of Biology, Johns Hopkins University* EMBRYONIC DIFFERENTIATION

Markowitz, Dr. William *U.S. Naval Observatory*. EARTH (ORBITAL MOTION)—in part.

Markus, John *Technical Director, Dictionary Department, McGraw-Hill Book Company* Series of articles on electrical devices and electrical terminology.

Marsden, Dr Joan Rattenbury. *Department of Zoology, McGill University, Canada* PHORONIDA

Marshall, Dr Max S *University of California School of Medicine* BACTERIOLOGY, MEDICAL, CULTURE

Marshall, Norman Bertram *Principal Scientific Officer, British Museum of Natural History, London, England* DEEP-SEA FAUNA

Marshall, Dr Virgil Harrison *Doctor of Dental Surgery, Charlottesville, Virginia* DENTISTRY (in part)

Marshall, Prof William Robert *Professor of Chemical Engineering, University of Wisconsin* DRYING

Martin, Albert Frederick *Manager, Structural Adhesives Laboratory, 3M Company, Minnesota Mining and Manufacturing Company* ADHESIVE, STRUCTURAL

Martin, Dr Arthur Wesley. *Department of Zoology, University of Washington* EXCRETION

Martin, Dr Joseph Denegre *Medical Director, Louisiana Department of Public Welfare* ZOONOSES

Martin, Dr Weston J *Professor of Plant Pathology, Louisiana State University* POTATO, SWEET (in part)

Mason, Dr Basil John *Warren Research Fellow of The Royal Society, Imperial College of Science, London, England* CLOUD PHYSICS

Mason, Dr Warren Perry *Head, Mechanics Research, Bell Telephone Laboratories, Inc* INTERFEROMETER, ACOUSTIC, RADIOMETER, ACOUSTIC, ULTRASONICS.

Mason, Willard Franklin *Consulting Engineer, Mason Engineering Company, Inc* SLIP RINGS (in part)

Massey, Sir Harrie *Quain Professor of Physics and Head of Physics Department University College, London, England* SCATTERING EXPERIMENTS, ATOMIC AND MOLECULAR

Mather, Dr Kirtley F *Professor emeritus of Geology, Harvard University* CONTINENT, GEOGRAPHY, PHYSICAL

Maurer, Ted C *Agronomist, Soil Conservation Service, U.S Department of Agriculture* COVER CROPS

May, Frank H *Inorganic Section Head, American Potash and Chemical Corporation* BORON (in part).

May, James Edward *Associate Professor of Aeronautical Engineering, University of Virginia* INCOMPRESSIBLE FLOW, SUBSONIC FLIGHT

Mayall, (Mrs) Margaret Walton *Director, American Association of Variable Star Observers* MIRA, NOVA, SUPERNOVA, VARIABLE STAR

Mayall, Robert Newton *Director, Planning and Research Associates, Boston* SUNDIAL

Mayer, Ivan *Engineering Associate, Esso Research and Engineering Company* ALKYLATION

Mayer, Dr Rudolph L *Leonard Wood Memorial Hospital, Washington* SULFA DRUGS

Mayerson, Prof Hymen Samuel *Professor of Physiology and Chairman of Department, School of Medicine, Tulane University.* CARDIOVASCULAR SYSTEM (in part).

Maynard, Dr. Harold Bright. *President, Maynard Research Counselors, Inc ; Chairman of the Board, H. B Maynard and Company, Inc.* METHODS ENGINEERING; METHODS STUDY; WORK MEASUREMENT.

Mays, Rolland Lee. *Development Supervisor, Molecular Sieve Products, Linde Company, Division of Union Carbide Corporation* MOLECULAR SIEVE (in part).

Mazia, Prof. Daniel *Department of Zoology, University of California,* CELL DIVISION, CYTOKINESIS

McBee, Prof Earl T *Department of Chemistry, Purdue University.* HALOGENATION (in part).

McCabe, Dr Warren L. *Administration Dean, Polytechnic Institute of Brooklyn.* FILTRATION, LEACHING; SEPARATION (MECHANICAL); other articles on unit operations

McCann, (Miss) Mary B *Instructor, Department of Nutrition, Harvard School of Public Health* COENZYME; METABOLISM.

McClearn, Dr. Gerald Eugene *Department of Psychology, University of California* BEHAVIOR AND HEREDITY.

McCleary, Prof Robert A *Department of Psychology, University of Michigan.* BODY RHYTHM; HUNGER, SLEEP, other articles on body rhythms

McClellan, Leslie Newman *Consulting Engineer, Engineering Consultants, Inc , Denver, Colorado.* CANAL, DAM, PIPELINE

McClung, Dr Leland S *Professor of Bacteriology, Chairman of Department, Indiana University.* BLACKLEG, BOTULISM, GANGRENE, GAS, TETANUS.

McConnaughey, Dr. Bayard H *Department of Biology, University of Oregon* DICYEMIDA, MESOZOA, ORTHONECTIDA

McCormick, Dr Jack *In Charge of Vegetation Studies, The American Museum of Natural History, New York* TERRESTRIAL ECOSYSTEM, VEGETATION ZONES

McCormick, Dr J R D *Lederle Laboratories* DEMETHYLCHLORTETRACYCLINE

McCrea, Prof John F *Associate Professor of Biophysics, Yale University* HYALURONIDASE

McCrosky, Dr Richard Eugene *Lecturer in Astronomy, Harvard University* COMET, METEOR, ZODIACAL LIGHT, articles on individual comets

McCutcheon, Prof F Harold *Professor of Physiology, University of Pennsylvania* RESPIRATORY SYSTEM (in part)

McElroy, Dennis L *Executive Vice-President, Consolidation Coal Company* COAL MINING

McElroy, Prof William D *Chairman, Department of Biology, Johns Hopkins University* BACTERIAL LUMINESCENCE

McEwen, Prof Robert Stanley, *Professor emeritus, Oberlin College* RESPIRATORY SYSTEM (in part)

McFarland, Forest *Executive Assistant Chief Engineer, Buick Motor Division, General Motors Corporation* GEAR LOADING, OVERDRIVE; TRANSMISSION, AUTOMOTIVE, other articles in mechanical power.

McGrain, Preston *Assistant State Geologist, Kentucky Geological Survey, University of Kentucky* OIL-FIELD WATERS

McGraw, Dr. Leslie D *Assistant Chief, Electrochemical Engineering Division, Battelle Memorial Institute.* ELECTROCHEMICAL PROCESS (in part).

McKee, Rear Admiral (Retired) Andrew Irwin *Director of Research and Design, Electric Boat Division, Vice-President, General Dynamics Corporation.* SUBMARINE

McKenna, Dr. Malcolm C. *Assistant Curator of Fossil Mammals and Birds, American Museum of Natural History, Assistant Professor of Geology, Columbia University.* DERMOPTERA FOSSILS; INSECTIVORA FOSSILS, articles on other fossil forms

McKenzie, Alexander Anderson. *Assistant Editorial Adviser, Technical Writing Service, McGraw-Hill Book Company.* DECCA; DECTRA; HYPERBOLIC NAVIGATION SYSTEM; LORAN.

McKetta, Dr John J *Graduate Professor and Chairman, Department of Chemical Engineering, University of Texas* PETROLEUM PROCESSING

McKusick, Dr Victor Almon *Professor of Medicine, Johns Hopkins University School of Medicine.* HUMAN GENETICS (in part).

McLaughlin, Dr John Joseph A. *Haskins Laboratories, Saint Francis College, Brooklyn* AXENIC CULTURE

McLean, Dr Franklin C *Professor emeritus of Physiology, University of Chicago* SKELETAL SYSTEM (in part).

McMath, Prof Robert R. *Director, McMath-Hulbert Observatory, University of Michigan* CORONAGRAPH; SPECTROHELIOSCOPE; TELESCOPE, ASTRONOMICAL.

McMillen, Wheeler *Vice-President, Farm Journal, Inc; Chairman of Board, The Chemurgic Council* CHEMURGY.

McNitt, Capt Robert Waring *U.S Navy* ARMAMENT, NAVAL.

McQuarrie, Dr Malcolm Caven *Ceramist, Patent Department, Kaiser Aluminum and Chemical Corporation* CERAMIC TECHNOLOGY, GLASS AND GLASS PRODUCTS, REFRACTORY, series of related articles

McVittie, Prof. George C *Professor of Astronomy and Director of Observatory, University of Illinois* SPACE (in part)

Meese, Harry J *Head Engineer, Landing Ships, Craft and Boats, Bureau of Ships, U S Navy* LANDING SHIPS AND CRAFT.

Meggers, Dr William Frederick *National Bureau of Standards* ELECTRON CONFIGURATION (in part), SPECTROSCOPY, WAVELENGTH STANDARDS, other articles in spectroscopy

Meigs, Dr Peveril *Geographer, Protection Research Division, Quartermaster Research and Engineering Center* ENVIRONMENTAL PROTECTION.

Meiklejohn, Dr Jane *Soil Microbiologist, Rothamsted Experimental Station, Harpenden, England* METHANOMONADACEAE, NITROBACTERIACEAE, SOIL MINERAL (MICROBIAL UTILIZATION), other articles on soil microbial cycles

Meinke, Prof William Wayne *Department of Chemistry, University of Michigan* ACTIVATION ANALYSIS, RADIOISOTOPE (ASSAY); RADIOMETRIC ASSAY

Meister, Prof Alton *Department of Biochemistry, Tufts University School of Medicine* ENZYME (in part)

Meixner, Prof Dr Josef. *Director, Institute Theoretical Physics, Aachen, Germany* BESSEL FUNCTIONS, BETA FUNCTION, GAMMA FUNCTION

Mellon, Prof M G *Department of Chemistry, Purdue University* OPAQUE MEDIUM; TRANSLUCENT MEDIUM, TRANSPARENT MEDIUM

Mellors, Dr Robert Charles *Associate Director of Research, Director of Laboratories, Hospital for Special Surgery, New York* MICROSCOPE, FLUORESCENCE (in part)

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Menzies, Dr Robert James *Research Associate, Biology Department, University of Southern California* ASELLOTA; ISOPODA

Mercanton, Dr Roger A *Hoffmann-LaRoche, Inc* BIOTIN (in part).

Merrill, Charles White. *Chief, Division of Minerals, Bureau of Mines, U S Department of Interior* MINING.

Merrill, Timothy W. *Director of Product Research, Vanadium Corporation of America* VANADIUM

Merritt, Frederick S. *Senior Editor, 'Engineering News-Record'* CONCRETE BEAM, PRESTRESSED CONCRETE; other articles on concrete usage

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Meszar, John. *Director, Switching Systems Development, Bell Telephone Laboratories, Inc* COUNTING CIRCUIT, SWITCHING CIRCUIT

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Miczaika, Dr Gerhard R *Research Associate, Harvard College Observatory, Manager, Astrometry Department, Aeronutronic, a Division of Ford Motor Company* ASTRONOMICAL PHOTOGRAPHY, ASTRONOMICAL SPECTROSCOPY

Middlebrook, Dr Gardner *Director, Research and Laboratories, National Jewish Hospital, Denver* JOHNE'S DISEASE, LEPROSY, TUBERCULOSIS

Middleton, Prof John Tylor *Professor of Plant Pathology, University of California* CUCUMBER, SQUASH (both in part)

Miles, Thomas Kirk *Head, Bitumen Department, Shell Development Company* ASPHALT AND ASPHALTITE (in part)

Mill, Dr George Stewart *Research Chemist, Shell Oil Company* DONNAN EQUILIBRIUM, EMULSION (both in part)

Miller, Prof Arthur K *Professor of Geology, State University of Iowa* CEPHALOPODA FOSSILS (in part)

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Miller, John Harold *Vice-President and Chief Engineer (retired), Weston Instruments, Division of Daystrom, Inc* AMMETER, CURRENT MEASUREMENT (in part) ELECTRODYNAMIC INSTRUMENT, GALVANOMETER (in part)

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Milligan, Dr W O *Department of Chemistry, William Marsh Rice University* ADSORPTION; ELECTROSTATIC PRECIPITATOR; SURFACE PHENOMENON (all in part), series of related articles

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Minnis, Dr Wesley *Assistant to Director of Research and Development, Allied Chemical Corporation* DYE

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Mock, Frank C *Bendix Products* CARBURETOR, FUEL SYSTEM, SUPERCHARGER

Molloy, Bruce G *Assistant to the President, Wallerstein Company, Division of Baxter Laboratories* TYROTHRICIN

Moment, Prof Gairdner Bostwick *Goucher College* CELL CONSTANCY

Mommaerts, Prof Wilfried F H M. *Los Angeles County Heart Association Cardiovascular Research Laboratory, Department of Medicine, The University of California* MUSCLE (BIOPHYSICS)

Monod, Dr Theodore *Institut Francais d'Afrique Noire, Afrique Occidentale Francaise* GNATHIIDEA, PANCARIDA

Montgomery, Donald N *Senior Engineer, Aeronutronic, a Division of Ford Motor Company* ELECTROKINETIC TRANSDUCER

Mood, Dr Alexander McFarlane *President, General Analytic Corporation* STATISTICS

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Moore, Dr M. B *Department of Biology, New Mexico Highlands University* OATS (in part)

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Menzies, Dr Robert James *Research Associate, Biology Department, University of Southern California* ASELLOTA; ISOPODA

Mercanton, Dr Roger A *Hoffmann-LaRoche, Inc* BIOTIN (in part)

Merrill, Charles White *Chief, Division of Minerals, Bureau of Mines, U.S. Department of Interior.* MINING

Merrill, Timothy W *Director of Product Research, Vanadium Corporation of America* VANADIUM

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Meszar, John *Director, Switching Systems Development, Bell Telephone Laboratories, Inc.* COUNTING CIRCUIT; SWITCHING CIRCUIT.

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Middlebrook, Dr Gardner *Director, Research and Laboratories, National Jewish Hospital, Denver* JOHNE'S DISEASE, LEPROSY, TUBERCULOSIS

Middleton, Prof John Tylor *Professor of Plant Pathology, University of California* CUCUMBER, SQUASH (both in part)

Miles, Thomas Kirk *Head, Bitumen Department, Shell Development Company* ASPHALT AND ASPHALTITE (in part)

Mill, Dr George Stewart *Research Chemist, Shell Oil Company* DONNAN EQUILIBRIUM, EMULSION (both in part)

Miller, Prof Arthur K *Professor of Geology, State University of Iowa* CEPHALOPODA FOSSILS (in part)

Miller, Dr Glenn Houston *Senior Physicist, Denver Research Institute, University of Denver* ELECTRICAL CONDUCTION IN GASES GLOW DISCHARGE, SPARK, ELECTRIC, other articles in electricity

Miller, John Harold *Vice-President and Chief Engineer (retired), Weston Instruments, Division of Daystrom, Inc* AMMETER, CURRENT MEASUREMENT (in part), ELECTRODYNAMIC INSTRUMENT, GALVANOMETER (in part)

Miller, Dr Julian Creighton *Head, Department of Horticulture Louisiana State University* POTATO, SWEET (in part)

Miller, Dr Lawrence Ingram *Professor of Plant Pathology, Tidewater Research Station, Virginia Polytechnic Institute* PEANUT (in part)

Miller, Prof Maynard M *Professor of Geology, Michigan State University, Director, Foundation for Glacier Research, Seattle, Wash* GLACIER TERRESTRIAL FROZEN WATER, SNOW FIELD series of related articles

Miller, Prof Milton Albert *Department of Zoology, University of California at Davis* ANTHURIDEA, ONISCOIDEA

Miller, Dr Stanley L *Department of Chemistry, University of California at La Jolla* LIFE, ORIGIN OF, PALEOBIOCHEMISTRY

Miller, Dr Winston Rivard *Consultant, Internal Medicine, Interstate Clinic, Minnesota* GLANDERS, MELIOIDOSIS

Milligan, Dr W. O *Department of Chemistry, William Marsh Rice University* ADSORPTION; ELECTROSTATIC PRECIPITATOR; SURFACE PHENOMENON (all in part); series of related articles

Millman, Dr Jacob *Department of Electrical Engineering, Columbia University* INVERTER (in part); OSCILLATOR; PARASITIC OSCILLATION; SIGNAL GENERATOR

Mills, Dr Harlow Burgess *Illinois Natural History Survey* APTERYGOTA; COLLEMBOLA, ORTHOPTERA, PROTURA

Milner, Dr Reid T *Department Head, Food Technology, University of Illinois* CEREAL CHEMISTRY, FOOD ENGINEERING (in part)

Minnis, Dr Wesley *Assistant to Director of Research and Development, Allied Chemical Corporation* DYE

Mischel, Prof Walter *Harvard University* ABNORMAL BEHAVIOR, FREUDIANISM, PERSONALITY THEORY, other articles on neuroses (all co-authored)

Mitchell, Prof Harold Hanson *Professor emeritus of Animal Nutrition, University of Illinois* IRON METABOLISM, SPECIALIZED TISSUE, other articles in biochemistry

Mock, Frank C *Bendix Products* CARBURETOR, FUEL SYSTEM, SUPERCHARGER

Molloy, Bruce C *Assistant to the President, Wallerstein Company, Division of Baxter Laboratories* TYROTHRICIN

Moment, Prof Gairdner Bostwick *Goucher College* CELL CONSTANCY

Mommaerts, Prof Wilfried F H M *Los Angeles County Heart Association Cardiovascular Research Laboratory, Department of Medicine, The University of California* MUSCLE (BIOPHYSICS)

Monod, Dr Theodore *Institut Francais d'Afrique Noire, Afrique Occidentale Francaise* GNATHIIDEA, PANCARIDA

Montgomery, Donald N *Senior Engineer, Aeronutronic, a Division of Ford Motor Company* ELECTROKINETIC TRANSDUCER

Mood, Dr Alexander McFarlane *President, General Anaylsis Corporation* STATISTICS

Moody, Captain Alton B *U S Navy Hydrographic Office* CELESTIAL NAVIGATION, DEAD RECKONING, NAVIGATION, other articles on navigation

Moody, Prof Paul Amos *Howard Professor of Natural History and Zoology, University of Vermont* EVOLUTION, ORGANIC

Moog, Dr Florence *Professor of Zoology, Washington University* DIGESTIVE SYSTEM (in part)

Moore, Dr Alice Elizabeth *Virus Study Section, Sloan-Kettering Institute for Cancer Research* TUMOR VIRUSES; other articles on individual tumor viruses

Moore, David William *Manager, Solid State Physics Laboratory, Lear, Inc* MICROCIRCUITRY

Moore, Dr Donald V *Department of Microbiology, Southwestern Medical School, University of Texas* ACANTHOCEPHALA, ARCHIACANTHOCEPHALA, EOACANTHOCEPHALA; PALAEACANTHOCEPHALA

Moore, Prof John A. *Professor of Zoology, Barnard College and Columbia University* SPECIATION

Moore, Prof John C *Associate Professor of Mathematics, Princeton University* TOPOLOGY

Moore, Dr M B *Department of Biology, New Mexico Highlands University* OATS (in part)

Moore, Prof Raymond C. *Department of Geology, University of Kansas* CARBONIFEROUS; ECHINODERMATA FOSSILS, other articles on geologic divisions

Moore, Prof. Richard K. *Chairman, Electrical Engineering Department, University of New Mexico.* ALTIMETER, RADIO.

Moreno, Dr Theodore. *Vice-President, Tube Division, Varian Associates.* MICROWAVE TRANSMISSION LINES.

Morey, Dr. George W. *U S. Geological Survey* OPTICAL MATERIALS.

Morgan, Dr. Ann Haven *Mount Holyoke College.* EPHEMEROPTERA; PLECOPTERA

Morgan, Rear Admiral (Retired) Armand Malcolm *U S. Navy, Retired.* SHIP, NAVAL.

Morgan, Dr Clifford T. *Lecturer in Psychology, University of Wisconsin* PSYCHOLOGY, PHYSIOLOGICAL AND EXPERIMENTAL.

Morgan, Dr. Karl Ziegler *Director of Health Physics, Division of Oak Ridge National Laboratory.* DECONTAMINATION (RADIOACTIVE CONTAMINANTS) RADIOACTIVE WASTE DISPOSAL, other articles in health physics

Morgan, William E *President, Colorado State University* AGRICULTURE (in part)

Morris, Robert M *Radio Facilities Engineer, American Broadcasting Company.* TELEVISION TRANSMITTER

Morrison, Dr. Charles Freeman, Jr. *Assistant Professor of Chemistry, Washington State University* COULOMETRIC ANALYSIS, ELECTRODEPOSITION ANALYSIS

Morrison, Dr George H *Head, Inorganic and Analytical Chemistry, General Telephone and Electronics Laboratories, Inc* EXTRACTION (in part), SEPARATION (CHEMICAL AND PHYSICAL)

Morse, Prof Robert W *Physics Department, Brown University* SONAR; UNDERWATER SOUND, related articles in acoustics

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Moser, J F, Jr. *Louisiana Division, Esso Research Laboratories* COKING (PETROLEUM REFINING)

Moses, Dr Montrose J *Associate Professor of Anatomy, Duke University School of Medicine* CELL NUCLEUS, CELL STRUCTURES

Mossman, Prof Harland Winfield *Professor of Anatomy, Medical School, University of Wisconsin* PLACENTATION

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Mowrer, Dr O Hobart *Research Professor of Psychology, University of Illinois* AGGRESSION, FRUSTRATION

Moxon, Dr Alvin L *Professor and Associate Chairman, Animal Science Department, Ohio Agricultural Experiment Station* AGRICULTURAL SCIENCE (ANIMAL).

Mrak, Chancellor Emil Marcel *University of California at Davis* DISTILLED SPIRITS, YEAST, articles on industrial uses of yeast—all co-authored

Mudd, Prof Stuart *Professor of Microbiology (Phipps), University of Pennsylvania School of Medicine, Director, Microbiology Research Laboratory, Veterans Administration Hospital, Philadelphia* LYOPHILIZATION

Mueller, Prof. Erwin W. *Department of Physics, Pennsylvania State University.* FIELD-EMISSION MICROSCOPY

Muhlethaler, Prof Dr Kurt *Swiss Federal Institute of Technology, Zurich* CELL PLASTIDS

Mulliken, Prof. Robert Sanderson *Physics Department, University of Chicago* MOLECULAR STRUCTURE AND SPECTRA, MOLECULE

Munnecke, Dr. Donald E. *Associate Professor of Plant Pathology, University of California* ORNAMENTAL PLANT (in part).

Murphy, Dr Glenn *Distinguished Professor of Engineering and Head of Theoretical and Applied Mechanics, Iowa State University* FROUDE NUMBER, MACH NUMBER; MODEL THEORY; REYNOLDS NUMBER

Murphy, Harold P. *Research Chemical Engineer (retired), Electric Storage Battery Company* STORAGE BATTERY.

Murray, Dr. Grover E *Boyd Professor of Geology, Louisiana State University* CENOZOIC, articles on related divisions of geologic time (co-authored)

Murray, Dr Haydn H *Director of Applied Research, Georgia Kaolin Company* CLAY, COMMERCIAL.

Musacchia, Dr X. J *Department of Biology, St Louis University* HIBERNATION (in part).

Muskat, Dr Morris *Technical Coordinator, Production Department, Gulf Oil Corporation* PETROLEUM RESERVOIR ENGINEERING

Muther, Richard *Executive Director, Richard Muther and Associates* MATERIALS HANDLING, PLANT FACILITIES, PRODUCTION METHODS.

Muus, Dr Bent J *Research Biologist, Danish Institute for Fishery and Marine Research* GORDIOIDEA, NECTONEMATOIDEA, NEMATOMORPHA

Myer, Percy Livingstone *Project Engineer, Western Union Telegraph Company* TELEGRAPHY (in part)

Myrvik, Dr Quentin N *Department of Microbiology, University of Virginia School of Medicine* BACTERIAL ENZYME; BACTERIAL COENZYME (both in part)

N

Nachtrieb, Prof Norman Harry *Institute for the Study of Metals, and Department of Chemistry, University of Chicago* LIQUID, VAPOR PRESSURE, VISCOSITY OF LIQUIDS, other articles in physical chemistry

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Nair, Dr John H *Consultant* FOOD MANUFACTURING (in part)

Naisbat, Dr Samuel S *Manager, Active Oxygen Chemicals Research, Food Machinery and Chemical Corporation* PEROXIDE

Namias, Jerome. *Chief, Extended Forecast Section, U.S Weather Bureau* WEATHER (FORECASTING AND PREDICTION)—in part.

Naylor, Dr Ernest *Lecturer in Zoology, University College of Swansea, Wales* VALVIFERA

Nedelsky, Prof Leo *Professor of Physical Sciences, University of Chicago* BALANCE (WEIGHING INSTRUMENT), MASS, WEIGHT, series of related articles

Nelsen, Prof Olin E *Professor of Zoology, Division of Biology, University of Pennsylvania* GLAND, articles on various glands

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Nelson, Prof Eric L *Department of Bacteriology, University of California at Los Angeles* BRUCELLACEAE.

Nelson, James Hugh *Chief, Geomagnetism Branch, U.S Coast and Geodetic Survey* DECLINOMETER, EARTH INDUCTOR, INCLINOMETER, MAGNETOMETER; VARIOMETER.

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Nesbitt, Dr Herbert H. J. *Director of Science Division, Faculty of Arts and Sciences, Carleton University, Canada.* SARCOPTIFORMES.

Nettleton, Dr. Lewis L *Partner in Firm Geophysical Associates, International* SALT DOME

Neuhauser, Robert G *Engineering Leader, Camera Tube Design, Electron Tube Division, Radio Corporation of America.* TELEVISION CAMERA TUBE.

Neumann, Dr F Gerhard *Professor of Oceanography, New York University.* OCEAN WAVES (in part)

Newcombe, Dr Curtis Lakeman *Senior Investigator, U.S. Naval Radiological Defense Laboratory.* MARINE ECOSYSTEM.

Newton, Prof Chester Whittier *Assistant Professor of Meteorology, University of Chicago* HURRICANE, STORM, TORNADO, other articles on storms and winds

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Nicol, Dr Joseph A Colin *Experimental Zoologist, Marine Biological Association, Plymouth, England* NERVOUS SYSTEM (INVERTEBRATE)

Niedermair, John C *Technical Director of Preliminary Ship Design, Bureau of Ships, U S. Department of the Navy, Consultant Naval Architect.* NAVAL ARCHITECTURE, SHIP DESIGN

Nier, Prof Alfred O *University of Minnesota* MASS SPECTROSCOPE

Nierenberg, Prof William A *Department of Physics, University of California* NUCLEAR MOMENTS

Nigrelli, Dr Ross F. *Pathologist, New York Aquarium, New York Zoological Society, Adjunct Professor of Biology, New York University* MYXOSPORIDIA, articles on related taxonomic groups

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Nixon, Dr. Alan C *Research Supervisor, Shell Development Company* GASOLINE

Noback, Charles Robert *Department of Anatomy, College of Physicians and Surgeons, Columbia University* MUSCULAR SYSTEM (in part)

Noble, Dr James A *Geological Sciences, California Institute of Technology* BATHOLITH, LACCOLITH, PLUTON

Nordell, Eskel. *Director of Technical Information, The Permutit Company* WATER SOFTENING

Novick, Aaron *Institute of Molecular Biology, University of Oregon* CHEMOSTAT

Novikoff, Dr. Alex B *Research Professor of Pathology, Albert Einstein College of Medicine, Yeshiva University* CYTOCHEMISTRY

O

Obery, Leonard J *Chief, 10 x 10 Supersonic Wind Tunnel Branch, Propulsion Aerodynamics Division, National Aeronautics and Space Administration* DIFFUSER, SUPERSONIC DIFFUSER (both in part).

O'Connor, Dr. Donald J *Associate Professor of Civil Engineering, Manhattan College* SEWAGE DISPOSAL; WATER POLLUTION

O Connor, Francis Martin *Group Leader, Molecular Sieve Products, Linde Company, Division of Union Carbide Corporation* MOLECULAR SIEVE (in part).

Odum, Dr Eugene Pleasants. *Alumni Foundation Professor of Zoology, University of Georgia* ECOLOGY.

Ofner, Dr. Alfred *Director of Technical Development, Hoffman-LaRoche, Inc* VITAMIN E; VITAMIN K (both in part).

Ogle, Dr. Kenneth N *Section of Biophysics, Mayo Clinic.* STEREOSCOPY

Ohman, M F. *Manager of Operations, Western Division, Dow Chemical Company* IODINE (in part).

Okulitch, Dr Vladimir J. *Professor and Head, Department of Geology, University of British Columbia, Canada* ARCHAEOCYATHA, PORIFERA FOSSILS.

Oldenburger, Prof Rufus *School of Mechanical Engineering, Purdue University* GOVERNOR, LINKAGE, MECHANICAL.

Olson, Prof Everett Claire *Department of Geology, University of Chicago* ANAPSIDA, SYNAPSIDA, articles on related fossil groups

Olson, Dr Harry F. *Director, Acoustical and Electromechanical Laboratory, Radio Corporation of America Laboratories* DISK RECORDING, MAGNETIC RECORDING, MICROPHONE; series of related articles

Olszewski, Robert Francis. *Research Consultant, Dodco, Inc.* AIRCRAFT INSTRUMENT PANEL (in part)

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Oppenheimer, Prof Jane M *Professor of Biology, Bryn Mawr College* EMBRYOLOGY

Osberg, Prof Philip Henry *University of Maine* FAULT AND FAULT STRUCTURES, FOLD AND FOLD SYSTEMS, other articles in structural geology

Oser, Dr Bernard L *Food and Drug Research Laboratories, Inc., New York City* FOOD (in part)

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Othmer, Prof Donald F *Polytechnic Institute of Brooklyn* FLUIDIZATION OF SOLIDS

Otis, Dr A B *Department of Physiology, College of Medicine, University of Florida* RESPIRATION, EXTERNAL, SPIROMETRY.

Owen, Dr Bradford Breckenridge *Associate Professor of Biology, Lehigh University.* KIDNEY.

P

Packard, Dr Charles E *Assistant Professor of Biology, Randolph-Macon College, Ashland, Virginia.* CHAETONOIDEA; GASTROTRICHA, MACRODASYOIDEA.

Page, Dr Robert M. *Associate Professor, Department of Biological Sciences, Stanford University* ASCOMYCETES, BASIDIOMYCETES, series of articles on related groups of fungi

Pai, Prof Shih I *Research Professor, Institute for Fluid Dynamics and Applied Mathematics, University of Maryland.* LAMINAR FLOW, TURBULENT FLOW, VISCOUS FLOW

Pake, Prof George E *Physics Department, Stanford University* DYNE, FORCE, NEWTON, POUNDAL

Palmerlee, Prof Albert S *Professor of Engineering Drawing, School of Engineering and Architecture, The University of Kansas* DESCRIPTIVE GEOMETRY, ENGINEERING DRAWING, PICTORIAL DRAWING (all in part)

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Parker, Eugene N. *Associate Professor, Fermi Institute and Department of Physics, University of Chicago* COSMIC RAYS.

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Parks, Prof. George Sutton *Department of Chemistry, Stanford University* CALORIMETRY; THERMOCHEMISTRY.

Parks, Prof. Roland D *Geology and Geophysics Department, Massachusetts Institute of Technology* MINING OPERATING FACILITIES (in part).

Parr, Prof. Robert G. *Department of Chemistry, Carnegie Institute of Technology.* VALENCE

Parrish, Dr William *Chief, X-ray and Crystallography Sections, Philips Laboratories* X-RAY FLUORESCENCE ANALYSIS; X-RAY POWDER METHODS.

Party, Prof Robert Walter *Department of Chemistry, University of Michigan* CHELATION

Patten, Dr. Bradley M *Professor of Anatomy, University of Michigan Medical School* CARDIOVASCULAR SYSTEM (in part).

Patterson, Dr. Claire Cameron *Division of Geological Sciences, California Institute of Technology* EARTH (AGE OF).

Patton, Dr. Harry Dickson *Professor of Physiology and Biophysics, University of Washington School of Medicine* MOTOR SYSTEMS, POSTURE, REGULATION OF, REFLEX, UNCONDITIONED (all in part)

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Peck, Prof Raymond E *Department of Geology, University of Missouri* CHAROPHYTA

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Pennak, Dr Robert William *Department of Biology, University of Colorado* MYSTACOCARIDA

Perch, Michael *Verona Research Center, Koppers Company, Inc* COKE

Perkins, Dr. David D *Department of Biological Sciences, Stanford University* LINKAGE, GENETIC, RECOMBINATION, GENETIC, SEX-LINKED INHERITANCE

Perkins, Kenneth W *Physical Sciences Editor, McGraw-Hill Encyclopedia of Science and Technology* METAL, PRECESSION OF EQUINOXES, ROCKET ASTRONOMY, articles in physics and acoustical engineering

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Pettit, Dr Edison *Member, Scientific Staff (retired), Mount Wilson and Mount Palomar Observatories* OBSERVATORY, ASTRONOMICAL

Pfaffmann, Dr. Carl *Professor of Psychology, Brown University.* SENSE, CHEMICAL, SMELL, TASTE

Phaff, Dr Herman Jan *Professor of Food Science and Technology, University of California at Davis* DISTILLED SPIRITS, FOOD MICROBIOLOGY, YEAST (all in part); series of articles on fungi.

Phelan, Richard M *Associate Professor of Mechanical Engineering, Cornell University* FRICTION; SCREW; SIMPLE MACHINE; other articles in machine design

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Philpott, Dr Jane *Associate Professor of Botany, Duke University* LEAF (BOTANY)—in part

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Pierson, Prof Willard James *Department of Meteorology and Oceanography, College of Engineering, New York University* OCEAN WAVES (in part).

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Pollister, Prof Arthur W *Columbia University* CELL (BIOLOGICAL)—in part, CENTRIOLE, CENTROSOME, PROTOPLASM (in part)

Polster, Dr Harry D *The Perkin-Elmer Corporation* MIRROR OPTICS, REFLECTION (ELECTROMAGNETIC RADIATION)

Ponikvar, Ade L *Editor, Production and Drilling, 'Petroleum Week,' McGraw-Hill Publishing Company.* OIL MINING, articles on various drills

Poole, Lynn *Director of Public Relations, Johns Hopkins University* ART, SCIENCE IN

Pope, Alan *Head, Aerodynamics Department, Sandia Corporation* WIND TUNNEL.

Porter, Prof Joseph P *Professor emeritus, Cornell University* LANDSCAPE ARCHITECTURE

Porter, Prof Keith Roberts *The Rockefeller Institute.* CELL INCLUSIONS, NONCYTOPLASMIC, CYTOLOGY, CYTOPLASM

Post, Dr Richard F *Lawrence Radiation Laboratory, University of California, Livermore.* FUSION, NUCLEAR, PLASMA PHYSICS, PROTON-PROTON CHAIN; THERMONUCLEAR REACTION

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Parr, Prof. Robert G *Department of Chemistry, Carnegie Institute of Technology* VALENCE

Parrish, Dr. William. *Chief, X-ray and Crystallography Section, Philips Laboratories.* X-RAY FLUORESCENCE ANALYSIS, X-RAY POWDER METHODS.

Parry, Prof. Robert Walter. *Department of Chemistry, University of Michigan* CHELATION

Patten, Dr. Bradley M. *Professor of Anatomy, University of Michigan Medical School.* CARDIOVASCULAR SYSTEM (in part)

Patterson, Dr. Claire Cameron *Division of Geological Sciences, California Institute of Technology.* EARTH (AGE OF)

Patton, Dr Harry Dickson. *Professor of Physiology and Biophysics, University of Washington School of Medicine* MOTOR SYSTEMS, POSTURE, REGULATION OF, REFLEX, UNCONDITIONED (all in part).

Pattullo, Dr June G *Scripps Institution of Oceanography* SEA LEVEL (DATUM PLANES), SEA LEVEL FLUCTUATIONS, SEA WATER (in part).

Payne, Harold G *Manager, Measurements Group, The Foxboro Company* PRESSURE MEASUREMENT, VACUUM MEASUREMENT, other articles on pressure and vacuum instrumentation

Peck, Prof. Raymond E *Department of Geology, University of Missouri* CHAROPHYTA

Pederson, Dr. Carl S *New York State Agricultural Station* LACTOBACILLACEAE

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Pennak, Dr Robert William *Department of Biology, University of Colorado* MYSTACOCARIDA.

Perch, Michael *Verona Research Center, Koppers Company, Inc* COKE

Perkins, Dr. David D *Department of Biological Sciences, Stanford University* LINKAGE, GENETIC, RECOMBINATION, GENETIC, SEX-LINKED INHERITANCE

Perkins, Kenneth W *Physical Sciences Editor, McGraw-Hill Encyclopedia of Science and Technology* METAL, PRECESSION OF EQUINOXES, ROCKET ASTRONOMY, articles in physics and acoustical engineering

Perry, Astor. *Extension Agronomist, North Carolina State College* PEANUT (in part)

Pette, Prof Dr Jan Willem *Director-in-Chief, The Netherlands Institute for Dairy Research at Ede, Professor in Milk Hygiene, University of Utrecht* MILK (in part)

Pettit, Dr Edison *Member, Scientific Staff (retired), Mount Wilson and Mount Palomar Observatories* OBSERVATORY, ASTRONOMICAL

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Raffel, Dr. Sidney. *Stanford University School of Medicine* ALLERGY, ATOPIC; ANAPHYLAXIS, ARTHUS REACTION, HYPERSENSITIVITY.

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Ragotzkie, Prof. Robert A *Department of Meteorology, University of Wisconsin.* MARINE MARSH

Raisz, Dr Erwin *Visiting Professor, Clark University* CARTOGRAPHY; GREAT CIRCLE, TERRESTIAL; MAP SCALE.

Rakestraw, Dr Norris W *Scripps Institution of Oceanography, University of California* SEA WATER (in part).

Ramberg, Dr Edward G *Fellow, Technical Staff,* Radio Corporation of America Laboratories. ELECTRON MOTION IN VACUUM, ELECTROSTATIC LENS, MICROSCOPE, ELECTRON (in part), other articles on electron optics

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Ramsdell, Prof Lewis Stephen *Chairman, Department of Mineralogy, University of Michigan* MINERAL, MINERALOGY.

Ramsey, Dr Glen Blaine *Principal Pathologist, Agricultural Marketing Service, US Department of Agriculture* LETTUCE, ONION (both in part)

Raper, Prof John R *Professor of Botany, Harvard University* EUMYCETES

Raper, Prof Kenneth B. *Departments of Bacteriology and Botany, University of Wisconsin* ACRASIALES, LABYRINTHULALES

Rashevsky, Prof Nicolas *Committee on Mathematical Biology, University of Chicago* BIOPHYSICS, MATHEMATICAL

Raski, Dr Dewey J *Nematologist, Department of Plant Nematology, University of California at Davis* NEMATOCIDE.

Ratliff, Dr Floyd *The Rockefeller Institute* BEHAVIORAL PSYCHOPHYSICS

Ratnoff, Dr Oscar D *Associate Professor of Medicine, Western Reserve University, Career Investigator, American Heart Association* BLOOD (in part), FIBRINOGEN

Raudebaugh, Dr Robert J *Development and Research Division, International Nickel Company, Inc* NICKEL ALLOYS

Rausch, Dr Marvin *Friedastrass, Munchen-Solln, West Germany* REFORMATSKY REACTION, GRIGNARD REACTION, ORGANOMETALLIC COMPOUND, TETRAETHYLLEAD

Rawles, Dr Mary Elbert *Staff Member, Department of Embryology, Carnegie Institution of Washington; Assistant Professor of Anatomy, Johns Hopkins University* FEATHER (BIRD); UROPYGIAL GLAND

Razran, Prof Gregory *Professor and Chairman, Department of Psychology, Queens College* REFLEX, CONDITIONED

Read, Prof Clark P *Department of Biology, Rice University* CESTODA, articles on related taxonomic groups.

Reddish, Dr George Fultz *St Louis College of Pharmacy and Allied Sciences* ANTISEPTIC

Redlich, Dr Fredrick Carl *Professor and Chairman, Department of Psychiatry, Yale University School of Medicine* PSYCHOANALYSIS, PSYCHOTHERAPY, articles on various psychoses

Reed, Prof Fredda D *Professor of Botany, Mount Holyoke College.* CALAMITALES

Reed, Prof Richard John *University of Washington* FRONT

Presley, Dr John T. *Leader, Cotton Pathology Investigations, Cotton and Cordage Fibers Research Branch, Crops Research Division, Agricultural Research Service, U S. Department of Agriculture.* COTTON (in part).

Press, Dr. Frank *California Institute of Technology Seismological Laboratory.* SEISMOGRAPH; SEISMOLOGY.

Prien, Dr Charles H. *Head, Chemistry and Chemical Engineering Division, Denver Research Institute, University of Denver* PYROLYSIS.

Priester, Gayle B *Baltimore Gas and Electric Company.* HEATING, COMFORT

Pringsheim, Prof. E G *Pflanzenphysiologisches Institut, Göttingen, Germany* BEGGIATOALES, CARYOPHANALES, CHLAMYDOBACTERIALES.

Pritchard, Prof Donald William *Chairman, Department of Oceanography, Johns Hopkins University* ESTUARINE OCEANOGRAPHY (in part).

Pritchett, W S *Associate Professor of Electrical Engineering, University of California* INDUCTOR; REACTOR, ELECTRIC (both in part).

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Puchstein, Albert Frederick *Consulting Engineer* ALTERNATING-CURRENT MOTOR, MOTOR, ELECTRIC, series of related articles

Puck, Dr Theodore T *Department of Biophysics, University of Colorado* CULTURE, TISSUE

Pullen, Dr Keats A. *Ballistic Research Laboratories, Aberdeen Proving Ground, Maryland* CIRCUIT, ELECTRONIC, TRANSFORMER (both in part)

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Putz, T J *Industrial Gas Turbine Department, Westinghouse Electric Corporation* GAS TURBINE

Pyddoke, Edward *Secretary and Registrar, University of London Institute of Archaeology, England* ARCHEOLOGY

Q

Quastler, Dr Henry *Senior Radiobiologist, Brookhaven National Laboratory* INFORMATION THEORY (BIOLOGICAL APPLICATIONS)

Quirin, Edward J *Frederic R Harris, Inc., Consulting Engineers* COASTAL ENGINEERING, COFFERDAM, other articles in coastal engineering

R

Raacke, Dr Else Dorothea *Associate Research Scientist, Kaiser Research Institute* DEOXYRIBONUCLEIC ACID, RIBONUCLEIC ACID

Raasch, Dr Gilbert O *Consulting Paleontologist, Shell Oil of Canada* EURYPTERIDA, MEROSTOMATA

Rabinowitch, Dr. Eugene *Department of Botany, University of Illinois* PHOTOSYNTHESIS

Rademacher, Prof. Hans *Professor of Mathematics, University of Pennsylvania* NUMBER THEORY, ZERO.

Riley, Prof. Reed F. *Department of Chemistry, Polytechnic Institute of Brooklyn.* ALKALINE-EARTH METALS; BARIUM; CALCIUM; STRONTIUM

Ris, Prof. Hans *Department of Zoology, University of Wisconsin* CHROMOSOME, CHROMOSOME ABERRATION.

Ritchey, Dr. H. W. *Vice-President, Rocket Operations, Thiokol Chemical Corporation* PROPELLANT (in part).

Rittenberg, Dr Sydney C *Professor of Bacteriology, University of Southern California.* SPIROCHAETALES; articles on related taxonomic groups, WATER ANALYSIS, other articles in water microbiology.

Roberts, J K *Standard Oil Company* NAPHTHA; PETROLATUM

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Rochow, Prof Eugene George *Harvard University* ELECTROCHEMICAL SERIES, ELECTRONEGATIVITY, SILICON.

Rockett, Frank H *Engineering Staff Editor, McGraw-Hill Encyclopedia of Science and Technology* Series of articles in astronomy and engineering

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Rogowski, Prof Augustus R. *Massachusetts Institute of Technology* COMBUSTION CHAMBER; IGNITION SYSTEM, LUBRICATION, ENGINE, series of related articles

Rollet, Dr Duane E. *Harvey Mudd College and Space Technology Laboratories, Inc.* CONSERVATION OF ENERGY, ENERGY, KI-

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S

Sacks, Dr Marun. *Biology Department, City College of New York* KINORHYNCHA.

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Sisler, Dr Harry Hall *Professor and Head, Department of Chemistry, University of Florida* AMMINE, AMMONIA, NITROGEN

Sistrom, William R *Assistant Professor of Biology, Harvard University* BACTERIAL GROWTH, MYXOBACTERALES

Sittig, Marshall *Consultant* ALKALI METALS, articles on individual alkali metals

Sittner, Dr W R *Sperry Semiconductor Division, Sperry-Rand Corporation* INFRARED DETECTOR, PHOTODIODE, PHOTO-TRANSISTOR

Semmes, Dr Josephine *Research Associate, Psychophysiological Laboratory, New York University, Bellevue Medical Center* AGNOSIA, AMNESIA; APHASIA; APRAXIA, ASTEREOGNOSIS.

Serr, Prof. Eugene Frank, Jr. *Pomologist, University of California at Davis.* NUT CROP CULTURE; articles on various nuts

Setlow, Prof. Richard B *Biophysics Department, Yale University.* PHYSIOLOGICAL ACTION SPECTRA

Seubold, Dr. Frank H *Senior Chemist, Aerojet-General Corporation* ANTIOXIDANT; INHIBITOR (CHEMICAL).

Shapiro, Hymin *Assistant Director of Chemical Research, Ethyl Corporation.* LEAD (in part).

Sharpe, Dr. C. F Stewart. *221 Monroe Street, Falls Church, Virginia* LANDSLIDE, MASS WASTING, other articles in geology.

Sharvelle, Dr. Eric George. *Department of Botany and Plant Pathology, Purdue University.* FRUIT (TREE) DISEASES—in part.

Sheard, Dr. Keith *Senior Research Officer, Division of Fisheries and Oceanography, Commonwealth Scientific and Industrial Research Organization, Australia* INDIAN OCEAN (in part)

Shearer, Prof J Lowen *Mechanical Engineering Department, Massachusetts Institute of Technology* MAGNETIC AMPLIFIER, SERVOMECHANISM, SYNCHRO

Sheffield, Dr Fred D *Associate Professor in Psychology, Yale University* EXTRASENSORY PERCEPTION (ESP)

Shellenberger, Dr John A *Department of Flour and Feed Milling Industries, Kansas State University* FOOD MANUFACTURING (in part), processing sections of various cereal grain articles

Shelton, Dr Frank H *Research Scientist, Kaman Nuclear, A Division of Kaman Aircraft Corporation* NUCLEAR EXPLOSION (in part)

Shepard, Prof Francis Parker *Scripps Institution of Oceanography, University of California* SUBMARINE CANYON

Sheppard, Dr Edith M *Senior Lecturer in Zoology, University College of South Wales and Monmouthshire, Cardiff, Wales* PHREATICOIDEA

Sheppard, Prof P. A *Imperial College, London, England* METEOROLOGY (in part)

Sherwood, Robert S *Manager of Engineering, Steam Turbine Division, Worthington Corporation* MACHINERY, MASS PRODUCTION, MECHANICAL ENGINEERING, TECHNOLOGY

Shiino, Dr Prof Sueo M *Professor of Zoology, Faculty of Fisheries, Prefectural University of Mie, Japan* CALIGOIDA, EPICARIDEA

Shirley, Prof David Allen *Department of Chemistry, University of Tennessee* KETONE, articles on various ketones

Shive, Prof William *Department of Chemistry and the Clayton Foundation Biochemical Institute, University of Texas* ENZYME INHIBITION

Shnidman, Louis *Superintendent of Gas Production, Rochester Gas and Electric Corporation* FUEL GAS

Shomon, Dr Joseph James *Chief, Education Division, Commission of Game and Inland Fisheries, Editor, 'Virginia Wildlife'* WILDLIFE CONSERVATION

Shoop, Rue M *Vice-President, Publicity, Multi-amp Electronic Corp., Union, New Jersey* ELECTRIC POWER SYSTEMS

Showalter, Albert Kenneth *Meteorologist, U.S Weather Bureau* WEATHER STATION.

Shreve, Prof. R Norris *Purdue University* NITRATION (in part), UNIT PROCESSES.

Smythe, Dr William Ralph *Professor of Physics, California Institute of Technology* ELECTROMAGNETIC RADIATION; MAXWELL'S EQUATIONS; WAVE EQUATION, other articles on electromagnetic theory.

Snell, Dr Arthur Hawley. *Assistant Director, Oak Ridge National Laboratory; Director, Thermonuclear Project, Oak Ridge National Laboratory* NEUTRON; NEUTRON CROSS SECTION; NEUTRON, DELAYED, NEUTRON OPTICS

Snell, Prof. Esmond E *Professor of Biochemistry, University of California* BIOASSAY (in part).

Snell, Dr Fred M. *Professor of Biophysics, University of Buffalo School of Medicine.* OPEN SYSTEMS, THERMODYNAMICS OF (BIOLOGY).

Snodgrass, Frank E *Scripps Institute of Oceanography, University of California at La Jolla* OCEAN WAVES (in part)

Snodgrass, Dr Robert Evans. *Honorary Research Associate (retired), Smithsonian Institution* ARTHROPODA, ONYCHOPHORA

Snook, Dr Theodore *Professor of Anatomy, University of North Dakota School of Medicine* TONSIL.

Snyder, Dr Thomas Elliott *Research Associate, U.S National Museum, Smithsonian Institution* ISOPTERA

Soderberg, Adolph *Consulting Mining Engineer, Western Mining Divisions, Kennecott Copper Corporation* MINING, OPEN-CUT OR PIT

Sohon, Dr Harry *Moore School, University of Pennsylvania* INDUCTANCE MEASUREMENT, PHASE-ANGLE MEASUREMENT, articles on electrical instrumentation

Solitare, Dr Gilbert Bernard *Department of Pathology, Yale University School of Medicine* MUSCULAR SYSTEM DISORDERS.

Souders, Dr Mott *Director, Oil Development, Shell Development Company* FRACTIONATING COLUMN, FUEL OIL, PETROLEUM PRODUCTS, other articles in petroleum chemistry

Spackman, Dr. William *Department of Geology, Pennsylvania State University* COAL PALEOBOTANY

Spangenberg, Dr Karl Rudolph. *Consulting Engineer* DIODE, VACUUM, PENTODE, VACUUM, TRIODE, VACUUM, VACUUM TUBE, articles on other electronic tubes.

Spedding, Dr Frank Harold. *Professor of Chemistry and Physics, and Director, Institute for Atomic Research, Iowa State University, Director, Ames Laboratory of the Atomic Energy Commission* RARE-EARTH ELEMENTS, articles on various rare-earth elements

Spencer, Dr John Francis Theodore [illegible]

Spindt, Dr Roderick S *Gulf Research and Development Company* BURNING VELOCITY MEASUREMENT, COMBUSTION WAVE MEASUREMENT, SPECTROSCOPY OF COMBUSTION

Spink, Dr Wesley William *Professor of Medicine, University of Minnesota School of Medicine* BRUCELLOSIS

Spinrad, Dr Bernard I *Division Director, Reactor Engineering Division, Argonne National Laboratory* NUCLEONICS; REACTOR PHYSICS, THERMAL NEUTRONS

Sprague, Dr George Frederick. *Crops Research Division, Agricultural Research Service, U.S Department of Agriculture, Beltsville, Md* BREEDING (PLANT).

Sprague, Prof Howard B *Head, Agronomy Department, Pennsylvania State University* GRASS CROPS (in part), articles on various grasses

Skaar, Dr Christen *Associate Professor, College of Forestry, Syracuse University.* WOOD PHYSICS.

Skerman, Victor Bruce Darlington *Reader in Bacteriology and Head, Department of Bacteriology, University of Queensland, Australia.* BACTERIA, TAXONOMY OF, SCHIZOMYCETES, articles on related taxonomic groups

Skovholt, Dr Oscar. *Director of Laboratory, Quality Bakers of America Co-op, Inc* FOOD MANUFACTURING (in part)

Slabaugh, Dr. Wendell H. *Professor of Chemistry, Oregon State College.* INTERFACE OF PHASES; SURFACE-ACTIVE AGENT.

Slater, Lloyd Edward. *Executive Director, Foundation for Instrumentation Education and Research* FOOD ENGINEERING (in part).

Slawson, Prof. Chester Baker *Mineralogical Laboratory, University of Michigan* DIAMOND, GEM, MANUFACTURED.

Slaymaker, Frank H *Manager, Electroacoustics Laboratory, Research Division, Stromberg-Carlson Division, General Dynamics Corporation* PUBLIC ADDRESS SYSTEM, SOUND REPRODUCTION SYSTEMS, ELECTRICAL

Sleeper, Ruth *Director, School of Nursing and Nursing Service, Massachusetts General Hospital, Boston.* NURSING

Slichter, Dr Charles Pence *Professor of Physics, University of Illinois* MAGNETIC RELAXATION, MAGNETIC RESONANCE.

Slichter, Prof Louis B *Institute of Geophysics, University of California at Los Angeles* EARTH DEFORMATIONS AND VIBRATIONS, EARTH TIDES

Sloss, Prof L L *Department of Geology, Northwestern University* EVAPORITE (SALINE)

Smack, John C *Assistant to General Sales Manager, Curtiss Wright Corporation* METAL INSPECTION, ULTRASONIC

Smith, C Price *Manager, Kinescope Engineering, Radio Corporation of America* KINESCOPE

Smith, Prof David Martyn *Associate Professor of Silviculture, Yale University School of Forestry* SILVICULTURE

Smith, Dr F G Walton *Director, The Marine Laboratory, University of Miami* OCEANOGRAPHY (in part)

Smith, Fred W *Assistant to Apparatus Engineer, Western Union Telegraph Company* TELETYPEWRITER

Smith, Dr Guy D *Director, Soil Survey Investigations, Soil Conservation Service* SOIL (in part)

Smith, Dr Harold H *Department of Biology, Brookhaven National Laboratory* MENDELISM

Smith, Dr. Harry *Senior Principal Scientific Officer, Microbiological Research Establishment, Experimental Station, Wiltshire, England* ANTHRAX

Smith, Prof H T. U. *Head of Geology Department, University of Massachusetts* AERIAL PHOTOGRAPH

Smith, James A *Electric Utility Engineering, General Electric Company* ELECTRIC POWER SUBSTATION

Smith, Prof Karl Ulrich *Psychology Department, University of Wisconsin.* AUDIOMETRY, DEAFNESS, HEARING, LOUDNESS, PITCH.

Smith, Philip H *Contributing Editor, Society of Automotive Engineers* AUTOMOBILE; AUTOMOTIVE VEHICLE, series of related articles

Smith, Dr. Raymond Lloyd *Professor and Head, Department of Metallurgical Engineering, Michigan College of Mining and Technology* ZONE REFINING

Stephens, Dr Charles R. *Research Supervisor, Charles Pfizer and Company* OXYTETRACYCLINE.

Stephenson, Prof Richard M *University of Connecticut* ISOTOPE SEPARATION (STABLE ISOTOPES)

Stepniewski, Wieslaw Zenon *Assistant Director of Engineering, Research Vertol Division, Boeing Airplane Company.* CONVERTIPLANE.

Stern, Prof. Herbert *Botany Department, University of Illinois.* CELL PROTOPLAST

Stern, Joseph A *School of Fisheries, University of Washington* FOOD MANUFACTURING (in part).

Sterner, Dr John. *Vice-President, Cordis Corporation* LAUNCHING PAD COMPLEX.

Stevens, John E. *Chief of Space Mechanics, Astronautics Division, Chance Vought Aircraft, Inc* LANDING GEAR

Stevenson, Dr Robert E *Hancock Foundation, University of Southern California.* ESTUARINE OCEANOGRAPHY (in part)

Stewart, Dr David B *U.S Geological Survey* SILICATE PHASE EQUILIBRIA

Stewart, Dr Grace Anne *Geologist (retired)* DEVONIAN.

Stewart, Dr John Westcott *Department of Physics, University of Virginia* DIMENSIONAL ANALYSIS, ELECTRICAL STANDARDS; REFRACTION OF WAVES, series of articles in electricity

Stewart, Prof Wilson Nichols *Chairman, Department of Botany, University of Illinois* COAL BALLS, PTERIDOSPERMAE

Stiles, Dr R. Martin *Assistant Professor, Department of Chemistry, University of Michigan* TROPOLONE

Stillwell, Dr G Keith *Mayo Clinic, Mayo Foundation Graduate School of Medicine, University of Minnesota* THERMOTHERAPY (in part)

Stirton, Prof Ruben Arthur *Director, Museum of Paleontology, University of California.* MAMMALIA FOSSILS, articles on related fossil groups

Stoeckeler, Dr J T. *Lake States Forest Experiment Station, University Farm, St Paul, Minnesota* FOREST SEEDING AND PLANTING

Stokes, Prof J L *Department of Bacteriology and Public Health, Washington State University* BACTERIAL NUTRITION

Stommel, Prof Henry M *Harvard University* GULF STREAM

Stone, Dr Kenneth G *Professor of Chemistry, Michigan State University* ORGANIC QUANTITATIVE ANALYSIS; REAGENT CHEMICALS STOICHIOMETRY, other articles in analytical chemistry

Stove, Prof Leon Stansfield *Bronson Professor of Comparative Anatomy, Yale University* BEHAVIOR, ONTOGENY OF, EYE, NERVOUS SYSTEM (all in part)

Storch, Dr Henry Herman. *Assistant Professor of Chemistry, New York University* COAL CHEMICALS, COAL GASIFICATION, FISCHER-TROPSCH PROCESS, related articles in chemical engineering

Storer, Prof Tracy I *Professor emeritus, Department of Zoology, University of California at Davis* Series of articles on various topics in zoology

Stotz, Prof Elmer H *University of Rochester School of Medicine and Dentistry* CYTOCHROME

Stover, Prof Harold Earl *Professor and Extension Agricultural Engineer, Kansas State University* RURAL SANITATION

Strachan, Dr Isles *Lecturer in Geology, University of Birmingham, England* GRAPTOLITHINA.

Strain, Dr Harold H *Senior Chemist, Argonne National Laboratory* CAROTENOID, CHROMATOGRAPHY

Spratt, Dr Nelson Tracy. *Chairman, Department of Zoology, University of Minnesota.* FETAL MEMBRANE; GASTRULATION, GERM LAYERS; articles on other fetal membranes.

Sprenkle, Raymond E *Director of Education, Bailey Meter Company.* ORIFICE; VENTURI TUBE.

Spurr, Prof. Stephen H *School of Natural Resources, University of Michigan.* ECOLOGY, APPLIED; FOREST ECOLOGY, FOREST MAPPING.

Squire, Prof. Charles Francis *Professor of Physics, The Rice Institute* ABSOLUTE ZERO; LOW-TEMPERATURE PHYSICS.

Srb, Prof, Adrian Morris *Department of Plant Breeding, Cornell University.* DOMINANCE, RECESSIVENESS, BLENDING.

Stadie, Dr William C *Maloney Clinic, University of Pennsylvania* LIPID METABOLISM

Stahnke, Dr. Herbert Ludwig *Head, Division of Life Sciences; Director, Poisonous Animals Research Laboratory; Professor of Zoology, Arizona State College* SCORPIONIDA.

Stakman, Dr. E. C. *Professor emeritus, University of Minnesota.* PLANT DISEASE; PLANT DISEASE CONTROL (both in part)

Standiford, Ferris Charles, Jr. *W L Badger Associates, Inc , Consulting Engineers* EVAPORATOR

Stansbury, Dr. Harry Adams, Jr. *Research Chemist, Union Carbide Chemicals Company.* ALDEHYDE, ACETALDEHYDE, BENZALDEHYDE; FORMALDEHYDE

Stapleton, Dr George Edward *Research Biologist, Radiation Biology Division, Oak Ridge National Laboratory* RADIATION MICROBIOLOGY

Stare, Prof Fredrick J *Department of Nutrition, Harvard University* NUTRITION

Starr, Eugene C *Chief Engineer, Bonneville Power Administration* ELECTRIC POWER GENERATION

Steacie, Dr E W R *President, National Research Council of Canada* FREE RADICAL

Stebbins, Prof G Ledyard *Department of Genetics, College of Agriculture, University of California at Davis* PLANT EVOLUTION

Steele, Dr. John Gordon *Chief, Soil Survey Reports, Soil Conservation Service, U.S Department of Agriculture, Beltsville, Md* SOIL (GREAT SOIL GROUPS)—in part

Steenrod, Prof Norman Earl *Professor of Mathematics, Princeton University.* FIBER BUNDLE

Steggerda, Prof F R *Professor of Physiology, University of Illinois* DIGESTIVE SYSTEM (in part)

Stehle, Prof. Philip McLellan *Professor of Physics, University of Pittsburgh.* CANONICAL TRANSFORMATIONS, HAMILTON'S EQUATIONS OF MOTION, LAGRANGE'S EQUATIONS, other articles in classical mechanics.

Steinberg, Prof. Arthur G. *Department of Biology, Western Reserve University.* HUMAN GENETICS (in part)

Steinberg, Dr. Daniel *Chief, Section on Metabolism, National Heart Institute* PROTEIN, articles on various proteins

Steinberg, Dr. Ellis Philip *Senior Chemist, Argonne National Laboratory.* NUCLEAR CHEMISTRY.

Steinert, Emil F. *Arc Welding Division, Westinghouse Electric Corporation* ARC WELDING.

Steinhaus, Prof. Edward A *Director, Laboratory of Insect Pathology, University of California.* INSECT CONTROL, BIOLOGICAL

Stephen, Dr A. C. *Formery, Keeper, Natural History Department, Royal Scottish Museum, Edinburgh, Scotland.* ECHIUROIDEA, PRIAPULOIDEA

Stephens, Dr Charles R. *Research Supervisor, Charles Pfizer and Company* OXYTETRACYCLINE

Stephenson, Prof Richard M. *University of Connecticut* ISOTOPE SEPARATION (STABLE ISOTOPES).

Stepniewski, Wieslaw Zenon. *Assistant Director of Engineering, Research Vertol Division, Boeing Airplane Company* CONVERTIPLANE

Stern, Prof Herbert *Botany Department, University of Illinois* CELL PROTOPLAST.

Stern, Joseph A *School of Fisheries, University of Washington* FOOD MANUFACTURING (in part).

Sterner, Dr John *Vice-President, Cordis Corporation* LAUNCHING PAD COMPLEX

Stevens, John E *Chief of Space Mechanics, Astronautics Division, Chance Vought Aircraft, Inc.* LANDING GEAR

Stevenson, Dr Robert E *Hancock Foundation, University of Southern California* ESTUARINE OCEANOGRAPHY (in part)

Stewart, Dr David B *U.S Geological Survey* SILICATE PHASE EQUILIBRIA

Stewart, Dr Grace Anne *Geologist (retired).* DEVONIAN.

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Stewart, Prof. Wilson Nichols *Chairman, Department of Botany, University of Illinois* COAL BALLS; PTERIDOSPERMAE

Stiles, Dr R Martin *Assistant Professor, Department of Chemistry University of Michigan* TROPOLONE.

Stillwell, Dr G Keith *Mayo Clinic, Mayo Foundation Graduate School of Medicine, University of Minnesota* THERMOTHERAPY (in part)

Stirton, Prof Ruben Arthur *Director, Museum of Paleontology, University of California* MAMMALIA FOSSILS, articles on related fossil groups

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Storch, Dr H. [illegible]

Ste[illegible] *Professor emeritus, Department of Zoology, University of California at Davis* Series of articles on various topics in zoology

Stotz, Prof Elmer H *University of Rochester School of Medicine and Dentistry* CYTOCHROME.

Stover, Prof Harold Earl *Professor and Extension Agricultural Engineer, Kansas State University* RURAL SANITATION

Strachan, Dr Isles *Lecturer in Geology, University of Birmingham, England* GRAPTOLITHINA

Strain, Dr Harold H *Senior Chemist, Argonne National Laboratory* CAROTENOID; CHROMATOGRAPHY

Strandberg, Prof. Malcom W. P. *Professor of Physics, Massachusetts Institute of Technology.* MICROWAVE SPECTROSCOPY

Strandtmann, Prof Russell William. *Texas Technological College.* MESOSTIGMATA (in part).

Stranks, Dr. Donald Richard *Senior Lecturer in Physical Chemistry, University of Melbourne, Australia* RADIOCHEMISTRY.

Straus, Dr. Reuben *Director of Laboratories and Research, Saint Joseph Hospital, Burbank, California.* CLINICAL PATHOLOGY.

Strausbaugh, Dr. P. D. *Professor emeritus of Botany, West Virginia University.* Series of articles in plant taxonomy.

Strayer, George Martin *Executive Vice-President and Secretary-Treasurer, American Soybean Association; Executive Director, Soybean Council of America, Inc* SOYBEAN (in part).

Streeter, Prof Victor L *University of Michigan* FLUID MECHANICS, PIPE FLOW; SOURCE FLOW, other articles in fluid mechanics

Strock, Clifford *Editor, 'Air Conditioning, Heating and Ventilating'* DEGREE-DAY

Stroke, Dr George W. *Massachusetts Institute of Technology* DOPPLER EFFECT, LIGHT

Stuart, Dr Edward G *Assistant Professor of Pathology, West Virginia Medical Center* Series of articles in anatomy and in human pathology

Stuart, Prof L C *Department of Zoology, University of Michigan* ZOOGEOGRAPHIC REGION, ZOOGEOGRAPHY

Stuart, William T *Editor, 'Electrical Construction and Maintenance,' McGraw-Hill Publishing Co* CONDUCTOR, ELECTRIC, CONNECTOR, ELECTRIC, WIRING (ELECTRIC), other articles on electric circuits

Stumm, Prof Erwin Charles *Department of Geology and Museum of Paleontology, University of Michigan* RUGOSA; TABULATA.

Stunkard, Dr Horace Wesley *Research Associate, Invertebrate Zoology, American Museum of Natural History* PARASITOLOGY

Sturges, Frank Caleb *Vice-President, Pennsylvania Drilling Company, President, Foundation Associates, Inc; President, Lake Drilling Company, President, Diamond Products, Inc, President, Triangle Pump and Supply Company* BORING AND DRILLING, MINERAL, CORE DRILLING, WELL LOGGING (MINERAL)

Sturtevant, Prof Alfred H *Thomas Hunt Morgan Professor of Biology, California Institute of Technology* GENE, GENETICS

Sturtevant, George Rodger *Manager (retired), Engineering, Meter Department, General Electric Company* ELECTRIC ENERGY MEASUREMENT, WATT-HOUR METER

Suess, Prof Hans E *University of California at La Jolla* ELEMENTS (COSMIC ABUNDANCE)

Sully, Dr. Arthur H *Director, British Steel Castings Research Association, Sheffield, England* MANGANESE

Summerbell, Robert K *Professor of Chemistry, Northwestern University* DIOXANE, ETHER, ETHYLENE OXIDE

Summers, Dr Thomas Eugene *Agricultural Research Service, Crops Research Division, U S Department of Agriculture* ABACA, JUTE (in part), RAMIE (in part)

Suomi, Dr Verner E *Department of Meteorology, University of Wisconsin* METEOROLOGICAL INSTRUMENTATION, other articles on meteorological instrumentation

Suter, Dr. Hans H *Texaco, Calgary, Canada* MUD VOLCANO

Sutherland, J R *Large Power Transformer Engineering, General Electric Company* AUTOTRANSFORMER; TRANSFORMER (in part).

Sutton, George P *Chief Scientist, Advanced Research Projects Agency, US Department of Defense* INTERPLANETARY PROPULSION, ROCKET, ROCKET ENGINE; ROCKET STAGING

Swanson, Prof Carl P. *Department of Biology, Johns Hopkins University* CHROMOSOME THEORY OF HEREDITY; MEIOSIS; RADIATION CYTOLOGY, SYNGAMY.

Swanson, Dr. Carroll Arthur *Professor of Botany, Ohio State University* PLANT TRANSLOCATION (ORGANIC SOLUTES).

Swern, Dr. Daniel *Research Supervisor, Eastern Regional Research Laboratory, U.S Department of Agriculture* HYDROXYLATION REACTION.

Switzer, Dr George *Curator, Division of Mineralogy and Petrology, Smithsonian Institution* CALICHE; NITER, NITRATE MINERALS, SODA NITER

Sylvester, Dr John Carl. *Director, Microbiologic Research Division, Abbott Laboratories* FUMAGILLIN

Tabor, Paul *Soil Conservation Service, U.S Department of Agriculture* COWPEA (in part). KUDZU, LEGUME FORAGES; LESPEDEZA, LUPINE

Tager, Prof Morris *Department of Bacteriology and Immunology, Emory University.* VIRULENCE

Tait, Dr John Barclay *Oceanographer, Marine Laboratory, Department of Agriculture and Fisheries for Scotland.* NORTH SEA

Tang, Prof K Y *Department of Electrical Engineering, Ohio State University* COUPLED CIRCUITS, NETWORK THEORY, ELECTRICAL, other articles on electric circuits

Tanner, Dr Fred W, Jr *Research Biochemist, Charles Pfizer and Company, Inc* CARBOMYCIN

Tarboux, Prof Joseph G. *Electrical Engineering Department, University of Michigan* RELAY.

Tattersall, Dr Olive Selden *Research Zoologist, Hayling Island, England* MYSIDACEA

Taube, Prof Henry *Department of Chemistry, University of Chicago* OXIDATION-REDUCTION

Taylor, Prof Angus Ellis *Chairman, Department of Mathematics, University of California at Los Angeles* CALCULUS, DIFFERENTIAL AND INTEGRAL, DIFFERENTIATION; PARAMETRIC EQUATION, PARTIAL DIFFERENTIATION

Taylor, Dr Gordon S *Tobacco Laboratory, Windsor, Connecticut* TOBACCO (in part)

Taylor, Prof J Herbert *Professor of Cell Biology, Columbia University* AUTORADIOGRAPHY, HISTORADIOGRAPHY, NUCLEAR RADIATION (BIOLOGY)—in part

Tedford, Dr Richard Hall *Assistant Professor of Geology, Division of Physical Sciences, University of California at Riverside* CARNIVORA FOSSILS, PERISSODACTYLA FOSSILS; articles on related fossil groups

Teleki, Prof Geza *Professor of Geology, George Washington University* EUROPE

Tenney, Dr Gerold H. *Los Alamos Scientific Laboratory, New Mexico* RADIOGRAPHY OF METALS

Thalmann, Prof Dr Hans Ernst *Visiting Professor of Paleontology, Stanford University (and University of Chile)* FORAMINIFERA FOSSILS.

Thoma, Dr Richard William. *The Squibb Institute for Medical Research* STEROID (in part)

Thoma, Roy Elbott, Jr *Research Chemist, Oak Ridge National Laboratory* FUSED-SALT PHASE EQUILIBRIA (in part).

Thomas, Dr Morgan David *Associate Professor of Geography, University of Washington* MINERAL RESOURCES CONSERVATION

Strandberg, Prof Malcom W. P. *Professor of Physics, Massachusetts Institute of Technology.* MICROWAVE SPECTROSCOPY.

Strandtmann, Prof. Russell William *Texas Technological College.* MESOSTIOMATA (in part).

Stranks, Dr. Donald Richard *Senior Lecturer in Physical Chemistry, University of Melbourne, Australia.* RADIOCHEMISTRY.

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Stuart, Prof L C *Department of Zoology, University of Michigan* ZOOGEOGRAPHIC REGION, ZOOGEOGRAPHY

Stuart, William T *Editor, 'Electrical Construction and Maintenance,' McGraw-Hill Publishing Co* CONDUCTOR, ELECTRIC; CONNECTOR, ELECTRIC, WIRING (ELECTRIC), other articles on electric circuits

Stumm, Prof Erwin Charles *Department of Geology and Museum of Paleontology, University of Michigan* RUGOSA, TABULATA.

Stunkard, Dr Horace Wesley *Research Associate, Invertebrate Zoology, American Museum of Natural History* PARASITOLOGY

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Sturtevant, George Rodger *Manager (retired), Engineering, Meter Department, General Electric Company* ELECTRIC ENERGY MEASUREMENT, WATT-HOUR METER

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Summerbell, Robert K *Professor of Chemistry, Northwestern University* DIOXANE, ETHER, ETHYLENE OXIDE

Summers, Dr Thomas Eugene *Agricultural Research Service, Crops Research Division, U.S Department of Agriculture* ABACA, JUTE (in part), RAMIE (in part)

Suomi, Dr Verner E *Department of Meteorology, University of Wisconsin* METEOROLOGICAL INSTRUMENTATION, other articles on meteorological instrumentation

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Sutton, George P *Chief Scientist, Advanced Research Projects Agency, U.S. Department of Defense* INTERPLANETARY PROPULSION; ROCKET; ROCKET ENGINE; ROCKET STAGING

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Swern, Dr Daniel *Research Supervisor, Eastern Regional Research Laboratory, U.S Department of Agriculture* HYDROXYLATION REACTION

Switzer, Dr George *Curator, Division of Mineralogy and Petrology, Smithsonian Institution* CALICHÉ; NITER, NITRATE MINERALS, SODA NITER

Sylvester, Dr. John Carl *Director, Microbiologic Research Division, Abbott Laboratories.* FUMAGILLIN

Tabor, Paul *Soil Conservation Service, U S Department of Agriculture* COWPEA (in part) KUDZU, LEGUME FORAGES, LESPEDEZA, LUPINE.

Tager, Prof Morris *Department of Bacteriology and Immunology, Emory University* VIRULENCE

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Taylor, Prof Angus Ellis *Chairman, Department of Mathematics, University of California at Los Angeles* CALCULUS, DIFFERENTIAL AND INTEGRAL, DIFFERENTIATION, PARAMETRIC EQUATION, PARTIAL DIFFERENTIATION

Taylor, Dr Gordon S *Tobacco Laboratory, Windsor, Connecticut* TOBACCO (in part)

Taylor, Prof J Herbert *Professor of Cell Biology, Columbia University* AUTORADIOGRAPHY, HISTORADIOGRAPHY, NUCLEAR RADIATION (BIOLOGY)—in part

Tedford, Dr Richard Hall *Assistant Professor of Geology, Division of Physical Sciences, University of California at Riverside* CARNIVORA FOSSILS, PERISSODACTYLA FOSSILS, articles on related fossil groups

Teleki, Prof Geza. *Professor of Geology, George Washington University* EUROPE.

Tenney, Dr Gerold H *Los Alamos Scientific Laboratory, New Mexico* RADIOGRAPHY OF METALS

Thalmann, Prof Dr Hans Ernst *Visiting Professor of Paleontology, Stanford University (and University of Chile)* FORAMINIFERA FOSSILS.

Thoma, Dr Richard William *The Squibb Institute for Medical Research* STEROID (in part).

Thoma, Roy Elliott, Jr *Research Chemist, Oak Ridge National Laboratory* FUSED-SALT PHASE EQUILIBRIA (in part)

Thomas, Dr Morgan David *Associate Professor of Geography, University of Washington* MINERAL RESOURCES CONSERVATION

Thompson, Prof Gerald Luther *Associate Professor of Applied Mathematics and Industrial Administration, Graduate School of Industrial Administration, Carnegie Institute of Technology* GAME THEORY.

Thompson, Dr. M L *Principal Geologist, Illinois State Geological Survey.* FUSULINIDAE.

Thompson, Dr. Stanley Gerald *Senior Staff Member, Lawrence Radiation Laboratory, University of California* BERKELIUM; CALIFORNIUM, EINSTEINIUM; FERMIUM, MENDELEVIUM

Thomsen, Prof. John S *Mechanical Engineering Department, Johns Hopkins University.* ATOMIC CONSTANTS, X-UNIT (both in part)

Thomson, Dr Harry C *Formerly, Ordnance Historian, U.S Department of the Army* ARAMAMENT, ARMY

Thomson, Prof Robb Milton *Department of Metallurgy, University of Illinois* ALLOY STRUCTURES, CRYSTAL DEFECTS, GRAIN BOUNDARIES (METALLURGY), TWINNING (CRYSTALLOGRAPHY)

Thorne, Prof Gerald *Professor of Plant Pathology and Zoology, University of Wisconsin* DORYLAIMOIDEA

Thurston, Dr H David *Institute of Agriculture, University of Minnesota* PLANT DISEASE CONTROL, POTATO, IRISH; (both in part)

Thwaites, Fredrik Turville *Assistant Professor emeritus, Department of Geology, University of Wisconsin* GLACIATED TERRANE, articles on various glaciated formations

Tikofsky, Dr Ronald Sherwood *Speech Research Laboratory and Speech Clinic, University of Michigan* SPEECH (in part)

Tilton, Dr George Robert *Geophysical Laboratory, Carnegie Institution of Washington* LEAD ISOTOPES, GEOCHEMISTRY OF

Tippo, Dr Oswald *Provost, University of Colorado* STELE, WOOD (ANATOMY AND IDENTIFICATION)

Tobias, Prof Julian Morris *Department of Physiology, University of Chicago* BIOPOTENTIALS AND ELECTROPHYSIOLOGY, ELECTRODIAGNOSIS, ELECTROTHERAPY

Toensing, Dr Clarence H *Manager, Powder Metals Research, Firth Sterling, Inc* TUNGSTEN

Toland, Dr William G *Research Scientist, California Research Corporation* OXIDATION PROCESS

Tompkins, Prof Charles B *Department of Mathematics, University of California at Los Angeles* CALCULUS OF VARIATIONS

Torrey, Dr Theodore W *Department of Zoology, Indiana University* URINARY SYSTEM (in part)

Townes, Prof Charles Hard *Physics Department, Columbia University* MASER

Tracy, Dr Paul Hubert *Professor emeritus, University of Illinois* CASEIN, CHEESE (in part), ICE CREAM (in part), MILK (in part), RENNIN

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Truax, Cmdr. Robert C *Bureau of Aeronautics, U.S. Department of the Navy* ASTRONAUTICAL ENGINEERING; ASTRONAUTICS, MISSILE

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Turnbull, Dr David *General Electric Research Laboratory* CRYSTAL GROWTH, other articles in crystallography.

Turner, Prof C Donnell *Professor of Biology, Duquesne University* Physiology section of each of the endocrine glands.

Turner, Dr Charles Wesley *Professor of Dairy Husbandry, University of Missouri* LACTATION, MAMMARY GLAND.

Turner, Prof Clesson N *Professor of Agricultural Engineering, Project Leader of New York Farm Electrification Council, Cornell University* RURAL ELECTRIFICATION

Turner, Dean Lewis *Utah State University* RANGE LAND CONSERVATION

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Tuttle, Dr W Norris *General Radio Company* DIGITAL VOLTMETER VACUUM-TUBE VOLTMETER

Tyler, Prof Albert *Division of Biology, California Institute of Technology* REPRODUCTION, ANIMAL series of related articles

Tyler, Ivan L *Research Counselor, Research and Development Laboratories Portland Cement Association* GROUT, GUNITE

Tyler, John E *Scripps Institution of Oceanography, University of California* SEA WATER (in part)

U

Uchida, Dr Tohru *Professor of Zoology, Hokkaido University, Japan* SCYPHOZOA articles on related taxonomic groups

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Underwood, Prof Benton J *Northwestern University* VERBAL LEARNING

Upton, Dr Arthur Canfield *Biology Division Oak Ridge National Laboratory* RADIATION INJURY (BIOLOGY)

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V

Valleau, Dr William Dorney *Distinguished Professor of Plant Pathology, University of Kentucky.* TOBACCO (in part).

Vallentyne, Prof John R. *Associate Professor of Zoology, Cornell University.* BIOSPHERE; BIOSPHERE, GEOCHEMISTRY OF.

Van Allen, Dr. J. A. *State University of Iowa.* VAN ALLEN RADIATION.

Van Andel, Dr. Tjeerd Hendrik *Scripps Institution of Oceanography, University of California* DELTA (in part); MARINE SEDIMENTS (in part)

Van Campenhout, Prof Ernest L *Professor of Anatomy, Histology, Embryology, University of Louvain School of Medicine, Belgium* PANCREAS (in part).

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Van Dorn, Dr William G *Scripps Institution of Oceanography, University of California* TSUNAMI

Van Dyke, Prof John Howard *Professor of Anatomy Hahnemann Medical College* ULTIMOBRANCHIAL BODIES

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Vincent, Sydney Archibald *Consulting Naval Architect* SHIP, MERCHANT.

Vine, Allyn C. *Physical Oceanographer, Woods Hole Oceanographic Institution* BATHYTHERMOGRAPH, OCEAN CURRENTS (in part), SEA WATER (in part)

Vishniac, Dr Wolf. *Department of Microbiology, Yale University* THIOBACTERIACEAE

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von Doenhoff, Albert E *Staff Scientist, National Aeronautics and Space Administration* AIRFOIL, AIRFOIL PROFILE, ASPECT RATIO

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W

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Wilson, Dr Morley E *Geological Survey of Canada (retired).* ARCHEOZOIC, BASEMENT ROCK, PRECAMBRIAN, PROTEROZOIC.

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Winkler, Dr Eva M *U S Naval Ordnance Laboratory* SHOCK-WAVE DISPLAY

Winograd, Harold *Consulting Engineer, Allis Chalmers Manufacturing Company* SEMICONDUCTOR RECTIFIER

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Wood, Dr Ivan Daley *Consulting Engineer* IRRIGATION OF CROPS

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Woodcock, Alfred Herbert *Oceanographer, Woods Hole Oceanographic Institution* SEA WATER (in part).

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Wooley, Prof John C. *Professor emeritus, University of Missouri* AGRICULTURE (STRUCTURES)

Wooster, Dr Warren S *Research Oceanographer, Scripps Institution of Oceanography, University of California* SEA WATER (in part)

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Wright, Elliott Francis *Chief Engineer, Pump Developments, Worthington Corporation* CENTRIFUGAL PUMP DISPLACEMENT PUMP, PUMP, PUMPING MACHINERY

Wulff, Dr Verner J *Masonic Research Laboratory* PHOTORECEPTION (in part)

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Young, Dr Roland S *Consulting Chemical Engineer, Canad* COBALT.

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Zacharias, Dr Jerrold Reinach *Professor of Physics, Massachusetts Institute of Technology* ATOMIC CLOCK.

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Zimmerman, Prof Arnold A. *Department of Anatomy, Baylor College of Medicine, Texas Medical Center* LYMPHATIC SYSTEM (in part)

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Zwilling, Prof Edgar *Brandeis University* TERATOGENESIS

How to use the Index

The purpose of the index is to help the user find specific information. To this end, an index entry has been made for every term discussed in the encyclopedia

Entries are specific rather than general The entries under "Chemistry" and "Chemical engineering" refer to the subject as a whole Specific chemical compounds, elements, and processes related to chemistry or chemical engineering are indexed under their own names, often with analytical subentries or cross references to related subjects.

In general, an index entry is a scientific or technological term rather than a common synonym For example, Phototube rather than Electric eye, *Drosophila melanogaster* rather than Fruit fly

An entry is made for a spelled-out form rather than an abbreviation Cross references have been made from common abbreviations, for example "AC *see* Alternating current" and "DNA *see* Deoxyribonucleic acid"

In chemical compounds with prefixes, the prefixes are disregarded *N*-benzoylglycine is under Benzoylglycine, beta sulfur under Sulfur.

The alphabetical arrangement is library style, word by word, rather than dictionary style in which the division of words is disregarded. Hyphenated words are arranged as separate words, so that Direct current is followed by Direct-current ammeter.

Volume numbers are given in boldface, followed by page numbers referred to in that volume. Thus "4 48-50, 12 136-140" indicates pages in volumes 4 and 12

The main discussion of a subject is indicated by an asterisk (*) after the page number on which the discussion is to be found, so that 12 151, 161-164* locates the main discussion on pages 161 to 164

Index

A

A display radar 11 206
A priori distribution statistics *13 71*
A supply (electronic power) 10 560
A 286 alloy 7 266
Aa lava 14 349
Aardvark 14 153
Abaca 1 1 2* 12 79
Abacus 1 2
Abakanowicz A 7 172
Abalone 1 2 3* 591 6 74 75
Abampere 5 552 5 628
Abatus 4 376
Abava Lake 1 107
Abbé E 1 591 4 136 8 72, 398 9 550
Abbé condenser 8 385
Abbé number *chromatic aberration* 5 90
Abbé refractometer 11 408
Abbé's sine condition 1 5
Abbot C G 13 266
Abbot silverdisk pyrheliometer 11 214
Abbott B C 8 640
Abbott Aubert effect 8 640
Abdomen 1 3* 397 7 135 14 120
  Insecta 7 135
Abdominal cavity 10 20
Abdominal rib 12 355
Abducens nerve 3 537
  embryology 9 47
Abrams 6 494
Abel, H 8 178 11 626
Abel, J J 7 165
Abel, N 6 282
Abel equation 2 84
Abelian groups 6 282
  canonical transformations 2 457
Abelian integral 4 561
Abelson P H 9 41, 14 85
Aberg B 5 529
Aberrant segregation *see* Gene conversion
Aberration, optical 1 3 7*, 7 30
  astigmatism 1 6
  chromatic 5 89 91
  coma 1 5 6
  curvature of field 1 6
  distortion 1 6 7
  geometrical optics 9 365 368
  lenses 7 451 454
  plotting of image errors 1 3 5
  spherical (aperture) aberration 1 5*, 9 367
  of telescopes 15 450 452
  vision 14 337
Aberration of light 1 7*, 7 504
Abies amabilis 5 278
Abies balsamea 2 97, 3 188, 5 277
Abies balsamifera 8 406
Abies concolor 5 277
Abies fraseri 5 277
Abies grandis 5 278
Abies lasiocarpa 3 189 5 278 10 299, *14 249*
Abies magnifica 5 278
Abies procera 5 278
Abietate 5 74
Abietic acid 11 629
Abiotrophy human genetics 6 512
Ablation 1 7
Ablation materials 12 553
  sensory learning 12 181
  snow line 12 392
  spacecraft *structure* 12 552
Abney level 5 458
Abnormal behavior 1 7 9*, 4 51
  convulsive *disorders* 3 452
  definition 1 8
  epilepsy 3 43
  Freudianism 5 534
  incidence 1 9
  mental deficiency 8 225
  mental illness 8 226
  neurosis 9 80
  organic origin 1 8
  paralysis agitans 9 547
  phenylpyruvic oligophrenia 10 114
  psychoanalysis 11 74
  psychogenic origins 1 8
  psychosis 11 79
  schizophrenia 12 66
  senile dementia 12 377
Abnormal behavior—*cont*
  somatization 12 500
  types 1 8
Abnormal fertilization embryology, experimental 4 573 574
Abnormal glow region 6 215 217
ABO blood groups system 2 267 268
Abomasum 4 158 8 72
Abraliopsis morisi 4 40
Abrams Duff 5 363
Abrams L. 10 327
Abranchus microstomus 11 556
Abrasion (honing) 6 477
  polishing 10 457
Abrasion (by streams) 5 338
Abrasion resistance hardness scales 6 337 338
Abrasive 1 9 10
  boride 2 294
  carbide 2 450 451
  diamond 4 101
  diamond grit 6 100
  emery 4 582
  grinding 6 272
  hardness tests 1 10
  materials 1 9 10
  silicon carbide 12 320
  wheels 1 10
  see also Refractory
Abrasive drilling 2 296
Abrasive sawing 12 41
Abrasive wheels 1 10

Abronia 5 38
Absaroka Ranges 9 157
Abscess 1 492, 2 2
Abscission flower 5 334
fruit 5 545
plant growth 10 337-338
Absolute age carbon bearing materials 11 291-297
earth 4 330-331
geochronometry 6 119
rock materials 11 591-594
Absolute ampere *see* Ampere
Absolute coulomb 4 458
Absolute differential calculus 2 403
Absolute electrical standards 4 458 459
Absolute entropy 5 11
Absolute error 12 310
Absolute farad 4 458
Absolute henry 4 458
Absolute humidity 6 515
Absolute ohm 4 458-459*, 9 276
Absolute pitch 10 244
Absolute pressure 10 581 582
Absolute systems of units 14 205-204
British 14 204
Absolute threshold (sensation) 12 178
Absolute volt 4 458-459
Absolute watt 4 458
Absolute zero 1 10-11*, 7 598, 13 486-487
and superconductivity 13 295 301
Absolutely continuous function of real variable 11 372
Absorbance 12 582
infrared spectroscopy 7 108
Absorber oil 10 72
Absorptance cadmium sulfide 7 615
Absorptometric analysis *see* Spectrophotometric analysis
Absorptiometric methods (gas analysis) 6 45 46
Absorption 1 11-19
dielectric *see* Dielectric absorption
digestive system 4 173
humidity control 6 516
particle beams 1 11
Absorption (electromagnetic radiation) 1 11 17
in atmosphere 11 214
coefficient 1 12
color centers 5 294-297
color filters 5 266
contrasted to scattering 1 13
dispersion 1 15-17
fluorescence 1 14 15
gases 1 14
infrared absorption of superconductors 13 299
interstellar 7 219 222
Absorption (electromagnetic radiation)—*cont*
laws 1 12-13
liquids 1 14
luminescence 1 15
measurement 1 13
optical materials 9 350-353
phosphorescence 1 15
physical nature 1 13 15
quantum theory 1 13-14
radio-wave propagation 11 520
selective 1 11-12
solids 1 14
Absorption (sound) 1 17 19
absorption coefficient 1 18 19
acoustical materials 1 17-19
anechoic chamber 1 400
mufflers 8 623-624
noise control 9 121*, 129
Absorption coefficient electromagnetic radiation 1 12
solutions 1 11
sound 1 18 19
Absorption cycle refrigeration 11 413
Absorption edge x-ray 14 578
Absorption refrigeration 1 147
Absorption spectra 12 593
infrared 7 107-110
spectrophotometric analysis 12 583
Absorption wavemeter 14 440
Absorptivity heat radiation 6 371
of skin 2 201
Absorptivity coefficient 12 582
Abutments arch 1 508
Abyla 3 255
Abyssal benthic zone marine ecosystem 8 108
Abyssal red clay 8 136
Abyssopelagic fauna 4 40
Abyssopelagic zone 4 39
AC *see* Alternating current
Acacatechin tannin 13 300
Acacia 6 297
Acacia longifolia 8 241
Acacia savanna 9 189
Acadian flycatcher 5 362
Acadian orogeny 15 411
Acalymma vittata 5 287
Acalyptera te 4 215
Acanthamoeba castellanii 1 330
Acantharia 11 515
Acanthaster 1 598 599
Acanthastrea echinata 12 77
Acanthephyra multispina 4 40
Acanthite 1 528
Acanthobdella 6 456
Acanthobothrium 13 530
Acanthocephala 1 19 25*, 420
Archiacanthocephala 1 19, 516
Acanthocephala—*cont*
Eoacanthocephala 1 19, 5 30-31
Palaeacanthocephala 1 19, 9 495
Acanthochelonema perstans 5 257-259
Acanthochelonema streptocerca 5 257
Acanthocheloneniasis- Filarioidea 5 258-260
Acanthocystis 6 390, 12 27
Acanthodes 1 24
Acanthodii 1 23 24*, 12 360
Acanthometra 11 315
Acanthonema 9 609
Acanthophrynus coronatus 1 300, 496
Acanthopteri *see* Perciformes
Acanthopterygii *see* Perciformes
Acanthorhina 3 61
Acanthoscelides obtectus 3 287
Acanthosoma larva 4 26
Acanthotelson 1 396
Acarapis woodi 14 115
Acari 12 29 30
Acariede *see* Miticide
Acaridiae 12 29
Acarina 1 24 25*, 496 558-559
chigger 3 59
gnathosoma 1 24
idiosoma 1 24
Ixodides 7 298
Mesostigmata 8 252
mite 1 24 8 517
miticide 8 518
Onychopalpida 9 328
tick 1 24
Trombidiformes 14 114-115
Acarus siro 12 29
Acaustobioliths 2 240
Accelerated frame of reference *see* Noninertial frame of reference
Accelerating grid cathode ray tube 2 555
Acceleration 1 25
angular 1 25* 27
and centripetal force 2 640 641
Coriolis *see* Coriolis acceleration and force
differentiation 4 150 151
and force 5 455 456
gravitational 6 263 265
instantaneous 1 25
linear 1 25 27
measurement 1 27
radial (centripetal) 1 25 2 640 641
rectilinear motion 8 601 602
relative 11 427
rigid body dynamics 11 572 573
tangential 1 25
Acceleration analysis 1 26 27
Acceleration measurement 1 27
Acceleration pickup *see* Accelerometer
Acceleration servomechanism 12 199
Acceleration testing rocket sled 11 612 614
Accelerator automotive *see* Throttle (automotive)
Cockcroft Walton *see* Cockcroft Walton accelerator
concrete 5 364
linear *see* Linear accelerator
2 Mercaptobenzothiazole 13 601
negative-ion *see* Negative ion accelerators
particle *see* Particle accelerator
rubber 11 636
Accelerin 3 195
Accelerometer 1 27-28
angular 1 28
electrokinetic transducer 4 481
inertial guidance system 6 288, 7 91
linear 1 27
solion 12 485
vibration pickup 14 321
Acceptor atom 1 28
semiconductors 12 167
Access control highway 14 14 15
Accessory bud 2 361
Accessory minerals 8 444
Accessory nerve 3 538
Accipiter striatus 6 345
Accipitridae 4 317 6 345, 14 377
Accordion 8 666 667
Accumulator electric *see* Storage battery
Acelous vertebra 12 354
Acenaphthene 5 236 10 485
Acentropus 7 468
Acephaline gregarine 13 12
Acer 3 188
Acer campestre 8 99
Acer macrophyllum 8 100
Acer negundo 8 99
Acer pensylvanicum 8 99
Acer platanoides 8 99
Acer pseudoplatanus 8 99, 13 360
Acer rubrum 8 99
Acer saccharinum 8 99 13 119
Acer saccharum 8 99 10 329 13 243
Aceraceae 12 26
Acerentulus barberi 11 61
Acerentomidae 11 61
Acervulus 8 212

tubulum 12 558
Digenea 4 148 150
tal 1 29
aldehyde 1 229
taldehyde 1 29*, 5 22 23, 92 10 570
ethyl alcohol 5 89
production 1 29
uses 1 29
taldehyde 2 (2 ethoxyeth oxy) ethyl 3 4 methylenedi oxyphenyl acetal 7 142
taldol production 1 29
tamide 1 303
ra Aceraminobenzaldehyde thiosemicarbazone 13 606
tate 1 30*, 5 74
tate butyrate film 10 405
tate cholesterol 13 526
tate rayon 5 75 14 526
tic acid 1 30* 590, 2 30 36 42 474 5 376 6 220, 9 92 12 565
acetate 1 30
acetylation 1 36
chemical properties 1 30 31
food preservation 5 426
molecular association 8 538
production 1 29 30
production by fermentation 14 324
solvent 12 496
see also Vinegar
Acetic acid bacteria 1 32
Acetic anhydride 1 43 44
acetylation 1 36
production 1 29
Acetimona 14 324
Acetinomonas Achromobacteraceae 1 39
Acetoacetate 5 74
Acetoacetic acid 2 30 35 7 534 ketosis 7 540
Acetoacetic ester see Ethyl acetoacetate
Acetoacetic ester chelate 3 20
Acetobacter 4 93 6 213, 8 83 11 65 14 509
Pseudomonadaceae 11 65
vinegar 14 524
Acetobacter pasteurianus 10 524
Acetobacter suboxydans fermentation 1 31 34
Bertrand's rule 1 31
biochemical reactions 1 32
L Sorbose production 1 33
Acetobacter xylinum 2 12
Acetobacter suboxydans fermentation 1 31
D(−) Acetoin 1 31
L(+) Acetoin 1 31
Acetol 1 32 2 30
Acetomonas 11 65
Acetone 1 34 35* 2 30 7 534
chemical uses 1 34
ketosis 7 540
Acetone—cont
petrochemical 10 43, 46
production 1 34
Acetone cyanohydrin 10 458
Acetone butanol fermentation 1 34 35*, 2 2
Acetone ethanol fermentation 1 35 36
Acetophenone 1 36
infrared spectrum 12 584
syn anti isomerism 7 279
ultraviolet absorption spectrum 12 585
Acetonuria (metabolism in ruminants) 8 265
1 acetoxy 3 chloro 4 pentanone 13 599
2 Acetoxypyridine 11 112
Acetyl chloride 1 36 44
Acetyl coenzyme A 1 36 7 277 10 549
metabolic disorders 8 259 261
N acetyl D glucosamine 6 522 8 583
Acetyl phosphate 1 36* 2 31 51
Acetylacetone 5 18
2 Acetylaminofluorene oncology 9 326
Acetylated sugar 8 591
Acetylation 1 36 37
acid halide 1 44 45
acylation 1 61-62
enzyme 5 20
Acetylcholine 1 37*, 6 358 10 435 12 564
cardiovascular system 2 502
carotid body 2 531
choline 5 83
endocrine mechanisms 4 590
muscle (biophysics) 8 637
pantothenic acid 9 538
skeletal muscle contraction 8 610
in unconditioned reflex 11 490
Acetylcholine cycle poison 10 436
Acetylcholine esterase 2 203
Acetylene 1 37*, 215 255, 2 399 6 515 14 207 209
acetylide 1 37
chemical binding 3 25
Grignard reaction 6 271
liquid propellant 11 6
petrochemical 10 43 44
petroleum products 10 72
polyacrylonitrile resin 10 459
Acetylene torch 13 684
N Acetylglucosamine acid 10 490
Acetylide 1 37
see also Carbide
N Acetylisatin 7 377
Acetylsalicylic acid 1 592
Acetylsulfonamide 13 211
Achalasia see Cardiospasm
Achard, Franz Carl 13 240
Achatina fulica 12 594
Achene 5 542, 12 145
Achermax 13 41
Acheronita atropos 7 460
Acheson, E. G. 1 9 6 100
Acheta 9 418
Acheta assimilis 9 416
Achillea 12 571
Achillet (asteroid) 14 114
Achlamydous flower 5 529
Achloe asterrimola 1 598
Achlya 4 596 10 200
Acholic state 7 531
Achondrite 8 314 315
Achondroplasia 1 37 59 12 568 13 492
Achondroplastic dwarfism 1 59 6 509
Achras zapota 3 59 4 359
Achroite 13 693
Achromat lens 7 452
Achromatiaceae 2 132
beggiatoales 2 132
Achromatic vision 14 546
Achromatium 2 132
Achromobacter 8 81, 432 433 10 61
Achromobacter fischeri 2 25
Achromobacter liquefaciens 13 542
Achromobacter serosus 1 38
Achromobacteraceae 1 38 39* 5 96
in milk 8 432
morphology 1 38
taxonomy 2 11
Achromycin see Tetracycline
Aci form 9 115
Acid see Acid and base see also specific entries such as Sulfuric acid
Acid amide see Amide acid
Acid and base 1 39 42*, 2 106 362, 3 457
acidity functions 1 42
amphoterism 1 342
Arrhenius Ostwald theory 1 39 40
Bronsted theory 1 40 41
coordination chemistry 3 437 461
hydrogen ion 6 550 552
hydroxide 6 570
Lewis theory 1 41 42
neutralization 9 82
pH 10 89
salt (chemical) 12 16 17
solvent 12 497
Usanovich theory 1 42
Acid anhydride 1 43 44
acetylation 1 36 37
acylation 1 61 62
Grignard reaction 6 271
see also Carboxylic acid
Acid base chemistry 3 457
properties, periodic table 10 14
Acid base indicator see Indicator, acid base
Acid base reaction titration 13 656
Acid blue 43 4 304
Acid chloride 14 549
Acid dyes 4 307
Acid fast stain 1 45 46*, 2 11
Acid green 1 4 299
Acid halide 1 44 45
acetylation 1 36 37
acylation 1 61 62
Grignard reaction 6 271
see also Carboxylic acid
Acid (hydrogenation) 6 552
Acid open hearth process 13 90
Acid phosphatase 8 197
Acid processes steel manufacture 13 94 102
Acid salt 12 16
Acid soil 12 426 427
control of pH 12 429
Acid treatment petroleum processing 10 70
Acid value fat and oil, non edible 5 184 189
wax 14 413 414
Acid yellow 3 4 302
Acid yellow 73 4 302
Acidic rocks 11 590
Acidity functions 1 42
Acidizing process oil and gas wells 9 299
Acidolysis 1 46* 14 18
Acidophil 2 265
Acidophilus milk 8 434
Acidosis 7 540
Acidulant (food) 5 376
Acineta 13 237
Acinous gland 5 43
Acipenser 11 514, 516
Acipenser brevirostrum 13 207
Acipenser fulvescens 1 46
Acipenser sturio 13 207
Acipenser sturio oxyrhynchus 13 207
Acipenser transmontanus 13 207
Acipenseridae 1 46
Acipenseriformes 1 46*, 57 58 9 442 13 208
Clupeiformes 3 222 223
Ackerman steering 1 46 47
Ackermann Rudolph 5 495
Acmaea 11 19
Acmaeidae 1 591, 7 519
Acme Color Separator (printing) 10 607
Acmite 1 667 11 129
Acne 1 47*, 12 569
Acne rosacea 1 47
Acnidosporidea 1 47*, 11 53, 13 11
Acoela 1 47-48* 10 414 14 144

Acoelomata 1 48*, 420
Aconine 10 440
cis-Aconitic acid Krebs cycle 7 370
Aconitine 10 440
Aconitum 1 247, 10 440
Acorn 9 231
Acorn barnacle 1 562, 3 563
Acorn oil 5 189
Acorn worm 1 414, 5 3
Acorus calamus 1 497, 13 123, 14 284
Acoustic absorption *see* Absorption (sound)
Acoustic compliance *see* Compliance, acoustic
Acoustic energy *see* Sound energy
Acoustic feedback *see* Feedback
Acoustic filter *see* Filter, acoustic
Acoustic free field *see* Free field, acoustic
Acoustic homing system (guided missile) 6 291
Acoustic impedance *see* Impedance, acoustic
Acoustic interferometer *see* Interferometer, acoustic
Acoustic listening buoy *see* Sonobuoy
Acoustic mass *see* Mass, acoustic
Acoustic meatus 4 318
Acoustic mine 1 48
Acoustic noise *see* Noise, acoustic
Acoustic ohm *see* Ohm, acoustic
Acoustic power 12 510
Acoustic resistance *see* Resistance, acoustic
Acoustic resonator *see* Resonator, acoustic
Acoustic torpedo 1 48
  antisubmarine warfare 1 485-486
  naval armament 1 542 543
Acoustic transducer *see* Transducer
Acoustic trauma 4 21
Acoustic velocity *see* Sound
Acoustic waves in bars 14 428-429
  in fluids 14 430-431
  in gases 14 426 428
  in liquids 14 428
  in solids 14 428 429
  see also Sound wave
Acoustic well logging 14 472
Acoustical absorption 9 121
Acoustical branches 7 415
Acoustical engineering architectural acoustics 1 517 520
  audio amplifiers 1 665
  disk recording 4 236 244
  dynamical analogies 4 315
  hearing aids 6 356 357
  loudspeakers 7 587 593
Acoustical engineering—*cont*
  magnetic recording 8 36-41
  mechanical vibration 8 190-193
  musical instruments 8 665-667
  noise control 9 120-129
  noise measurement 9 130-133
  optical recording 9 353 358
  public address systems 11 88 90
  shock isolation 12 291-294
  sonar 12 502-505
  telephony 13 445 447
  transducers 14 18
  vibration damping 14 316 318
  vibration isolation 14 318 320
  vibration machines 14 320 321
  vibration pickups 14 321
  see also Acoustics
Acoustical image *see* Image acoustical
Acoustical materials 1 17-19
Acoustical tile 1 18
Acoustics 1 48 49
  architectural 1 517 520
  atmospheric 1 631 632, 12 515 517
  electroacoustics 4 463
  engineering 1 48-49
  geometrical (ray) 1 518
  musical 8 661-664
  noise control 9 120 130
  physical (wave) 1 518
  psychoacoustics 11 72 74
  sonics 12 506
  sound 12 509 518
  ultrasonics 14 182-186
  underwater sound 1 49
  vibration 14 311 316
Acquired immunity 7 34
Acrania 1 49*, 420, 11 513
Acrasiales 1 49 50*, 7 375
Acrasieae *see* Acrasiales
Acrasin 1 50
Acrasina 8 677
Acratocnus 4 411
Acrididae 6 261, 7 334
Acridine 1 50 51*, 463, 3 236
Acridine dye 4 302
Acridine Orange NO 1 51
Acriflavine 1 51, 4 302
Acrilan 5 244
  dyeing 4 310
Acrilan 16 dyeing 4 310
Acris gryllus 5 538
Acrocephalosyndactyly 12 368
Acroceridae 4 212
Acrodus 7 327
Acrodynia 4 236
Acrolein 1 51*, 10 43
  herbicide 6 421
Acrolophus popeanellus 7 462
Acromegaly 6 596
Acropora 3 474, 12 76
Acropora hyacinthus 12 77
Acroporid corals 12 78
Acroricnus aequatus 6 581
Acrosalenidae 6 399
Acrosome 5 236, 12 602
Acrosternum hilare 6 405
Acrotelsa collaris 13 629
Acrothoracica 1 51-52*; 3 145, 562
Acrotreta gemma 9 38
Acrux (Alpha Crucis) 3 569
Acrylate 5 74
Acrylic acid 2 475
Acrylic ester 14 18
Acrylic fiber 4 310
Acrylic resins 9 493
Acrylonitrile 1 52
  cyanoethylation 3 634
  fumigant 5 561
  nitrile rubber 11 640
Acrylonitrile-butadiene rubber 10 46
Actaea alba 10 11
Actaeon 8 561, 13 406
Actaeonidae 9 345, 13 406
Actaletidae 3 290
ACTH *see* Adrenocorticotropic hormone
Actias luna 7 469
Actidione 5 563, 10 316
  see also Cycloheximide
Actin 2 492, 610, 8 611
  muscle (biophysics) 8 642
Actinastrum 1 235
Actinia 1 52 54, 3 255
Actiniaria 1 52-54* 3 255
  Anthozoa 1 455
  Edwardsia stage 1 54
  Halcampoides stage 1 54
  morphology 1 53 54
Actinide elements 1 54 55*, 8 222
  actinium 1 54 55
  americium 1 301 302
  berkelium 2 168
  californium 2 416
  curium 3 624 625
  einsteinium 4 417 418
  fermium 5 217
  magnetochemistry 8 53
  neptunium 9 41 42
  nobelium 9 115 116
  protactinium 11 30
  thorium 13 610 612
  see also Rare earth elements, Transuranium elements
Actinistia *see* Coelacanthiformes
Actinium 1 55
  electron configuration 4 504
  ionization potential 4 504
  radioactivity 11 278
Actinobacillus 2 352
Actinobacillus lignieresi 2 352
Actinobacillus mallei 2 352; 6 205
  glanders 6 205
Actinochitinosi 1 24 25
Actinolite 10 12
  asbestos 1 569
  peridotite *10 12*
Actinomonas 11 548
Actinomorphic flower 5 327
Actinomorphy 10 345
Actinomyces 1 466 467, 9 620
Actinomyces bovis 1 56
Actinomyces israeli 1 56
Actinomycetaceae 1 55 56
  taxonomy 2 11
Actinomycetales 1 56*, 2 10
  Mycobacteriaceae 8 677
  Schizomycetes 12 65 66
  Streptomycetaceae 13 173
  taxonomy 2 11
Actinomycete 1 464, 12 459, 13 178
  actinophage 1 57
  soil microorganisms 12 461
  viomycin 14 327
Actinomycin 1 468
Actinomycosis 1 56*, 466 467, 5 563, 10 428
  agricultural science 1 122
Actinomyxida 1 57*, 3 226, 11 52, 13 11
Actinon 11 278, 325
Actinophage 1 57
Actinophrys 6 390, 12 27
Actinoplanaceae 1 57
  taxonomy 2 11
Actinoplanes 1 57
Actinopoda *see* Actinopodea
Actinopodea 1 57*, 11 52, 315
  Heliozoida 6 390, 11 52
  Radiolarida 11 52 12 27
  Sarcodina 12 27-29
Actinopteri *see* Actinopterygii
Actinopterygii 1 57-58*, 9 442 443
  Acipenseriformes 9 442
  Amiiformes 1 304, 9 442
  Anguilliformes 1 406 9 442
  Batrachoidiformes 2 111, 9 442
  Beloniformes 2 161, *9 442*
  Berycriformes 2 170, 9 442
  carp 2 532
  Cluperiformes 3 222 223, 9 442
  croaker 3 550
  Cypriniformes 3 647 648, 9 442
  Cyprinodontiformes 3 648 649 9 442
  dace 4 1
  Echeneiformes 4 359, 9 442
  evolutionary changes in 9 443

pteryg—*cont*
lying fish 5 363
Gadiformes 6 2, 9 442
Gasterosteiformes 6 71, 9 442
Gobiesociformes 6 229 9 442
Lampridiformes 7 589, 9 442
Lophiiformes 7 585 9 442
Mastacembeliformes 8 168 9 442
Myctophiformes 8 679 9 442
Notacanthiformes 9 169, 9 442
Pegasiformes 9 442 610
Perciformes 9 442, 10 9 10
Percopsiformes 9 442
Pleuronectiformes 9 442 10 417-418
Polypteriformes 9 442, 10 489 490
rayfin 1 57 58
Saccopharyngiformes 9 442 12 2
Semionotiformes 9 442, 12 175
Synbranchiformes 9 442 13 567
Tetraodontiformes 9 442 13 550
Zeiformes 9 442 14 610
chinoptera 6 466
cinosphaerium 12 27
cinostele 13 105
ctinostroma 3 261
ctinostromariacea 12 604
ctinothrips 13 629
Actinotrocha larva 10 131
Actinouranium radioactivity 11 278
Actinula larva Coelenterata 5 255 261
Action (physics) dimensional analysis 4 535
Planck's constant 10 265
principle of least action 7 443 444
Action and reaction law of 9 91
Action force Newton's laws of motion 9 91
Action potentials biopotentials and electrophysiology 2 257
Action spectra ultraviolet radiation (biology) 14 188
Action variables 6 332
Actiplina *see* Radiolarida
Actissa princeps 11 52
Actithiazic acid 1 476
Actitis macularia 12 23
Activated alumina desiccant 4 77
Activated carbon 1 58 59
charcoal 3 10
gas mask 6 60
Activated carbon—*cont*
in sugar manufacturing 13 259
Activated 7 dehydrocholesterol 14 343
Activated fin 12 273
Activated sludge plants 12 226
Activation, neutron *see* Neutron activation
Activation analysis 1 59*; 11 306
neutron activation 11 293
Activation and affectivity (behavior) 8 605
Activation energy kinetics (chemical) 7 356 357
Activation overvoltage 9 457
Activation theory emotion 4 584
Activator luminescence 7 611
Active sonar *see* Sonar
Active transport metabolic disorders 8 259
Activity (thermodynamics) 1 59 61* 13 575
activity coefficients 1 60 61
equilibrium chemical 5 50
free energy 5 495
fugacity 5 559
hydrogen ion 6 551
standard states 1 60
theory 1 59 60
see also Solution
Activity coefficient (thermodynamics) 1 60 61
Actomyosin 8 631
Actuator hydraulic *see* Hydraulic actuator
Actuator servo *see* Servomotor
Aculea 7 466
Aculeata 6 574
Aculognathidae *see* Lathridiidae
Acutance photography 10 157
Acute childhood infections 4 54
Acute leukemia 3 192 202
Acute pharyngitis 10 100
Acyanogenesis gene action 6 106
Acyclic compounds 9 394 14 207
Acyclic hydrocarbon derivatives 9 393 397
Acyl adenylate 2 30
Acyl CoA dehydrogenase 7 532
Acyl exchange 1 46
Acyl group 1 61 5 75
Acyl halide 1 44
Acylation 1 61 62
acid anhydride 1 43 44
acid halide 1 44-45
Friedel Crafts reaction 5 525
N-Acylethanolamine 9 461
O Acylethanolamine 9 461
N-Acylglutamate 9 112
3 Acylindole 7 63
Acyloin condensations 5 575
Acylpyridinium salts 11 112
N Acylpyridinium salts 11 112
Adamello 5 119
Adams, J. C. 4 555 9 40 10 420
Adams, W. S. 4 417; 7 505
Adams-Williamson expression seismology 12 155
Adam's apple *see* Thyroid cartilage
Adams catalyst 10 412
Adamsite 9 401
Adapidae 10 589
Adapidium 13 641
sensation 12 177
Adaptation (biology) macroevolution 8 11
Adaptive radiation (evolution) 8 11
Adaptometer 14 336
Adcock direction finder 4 232, 9 29
Added color plates printing 10 607
Adder (analog) 1 360 370
mechanical differentials 1 369 389
Adder's tongue fern 9 542
Adding machines 2 400
Addis count 3 193
Addison, T. 6 482
Addison's disease 1 62* 4 256 6 482
clinical pathology 5 192 202
pigmentation 10 225
see also Adrenal disorders, Adrenal gland
Addition 1 62
algebraic 1 258
analog computer solution 1 368 370
digital computer 4 182
number system 9 220
1,4 Addition (Diels Alder reaction) 4 116
Addition compounds *see* Clathrate compounds
Addition formulas plane trigonometry 14 94 95
Addition polymerization 10 480 483
alkali metals and metallic alkyls 10 482
complex or ionic catalysis 10 482
free-radical catalysis 10 480
processes 10 480
see also Polymerization
Addition reaction 1 62 64*, 2 346
alkyne 1 255
Diels Alder reaction 4 116 117
halogenation 6 325-330
hydrogenation 6 552 553
Addition reaction—*cont*
organic chemical synthesis 9 391 392
polyolefin resins 10 487
steric effect 13 131
see also Addition polymerization, Diene
Addition rule probabilities infinite spaces 10 625
Additive coloration color centers 3 295
Additive colorimeters 3 301
Additive processes photography, color 10 167
Additives gasoline 6 70 71
Additives food *see* Food additives
Adduct rubbers 11 643 644
Adelaida 1 64*, 3 219
Adelie penguin 12 607
Adenine 2 195 4 66, 9 209, 10 330 332 11 115, 14 218
excretion 5 137 143
Adenocarcinoma 2 515 5 260, 9 320 321, 11 481
Adenohypophysis 10 247
see also Hormone, adenohypophyseal
Adenoid 13 669
Adenoma 9 320
bronchial 7 621
Adenophorea 9 50, 52
Adenosine nucleic acid 9 210
Adenosinediphosphate (ADP) 1 64* 2 39, 50, 459, 6 220 10 349, 352, 371
amino acid 1 311 318
biological oxidation 2 214
nucleic acid 9 214
photosynthesis 10 191
Adenosinemonophosphate (AMP) 1 65 7 531
nitrogen excretion 9 112
Adenosinephosphate 2 50 51
Adenosinetriphosphate (ATP) 1 64
amino acid 1 311-318
bacterial coenzyme 2 13 14
bacterial metabolism (fatty acid) 2 50
biological oxidation 2 214
bioluminescence 2 221
carbohydrate metabolism 2 438
glucose 6 phosphate 6 218
glutamine 6 220
Krebs cycle 7 370
metabolic disorders 8 259
mitochondria 8 520
muscle biochemistry 12 563
muscle biophysics 8 641
muscle contraction 8 611
nitrogen excretion 9 112
phosphorus 10 156
photosynthesis 10 191

Adenosinetriphosphate—*cont*
plant metabolism 10 349, 352
in plants 10 371
transferases 5 24
Adenosis 2 325
S Adenosylhomocysteine 8 541
S Adenosylmethionine 8 541
Adenovirus 1 65
fluorescent antibody method 8 383
Adenovirus type 4 10 428
Adenylic acid 1 65-66*, 2 30
adenosinetriphosphate (ATP) 1 64
nucleic acid 9 208
Adephaga 5 276
Adermin 14 342
ADF (automatic direction finder) 4 231-232
ADH *see* Antidiuretic hormone
Adhara 13 41
Adherence, immune *see* Immune adherence
Adhesion, molecular 1 66
and cohesion 3 268
Adhesion tension interface of phases 7 181
Adhesive 1 66 70
glue 6 219
mucilage 8 621 622
Adhesive, structural 1 66 70
Adiabatic change, atmosphere *see* Atmospheric adiabatic change
Adiabatic demagnetization 1 70, 3 572 574, 7 599
Adiabatic engine 5 4
Adiabatic invariants plasma physics 10 391 392
Adiabatic process 1 70
Adiantum 13 116
Adimeridae *see* Colydiidae
Adineta 2 114
Adinotherium ovunum 9 171
Adipamide 1 303
Adipate 5 74
Adipic acid 2 475, 10 460
Adipokinin fatty acid transport 7 534
Adiponitrile 1 70*, 10 46
Adipose dolorosi 9 212
Adipose tissue 1 70*, 12 564
brown fat 1 70
lipid metabolism 7 531
multilocular 1 70
unilocular 1 70
white fat 1 70
Adirondacks 9 142
Adjacency matrix 6 254
Adler, A 5 535, 11 74, 80
Admiral butterfly 2 381
Admiralty brass 5 470
Admiralty coefficient 12 280
Admiralty metal tin alloys 19 650
Admittance 1 71
conductance 3 382 383
parallel ac circuits 1 273
susceptance 13 330
Admixtures concrete 3 364
Admation (botany) 5 326-334
Adonis 1 597
Adova 5 333
Adrenal cortex hormone adenohypophyseal 6 480
Adrenal cortex steroid 1 71-73
androgen 1 398
corticoid biosynthesis 1 71
corticoid catabolism 1 73
sterol 13 130
Adrenal disorders 1 73-74
Adrenal gland 1 74 78, 488, 4 236, 588, 6 482
abnormalities 1 78
adrenalectomy 1 77
in Amphibia 1 74
anatomy 1 74 75
biochemistry 1 77
biosynthesis of cortical steroids 1 78
in birds 1 75
catechol amine 1 76
Chromaffin cell 1 74
embryology 1 74
epinephrine 1 76
in fishes 1 75
histology 1 75 76
in mammals 1 75
norepinephrine (arterenol) 1 76
phenylalanine 1 76
physiology 1 76 78
progesterone in biosynthesis 1 78
in Protothoria 1 75
in reptiles 1 75
suprarenal gland 9 78
tyrosine 1 76
zona fasciculata 1 75
zona glomerulosa 1 75
zona reticularis 1 76
Adrenal hyperplasia 13 526
Adrenal medulla (physiology) 1 76, 5 41
Adrenalectomy 1 77
Adrenalin 4 585, 11 71, 81
chromatophore 3 98 103
Adrenalin endocrine mechanisms 4 590
see also Epinephrine Hormone, adrenal medullary
Adrenergic heart beat 3 139
Adrenex 3 285
Adrenocortical *hormone see* Adrenal cortex steroid
Adrenocorticoid *see* Adrenal cortex steroid
Adrenocorticotrophin 13 618
endocrine mechanisms 4 590
pituitary gland 10 260
Adrenocorticotropic hormone (ACTH) 1 71, 9 629
adenohypophyseal hormone 6 479 480
adrenal gland 1 74 78
endocrine mechanisms 4 590
hypophysis 6 596 10 250
Adrenogenital syndrome 1 73 78
Adrenosterone 13 526
Adrian, Lord 8 203
Adriatic Sea 5 114, 8 207
delta-Adrosten-17 *beta ol 3-one* 6 235
Adsorbate 1 79
Adsorbent 1 79
activated carbon 1 58
chromatography 3 92
gas mask 6 59
Adsorption 1 78 82
activated carbon 1 58 59
applications 1 79
catalysis 2 549
cell-surface ionization 2 624
charcoal 3 10
desiccant 4 77
drying 4 282
gas chromatography 6 46 49
humidity control 6 516
isobars 1 80
isotherms 1 80 81
kinetics 1 81 82
molecular sieve 8 546 547
precipitation (chemistry) 10 572
protein isolation 11 36
surface phenomenon 13 314 315
thermodynamics 1 81
types 1 79 80
Adsorption chromatography 3 93 96
Adula 5 119
Adularescence 6 96
Adularia 5 210
Adventia 1 553
Adventitia 14 291
Adventitious bud 2 361
Adventitious roots 13 124
Adventurine 5 213
Aechmina 9 510
Aechminidae 9 510
Aechmophorus occidentalis 6 268
Aecidiospore 11 651
Aecidium 11 654
Aedes 6 515
Aedes aegypti 4 62 218 8 214 599 14 105
Aedes albopictus 4 62 218
Aedes polynesiensis 5 258
Aega psora 12 533
Aegean Sea 5 114, 8 207
Aegeriidae 7 464
Aegerinaugite 11 129
Aegialitidae *see* Salpingidae
Aegidae 5 291
Aegina 3 255
Aegina, Gulf of 5 114
Aegla 4 51
Aegotheliidae 2 448
Aegypiinae 3 178
Aeluroidea *see* Feloidea
Aeolosomatidae 9 313
Aeolothrips fasciatus 13 628
Aepophilidae 6 401
Aepyornis 1 82
Aepyornithidae 1 82
Aepyornithiformes elephant birds 1 82, 694
Aerating agent (food) 5 376
Aeration water treatment 14 409
Aerenchyma 13 115
Aerial *see* Antenna (aerial)
Aerial jeep 1 197
Aerial navigation *see* Air navigation
Aerial photograph 1 82 84*, 10 100
archaeological applications 1 84
engineering applications 1 83
in forest mapping 5 456
in forestry 1 83
geological applications 1 82
geographical uses 1 82
in meteorology 1 84
military intelligence 1 83
petroleum prospecting 11 25
photogrammetry 10 456
soil science and agriculture 1 83
Aerial surveys photographing 13 679
stereoplotting *instrument* 13 679
topographic surveying and mapping 13 678 679
Aerial tramways 2 364
Aerial transmission lines 14 52
Aerial warfare 1 554 557
Aerobacillus polymyxa 2 44
Aerobacter 1 84* 2 44, 5 1, 69 9 173
Enterobacteriaceae 5 1 2
IMViC test 7 48 49
Aerobacter aerogenes 1 466 467 2 378 624 5 67 424 8 431 13 528
Aerobacter cloacae 13 541
Aerobacter levanicum 7 486
Aerobic bacteria 13 1
Aerodynamic center 1 84
Aerodynamic downwash atmospheric pollution 1 644

Aerodynamic drag *see* Aerodynamic wave drag
Aerodynamic flight limits 1 89
Aerodynamic force 1 84 87
ballistic range 2 77
change in momentum 1 84-85
drag 1 86
flutter 5 355 356
helicopter 1 85
jet engine 1 85
lift production 1 85 86
propeller engine 1 85
STOL airplane 1 86
subsonic flight 13 226
turbopropeller engine 1 85
VTOL airplane 1 86
Aerodynamic heating 1 103
aerothermodynamics 1 103
heat convection 5 442 443
Aerodynamic lift airship 1 217
autogiro 1 674
Aerodynamic resistance airplane 1 209
Aerodynamic surface aerodynamic center 1 84
Aerodynamic test shock wave display 12 298 299
Aerodynamic wave drag 1 87 88* 534 13 308
aerodynamic efficiency 1 88
aerodynamic force 1 84 87
airship 1 218
causes 1 87
effect on lift drag ratio 1 88
form 5 344
reduction 1 87 88 13 175
Reynolds number 11 540
skin friction 5 544 12 372
stability and control 1 88
streamlining 13 175
subsonic flight 13 225
supersonic flight 13 308
transonic flight 14 61 64
Aerodynamics 1 88 89
ballistic range 2 76 78
branches 1 89
compressible flow 5 348 349
helicopter rotor 6 385
hydraulic analog table 6 526
kite 7 364
spacecraft structure 12 547
subsonic flight 13 224 229
supersonic flight 13 307 309
transonic flight 14 61 64
turbine blades 13 89
wind tunnel tests 14 497 501
Aeroelastic stability 1 192
Aeroelasticity 1 89 93
buffeting 1 91
control effectiveness 1 90
control reversal 1 90
divergence 1 90
dynamic stability 1 91
flutter 1 90, 5 355 356*
gust loads 1 92
noise 1 92 93
stall flutter 1 91
Strouhal number 1 91
vibration 1 92 93
Aerology 1 93
Aeromagnetic surveying 1 93 94
air borne magnetometers 1 93
compilation and interpretation 1 94
field equipment and methods 1 94
fluxgate magnetometers 1 93
mineral prospecting 11 21
nuclear magnetometers 1 93 94
values and limitations 1 94
Aeromechanics 1 94 95
See also Aerodynamics
Aeromonas 11 64
Aeronautical charts 2 535 9 17
polar navigation 10 442
Aeronautical engineering 1 95
airplane fuselage design 5 597 598
astronautical engineering 1 603
flight science 5 309 310
superaerodynamics 13 295
Aeronautical meteorology 1 95 97
icing 1 97
jet stream 1 96
lightning strikes 1 97
low visibility at terminals 1 95
tropopause 1 96
turbulence 1 96
upper winds and temperature 1 96
Aeronautics 1 97 98
telemetering 13 429
Aeronomy 1 98 99* 6 171
auroral patterns 1 99
electric current relationships 1 99
gas motions 1 99
ionospheric character 1 99
properties of upper atmosphere 1 98
radiation relationships 1 98
see also Astronomical geophysics
Aerosol 1 99 101* 9 585
atmosphere 1 101
atmospheric pollution 5 645
cloud physics 5 214
coagulation 1 100
diffusion 1 100
dust and mist collection 4 296
filtration 1 101
formation 1 100
marine organic materials 12 104
optical and electrical properties 1 101
screening smoke 12 81 82
sea salt 12 103
sea water droplets 12 103
stability 1 100
see also Size reduction
Aerosol bioclimatology 2 200
Aerospace vehicle flight regime 1 89
Aerosporin *see* Polymyxin
Aerostat 1 101 102
airship 1 217 220
balloon 2 86
Aerostatics 1 101 102
Archimedes principle 1 103
Boyle's law 1 101
buoyancy 2 572
Charles law 1 101
Dalton's law 1 101
Joule's law 1 101
Pascal's law 1 101
Aerothermochemistry 1 102
see also Gas dynamics
Aerothermodynamics 1 102 104
aerodynamic heating 1 103
compressible flow 5 348 349
external flow 1 103
internal flow 1 102 103
skin friction 12 372
spacecraft structure 12 547
see also Gas dynamics
Aesclepiadaceae 6 115
Aesculus 5 188
Aesculus glabra 2 559
Aesculus hippocastanum 2 559
Aesculus ortandra 2 559
Aeshnidae 9 275
Aestivation 5 327
Aether *see* Ether (physics)
Aethoprora metopoclampa 8 679
Aetobatis narinari 8 573
Aetosaurus 13 545
AF *see* Audio frequency series of entries
AFC (automatic frequency control) 1 675
Affectivity and activation (behavior) 8 605
Afferent impulse in decerebrate rigidity 10 527
Afibrinogenemia 5 195
Afocal lens 5 366
Afocal optical system 9 565
Africa 1 104 109
climate 1 104 106
coal fields (location) 8 444 449
coal resources (table) 8 454
drainage 1 108
folded areas 1 107 108
islands 1 108
oil and gas field (locations) 8 447
physical map 1 105
plateau features 1 106 107
resources of 4 545
rift valley system 1 107
vegetation 1 104 106
volcanic features 1 107
African mango 11 32
African longfish 4 210
African plateau 1 107
African sleeping sickness *see* Sleeping sickness African
African trypanosomiasis *see* Sleeping sickness African
After feather 5 195
After image vision 14 559
Afterbirth 5 241
Afterburner 1 109 110
turbojet 1 174 186 14 149
turboprop 14 151
Afterburning burning velocity measurement 2 575
effect of 14 158 159
Afterflame flameproofing 5 295
Afterglow flameproofing 5 295
shock wave display 12 299
see also Phosphorescence
Aftershocks, earthquake 4 355
Aftertreating agents dye 4 509
Aftonian (Interglacial) 6 195
AG *see* Alternating gradient
Agamemnon (asteroid) 14 114
Agamidae 13 23 24
Agamma globulinemia 1 110* 2 265
gamma globulin 6 33
in immunity 7 34
metabolic disorders 8 257
Aganasteridae 9 342
Agaonidae 6 574
Agaporus 11 69
Agar 1 110* 6 5, 297
Agar gel test antigen antibody reaction 1 473
Agarbacterium 1 59
Agarbacterium mesentericum 13 342
Agaricales 8 660
Agaricus bisporus 8 660
Agassiz, A 9 266
Agassiz, L 1 622
Agassiz Plain Lake 9 133
Agate 1 111*, 12 321
chalcedony 3 6
gem 6 99
type 14 171

Agate Bridge 10 43
Agathis 3 187, 401
Agave 3 190, 7 514, 10 352, 13 120
Agave cantala 12 348
Agave fourcroydes 12 79, 348
Agave sisalina 12 79, 348
Agave worm 7 464
AGC (automatic gain control) 1 675 676*, 13 471
Age, absolute *see* Absolute age
Age, neutron 11 366-367
Age hardening treatment nonferrous metals and alloys 6 379
Age inhibitor plastic compounding 10 476
Age theories, earth 4 330 331
Agelaius phoeniceus 2 254
Agelenopsis 1 498
Agenesis· hypoplasia 6 597
  nervous system disorders 9 69
Ageusia 12 385
Agfa Copyrapid 10 161
Agfacolor film 10 167
Agglutination reaction 1 111
  antigen-antibody reaction 1 473
  conglutination 3 599
  Lancefield differentiation scheme 7 590
Agglutination test 13 14
Agglutinin 1 112
  agglutination reaction 1 111
Aggregate, concrete 5 362
Aggression 1 112
  frustration 5 549
Agitation mixing 8 522-524
Aglantha 3 255, 14 10
Aglaophamus 10 463
Aglaspida 8 244; 14 563
Aglomerular kidney 5 140
Aglycon 6 224
Aglycon group 6 219
Agnatha 1 112 113*, 414, 420, 5 205, 14 308
  Cephalaspidomorphi 1 112-113, 2 645
  Coelolepida 3 262
  Cyclostomata 1 113, 5 644
  Myxinidae 1 113
  Osteostraci 9 446
  Paleozoic 1 112
  Petromyzontidae 1 113
  Pteraspidomorphi 1 113, 11 85
  Recent Agnatha 1 113
Agnosia 1 113*, 489, 595
Agonistites 4 87
Agonistic behavior 12 400
Agoraphobia 10 119
Agranulocytosis 13 244
  leukopenia 7 486
Agricultural chemistry 1 113-114
  chemurgy 3 53-55
  fertilizer 5 236 239
  fumigant 5 561
  important chemicals 1 114
  scope 1 113 114
  soil sterilization 12 465
  see also Cereal chemistry
Agricultural drainage 1 138-139
Agricultural engineering 1 114-116
  crop processing 1 115
  electric power 1 115
  farm structures 1 115
  machinery 1 114
  power 1 114
  soil conservation 1 116
  training 1 116
  water conservation 1 116
Agricultural machinery 1 116
  fertilizing 5 241
  selection 1 117
  terracing 13 500
  tractor 14 11-12
  use cost 1 117
  work capacity 1 117
  see also Agricultural soil and crop practices
Agricultural meteorology 1 118-119
Agricultural residues chemurgy 3 54-55
Agricultural science (animal) 1 119 122*, 12 249
  artificial insemination 1 120
  breeding, systems of 1 120
  breeding terminology 1 120
  cattle production, dairy 2 564-568
  chemurgy 3 53 55
  feedstuffs 1 120 121
  livestock breeding 1 119
  livestock feeding 1 120
  livestock fungus infections 1 122
  livestock judging 1 121
  livestock nutritional requirements 1 121
  livestock pest control 1 121
  mule production 8 625
  new breed formation 1 120
  swine production 13 542
  see also entries on specific animals
Agricultural science (plant) 1 122-126
  bean 2 115
  chemurgy 3 55 55
  fertilizers 1 122
  flax 5 299
  fungicides 1 125, 5 563
  growth regulator 1 125
  herbicides 1 124
  insecticides 1 123
Agricultural science (plant)—*cont*
  mechanization 1 122
  nematocides 1 123
  peanut 9 602-606
  photoperiodism 1 125
  plant nutrition 1 122
  plant translocation (organic solutes) 10 381
  soil sterilization 12 465
  sorghum 12 506 509
  soybean 12 533 537
  squash 13 29
  strawberry 13 172
  sugar beet 13 241
  sugar cane 13 243
  sunflower 13 292
  viruses 1 125
  see also entries on specific plants
Agricultural soil and crop practices 1 126-134
  broadcasters 1 128
  cattle production 2 562, 567
  corn 3 483
  cover crops 5 526-528
  drill 1 128
  drying and storage 1 131
  fertilizing 5 241
  harrowing 1 127
  harvesting 1 129
  plant disease control 10 315
  planting 1 128
  plowing 1 126
  processing crops 1 133
  terracing 13 500
  tillage 1 128
  see also entries on specific crops
Agriculture 1 134 138* 4 400
  agronomy 1 141
  alfalfa 1 232-235
  chemistry 1 115 114
  corn 3 481
  ecology 4 400
  grain crops 6 245
  legume forages 7 449
  meteorology 1 118 119
  oasis 9 238
  plant disease 10 304
  rural electrification 11 652 653
  rye 11 656
  in United States 1 134
  wheat 14 479
  world conditions 1 136
  terracing 13 500
Agriculture (drainage) 1 138-139
Agriculture (structures) 1 115 139 141
  grain storage and -processing 1 141
  housing types 1 140
Agrionidae 9 275
Agrobacterium 5 96, 11 345
  Rhizobiaceae 11 346
Agrobacterium gypsophilae 11 346
Agrobacterium pseudotsugae 11 346
Agrobacterium radiobacter 11 346
Agrobacterium rhizogenes 11 346
Agrobacterium rubi 11 346
Agrobacterium stellulatum 11 346
Agrobacterium tumefaciens 5 546, 6 252, 10 307, 11 345 346
Agromyzidae 4 212
Agronomy 1 141-142
Agropyron 3 190
Agropyron smithii 3 190
Agrostis alba 11 387
Aguardiente 4 255
Agulhas current 9 247
Agulhas stream 7 56
Ailanthus 2 579
Aileron 1 213
  stability and control 13 228
  wings 14 517
Ailuropoda melanoleuca 9 536
Ailurus 9 536
Ainslie volcanics 11 597
Air 1 142
  atmosphere 1 627 629
  composition 1 637 638
  heat convection 3 439 444
  moisture content 8 533
  refrigerant 11 415
  velocity of sound in 12 513, 14 431
  water vapor content 3 214
  see also Atmosphere
Air almanac 1 142
  celestial body identification 2 583
Air armament *see* Armament air
Air bladder 12 180
Air-blown asphalt 1 591
Air brake 1 142*, 2 518
Air car 1 197
Air carriers air transportation 1 160
Air circulation measurement 1 221
Air classifiers mechanical 3 156
Air-cleaning devices 1 152
Air compressor 1 142 143
  see also Compressor
Air conditioning 1 143 145
  comfort control 5 516 517
  comfort equation 1 144
  dehumidifier 4 46
  effective temperature 1 144
  heat pump 6 367 369
  humidifier 6 514

Air conditioning—cont
inside air temperature 1 144
marine machinery 8 123 124
relative humidity 1 144
temperature humidity index 13 401
thermostat 13 593
Air conditioning automotive 1 145 146
Air contaminants mines 8 492
Air cooling 1 146 147
absorption refrigeration 1 147
dry 1 146
evaporative 1 146
heat transfer 1 146
ice as heat sink 1 146
mechanical refrigeration 1 147
steam jet refrigeration 1 147
wet 1 146
Air cooling system engine 4 603 604
finned surface 4 605
heat transfer 4 605
Air cushion vehicle 1 197
Air cycle refrigeration 11 414
Air decontamination 4 38
Air depolarized alkaline cell 14 477-478
Air dielectric capacitor 2 446
Air disinfectants 1 475
Air embolism 4 565
Air entraining portland cement 3 398* 3 364
Air explosion nuclear 9 181 184
Air filter 1 147 148
dust and mist collection 4 296
electronic air cleaners 1 148
electrostatic precipitation 1 147
impingement 1 147
straining 1 147
viscous impingement air filters 1 148
warm air heating system 14 385
Air glow 1 148
Air heater 4 403 404
Air lift pump 4 246
Air liquefier 8 574 575
Air mass 1 148 151
development of concept 1 148
fronts 5 538* 8 327 329
jet systems 8 327 329
origin of 1 149
weather significance 1 149
Air navigation 1 151 9 10
air almanac 1 342
air traffic control 1 339
airport zone 9 21
Air navigation—cont
approach and landing zone 9 21
dead reckoning 4 18 21
instruments 9 17-18
long distance enroute zone 9 20
navigator's chart 9 17
polar regions 10 442 445
pressure altimeter 1 287 288
radio altimeter 1 288 289
short distance enroute zone 9 21
squall line 13 21
see also Guidance systems Navigation systems electronic
Air percussion drilling mineral 2 296
Air pocket 1 151
Air pollution see Air pollution control Atmospheric pollution
Air pollution control 1 151 155
air cleaning devices 1 152
air monitoring instrument 1 155
atmospheric dilution 1 153
dust and mist collection 4 296
electrostatic precipitator 4 538 539
incineration 1 154
incinerator design 1 155
smoke 12 587
see also Atmospheric pollution
Air position indicator 6 281
Air pressure 1 155 158
causal relationships 1 156
climatology 3 174 178
cyclone 5 640
designating 1 156
deviations and variations 1 157
diurnal variation 1 157 159
geographical characteristics 1 157
high atmospheric 1 640 642
hurricane 6 520
isobar (meteorology) 7 274
low atmospheric pressure 1 642 643
maps 7 274 290
millibar unit 8 440 441
in moving air 1 156
upper air patterns 8 553 555
Air propeller see Propeller air
Air revitalization equipment 8 124
Air rotary drilling 2 297
Air sea interface 12 103 105
aerosols 12 103 104
Air sea interface—cont
air bubbles 12 103 104
conduction 12 103
droplet ejection 12 103 104
evaporation 12 103
heat and water vapor 12 103
ocean meteorological relations 9 263 264
radiation 12 103
thermocline 13 562
Air separation process 1 659
Air sextant 2 585, 12 234 235
Air speed indicator 1 220
Air standard cycle 9 451
Air supply masks 6 60
Air suspension automotive 1 681 682
Air temperature 1 158 159
annual range 3 424
diurnal range 6 269
fluctuation in 5 170
greenhouse effect 6 269
isanomal 7 271
Libyan Desert 4 327
over continents 3 424
polar regions 10 440 441
upper air measurement 1 652
Vostok Antarctica 4 327
Air to air combat 1 554 557
Air to air missiles 1 556
Air to surface missile 1 557
Air traffic 1 160
Air traffic control 1 159 163 164* 14 12 13
airway beacons 13 4
surveillance radar 13 323
Air Traffic Control Transponder System 1 159 160
Air transportation 1 160 161* 14 65
airport 1 162
cargo lines 1 160
classes of service 1 160
helicopter 6 599
international lines 1 160
local lines 1 160
military aviation 1 160 162
regulation 1 162 163
safety 1 163
supplemental lines 1 160
territorial lines 1 160
traffic 1 160
trunk lines 1 160
urban lines 1 160
Air turbulence study 1 405
Air velocity measurement 1 220 221
anemometer 1 402
bridled pressure plate 1 221
heated thermocouple 1 221
kata thermometer 1 221
pitot static tube 1 221
venturi tube 1 221
Air waves see Meteorology (wave optic)
Air waves, upper synoptic 1 164*, 8 331 332
Airborne magnetic survey mineral prospecting 11 21 22
Airborne magnetometer 1 93 11 22
Airborne radar 1 164 166
Doppler drift 1 165
Doppler radar 4 265 268
drift measurement 1 165
electronic pilotage equipment 1 164
radome 11 525
squall line detection 13 21
weather detection 1 166
see also Radar
Airborne radioactivity surveys mineral prospecting 11 24
Aircraft 1 166
aerodynamic heating 1 105
aileron control 1 689
air propeller 11 10
air velocity measurement 1 221
airport engineering 1 214
altitude control 1 689
automatic flight control systems 5 309 309
autopilot 1 689
bank angle control 1 689
ceiling 5 304
classifications 1 166
cockpit controls 5 307
combat 1 554 557
conventiplane 3 445
degrees of freedom 5 303
diffuser 4 142
directional controls 5 307
dive 5 305
drone 4 274
dynamic characteristics 5 305
dynamic handling qualities 5 302
dynamic performance 5 302
elastic behavior 1 89 93
elevator 4 559 560
endurance 5 305
equations of motion 5 303
ferret (reconnaissance) 4 521
flight characteristics 5 302 306
flight controls 5 306 309
flight dynamics 5 309
flight performance 1 188
flutter 5 355 356
glide 5 305
ground speed radar measurement 1 164 165
growth factor 12 547
handling characteristics 5 306
heading control 1 689

Aircraft—*cont*
helicopter 6 383-389
instrumentation *see* Aircraft instrumentation
jet range and endurance 5 305
landing 5 306
landing gear 7 393 395
naval 1 541-542
noise 1 182-184
ornithopter 9 408-409
parachute 9 543-544
pitch control 4 559 560*, 5 307
pitch-rate control 1 689
pressure altimeter 1 287-288
radio altimeter 1 288-289
range 5 304
rate of climb 5 304
roll controls 5 307
roll-rate control 1 689
stability 13 31
static characteristics 5 304
static handling qualities 5 302
static performance 5 302
subsonic flight 13 224
supersonic flight 13 307-309
take-off 5 306
thrust defined 13 615
vertical take-off and landing 5 445
wind tunnel tests 14 497-501
wing 14 508 518
yaw control 1 689, 11 649
see also Airplane, Airship
Aircraft, military 1 161
Aircraft accidents 1 696
Aircraft armament *see* Armament, air
Aircraft braking thrust reversal 1 188
Aircraft cannon 1 534
Vulcan 1 534
Aircraft carburetion 2 479
Aircraft carrier 12 262 265
Aircraft compass system 1 166
dead reckoning 4 21
Aircraft drift measurement 1 165
Aircraft early warning 1 220
Aircraft engine 1 166 167
carburetor 2 477 480
criteria 10 591
helicopter 6 385-386
magneto ignition 8 52
mufflers 8 623 624
ramjet 11 335 336
reciprocating 1 167-170*, 7 196 209
supercharger 13 295
turbine 14 148 152
turbofan 14 149, 154-155*
turbojet 14 149, 155-157*
Aircraft engine—*cont*
turboprop 14 149 152, 157-158*
turboram jet 14 158-160
see also entries on specific engines
Aircraft engine, reciprocating 1 167-170*, 7 196-209
Aircraft engine performance 1 171-177
air speed 1 176-177
altitude capability 1 176-177
flight envelopes 1 176
ramjet 1 175-176
range 1 176 177
reciprocating engine 1 171-177
specific fuel consumption 1 177
turbojet 1 173
turboprop 1 174-175
Aircraft fire 1 188
Aircraft fuel 1 177 179
additive 1 178
freezing 1 178
impurities 1 188
jet fuels 1 178-179
piston engine fuels 1 177-178
propulsion 1 187
ramjet 11 336
specifications 1 179
temperature stability 1 179
volatility 1 178 179
Aircraft fuel system 5 558
boost pumps 5 558
Aircraft guns 1 534 536
sights 6 298 299
Aircraft instrument panel 1 179 181
flight and navigation instruments 1 179 180
integrated display 1 180
organization for decision 1 180 181
Aircraft instrumentation 1 181-182
air speed indicator 1 220
angle of attack indicator 14 597
automatic horizon 1 676
flight test 1 181
glide path indicator 6 212 213
navigation instruments 1 181 9 17-18*
power plant 1 181
radio compass 4 231 232
rate of climb indicator 11 346 347
sextant 12 234 235
stall warning indicator 13 36*, 14 597
terrain clearance indicator 13 502
Aircraft instrumentation—*cont*
turn and bank indicator 14 163-164
yaw indicator 14 597
see also Navigation systems, electronic, entries on specific instruments
Aircraft landing airport visibility 1 95
Aircraft landing equipment terrain-clearance indicator 13 502
Aircraft low approach systems 1 182
altimeters 1 287-289
autopilot 1 690
instrument landing system (*ILS*) 7 147-149
precision approach radar 10 577-578
Aircraft maneuvers *see* Flight characteristics
Aircraft noise 1 182-184
aeroelasticity 1 93
air-to ground propagation 12 517
boundary layer noise 1 184
exhaust noise 1 183
fuselage design 5 591
jet noise 1 183 184
noise control 9 122
propeller noise 1 182 183* 11 12
propulsion system noise 1 187
Aircraft propeller *see* Propeller air
Aircraft propulsion 1 184 188
electromagnetic 4 490 492
engine 1 166
engine installation 1 186
fire 1 188
fuels 1 187
gas turbine 6 67
nuclear 9 175 176
performance 1 185
Propulsion system noise 1 187
ramjet 11 335 336
requirements 1 184 185
speed requirement 1 185
systems 1 185
thrust reversal 1 188
turbine 14 148 152
see also entries under specific engines
Aircraft rudder *see* Rudder aircraft
Aircraft safety airport visibility 1 95
fire 1 189
jet stream (meteor) 7 510
lightning strikes 1 97
turbulence 1 96
Aircraft safety—*cont*
weather-avoidance radar 8 520
Aircraft stabilizer *see* Stability aircraft
Aircraft testing 1 185 197
aerodynamic shape 1 [illegible]
aeroelastic stability 1 [illegible]
aeroelasticity characteristics 1 189
air loads 1 191 192
airframe loading 1 191
canopy ejection 1 190
controllability 1 191
data processing 1 197
data recorders 1 194
data reduction 1 192
development testing 1 191
dynamic ground tests 1 189 191
engine tests 1 191
fatigue life studies 1 192
flight test instruments 1 *182*
flight testing 1 191 194
flow separation patterns 1 189
flutter 1 192
full scale testing 1 189
ground tests 1 191
instrumentation 1 192 197
lift and drag curves 1 189
maneuverability 1 192
model flight tests 1 189
model testing 1 189
performance 1 191 192
pilot seat ejection 1 189
rocket sled testing 1 189 191, 11 612 614*
shock patterns 1 189
stability 1 191
static loading tests 1 191
static stability 1 189
structural flexibility 1 189
structural flight tests 1 191
telemetering 13 426
transducer 1 193
vibration 1 191
wind tunnel 1 189 14 501
wing air load distribution 1 189
see also Environmental test
Airflow patterns schlieren photograph 12 67 68
shadowgraph 12 259
Airfoil 1 198 201
aerodynamic center 1 84
aerodynamic force 1 85
air propeller 11 10
aspect ratio 1 589
design dynamic similarity 4 512
effective aspect ratio 1 200
efficiency factor 1 200
elliptical planform 1 199 201

rfoil—*cont*
elliptical wing 1 198 199
fluid flow properties 5 344
lift-control devices 15 227
lift drag ratio 1 201
multiplanes 1 201
pitching moment coefficient 1 200
prediction of wing characteristics 1 199
subsonic flight 13 224
tail assembly 15 386
wing 1 198 199 14 508 518*
wing drag coefficient 1 200
irfoil profile 1 199, 201 206*
circular transform 1 204 205
classification 1 205 206
dimensional analysis 1 201 202
effects of viscosity 1 202
flow around a cylinder 1 202 203
flow regimes 1 202
flow with circulation 1 203 204
Joukowsky transformation 1 204
Kutta condition 1 204 205
NACA designations 1 205 206
perfect fluid flow 1 202
prediction of wing characteristics 1 199
section drag coefficient 1 202
section moment coefficient 1 202
thin airfoils 1 205
Airframe 1 206 208
fuselage 1 206 5 586 591*
materials 1 208
tail assembly 15 386
wing structures 1 206, 14 510 518*
Airlines 1 160
Airplane 1 208 214
aerodynamic resistance 1 200
ailerons 1 213
air brake 1 142
air speed indicator 1 220
airfoil 1 198 201
angle of attack 1 211
area rule 1 210
B 17 1 536
B 24 1 536
B 58 1 536
bomber 1 534 537
buffeting 1 91
combat 1 534 537
control reversal 1 90
controls 1 213
dynamic stability 1 91
elevators 1 213
engines 1 208 209
Airplane—*cont*
F9F 8 12 262
F 80 1 536
F 101 1 536
F 102 1 536
F-105 1 534-535
F 106 1 536
fighter 1 534 537
fighter bomber 1 534 537
flight science 5 309 310
flutter 1 90
flying boat 12 123
fuselage 5 586 591
gross weight 1 185
gust loads 1 92
induced drag 1 211
lift force 1 211
Lightning 1 534
Mustang 1 534
pressure drag 1 209 210
propulsion 1 208 209 11 16 18*
ramjet 1 208
range 1 212
reciprocating engine 1 208
rocket 1 208
rudder 1 213
seaplane 12 123
skin friction 1 209
spoiler 1 213
stability 1 212 213
STOL (short take-off and landing) 1 86
streamline 1 210
structures 1 213 214
tail assembly 15 386
tail stabilizer 1 213
thrust 1 208
Thunderbolt 1 534
turbojet 1 208
turboprop 1 208
unpowered 6 213
vertical tail 1 213
VTOL (vertical take off and landing) 1 86
*14 308 510**
wave drag 1 210
see also Aircraft
Airplane shock absorber 12 291
Airport 1 162 216*
air carrier service category 1 215
asphalt surfaces 1 591
beacon 11 4
buildings 1 162
continental 1 162 215
express 1 162
Federal Aviation Agency classification 1 162
feeder 1 162
hangars 1 162
intercontinental 1 162 215
intercontinental express 1 162
lighting 11 652
local 1 215
personal 1 162
Airport—*cont*
runway *see* Runway, airport
runway length code 1 162
secondary 1 162
standards 1 215
traffic control tower 1 165
trunk line 1 162, 215
visibility 1 95
see also Airport engineering
Airport engineering 1 214 216* 14 63
buildings 1 216
construction 1 216
design 1 216
facilities 1 162
parking apron 1 216
pavement 1 216
planning 1 214
runway construction 11 630
runway lengths 1 216
site locations 1 215
soil foundations 12 458
taxiways 1 216
terrain 1 215
see also Airport
Airport runway *see* Runway, airport
Airport surface detection equipment 1 216 217
high definition radar 1 216
pneumatic system 1 216
Airship 1 217 220
aerodynamics 1 218 219
blimp 2 259 261
buoyant force 1 101
consumption of fuel 1 218
dirigible 4 234
drag 1 218
gases 1 217
hangar 1 219
hull 1 217
lift 1 217 218
mooring 1 218
rigid 4 234
uses 1 219
wind tunnel tests 1 218
Airsickness 1 696 2 201
Airswept conical ball mill pulverizing 3 560
Airway beacons 11 4
Airy Sir George 7 504
Airy disk 4 136 9 363
Airy formula resolving power 11 499 500
Airy Heiskanen isostatic system 15 519 520
Airy's integral 2 180
AISI type (stainless steel) 13 34 35
Aistopoda 1 221*, 336 7 474
Aitken R. G. 2 146
Aitoff Hammer oval world projection 8 97
Aix sponsa 4 290
Aizoaceae 2 643
Ajaccyathus 1 504
Ajax flexible coupling 5 526
Akermanite 8 235
Akinetes 12 67
Akron ZRS 4 1 218
Akulov, N. A. 5 231
Alabama Black Belt 9 151
Alabamine 6 324
Alabaster 6 501
Alaid Volcano 1 525
Alanap 6 422
Alanap-5 6 422
Alanine 2 12 45, 195 7 164 14 17
alpha Alanine 1 589
beta Alanine 9 557
amino acids 1 309 319
in histone 9 217
plant metabolism 10 557
in protamines 9 217
Alanine racemase 5 24
beta Alanyl 1 methyl 1 histidine *see* Anserine
beta Alanyl 1 histidine *see* Carnosine
Alaria 10 89
Alarm systems 1 222
fire detector 5 278
Alaska 1 522, 9 158 159
Arctic Rockies 9 159 159
Arctic slope 9 352
fiord 5 277
Pacific mountain system 9 158 159
see also Arctic and subarctic Islands, Arctic Ocean, Bering Sea
Alaska cedar 2 568 579, 3 647
Alaska *Current* 9 219
Alaska Highway 9 159
Alaska Peninsula 1 523
Alaska Range 9 159
Alaskan brown bear 2 118
Alaterythere alata 10 429
Alauda arvensis 7 404
Alaudidae 7 404 9 589
Albarnie 14 136
Albamycin *see* Novobiocin
Albanian Alps 5 117
Albatross 1 222* 10 637
Albedo (astronomy) Jupiter 7 522
Mars 8 147
Saturn 12 38
Albedo (climatology) 3 374
insolation 7 143 145
ocean areas 8 116
polar regions 10 441
Albedo (nuclear physics) 1 223 11 567
Albedo (optics) 1 222 223
geometrical 1 223
physical (spherical) 1 223
Alberger process 12 17
Albers equivalent conic projection 8 97
Albert, Lake 1 107 109

Albertan epoch 2 425
Alberti, F von 14 81
Albertite 1 223
Albertoguadrya 1 601
Albian stage 3 543
Albinism 4 236
  human genetics 6 501
Albinobacter 5 1-2
Albite 1 223 224*, 5 211-213, *12 476*
  feldspar species 5 207
Albite law twin law, feldspar 5 207
Alboran Sea 8 207
Albrecht net radiometer 11 215
Albula group 5 117
Albumen plates 10 602
Albumin 1 224*, 2 263, 4 414, 5 376
  blood chemistry 3 197
  protein 11 39
Albumin process 10 615
Albuminoids protein 11 39
Albuminuria 9 40
  metabolic disorders 8 257
Alca torda 1 667
Alcaligenes 8 432
Alcaligenes viscolactis 1 38, 8 432-433
Alcedinidae 3 473, 7 361
Alces alces 8 597
Alces americana 8 597
Alchemy 3 46
Alchrome 7 265
Alcidae *3 10, 11 91*
Alciopidae 10 461
Alclad products 8 280
Alcohol 1 224-225*, 475
  acetylation 1 36 37
  antifreeze mixture 1 471
  bacterial aerobic oxidations 2 29 30
  butanol 2 379
  cetyl 2 662
  ester 5 71-77
  ethyl 5 89 91
  Fischer-Tropsch process 5 283
  glycerol 6 220 221
  glycol *6 225*
  Grignard reaction 6 270
  methane 8 339-340
  polyhydroxy alcohol 10 473
  printing-ink vehicles 7 113
  propanol 11 6
  see also Ethyl alcohol
Alcohol consumption 2 156
Alcohol dehydrogenase 5 22
  enzyme 5 20 22
Alcoholic beverage *see* Distilled spirits
Alcoholic fermentation bacterial carbohydrate 2 38-41
Alcoholysis 1 225*; 14 18
Alcoholysis reaction 14 19
Alcomax II 1 266
Alcomax III 1 266
Alcor 14 235
Alcres 7 265
Alcyonacea 1 225-226*, 3 255
  anthozoa 1 455
Alcyonaria 1 226-228, 3 255, 261
  Alcyonacea 1 225
  Anthozoa 1 455
  Coenothecalia 3 264
  Gorgonacea 6 238
  Pennatulacea 9 *621*
  Stolonifera 13 148
  Telestacea 13 452
Alcyonidium 3 611
Alcyonium 1 226, 3 255
Alcyonium palmatum 1 226
Aldebaran 1 228*, 13 41
Aldebaranium 14 606
Aldehyde 1 228 232
  acetaldehyde 1 29
  acrolein 1 51
  aldol condensation 1 228
  benzaldehyde 2 164
  benzoin condensation 1 230
  Cannizzaro reaction 1 228-229
  chemical properties 1 228
  formaldehyde 5 472-473
  furfural 5 566
  Gatterman Koch synthesis 1 231
  Grignard reaction 6 270
  nomenclature 9 396
  oxime 9 468
  Reformatsky reaction *1 230, 11 402*
  Riemer Tiemann synthesis 1 231
  Schiff base 12 62
  synthesis 1 230
  tests 1 230
Aldehydecollidine 11 110
Alden, J 13 266
Alder 5 178
Alder fly 6 594
Aldohexose 2 454
Aldol condensations 1 228 3 374
Aldolase 2 16, 5 23 10 370
  bacterial enzyme 2 16
Aldopentose 2 454
Aldose 2 451
Aldosterone 1 232* 6 485
  adrenal cortex steroid 1 72
  endocrine mechanisms 4 390
Aldoxime 9 468
Aldrich, L T 13 522
Aldrich regain indicator 8 534
Aldrin 7 140
Aldrovandi, U 1 422
Ale 8 80 87
Alectoris graeca 9 588
Alethopteris 9 504, 11 86
Aleukemic leukemia 7 481
Aleurtiospores 8 570
  Moniliaceae 8 568
Aleurites fordii 14 137
Aleutian Islands 1 523
Aleutian Low 1 522
Aleutian Range 1 523
Aleutian Trench 4 326
Alexander, F 12 501
Alexandrian series 12 327
Alexandrite 3 116, 6 98
Alexandrowicz, J S 6 357
Aleyrodidae 6 473
Alfalfa 1 232 235
  agricultural importance 1 232
  botanical characteristics 1 233
  dehydrating equipment 1 152
  diseases 1 234
  flower 1 233
  improvement of strains *1 233*
  plant 1 233
  pollination 1 233
  seed 1 233
Alfalfa butterfly 2 381, 7 472
Alfalfa dwarf virus 1 234
Alfalfa seed gum 8 92
Alfalfa weevils 14 461
Alfin catalyst 10 491
Alfvén, H 14 265
Alfvén waves 8 56 10 392-393
Algae 1 235-237*, 8 348, 12 459
  atoll 1 647
  Charophyta 3 11
  Chlorophyta 1 237, 3 80 83
  Chrysophyta 1 237
  classification 1 237
  compensation intensities 12 106
  Cyanophyta 1 237
  distribution 1 236
  economic importance 1 237
  Euglenophyta 1 237
  fossils *see* Algae fossils
  halophilic *see* Halophilic algae 2 340
  Phaeophyta 1 237
  Pyrrophyta 1 237
  reproduction 1 236
  Rhodophyta 1 237
  silica deposits on 12 417
  soil microorganisms 12 462
  Thallophyta 1 235
Algae fossils 1 237 238
  coralline algae 5 476
  geologic range 1 237
  Girvanella 6 190
  Halimeda 6 319
  important families 1 237
  Precambrian floras 9 503
  Solenopora 12 475
Algal biostromes 7 516
Algal structures sedimentary rocks 12 155
Algäu Alps 5 117
Algebra 1 238 241
  addition 1 62
Algebra—*cont*
  algebraic operations and expressions 1 238
  axiom 1 238 239
  conditional equations 1 239
  division 4 259
  equation 1 239 240
  equations, theory of 5 46
  exponent 1 239, 5 154 155
  factoring 1 240
  fraction 1 240
  group theory 6 285
  identity 1 239 240
  lattice (mathematics) 7 401
  multiplication 8 626
  notation 8 174
  number system *1 239*
  perturbation (mathematics) 10 39
  power 1 239
  proportion 1 241
  quadratic formula 1 241
  radical 1 239
  ratio 1 241
  root 1 239
  subtraction 13 231
  variation 1 241
  see also Analytic geometry
Algebraic number theory 9 225-226
Algebraic numbers 9 224
Algebraic operations and expressions 1 238
Algenib 9 610
Algesireceptor *12 180*
Algin 6 297, 10 89
Alginic acid 10 89, 11 64
Alginite 3 232
Alginomonas 11 64
Algol 10 30
  binary stars 2 190
  light 7 505
Algor mortis 4 23
  see also Death
Algorithm division 5 46
  euclidean 6 154
Alicella gigantea 6 35
Alicyclic compounds 14 207
Alicyclic hydrocarbon 1 241 244* 6 534
  molecular structure 1 243 245
  occurrence and nomenclature 1 241 242, 9 397
  properties 1 243
  stereochemistry 1 243 244
  uses 1 241
Alicyclic organochlorine compounds 3 75 76
Alidade 1 244
Alignment chart *see* Nomograph
Alima 13 151
Alima larva 5 566
Alioth 14 235

Aliphatic hydrocarbon 1 244-246*, 6 533 534
alkane 1 251
Aliphatic organochlorine compounds 3 73 75
Aliquot portion sampling techniques 12 21
Aliting 8 280
Alizarin 1 456 6 224
Alizarin yellow GG acid base indicator 7 60
Alizarine 4 305
Alizarine sapphire SE 4 304
Alkadiene 6 534
Alkadienyne 1 246, 6 534
Alkadiyne 6 534
Alkali 1 246
production 4 466
Alkali feldspars 5 209 212
Alkali halides color centers 5 294 297
Hall effect 6 521
ionic crystals 7 247
photoconductivity 10 140
photoemission 10 154
Alkali metal cations *in biogeochemical cycle* 2 244
Alkali metals 1 246
Brillouin zone theory 2 338
cesium 2 656 657
cohesion 3 269
francium 5 495
lithium 7 543 546
organometallic compound 9 402
potassium 10 530 532
rubidium 11 647 648
sodium 12 408-412
spectra 1 658 660
see also entries under specific metals
Alkali rhyolite 10 86, 11 560
Alkali soils 12 427
Alkali vapor magnetometers 1 94
Alkaline cell 14 477-478
Alkaline-earth metals 3 246-247
barium 2 94 96
beryllium 2 170 172
calcium 2 400
ionic crystals 7 247
magnesium 8 18 24
radium 11 522 524
strontium 13 194 195
see also entries under specific metals
Alkaline phosphatase 12 566
blood chemistry 3 197
Alkaline storage battery 13 157 159
freezing of electrolyte 13 159
Alkaloid 1 247 248* 10 434
atropine 1 664
caffeine 2 388 389
cocaine 5 249
Alkaloid—cont
hygrine 11 150
isolation, separation, and identification 1 248
lupine 7 622
morphine 8 598
nicotine 9 100
occurrence 1 247 248
opiates 9 345
plant metabolism 10 559
quinine 11 190
strychnine 13 207
theobromine 13 546
uses 1 248
wood chemicals 14 527
see also entries under specific alkaloids
Alkane 1 248 251* 2 377, 6 533
alkylation 1 251
cetane 2 661
dehydrogenation 1 250 251
ethane 5 84 85
Fischer Tropsch process 5 283
halogenation 1 250
isomerization 1 251
Kolbe hydrocarbon synthesis 7 560
methane 8 539
nitration 1 250
nomenclature 1 248 249, 9 395
occurrence 1 249
octane 9 273
oxidation 1 250
propane 11 6
properties 1 249 251
sulfonation 1 250
synthesis 1 249
Alkanesulfonic acids 1 250
Alkanolamine 1 251
Alkaptonuria 1 460 6 507 508 8 258
fumaryl acetoacetic acid 8 258
gene action 6 106
homogentisase 8 258
homogentisic acid 8 258
ochronosis 8 258
Alkaptonuric ochronosis 10 226
Alkatetraene 6 534
Alkatriene 6 534
Alkene 1 252* 6 533
addition reaction 1 62 64
cyclododecatriene 5 639 640
cyclooctatetraene 5 640
epoxidation 5 43 44
ethylene 5 95
Fischer-Tropsch process 5 283
nomenclature 9 395
polyalkene 10 460 461
polyolefin resins 10 487
propylene 11 18
see also Olefin
Alkenediyne 1 246
Alkenylbenzene 6 534
Alkenyne 1 246 6 534
Alkoxy group ester 5 75
Alkyd polyester resins 10 466
Alkyl halide alkane 1 249
Grignard reaction 6 260
halogenated hydrocarbon 6 525 526
N Alkyl pyrrolidone 7 376
Alkyl radical 1 252 253
hexaphenylethane 6 455
nomenclature 9 395
Alkylaluminum compounds 9 405
Alkylamidinothiourea 1 490
Alkylarsenoxide 9 401
Alkylarsine 9 401
Alkylarsonic acid 9 401
Alkylarsonous acid 9 401
Alkylaryl sulfonate 14 207
Alkylate aviation gasoline 6 69
Alkylation 1 253 254*, 2 377, 5 87
alkane 1 251
cracking 5 552 555
ethyl malonate 5 92 93
Friedel Crafts reaction 5 556
petroleum processing 10 60
organometallic compounds 9 376
see also Reforming (petroleum refining)
Alkylbenzene 6 529 534
Alkylberyllium compounds 9 405
Alkylboron compounds 9 405
Alkylcadmium compounds 9 403
1 Alkylimidazole 7 32
3 Alkylindole 7 63
Alkyllithium compounds 9 402
Alkylmagnesium compound 9 403
Alkylmercury compound 9 403
Alkylphosphine 9 404
Alkylphosphonic acid 9 404
Alkylphosphonous acid 9 404
Alkylphosphonous dichloride 9 404
Alkylsodium compounds 9 402
Alkylzinc compounds 9 405
Alkyne 1 255*, 6 533
acetylene 1 57
addition reaction 1 62 64
nomenclature 9 395
Alkynylbenzene 6 534
All-crop drill 1 128
All trans retinene photoreception 10 182
Allantoic 1 255 256* 11 269
Allantoic acid 2 36
Allantoic bladder 14 220
Allantoic vein 2 500
Allantoin 2 36, 7 33, 14 218
mytasis 8 680
Allantois 1 256*, 3 138 241 14 225
Amniota 1 329
extraembryonic membrane 1 256
fetal membrane 1 256
germ layer 1 256
placenta 1 256
placentation 10 253
Reptilia 11 482
urinary system 14 223 225
Allantonematidae 14 169
Allard, H. A. 10 175
Alleculidae 3 276
Allee W. 14 624
Alleghenian zone 8 245
Allegheny Escarpment 9 149
Allegheny mound ant 8 582
Allegheny Mountains 9 149
Allegheny Plateau 9 149
Allegheny River 13 520
Allele 1 258 257
genotype 1 256
multiple 1 256
symbolism 1 256
Allen, C. W. 13 287
Allen E. 2 216
Allen, F. W. 10 575
Allen Moore cell chlorine manufacture 5 70
Allene 1 245, 4 117; 10 460
optical activity 9 349
Allenrolfea 3 191
Aller, L. H. 4 547
Allergen 1 472 366, 601
anaphylaxis 1 395
hypersensitivity 8 589
Allergic rhinitis *see* Hay fever
Allergy 1 474 2 347
atopic 1 257*, 6 589
see also Hypersensitivity
Allethrin insecticide 7 342
Alliesi, Lorenzo 14 596
Alligator 1 257*, 5 552
Crocodilia 5 551 553
vertebra 14 507
Alligator gar 6 59
Alligator mississippiensis 1 257, 5 552, 6 457 7 558, 11 527
Alligator sinensis 1 257
Allium 5 553
Allium ascalonicum 9 326
Allium cepa 9 326
var aggregatum 9 326
var viviparum 9 326
Allium fistulosum 9 326
Allium porrum 9 326
Allium sativum 6 59, 9 326
Allium schoenoprasum 9 326
Allobathynella 13 567
Allochemical metamorphism 8 302
Allochronic species 12 572
Allocinnamic acid (cis) 2 475
Allodermanyssus sanguineus 8 253 11 567

Albertan epoch 2 425
Alberti, F von 14 81
Albertite 1 223
Albertoguadrya 1 601
Albian stage 3 543
Albinism 4 236
  human genetics 6 501
Albinobacter 5 1-2
Albite 1 223-224*; 5 211-213, 12 476
  feldspar species 5 207
Albite law twin law, feldspar 5 207
Alboran Sea 8 207
Albrecht net radiometer 11 215
Albula group 5 117
Albumen plates 10 602
Albumin 1 224*, 2 263, 4 414, 5 376
  blood chemistry 3 197
  protein 11 39
Albumin process 10 615
Albuminoids protein 11 39
Albuminuria 9 40
  metabolic disorders 8 257
Alca torda 1 667
Alcaligenes 8 432
Alcaligenes viscolactis 1 38, 8 432-433
Alcedinidae 3 473, 7 361
Alces alces 8 597
Alces americana 8 597
Alchemy 3 46
Alchrome 7 265
Alcidae 3 10, 11 91
Alciopidae 10 461
Alclad products 8 280
Alcohol 1 224-225*, 475
  acetylation 1 36-37
  antifreeze mixture 1 471
  bacterial aerobic oxidations 2 29 30
  butanol 2 379
  cetyl 2 662
  ester 5 71 77
  ethyl 5 89-91
  Fischer-Tropsch process 5 283
  glycerol 6 220-221
  glycol 6 223
  Grignard reaction 6 270
  methane 8 339 340
  polyhydroxy alcohol 10 473
  printing ink vehicles 7 113
  propanol 11 6
  see also Ethyl alcohol
Alcohol consumption 2 156
Alcohol dehydrogenase 5 22
  enzyme 5 20 22
Alcoholic beverage *see* Distilled spirits
Alcoholic fermentation bacterial carbohydrate 2 58-61
Alcoholysis 1 225*, 14 18
Alcoholysis reaction 14 19
Alcomax II 1 266
Alcomax III 1 266
Alcor 14 235
Alcres 7 265
Alcyonacea 1 225 226*, 3 255
  anthozoa 1 455
Alcyonaria 1 226 228, 3 255, 261
  Alcyonacea 1 225
  Anthozoa 1 455
  Coenothecalia 3 264
  Gorgonacea 6 238
  Pennatulacea 9 621
  Stolonifera 13 148
  Telestacea 13 452
Alcyonidium 3 611
Alcyonium 1 226, 3 255
Alcyonium palmatum 1 226
Aldebaran 1 228*, 13 41
Aldebaranium 14 606
Aldehyde 1 228-232
  acetaldehyde 1 29
  acrolein 1 51
  aldol condensation 1 228
  benzaldehyde 2 164
  benzoin condensation 1 230
  Cannizzaro reaction 1 228 229
  chemical properties 1 228
  formaldehyde 5 472-473
  furfural 5 566
  Gatterman-Koch synthesis 1 231
  Grignard reaction 6 270
  nomenclature 9 396
  oxime 9 468
  Reformatsky reaction 1 230, 11 402
  Riemer Tiemann synthesis 1 231
  Schiff base 12 62
  synthesis 1 230
  tests 1 230
Aldehydecollidine 11 110
Alden, J 13 266
Alder 5 178
Alder fly 6 394
Aldohexose 2 454
Aldol condensations 1 228, 5 374
Aldolase 2 16, 5 23, 10 370
  bacterial enzyme 2 16
Aldopentose 2 454
Aldose 2 451
Aldosterone 1 232* 6 485
  adrenal cortex steroid 1 72
  endocrine mechanisms 4 590
Aldoxime 9 469
Aldrich, L T 13 522
Aldrich regain indicator 8 534
Aldrin 7 140
Aldrovandi, U 1 492
Ale 8 80 87
Alectoris graeca 9 588
Alethopteris 9 503, 11 86
Aleukemic leukemia 7 491
Aleuriospores 8 570
  Moniliaceae 8 568
Aleurites fordii 14 157
Aleutian Islands 1 523
Aleutian Low 1 522
Aleutian Range 1 523
Aleutian Trench 4 326
Alexander, F. 12 501
Alexandrian series 12 327
Alexandrite 3 116, 6 98
Alexandrowicz, J S 6 357
Aleyrodidae 6 473
Alfalfa 1 232-235
  agricultural importance 1 232
  botanical characteristics 1 233
  dehydrating equipment 1 132
  diseases 1 234
  flower 1 233
  improvement of strains 1 233
  plant 1 233
  pollination 1 233
  seed 1 233
Alfalfa butterfly 2 381; 7 472
Alfalfa dwarf virus 1 234
Alfalfa seed gum 8 92
Alfalfa weevils 14 461
Alfin catalyst 10 491
Alfvén, H 14 265
Alfvén waves 8 56 10 392-393
Algae 1 235 237*, 8 548, 12 459
  atoll 1 617
  Charophyta 3 11
  Chlorophyta 1 237, 3 80 85
  Chrysophyta 1 237
  classification 1 237
  compensation intensities 12 106
  Cyanophyta 1 237
  distribution 1 236
  economic importance 1 237
  Euglenophyta 1 237
  fossils *see* Algae fossils
  halophilic *see* Halophilic algae 2 340
  Phaeophyta 1 237
  Pyrrophyta 1 237
  reproduction 1 236
  Rhodophyta 1 237
  silica deposits on 12 317
  soil microorganisms 12 462
  Thallophyta 1 235
Algae fossils 1 237 238
  coralline algae 3 476
  geologic range 1 237
  Girvanella 6 190
  Halimeda 6 319
  important families 1 237
  Precambrian floras 9 503
  Solenopora 12 473
Algal biostromes 7 516
Algal structures sedimentary rocks 12 135
Algäu Alps 5 117
Algebra 1 238 241
  addition 1 62
Algebra—*cont*
  algebraic operations as expressions 1 238
  axiom 1 238 239
  conditional equation 1 24
  division 4 239
  equation 1 239 240
  equations, theory of 5 6
  exponent 1 239 5 151
  factoring 1 240
  fraction 1 240
  group theory 6 283
  identity 1 239 240
  lattice (mathematics) 7
  multiplication 8 626
  notation 8 174
  number system 1 239
  perturbation (mathematics) 10 39
  power 1 239
  proportion 1 241
  quadratic formula 1 241
  radical 1 239
  ratio 1 241
  root 1 239
  subtraction 13 231
  variation 1 241
  see also Analytic geometry
Algebraic number theory 9 225 226
Algebraic numbers 9 224
Algebraic operations and expressions 1 238
Algenib 9 610
Algesireceptor 12 180
Algin 6 297, 10 89
Alginic acid 10 89, 11 64
Alginite 5 252
Alginomonas 11 64
Algol 10 30
  binary stars 2 190
  light 7 503
Algor mortis 4 23
  see also Death
Algorithm division 5 46
  euclidean 6 154
Alicella gigantea 6 35
Alicyclic compounds 14 207
Alicyclic hydrocarbon 1 244*, 6 534
  molecular structure 1 243
  occurrence and nomenclature 1 241 242, 9 397
  properties 1 243
  stereochemistry 1 245 246
  uses 1 241
Alicyclic organochlorine compounds 5 75 76
Alidade 1 244
Alignment chart *see* Nomograph
Alima 13 151
Alima larva 5 566
Alioth 14 235

Aliphatic hydrocarbon 1 244-246*, 6 533 534
alkane 1 251
Aliphatic organochlorine compounds 5 75 75
Aliquot portion sampling techniques 12 21
Aliting 8 280
Alizarin 1 456 6 224
Alizarin yellow GG acid base indicator 7 60
Alizarine 4 503
Alizarine sapphire SE 4 504
Alkadiene 6 534
Alkadienyne 1 246 6 534
Alkadiyne 6 534
Alkali 1 246
production 4 466
Alkali feldspars 5 209 212
Alkali halides color centers 3 294 297
Hall effect 6 521
ionic crystals 7 247
photoconductivity 10 140
photoemission 10 154
Alkali metal cations in biogeochemical cycle 2 244
Alkali metals 1 246
Brillouin zone theory 2 318
cesium 2 656 657
cohesion 5 269
francium 5 493
lithium 7 543 548
organometallic compound 9 402
potassium 10 530 532
rubidium 11 647 649
sodium 12 408 412
spectra 1 658 660
see also entries under specific metals
Alkali rhyolite 10 86 11 560
Alkali soils 12 427
Alkali vapor magnetometers 1 94
Alkaline cell 14 477 478
Alkaline-earth metals 1 246 247
barium 2 94 96
beryllium 2 170 178
calcium 2 400
ionic crystals 7 247
magnesium 8 18 24
radium 11 522 523
strontium 13 194 195
see also entries under specific metals
Alkaline phosphatase 12 366
blood chemistry 3 197
Alkaline storage battery 13 157 159
freezing of electrolyte 13 159
Alkaloid 1 247 248* 10 434
atropine 1 664
caffeine 2 588 589
cocaine 3 249
Alkaloid—cont
hygrine 11 130
isolation separation, and identification 1 248
lupine 7 622
morphine 8 598
nicotine 9 100
occurrence 1 247 248
opiates 9 345
plant metabolism 10 559
quinine 11 190
strychnine 13 207
theobromine 13 546
uses 1 248
wood chemicals 14 527
see also entries under specific alkaloids
Alkane 1 248 251*, 2 577, 6 533
alkylation 1 251
cetane 2 661
dehydrogenation 1 250 251
ethane 5 84 85
Fischer Tropsch process 5 285
halogenation 1 250
isomerization 1 251
Kolbe hydrocarbon synthesis 7 369
methane 8 539
nitration 1 250
nomenclature 1 248 249 9 395
occurrence 1 249
octane 9 275
oxidation 1 250
propane 11 6
properties 1 249 251
sulfonation 1 250
synthesis 1 249
Alkanesulfonic acids 1 250
Alkanolamine 1 251
Alkaptonuria 1 460 6 507-509 8 258
fumaryl acetoacetic acid 8 258
gene action 6 106
homogentisase 8 259
homogentisic acid 8 258
ochronosis 8 258
Alkaptonuric ochronosis 10 226
Alkatetraene 6 534
Alkatriene 6 534
Alkene 1 252* 6 535
addition reaction 1 62 64
cyclododecatriene 5 639 640
cyclooctatetraene 5 640
epoxidation 5 43 44
ethylene 5 93
Fischer Tropsch process 5 285
nomenclature 9 395
polyalkene 10 460 461
polyolefin resins 10 487
propylene 11 18
see also Olefin
Alkenediyne 1 246
Alkenylbenzene 6 534
Alkenyne 1 246, 6 534
Alkoxy group esters 5 75
Alkyd polyester resins 10 466
Alkyl halide alkane 1 249
Grignard reaction 6 269
halogenated hydrocarbon 6 525 526
N-Alkyl pyrrolidone 7 376
Alkyl radical 1 252 253
hexaphenylethane 6 435
nomenclature 9 395
Alkylaluminum compounds 9 405
Alkylamidinoisourea 1 490
Alkylarsenoxide 9 401
Alkylarsine 9 401
Alkylarsonic acid 9 401
Alkylarsonous acid 9 401
Alkylaryl sulfonate 14 203
Alkylate aviation gasoline 6 69
Alkylation 1 253 254*, 2 577 5 87
alkane 1 251
cracking 5 532 535
ethyl malonate 5 92 93
Friedel Crafts reaction 5 536
petroleum processing 10 69
organometallic compounds 5 576
see also Reforming (petroleum refining)
Alkylbenzene 6 529 534
Alkylberyllium compounds 9 405
Alkylboron compounds 9 405
Alkylcadmium compounds 9 405
1 Alkylimidazole 7 52
3 Alkylindole 7 63
Alkylithium compounds 9 402
Alkylmagnesium compound 9 402
Alkylmercury compound 9 405
Alkylphosphine 9 404
Alkylphosphonic acid 9 404
Alkylphosphonous acid 9 404
Alkylphosphonous dichloride 9 404
Alkylsodium compounds 9 402
Alkylzinc compounds 9 405
Alkyne 1 255* 6 535
acetylene 1 57
addition reaction 1 62 64
nomenclature 9 395
Alkynylbenzene 6 534
All crop drill 3 229
All trans retinene photoreception 10 182
Allanite 1 255 256* 11 269
Allantoic acid 2 36
Allantoic bladder 14 220
Allantoic vein 2 500
Allantoin 2 36, 7 53, 14 218
myiasis 8 680
Allantois 1 256*, 5 158, 241 14 225
Amniota 1 529
extraembryonic membrane 1 256
fetal membrane 1 256
germ layer 1 256
placenta 1 256
placentation 10 233
Reptilia 11 482
urinary system 14 225 227
Allantonematidae 14 169
Allard, H. A. 10 175
Alleculidae 3 276
Allee, W. 14 621
Allegheman zone 8 245
Allegheny Escarpment 9 149
Allegheny mound ant 8 582
Allegheny Mountains 9 149
Allegheny Plateau 9 149
Allegheny River 13 520
Allele 1 256 257
genotype 1 256
multiple 1 256
symbolism 1 256
Allen, C. W. 13 287
Allen, S. 2 216
Allen, F. W. 10 575
Allen Moore cell, chlorine manufacture 5 70
Allene 1 255 4 112, 10 460
optical activity 9 349
Allenrolfea 5 193
Aller, L. H. 4 547
Allergen 1 472 566, 601
anaphylaxis 1 595
hypersensitivity 6 589
Allergic rhinitis see Hay fever
Allergy 1 474, 2 547
atopic 1 257*, 6 589
see also Hypersensitivity
Allethrin insecticide 7 142
Allievi, Lorenzo 14 396
Alligator 1 257*, 5 552
Crocodilia 5 551 553
vertebra 14 307
Alligator gar 6 59
Alligator mississippiensis 1 257, 5 552 6 437 7 558, 11 527
Alligator sinensis 1 257
Allium 5 553
Allium ascalonicum 9 326
Allium cepa 9 326
var aggregatum 9 326
var viviparum 9 326
Allium fistulosum 9 326
Allium porrum 9 326
Allium sativum 6 59 9 326
Allium schoenoprasum 9 326
Allobathynella 13 567
Allochemical metamorphism 8 302
Allochronic species 12 572
Allocinnamic acid (cis) 2 475
Allodermanyssus sanguineus 8 253 11 567

Albertan epoch 2 425
Alberti, F von 14 81
Albertite 1 223
Albertoguadrya 1 601
Albian stage 3 543
Albinism 4 236
  human genetics 6 501
Albinobacter 5 1-2
Albite 1 225-224*, 5 211 213, 12 476
  feldspar species 5 207
Albite law twin law, feldspar 5 207
Alboran Sea 8 207
Albrecht net radiometer 11 215
Albula group 5 117
Albumen plates 10 602
Albumin 1 224*, 2 263, 4 414, 5 376
  blood chemistry 3 197
  protein 11 39
Albumin process 10 615
Albuminoids protein 11 39
Albuminuria 9 40
  metabolic disorders 8 257
Alca torda 1 667
Alcaligenes 8 432
Alcaligenes viscolactis 1 38, 8 432 433
Alcedinidae 3 473, 7 561
Alces alces 8 597
Alces americana 8 597
Alchemy 3 46
Alchrome 7 265
Alcidae 3 10, 11 91
Alciopidae 10 461
Alclad products 8 280
Alcohol 1 224 225*, 475
  acetylation 1 36-37
  antifreeze mixture 1 471
  bacterial aerobic oxidations 2 29 30
  butanol 2 379
  cetyl 2 662
  ester 5 71-77
  ethyl 5 89 91
  Fischer Tropsch process 5 285
  glycerol 6 220 221
  glycol 6 223
  Grignard reaction 6 270
  methane 8 339 340
  polyhydroxy alcohol 10 473
  printing-ink vehicles 7 113
  propanol 11 6
  see also Ethyl alcohol
Alcohol consumption 2 156
Alcohol dehydrogenase 5 22
  enzyme 5 20 22
Alcoholic beverage *see* Distilled spirits
Alcoholic fermentation bacterial carbohydrate 2 38 41
Alcoholysis 1 225*, 14 18
Alcoholysis reaction 14 19
Alcomax II 1 266
Alcomax III 1 266
Alcor 14 235
Alcres 7 265
Alcyonacea 1 225-226*, 3 255
  anthozoa 1 455
Alcyonaria 1 226-228, 3 255, 261
  Alcyonacea 1 225
  Anthozoa 1 455
  Coenothecalia 3 264
  Gorgonacea 6 238
  Pennatulacea 9 621
  Stolonifera 13 148
  Telestacea 13 452
Alcyonidium 3 611
Alcyonium 1 226, 3 255
Alcyonium palmatum 1 226
Aldebaran 1 228*, 13 41
Aldebaranium 14 606
Aldehyde 1 228-232
  acetaldehyde 1 29
  acrolein 1 51
  aldol condensation 1 228
  benzaldehyde 2 164
  benzoin condensation 1 230
  Cannizzaro reaction 1 228 229
  chemical properties 1 228
  formaldehyde 5 472-473
  furfural 5 566
  Gatterman-koch synthesis 1 231
  Grignard reaction 6 270
  nomenclature 9 396
  oxime 9 468
  Reformatsky reaction 1 230, 11 402
  Riemer-Tiemann synthesis 1 231
  Schiff base 12 62
  synthesis 1 230
  tests 1 230
Aldehydecollidine 11 110
Alden, J 13 266
Alder 5 178
Alder fly 6 394
Aldohexose 2 454
Aldol condensations 1 228, 3 374
Aldolase 2 16, 5 23, 10 370
  bacterial enzyme 2 16
Aldopentose 2 454
Aldose 2 451
Aldosterone 1 232* 6 483
  adrenal cortex steroid 1 72
  endocrine mechanisms 4 590
Aldoxime 9 468
Aldrich, L T 13 522
Aldrich regain indicator 8 534
Aldrin 7 140
Aldrovandi, U 1 492
Ale 8 80 87
Alectoris graeca 9 588
Alethopteris 9 504, 11 86
Aleukemic leukemia 7 481
Aleuriospores 8 570
  Moniliaceae 8 568
Aleurites fordii 14 137
Aleutian Islands 1 523
Aleutian Low 1 522
Aleutian Range 1 523
Aleutian Trench 4 326
Alexander, F 12 501
Alexandrian series 12 327
Alexandrite 3 116, 6 98
Alexandrowicz, J S 6 357
Aleyrodidae 6 473
Alfalfa 1 232-235
  agricultural importance 1 232
  botanical characteristics 1 233
  dehydrating equipment 1 132
  diseases 1 234
  flower 1 233
  improvement of strains 1 233
  plant 1 233
  pollination 1 233
  seed 1 235
Alfalfa butterfly 2 381, 7 472
Alfalfa dwarf virus 1 234
Alfalfa seed gum 8 92
Alfalfa weevils 14 461
Alfin catalyst 10 491
Alfvén, H 14 265
Alfvén waves 8 56, 10 392-393
Algae 1 235 237*, 8 348, 12 459
  atoll 1 617
  Charophyta 3 11
  Chlorophyta 1 237 3 80 85
  Chrysophyta 1 237
  classification 1 237
  compensation intensities 12 106
  Cyanophyta 1 237
  distribution 1 236
  economic importance 1 237
  Euglenophyta 1 237
  fossils *see* Algae fossils
  halophilic *see* Halophilic algae 2 340
  Phaeophyta 1 237
  Pyrrophyta 1 237
  reproduction 1 236
  Rhodophyta 1 237
  silica deposits on 12 317
  soil microorganisms 12 462
  Thallophyta 1 235
Algae fossils 1 237 238
  coralline algae 5 476
  geologic range 1 237
  Girvanella 6 190
  Halimeda 6 319
  important families 1 237
  Precambrian floras 9 505
  Solenopora 12 473
Algal biostromes 7 516
Algal structures sedimentary rocks 12 135
Algäu Alps 5 117
Algebra 1 238 241
  addition 1 62
Algebra—*cont*
  algebraic operations and expressions 1 238
  axiom 1 238 239
  conditional equations 1 239
  division 4 239
  equation 1 239 240
  equations, theory of 5 6
  exponent 1 239 5 194 195
  factoring 1 240
  fraction 1 240
  group theory 6 283
  identity 1 239 240
  lattice (mathematics) 7 470
  multiplication 8 626
  notation 8 174
  number system 1 240
  perturbation (mathematics) 10 39
  power 1 239
  proportion 1 241
  quadratic formula 1 241
  radical 1 239
  ratio 1 241
  root 1 239
  subtraction 13 231
  variation 1 241
  see also Analytic geometry
Algebraic number theory 9 225 226
Algebraic numbers 9 224
Algebraic operations and expressions 1 238
Algenib 9 610
Algesioreceptor 12 180
Algin 6 297, 10 89
Alginic acid 10 89, 11 64
Alginite 3 252
Alginomonas 11 64
Algol 10 30
  binary stars 2 190
  light 7 505
Algor mortis 4 25
  see also Death
Algorithm division 5 46
  euclidean 6 154
Alicella gigantea 6 35
Alicyclic compounds 14 207
Alicyclic hydrocarbon 1 241 244*, 6 534
  molecular structure 1 242 243
  occurrence and nomenclature 1 241 242, 9 507
  properties 1 243
  stereochemistry 1 243 244
  uses 1 241
Alicyclic organochlorine compounds 3 75 76
Alidade 1 244
Alignment chart *see* Nomograph
Alima 13 151
Alima larva 3 566
Alioth 14 235

Alternating current circuit theory—*cont*
polyphase circuits 1 275 292
power 1 274 4 436
power factor 1 275, 10 554
power in balanced Y and delta systems 1 279
production of polyphase voltages 1 279
quadrature 11 134
RC series circuit 1 273
reactance 13 348 349
resonance 1 274, 11 501
RL series circuit 1 273
RLC series circuit 1 271
root mean square values 1 271
self inductances in parallel 1 271
self inductances in series 1 271
sine waves 1 271
single phase 1 271 275
six phase systems 1 280
star connection (polyphase) 1 275
susceptance 13 330
three phase voltages from single phase sources 1 280
total inductance 1 271
transients 14 30 35
two phase systems 1 275
unbalanced loads 1 277
unbalanced polyphase systems 1 275 282
unbalanced Y load 1 279
vector representation of qualities 1 272
volt amperes 1 274 14 368
voltage or current sequence 1 278
waveform nonsinusoidal 14 459
Y connected polyphase systems 1 276 277
Alternating current distribution systems 4 425
Alternating current generator 1 282 284* 287
electric power generation 4 435
elementary three phase generator 1 279
induction 1 284
magneto 8 51 52
nonsynchronous 1 284
prime mover 1 282
slip rings 12 481
synchronizing 13 375
synchronous 1 282
tachometer 13 485
three phase generation 1 279
windings 14 504 506
Alternating current motor 1 284 287
characteristics 1 285
classification 1 284
induction motor 7 74 79
polyphase induction motor 7 74 77
repulsion motor 11 484 485
series motor 1 284, 14 206*
servomotor 12 204
single phase induction 7 77 79
speed control 1 285 287
synchronous motor 13 360
synchronous speed 13 375
universal 14 206
windings 14 504 506
Alternating current transients 14 33 35
Alternating gradient focusing 9 575
Alternating gradient synchrotron 9 573 579 580*
Alternating series 12 191
Alternation of generations see Metagenesis
Alternator 1 282 284* 287
Alteutha interrupta 6 344
Altimeter pressure 1 287 288
Altimeter *radio* 1 289 299
frequency modulated 1 289 13 502
principle 1 288
pulse *modulated* 1 289
terrain clearance *indicator* 13 502
Altiplano 12 524
Altitude (celestial navigation) 2 581
Altitude (solid geometric) 12 473
Altitude measurement radio altimeter 1 288 289
Altitudinal vegetation zonation 14 288 289
Alvan R G 8 506
Altocumulus 3 210 212
Altostratus 3 211 212
Dr. Altrose 2 455
Altun Tagh 1 577
Aluchrom O 7 265
Alum 1 290* 298 12 16
from alunite 1 298
ferric 7 259
iron 7 259
Alumel 1 268 9 96
Alumina extraction 1 290 292
refractory 11 409
Aluminate 1 290
Aluminizing metal coatings 8 280
Aluminosilicate 12 476
molecular sieve 8 546
Aluminosilicate refractories 11 409
Aluminothermic manganese 8 87
Aluminothermic reaction ferroalloy 5 224
Aluminous cement 2 627
Aluminous laterite 7 407
Aluminum 1 290 298
alloy 1 295 297
alumina extraction 1 290 292
aluminous laterite 7 407
anodizing 4 534 535
from diaspore clay 5 161
electric conductors 3 502
electron configuration 4 504
extraction and refining 11 120
extractive metallurgy 8 277
fabrication methods 1 294 295
food engineering 5 402
heat of combustion 8 290
ionization potential 4 504
occurrence 1 290 2 112 113
organometallic compound 9 402 403
photoflash lamp 10 155
physical properties 1 292 298
production 1 290 294 4 466
reflectivity 8 510
resistivity 11 497
velocity of sound in 12 516 14 431
Aluminum alloys 13 295
radiation damage 11 223
Aluminum brass 3 470
Aluminum bronze 3 469
Aluminum *chloride* 1 298 3 73
alkylation catalyst 1 253
Aluminum oxide abrasive 1 9
thermal conductivity 3 391
Aluminum oxide *film capacitors* 2 447
Aluminum soap lubricant 7 605
Alundum crucible filtration 6 262
Alunite 1 290 298*
Alvarez L W 2 559
Alveolar consonant 10 121
Alveolina 5 431 432
Alveolinidae 5 435
Alvite hafnium *ore* 6 317
Alwin C 5 461
Alytes 9 515
Alytes obstetricans 12 8
Alzheimer's disease 9 68
AM *see* Amplitude modulation
A M (time) 13 643
Amagat E H 13 568
Amagat's law of additive volumes 13 568
Amalgam 1 298
Amalgamation gold 6 255
silver 12 535
Amanita muscaria 8 660, 10 434
Amanita phalloides 7 563 8 660 9 535 10 434
amino acids 1 308
Amanita verna 8 660
beta Amanitine 8 660
gamma Amanitine 8 660
Amaranthaceae 2 643
Amaranthus 10 436
Amaryllidaceae 7 511, 10 515
seed 12 548
Amateur observatories 9 242
Amateur radio 1 298 299
frequency allocation 1 298
license 1 299
public service 1 298 299
regulations 1 299
spectrum allocations 11 200
technical contributions 1 299
Amaurosis 9 69
Amaurotic familial idiocy 9 69
Amazon ant 1 437
Amazon Plain 12 526
Amazon River 11 69 586 12 529 529
Amazon stone 8 550
Amazona 11 69
Amazonite 6 98 8 550
Amazons Solimoes 12 529
Ambartsumian V A 3 501 506 7 222
Amber 1 299 300* 8 98
Ambergris 1 300
Ambient noise 9 117
Ambipolar diffusion 6 216
Amblygonite 1 300*, 7 544
Amblyomma americanum 15 14 631
Amblyomma cajennense 7 299 15 14
Amblyomma helvetarum 6 362
Amblypygi 1 300* 496
Amblystoma 11 478
Amblystoma mexicanum 9 77 78
Amblystoma punctatum 9 49
Ambrein 14 111
Ambrette *seed oil* 13 497
Ambrosia beetle 3 278 14 558
Ambush bug 6 401
Ambystoma 2 154
Ambystoma mexicanum see Axolotl
Ambystoma tigrinum 9 38, 12 6
Ambystomoidea 2 568
Ameba 1 300
see also Amoeba
Amebelodon 10 636
Amebiasis 1 300 301*, 331, 466 467 705, 10 428
disease mechanism 1 301
epidemiology 1 300
fumagillin 5 560
pathogenesis 1 301

Allocoecla 1 257, 10 414, 14 144
Prorhynchidae 1 258
Allogenic succession 13 231
Allognathosuchus 3 554
Allogromiidea 5 435
Allohydroxy D-proline 2 35
Allomyces 10 200
Allocrimene 6 533
Allophane 3 164 165
Allophene gene action 6 112
Allophones 10 120
Allophore 3 99
neural crest 9 78
Allopolyploid 10 488
Allopora 3 255
Allopregnane 1 74 78
Allosaurus 4 199, 7 327
D(+)-Allose 2 455
Allostichaster 1 599 600
Allotheria 1 258*, 8 82
Mammalia 1 258
Multituberculata 8 82
Allotriognathi *see* Lamprotdifor mes
Allotriomorphic granular tex ture 7 11
Allotype 14 172
Allowance (mechanical) 1 258
force fit 5 437
location fit 7 570
press fit 10 580
running fit 11 650
Allowed band band theory of solids 2 91-92
Allowed transition selection rules 12 160-162
Allovan 11 114
endocrine mechanisms 4 504
Alloy 1 258 260
Alnico 1 266
aluminum 1 295-297
amalgam 1 298
assaying 1 593
bearing alloys 1 258
binary 1 260 265
brass 2 320
Brillouin zone theory 2 539
bronze 2 549
cadmium 2 588
cast iron 2 559 561
cobalt 3 247
copper 3 468 471
corrosion 3 488
corrosion resisting 1 258-259
die casting 1 259
fusible 1 259
germanium 6 177
gold 6 211 232
heat treatment 6 378 392
high temperature 1 259
interstitial 1 261
iron 7 265 267
iron silicon 7 268
Alloy—*cont*
lead 10 88
low-expansion 1 259
low-melting 2 218-250
magnesium 8 20 24
magnetic 1 259-260
manganese 8 87-88
metal forming 8 286 287
microradiography 8 366
nickel 9 95 97
palladium 9 523
platinum 10 411
resistivity 11 496
rhodium 11 550
silver 12 331-332
soldering 12 471
solid-state chemistry 12 477 478
stainless steel 13 34 35
steel 13 89 93
structural properties 1 260-265
substitutional 1 261-262
superconductivity 13 295 301
ternary 1 260
thermal conductivity 3 391
thermocouple alloys 1 260
tin 10 88, 13 619-650
titanium 13 655
see also Intermetallic com pound, entries under specific names
Alloy deposition 4 532
Alloy junction transistor 7 319
impurity content 7 319
n p n 7 319
p n-p 7 319
Alloy steels 13 91
Alloy structures 1 260 265
Brillouin zone 2 539
electron compounds 1 263-264
interstitial alloys 1 261
order disorder in 1 264 265
phase diagrams 1 260
size and valence factors 1 261 263
solid solution 12 474
substitutional alloys 1 261 262
Alloyed corrosion resisting al loy 7 266
Alloying corrosion prevention 3 491
by ultrasonics 14 185
Allport G *8 608 10 35
Allred A L 4 520
Allred D M 12 30
Allspice 1 265* 8 685, 12 612
Allusial cones 5 312
Allusial fan 4 75 76 10 260
Allusial soils 12 434
Allyl alcohol 10 43, 46
Allyl chloride 3 75, 6 326, 10 43 46
Allyl halides 6 326
Allylacetic acid 1 63
Allylene 2 451
Allylic rearrangement 13 402
Allylic termination 7 111
Almanac, Nautical *see* Nautical Almanac
Almandite 6 40
Almond 1 265-266*, 9 231
Almond calico disease 1 495
Almond oil 5 189
Almost periodic functions 5 488 489
Almucantars 1 607
Alnico 1 260, 266*, 8 25
electron diffraction pattern 4 507
ferromagnetism 5 235 234
magnetic alloy 7 263
Alnilam 9 407
Alnoite 7 389 390
Alnus 5 178
Alnus incana 10 12
Alnus rubra 11 386
Aloe 13 120
Alopecia 4 236
Alopex lagopus 5 490
Alosa sapidissima 12 238
Alouatta 8 572
Alpaca 1 266
Alpha Bootis *see* Arcturus
Alpha Canis Minoris *see* Pro cyon
Alpha Capricornids 8 308
Alpha cell 9 531
Alpha Centauri 1 266 267
Alpha Crucis 3 569
Alpha Orionis *see* Betelgeuse
Alpha particles *see* Alpha rays
Alpha quartz 6 127 11 182
Alpha rays 1 267 269*, 691, 11 280 284
Geiger Briggs rule 1 268
ionization by 1 267 268
nuclear radiation (biology) 9 106
radiation cytology 11 222
range straggling 1 268
range vs energy 1 268 269
Rutherford scattering ex periments 1 655
Alpha rhythms electroenceph alography 4 478
Alpha Scorpii *see* Antares
Alpha sulfur 15 255 256
Alpha taxonomy 1 421
Alpha Ursae Minoris 10 447
Alpha Virginis *see* Spica
Alphacidae 4 29
Alphaeata 9 610
Alpheus 8 76
Alpheus heterochaelis 4 29
Alpine chat 12 396
Alpine facies 14 81 83
Alps 5 117, 15 407 409
orogenic sediments 12 12
tectonic map 15 409
Alsike clover 3 220
Alsophila pometana 2 47, 7 469, 472
Altai Savan Range 1 577
Altair 13 41
Altaite 13 482
Alteration halos 11 20
Alterman, Z 4 519
Alternaria 2 99, 5 298 6 74, 7 328, 13 541
Alternaria brassicae 4 52
Alternaria tenuis 4 52
Alternating current 1 269 270*, 4 423
advantages over direct cur rent 1 269
circuit elements 1 269 271
conversion to direct cu rent 3 444
measurements 4 455
peak and rms values 1 269
phase 1 269
phase diagrams 1 270
power for mixing 8 490
resonance 1 270
skin effect 12 371
Alternating current ammeter 1 320 323
Alternating current armatur windings 14 505 506
Alternating current circuit the ory 1 270 282
admittance 1 71, 273
balanced *n* phase mesh 1 276
balanced *n* phase star 1 27
balanced polyphase systen 1 275 282
capacitances in parallel 1 271
capacitances in series 1 27
capacitive reactances 1 27 272
complex representation quantities 1 274 274
conductance 3 382 383
delta connected polypha systems 1 277
double delta connections 1 281
double Y connection 1 2
four phase systems 1 275
graphical means of ad tion 1 272
impedance 1 271 272, 7
inductive reactance 1 27 272
mesh connection (pol phase) 1 275
mutual inductance 1 271
nonsinusoidal waveform 14 488
parallel circuits 1 273
phase angle 1 271

Alternating-current circuit theory—*cont*
polyphase circuits 1 275 282
power 1 274 4 436
power factor 1 275 10 554
power in balanced Y and delta systems 1 279
production of polyphase voltages 1 279
quadrature 11 134
RC series circuit 1 273
reactance 11 548 549
resonance 1 274 11 501
RL series circuit 1 273
RLC series circuit 1 271
root mean square values 1 271
self inductances in parallel 1 271
self inductances in series 1 271
sine waves 1 271
single phase 1 271 275
six phase systems 1 280
star connection (polyphase) 1 275
susceptance 15 550
three phase voltages from single phase sources 1 280
total inductance 1 271
transients 14 30 35
two phase systems 1 275
unbalanced loads 1 277
unbalanced polyphase systems 1 275 282
unbalanced Y load 1 278
vector representation of qualities 1 272
volt amperes 1 274 14 368
voltage or *current* sequence 1 278
waveform nonsinusoidal 14 434
Y connected polyphase systems 1 276 277
Alternating current distribution systems 4 424
Alternating current generator 1 282 284* 287
electric power generation 4 435
elementary three phase generator 1 279
induction 1 284
magneto 8 50 52
nonsynchronous 1 284
prime mover 1 292
slip rings 12 581
synchronizing 15 573
synchronous 1 282
tachometer 15 485
three phase generation 1 279
windings 14 504 506
Alternating current motor 1 284 287
characteristics 1 285
classification 1 284
induction motor 7 74 79
polyphase induction motor 7 74 77
repulsion motor 11 481 485
series motor 1 284 14 206*
servomotor 12 204
single phase induction 7 77 79
speed control 1 285 287
synchronous motor 15 569
synchronous speed 15 573
universal 14 206
windings 14 504 506
Alternating current transients 14 35 55
Alternating gradient focusing 9 575
Alternating gradient synchrotron 9 573 579 580*
Alternating series 12 191
Alternation of generations *see* Metagenesis
Alternator 1 282 284* 287
Alteutha interrupta 6 344
Altimeter pressure 1 287 288
Altimeter radio 1 288 289
frequency modulated 1 289 15 502
principle 1 288
pulse modulated 1 289
terrain clearance indicator 15 502
Altiplano 12 524
Altitude (celestial navigation) 2 583
Altitude (solid geometric) 12 473
Altitude measurement radio altimeter 1 288 289
Altitudinal vegetation zonation 14 298 299
Altken R G 8 506
Altocumulus 3 210 212
Altostratus 3 211 212
Alto Altrose 2 455
Altyn Tagh 1 577
Aluchrom O 7 265
Alum 1 290* 298 12 16
from alunite 1 298
ferric 7 259
iron 7 259
Alumel 1 260 9 96
Alumina extraction 1 290 292
refractory 11 409
Aluminate 1 298
Aluminizing metal coatings 8 280
Aluminosilicate 12 476
molecular sieve 8 546
Aluminosilicate refractories 11 409
Aluminothermic manganese 8 87
Aluminothermic reaction ferroalloy 5 224
Aluminous cement 2 627
Aluminous laterite 7 407
Aluminum 1 290 298
alloy 1 295 297
alumina extraction 1 290 292
aluminous laterite 7 407
anodizing 4 534 535
from diaspore clay 3 161
electric conductors 5 392
electron configuration 4 501
extraction and refining 11 120
extractive metallurgy 8 277
fabrication methods 1 294 295
food engineering 5 402
heat of combustion 8 290
ionization potential 4 501
occurrence 1 290 2 112 113
organometallic compound 9 402 403
photoflash lamp 10 155
physical properties 1 297 298
production 1 290 294 4 466
reflectivity 8 510
resistivity 11 497
velocity of sound in 12 516 14 451
Aluminum alloys 13 205
radiation damage 11 223
Aluminum brass 3 470
Aluminum bronze 3 469
Aluminum chloride 1 298 3 73
alkylation catalyst 1 253
Aluminum oxide abrasive 1 9
thermal conductivity 3 391
Aluminum oxide film capacitors 2 447
Aluminum soap lubricant 7 605
Alundum crucible filtration 6 262
Alunite 1 290 298*
Alvarez L W 2 359
Alveolar consonant 10 121
Alveolina 5 431 432
Alveolinidae 5 435
Alvin *hafnium* ore 6 317
Alwin C 5 461
Alvites 9 545
Alytes obstetricans 12 8
Alzheimer's disease 9 68
AM *see* Amplitude modulation
A M (time) 15 643
Amagat E H 13 569
Amagat's law of additive volumes 13 568
Amalgam 1 298
Amalgamation gold 6 255
silver 12 333
Amanita muscaria 8 660 10 434
Amanita phalloides 7 563, 8 660 9 535, 10 434
amino acids 1 309
Amanita verna 8 660
beta Amanitine 8 660
gamma Amanitine 8 660
Amaranthaceae 2 613
Amaranthus 10 336
Amaryllidaceae 7 514, 10 345
seed 12 514
Amateur observatories 9 242
Amateur radio 1 298 299
frequency allocation 1 298
license 1 299
public service 1 298 299
regulations 1 299
spectrum allocations 11 260
technical contributions 1 299
Amaurosis 9 69
Amaurotic familial idiocy 9 69
Amazon ant 1 437
Amazon Plain 12 526
Amazon River 11 69 536 12 528 529
Amazon stone 8 550
Amazona 11 69
Amazonite 6 98 8 550
Amazons Solimoes 12 528
Ambartsumian, V 3 385 506 7 222
Amber 1 299 300*, 6 99
Ambergris 1 300
Ambient noise 9 117
Ambipolar *diffusion* 6 216
Amblygonite 1 300* 7 544
Amblyomma americanum 13 14, 631
Amblyomma cajennense 7 260, 13 14
Amblyomma hebraeum 6 362
Amblypigi 1 300*, 496
Amblystoma 11 478
Amblystoma mexicanum 9 77 78
Amblystoma punctatum 9 49
Ambrein 14 111
Ambrette seed oil 13 497
Ambrosia beetle 3 279 14 538
Ambush bug 6 401
Ambystoma 2 134
Ambystoma mexicanum *see* Axolotl
Ambystoma tigrinum 9 38, 12 6
Ambystomoidea 2 568
Ameba 1 300
see also Amoeba
Amebelodon 10 636
Amebiasis 1 300 301*, 331 466 467 793 10 429
disease mechanism 1 301
epidemiology 1 300
fumagillin 5 560
pathogenesis 1 301

Amebiasis—*cont*
Protozoa 11 60
therapy 1 301
Amebic abscess 7 563
Amebic diarrhea 1 301
Amebic dysentery *see* Amebiasis
Amebula 3 226-227
Ameiva longipes 6 344
Ameiurus 9 50
Ameiurus nebulosus 2 552
Amentia *see* Mental deficiency
Amera 1 301*, 9 30
American antelope 1 443
American beech 2 129
American Bemberg rayon 5 245
American bittern 6 425
American brant 6 236
American buffalo 2 250
American Bureau of Shipping 4 280, 12 274
American cockroach 9 416
American crocodile 3 551
American eel 1 406
American elm 4 564, 13 113
American Ephemeris and Nautical Almanac 5 32
American linden 2 108
American National screw thread 12 85
American Petroleum Institute (API) hydrometer scale 6 562, 9 283
American roach 3 251
American screw worm 8 680
American spotted fever *see* Spotted fever, Rocky Mountain
American Standard screw thread 12 85
American sturgeon 13 207
American sycamore 13 360
American trypanosomiasis 6 400 410
American Type Founders Hadego (type) 3 348
American Type Founders Typesetter 3 348
American Wire Gage (AWG) 14 521
Americium 1 301 302*, 14 66
electron configuration 4 504
ionization potential 4 504
Americyl ion 1 301
Amerosporae 5 563
Amethyst 1 302
gem 6 99
quartz 11 182
Amethopia 5 171-172
Amia 12 355 356 9 443, 11 514, 13 337
Amia calva 1 304, 4 260, 12 396
Amici, G B 12 589
Amici cube 8 507
Amici direct vision prism system 10 623
Amici roof prism 8 508, 10 18
Amictic egg Rotifera 11 634
Amictic lake 5 523
Amidase bacterial enzyme 2 19
Amide 1 302, 9 110
lactam and lactim 7 376
organic quantitative analysis 9 399
plant metabolism 10 356
Amide, acid 1 302 303
phthalimide 10 198
see also Carboxylic acid
Amide ion 1 326
Amidine 1 303 304*, 7 32
Amidopyrine 7 486
Amidae 1 304
Amiiformes 1 57-58, 304*, 9 442
Clupeiformes 3 222-223
dogfish 4 260
Amination 1 304-305
ammonolysis 1 304-305
hydrogenation 6 552
reduction 1 304
Amine 1 305-307
acetylation 1 36-37
amidine 1 303 304
aniline 1 407 408
anthranilic acid 1 456
benzedrine 2 164
benzidine 2 165
Curtius reaction 1 307
diazotization 4 105
exhaustive methylation 1 306
Hofmann hypohalite reaction 1 307
naphthylamine 9 5
nomenclature 9 396
Schiff base 12 62
toluidine 13 665
Amine oxidase 11 71
Amino acids 1 307-319* 4 170
animal feed composition 1 427
arginine 1 529
asparagine 1 588
aspartic acid 1 588
bacterial aerobic oxidations 2 35
bacterial biosynthesis 2 56 57
bacterial nutrition 2 65
biochemistry 2 199
biosynthesis 1 311 318
chemical fossils 5 29
conjugation 1 307 313
creatine creatinine 5 540
cysteine 5 619
cystine 5 619
deamination 1 312
decarboxylation 1 312
degradation 1 312
determination 1 309
by electric discharges 7 497
formation 1 311
in fossils 9 498
Amino acids—*cont*
free occurrence 1 308
glutamic acid 6 219
glutamine 6 220
glycine 6 221
histidine 6 457
ionic state 1 308
isolation 1 309
isoleucine 7 276 277
leucine 7 479
lysine 7 638
metabolism 1 311-314
methionine 8 341
in nutrition 1 314
peptide 9 629
phenylalanine 10 114
plant metabolism 10 356
proline 11 5
properties 1 308
in proteins 11 34
racemization 1 313
radiation effect on 11 217
serine 12 196
subtilin 13 230
in swine production 13 341
threonine 13 612
transfer 1 311
tryptophan 14 125
tyrosine 14 176
urea 14 215
valine 14 259
vitamin B_6 role 1 313
beta Amino acid 2
Amino acid deamina
Amino acid decarbo
Amino acid oxidase 2 18
Amino acid transaminase 2 18
Amino aciduria 8 258
Amino alcohol 1 251
5 Amino imidazole ribosylphosphate 2 60
Amino ketone and hydroxy ketone dye 4 304
delta Amino levulinic acid 2 57
Amino resins *see* Polymer
Urea Formaldehyde type resins
Amino sugars 8 585
Amino xanthene dye 4 302
alpha Aminoadipic acid 7 658
p Aminobenzenesulfanilamide 13 244
p Aminobenzenesulfonic acid 13 245
para Aminobenzoic acid 1 319 320* 2 35 4 236 14 140
bioassay 2 194
sulfa drugs 13 244
gamma Aminobutyric acid 6 358
epsilon Aminocaproic acid 10 460
epsilon Aminocaprolic lactam 10 460
D 4 Amino 4 carboxy n butyl penicillin 9 619
2-Amino 5-chloropyrimid
11 113
4 Amino-5 cyanopyrimidine
13 599
2 Amino 2 deoxy D glucose
D glucosamine 8 585
o Aminodiphenylamine 2
omega Aminododecanoic ac
lactam 3 640
2-Aminoethylsulfuric acid
exchange 7 242
Aminoguanidine 6 540
Aminohydroxy triarylmeth
dye 4 301
2 Amino 4 hydroxytetridine
6 106
2 Amino 6 hydroxypurine
14 218
beta-Aminoisobutyric acid
1-Aminoisoquinoline 7 289
D-4 Amino-5 isoxazolidinon
5 643
o-Aminomandelic acid 7 64
2-Amino-4 methylpyrimidin
11 114
6 Aminopenicillanic acid
cillin 9 619
Aminopeptidases 5 203 204
para Aminophenol 1 320
beta Aminopropionic acid
6 Aminopurine 14 218
2 Aminopyridine 11 110
Aminoquinoline
para-Aminosalicylic acid 1
464 468 475, 7 283
Aminotriazole 4 43
3 Amino 1, 2 4 triazole 6
omega Aminoundecanoic ac
10 460
delta-Aminovalerate 2 46
Amitrol 6 425
Amitrol *see* 3 Amino 1,
triazole
Ammite 6 425
Ammeter 1 320 325
circumferential vane
comparison of types
current measurement
electrodynamic 1 321,
hot wire 1 322
moving iron 1 321
permanent magnet
able coil 1 320
polarized vane 1 321
rectifier type 1 323
repulsion vane 1 321
soft iron 1 321
thermal 1 322 323
Ammine 1 323 324
Ammodiscus incertus 5 430
Ammomarginulina bellens
5 432
Ammonation 1 324 325

Ammonia 1 324 327*, 6 544, 546 10 45 44
amino acid 1 511
ammonation 1 324 325
chemical properties 1 324 325
hexamethylenetetramine 6 435
hydrazine 6 550
molecular structure 1 324
nitrogen cycle 9 110
nitrogen fertilizers 5 257
physical characteristics 1 324
polyacrylonitrile resin 10 459
production by high pressure processes 6 448 449
refrigerant 11 415
solvent 12 496
uses 1 324
velocity of sound in 12 515
ammonia maser *atomic clock* 1 650
see also Maser
ammonia niter 9 102
ammonia-oxidizing bacteria 9 107
ammonia soda process 12 412
ammoniacal *silver nitrate solution* 1 485
ammonification 9 110
ammonium *chloride* 12 472
ammonium dihydrogen phosphate 12 516
ammonium nitrate 5 151
blasting medium 8 473
ammonium salt 1 327* 9 110, 11 183
ammonium sulfamate 6 425
ammonium tetrathiotungstate 14 140
ammonium tungstate 14 140
ammono compound 1 326
Ammonoidea 1 328 2 647 8 559
Cephalopoda 2 645
fossil 2 647
ammonolysis 1 304 305
amination 1 304 305
ammonia 1 325
ammonotelv 5 137 143
Ammophila 4 293 5 38
Ammotheidae 11 106
ammunition 1 539
armor piercing 1 539
armor piercing incendiary (API) 1 539
armor piercing incendiary tracer (API T) 1 539
artillery 1 540
ball 1 539
fixed 1 540
incendiary 1 539
naval guns 1 542 543
separate loading 1 540
small arms 1 539 540
tracer 1 539
Ammunition ship 12 267
Amne Machin Mountains 1 577
Amnesia 1 328*, 6 600
Amnestus 6 410
Amnion 1 256, 135, 328*, 394, 5 158, 241 13 531
Amniota 1 328
Reptilia 11 482
Amniota 1 328 329 13 531, 14 308
Amniote kidneys 14 228
Amoben 6 421
Amodiaquine 8 77
Amoeba 3 650, 5 203 8 407
Amoeba dubia 1 330 11 50
Amoeba proteus 1 329 330, 2 639
Amoebida 1 329 331*, 11 52, 12 27
ameba 1 300
Endamoebidae 1 331
identification 1 331
intestinal amebas 1 330
locomotion 1 329
nutrition 1 329
transmission 1 331
Amoebina *see* Amoebida
Amoebobacter 11 552
Amoebocyte 10 515
Amorphophallus 8 92
Amorphous frost 5 540
Amorphous solid 1 331
thermal conductivity 5 590 591
Amorphous state 6 446 447
Amortisseur windings 13 572
Amosite 1 569
Ampelisidae 6 36
Ampère André Marie 1 332, 3 628, 4 244 245, 10 232
Ampere 1 331 332* 3 628 4 460 461
absolute 1 332 4 458 459
International 1 332
standard 3 626 4 458
Ampere's law 1 332 333* 10 232
applications 1 333
Biot Savart law 2 246
field near a current 1 332-333
magnetic field 8 30
right hand rule 1 332
units 1 332
Ampere turn 1 333*, 8 31
Amperometric titration *see* Titration, amperometric
Amphechinus 7 143
Amphetamine *see* Benzedrine
Amphiarthrosis 7 314 12 352
Amphibia 3 333 334, 420, 13 530
Anura 1 335
Caudata 1 335 2 568
ecology 1 334
evolution 1 334
fossils see Amphibia *fossils*
Gymnophiona 1 333 6 500
morphology 1 333
Amphibia—cont
physiology 1 334
Salientia 1 335, 12 8
Tetrapoda 1 333
Urodela 1 335
Amphibia *fossils* 1 334 336
Labyrinthodontia 1 334, 7 575
Lepospondyli 1 334
Microsauria 8 570
Amphibian metamorphosis endocrine *mechanisms* 4 593 596
Amphibicorisae 6 406 408
Gerroidea 6 406
Amphibiotes see Sarcopterygii
Amphibious *vehicle* 7 396
Amphibious warfare 7 393 396
Amphiblastula larva 2 594, 4 55 10 517
Amphibole 1 336 337*, 12 477
anthophyllite 1 454
composition 1 336
crystal structure 1 337
cummingtonite 3 623
genetic relations 1 337
glaucophane 6 212
hornblende 1 336 6 496
nephrite 7 301
occurrence 1 337
physical and optical properties 1 336
Amphibole *asbestos* 1 569
Amphibole schist 11 591
Amphibolips confluenta 6 581
Amphibolite 1 337 338* 11 593
Amphicoela 1 338
Amphicoelous *vertebra* 12 554
Amphicribral vascular bundle 14 283
Amphid 1 702
Amphidiscophora 1 338*, 10 515
Amphidiscosa 10 515
Hemidiscosa 6 399 10 515
Hexactinellida 1 338
Amphidiscosa 1 338
Amphidromic points 13 633
Amphitheha 4 41
Amphilestes 14 89
Amphilina 1 339
Amphilinidea 1 338 339 10 414
Cestodaria 1 338
Cestodea 2 659
Amphimonadidae 11 45
Amphimonas 8 168 11 45
Amphineura 1 339*, 8 559 575
Aplacophora 1 339 490, 8 559
Monoplacophora 1 339, 8 559
Polyplacophora 1 339, 8 559 10 487
Amphinome 10 462
Amphinomidae 10 461
Amphinous 11 516
Amphiodontid 13 562
Amphiophiura 9 343
Amphioxus 1 414, 5 263, 9 529 12 554
Amphioxus lanceolatus 11 513
Amphiphloic siphonostele 13 105, 116 117
Follicales 5 260 264
Amphipholis 9 343
Amphipholis squamata 9 344
Amphipleura pellucida 4 103
Amphipoda 1 339 341, 565, 5 565
Caprellidea 1 340 2 447
economic importance 1 341
Gammaridea 1 339 6 35
Hyperiidea 1 340, 6 586
Ingolfiellidea 1 340
Malacostraca 1 339
Amphiporus 6 479 11 560
Amphiporus gracilis 11 559
Amphiprion perrula 4 384
Amphiroa 5 476
Amphisbaena darwini 7 558
Amphisbaenidae 13 21
Amphisopidae 10 107
Amphissites 9 510
Amphissites marginiferus 9 513
Amphistegina 5 431
Amphistome 4 148 150
Amphistyly 12 360
Amphitherium 9 538
Amphitretus 4 40
Amphitrite 10 461
Amphiuma 2 568 12 7
Amphiuma means 2 569
Amphiura 9 345 344
Amphiuridae 9 344
Amphivasal bundle 14 283
Amphiroidae 5 276
Amphorellina 13 651
Amphoriscidae 13 560
Amphoriscus 13 560
Amphotericin B 1 341-342*, 476, 5 563
antibiotic 1 466 468
antimicrobial activity 1 341
assay 1 341
chemistry 1 341
pharmacology 1 341
production 1 342
therapeutic effect 1 341
Amphoterism 1 342
Amphoterite 8 314
Amplidyne 4 229 230
Amplification *see* Gain
Amplification factor triode 14 108
vacuum tube 14 247
Amplifier 1 342 350
audio *see* Audio amplifier
automatic gain control (AGC) 1 675
backward wave tube 2 4
beam power tube 2 114 115
cascode *see* Cascode amplifier

Amplifier—*cont*
cathode follower 2 552
chopper stabilization 14 323
classes of operation 10 543-544
coincidence *see* Coincidence amplifier
definition 1 342
direct-coupled *see* Direct-coupled amplifier
distortion 4 256-257
distortion reduction 5 198
feedback 5 198
gain with feedback 5 199
grounding, electronic equipment 6 279 281
high frequency 9 551-552
impedance matching 7 37-38
instability, electrical 7 146
intermediate-frequency amplifier 7 191
klystron 7 367
low noise 9 551-552
maser 8 156 160
microwave 8 424-426
motorboating 8 616
parametric *see* Parametric amplifier
parasitic oscillation 9 554
power 10 553 554
push pull *see* Push pull amplifier
radio frequency *see* Radio-frequency amplifier
tank circuit 13 390
traveling wave tube 14 68-71
types 1 342
vacuum-tube *see* Vacuum-tube amplifier
video *see* Video amplifier
voltage amplifier 14 355
see also Hydraulic actuator, Magnetic amplifier, Servomechanism
Amplifier type meter 14 254
Amplitron 8 72
Amplitude (wave motion) 1 350*, 10 101
Amplitude distortion 4 256
Amplitude modulation 1 350-351*, 8 526 527
bandwidth occupancy 8 527
cathode modulation 1 357
Doppler system 8 528
detectors 1 357
double sideband plus carrier (AMS) 8 528
grid modulator 1 355 357
methods 1 353
microwaves 8 414
modulators 1 354
in multiplexing 1 352
phase discrimination multiplexing 8 529
Amplitude modulation—*cont*
plate modulation 1 354
plate modulated Class C amplifier 1 355
radio 11 242
single sideband, suppressed carrier (SSB) 8 528
television picture transmission 13 458
uses 1 365
vestigial sideband (VSB) 8 528
Amplitude modulation detector 1 357-363
crystal diode 1 359-360
diode 1 357-358
grid 1 358 359
heterodyne 1 361
infinite impedance 1 361
oscillating 1 361
plate 1 360
regenerative 1 361
superregenerative 1 362
Amplitude modulation radio 1 363-365
aviation and marine navigation aids 1 364 365
bandwidth requirements 2 93
broadcasting 11 247 251
fidelity 1 363
frequency range 1 363
high frequency (short-wave) broadcasting 1 363-364
low frequency (long wave) broadcasting 1 363
medium frequency broadcasting 1 363
radiotelegraphs 1 364
single sideband hi telephony 1 364
television broadcasting 1 365
Amplitude modulation radio transmitter 11 263 264
antennas 11 264
equipment 11 264
high level modulated 11 265
low level modulated 11 265
monitoring 11 264
protection 11 264
Amplitude modulator 1 354 357* 8 529
cathode 1 354 357
grid 1 354
plate 1 354 355
Ampulicidae 6 574
Ampulla 4 520 13 52
Ampulla of Vater gallbladder 6 15 17
pancreas 9 535
Ampullae of Lorenzini 12 180
AMS 6 423
Amsel A. 5 549
Amu see Atomic mass unit
Amu River 1 580
Amur River 1 580
Amygdalase 5 203
Amygdalin 10 439
Amygdaloid 1 365
Amygdaloidal lava 1 365
Amygdaloidal structure igneous rocks 7 13
Amygdule 1 365
in basalt 2 106
Amyl chlorides 3 75
Amyl phenols 6 422
Amylase 1 365 366*, 2 19, 461, 5 27-28, 203 204, 8 82
blood chemistry 5 197
enzyme 5 20 22
maltase 8 81
salivary 4 164
alpha Amylase 4 164
Amylase determinations: clinical pathology 3 192-202
Amylene 3 235
Amyloglucosidase 5 28
Amylo-1 6 glucosidase 8 262
Amyloid 8 257
metabolic disorders 8 257
Amylolosis 13 9
Amylolytic enzyme 4 170, 9 609
Amylopectin 10 490
gum 6 298
starch 13 51
Amylopsin 4 170
Amylose gum 6 298
starch 13 51
see also Cellulose
Amylo 1 4 (or 1 6) transglucosidase 8 262
Amyotonia congenita 8 659
Amyotrophic lateral sclerosis 9 69
Amytal 6 595, 11 114, 14 217
A N radio range 11 254 255
Anabaena 3 636 9 11, 12 67
Anabantidae 10 10
Anabas 11 316
Anabiosis 13 397
Anabolism 8 263 264
bacterial 2 47 63
Anabrus simplex 9 416
Anacanthini *see* Gadiformes
Anacardiaceae 8 90 10 458 12 26 14 282
Anacardium occidentale 2 538
Anaconda 2 272 12 190
Anactinia pelagica 2 654
Anactinochitinosi 1 24 25
Anadromous fish 8 427
Anaerobic bacteria 2 7 13 1
Anaerobic plates culture pure 5 616
Anagale 7 145
Anagale gobiense 10 589
Anagalopus 7 143
Anagliph 10 160
Anagrus armatus 8 583
Anaitopus vemulosus 4 210
Anal gland 12 61
Analbite 1 224 5 211
Analcime 1 266*, 14 611
Analcite 12 476
Analemma (globe) 6 211 213
Analgesics 1 366
Analog computer 1 366 369*, 3 359
comparison to digital computers 1 367
computing circuits 1 369 376
computing mechanisms 1 368 376
coordinate system converters 1 383 384
differential analyzer 4 122 124
electromechanical 1 367
electronic 1 367
function generation 1 379 383
mechanical 1 367
mechanical-electrical analogies 1 368
simulator 12 340
slide rule 12 378
solution of equations 1 381 386
symbols 4 123
Analog computing devices 1 368-376
electrical addition 1 369
electrical differentiation 1 374
electromechanical differentiation 1 374
electromechanical division 1 375
electromechanical integrators 1 375 376
electronic integrators 1 376
electronic quarter-square multiplier 1 372
mechanical addition 1 369 369
mechanical differentiation 1 373 374
mechanical division 1 372
mechanical integrators 1 375
mechanical multiplication 1 370
pulse width pulse amplitude multipliers 1 371 372
servomultipliers 1 371
time division multipliers 1 371
see also Analog computer
Analog to digital converter 1 386
Analogies dynamical *see* Dynamical analogies
Analysis (mathematics) calculus differential and integral 2 401 403
calculus of vectors 2 416

Analysis of variance 1 386 387
biometrics 2 228
restrictions on use 1 386
Analyte 13 653
Analytic functions complex *numbers and complex variables* 5 339 340
group theory 6 283 284
series 12 192
Analytic geometry 1 387 392
angle 1 388 389
area of a triangle 1 389
circle 1 389
conic sections 1 389 390, 5 399 400
coordinate systems graphical 3 454 456
equations 1 388
line 1 388
linear combinations 1 389
loci 1 388
plane 1 388
slope 12 382
surface 1 391 392
see also Algebra
Analytic number theory 9 226 227
Analytical balance *see* Balance (analytical)
Analytical chemistry 1 392 394
chemical microscopy 5 30
chromatography 5 91 98
colorimetric analysis 3 301
coulometric analysis 5 517
determination 1 393
dielectric constant 4 112 113
electrodeposition analysis 4 473 475
errors in 1 394
fluorimetric analysis 5 550 551
gas analysis 6 45 46
gravimetric analysis 6 262 263
instrumental analysis 7 151 152
isotope dilution techniques 7 293
molecular weight 8 556 558
optical methods 9 553
polarimetric analysis 10 446
polarographic analysis 10 454
qualitative *analysis* 11 136 138
quantitative *analysis* 11 142 144
radiochemistry 11 299
radioisotopes 11 290
refractometric analysis 11 408
sampling 1 392 395 12 21
solubilizing of samples 12 484 485
Analytical chemistry—cont
spectrochemical analysis 12 578
spectrophotometric analysis 12 586
thermoanalysis 13 536
Analytical chemistry, errors in 1 394
Analyzer, sound *see* Sound analyzer
Analyzer, spectrum *see* Spectrum analyzer
Anamnia 1 394 395* 13 551
Anamniota 1 394 14 308
Anamniote kidneys 14 226 228
Anamorphic lens 5 127-128
Anamorphosis 1 563
Protura 11 61
Anamorphotic lens systems 1 591 12 609
Ananas sativus 10 237
Anancus 10 636
Anaphase (cell) 3 109
meiosis 8 211
mitosis 8 521
Anaphylactic reaction antigen antibody 1 475
Anaphylactoid reaction hypersensitivity 6 590
Anaphylaxis 1 395* 566 6 589
Anaplasia 1 395
oncology 9 519
Anaplasma 6 515, 11 567
Anaplasma marginale 11 567
Anaplasmataceae 11 567
Anaplastic carcinoma 2 519
Anapsid 11 484
Anapsida 1 395 396* 11 484
Chelonia 11 484
Cotylosauria 5 515 11 484
Anarcestes 4 87
Anas 11 527
Anas acuta 4 290 291
Anas platyrhynchos 1 436 4 290
Anas rubripes 6 405, 407 13 29
Anasarca 4 400
Anasca 3 16
Anasibirites multiformis zone 14 82
Anaspida 1 396* 420
Anaspidacea 1 396* 563
Syncarida 13 567
Anaspides 13 567
Anaspides tasmaniae 1 396 562
Anaspididae 1 396
Anastatic water 6 278
Anastigmatic lenses 7 453
Anastrepha 4 219
Anatase 11 656 13 652
Madelung constant 8 15
Anatidae 1 436 4 290, 8 236 13 533
Anatolian plateau 1 589
Anatomy, regional 1 396 397
Anatosaurus 4 200 201, 12 362
Anauxite 3 165
Ancestrula 2 356
Anceus form 6 225
Anchisaurus 4 199
Anchistropus 5 151
Anchor machinery, marine 8 125
Anchoroholus mirabilis 6 344
Anchovy 3 223, 5 416 419
Ancistrocroma 11 59
Ancistrodon contortrix 3 472
Ancistrodon piscivorus 3 515
Ancistromesus 8 561
Ancorina 3 88
Ancylostoma 13 195
Ancylostoma braziliense 6 478
Ancylostoma caninum 6 478
Ancylostoma duodenale 6 478 13 192
Ancylostomidae 13 195
Ancylus Lake 2 87
AND circuit cryotron 3 577
digital computer 4 178 181
AND function 13 358
AND gate switching circuit 13 345
Andalusite 1 397
Andaman Sea 2 56 9 271
Andean condor 5 178
Andean peaks (elevations) 12 529
Anderson C D 4 302 8 247, 10 521
Anderson E F 8 608
Anderson E M 13 417
Anderson F R 12 103
Anderson P W 1 470 471
Anderson V C 12 60
Anderson bridge inductance measurement 7 67
Anderson theory of antiferromagnetism 1 470 471
Andes Mountains 12 524
Andesine 1 397*, 5 213
Andesite 1 397 398* 7 16 10 86 11 500 14 347
composition 1 397
compressive strength 4 613
occurrence 1 398
origin *in sial* 13 413
petrographic province 10 51
texture and structure 1 399
Andesite porphyry 11 500
Andesitic tuff 14 134
Ando soils 12 434
Andradite 6 40 12 351
Andrena rufipennis 8 633
Andreaeopsida 8 633
Andreanof Island 1 523
Andrena 6 582
Andrenid bee 6 574
Andrenidae 6 574
Andrews Donald H 1 552
Andrews Thomas 7 535
Andrewsarchus 2 524
Andrias 5 578
Androconium 7 459-473
Androecium 5 527
Androgen 1 394 399*, 6 479 11 477, 13 529
biosynthesis 1 398
catabolism 1 399
estrogen 5 77
reproductive system 11 475
sex determination 12 228
sterol 13 539
Androgenesis 1 399 400, 5 234
Andromeda (constellation) 3 412 413
Andromeda Nebula 1 400
Andromedotoxin 10 440
Andrometrogyny 8 213
Andropogon 4 293, 5 38
Andropogon furcatus 2 272
Andropogon scoparius 2 272, 5 190, 11 621
Andropogoneae 5 189
Andros Island 14 474
delta 4 Androstene 3, 17 dione 1 398 399 5 77, 9 454, 13 526
delta 4 Androstene 11 (beta) ol 3, 17 dione 13 526
delta 4 Androstene 3 11 17 trione 13 526
Androsterone 13 526
reproductive system 11 477
Anechoic chamber 1 400*, 1 665
Aneides lugubris 12 7
Anelasticity 1 400 401
Anemia 1 401 402 5 196, 4 256
circulation disorders 3 141 144
congenital hemolytic 1 401
fragility test in congenital hemolytic 5 195
hematologic disorders 6 395 396
hemolytic 1 401
hookworm disease 6 478
iron deficiency 1 401
myelophthisis 1 402
panerythropenia 1 402
pernicious 1 401 6 412
sickle cell 1 401, 5 195
thalassemia 1 401
Vitamin B_{12} 14 342
Anemia, congenital *hemolytic* 1 401
hematocrit determination 5 195
Anemochory population dispersal 10 498
Anemometer 1 402 403* 14 493
air velocity measurement 1 221
cup 1 402
hot wire 1 402 14 502 503
propeller 1 402
vane 1 402
Anemone 1 52, 247 5 188
Anemone patens 2 242
Anemonia 1 52 54
Anemophilous flower 5 326

Amplifier—*cont*
cathode follower 2 552
chopper stabilization 14 323
classes of operation 10 543-544
coincidence *see* Coincidence amplifier
definition 1 342
direct coupled *see* Direct-coupled amplifier
distortion 4 256-257
distortion reduction 5 198
feedback 5 198
gain with feedback 5 199
grounding, electronic equipment 6 279-281
high frequency 9 551-552
impedance matching 7 37-38
instability, electrical 7 146
intermediate frequency amplifier 7 194
klystron 7 367
low noise 9 551-552
maser 8 156 160
microwave 8 424-426
motorboating 8 616
parametric *see* Parametric amplifier
parasitic oscillation 9 554
power 10 553-554
push-pull *see* Push-pull amplifier
radio frequency *see* Radio-frequency amplifier
tank circuit 13 390
traveling wave tube 14 68-71
types 1 342
vacuum tube *see* Vacuum-tube amplifier
video *see* Video amplifier
voltage amplifier 14 355
see also Hydraulic actuator Magnetic amplifier Servomechanism
Amplifier type meter 14 254
Amplitron 8 72
Amplitude (wave motion) 1 550*, 10 101
Amplitude distortion 4 256
Amplitude modulation 1 350-351* 8 526 527
bandwidth occupancy 8 527
cathode modulation 1 357
Day's system 8 528
detectors 1 357
double sideband plus carrier (AM) 8 528
grid modulator 1 355 357
methods 1 353
microwaves 8 414
modulators 1 354
in multiplexing 3 352
phase discrimination multiplexing 8 528
Amplitude modulation—*cont*
plate modulation 1 354
plate-modulated Class C amplifier 1 355
radio 11 242
single-sideband, suppressed carrier (SSB) 8 528
television picture transmission 13 458
uses 1 365
vestigial sideband (VSB) 8 528
Amplitude-modulation detector 1 357-363
crystal diode 1 359 360
diode 1 357-358
grid 1 358 359
heterodyne 1 361
infinite-impedance 1 361
oscillating 1 361
plate 1 360
regenerative 1 361
superregenerative 1 362
Amplitude modulation radio 1 363 365
aviation and marine navigation aids 1 364 365
bandwidth requirements 2 93
broadcasting 11 247-251
fidelity 1 363
frequency range 1 363
high frequency (short-wave) broadcasting 1 363 364
low frequency (long wave) broadcasting 1 363
medium frequency broadcasting 1 363
radiotelegraphy 1 364
single sideband hf telephony 1 364
television broadcasting 1 365
Amplitude modulation radio transmitter 11 263 264
antennas 11 264
equipment 11 264
high level modulated 11 263
low level modulated 11 263
monitoring 11 264
protection 11 264
Amplitude modulator 1 354 357* 8 529
cathode 1 354 357
grid 1 354
plate 1 354 355
Ampullaceae 6 574
Ampulla 4 320, 13 52
Ampulla of Vater gallbladder 6 13 17
pancreas 9 535
Ampullae of Lorenzini 12 180
AMS 6 425
Amsel A 5 549
Amu *see* Atomic mass unit
Amu River 1 580
Amur River 1 580
Amygdalase 5 203
Amygdalin 10 439
Amygdaloid 1 365
Amygdaloidal lava 1 365
Amygdaloidal structure, igneous rocks 7 13
Amygdule 1 365
in basalt 2 106
Amyl chlorides 3 75
Amyl phenols 6 422
Amylase 1 365-366*, 2 19, 461, 5 27-28, 203 204, 8 82
blood chemistry 3 197
enzyme 5 20-22
maltase 8 81
salivary 4 161
alpha-Amylase 4 164
Amylase determinations: clinical pathology 3 192 202
Amylene 3 235
Amyloglucosidase 5 28
Amylo 1, 6-glucosidase 8 262
Amyloid 8 257
metabolic disorders 8 257
Amyloidosis 13 9
Amylolytic enzyme 4 170, 9 609
Amylopectin 10 490
gum 6 298
starch *13 51*
Amylopsin 4 170
Amylose gum 6 298
starch 13 51
see also Cellulose
Amylo 1 4 (or 1 6) transglucosidase 8 262
Amyotonia congenita 8 659
Amyotrophic lateral sclerosis 9 69
Amytal 6 505 11 114, 14 217
A N radio range 11 254 255
Anabaena 3 636, 9 11, 12 67
Anabantidae 10 10
Anabas 11 516
Anabiosis 13 397
Anabolism 8 263 264
bacteria 2 47 63
Anabrus simplex 9 116
Anacanthini *see* Gadiformes
Anacardiaceae 8 90 10 438, 12 26 14 282
Anacardium occidentale 2 558
Anaconda 2 272 12 300
Anactinia pelagica 2 654
Anactinochitinosi 1 21 25
Anadromous fish 8 427
Anaerobic bacteria 2 7, 13 1
Anaerobic plates culture pure 9 616
Anagale 7 143
Anagale gobiensis 10 580
Anagalopus 7 143
Anaglyph 10 160
Anagrus armatus 6 581
Anagyrus vesculosus 4 210
Anal gland 12 61
Analbite 1 224, 5 211
Analcime 1 266*, 14 611
Analcite 12 476
Analemma (globe) 6 214 215
Analgesics 1 366
Analog computer 1 366 5*, 3 359
comparison to digital computers 1 367
computing circuits 1 367 376
computing mechanisms 1 368 376
coordinate system converters 1 385 386
differential analyzer 4 122 124
electromechanical 1 367
electronic 1 367
function generation 1 376 385
mechanical 1 367
mechanical electrical analogies 1 368
simulator 12 340
slide rule 12 378
solution of equations 1 384 386
symbols 4 123
Analog computing devices 1 368 376
electrical addition 1 369
electrical differentiation 1 374
electromechanical differentiation 1 374
electromechanical division 1 373
electromechanical integrators 1 375-376
electronic integrator 1 376
electronic quarter-square multiplier 1 372
mechanical addition 1 369 380
mechanical differentiation 1 375 374
mechanical division 1 372
mechanical integrators 1 375
mechanical multiplication 1 370
pulse width, pulse amplitude multipliers 1 371 372
servomultipliers 1 371
time division multipliers 1 371
see also Analog computer
Analog to digital converter 1 396
Analogies dynamical *see* Dynamical analogies
Analysis (mathematics) calculus differential and integral 2 401 403
calculus of vectors 2 410

alysis of variance 1 386-387
biometrics 2 228
restrictions on use 1 386
alyte 13 655
alytic functions complex numbers and complex variables 5 339 340
group theory 6 283 284
series 12 192
nalytic geometry 1 387 392
angle 1 388 389
area of a triangle 1 389
circle 1 389
conic sections 1 389 390,
line 1 388
linear combinations 1 389
loci 1 388
plane 1 388
slope 12 382
surface 1 391 392
see also Algebra
Analytic number theory 9 226 227
Analytical balance see Balance (analytical)
Analytical chemistry 1 392 394
chemical microscopy 3 30
chromatography 3 91 98
colorimetric analysis 3 301
coulometric analysis 3 517
determination 1 393
dielectric constant 4 112 113
electrodeposition analysis 4 473 475
errors in 1 394
fluorimetric analysis 5 350 351
gas analysis 8 45 46
gravimetric analysis 6 262 265
instrumental analysis 7 151 152
isotope dilution techniques 7 295
molecular weight 8 556 558
optical methods 9 353
polarimetric analysis 10 446
polarographic analysis 10 454
qualitative analysis 11 136 139
quantitative analysis 11 142 144
radiochemistry 11 299
radioisotopes 11 299
refractometric analysis 11 408
sampling 1 392 393 12 21
solubilizing of samples
Analytical chemistry—cont
spectrochemical analysis 12 578
spectrophotometric analysis 12 586
thermoanalysis 13 556
Analytical chemistry, *errors in* 1 394
Analyzer, sound *see* Sound analyzer
Analyzer, spectrum *see* Spectrum analyzer
Anamnia 1 394 395* 13 551
Anamniota 1 394 14 508
Anamorphic lens systems 1 591, 12 603
Anamas solitus 10 257
Anancus 10 635
Anaphase (cell) 3 109
meiosis 8 211
mitosis 8 521
Anaphylactic reaction antigen antibody 1 473
Anaphylactoid reaction hypersensitivity 6 590
Anaphylaxis 1 395* 566 6 589
Anaplasia 1 395
oncology 9 319
Anaplasma 8 325 11 567
Anaplasma marginale 11 567
Anaplasmataceae *11 567*
Anaplastic carcinoma 2 348
Anapsid 11 484
Anapsida 1 395 396* 11 484
Chelonia 11 484
Corvlosauria 5 515, 11 484
Anarcestes 4 87
Anas 11 527
Anas acuta 4 290 291
Anas platyrhynchos 1 456 4 290
Anas strepta 6 405 407 15 29
Anasarca 4 409
Anasca 3 16
Anastomites multiformis zone 14 82
Anaspida 1 396 429*
Anaspidacea 1 396* 563
Syncarida 13 367
Anaspides 13 367
Anaspides tasmaniae 1 396 562
Anaspididae 1 396
Anastatic water 6 276
Anastigmatic lenses 7 455
Anastrepha 4 219
Anatase 11 656 13 632
Madelung *constant* 8 15
Anatidae 1 436 4 290 6 236 13 333
Anatolian plateau 1 580
Anatomy regional 1 396 397
Anatosaurus 4 200 201, 12 362
Anatoxin 3 165
ula 2 356
Anceus form 6 225
Anchisaurus 4 199
Anchistropus 3 151
Anchor machinery marine 8 125
Anchorabolus mirabilis 6 344
Anchovy 3 223, 5 416 419
Ancistrocoma 11 59
Ancistrodon contortrix 3 472
Ancistrodon piscivorus 3 515
Ancistromesus 8 561
Ancoma 5 88
Ancylostoma 13 193
Ancylostoma braziliense 6 478
Ancylostoma caninum 6 478
Ancylostoma duodenale 6 478, 13 192
Ancylostomidae 13 193
Ancylus Lake 2 87
AND circuit cryotron 3 577
digital computer 4 178 181
AND function 13 358
AND gate switching circuit 13 345
Andalusite 1 397
Andaman Sea 7 36 9 273
Andean condor 5 178
Andean peaks (elevations) 12 529
Anderson, C. D. 4 502 8 217, 10 524
Anderson, F. F. 8 609
Anderson, E. M. 15 417
Anderson, E. R. 12 103
Anderson, P. W. 1 470 471
Anderson, V. C. 12 60
Anderson bridge inductance measurement 7 67
Anderson theory of antiferromagnetism 1 470 471
Andes Mountains 12 524
*Andesine 1 397** 5 213
Andesite 1 397 398*, 7 16 10 86 11 590 14 347
composition 1 397
compressive strength 4 613
occurrence 1 398
origin in sial 13 413
petrographic province 10 51
texture and structure 1 398
Andesite porphyry 11 590
Andesitic tuff 14 134
Ando soils 12 434
Andradite 6 40 12 351
Andreaea rupestris 8 635
Andreaeopsida 8 635
Andreanof Island 1 523
Andrena 6 582
Andrenid bee 6 574
Andrenidae 6 574
Andrews, Donald H. 1 552
Andrews, Thomas 7 535
Andrias sarchus 2 524
Andrias 3 578
Androconium 7 459-473
Androecium 5 527
Androgen 1 398 399*, 6 479 11 477, 15 526
biosynthesis 1 398
catabolism 1 399
estrogen 5 77
reproductive system 11 475
sex determination 12 228
sterol 13 359
Androgenesis 1 399 400 5 234
Andromeda (constellation) 3 412 413
Andromeda Nebula 1 400
Andromedotoxin 10 440
Andromerogony 8 211
Andropogon 4 293, 5 38
Andropogon furcatus 2 272
Andropogon scoparius 2 272 5 190 11 621
Andropogoneae 5 189
Andros Island 14 473
delta 4 Androstene 3 17 dione 1 398 399 3 77 9 454, 13 526
delta 4 Androstene 11 (*beta*) ol 3, 17 dione 13 526
delta 4 Androstene 3, 11, 17 trione 13 526
Androsterone 13 526
reproductive system 11 477
*Anechoic chamber 1 400**, 1 665
Aneides lugubris 12 7
Anelasticity 1 400 401
Anemia 1 401 402, 3 196, 4 296
circulation disorders 3 141 144
congenital hemolytic 1 401
fragility test in congenital hemolytic 3 195
hematologic disorders 6 393 396
hemolytic 1 401
hookworm disease 6 478
iron deficiency 1 401
myelophthisis 1 402
pancytopenia 1 402
pernicious 1 401, 6 412
sickle cell 3 401, 3 195
thalassemia 1 401
Vitamin B_{12} 14 542
Anemia congenital hemolytic 1 401
hematocrit determination 3 195
Anemochory population dispersal 10 495
Anemometer 1 402 403*, 14 499
air-velocity measurement 1 221
cup 1 402
hot wire 1 402 14 502 503
propeller 1 402
vane 1 402
Anemone 1 52, 247, 3 189
Anemone patens 2 212
Anemonia 1 52 54
Anemophilous flower 5 326

Anemotaxis 13 103
Anencephaly 9 69
Anepitheliocystida 4 148 150
Anesthesia 13 323
  thermotherapy 13 596
  xenon 14 561
Anesthetic 1 403
  ether 5 86
Anestrus 5 79
Anethole 5 71
Anethum graveolens 4 192
Aneto, Peco d' 5 119
Aneuploidy 3 113
Aneurin *see* Thiamine
Aneurophyton 9 504
Aneurysms 1 403*, 3 141-144, 6 412
  abdominal 1 403
  aortic 1 403
  thoracic 1 403
Angelic acid (cis) 2 475
Angelica 14 507
Anger 4 583
  physiological response 4 585
Angina pectoris 1 403-404*, 6 360
Angioblast 2 483
Angiogenesis 2 483
Angiospermae 1 404*, 10 321, 346, 14 595
  Dicotyledoneae 1 404, 408, 10 346
  flower 1 404
  fossil plants 9 503
  Monocotyledoneae 1 404, 8 572, 10 346
  Pteropsida 1 404
  reproduction 1 404
Angiospermous wood anatomy 14 524 525
Anguientsin 4 588, 14 233
Angle 1 388 389, 404 405*
  dihedron 4 192
  measurement *see* Angular measurement
  noneuclidean geometry 6 159 160
  plane trigonometry 14 93
  protractor 11 60
  radian measure 11 212
Angle modulation 1 405, 8 527
  frequency modulation 3 511 514
  narrow band 8 528
  phase 10 103
  wide band 8 528
Angle of attack airplane 1 211
  wing twisting 1 90
Angle of attack indicator 14 507
  stall warning indicator 13 36
Anglerfish 7 583
Anglesite 1 406*, 7 425
Angora goat 6 227
Angoumois grain moth 7 467
Angrite 8 315
Angstrom, A J 1 406
Angstrom (unit) 1 406
Angstrom compensation pyrheliometer 11 214
Anguidae 13 24
Anguilla rostrata 4 412 1 406
Anguilliformes 1 406*, 9 442
  eel 4 412
Angular acceleration *see* Acceleration
Angular accelerometers 1 28
Angular displacement 4 244
  harmonic motion 6 342
Angular force lattice vibrations 7 414
Angular frequency 1 406
  harmonic motion 6 341
Angular magnification 8 72
Angular measurement alidade 1 241
  clinometer 3 202
  sextant 12 234 235
  surveying 13 325
  synchro 13 367 369
  theodolite 13 546
  transit 13 525
Angular momentum 1 406 407
  conservation of 1 406 407, 3 408, 11 573
  of electron 4 517
  of galaxies 5 506
  gyromagnetic effect 6 306 307
  of nucleus 9 202 208
  rigid body dynamics 11 573
  rotational motion 11 632
  selection rules 12 160 162
  of solar system 3 508
  spin 12 615
Angular resolution (optics) *see* Resolving power (optics)
Angular speed 14 293
Angular speed measurement tachometer 13 582 585
Angular transformation bio metrics 2 231
Angular unconformity 14 191
Angular velocity 14 292
Angular vibration harmonic motion 6 342
Angyal, S 10 33
Anharmonic oscillator 1 407
Anhedral crystal 7 11
Anhedral wing shape 15 228
Anhimidae 1 456
Anhinga anhinga 9 612
Anhydride acid *see* Acid anhydride
Anhydrite 1 407* 2 598
  evaporite (saline) 5 127
  Permian deposits 10 25 27
Anhydrone 4 77
Anhydrous ammonia 5 237
Anil 7 280
Anilidae 13 27
Aniline 1 407 408*, 305
  diazotization 4 107
  see also Toluidine
Aniline black 1 408
Aniline-formaldehyde resins 14 217
Aniline presses (printing) 10 620
Aniline printing 10 600
Anilocra 5 291
Animal 1 408
  classification 1 422
  geologic distribution 9 521
  see also Animal kingdom, specific entries on various animals
Animal assay 2 198
Animal breeding *see* Breeding (animal)
Animal community 1 408 411
  classification 1 409
  consortium 1 411
  in deep sea 4 39
  distribution 1 409
  divisions 1 408
  habitat 1 408
  operation 1 410
  social relations 1 411
Animal evolution 1 411 416
  annelids 1 415
  arthropods 1 415
  chordate origins 1 414
  conquest of land 1 415
  Deuterostomia 1 415
  early Metazoan history 1 411 413
  Enterocoelia 1 413
  fish 1 414
  lower animals 1 411
  mammal origins 1 415
  Metazoa 1 411
  mollusks 1 415
  Parazoa 1 411
  primates and man 1 416
  Protostomia 1 415
  Protozoa 1 411
  reptile radiation 1 415
  sessile arm feeders 1 414
  worm phyla 1 415
Animal feed composition 1 425 427
  manufacturing 5 405 406
Animal growth 1 417
  chemical requirements 1 417
  course 1 418
  growth factors 1 418
  growth regulation 1 419
  hormones in 1 418
  inorganic substances in 1 417
  measurement 1 418
  organic substances in 1 417
  relative growth 1 418
  size limitation 1 419
  stimulants 1 475
Animal kingdom 1 419 420* 2 314
Animal morphogenesis 1 420 421
  differential growth 1 421
  embryology 4 568
  experimental studies 1 421
  form and function 1 420
  nervous system 9 44 45
  pattern of structure 1 420
  thyroid 13 622
Animal pelts *see* Leather and fur processing
Animal starch *see* Glycogen
Animal symmetry 1 422
  antimere 1 475
  asymmetry 1 422
  bilateral 1 422
  biradial 1 422
  radial 1 422
  spherical 1 422
Animal systematics 1 422 423
  descriptive phase 1 422
  phylogenetic phase 1 423
Animal virus 1 423 425
  adenovirus 1 65
  agglutination reaction 1 112
  chickenpox and shingles 3 58
  cold, common 3 275
  coxsackie virus 3 550
  culture embryonated egg 3 614
  dengue fever 4 62
  enterovirus 5 5
  ECHO virus 4 579
  encephalitis equine 4 597
  epidemiology 1 425
  exanthem subitum 5 133
  foot and mouth disease 5 429
  German measles 6 175
  hemadsorption viruses 6 394
  herpes simplex 6 426
  inclusion blennorrhea 7 33
  inclusion bodies (virus) 7 55
  infectious mononucleosis 7 93
  influenza 7 98
  keratoconjunctivitis (epidemic) 7 537
  louping ill 7 593
  lymphocytic choriomeningitis 7 636
  lymphogranuloma psittacosis group 7 639
  lymphogranuloma venereum 7 636
  measles 8 188
  meningitis 8 224
  molluscum contagiosum 8 561
  multiplication 1 424
  mumps 8 632

Animal virus—cont
mutation 1 424
myxomatosis infectious (rabbits) 8 687
myxovirus 8 689
Newcastle disease 9 91
phlebotomus fever 10 115
pneumonitis 10 429
poliomyelitis 10 456 459
psittacosis 11 69
rabies 11 197
Rous sarcoma 11 635
salivary gland virus disease 12 14
size 1 423
smallpox 12 585
tick fever Colorado 13 630
trachoma 14 9
tumor viruses 14 136
West Nile fever 14 476
yellow fever 14 604
see also Bacteriophage Plant virus Virus
non 4 494
chemical binding 3 25
coordination number 3 461 462
ion exchange 7 241
in sea water 12 108
in soils 12 426
ionic surface active agent 13 321 322
isomorphic tautomerism 13 402 403
Ass 5 612
Intsakidae 1 572
Anise 1 427
oil 5 71
spice and flavoring 12 612
Anisoptera 1 427
Anisotropic 8 559
Anisotropic effective mass see Effective mass (charge carriers)
Anisotropy (physics) 1 428
birefringence 2 244
ferromagnetism 5 231 234
magnetic 5 471
single crystals 5 580 12 341*
Anisotropy constants ferromagnetism 5 231
Anisotropy energy crystalline 5 231
Ankaratherium 10 500
Ankerite 1 429
carbonate minerals 2 467
Ankistrodesmus 1 235
Ankle 1 429
Ankyloglossia 4 165
Ankylosaur 11 484
Ankylosauria 11 484
Ankylosaurus 4 201, 11 481
Annealing glass 6 207
induction heating 7 73
nonferrous metals and alloys 6 378
steel 6 380 381
Annelida 1 429, 428 430 5 262
circulatory system 1 429
embryology 1 429
excretory system 1 429
Hirudinea 6 436 437
metamerism 1 429
morphology 1 429
muscular system 1 430
nervous system 1 429
Oligochaeta 9 513
Polychaeta 10 461
Polymera 10 478
regeneration 1 430, 11 420 421
reproductive system 1 430
Annelida fossils 1 431 432
conodonts 1 432
Gephyrea 1 431
Hirudinea 1 431
Oligochaeta 1 431
Polychaeta 1 431
scolecodonts 1 431
Annellidae 13 21
Annual parallax 9 545
Annual plants 1 432 433
Annular bit 2 296
Annular drainage 11 483
Annular eclipse 4 390
Annular space boring and drilling mineral 2 297
Annularia 2 391 9 502 504
Annulata see Annelida
Anobiidae 3 277
Anobium punctatum 3 237
Anode dark space glow discharge 6 215 216
Anode glow 6 215 216
Anode rays see Canal rays
Anode rise 1 501
Anodic inhibitor 7 112
Anodic pickling 4 532
Anodized aluminum dyeing 4 511
Anodized aluminum wire 8 27
Anodized magnesium 4 535
Anodizing 4 469
electroplating of metals 4 534
Anodonta 5 100 9 613
Anogrossus latifolia 6 297
Anoles 9 102 10 127
Anolis carolinensis 3 7
Anomalistic year 14 509
orbital motion of Earth 4 536
Anomalocoela 12 8
Anomalops 2 220
Anomalous dispersion see Dispersion
Anomalous Zeeman effect 14 608 609
Anomaly (astronomy) eccentric 2 581
mean 2 581
true 2 581
Anomocoela 1 433
Anomphalacea 6 75
Anomura 4 21 31
Anopheles 4 218 5 258 6 315 317 8 77 599
Anopheles darlingi 5 258
Anopheles durensi 6 315
Anopheles gambiae 5 258
Anopla 1 433
Heteronemertini 6 429
Palaeonemertini 9 496
Rhynchocoela 1 433
Anoplocephala magna 12 30
Anoplocephala perfoliata 12 30
Anoplocephalidae 12 30
Anoplophrya 1 601
Anoplothere 1 568
Anoplura 1 433 431 7 154 593
Anorexia 6 529
Anorthite 1 434*, 5 214
feldspar species 5 207
Anorthoclase 1 434 435* 5 212
Anorthosite 1 435* 6 1 7 16
bytownite 10 86
petrographic province 10 32
Anosmias 12 586
Anostraca 1 435* 560 3 562
Anostylostroma 13 192
Anoxia 1 435* 606 6 412
circulation disorders 3 141 144
hematologic disorders 6 395
see also Hypoxia
Anschutz 11 6 803
Anscocolor film 10 167
Anser albifrons 6 237
Anser anser 1 436
Anser cygnoid 1 436
Anseranas semipalmata 1 436
Anseriformes 1 436* 691
Ciconiiformes 3 120
swan 13 355
Anserine 6 457 9 629
Ant 1 436 437* 6 574
arms 12 406
carpenter 12 407 14 558
Hymenoptera 1 436
important species 1 437
ponerine 12 405
social organization 1 436
Ant blood beetle 3 277
Ant lion 1 437
Ant loving beetle 3 276
Antarctic Bottom Water 1 626
Antarctic Circle 1 437
Antarctic Convergence 1 439 442, 626
Indian Ocean 7 58
Antarctic Intermediate Water Indian Ocean 7 58
Antarctic Ocean 1 437 440*, 9 271
Antarctic Convergence 1 439
climate and biology 1 439
ice 1 438
icebergs 7 7 8
oceanographic investigations 1 438
subsurface water movement 1 439
Subtropical Convergence 1 439
surface circulation 1 438
Antarctica 1 440 442
area of ice cover 1 521
biological distributions 1 442
climatic character 1 440
coal measures 1 440
coastal oceanic relations 1 441
international scientific aspects 1 442
magnetic patterns 1 442
physical map 1 441
structure and land surface 1 440
see also Antarctic Ocean
Antarctosaurus 4 200
Antares 1 442* 13 41
Antaugyphore 3 99
Anteater 1 442 443*, 4 411 12 47
Antelao 5 119
Antelian group 5 337
Antelope 1 443* 567
pronghorn 1 443
Antenna (aerial) 1 443-453
array 1 447* 11 203
beam 1 447
biconical 1 445 446
bow tie 1 445 446
broadcast receiving 1 444 447
cheese 1 449
comb 1 451
conical 1 445-446
core use of ferrites 5 221
corner reflector 1 446
cylindrical parabolic reflector 1 448 449
dielectric wave guide 1 449
dipole 1 444 445* 11 203
directional antennas 1 363
directive 1 363
diversity 1 446 453
Doppler radar 4 296
electromagnetic horn 1 447-449

Anemotaxis 13 403
Anencephaly 9 69
Anepitheliocystida 4 148 150
Anesthesia 13 323
  thermotherapy 13 596
  xenon 14 561
Anesthetic 1 403
  ether 5 86
Anestrus 5 79
Anethole 5 71
Anethum graveolens 4 192
Aneto, Peco d' 5 119
Aneuploidy 3 113
Aneurin *see* Thiamine
Aneurophyton 9 504
Aneurysms 1 403*, 3 141-144, 6 412
  abdominal 1 403
  aortic 1 403
  thoracic 1 403
Angelic acid (cis) 2 475
Angelica 14 507
Anger 4 583
  physiological response 4 585
Angina pectoris 1 403-404*, 6 360
Angioblast 2 483
Angiogenesis 2 483
Angiospermae 1 404*, 10 321 346, 14 595
  Dicotyledoneae 1 404, 408, 10 346
  flower 1 401
  fossil plants 9 503
  Monocotyledoneae 1 404, 8 572, 10 346
  Pteropsida 1 404
  reproduction 1 404
Angiospermous wood anatomy 14 524-525
Angiotensin 4 588, 14 233
Angle *1 388 389, 404-405**
  dihedron 4 192
  measurement *see* Angular measurement
  noneuclidean geometry 6 159 160
  plane trigonometry 14 93
  protractor 11 60
  radian measure 11 212
Angle modulation 1 405, 8 527
  frequency modulation 5 511-514
  narrow band 8 528
  phase 10 103
  wide-band 8 528
Angle of attack· airplane 1 211
  wing twisting 1 90
Angle of attack indicator 14 597
  stall warning indicator 13 36
Anglerfish 7 583
Anglesite 1 406*, 7 425
Angora goat 6 227
Angoumois grain moth 7 467
Angrite 8 315
Angstrom, A J 1 406
Angstrom (unit) 1 406
Angstrom compensation pyrheliometer 11 214
Anguidae 13 24
Anguilla rostrata 4 412, 1 406
Anguilliformes 1 406*, 9 442
  eel 4 412
Angular acceleration *see* Acceleration
Angular accelerometers 1 28
Angular displacement 4 244
  harmonic motion 6 342
Angular force lattice vibrations 7 414
Angular frequency 1 406
  harmonic motion 6 341
Angular magnification 8 72
Angular measurement alidade 1 244
  clinometer 3 202
  sextant 12 234 235
  surveying 13 325
  synchro 13 367-369
  theodolite 13 546
  transit 13 325
Angular momentum 1 406 407
  conservation of 1 406-407 3 408, 11 573
  of electron 4 517
  of galaxies 3 506
  gyromagnetic effect 6 306 307
  of nucleus 9 202 208
  rigid body dynamics 11 573
  rotational motion 11 632
  selection rules 12 160 162
  of solar system 3 508
  spin 12 615
Angular resolution (optics) *see* Resolving power (optics)
Angular speed *14 295*
Angular speed measurement tachometer 13 382 385
Angular transformation bio metrics 2 231
Angular unconformity 14 191
Angular velocity 14 292
Angular vibration harmonic motion 6 342
Angyal A 10 33
Anharmonic oscillator 1 407
Anhedral crystal 7 11
Anhedral wing shape 13 228
Anhimidae 1 436
Anhinga anhinga 9 612
Anhydride, acid *see* Acid anhydride
Anhydrite 1 407*, 2 308
  evaporite (saline) 5 127
  Permian deposits 10 25 27
Anhydrone 4 77
Anhydrous ammonia 5 237
Anil 7 289
Anilidae 13 27
Aniline 1 407-408*, 305
  diazotization 4 107
  see also Toluidine
Aniline black 1 408
Aniline formaldehyde resins 14 217
Aniline presses (printing) 10 620
Aniline printing 10 600
Aniocra 5 291
Animal 1 408
  classification 1 422
  geologic distribution 9 521
  see also Animal kingdom, specific entries on various animals
Animal assay 2 198
Animal breeding *see* Breeding (animal)
Animal community 1 408-411
  classification 1 409
  consortism 1 411
  in deep sea 4 39
  distribution 1 409
  divisions 1 408
  habitat 1 408
  operation 1 410
  social relations 1 411
Animal evolution 1 411-416
  annelids 1 413
  arthropods 1 413
  chordate origins 1 414
  conquest of land 1 415
  Deuterostomia 1 413
  early Metazoan history 1 411 415
  Enterocoelia 1 413
  fish 1 414
  lower animals 1 411
  mammal origins 1 415
  Metazoa 1 411
  mollusks 1 413
  Parazoa 1 411
  primates and man 1 416
  Protostomia 1 413
  Protozoa 1 411
  reptile radiation 1 415
  sessile arm feeders 1 414
  worm phyla 1 413
Animal feed composition 1 425 427
  manufacturing 5 405 406
Animal growth 1 417
  chemical requirements 1 417
  course 1 418
  growth factors 1 418
  growth regulation 1 419
  hormones in 1 418
  inorganic substances in 1 417
  measurement 1 418
  organic substances in 1 417
  relative growth 1 418
  size limitation 1 419
  stimulants 1 425
Animal kingdom 1 416 426*, 2 314
Animal morphogenesis 1 42- 421
  differential growth 1 421
  embryology 4 568
  experimental studies 1 421
  form and function 1 421
  nervous system 9 44-45
  pattern of structure 1 421
  thyroid 13 622
Animal pelts *see* Leather and fur processing
Animal starch *see* Glycogen
Animal symmetry 1 422
  antimere 1 475
  asymmetry 1 422
  bilateral 1 422
  biradial 1 422
  radial 1 422
  spherical 1 422
Animal systematics 1 422 425
  descriptive phase 1 422
  phylogenetic phase 1 423
Animal virus 1 423 425
  adenovirus 1 65
  agglutination reaction 1 112
  chickenpox and shingles 3 58
  cold common 3 273
  coxsackie virus 5 510
  culture embryonated egg 3 614
  dengue fever 4 62
  enterovirus 5 3
  ECHO virus 4 370
  encephalitis, equine 4 567
  epidemiology 1 425
  exanthem subitum 5 135
  foot and mouth disease 5 429
  German measles 6 175
  hemadsorption viruses 6 394
  herpes simplex 6 426
  inclusion blennorrhea 7 53
  inclusion bodies (virus) 7 55
  infectious mononucleosis 7 95
  influenza 7 98
  keratoconjunctivitis (epidemic) 7 537
  louping ill 7 593
  lymphocytic choriomeningitis 7 636
  lymphogranuloma psittacosis group 7 636
  lymphogranuloma venereum 7 636
  measles 8 188
  meningitis 8 224
  molluscum contagiosum 8 561
  multiplication 1 424
  mumps 8 632

Antibody—cont
fluorescent antibody technique 8 583
gamma globulin 6 33
in immediate hypersensitivity 1 566
immunity 7 33
lysin 7 638
neutralization reaction 9 82
neutralizing 9 82
opsonin 9 546
in phagocytosis 10 91
precipitin 10 576
Quelling reaction 11 188
in serology 2 201
synthesis 6 34
in syphilis 13 375
toxin antitoxin reaction 14 7
toxoplasmosis 14 7
Weil's disease 14 464
Anticaking agent (food) 5 376
Anticholinesterase 3 45
insecticide 7 142
Anticline 1 469
fold systems 5 568
Anticoagulant rodenticide 11 615
Anticorrosive paint 4 282
Anticorrosive pigment 10 224
Anticyclone 13 165 14 446
atmospheric high 1 640 642
Anticyclonic circulation 14 493 494
Antiderivative integration 7 167
Antidifference 10 646
Antidifferentiation 2 402
Antidiuretic hormone 13 608, 14 252
endocrine mechanisms 4 593
osmoregulatory mechanisms 9 441
Antidotes for poison 14 6
Antifebrin phenacetin 10 110
Antiferroelectrics 5 227 229
Curie Weiss law 5 623 624
Antiferromagnetic resonance 8 46
Antiferromagnetic susceptibility 13 331 332
Antiferromagnetism 1 469 471
antiferromagnetic susceptibility 13 331 332
contrasted with ferromagnetism 1 470* 5 251
ferrimagnetism 5 210
magnetic anisotropy 1 471
magnetochemistry 8 54
Néel temperature 1 469 470
neutron diffraction 9 90 91
superexchange 1 471
Antifertilizin 3 234 236
Antifluorite structure 12 477
Antifoam 3 366
Antifoggant photography 10 162
Antifouling paint 4 282
Antifreeze mixture 1 471 472
ethylene glycol 5 94
Antifriction bearing *see* Bearing antifriction
Antifungal agents *see* Fungistat and fungicide
Antigalvanic paint 4 282
Antigen 1 472*, 475 566
agglutinin 1 112
allergy, atopic 1 257
anaphylaxis 1 595
animal virus 1 424
antibody 1 468
blood groups 2 269
fluorescent antibody technique 8 583
hypersensitivity 6 589
isoantigen 7 274
pneumococcus 10 426
Salmonella 12 14
serum 12 198
sources 1 472
specificity 1 472
Antigen antibody reaction 1 472 473 474* 12 196
agar gel test 1 473
agglutination reaction 1 473
anaphylactic reaction 1 475
bacteria 2 8
biological specificity 2 217
capsular swelling reaction 1 473
complement fixation reaction 1 473
delayed allergic reaction 1 473
gamma globulin 6 33
lytic reaction 1 473
neutralization reaction 1 473
phagocytic reaction 1 473
precipitin reaction 1 473
protection reaction 1 473
ring test 1 473
Schick test 1 473
skin reaction 1 473
Antigen antibody test 6 106
Antigenic mosaic 1 472
Antigonum leptopus 10 472
Antigorite 12 197
Antigravity 1 474
Antihemophilic factor 2 266
Antihistamines 1 474* 6 457
Antiknock agents 1 474 475
aircraft fuel 1 178
combustion knock 3 309
gasoline 6 71
tetraethyllead 7 426, 13 529
Antilles West Indies 14 474 476
Antilles Current 1 626
Antilocapra 1 568
Antilocapra americana 1 445
Antilocapridae 1 443, 569
Antimatter 1 475
elementary particle 4 542 545
symmetry laws 13 565
Antimere 1 475
Antimetabolite enzyme inhibition 5 29
Antimicrobial agents 1 475 477
antibacterial agents 1 463 464
chemotherapy 5 52
iodoform 7 240
isonicotinic acid hydrazide 7 292
nitrofuran 9 107
Antimonate 1 477
Antimonite salts 1 478
Antimony 1 477-478
allotropic forms 1 477
analytical methods 1 478
electron configuration 4 504
extraction and refining 11 120
extractive metallurgy 8 277
ionization potential 4 504
occurrence 1 477
ore of 2 515 13 140
organometallic compound 9 403
preparation 1 477
properties 1 477 478
tetrahedrite 13 529
Antimony fluoride band spectrum (photograph) 2 90
Antimony sulfide cell 10 140
Antineutron 1 478 479*, 9 83
elementary particle 4 545
Antinode (physics) 13 36
Antinoise microphone 8 561
Antioxidant 1 479 480
food 5 326
gasoline additives 6 70
lubricant 7 603
rubber 11 636
Antiozonant rubber 11 637
Antiparasitics animal 1 475
man 1 475
Antiparticle 1 475
antineutrino 9 83
antineutron 1 478 479
antiproton 1 491 492
elementary particle 4 542 543
positron 10 524
Antipatharia 1 455, 480 481* 3 255
Antipathes 3 255
Antipathes longibrachiata 1 481
Antipathes rhipidion 1 481
Antipersonnel mines 1 540
Antiperthite 3 211 212
igneous rocks 7 12 15
Antipodals botany 5 526 554
Antipolarization ferroelectrics 5 229
Antiproton 1 481 482*, 4 543
Antipyretic aspirin 1 592
phenacetin 10 110
Antipyrine 11 110
Antireflection coatings 6 185
Antirenin 14 253
Antiresonance 1 482, 11 502 12 74
Antirrhinum 4 254
Antiseptic 1 482 484
alcohol 1 485
comparison of 1 483
essential oils 1 483
iodine 1 482
mercurial compounds 1 482
quaternary ammonium compounds 1 483
silver compounds 1 485
Antiserums 2 217
Antisubmarine howitzer 12 267
Antisubmarine nets 1 485
Antisubmarine warfare 1 484 487
airship 1 220
naval ships 12 263 267
sonar 12 502 504
sonobuoy 12 506
Antisymmetric wave function exclusion principle 5 157
Antitank artillery 1 538 539
Antitank mines 1 540
Antitank projectile 1 540
Antitorpedo nets 1 485
Antitoxin 1 487*, 13 527
biologicals 2 217
gangrene, gas 6 38
neutralization reaction (antibody) 9 82
reaction with toxin 14 7
Antivenin 2 217 12 80
Antiwear additive lubricant 7 603
Antiworld 1 475
Antlia 3 413 414
Antlike flower beetle 5 277
Antlike leaf beetle 5 277
Antlike stone beetle 5 276
Antoniadi, E. M. 8 154
Antrim Plateau basalts 11 597
Antrypol 12 378
ANTU 9 5 11 615
Anura *see* Salientia
Anuraphis maidi radicis 6 474
Anuria 5 192 202
Anuropus 5 290
Anus 1 487
hemorrhoids 6 414
Aorta 1 487
circulation 5 137 141
dorsal formation of 2 484
ventral formation of 2 485
Aortic aneurysms 1 403

Antenna (aerial)—*cont*
equiangular spiral 1 445-446
feeding and matching 1 451
fishbone 1 451
folded dipole 1 445 446
full wave 1 451
ground effects 1 453
half wave 1 445 446
helical 1 447
horn reflector 1 446 448
impedance 1 450 451
lenses 1 448 449*, 11 203
linear conductor 1 444-447
loading 7 565
long-wire 1 446
loop 1 445 9 13
measurement 1 447
microwave 8 414 415
monopulse radar 8 577
multiple tuned 1 444 445
MUSA 1 447
noise 9 119
optical types 1 448-449
parabolic reflector 1 448-449
parasitic arrays 1 447
pillbox 1 449
radar 11 202 204
radiation 1 449-453*
14 55-56
radiation efficiency 1 450
radiation resistance 1 450-451
radio receiver 11 259
radio telescope 11 261-263
reflecting 1 448 449
rhombic 1 446
slot 1 448
television receiver 13 470
television transmitter 13 480
towers 1 451, 14 1
tracking 1 447
types and arrays 1 444 449
uhf 1 443 453
uhf 1 *443 453*
wave guide 1 447-448
wire 1 446
Yagi 14 597
Antenna radiation 1 449 453
Antenna scanning radar 11 201 205
Antennal gland 5 565, 4 28, 5 105
Antennaria 10 489
Antennata see Mandibulata
Anthelia fulginosa 1 227
Anther 5 327
Antheraea assamensis 7 469
Antheraea polyphemus 7 469
Antheraea yamamai 7 469
Antheridia 8 634
Antheridium 1 574, 5 66, 263
Chlorophyta 3 80 83
reproduction, plant 11 454
Anthicidae 3 277
Anthocaris midea 7 463
Anthoceros 1 453; 2 554, 5 38
Anthocerotae 1 453 454, 10 346
alternation of generations 1 454
structure 1 453
Anthocoridae 6 401
Anthocyanidin 1 454
Anthocyanin 1 454
glycoside 6 224
pigments 6 209
plant metabolism 10 360
Anthocyathea 1 510
Anthomastus 1 226, 3 255
Anthomastus antarcticus 1 227
Anthomedusae see Gymnoblastea
Anthomyzidae 4 212
Anthonomus grandis 3 287, 14 460
Anthophora 6 582
Anthophora edwardsii 6 676
Anthophyllite 1 336, 454 455*, 3 623
asbestos 1 569
Anthopleura 1 52 54
Anthopleura stella 1 52-54
Anthopleura xanthogrammica 1 52-54
Anthoplexaura dimorpha 6 238
Anthosomidae 2 418
Anthoxanthin glycoside 6 224
Anthozoa 1 455 456*, 2 555, 3 255 262, 14 618
Actiniaria 1 455, 3 255
Alcyonacea 1 455, 3 255
Alcyonaria 1 228 455, 3 255
Antipatharia 1 455, 3 255
Ceriantharia 3 255
Cerianthoria 1 455
Coelenterata 1 455
Coenothecalia 1 455, 3 255
Corallimorpharia 3 255
ecology 1 456
Gorgonacea 1 455, 3 255
life cycle 1 455
morphology 1 455
Pennatulacea 1 455, 3 255
physiology 1 455
Ptychodactiaria 3 255, 11 88
Rugosa 1 455
Scleractinia 1 455, 3 255
Stolonifera 1 455, 3 255
Tabulata 1 455
taxonomy 1 455
Telestacea 1 455, 3 255
Zoantharia 1 455; 3 255, *14 618*
Zoanthidea 1 455, 3 255
Anthracene 1 456*, 548, 3 236
Anthracite 3 230 231; 8 452
Anthracnose 2 117, 6 252, 11 344
alfalfa 1 254
currant 3 625
Melanconiales 8 212
pea 9 600
Anthracosauria 1 331, 456*, 7 375
Anthracothere 1 568
Anthracotheriidae 1 569
Anthranilic acid 1 315, 456*, 2 35, 475, 14 126
meta Anthranilic acid 2 475
para Anthranilic acid 2 475
Anthraquinone 1 456
9,10 Anthraquinone 11 194
dye 4 304
Anthraquinone pigments 1 456-457
glycoside 6 224
Anthrax 1 457-458*, 466-467, 2 1, 564, 4 218
in animals 1 457
heterophile antigen 6 429
in man 1 457
Anthraxylon 3 232, 12 140
Anthrenus scrophulariae 3 287
Anthribidae 3 278
Anthrocerotae 2 353
Anthropochory population dispersal 10 498
Anthropology, physical 1 458-461
evolution 1 458
genetics 1 459 460
individual variation 1 460
man classification of 1 458
osteology 1 459
race formation and change 1 459
race geographic distribution 1 458
racial psychology behavior 1 459
somatotyping 1 460 461
statistical analysis 1 461
Anthropometry 1 461 462
Anthroposcopy 1 462
Anthroposphere 2 239 240
Anthura 7 285
Anthuridea 1 462
Anthurium 1 497
Anti Atlas 1 107
Anti-icing wing 14 516 517
Anti isomorphous substance 7 282
Anti rust additives lubricant 7 605
Anti-Stokes lines 11 333 334
Antiaircraft artillery 1 538 539*, 542
fire control systems 5 280 281
gun 1 542
Antiarchi 1 462 463*, 10 255
Antibacterial agents 1 463 64*, 475
chloramine T 3 66
dye 1 463
gaseous 1 463
sulfa drugs 13 245
volatile preservatives 1 63
Antiberon 2 105
Antibiotic 1 464 468*, 472 12 amphotericin B 1 511
antimicrobial action 1 465
bacitracin 2 2
bioassay 2 196
carbomycin 2 461
cattle production, beef 2 562
chlortetracycline 3 89
control 1 464
cycloserine 3 643
demethylchlortetracycline 4 53
effects on animal disease 1 465
effects on human disease 1 465
effects on plant disease 1 468
enzyme inhibition 5 30
erythromycin 5 66
feed supplements 1 426
food manufacturing 5 417
food preservation 5 427
fumagillin 5 560
griseofulvin 6 274
kanamycin 7 329
mode of action 1 465
neomycin 9 35
not used clinically 1 468
novobiocin 9 173
nystatin 9 235
oxytetracycline 9 474
penicillin 9 619
pharmacologic action 1 465
polymyxin 10 483
production 1 464
rickettsioses 11 370
source 1 464
Staphylococcus 13 57
Streptomyces 13 179
streptomycin 13 179
subtilin 13 230
tetracycline 13 527
tyrothricin 14 177
viomycin 14 327
Antibody 1 468 469*, 15 8
ablastin 1 7
agglutination reaction 1 111
agglutinin 1 112
allergy atopic 1 257
in antigen antibody reaction 1 473
as antitoxin 1 487
in blood 2 265
blood groups 2 266
clinical pathology 5 192 202

Arachnida—cont
Pseudoscorpionida 11 67
Scorpionida 12 79
Uropygi 14 235
Arachnodactyly 12 368
Arachnoid membrane 8 224
Arachnoidea 8 244
Arachnoides 5 226
Arachnoidiscus ehrenbergii 4 103
Aradidae 6 401
Araeoscelis 11 50
Araeosoma 4 373
Arafura Sea 7 56 9 271
Arafura Shelf 12 531
Aragonite 1 496 497
calcite 2 397
carbonate minerals 2 468
limestone 7 515
in pearl 9 606
Aragonite-calcite ratio 9 516
Arakan Yoma 1 580
Aral Sea 1 580, 7 387
Arales 1 497* 10 346
dasheen 4 35
Araliaceae 6 189 14 189
Aralkyl derivatives 6 327
Arambourg, C. 13 495
Aramidae 6 286
Aramite 8 518
Aran-Duchenne atrophy 8 659
Araneae 1 496 497*
classification 1 498
morphology 1 497
silk 1 498
Araneida 1 558 559
Araucaria 3 187
Araucarioxylon 9 505 10 45
Arbacia 1 499 2 638 639
Arbacia punctulata 11 49
Arbacioida 1 499*, 4 360 371
Arbor group 8 virus 4 62
Arbor viral encephalitides 1 499 500
yellow fever 14 604
Arbor virus equine encephalitis 4 587
Arbor vitae nervous system 9 60
Arboretum 1 500* 2 506
Arborvitae 1 500* 2 578 9 408
Arbutin 6 224
Arc (mathematics) 1 500
chord 3 87
Arc reflex, reflex unconditioned 11 399 400
Arc body 1 501
Arc discharge 1 500 502* 4 452
anode rise 1 501
applications 1 501
arc body 1 501 502
arc heating 1 502 503
arc production 1 501
cathode fall 1 501
gas tube 6 60
space charge 1 501
Arc discharge—cont
spectrochemical analysis 12 579
Arc distance, latitude 3 456-457
longitude 3 457
Arc heating 1 502 503*, 6 377
air-arc furnaces 1 502 503
arc boring machines 1 502
arc welders 1 502
direct arc furnace 1 502
electric furnace 4 427
indirect arc furnace 1 502 503
melting 1 502
smelting 1 502
submerged-arc furnace 1 502
Arc lamp 1 503 504
carbon arc 1 503
flame arc 1 504
metallic-electrode 1 504
xenon filled 14 561
Arc magnetohydrodynamic (*MHD*) engine 4 491
Arc processes, nitrogen fixation 9 113
Arc quenchers, switch, electric 13 343
Arc welding 1 504 507*, 14 466 467
ac welders 1 505
carbon electrode 1 504
circuit 1 504
consumable electrodes 1 506
current source 1 504
dc welders 1 506
elements of weld 1 504
inert gas metal 1 505
metal 1 504
multiple-operator dc 1 506
nonconsumable electrodes 1 506
submerged melt 1 505
Arcas rocket 8 322
Arcella 1 500 13 524
Arceuthobium vaginatum forma cryptopodum 14 74
Arch 1 507 509
abutment 1 507
axis 1 507
bridge 1 507 509
concrete 1 508
crown 1 507
extrados 1 507
foundations 1 308
intrados 1 507
lamella 1 509
rise 1 507
single hinged 1 508
skewback 1 507
span 1 507
steel 1 508
structures 1 507 509
two hinged 1 508
wood 1 509
Arch (anatomy), branchial 12 356
hyoid 12 356
mandibular 12 356
visceral 12 356
Arch dam 4 4
Arch supports, tunnels 14 142
Archaeoceti 2 660
Archaeocidaridae 3 120
Archaeocyatha 1 509 510
Archaeocyathea 1 510
Archaeocyte 4 56 10 515
Archaeogastropoda *see* Aspidobranchia 1 591
Archaeolaginae 7 585
Archaeolagus 7 585
Archaeolambda 9 537
Archaeolambdidae 9 537
Archaeolithothamnium 3 476
Archaeomycteris 3 64
Archeopteryx 9 520
Archaeopteris latifolia 1 510
Archaeopterygidae 1 511
Archaeopterygiformes 1 510
Archaeopteryx 1 415, 511, 693 694, 3 88 7 327, 12 362
Archaeopteryx lithographica 1 511
Archaeopteryx macrura 1 511
Archaeornis 1 694
Archaeornis siemensi 1 511
Archaeornithes 1 510 511
Archaeornithidae 1 511
Archangiaceae 8 687
Archanthropinae 5 478
Archean 1 515
Archegonia 8 634
Archegonium 5 263
reproduction 11 454
Archelon 11 484
Archenteron 6 78 79
Archeocalamites 9 504
Archeological chemistry 1 511 513
preservation 1 512 513
restoration 1 512
Archeology 1 513-515
dating ancient beams 4 59
excavation 1 514
methods 1 513 514
relation to other disciplines 1 513
Archaeopteris 1 510
Archeopteris 9 504
Archeostigillaria 9 504
Archeozoic 1 515 516
Archer see Sagittarius
Archeria 4 565
Archesporium 5 326 334
Archestemata 5 276
Archiacanthocephala 1 516
Archiannelida 1 429 516
Archibald approach-to-equilibrium method, ultracentrifuge 14 180
Archibenthic zone 8 108
Archichlamydeae 1 517*, 10 346
Archilochus colubris 6 516
Archimedes 1 517, 3 130, 7 166 9 542, 13 1
Archimedes' principle 1 101, 517
Archimedes' spiral 13 1
Archinephros 14 226
Archipallium 9 59
Archipelagic aprons 13 219
Archistriatum 9 59
Architectural acoustics 1 517 520
acoustical design of rooms 1 519 520
acoustical images 7 29
echoes 4 377
loudspeaker placement 7 592 593
noise control in buildings 9 129 130
reflection of sound waves 11 395 396
resonant frequencies of rooms 1 518
reverberation 11 539
sound absorption 1 17 19
sound amplification systems 1 520
sound fields in enclosures 1 517 518
sound transmission through partitions 1 518 519
Architectural contracts *see* Engineering and architectural contracts
Architectural engineering 1 520 521
curriculum 1 521
licensing 1 521 4 606
noise control 9 129 130
Architeuthis 4 51
Architeuthis harveyi 13 30
Architeuthis princeps 2 634
Archosauria 1 415 521*, 11 484
Crocodilia 11 484
dinosaur 4 198 202
Ornithischia 11 484
Pterosauria 11 484
Saurischia 11 484
Thecodontia 11 484
Arctic alpine zone 8 245
Arctic and subarctic islands 1 521 525
Aleutian Islands 1 523
Canadian Arctic Archipelago 1 523
climate 1 522
Devonian strata 4 89
diversity of land surfaces 1 521
Greenland 1 524
Newfoundland 1 524
vegetation and soils 1 522
Arctic basin 1 525
Arctic Circle 1 525
Arctic fox 5 490

Aortic arch, formation of 2 484
Aortic body 1 488 489
aortic paraganglia 1 488
cardiovascular system 2 503
circulation 3 137-141
glomus aorticum 1 488
neural gland 9 78
Aortic paraganglion 1 488
Aortic ring 2 520
Aortic stenosis 2 511, 3 141-144
Apanteles 6 580
Apatemyidae 7 143
Apatemys 7 143
Apatite 1 489*; 11 128
apatite series 1 489
calcium mineral 2 398
in meteorites 8 313
phosphate rock 1 489
Apatopygus recens 9 214
Apatornis 7 8
Apatornis celer 7 8
Apatornithidae 7 8
Apaulina 8 680
Apennine Peninsula 5 116
Apennines 5 117, 13 409
Aperture aberration *see* Spherical aberration
Apetalae 1 517
Apetaly 5 327
Apex ellipse 4 560
Aphanite 1 489
Aphanitic rock 7 10, 16
Aphanocapsa 3 636
Aphanomyces 5 298, 10 200
Aphanomyces cochlioides 13 241
Aphanomyces euteiches 9 600
Aphanothrete 12 67
Aphasia 1 489 490* 12 509
Aphasmidia *see* Adenophorea
Aphasmidiea *see* Adenophorea
Aphelenchoidea 1 490
Aphelenchoides 9 29
Aphelenchoides cocophilus 3 253
Aphelenchus hibernation 6 436 441
Aphelion 1 490*, 6 125
orbital motion 9 371
Aphelochirus 6 400, 406
Aphelopus theleae 6 579
Aphid 1 490 13 241
spring grain 1 490
Aphid fly 4 212
Aphidae 1 490 6 474
Aphidius 6 580
Aphis 5 516 518
Aphis gossypii abaca 1 1
Aphoulea 6 474
Aphonia 12 509
Aphrocallistes 6 434-435
Aphrodite 10 461
Aphroditidae 10 461
Aphranorus 7 143
Aphycus 6 581
Aphyllidae 6 401
API *see* Armor piercing incendiary ammunition
Apical dominance plant growth 10 334
Apical meristem *see* Meristem, apical
Apicotermes 7 288
Apidae 6 574
Apioceridae 4 212
Apis mellifera 2 127, 6 582, 12 231
Apistobranchidae 10 461
Apium graveolens 2 579
Aplacophora 1 339, 490, 8 559
Aplanatic sphere 12 609
Aplasia 6 597
Aplite 1 490-491*, 10 86
Aplodinotus grunniens 12 249
Aplysia 3 130, 9 515
Aplysilla 4 55
Apnea 11 525
Apneumonomorphae 1 498
Apocarps 10 345
Apocheridium 7 472
optical 7 452
Apochromatic lens chromatic aberration 3 90
Apocrine gland 5 43, 13 334
epithelium 5 41-43
Apocrita 6 574
Apocynaceae 6 115, 11 347, 13 195
Apoda Amphibia 7 474, 12 363
Crustacea 1 491*, 3 145 562
Echinodermata 1 491*, 4 360
Apodes *see* Anguilliformes
Apodidae 1 491 13 336
Apodiformes 1 491* 694
hummingbird 6 516
swift *13* 336
Apodization 4 137
Apoenzyme 2 13, 19 4 207, 5 20
Apogee 1 491* 6 126
artificial satellites 1 33 36* 12 34
tide 13 635
Apogyne 1 495
Apollo 1 597
Apomorphine 9 4
Aponeuroses 13 491
Apophyllite 1 491
Apoplexy 6 412
circulation disorders 3 141-144
Apopyle 10 514
Aporidea 1 491* 10 414
Aporogamy botany 5 326 334
Aposematic coloration 11 32
Apostilb 7 610
Apostomatida 1 492*, 6 467, 11 53
Apothecaries' pound 14 461
Apothecaries' weight 8 188
Appalachian bituminous coal fields 9 150
Appalachian highlands 9 144-150
Appalachian Mountains 9 410
Appalachian orogeny 13 411
Appalachian Piedmont 9 148
Appalachian Plateau 9 149
Appalachian Trail 9 146
Apparent motions planets 10 267
Apparent power 14 368
Apparent precession gyroscope 6 310
Apparent solar time 13 642
Appendicitis 1 492*, 6 73, 7 223
Appendicular musculature amphibians and reptiles 8 655
birds 8 655
fishes 8 655
homologies 8 655
terrestrial vertebrates 8 655
Appendicular skeleton 12 358
median fin development 12 357
morphogenesis 12 357
paired appendages 12 357
Appendicularian 14 140
Appendix 1 492*, 4 162
Apple 1 493 494*, 13 113
cultivation 1 493
disease control 1 493
distribution in North America 1 493
economic importance 1 494
production trends 1 493
propagation 1 493
Apple cedar rust 5 546-548
Apple maggot 4 217 5 362
Apple powdery mildew 5 546
Apple red bug 6 405
Apple scab 1 574 5 546 548
Applegate diagram 7 365 366
Appleton E \ 7 254
Applied experimental psychology *see* Human engineering
Approximate integration 7 171 172
Apraxia 1 494
Apricot 1 494 495
diseases 1 495
economic importance 1 495
kernel 5 189
propagation 1 495
Aprotic solvent 1 39
Apteudes 4 41 12 601
Apteudes spinosus 13 388
Apsides 1 495
orbital motion 9 371
Apsidobranchia 12 389
Apsidospondyli 1 495
Aptenodytes 9 618
Aptenodytes forsteri 12 607
Apteria 5 105-107
Apternodus 7 115 144
Apterygiformes 1 495*, 694 kiwi 7 365
Apterygota 1 495
Collembola 3 289 290, 7 134
Diplura 7 134
Insecta 7 134
Protura 7 134, 11 61
Thysanura 7 134
Apteryx 7 365
Apteryx australis 1 495
Aptian stage 5 545
Apuan Apennines 5 118
Apus 1 561, 3 412, 414*, 9 171
Apus cancriformis 3 567
Aqua regia 1 495 496
Aqualung *see* SCUBA
Aquamarine 2 170, 174, 6 98
Aquarids (Halley's comet) 6 822
Aquarius 1 496, 3 412 413*
Aquataine 13 409
Aquatic biocycle 3 526 527
Aquatint 10 617
Aqueduct 14 141
Aqueduct of Sylvius 9 46
Aqueous chamber, embryology 5 166
Aqueous electrolyte primary battery 10 587 588
Aqueous humor eye 5 162 171
Aquifer 1 496*, 14 391
in artesian systems 1 538
petroleum reservoir 10 77
water supply engineering 14 404
Aquila chrysaetos 4 317
Aquila (constellation) 3 412 413
Aquilegia 10 488
Aquo compound 1 526
Ara 11 69
Ara (constellation) 3 412 413
Arabin 9 608
Arabella 1 432
Arabellidae 10 461
Arabellites 1 432
Arabian camel 2 427
Arabian peninsula 1 580
Arabian Sea 7 56 58, 9 271
Arabin chicle 3 50
Arabinose 2 12 6 223, 8 578
D-Arabinose 8 580
D(−)-Arabinose 2 455
l-Arabinose gum 6 297
D-Arabinose cyanohydrin 8 58
Arabinose 5 phosphate 2 17
Arabis 4 293
Araceae 1 497 4 13, 10 315
Arachidic acid 2 474 10 356
Arachidonic acid 5 183
Arachis hypogaea peanut 9 60
Arachnida 1 496*, 557 3 22
Amblypygi 1 500
Araneae 1 497
Palpigradi 9 525
Pedipalpi 9 609
Phalangida 10 91

Arrhenius equation kinetics (chemical) 7 357
Arrhenius Ostwald theory acid and base 1 39 40
Arrhenius relation ionization constants 4 496
Arrhenoblastoma 11 480
Arrowroot 12 76 13 50
Arrowroot starch 1 549
Arrowworm 3 1
Arsenate 1 550*, 7 140
Arsenic 1 550 551
allotropic forms 1 550
analytical methods 1 551
electron configuration 4 504
extractive metallurgy 8 277
herbicide 6 421
ionization potential 4 504
occurrence 1 550
organoarsenic compound 9 401
organometallic compound 9 403
poison 10 435
preparation 1 550
properties 1 550 551
soil sterilization 12 464
tetrahedrite 13 529
Arsenic trioxide 6 421
Arsenical insecticide 7 140
Arsenide 1 550
Arsenious acid 1 551
Arsenite (chemical) 1 551
Arsenolite 1 551
Arsenopyrite 1 550 552
Arsine 1 551 6 546
hydride metal 8 552
Arnoldotherium 4 566
Art science in 1 552
Arteidae 6 425
Artemia 9 434 10 488
Artemia salina 1 435 2 239 340
Artemisia 3 190 5 59
Artemisia spinescens 3 191
Artemisia tridentata 3 191 10 290 14 298
Arterenol *see* Norepinephrine
Arterial system 2 497 499
aortic arches 2 498
dorsal aorta 2 497
somatic arteries 2 498
ventral aorta 2 497
visceral arteries 2 497
Arteriole 1 553 2 500 13 504
Arteriosclerosis 1 403 2 267 4 235 6 412 8 260
angina pectoris 1 403
circulation disorders 3 141 144
Parkinson's disease 9 567
sterol 13 140
Arterite auricle contact 1 668
Artery 1 552 553* 3 137 141
Artery (traffic) 14 13 15
Artesian aquifer 13 18
Artesian systems 1 553 554
Artesian water 6 277 278 14 407
Artesian well 1 553
Arthritis 1 554*, 7 315 8 257
Arthrobacter 3 497, 11 548, 12 65
Arthrobacter globiformis 3 497
Arthrobranchia 4 26
Arthrodira 1 554 555*, 10 255
Arctolepiformes 1 527 528
Stegoselachii 13 104
Arthromitaceae 2 537
Arthropod vector 1 499
Arthropoda 1 420 555 566 3 262, 8 244 14 102
Acarina 1 559
Anaspidacea 1 565
Anostraca 1 560
Arachnida 1 557
Arachnoidea 8 244
Araneida 1 559
Branchiura 1 561
Chelicerata 1 555 557 3 22
Chilopoda 1 564
Cirripedia 1 561
classification 1 555
Copepoda 1 561
Crustacea 1 560
Diplopoda 1 561 4 209
endocrine mechanisms 4 596
Entomostraca 1 560
Eurypterida 1 557
gum 6 298
Hexapoda 1 563 6 455
Insecta 7 133 137
Malacostraca 1 562
Mandibulata 1 555 560
morphology 1 555
Myriapoda 1 563
Ostracoda 1 561
Pauropoda 1 565
Pentastomida 9 623
Pycnogonida 1 557
regeneration 11 421
rickettsioses 11 570
scorpion 1 558
Symphyla 1 565
Trilobita 1 555 556 14 102
Xiphosurida 1 557
Arthrospores 4 52 8 570 14 500
Arthrotardigrada 6 431 13 395
Arthur Lake 1 672
Arthus reaction 1 566
hypersensitivity 6 500
Artichoke 1 566
Articulata 2 314 4 560 568 569
Brachiopoda 1 566
Echinodermata 1 566 567* 4 568
Palaeotremata 9 497
Protremata 11 60
Telotremata 13 495
Articulation sound reproduction systems 12 519
Articulation index noise control 9 125 126
Articulation test 1 666, 11 72 74
Articulina sagra 5 432
Artifact 1 514
Artificial gravity 1 474, 12 545
see also Gravity
Artificial horizon *see* Automatic horizon
Artificial insemination 1 120 animal breeding 2 327
Artificial parthenogenesis 4 573
Artificial planet *see* Planet artificial
Artificial radioactivity *see* Induced radioactivity
Artificial satellite *see* Satellite, artificial
Artillery 1 538 539
field 1 538 539
fire control systems 5 290 291
guns 1 538 539
howitzers 1 539 539
railway guns 1 539
seacoast 1 539
sights 6 299
tank 1 538 539
Artinskian stage 10 23
Artiodactyla 1 567 568, 8 82, 12 364
bison 2 250
camel 2 427
caribou 2 522
cattle 2 561
chamois 3 7
classification 1 567
deer 4 42
elk 4 560
giraffe 6 184
gnu 6 226 227
goat 6 227 229
hippopotamus 6 455
hog 6 460
ibex 7 1
moose 8 507
musk ox 8 668
peccary 9 609
pecora 1 568
reindeer 11 423
Ruminantia 1 568
Suiformes 1 567
Tragulina 1 568
Tylopoda 1 568
Artiodactyla fossils 1 567 569
Artina 3 477
Artocarpus altilis 2 324
Astystone 5 291
Arum 1 497
Aryabhata 3 130
Aryl halide 6 327
Grignard reaction 6 269
halogenated hydrocarbon 6 325
N-Arylanthranilic acid 1 51
2-Arylcinchoninic acid 11 192
Arylmagnesium compounds 9 405
Arylmercury compounds 9 402 403
Arytenoid cartilage 14 346 larynx 7 406
Aryltin compounds 9 402
Asbestos 1 569 570
amphibole asbestos 1 569
anthophyllite variety 1 455
calcium mineral 2 509
insulation, electric 7 159
mining and processing 1 570
serpentine 1 569, 12 197
synthesis 1 570
uses 1 570
Asbolite 3 216
Asaphus tyrannus 1 559 12 8
Ascariasis 1 571
Ascaridata *see* Ascaridina
Ascaridia columbae 1 572
Ascaridia dissimilis 1 572
Ascaridia galli 1 572
Ascaridida 1 571*, 9 50
Ascaridina 1 571
Oxyurina 1 571 9 475
pinworm 10 239 239
Ascaridina 1 571 572
Ascaridoidea 1 572
Ascaris 1 572 573* 2 601, 11 511
infestation 1 573
morphology 1 573
Ascaris lumbricoides 1 572 573, 14 329 411
var. *hominis* 1 571
var. *suum* 1 571
Ascaris suum 1 572
Ascaroidea *see* Ascaridoidea
Ascarops strongylina 13 6
Ascending node orbital motion 9 572
Ascension Island 1 109 9 263
Aschelminthes 1 415, 420, 573-574*
Gastrotricha 1 573
Kinorhyncha 1 573, 7 362
Nematoda 1 573
Nematomorpha 9 33
Rotifera 1 573, 11 633
Aschersonia 14 630
Aschiza 4 211-219
Aschoff body 6 538
Ascidia 1 574, 2 240
Ascidiacea 1 574* 14 140
sea squirt 12 98
Ascidicola rosea 9 169 170
Ascites 4 409 11 490
Ascorhyta 12 601
Ascorhyta boehmeriae 11 335
Ascochyta gossypii 3 513
Ascochyta imperfecta 12 604
Ascochyta leaf 9 600
Ascochyta pinodella 9 600
Ascochyta pisi 9 600 12 604
Ascoglena 5 99
Ascogonium 5 66

Arctic front 5 539
Arctic ice cap 1 525
Arctic Ocean 1 525 527*, 5 114
  Arctic basin 1 525
  Arctic ice cap 1 525
  ice drift 1 525
  icebergs 7 6
  inflow and outflow 1 525
  seas tributary to 9 271
  sea water structure 1 526
Arctic pack ice 1 521
Arctic sea smoke 5 367
Arctic stage (Jurassic) 7 325
Arctic tern 3 10
Arctiidae 7 464
Arcto Tertiary Geoflora 9 506
Arctogaean realm Holarctic region 14 620
  Paleotropical region 14 620
  zoogeographic region 14 620
Arctoidea *see* Canoidea
Arctolepiformes 1 527 528
Arctonoe 10 465
Arctostaphylos 3 189
Arcturidae 14 264
Arcturus 7 285
Arcturus (star) 1 528*, 2 290, 15 41
Arcuale 12 354
Arcyria cinerea 8 677
Ardea herodias 6 426
Ardennes 5 117
Area 1 528
  centroid 2 641
  moment of inertia 8 565
  of triangle 1 389
Area measures 8 188
Area rule aerodynamics 1 210, 14 63 64
Areadia, Gulf of 5 114
Areal velocity 1 528*, 2 580
Areca catechu 2 183
Arenaceous rocks 1 528
Arenaria 14 165
Arenaria interpres 14 165
Arenaria melanocephala 14 165
Arenicola 9 65, 10 461, 11 511
Arenicolidae 10 462
Arenigian series 9 373
Arenite 1 528, 532, 11 590, 12 130, 135
Areography 10 325
Areole Nematomorpha 9 33
Arfvedson, J A 7 543
Arfvedsonite 1 536
Argas persicus 7 298
Argasidae 7 298, 13 629
Argelander system 14 277
Argentaffin cell 4 161
Argentea 5 119
Argentine ant 1 437
Argentite 1 528 529*; 12 329, 532
Argie water 6 276
Argidae 6 574
Argillaceous rocks 1 529
Argillaceous sandstone 13 209
Argillaceous sediments 3 159
Argillite 1 529
Arginine 1 529 530*, 2 46, 195, 3 540, 7 161, 9 216, 14 215
  amino acids 1 308 319
  excretion 5 137-143
  in histone 9 217
  nitrogen excretion 9 113
  plant metabolism 10 357
  in protamines 9 217
  Protozoa 11 51 60
Arginine phosphate 4 362
Argininosuccinic acid nitrogen excretion 9 112
Argo 3 412 413
Argon 1 530-531
  cryogenic properties 3 572
  electron configuration 4 504
  ionization potential 4 504
  inversion temperature 7 538
  line spectrum 7 521
  production 1 637
  velocity of sound in 12 513
  in welding 14 467
Argonaut 9 7
Argonauta 2 644
Argonauta argo 9 7, 274
Argonautidae 9 7
Arguloida 1 531*, 2 319, 3 562
Argulus japonicus 2 320
Argument of perihelion orbital motion 9 372
Argumentation logic 7 581
Argynnis 7 471
Argyrodite 1 531*, 6 176
Argyrol 1 483
Argyrosis 13 9
Arhynchobdellae 1 531-532
  Gnathobdellae 1 531
  Pharyngobdellae 1 532
Arhythmic species community 3 324-325
Arid transition zone 8 245
Ariel 14 214
Aries 1 532*, 3 412-413
Aristae 3 648
Aril 12 144, 14 605
Arilus 6 409
Arilus cristatus 14 487
Aristasoma aeconomicum 3 529
Aristocystites 4 209
Aristolochia 14 500
Aristolochiaceae 1 532
Aristolochiales 1 532*, 10 346
Aristotelian logic lattice (mathematics) 7 411
Aristotle 1 422, 7 349, 578, 10 378
Aristotle's lantern 4 374, 12 100
Arithmetic addition 1 62
  division 4 259
  multiplication 8 626
  subtraction 13 231
Arithmetic mean 10 616 11 626
Arithmetic *n* space 2 403-404
Arithmetic progression 10 616
Arithmetic series 12 189
Arizona cypress 3 617
Arkansas River 9 153
Arkansas Valley 9 153
Arkose 1 532 533*, 12 241
  redbed 11 387
Arkwright, R 12 618
Arm 1 533 534
Armadillidiidae 12 532
Armadillidium 1 563
Armadillidium vulgare 9 327
Armadillo 1 534*, 4 411, 6 182, 12 47
Armament, air 1 534 537
  aircraft guns 1 534-536
  aircraft rockets 1 536
  bombs 1 536
  fire-control mechanisms 1 537
  gun sights 6 298 299
Armament, army 1 537 540
  ammunition 1 539
  armored vehicles 1 540
  artillery 1 538
  gun sights 6 298 299
  infantry weapons 1 537 538
  rockets and missiles 1 540
Armament, incendiary 7 54
Armament, naval 1 541 544
  acoustic mine 1 48
  acoustic torpedo 1 48
  air-launched armament 1 541 542
  antisubmarine warfare 1 484 487
  depth charge 1 484 486
  mines 1 543
  submarine launched 1 543 544
  surface launched 1 542 543
  torpedoes 1 543
  weapon systems 1 541
Armature 1 544 545
Armature reaction 1 545
Armature relay 11 441
Armature windings 1 544 14 504 506
  ac 14 505 506
  dc 14 505
  dc generator 4 223
  dc motor 4 226
Armenian highlands 1 577
Armillaria 2 585
Armillaria mellea 1 495
Armillarias 3 265
Armillifer moniliformis 9 624
Armor piercing ammunition 1 539
Armor piercing bomb 1 536
Armor piercing incendiary ammunition 1 539
Armor piercing incendiary tracer ammunition 1 539
Armor piercing weapon 12 242
Armoracia rusticana 6 492
Armored cable 14 521
Armored dinosaur 11 484
Armored personnel carrier 1 540
Armored relics (mineral) 8 [illegible]
Armored vehicles 1 540
Armstrong, E H 5 511, 11 250
Armstrong, H E 4 298
Armstrong circuit frequency modulation 10 104 105
  phase modulator 10 104 105
Army ant 1 437, 12 406
Army armament *see* Armament, army
Army worm 1 545*, 7 472
Arndt Estert method methylation 4 105
Arnel 5 243
Arnold, Kenneth 5 363
Arnon, D I 2 55
Aroeoscelis 11 484
Aromatic 1 546
Aromatic bottoms 6 422
Aromatic compounds bacterial biosynthesis 2 57
  hydrogenation 6 552
Aromatic hydrocarbon 1 546-549
  aromatic character 1 546 547
  aromatic ions 1 548
  azulene 1 548
  benzene 2 164
  benzophenone 2 165
  biphenyl 2 247
  Friedel Crafts reaction 5 536
  halogenated 6 327 328
  naphthalene 9 2 3
  nomenclature 9 397
  nonbenzenoid aromatic systems 1 547-548
  in petroleum 10 55
  phenanthrene 10 110
  polycyclic systems 1 548
  polynuclear hydrocarbon 10 485
  resonance (molecular structure) 1 547
  toluene 13 665
Aromatic ions 1 548
Aromatic polycarbonates 10 464
Aromatization 1 549
  cracking 5 532 535
  petroleum processing 10 69
  see also Reforming (petroleum refining)
Arons A B 12 102
Arousal function motivation 8 607
Aroyl halide 1 44
Arp, H C 15 42
Array, antenna 1 447
Arrhenius, S 1 39, 4 485, 7 496 10 210

Asteroidea—*cont*
Echinodermata fossils 4 371 372
Forcipulata 4 360 5 438
Hemizonida 4 360, 6 410
Phanerozonia 4 360 10 92
Platyasterida 4 360, 10 412
Spinulosa 4 360 12 618
Asteronychidae 5 124
Asterope 8 682
Asterophyllites 2 391, 9 504
Asteropinae 8 682
Asteroschematidae 5 124
Asterosporium 8 215
Asterosporium hoffmanni 8 215
Asteroxylon 9 504 11 68
Asterozoa 5 601
Asteroidea 5 599 600
Ophiuroidea 9 343
Somasteroidea 12 500
Asthenosoma 4 373
Asthma 1 257 601*
bronchial 2 347
hypersensitivity 6 588
Astigmatism 1 6* 5 171 172, 9 367 368
see also Aberration, optical
Astomatida 1 601* 6 467 11 53
Holotricha 1 601
Aston dark space 6 215 216
Astraea 1 596
Astragalus 2 244 6 297 10 439
Astramoeba flagellipodia 1 530
Astrangia 3 255
Astraphloxine FF 4 303
Astrapotheria 1 601 602* 8 82
Astrapotheriidae 1 601
Astrapotheriodea 1 601
Astrapotherium 1 601
Astrapotherium magnum 1 601
Astrocenid coral 12 77
Astrocoenida 12 78
Astrocyte 9 32
Astrogeodetic points 6 123
Astrogeophysics *see* Astronomical geophysics
Astrograph 1 615
Astrolabe prismatic 1 602 603
Astrometry 1 603
Astromyelon 2 391
Astronaut 12 540 543
atmosphere requirements 12 541 542
body heat 12 540
decompression 12 543
ebullism 12 543
escape 12 540
feeding 12 542
g tolerance 12 540
hypoxia 12 543
isolation confinement reactions 12 540 541
metabolic requirements 12 542
neuromuscular coordination 12 542
orientation 12 542
Astronaut—*cont*
oxygen recycling 12 542
Project Mercury 12 540
radiation risk 12 542
water recycling 12 542
weightlessness 12 542
work test cycle 12 540 541
Astronautical engineering 1 603 606
auxiliary power 1 605
cost and reliability 1 604
environment 1 606
ground *communication* and support 1 605
guidance and control 1 605
propulsion requirements 1 604
spacecraft 1 605
Astronautics 1 603, 606
Astronomical coordinate systems 1 606 607
astronomical latitude 7 409*, 582
celestial sphere 2 587
ecliptic system 1 607
equatorial system 1 606 607
frame of reference 5 493
galactic system 1 607
horizon *system* 1 607
meridian 8 238
transformations between *systems* 1 607
Astronomical frame of reference 5 493
Astronomical *geophysics* 1 607 608
cosmic rays 3 498 502
Astronomical horizon 6 479
Astronomical instruments 1 608 615
astrometry 1 603
filar micrometer 1 612 615
meridian circle 1 610
in observatories 9 242 243
prism transit 1 610
Schmidt camera 12 69
spectrohelioscope 12 581
telescope 13 448 452
transit 1 609 612
zenith telescope 1 610 612
Astronomical latitude *see* Latitude astronomical
Astronomical longitude *see* *Longitude* astronomical
Astronomical nutation *see* Nutation (astronomy)
Astronomical observatory *see* *Observatory* astronomical
Astronomical photography 1 615 615
astrometry 1 603
measurement of parallax 9 545
optical tracking instruments 9 360 362
telescopes 13 449 452
Astronomical spectrograph 13 40
Astronomical spectroscopy 1 615 618*, 12 587
gaseous nebulae 9 25 26
radio astronomy 11 243 247
Astronomical transit (instrument) *see* Transit instrument (astronomy)
Astronomical triangle 1 607
Astronomical unit 1 618*, 9 545
measurement of 4 556
parsec 9 567
Astronomy 1 618 619
azimuth 1 702
celestial mechanics 2 579-585
coordinate systems 1 606 607
cosmology 3 509 510
eclipses 4 380 383
interstellar matter 7 219 222
positional 1 603-609
radio 11 245 247
rocket 11 600
spherical 1 607
statistics *see* Air Almanac
see also Astronomical instruments
Astropecten 1 593
[illegible]
[illegible]
[illegible]

Ascomycetes 1 574*, 5 561, 14 528
Erysiphales 5 66
Eurotiales 5 123
Myriangiales 8 682
Saccharomycetales 12 1
Asconema 7 638
Asconiscus 5 33
Asconoid sponge 2 393
Ascophora 3 16
Ascophyllum 8 107, 10 90
Ascorbic acid 1 574 575*, 4 236, 5 371, 376 12 89, 14 340
Acetobacter suboxydans fermentation 1 33
deficiency in scurvy 12 90
industrial production 1 575
plant metabolism 10 353
Ascospores 5 123
yeast 14 600 601
Ascothoracica 1 575*, 3 145, 562
Ascus 12 1
Ascute 3 158
Ascyssa 7 480
Asdic *see* Sonar
Asellodea 1 576
Asellota 1 575 576
Asellus 7 284
Asellus communis 1 576
Asexual reproduction animal 11 448 449
plant 11 450-452
Ash 1 576
Ash gray leaf bug 6 401
Ash lace bug 6 405
Ash plant bug 6 405
Ashby William 3 638
Ashbya gossypii 11 561 14 602, 604
Ashgillian series 9 575
Asia 1 576 588
central and east Asian steppe lands 1 585 586
climate 1 581-583
coal fields (location) 8 448 449
coal fields (maps) 8 455 456
coal resources (table) 8 454
continent-ity 1 581
desert and semidesert regions 1 587 588
eastward cyclonic drift 1 582
hill lands 1 580
islands 1 580
lowland plains 1 580
mid latitude mixed forests 1 584 585
mixed evergreen forests 1 586
monsoon tropical deciduous forest 1 587
monsoons 1 581, 8 584 585*
mountain chains 1 577
oil and gas field (locations) 8 447
Asia—*cont*
physical map 1 578 579
plateau lands 1 577-580
rainfall patterns 1 582-583
savanna and tropical scrub forest 1 587
soil patterns 1 583-584
taiga or boreal coniferous forest 1 584
tropical and subtropical rainforest 1 586-587
tundra zone 1 584
vegetation patterns 1 584 588
westward cyclonic drift 1 582
Asiatic cholera *see* Cholera vibrio
Asiatic garden beetle 3 287
Asiatic musk deer 1 568
Asilidae 4 212
Asileptodaurus 11 51
Askja 5 120
Asmithwoodwardia 3 394
Asp 3 248
Asparagine 1 588* 589
amino acids 1 308 319
plant metabolism 10 357
Asparagus 1 588* 2 618 9 563 14 283
Asparagus officinalis 1 588
Aspartase 5 23
Aspartic acid 1 588* 2 56 59 245 6 457 7 164 14 17
amino acids 1 308 319
in histone 9 217
Krebs cycle 7 371
nitrogen excretion 9 112
plant metabolism 10 357
in protamine 9 217
tyrothricin 14 177
L-Aspartic acid 5 23
Aspect ratio (aerodynamics) 1 580, 14 63
airfoil 1 589
cinematography 3 124 129
effective 1 589
geometric 1 589
subsonic flight 13 228
television 13 477
wing 1 589
Aspen 12 8
Aspergillaceae *see* Eurotiaceae
Aspergillin 1 468
Aspergillosis 1 574 580 590*
Aspergillus 1 466-467, 5 123, 8 569, 9 235 603, 10 314, 12 30 461 13 541, 14 483
Aspergillus fischeri 5 188
Aspergillus flavus 5 28
Aspergillus flavus oryzae 7 369
Aspergillus fumigatus 1 341, 580 5 44, 560, 9 236
Aspergillus niger 1 589 5 146, 5 28, 215 6 217 7 223, 8 570, 9 327, 10 324, 12 348
cellobiose 2 620
Aspergillus niger—cont
gallic acid 6 18
tatartaric acid 7 297
Aspergillus niveo-glaucus 8 569
Aspergillus oryzae 1 574, 5 28
Aspergillus terreus 7 297
Asphalt and asphaltite 1 590-591
asphalt 1 591, 9 493, 10 55, 72
natural occurrence 1 590
petroleum geology 10 61
Asphalt Lake, Trinidad 1 590
Asphalt varnish 14 282
Asphaltic oil from torbanite 13 683
Asphaltite 1 590 591
gilsonite 6 186
Aspheric surfaces, optical 1 591
see also Spherical and aspheric surfaces, optical
Aspicularis tetraptera 9 476
Aspidiotus perniciosus 6 476
Aspidiphoridae *see* Sphindidae
Aspidobothria *see* Aspidogastrea
Aspidobranchia 1 591 592*, 11 18
Aspidochirota 1 592* 4 360
Aspidocotylea *see* Aspidogastrea
Aspidodiadematidae 4 93
Aspidogastrea 1 592* 10 414, 14 77
Aspidogastridae 1 592
Aspinothoracida *see* Brachythoraci
Aspirin 1 866 592* 10 112, 12 8
toxicology 14 5
Asplanchna 8 575, 11 634, 12 236
Asprey, L. B. 1 301
ASROC 1 486
Assassin bug 2 362 6 401 7 364
Assaying 1 593 594
cupellation 1 593
face average value 8 498
fire assaying procedure 1 593
pilot assay 1 593
platinum metals 1 593
radioisotope 11 306
sampling 1 593
scorification 1 593
volume weighting value 8 497-498
weighing 1 593
Assembly drawing 4 611
Assembly methods 1 594
automation 1 679
conveyorized line 1 594
fixture or work station assembly 1 594
hand assembly 1 594
mechanized or automatic assembly 1 594
Assembly methods—*cont*
progressive line 1 594
shrink fit 12 308
Assimilation 2 215
Assman psychrometer 11 82
Association solvation 12 494
Associative law for addition 3 337
group theory 6 292
for multiplication 3 337
Assortative mating genetics 6 504
Assur, A. 12 102
Astable multivibrator 8 631
Astacidae 3 539, 4 31
Astacinae 3 539
Astacus 3 539, 5 205
Astasia 5 98
Astatine ion 1 595
Astatine 1 595*, 6 324
electron configuration 4 504
radioactivity 11 278
Astaxanthin 5 108
Asteidae 4 212
Aster 3 190
Aster wilt 9 408
Aster yellow 13 292
Astereognosis 1 595 596
agnosia 1 115
sensory learning 12 184
Asteriidae 1 599, 5 458
Asterinidae 12 619
Asterism in corundum 3 496
in gem stones 6 96
in sapphire 12 26
Asteroblastus 4 210
Asterocampa 7 471
Asterococcus 1 235
Asterocyclinidae 5 435
Asterodon dilatatus 9 599
Asterodon miliaris 9 599
Asterodon robustus 1 600
Asteroid 1 596 598
Adonis 1 597
Apollo 1 597
Astraea 1 596
Big Four 1 596 597
Ceres 1 596 598, 2 653 654*
Eros 1 596-597, 5 65*
Hermes 1 597
Hidalgo 1 596 597
Hilda group 1 596
Icarus 1 596 597
Juno 1 596 597
masses 1 597
nomenclature 1 596
orbital elements 1 596
origin 1 598
Pallas 1 596 598
sizes and shapes 1 596 597
surface structure 1 597
Thule group 1 596
Trojan planets 14 114
Vesta 1 596 597
Asteroidea 1 598 600*, 4 360 371 372, 13 52

Atomic constants—cont
errors 1 653
measurement 1 650 651
Planck's constant 10 266
precise values 1 651-652
Rydberg constant 11 656
x unit 14 590
Atomic diamagnetism *see* Diamagnetism
Atomic energy *see* Nuclear energy
Atomic fallout *see* Radioactive fallout
Atomic heat (heat capacity) 12 374
Atomic hydrogen torch 6 544
Atomic magnetic moment *see* Magnetic moment atomic
Atomic mass unit 1 652*, 9 199
Atomic nucleus *see* Nucleus, atomic
Atomic number 1 652
Atomic oscillation *see* Oscillation
Atomic physics 1 652* 15 548
atomic and molecular beams 8 538 542
atomic constants *see* Atomic constants
atomic structure and spectra 1 652-662
electron configuration 4 503 506
electron spin 4 518 518
elementary particles 4 542-544
heat radiation 6 368 373
quantum electrodynamics 11 148 150
quantum mechanics 11 153 162
x rays *see* X rays
Atomic power plant *see* Nuclear power Power plant
Atomic scattering experiments *see* Scattering experiments, atomic and molecular
Atomic selection rules *see* Selection rules (physics)
Atomic structure and spectra 1 652 662
atomic sizes 1 655
Bohr atom 1 653 655
Bohr's correspondence principle 1 653 655
chemical structures 3 32 42
coupling schemes 1 655 657
electron configuration 4 503 506
elliptical orbits 1 654 655
flame photometry 5 294
ionization potential 7 254
isoelectronic sequence 7 276
isotope shift 7 296
Atomic structure and spectra—*cont*
line spectrum 7 520 521
luminescence 7 611 612
magnetochemistry 8 52 54
Paschen Back effect 9 588
periodic table 10 13-15
quantization of hydrogen atom 1 653 654
quantum mechanics 11 153-162
quantum numbers 11 162
Ritz's combination principle 11 580 581
Rydberg constant 11 656
spectrum and term diagram *helium* 1 660
hydrogen 1 657-658
mercury 1 660 661
sodium 1 658 660
spin-orbit coupling 1 655
valence 14 257
vector model of atom 1 655 657
width of spectral lines 1 661 662
Atomic susceptibility *see* Susceptibility magnetic
Atomic vibration 6 342 343 7 412 415
see also Vibration
Atomic volumes 10 14
Atomic weight 1 662 663
Atomizer 1 649
Atoxyl 9 401
ATP *see* Adenosinetriphosphate
ATR tube 11 212
Atracheata *see* Bryophyta
Atractidae 9 475
Atrazine 6 425
Atremata 1 663
Atresia 4 150 175, 9 330
Atrioventricular node 3 158
Atriplex 3 191 5 58
Atriplex confertifolia 10 209
Atriplex hortense 12 615
Atriplex vesicaria 10 284
Atrium 2 482 3 137
Atropa 10 359
Atropa belladonna 1 664 2 160, 10 440
Atrophic rhinitis 13 540
Atrophy 1 663 664
neurotrophic 1 664
pressure 1 663
senile 1 663
toxic 1 664
Atropine 1 664* 2 161 6 106 9 547 10 434 14 6
Atropinesterase 6 106
Attapsaceae 15 485
Atta 1 437, 6 581
Attacus atlas 7 469
Attacus edwardsi 7 469
Attagenus piceus 3 287
Attalea funifera 14 287
Attapulgite 3 162, 165
class 3 162
structural characteristics 3 166
Attenuation 1 664
interference 12 253 254
microwave transmission lines 8 423
neper 9 38
noise 12 253 254
of sound in atmosphere 12 515 517
spurious radiation 12 253 254
transmission line 14 49
Attenuation coefficient 1 664
Attenuator 1 664
ferrite 5 221
recording 8 37
Attitude-control systems 1 691
Attitude indicator *see* Automatic horizon
Attraction sphere *see* Centrosome
Attritus 3 232, 12 140
Attu Island 1 523
Atvidae 4 29
AU see Astronomical unit
Aubert λ 8 640
Aubrite 8 514
Auchenorhyncha 6 469 472
Cercopidae 6 470
Cicadellidae 6 470
Cicadidae 6 470
Fulgoroidea 6 470
Membracidae 6 470
Aucheromyia luteola 8 680
Audibility curve 1 666
Audio 1 664 665
Audio amplifier 1 665, 14 357 358
distortion 1 665
feedback 1 665
frequency response 1 665
high fidelity 1 665
power output 1 665
preamplifier 10 565
RC coupled 14 355 358
vacuum tube amplifier 1 343
Audio frequency 1 664 665
Audio frequency (AF) amplifier 1 345
Audio frequency transformer 14 27 28
Audiogram 1 666 4 21 9 126
Audiometer 1 665
Audiometry 1 665 667
anechoic room 1 665
articulation tests 1 666
audiogram 1 666
audiometer 1 665
audiometric testing 1 667
loudness 7 583
noise control 9 126
Audiometry—cont
reverberation chamber 1 665
tests 1 665
Audition *see* Hearing
Auditorium acceptable noise levels 9 129
acoustical design 1 519 520
sound amplification systems 1 520
Auditory capsule 12 358
Auditory learning 12 184
Auditory masking *see* Masking (sound)
Auditory nerve 3 538
Auditory ossicle 4 319
Auditory perspective 13 127 128
Auerbach's plexus 4 156
Aulacchis 5 521 534
Auger (mining) 8 486*, 499
Auger drilling 2 295
Auger effect 1 667*, 10 151
Augite 1 667* 11 129, 15 549
Auk 1 667, 3 10, 11 91
Auklet 3 10 11 91
Aulechinus grayae 4 339
Aulocystis 6 433 7 623
Aulodont dentition 4 57
Aulodonta 1 667
Aulostomus maculatus 6 71
Aural microphonic 6 332
Auramine O 4 301
Aurelia 5 255
Aurelia aurita 7 301 12 165
Aureole contact 1 668 669
Aureole (optics) 8 321
Aureomycin *see* Chlortetracycline
Aureothricin 1 476
Auricle 4 318 6 557, 12 180
Auricularia larva 4 383, 6 467, 12 91
Auriga 5 412 413
Aurine 4 301
Aurochs 2 561
Aurora 1 99 669*
australis 1 669
borealis 1 669
earth current storms 13 508
geomagnetic storm 6 143 13 508
Auroral patterns 1 99
Auroral transitions 9 25 26
Austenite steel 6 579 13 90
Austenitic cast iron 2 541
Austenitic stainless steel 13 34
Australia 1 669 675
coal fields 8 448 449
coal resources 8 454
eastern highlands 1 670
fauna 14 625
interior lowland 1 671
physical map 1 670
regions 14 620, 623 624
resources of 4 345

Atlantic Ocean—*cont.*
transoceanic profile (N.A.) 13 217
Atlantic salmon 12 14
Atlantic sturgeon 13 207
Atlas 12 363
Atlas cedar 2 578-579
Atlas Mountain 1 107
Atlases 2 535
Atmosphere 1 627 629
absorbed radiation 7 144-145
air glow 1 148
air mass 1 148
attenuation of infrared radiation by 7 106
cloud water 3 209
composition 1 627, 629
condensation in 10 575
cooling power 12 180
cosmic-ray particles in 3 498 500
cosmic ray-produced nuclides 11 270
electrical processes in *see* Atmospheric electricity
electromagnetic radiation 11 214 215
exosphere 1 629
gases, production in 1 638
greenhouse effect 6 269
ice nuclei in 3 216
interaction with sea 12 103-105
internal wave 14 417
inversion layer waves 14 417
investigations 1 98
ionosphere 1 628-629, 7 254 255*
isentropic surface 7 272-273
isopycnic surfaces 7 288
isosteric surfaces 7 288
jet stream 7 310
of Jupiter 7 323
layer character 1 627
of Mars 8 148
mass of 1 629
of Mercury 8 232 233
mesosphere 1 628, 8 252
motions, dynamics of 8 336
naturally radioactive inert gases 1 630
optical phenomena 8 320-321
origin 1 630 631
physics of the air 8 323-327
planet 10 270
polar regions 10 440 442
pollution *see* Atmospheric pollution
radiation relationships 3 172-174
radio-wave propagation 11 319 322
of Saturn 12 38
Atmosphere—*cont*
sound propagation 12 515-517
stratosphere 1 627 628
of sun 13 264 266
temperature *see* Air temperature, Atmospheric adiabatic change
thermal acceptance 12 180
thermal stability 1 633
trace constituents 1 629
tracer studies 1 635
troposphere 1 627, 14 118
upper 1 98
vertical structure and nomenclature 8 324
water vapor content 6 515-516, 560 562
weather (forecasting and prediction) 14 446 454
Atmosphere, geochemistry of 1 629 631
cosmic ray produced isotopes 1 630
organic and inorganic impurities 1 630
origin of Earth's atmosphere 1 630-631
permanent gases and vapors 1 629
secondary atmosphere 1 631
structure of atmosphere 1 630
Atmospheric acoustics 1 631 632*, 12 515 517
Atmospheric adiabatic change 1 632 634
adiabatic diagram 1 632
atmospheric lapse rate 1 632
atmospheric stability 1 633
change with vertical motion 1 632
mathematical expression 1 633
potential temperature 1 632
Atmospheric chemistry 1 634 635
carbon dioxide 1 635
element circulations 1 634
isotopic tracers 1 635
nitrogen compounds 1 634
ozone 1 635
particulate characteristics 1 634
radioactive tracers 1 635
sea salts 1 634
Atmospheric circulation air mass 1 149
air waves, upper synoptic 1 164
drought 4 275
flow pattern 14 447
horizontal convergence 13 162
Atmospheric circulation—*cont*
horizontal divergence 13 162
hurricane 6 520-521
monsoon 1 581 582, 8 584-585*
storm 13 162-164
and temperature inversion 13 488
wind 14 493-495
Atmospheric electricity 1 635 636*, 8 327
disturbed-weather phenomena 1 635
dust particles 4 297
electrojet, upper air 4 479
energy sources 4 602
fair-weather field 1 636
thunderstorm 13 617
Atmospheric evaporation 1 636 637
methods of measurement 1 637
rate and heat factors 1 636
Atmospheric gases, production of 1 637 640
argon 1 530 531
compression 1 638
condenser 1 638
cooling 1 638
expansion process 1 638
krypton 7 372 373
liquefaction 7 535 540
rectifying column 1 638
Atmospheric high 1 640 642
Atmospheric ion 1 642 643
air mass and front associations 1 642
cyclone 3 640
generation and dynamics 1 642
motion and surface winds 1 642
relations with terrain character 1 643
tropical lows 1 642
Atmospheric optics *see* Meteorological optics
Atmospheric pollution 1 151 155, 643 646*, 2 220
area sources 1 645
dust and mist collection 4 296
global 1 646
meteorological influences 1 643 644
oncology 9 323
plant disease 10 304
predicting 14 447
smog 12 587
smoke 12 587
sources 1 151, 644
temperature inversion 13 488
terrain and weather influences 1 645
see also Air pollution control
Atmospheric pressure 8 440
baroclinic field 2 102
barotropic field 2 102
measurement 2 102 10 581 582*
microseisms 12 156
squall line passage 13 21
tornado 13 685
see also Air pressure, Decompression illness
Atmospheric static *see* Static
Atmospheric turbulence 8 334
aeroelasticity 1 92
aeronautical meteorology 1 96
Atmospheric water 8 326
cycle 6 560
world supply 13 217
see also Cloud physics, Hydrometeorology, Precipitation (meteorology)
Atmospheric waves 8 331
Atoll 1 646 647
coral 3 474
Atolla 3 255, 4 39
Atom 1 648
electron configuration 14 257
cosmic abundance 4 552
ionization 7 252
isobar 7 271
isomer 7 280 281
isotone 7 291
isotope 7 291 293
mass 9 205 204
vector model 1 655-657
Atom atom collisions 12 56 57
Atomic beam clock *see* Atomic clock
Atomic beam magnetic resonance method 1 649
Atomic beams 8 538 542*, 1 648 650
electron spin 4 518
nuclear moments 9 192
Atomic bomb 1 648
chain reaction 3 6
fission 1 648, 5 288
fusion 1 648
fusion bomb 6 548
hydrogen bomb 6 548
neutron emission 9 84
nuclear explosion 9 184
nuclear fusion 5 591 595
radioactive fallout 11 267 268
Atomic clock 1 649 650
relativity 11 458
time interval measurement 13 646
Atomic collisions *see* Scattering experiments, atomic and molecular
Atomic constants 1 650 652
Avogadro number 1 650 698

Auxiliaries naval *see* Naval auxiliaries
Auxin 1 421, 693, 10 179 364, 13 124
electrotropism *10* 365
endocrine mechanisms 4 590
geotropism 10 365
plant growth 10 330 334 335
plant morphogenesis *10* 362
Auxochore 10 499
Auxochrome 4 298 12 583
Auxospore 3 119
AV node 3 138
Avalanche 1 695
Avalanche ionization cryostat 5 575
AVC *see Automatic gain control* (AGC)
Avena 10 363
Avena fatua 5 334
Aventurine 1 397 6 99
Aventurine glass 9 333
Average error method of 11 77
Averages method of curve fitting 5 630
Aves 1 420 695* 2 248 13 550
Amniota 1 328
Archaeornithes 1 510 694
Caprimulgiformes 2 448
Charadriiformes 5 10
Ciconiiformes 5 120
Coliiformes 5 288
Columbiformes 5 302
Coraciiformes 5 473
Cuculiformes 5 612
environmental adaptations 1 694
Falconiformes 5 178 179
fossils *see* Aves fossils
Gaviiformes 6 81
Neornithes 1 694
Passeriformes 9 589
Pelecaniformes 9 612
Piciformes 10 215
Podicipitiformes 10 429
Procellariiformes 10 637
Psittaciformes 11 60
Rheiformes 11 543
taxonomy 1 694
Aves fossils 1 694 695
Diatrymiformes 4 104
Aves fossils—cont
Dinornithiformes 4 198
Hesperornis 6 427
Avian leukosis 1 695
Aviation 1 695 696
applications 1 695
classes 1 695
fleet classification 1 696
[illegible] 1 695
6 69 70
Aviation medicine 1 696
Aviation regulation industry 1 163
international 1 162 163
state 1 163
United States 1 162 163
Aviation safety 1 163 164
instrument flight rules (IFR) 1 163 164
traffic control 1 163 164
visual flight rules (VFR) 1 163 164
Avicennia 3 186 8 91
Avidin 2 245 9 218
Avigation see Aerial navigation
Avitaminoses 4 236
beriberi 2 166
rickets 11 566
scurvy 12 89
Avocado 1 696
Avocet 1 696 697
Avogadro's law 1 697* 13 568
Avogadro number 1 697 698
atomic constants 1 650 652
combining volumes law of 3 506
molecular weight 8 556
precise value 1 652
Avoirdupois weight 8 188
Avon River 11 586
Avonian (Carboniferous) 2 469
Awabi 1 2 3
Awash River 1 107
AWG 14 521
Ax A F 4 584
Axel Heiberg Island 1 523
Axenic animals 2 8
Axenic culture 1 698 701*, 2 5
algae 1 699
Axenic culture—cont
chemical methods 1 698
insects 1 700
metazoa 1 700
physical methods 1 698
principles of isolation media 1 699
Protozoa 1 700
vertebrates 1 700
[illegible] *see* Vitamin A
pressor 3 319
11 541
ure 8 616, 671
Axial skeleton 12 354
Axiidae 4 41
Axil 2 361
Axillary bud 2 361
Axinella polycapella 3 159
Axinellina 3 158
Axinite 10 425
Axiom 1 238 239 13 546
algebra 1 238 239
geometry 6 154
operator theory 9 339
Axis (coordinate systems) 3 454 456
Axis (earth's) 6 124 125
Axis (vertebra) 12 363
Axle 1 701 702* 14 487
bearings 1 701
construction 1 701
semifloating 1 702
shafting 12 240
types 1 701
Axolotl 9 58 11 430 12 6 229
Axon 9 54 79
Axoneme Protozoa 11 51 60
Axonolaimoidea 1 702
Axonometric drawing 10 214 216
Axopodia Protozoa 11 51 60
Ayrshire 2 566
Ayrton and Perry inductometer 7 80
Ayrton Jones current balance 5 627
Azlena americana 4 291
Azlena valisneria 1 436, 4 291
Azlinae 4 291
AZEL scope precision approach radar 10 578
Aza 6 428
Azacyclobutadiene 6 428
9 Azafluorene *see* Carbazole
Azalea 9 408
Azalea lace bug 6 405
2 Azanaphthalene 6 429
Azaserine 1 476
Azelaic acid 2 475
Azeotrope 4 247
Azeotropic distillation 4 252
Azeotropic mixture 1 702*, 12 492
Azete 6 428
Azide 1 702*, 9 105, 110
Azimuth 1 702 4 36 9 11
celestial navigation 2 594
surveying 13 524
Azimuthal projection 8 96 97
Azimuthal quantum number 11 162
Azine 6 550
Azine dye 4 303
Azlina Tripoli 1 104
Azlactone 9 461
Azo dye 4 105 299 11 194
Azobenzene 1 408
Azoic coupling component 2 4 300
Azoic diazo compound 37 4 300
Azoic dye 4 300
Azoic printing 13 543
Azole 1 702 703
imidazole 7 31-33
oxazole 9 461
pyrazole 11 109
thiazole 13 599 601
Azomycin 1 476
Azonal soil 12 455 454
see also succession, ecological
4 Azopyrazolone 11 110
Azore Islands 1 109
Azores 9 263
Azotobacter 2 65 243 9 111, 11 548 12 460
Azotobacter agile 1 703
Azotobacter chroococcum 1 703
Azotobacter vinelandii 1 703
Azotobacteraceae 1 703*, 2 11 5 96
Azotomonas 11 64, 12 460
Azov Sea of 5 114
Azulene 1 548
Azurite 1 703* 3 464 6 99
Azygos vein 2 500

Australia—*cont*
Tasmania 1 672
see also New Zealand
Australian fauna 14 623
Australian frilled lizard 13 23
Australian Shield 10 567
Australopithecinae 5 477
Australopithecus 1 416, 5 477, 7 304
Austrian Alps 5 117
Austrides 13 409
Austrodecidae 11 106
Austroriparian zone 8 245
Autecology 4 388
Authigenesis in diagenesis 4 91
Authigenic minerals 1 673 674
authigenic feldspars 5 207
chlorite 5 77
formation on sea floor 12 108-109
in loess 7 574
in sedimentary rocks 12 134
Authigenic sediments 8 133
Auto ionization *see* Auger effect
Autoantigen 1 472, 7 274
Autochory population dispersal 10 498
Autochrome plate 10 167
Autochthonous microorganism 12 459
Autoclave 1 674*, 13 134
Autodestructive alkylation 1 251
Autodiastyly 12 360
Autoecious rust (microbiology) 11 654
Autogamy 11 450
Ciliophora 3 120 122
Protozoa 11 58
Autogenic boundary 14 21
Autogenic succession 13 231
Autogeosynclines 6 174
Autogiro 1 674 675
Autoinhibition (chemical) 7 111
Autolysis 4 22-24
Autolytic enzymes 2 20
Autolytus 10 465
Automatic control 14 12 13
see also Automation Control systems, Servomechanisms
Automatic direction finder 4 251 252
Automatic frequency control (AFC) 1 675
Automatic gain control (AGC) 1 675 676* 13 471
Automatic horizon 1 676
Automatic message accounting (AMA) 13 353
interurban 13 436
local 13 433
Automatic pistol 1 537-538
Automatic printing telegraph, code 13 421
Automatic rifle 1 537 538
Automatic screw machine 7 408
Automatic sprinkler systems *see* Sprinkler, automatic
Automatic temperature control *see Temperature control, automatic*
Automatic ticketing equipment 13 357
Automatic transmissions *see* Transmission, automotive
Automatic voltage control 4 431
Automatic volume control *see* Automatic gain control
Automation 1 676 679
assembly methods 1 591
decision making 3 431
historical development 1 676 677
instrumentation 7 154
levels of mechanization 1 677 679
machine tools 13 672
materials handling machines 8 171
mechanization profile 1 678 679
miniaturization of equipment 8 470
production engineering 10 611
Automeris io 7 469
Autometamorphism 8 304
Autometer 1 155
Automobile 1 680 681
air conditioning 1 145 146
axle 1 701 702
body 1 682
body types 1 680
differential 4 121
distributor 4 259
driving 14 12 14
engine 1 680 683
frame 1 680 683 684*
gas turbine 14 152-154
generator 4 221
headlamps 7 29
highways 14 12 14
lead acid storage battery 13 153
mufflers 8 623 624
noise control 9 122 123
odometer 12 600
overdrive 9 455-456
parking 14 15
power steering 13 102
spark plug 12 561-562
speedometer 12 600 13 581
traffic 14 12 14
transmission 1 680 14 45 47*
universal joint 14 204 206
valve train 14 262 264
voltage regulator 14 366
see also Automotive vehicle
Automobile brake 1 680 681
Automobile carburetion 2 478 479
accelerating pump 2 478
idling system 2 478
mixturing 2 479
power enrichment 2 478
Automobile engine *see* Automotive engine
Automotive air conditioning, *see* Air conditioning, automotive
Automotive air suspension 1 681-682
Automotive body 1 682
Automotive chassis 1 680, 682
Automotive engine 1 683, 687 688, 7 201
bore stroke ratio 7 201
breathing and exhaust 7 201
carburetor 1 687 2 477 480*
compression ratio 7 201
cooling system 1 688, 4 603 604*
cycle of operation 1 687
cylinders 1 687 7 201
engine balance 7 203
firing order 7 204
four stroke 1 687
fuel injector 1 687
fuel system 5 558
icing 7 205
ignition 1 687
intake manifold 7 204
L head 1 687
manifold heat 7 204
Otto cycle 9 450 451
overhead valve 1 687
performance criteria 10 591
piston motion 7 203
torsion dampers 7 204
truck 14 120
turbine 14 152 154
two stroke 1 687
typical American 7 206
V 8 engine 7 201
valve in head 1 687
valve train 14 262 264
valves 1 687
vapor lock 14 274
vibration 7 203 8 102
Automotive frame 1 683 684
Automotive steering 1 684 685
automobile 1 680
linkage 1 684
power steering 13 102 103
road wheels 1 685
steering gear 1 684
tie rod 13 610
Automotive suspension 1 680 682 685 686*
air 1 681 682
torsion bar 13 609
truck 14 120
Automotive transmission *see* Transmission, automotive
Automotive vehicle 1 680 686
axle 1 701 702
body 1 682
brakes 1 689
bus 2 355 356
chassis 1 680, 682
components 1 682
diesel engine 1 688
distributor 4 259
engine 1 683, 687-688 7 201
frame 1 688
internal combustion engine 1 688
motorcycle 8 616 617
noise control 9 122 123
operation 1 680 682
springs 1 685
steering 1 685 688
structure 1 681
suspension 1 685 686*, 690
tires 13 651
tractor 14 11 12
transmission 1 688
truck 14 120
universal joint 14 204
voltage regulator 14 366
Autonavigator 7 91, 8 517
Autonomic nervous system 1 689*, 13 461
embryology 9 47 48
muscle 8 635
parasympathetic system 9 557
Autophene 6 112
Autopilot 1 689 691
automatic approach 1
cruise control 1 689
guidance systems 6 296
ILS connection 1 690
radio command 1 689
response 1 690
stability 1 690
Autoplastic transplantation 4 572
Autoradiography 1 691 692
biochemistry 2 299
cytochemistry 5 650
particle detectors 9 58
Autosembly miniaturization of equipment 8 470
Autosticta cedemea 3 287
Autosome 12 250
Autostyly 12 357, 360
Autotomy 1 692* 13 23 53
Ophiuroidea 9 344
regeneration 11 421
Autotransformer 1 692 693
Autotrophic bacteria 13 1
Autotrophic nutrition 5 99
Autoxidation 1 479
Autumnal equinox 5 62 10
Autunite 9 186 11 269 14

B

B 17 1 536
B 21 1 536
B 58 1 536
B display radar 11 208
B power supply electronic 10 560
Baade W 3 506 4 535 13 59 14 278
Babbitt I 2 119
Babbitt alloy 1 258
  bearing 2 119
  tin 15 650
Babcock Harold 13 268
Babcock Horace 13 268
Babcock test milk 8 428
Babesia bigemina 6 315 7 299 11 60
Babesiasis 7 299
Babesiidae 6 319
Babinet's principle 4 139
Baboon 2 1
Babson globe 6 214
Babylon weeping willow 14 493
Bacchalaureus japonicus 1 555
Bacillaceae 2 1 2* 5 96
  anthrax 1 457
  Bacillus 2 2
  Clostridium 2 2
  ecology 2 2
  endospore properties 2 1
  milk 8 432
  spore germination 2 1
  sporulation 2 1
  taxonomy 2 11
Bacillariophyceae 3 117
  Centrales 3 119
  diatom 4 103 104
  Pennales 3 119
Bacillary dysentery 2 2* 4 233 5 1
  infant diarrhea 7 93
  heterophile antigen 6 429
  Shigella 12 234
Bacillus 8 340
  amylase 2 19
  Erythromycin activity 5 67
  flagellum 2 63
  in milk 8 432
  penicillin activity 9 620
  taxonomy 2 1 2
Bacillus aerosporus see Bacillus polymyxa
Bacillus alkalescens 5 70
Bacillus amylozyme 9 606 11 590
Bacillus anthracis 10 427 428
  amino acids 1 508
Bacillus anthracis—cont
  anthrax 1 457
  antibiotics active against 1 466 467
  bacterial cell chemistry of proteins 2 12
  in sheep 2 68
  sporicidal test 2 197
  taxonomy 2 2
Bacillus brevis 1 466 467 9 629 14 177
Bacillus cereus 2 14, 5 425 8 432 433
Bacillus circulans 8 435
Bacillus coagulans 5 424
  lactic acid 7 578
Bacillus despar 5 70
Bacillus licheniformis 2 2 8 433
Bacillus macerans 1 55 4 93
Bacillus megatherium 2 12, 7 486 12 232
Bacillus mesentericus 5 28 7 486
Bacillus mycoides 5 65
Bacillus polymyxa 1 466-467 2 378 10 483
Bacillus stearothermophilus 2 2 5 424
Bacillus subtilis antibacterial activity of carbomycin 2 461
  antibiotics active against 1 466 467
  2 3 butanediol fermentation of carbohydrates 2 44
  cell surface ionization 2 624
  Ford's type 2 378
  levan producer 7 486
  in milk 8 432 433
  pathogen to *germfree* vertebrate 6 180
  source of amylase 5 28
  spore germination 2 14
  strain *Tracy see Bacillus licheniformis*
  subtilin 13 230
  taxonomy 2 2
  in wool 13 542
B. cellulosa vulgatus 7 486
Bacitracin 1 508 461 468 475 2 2 8*
Back E 9 588
Back-emission electron radiography 11 305
Back reflection Laue camera 14 573
Backbone *see* Spine
Background count 2 3
Background noise 9 117
Backhoe 3 416, 5 133 134*
Backing pumps 14 241 242
Backing wind 2 3
Backlash gear 6 82
Backlin, F 14 590
Backsaw 14 542
Backshore (beach) 12 302
Backswimmer 6 401
Backus R H 12 60
Backward wave tube 2 3 5
  amplifiers 2 5
  helix circuit 2 4
  Karp circuit 2 4
  M type oscillator 2 4
  O type oscillator 2 4
Backwash 12 301
Bacteremia 5 67 13 8
Bacteria 2 5 9
  antibiotic producers *see* Antibiotic
  bacterial variation 2 8 6 6
  biochemistry 2 199
  cell chemistry 2 11 12
  cell surface ionization 2 624
  cell wall 2 6
  cocci 2 6
  coenzymes 2 12 13
  constancy 2 66
  digestion tests 2 8
  diseases caused *see* Disease bacterial
  dissociation 2 9
  endospores 2 14 15
  enzyme 2 15 20
  enzyme industrial production *see* Enzyme (industrial production)
  fermentation 2 7
  fluorescent antibody technique 8 383
  genetics 2 20 22
  growth 2 22 24
  halo obligatory 2 340
  halo tolerant 2 340
  interrelationship with other organisms 2 9
  luminescence 2 25
  lysogenic 2 9* 3 288
  medical importance *see* Bacteriology *medical* metabolism 2 25 65
Bacteria—cont
  motility 2 6 63 64*
  natural defenses against bacterial infections 2 8
  nucleus 2 6
  nutrition 2 63 64
  origin 2 66
  oxygen relationships 2 7
  pathogen 9 593
  physiology 2 63 66
  plectridium 2 6
  pure cultures 2 5
  respiration 2 7
  science and study of 2 66 67, 8 348
  sexlike mechanisms 2 21
  shape and arrangement 2 6
  in soils 12 459 460
  stains and staining reactions 2 6
  taxonomy 2 6, 10 11*
  temperature *relationships* 2 7
Bacteria lysogenic 2 9
Bacteria taxonomy of 2 10 11
Bacterial anabolism 2 47 64
Bacterial blight cotton 3 514
  pea 9 600
Bacterial canker 1 495
Bacterial catabolism 2 26 47
Bacterial cell chemistry 2 11 12
  action of *enzymes* on bacterial structures 2 12
  capsules 2 12
  carbohydrates 2 12
  cell walls 2 12
  chemical anatomy 2 12
  chemical composition 2 11
  flagella 2 12
  lipid 2 12
  nucleic acids 2 12
  proteins 2 12
  protoplasmic membrane 2 12
Bacterial chemosynthesis photosynthesis 10 191 192
  see also Bacterial metabolism
Bacterial coenzyme 2 12 14
  bacterial metabolism 2 25 65
  function 2 13
  growth factors 2 13
  reaction specificity 2 14
Bacterial endocarditis 6 359

Bacteriology medical—cont
Weil's disease 14 464
yaws 14 507
Bacteriophage 2 9, 69 70*, 4 66 8 377 13 58
cheese 3 12
coliphage 5 288
deoxyribonucleic acid 9 216
infection lytic 7 91
metabolic disorders 8 259
recombination genetic 11 580
virus 14 530
Bacteriophage T4 spontaneous mutation frequencies 8 675
Bacteroidetes 3 78
Bacterium aerogenes see Aerobacter aerogenes
Bacterium coli see Escherichia coli
Bacterium tularense see Pasteurella tularensis
Bacteriostasis thiosphere 13 549
Bacteroidetes 2 70 71* 5 96
classification 2 71
morphology 2 70
pathogenicity 2 71
taxonomy 2 11
Bacteroides fragilis 2 71
Bacteroides fundiliformis see Sphaerophorus necrophorus
Bactogen *see* Chemostat
Bactrian camel 2 427
Baculum 5 472 473
Baddeleyite 2 71* 14 616
Badge film *see* Film badge
Badger 2 72
Baesche process 13 260
Badlands 4 76
Baeolophus bicolor 14 655
Baer, K. E. von 4 569
Baeyer, A. von 13 401
Baeyer's strain sheeche by truncation 1 245
Baffin Bay 9 271
Baffin Island 1 525
Baffle acoustics 7 580 12 512
Baffle (mixing) 8 528
Bagasse 13 297
Bagnold, R. A. 4 296 13 174
Bagworm 2 552 7 164
Bahama Islands 9 151 14 478 479
Bahiera Island 1 580
Bahrel Jebel River 1 409
Baiera 9 505
Baikal 9 286
Bailey, S. W. 11 509
Bain, G. 8 141
Bain, H. 10 430
Bairdiidae 10 425
Baird's beaked 11 572
Baja California 9 161
Bajada 8 75 76
Bajocian stage 7 525
Bakamo disease 6 181, 11 565
Baker, J. B. 7 199
Baker, R. F. 8 377
Baker Nunn camera 1 615 614
Baker Super-Schmidt meteor camera 9 562
Baker's yeast 14 603 604
Bakery products 5 412
Baking powder 2 72
Bakony Forest 5 118
BAL *see* British anti-lewisite
Balaenoptera musculus 14 479
Balance (analytical) 2 72 73
Balance (constellation) *see* Libra
Balance (weighing instrument) 2 73 74
analytical 2 72 73
beam 2 74
density 2 74
equal arm 2 74
gravity 2 74
fluids 2 74
microbalance 2 74
platform 2 74
spring 2 73 74
steelyard 2 74
torsion balance 2 74, 6 264
triple beam 2 74
weight measurement 14 461 462
Westphal 2 74
Balance wheel escapement 5 69
Balanced genetic polymorphism 6 501
Balancing shaft *see* Shaft balancing
Balancing machine (shaft) 12 239 240
Balancing organ 4 214
Balanidae 2 74
Balanites 11 482
Balanocidaris 4 369
Balanoglossus 3 263 5 5
Balanomorpha 2 74 75* 13 668
Balanophora 12 25
Balanophoraceae 12 25
Balanophyllia gigas 12 77
Balanops 2 75
Balanopsidaceae 2 75
Balanopsidales 2 75* 10 346
Balantidiasis 2 75
Urchostomatida 14 87
Balantidium 6 492 14 87
Balantidium coli 2 75 14 87
Balanus 1 502 3 145 364 5 201
Balanus balanoides 2 74
Balanus eburneus 13 668
B. tintinnabulum rostratus 2 74
Balard, J. 2 933
Balaton Lake 5 115
Balbash Hsiun process 12 331
Balco 7 265
Baldwin Escarpment 3 244 9 151
Balcony acoustical design 1 520
Bald eagle 4 317
Bald faced hornet 6 582
Baldness, genetics of 6 511
Baldpate 4 290
Baldwin, E. 4 362
Balearic Sea 8 207
Baleen whale 2 206
Bali Sea 9 271
Balistes carolinensis 13 530
Balkan, Central 5 118
Balkan Little 5 118
Balkan Western 5 118
Balkan Peninsula 5 116
Balkan Ranges 5 117
Balkash Lake 1 580
Ball ammunition 1 530
Ball bearing 2 123 126
angular contact 2 123
fatigue 2 124
life 2 124
mountings 2 126
races 2 125
radial 2 123
structure 2 125
thrust 2 125
Ball bearing mill 2 75
Ball bearing pulverizer 2 75
Ball breaker (oceanography) 8 146 147
Ball cartridge 1 530
Ball clay 2 618, 3 161
Ball mill 3 539
diamond recovery 4 100
Ballast (electric)
Ball
Ballast tanks submarine 13 211 212
Ballast tube 2 75
Ballhead governor 6 239 240
Ballistic camera 9 360 362
Ballistic gyroanometer 6 25
capacitance measurement 2 441
fluxmeter 5 361
impulse 7 47
search coil 12 123
Ballistic missile 2 75 76* 8 512
arms armament 1 540
guidance 8 517
hypersonic flight 6 592
nose cone *see* Nose cone
Polaris 1 541
Redstone 1 540
reentry *see* Reentry
Thor 9 562
see also Missile
Ballistic pendulum 2 83* 9 618
Ballistic range 2 76 78
aerodynamic forces 2 77
Ballistic range—cont
comparison with wind tunnels 2 78
shadowgraph studies 2 76
shock wave display 12 298 299
trajectory coordinates 2 78
Ballistic trajectory 2 72*, 6 591
Ballistics, exterior 2 78 82
Didion-Bernoulli method 2 81
drag 2 80 81
numerical integration 2 81
Otto-Lardillon method 2 81
rigid body dynamics 13 571
Siacci method 2 81
stabilization by spinning 2 82
Ballistics, interior 1 539 540, 2 82 84*
Ballistite 5 75
Ballistospores 13 10
Ballochore population dispersal 10 499
Balloneis 2 260
Balloon 2 84 86* 6 544
astronomical spectroscopy 1 617
buoyant force 1 101
helium 6 390
meteorological 2 84, 8 318
sky hook 5 363
Ball race pulverizer 3 561
Balmer series 1 657
Balsa 2 86 87
circulation 2 87
ecology 2 89
geologic history 2 87
gravity measurements 13 514
ice 2 89
salinity 2 87
water level 2 89
Baltic Shield 10 367
Baltimore oriole 9 407
Bamboo 2 89
Banach lattice 7 412
Banach space 9 340
Banana 2 89 90
diseases 2 90
distribution 2 89
wild 2 1
Band elimination filter 5 267
Band head band spectrum 2 90
Band pass filter acoustic 5 263
color 5 266
electric 5 267 11 221 222
Band rejection filter 5 267
Band saw 12 41 14 542

Bacterial endospores 2 6, 14-15* 20*
Bacillaceae 2 1
constituents 2 14
formation 2 14
germination 2 15
sterilization 13 133
structure 2 14
Bacterial enzyme 2 13, 15-20*
adaptive exoenzymes 2 19
aldolase 2 16
amino acid deaminase 2 18
amino acid decarboxylase 2 18
amino acid oxidase 2 18
amino acid transaminase 2 18
autolytic 2 20
bacterial metabolism 2 25-63
carbuncle 2 477
classification 2 15
decarboxylase 2 17
dehydrogenase 2 16
endoenzymes 2 15
enolase 2 16
epimerase 2 16
exoenzymes 2 19
extracellular and activators in virulence 14 330
isomerase 2 16
ketolase 2 16
kinase 2 15
medical importance 2 19
mutase 2 17
oxidase 2 17
phosphatase 2 18
phosphorylase 2 18
reactions involving carbohydrate 2 16
synthetase 2 17
transketolase 2 17
Bacterial genetics 2 17, 20 22*, 67
application to biological problems 2 22
genotypic change 2 20
mutation 2 20
phenotypic change 2 20
population change 2 20
recombination 2 21
role of deoxyribonucleic acid (DNA) 2 21
sexlike mechanisms 2 21
transduction 2 21
transformation 2 21
Bacterial growth 2 22 25
balanced growth 2 23
chemostat 2 24
continuous culture 2 24
environment and growth rate 2 24
exponential growth phase 2 23
growth end point 2 24
individual cell growth 2 24
lag phase 2 23
stationary phase 2 24
Bacterial growth—*cont*
turbidostat 2 24
Bacterial infection *see* Bacteriology, medical, Disease, bacterial, Virulence
Bacterial leaf spot 5 546 548
Bacterial luminescence 2 25*, 220
cell (pressure temperature effects) 2 599
Bacterial metabolism 2 25 63
adenosinephosphates 2 50 51
aerobic oxidations 2 27-37
aromatic compounds 2 33 35
inorganic substances 2 28-29
nitrogen containing organic substances 2 35-37
nitrogen free aliphatic compounds 2 29 35
amino acid fermentation 2 45 47
anaerobic oxidations 2 37 38
carbonate reduction 2 37
denitrification 2 37
nitrate reduction 2 37
sulfate reduction 2 37
bacterial anabolism 2 47-63
bacterial biosyntheses carbohydrates 2 54-56
bacterial carbohydrate fermentation alcoholic 2 38 41
butyric acid 2 42
lactic acid 2 41 42
bacterial coenzyme 2 14
bacterial enzyme 2 20
biochemistry 2 199
biosynthesis of complex substances 2 60
nucleic acids 2 62
proteins 2 61
carbohydrate fermentations 2 38-45
butanol acetone fermentation 2 43
ethanol-acetone fermentation 2 44
propionic acid fermentation 2 42
catabolism and anabolism 2 26 51 52
endogenous and exogenous catabolism 2 26
fermentative metabolism 2 38 47
oxidative metabolism 2 27 38
cell organization 2 62
energy relations 2 47-48
energy rich coenzyme substrate complexes 2 51
Bacterial metabolism—*cont*
fermentation of nitrogen compounds 2 45 47
purine fermentation 2 47
group transfer 2 52
intermediary metabolism 2 26
oxidative and fermentative assimilation 2 52
permeases 2 62
phosphorylated compounds 2 48-50
specific biosyntheses 2 52-60
amino acids 2 56 57
aromatic compounds 2 57
carotenoids 2 54
fatty acids 2 52 60
lipid 2 52 60
purine 2 60
pyrimidine 2 59
pyrroles 2 57
steroid 2 54
Bacterial motility 2 6, 63 64*
flagellum 2 63
mechanisms 2 63
plant movements 10 366
tactic responses 2 64
types 2 63
Bacterial nutrition 2 64 65
carbon 2 64
energy 2 64
growth factors 2 65
minerals 2 65
nitrogen 2 65
oxygen 2 65
Bacterial photosynthesis 10 191 192
Bacterial physiology 2 65 67
areas 2 65
cell chemistry 2 11 12
endospores 2 15
enzyme 2 15 20
genetics 2 20 22
growth 2 22 25
luminescence 2 25
motility 2 63 64
nutrition 2 64 65
Bacterial soft rot 9 327
Bacterial spot peach 9 601
Bacterial toxin *see* Toxin, bacterial
Bacterial wetwood elm 14 76
Bacterial wilt alfalfa 1 234
peanut 9 603
Bacterinastrum canians 8 128
Bacteriochlorophyll 2 55 3 78
Rhodobacteriineae 11 552
Bacteriology 2 66 67
biochemistry 2 67
classification 2 67
cycle of matter 2 66
disease and spoilage 2 66
genetics *see* Bacterial genetics
Bacteriology—*cont*
physiology 2 65 67
Bacteriology, medical 2 67 69
anthrax 1 457 458
bacillary dysentery 2 2
bacteria 2 3
bejel 2 159
botulism 2 307
brucellosis 2 353
Carrion's disease 2 33
cholera vibrio 3 84
contributions by insects 2 68
cystitis 3 650
endocarditis 4 588
enteric bacilli 5 1
Gaffkya tetragena 6 2
glanders 6 206
gonorrhea 6 235 236
gram negative diplococci 6 247
granuloma inguinale 6
hemophilic bacteria 6
hemorrhagic septicemia 6 413
hyaluronidase 6 522
identification of pa genic bacteria 2 68
immunity 2 68
infant diarrhea 7 93
infection 7 91
jaundice 7 302 303
leprosy 7 475
listeriosis 7 543
melioidosis 8 214
meningitis 8 224
meningococcus 8 224
osteomyelitis 9 416
paracolon bacilli 9 544
parapertussis 9 554
paratyphoid fever 9 56
paratyphoid gastroenteritis 9 562
paresis, general 9 564
pink eye 10 238
pinta 10 238
plague 10 255
pneumococcus 10 425
proteus 11 44
Pseudomonas aeruginosa 11 66
pseudotuberculosis 11
Quellung reaction 11
rat bite fever 11 545
relapsing fever 11 426
rheumatic fever 11 545
Salmonella 12 16
scarlet fever 12 51
septicemia 12 188
Shigella 12 254
study of specific prope 2 68
tuberculosis 14 129
tularemia 14 154
typhoid fever 14 173
Vincent's angina 14 324
virulence 2 68

Bacteriology medical—cont
Weil s disease 14 461
yaws 14 597
Bacteriophage 2 9, 69 70*, 4 66, 8 377 13 38
cheese 5 12
coliphage 3 289
deoxyribonucleic acid 9 216
infection lytic 7 94
metabolic disorders 8 259
recombination, genetic 11 340
virus 14 550
Bacteriophage T4 spontaneous mutation frequencies 8 675
Bacteriostatin 5 78
Bacterium aerogenes see Aerobacter aerogenes
Bacterium coli see Escherichia coli
Bacterium tularense see Pasteurella tularensis
Bacterization rhizosphere 11 549
Bacteroidaceae 2 70 71* 5 96
classification 2 71
morphology 2 70
pathogenicity 2 71
taxonomy 2 71
Bacteroides fragilis 2 71
Bacteroides fundiliformis see Sphaerophorus necrophorus
Bactogen *see* Chemostat
Bactrian camel 2 427
Baculum 5 472 473
Baddeleyite 2 71* 14 616
Badge film *see* Film badge
Badger 2 72
Baehuche process 13 260
Badlands 4 76
Baeolophus bicolor 13 655
Baer, K. E. von 4 569
Baever, A. von 13 401
Baever's theory alcoholic by dissociation 1 243
Baffin Bay 9 271
Baffin Island 1 525
Baffle (acoustics) 7 489 12 512
Baffle (mixing) 8 525
Bagasse 13 237
Bagnold, R. A. 4 296 13 174
Bagworm 2 552 7 464
Bahama Islands 9 151 14 473 474
Bahrein Island 1 580
Bahrel Jebel River 1 409
Baiera 9 408
Baikal 9 286
Baikiaea, W. W. 11 599
Bainite 6 381
Baiomys 10 430
Baiomyidae 10 429
Baja (class) 1 11 472
Baja California 9 161
Bajada 4 75 76
Bakanae disease 6 184, 11 565
Baker, J. B. 7 198
Baker, R. F. 8 377
Baker Nunn camera 1 613 614
Baker Super-Schmidt meteor camera 9 362
Baker's yeast 14 603 604
Bakery products 5 412
Baking powder 2 72
Bakony Forest 5 118
BAL *see* British anti lewisite
Balaenoptera musculus 14 479
Balance (analytical) 2 72 73
Balance (constellation) *see* Libra
Balance (weighing instrument) 2 73 74
analytical 2 72 73
beam 2 74
density 2 74
equal arm 2 74
gravity 2 74
Jolly 2 74
microbalance 2 74
platform 2 74
spring 2 73 74
steelyard 2 74
torsion balance 2 73 6 264
triple beam 2 74
weight measurement 14 461 462
Westphal 2 74
Balance wheel escapement 5 69
Balanced genetic polymorphism 6 504
Balancing shaft *see* Shaft balancing
Balancing machine (shaft) 12 239 240
Balancing organ 4 214
Balanidae 2 74
Balanitis 11 482
Balanocidaris 4 360
Balanoglossus 3 263 5 3
Balanomorpha 2 74 75* 13 608
Balanophora 12 25
Balanophoraceae 12 25
Balanophyllia gigas 12 77
Balanops 2 75
Balanopsidaceae 2 75
Balanopsidales 2 75* 10 346
Balantidiasis 2 75
Trichostomatida 14 87
Balantidium 6 482 14 87
Balantidium coli 2 75 14 87
Balanus 1 562 3 145 563 5 201
Balanus balanoides 2 74
Balanus eburneus 13 608
Balanus rostratus 2 74
Balard, J. 2 911
Balaton Lake 5 115
Balbach Thum process 12 333
Balco 7 265
Balcones Escarpment 3 214 9 151
Balcony acoustical design 1 520
Bald eagle 4 317
Bald faced hornet 6 582
Baldness, genetics of 6 511
Baldpate 4 290
Baldwin, E. 4 362
Balearic Sea 8 207
Baleen whale 2 206
Bali Sea 9 271
Balistes carolinensis 13 530
Balkan, Central 5 118
Balkan, Little 5 118
Balkan, Western 5 118
Balkan Peninsula 5 116
Balkan Ranges 5 117
Balkash, Lake 1 580
Ball ammunition 1 539
Ball bearing 2 125 126
angular contact 2 123
fatigue 2 124
life 2 124
mountings 2 126
races 2 123
radial 2 125
structure 2 123
thrust 2 123
Ball bearing mill 2 75
Ball bearing pulverizer 2 75
Ball breaker (oceanography) 8 146 147
Ball cartridge 1 539
Ball clay 2 648 5 161
Ball mill 3 559
diamond recovery 4 100
Ballast (electric)
ballast resistor 2 75
fluorescent lamp 5 348 349
mercury vapor lamp 8 254
vapor lamp 14 274
Ballast resistor 2 75
Ballast tanks submarine 13 211 212
Ballast tube 2 75
Ballhead governor 6 239 240
Ballistic camera 9 360 362
Ballistic galvanometer 6 23
capacitance measurement 2 444
fluxmeter 5 361
impulse 7 47
search coil 12 123
Ballistic missile 2 75 76* 8 512
arms armament 1 540
guidance 8 517
hypersonic flight 6 592
nose cone *see* Nose cone
Polaris 1 544
Redstone 1 540
reentry *see* Reentry
Thor 9 362
see also Missile
Ballistic pendulum 2 83*, 9 618
Ballistic range 2 76 78
aerodynamic forces 2 77
comparison with wind tunnels 2 78
shadowgraph studies 2 76
shock wave display 12 298 299
trajectory coordinates 2 78
Ballistic trajectory 2 75*, 6 591
Ballistics exterior 2 78 82
Didion Bernoulli method 2 81
drag 2 80 81
numerical integration 2 81
Otto Lardillon method 2 81
rigid body dynamics 11 574
Siacci method 2 81
stabilization by spinning 2 82
Ballistics interior 1 559 560 2 82 83*
Ballistite 5 77
Ballistospores 13 10
Ballochore population dispersal 10 490
Ballonets 2 260
Balloon 2 84 86*, 6 544
astronomical spectroscopy 1 617
buoyant force 1 101
helium 6 300
meteorological 2 94 8 518
sky hook 5 563
Ball race pulverizer 3 561
Balmer series 1 657
Balsa 2 86 87
Balsam fir 2 97, 5 278
Balsaminaceae 12 26
Baltic Ice Lake 2 87
Baltic Sea 2 87 89*, 5 114 9 249 250 271
circulation 2 87
ecology 2 89
geologic history 2 87
gravity measurements 13 514
ice 2 89
salinity 2 87
water level 2 89
Baltic Shield 10 567
Baltimore oriole 9 407
Bamboo 2 89
Banach lattice 7 412
Banach space 9 340
Banana 2 89 90
diseases 2 90
distribution 2 89
wild 1 1
Band elimination filter 5 267
Band head band spectrum 2 90
Band pass filter acoustic 5 265
color 5 266
electric 5 267 11 221 222
Band rejection filter 5 267
Band saw 13 41 14 548

Band spectrum 2 90 91
molecular structure and spectra 8 551-555
spectroscopy of combustion 12 591
Band stop filter 5 267
Band-tailed pigeon 4 270
Band theory of solids 2 91 93*, 12 477-478, 480
allowed bands 2 91-92
alloy structures 1 261
Brillouin zones 2 338 339
conduction band 3 391
effective mass 2 92
energy-band calculation 2 92-93
forbidden bands 2 91-92
Hartree-Fock equations 2 92 93
holes in solids 6 463 464
insulators 7 163
Kronig Penney model 7 371
semiconductors 12 166
transitions between states 2 92
Banda Sea 9 271 12 531
Banded agate 1 111
Banded coal 5 229
Banded gecko 6 91
Bandwidth 2 93
amplifier 1 343-344
filters 5 266-267
microwave tube 8 425
noise measurement 9 152 153
radio 11 242
Bandwidth measurement 12 593
Bandwidth requirements (communications) 2 93 94
Banff National Park 9 157
Banffia 1 431
Bang's disease 2 564
Bangalore torpedo 1 540
Bank indicator *see* Turn and Bank Indicator
Bank swallow 13 535
Bankia gouldi 12 291
Bankometer hydrometer scale 6 562
Banks Islands 1 523, 9 166
Banting, F G 7 163, 9 533
BAR (Browning automatic rifle) 1 537
Bar built estuary 5 82
Bar linkage 7 527
Bar magnet 8 26
Baragwanathia 9 504
Barba amarilla 5 215
Barbane 6 421
Barbel 12 180
Barbera 14 507
Barbicel 5 195
Barbital 11 114, 14 217
Barbiturates 2 94*, 6 595, 14 16
sedation 12 129
types 2 94
Barbituric acid 2 36, 94, 11 114, 14 217
Barbourula 9 345
Barbule 5 195
Barbus thermalis 2 598
BARC (landing craft) 7 396
Barchan 4 292
Barcroft, J 10 210
Bard, P 4 584
Bard vetch 14 310
Bardeen, J 12 170, 13 301, 14 186
Bardeen-Cooper-Schrieffer theory 13 301
Barents Sea 1 626, 5 114, 9 271
Barentsia 5 7
Barge transportation 7 114-116
Baringo, Lake 1 107
Barite 2 94*, 8 277, 13 254
barium sulfate ore 2 95 96
Barium 2 94-96
analytical methods 2 96
barite (barium ore) 2 95-96
electron configuration 4 504
extraction of metal 2 95, 8 277
ionization potential 4 504
natural occurrence 2 95
organometallic compound 9 402
principal compounds 2 96
Barium chromate 3 105
Barium crown glass 9 351 352
Barium feldspar 5 207
Barium ferrite 2 650
Barium flint glass 9 351 352
Barium fluoride 2 90
Barium titanate 2 96 97*, 5 225 229 13 653
compared to Rochelle salt 2 97
ferroelectrics 5 225-229
perovskite 10 28
plot of dielectric constant vs temperature 6 600
Bark 2 97 98
Bark beetle 2 131 3 278, 14 538
Bark gnawing beetle 3 277
Bark louse 11 70
Barker method crystallography 3 607 608
Barkhausen effect 2 98* 5 233
magnetization 8 51
Barkla, Charles I 653, 14 567
Barley 2 98 101*, 10 374
cultural practices 2 99
description 2 98
diseases 2 99 100
as food 5 373
genetics 2 98
malting 2 100
origin 2 98
pearl 2 100
pot 2 100
varieties 2 99
Barley stripe 2 99
Barlow, W H 3 596, 13 507
Barn (structure) 1 140
Barn (unit) 2 101
Barn owl 9 460, 13 185
Barn swallow 13 532
Barnacle 1 51 52, 562, 2 101-102*, 3 145, 7 455, 13 609
Barnard, E E 7 324, 8 154
Barnes, T C 10 211
Barnett, M A F, 7 254
Barnett, S J 6 307
Barnett, William 7 196
Barnett method gyromagnetic effect 6 306 307
Barochore population dispersal 10 499
Baroclinic field 2 102
Barometer 2 102*, 10 581
liquid-column gage 2 102
meteorological 2 102
Barometric density formula 2 280
Barometric height units 1 156
Barometric leveling 13 326
Barometric pressure *see* Air pressure, Atmospheric pressure
Baron (herbicide) 6 423
Baronia brevicornis 7 470
Barophilic species 4 41
Baroque pearl 9 607
Barot Mountains 5 118
Barotropic field 2 102 103
Barracuda 2 105
Barrande, Joachim 12 327
Barred owl 9 460
Barred spiral galaxy 6 6
Barrel 8 188
electroplating of metals 4 533
Barrel distortion 1 6 7
Barrell, J 4 102
Barremian substage 3 543
Barren Lands 9 143 144
Barretter 2 103
Barrier fission *see* Fission nuclear
Barrier beaches 12 302
Barrier grid storage tube 13 160
Barrier like 7 387
Barrier layer (semiconductors) 12 169
Barrier layer cell photometer 10 171
Barrier layer rectifier 12 173
Barrier range 1 671
Barrier reef 2 103
Barrow, G 8 300
Barrow Canyon 9 167
Barrow (bog) 6 460
Barr reaction 4 106
organoarsenic compound 9 401
Bartholin's gland 14 256
Bartle Frère Mountain 1 671
Bartonella 11 567
Bartonella bacilliformis 2 392 11 567
Bartonellaceae 11 567
Barycentric calculus 2 104 105 theorems 2 104
Barycentric coordinates 2 104 105
Barye 8 441
Barylambda 9 537
Barylambdidae 9 537
Baryon 2 105*, 8 249
conservation 2 105 13 564 564
elementary particle 4 543 544
Baryta *see* Barite
Barytes *see* Barite
Basal cell carcinoma 9 321
Basal ganglia 8 615
Basal metabolic rate 13 591
clinical pathology 3 192 202
Basalt 12 354
Basalt 2 105 106*, 7 16 11 590 591
composition 2 105
compressive strength 4 611
flood 14 350
formation 2 105
occurrence 2 106
plateau 14 350
from subcrust (lunar) 15 412 413
texture 2 105
Basalt porphyry 11 590
Basaltic lava 7 421
Basaltic lead 7 428
Basanite 7 16 514
Bascule bridge 2 334
Base, chemical 1 39-42*, 2 106 6 570
see also Acid and base entries under specific chemicals
Base, mathematical geometry 12 475
logarithmic 7 576
Base box tin plating 4 551
Base centered monoclinic crystal lattice 3 594 595
Base centered orthorhombic crystal lattice 3 594 595
Base detonating (BD) fuze 1 540
Base exchange 14 611
Base level 5 359
Base line surveying 13 524
Basellaceae 2 643
Basement complex (rock) 2 106 107
Basement membrane 5 41
Basement rock 2 106 107
Basement waterproofing 5 482
Basic blue 9 4 301
Basic blue 26 4 302
Basic dye 4 302 309

Basic green 4 4 301
Basic motion time study 14 555
Basic open hearth process 13 95
Basic orange 2 4 299
Basic red 2 4 303
Basic red 9 4 301
Basic red 12 4 305
Basic rocks 11 590
Basic salt 12 16
Basic violet 10 4 302
Basic yellow 2 4 301
Basidiobolus 10 200
Basidiocarps 8 660
Basidiomycetes 2 107* 5 561, 12 461 14 528
Heterobasidiomycetidae 6 427
Homobasidiomycetidae 6 469
mushroom 8 660
Sporobolomycetales 13 10
basidiospores 6 427 11 654
basidium 2 107
Basil 12 612
Basilar membrane 4 323 6 552 10 124
Basilar papilla 4 322
Basilarchia archippus 2 381
Basiliscus 13 23
Basin 2 107
Aquitaine 13 409
caldera 10 84
cirque 3 144
closed 6 568
coal (carboniferous) 2 470
in desert areas 4 75
Great Basin 8 618
intracratonic 6 174
lake 7 386-389
playa 10 415
river 11 591
sedimentary *see* Sedimentary Basin
syncline 13 373
Wyoming Basin 8 618
Basin and range province 8 618 9 160 10 264 265
Basin area major rivers 11 582
Basin irrigation 7 270
Basin margin evaporites 5 128
Basipodite 3 561
Baskerville John 14 171
Basket star 13 53
Basking shark 12 243 13 20
Basommatophora 6 77
Basophil 2 263 6 496
Bass 2 107
Bass Strait 7 56 59
Bassariscus astutus 3 149
Bassler R 2 555 3 16 579 611 611 6 500 14 80
Bassoon 8 665 666
Basswood 2 108 109
Basswood lace bug 6 405
Bast fibers 3 249 250 12 79
Bastite 4 616 12 197
Bastnaesite 2 654 11 342
Bat 2 109* 3 63
Bat bug 6 401
Bat fly 4 212
Bat tick fly 4 212
Batch leaching 7 422 423
Batch melter direct-arc furnace 1 502
Batea 8 477
Bateman H 14 200
Batesian mimicry 11 31 33
Bath sponge 4 56 13 10
Bathochromic shift spectrophotometric analysis 12 583
Batholith 2 109* 10 84 421
core areas of mountains 9 411
granite type 10 51
granodiorite type 10 51
Nevadan intrusions 13 410
regional ore guides 11 20
Sierra Nevada 8 618
Bathonian stage 7 325
Bathormithidae 1 694
Bathycalanus swerdrupi 3 462
Bathycrinus 3 548
Bathyctenidae 4 39
Bathycuma 4 41
Bathyergidae 11 615
Bathynella 13 567
Bathynella natans 2 109
Bathynellacea 2 109
Syncarida 13 567
Bathynomus 3 290 7 283
Bathypathes alternata 1 481
Bathypelagic fauna 4 39 40
Bathypelagic zone 4 39
Bathyphotometer 4 40
Bathyplates 1 592
Bathypteroidae 4 41
Bathyscaph 2 109 110
Bathysiphon 5 435
Bathythermograph 2 110 111* 12 114
temperature depth traces 2 111
Batillipes 13 597
Batillipes mirus 6 431
Batiste 13 537
Batoidea fossils 2 111
Batoidea *see* Rajiformes
Batrachoididae 2 111
Batrachoidiformes 2 111* 9 442
Batrachosauria 3 515
Batrachoseps attenuatus 12 7
Batten plates column 3 304
Battening textile 13 535
Battery (electric) 2 111 112
applications 2 111
fuel cell *see* Fuel cell
life 2 112
mercury *see* Mercury battery
nuclear *see* Nuclear battery
power supply electronic 10 561
primary *see* Primary battery
ratings 2 112
reliability 2 112
reserve battery *see* Reserve battery
size 2 112
solar *see* Solar battery
storage *see* Storage battery
see also Dry cell Wet cell
Battery charging 13 156
generators 4 221
Battery grid alloys 7 426
Battleship 12 262
Battus philenor 7 470, 11 32
Batuecas T 1 698
Baudot code teletypewriter 13 453
Bauhin, C. 10 378
Bauhinia 3 186
Baumé hydrometer scale 6 562
Baurosuchus 3 553
Bauxite 1 290 2 112 113*, 8 277
commercial 2 113
laterite 7 407
production 2 113
processing 1 291
refractory 11 409
Bavarian Alps 5 117
Baveno law feldspar 5 207
Baxter Basin pool 9 6
Bay (geomagnetism) 6 144
Bay (oceanography) 5 79
fiord 5 277
Bay (spice) 12 612
Bay of Bengal 9 271
Bay of Fundy 13 636 14 599
Bay sediments 8 132 133
Barberry 8 693
Bayer J 3 412
Bayer process alumina extraction 1 290
Bayes method statistics 13 71
Bayliss W 4 171 589 10 211
Bayonet 1 537
Barooka 1 540* 12 242
Bcc *see* Body centered cubic lattice
BCPC 6 421
Bdelloidea 2 113 114* 11 633 12 236
Bdellomorpha 2 114
Bdellonemertini *see* Bdellomorpha
Bdellostoma 11 515
Bdelloura candida 10 413 14 89
BDI (landing craft) 7 396
Beach F A 10 36 127 11 479
Beach cusps 12 303
Beach cycles 12 302 303
Beach deposits 12 305
Beach environment 12 305 306
Beach erosion 3 242
groin 6 275
Beach formation 12 303 304
Beach profile 12 302
Beach sands longshore movement 12 304 305
seasonal migration 12 302
size of sediment 12 303
sorting 12 304
source 12 305
thorianite in 13 609
Beach scarp 12 302
Beach sediments 12 305
Beach slopes 9 8
Beach types 12 301 302
Beach worm 12 306
Beacon light *see* Light beacon
Beaded lizard 6 185, 13 24
Beam 2 114
cantilever 2 439
concrete *see* Concrete beam
deflection 7 567, 13 205
elastic stresses 7 566
girder plate 6 188
inelastic stresses 7 566
lateral buckling 7 567
loading transverse 2 114 7 565 568*
plate structural 10 407
section modulus 7 566
shear center 7 569
shear flow 7 567
statically indeterminate 7 567
steel and concrete 3 343 344
stiffeners 6 189
types 7 566
unsymmetrical bending 7 567
Beam (ships) 12 269
Beam antenna *see* Antenna (aerial)
Beam balance 2 74
Beam column 2 114* 3 303
interaction formula 2 11
secant formula 2 114
Beam power tube 2 114 115
construction 2 115
current voltage characteristics 2 115
Beam relay 11 442
Beam rider guidance system 6 287 290 8 516
Beam splitting camera 2 430
Beamhouse 7 445
Beams J W 7 338
Beams atomic *see* Atomic beams
Beamwidth radar 11 202
Bean 2 115 118
culture 2 116
diseases 2 117-118
production statistics
types 2 115
utilization 2 117
Bean clam 12 306
Bean mosaic 2 118
Bean thresher 1 130
Bean thrips 13 628
Bean weevil 3 278 287

Bear 2 118
  gestation period 6 182
Bear Driver *see* Bootes
Bearden, J A 1 651, 14 590
Bearing, antifriction 2 118-126
  Babbitt metals 1 258, 2 119
  ball *see* Ball bearing
  bath lubrication 2 121
  bushing 2 376
  cast iron 2 119
  drop feed oilers 2 121
  fluid film hydrodynamic bearings 2 122
  fluid-film hydrostatic bearings 2 122
  forced feed lubrication 2 121
  gas lubricated 2 122
  lubricants 2 120, 7 601 606
  materials 2 119
  mean bearing pressures 2 121
  noise control 9 125
  oil rings 2 121
  porous metal 2 120
  roller *see* Roller bearing
  rubber 2 119
  waste-packed 2 121
  wick and felt feeders 2 121
  wooden 2 119
Bearing (navigation) 9 11
Bearing alloys 1 258
  lead 7 427
  tin 13 650
Bearing power (soil) 12 458
Beat 2 126, 8 661-662*
Beat frequency 2 126
Beat frequency oscillator *see* Heterodyne oscillator
Beattie, J A 14 22
Beattie Bridgeman equation 2 126-127
  for gases 13 568
Beaufort scale 14 493, 496
Beaufort Sea 1 525, 9 166, 271
Beaufort series 10 25
de Beaumont, J 11 467
Beauveria 8 569
Beaver 2 127*, 12 61, 14 490
Beaver parasite beetle 3 276
Bêche-de-mer 6 463-467
Beck, D E 7 473
Beck-dveing 4 311
Becke, F 8 299
Becker blood group 2 269
von Beckh, H 12 540
Beckman aspirator burner 5 294
Beckmann rearrangement 3 640
  lactam and lactim 7 377
  oxime 9 468
Beckmann thermometer 2 420
Becquerel, (Antoine) Henri 3 47, 11 223, 14 209
Becquerel E, H 317
Bedbug 2 127*, 362 6 401
Bed load longshore transport 12 304
Bedded chert 3 57
Bedding planes cave 2 571
  stylolites 13 208
Bedspring antenna radar 11 203
Bee and beekeeping 2 127-129
  colony reproduction 2 129
  drones 2 128
  female caste determination 2 128
  food of honeybees 2 128
  honey 2 129
  honeybee colony 2 128
  honeybee comb 2 129
  queen bee 2 128
  swarming 2 129
  worker bees 2 128
Bee bird 7 361
Bee bread 12 405
Bee eater 3 473
Bee fly 4 212, 5 362
Bee louse 4 212
Bee martin 7 361
Bee moth 7 472
Bee tree linden 2 108
Beech 2 129 130
Beef marrow 5 189
Beef tallow 5 189
Beefwood 2 545
Beehive 2 436
Beehive ovens 3 270
Beekeeping *see* Bee and Bee keeping
Beer 8 80-81
de Beer G 1 511
Beer's law 1 12-13
  spectrophotometric analysis 12 581
Beeswax 2 128, 7 529
  Indian 14 443
  ordinary 14 443
Beet 2 130* 184
Beet sugar *see* Sugar beet
Beet sugar 13 256, 258
Beetle 2 130 131
  see also entries under specific names
Beggartick 12 146
Beggiatoa alba 2 131
Beggiatoaceae 2 131
Beggiatoales 2 131 132
  Achromatiaceae 2 132
  Beggiatoaceae 2 131
  Leucotrichaceae 2 132
  Schizomycetes 12 65 66
  taxonomy 2 11
  Vitreoscillacea 2 132
Begonia 5 37, 39, 8 211
Behaim Martin 6 214
Behavior abnormal *see* Abnormal behavior
  aggression 1 112
  consistencies 10 30 31
Behavior abnormal—*cont*
  display 12 398
  ecology 4 401
  emotion 4 583
  hoarding *see* Hoarding behavior
  human 4 401
  instinctive *see* Instinctive behavior
  motivation 8 602
  problem solving 10 633 636
  psychology, physiological and experimental 11 75
  reproductive *see* Reproductive behavior
  reticular formation (brain) 11 535
  sexual *see* sexual behavior
  social 12 395
  see also Behavior, ontogeny of
Behavior, ontogeny of 2 132 148
  approaches to study of experience 2 142-143
  behavioral parameters 2 133
  constitutional and environmental interaction 2 132
  cretinism 5 546
  critical period 2 133
  development in birds 2 138 139
  development in mammals 2 139
  developmental stages 2 135 137, 144 148
  developmental stages in man 2 140 142
  effect of experience in mammals 2 142-148
  effect of restricting experience 2 143 144
  instinctive behavior 7 146
  physiological development 2 135 142
Behavior and heredity 2 148 157
  alcohol consumption 2 156
  brain anatomy and physiology 2 156
  dominance or aggression in mice 2 154 155
  effect of social isolation 2 155
  emotion 2 153
  endocrine systems 2 157
  exploratory motivation 2 152
  food motivation 2 152
  genetic differences 2 148
  genotype 2 155 156
  Heron study 2 151 152
  instinctive behavior 7 146
  learning 2 149 152
  links between genes and behavior 2 156
Behavior and heredity—*cont*
  locomotor activity 2 149
  McGill selection process 2 152
  motivation 2 152 153
  orientation response 2 149
  sexual behavior 2 155
  social behavior 2 153 155
  social behavior of dogs 2 153 154
  sound induced seizures 2 156
  Tryon study 2 149 151
Behavior strategy game theory 6 26
Behavioral psychophysics 2 157 159
  example 2 158
  fundamental measures 2 157
  significance 2 158
Behenic acid 2 474
Behren, O 9 534
Beijerinck, M W 2 67
Beijerinckia 1 703 12 460
Beilby process 3 634
Bejel 2 159, 13 374
Bel 2 159
Belemnites 2 159 4 107
Belemnoidea 2 159*, 3 275, 4 107
  Cephalopoda 2 645
Belemnoteuthis sinica 2 159
Belgian process zinc 14 624
Belgian retort 11 122
Belgian stallion 6 489
Belinuracea 14 565
Bell Alexander Graham 4 434 6 542, 13 429, 445
Bell, Sir Charles 7 349
Bell, P H 13 244
Bell, R A 11 599
Bell 2 159 160*, 8 665 667
Bell casting 2 160
Bell metal 2 159
Bell type pressure gage 10 581
Belladonna 1 664, 2 160 161* alkaloid 1 248
Bellatrix 9 407 15 41
Bellefontia 2 426
Bellerophontacea 6 75
Bellows element pressure gage 10 582
Belon, P 1 422
Belonidformes 2 161*, 9 442
Belonolaimus 9 603
Belonolaimus gracilis 9 603
Belostoma 6 401
Belostomatidae 6 401
  water bug 14 591
Belousov, V V 15 417
Belt conveyor 2 365
Belt drive 2 161 162
  belt materials 2 161
  belt shapes 2 161
  crossed drive 2 162
  open drive 2 162

Belt drive—*cont*
pulley 11 91 93
quarter turn 2 162
speed ratio 2 161
V belt 14 284 285
Belted coastal plains 3 245
Beltran System 9 522
Beltrami, E. 6 155
Bemidone 9 4
Ben oil 9 539
Benactyzine 14 16
Benadryl *see* Diphenhydramine hydrochloride
Bence Jones protein 3 192 202
metabolic disorders 8 257
urinalysis 14 219
Bench mining 8 472
Bench border irrigation 7 270
Bench mark 13 525
Bench plane 14 545
Bench terraces (agricultural) 13 498
Benday plates 10 610 611
Bending 7 565 566
bending moment diagram 7 566
centroid 2 631
forging 5 470
sheet metal 12 249 250
Bending moment 2 162 163*, 4 420
Bendix Weiss joint 14 205 206
Beneckea 1 59 2 19
Achromobacteraceae 1 59
Benedenia girellae 14 78
Beneficiation of ore 8 276 278 9 589 591
Benes, H. A. 12 486
Bengal tiger 13 649
Benguela Current 1 626 9 249
Beni River 12 529
Benioff linear strain seismograph 12 149
Benioff vertical seismometer 12 148
Benin 9 18
Bennett, W. 10 233
Bennettitales 2 165* 3 639 6 500 10 346
Benninghoff's lines, bone 2 284
Bent tube boiler 14 412
Benthemphagus 4 40
Benthesicymus 4 26
Benthic community 8 108
Benthic fauna 4 40
Benthic plant production 12 119
Benthic zone 5 14
Benthonic animals, Black Sea 2 231
Bentonia fossils 2 356
foraminifera 5 430
Benthopecten pentacanthus 9 170
Bentinck 5 329 335 7 519
Bentinckia nicobarica 4 43
Bentley, H. A. 12 391
Bentonite 2 163 164*, 3 160, 162
in black shale 2 254
circulating fluid, drilling 9 291 292
occurrence 2 163
origin 2 163
uses 2 165
Benue River 1 108
Benzal chloride 3 76
Benzaldehyde 1 228, 2 55, 164*
Benzamide 1 303
Benzazide 11 118
Benzedrine 2 164* 3 76
Benzene 2 164 165*, 6 554, 10 48
chemical binding 3 25
coal chemical 3 235
gamma Benzenehexachloride 7 140
isomerism, molecular 7 277
petrochemical 10 43
properties 2 165
resonance (molecular structure) 13 502
solvent 12 496
uses 2 164
Benzene hexachloride 2 165, 3 75, 8 518
Benzenesulfonate process 10 112
Benzenesulfonyl chloride 1 305
Benzidine 2 165
biphenyl 2 247
Benzidine yellow 10 224
Benzil 9 543
Benzimidazole 1 705
Benzoate 2 165* 5 74
benzoic acid 2 165
Benzocyclopentadiene 7 56
Benzoflavine 1 51
Benzoic acid 2 55 165* 475 10 114
benzoate 2 165
food preservation 5 426
Benzoin [illegible]
1 23[illegible]
conc
3*
Benzoin [illegible]
Benzol c[illegible]
Benzoph[illegible]
7 339
[illegible]
[illegible]
[illegible]
Benzotrichloride 3 76
Benzoxazole 1 705
Benzoyl chloride 1 44, 305
Benzoyl peroxide 3 376
Benzoylation 1 44 61 62
Benzoylformic acid 2 55
N-Benzoylglycine 9 462
Bis(benzoylpyruvato)beryllate (II) ion 3 335
N-Benzoylquinolinium cation 11 191
3,4 benzpyrene 9 324
Benzyl chloride 3 76
Benzyl halides 6 527
p,p Benzylidenebis *N,N*-dimethylaniline 7 60
Benzylpenicillin 9 619
6 Benzylsulfamidopenicillanic acid 9 619
Benzyltrichlorosilane 12 522-523
Benzyne 2 165-166
Beranek, L. L. 9 128
Berberine 1 248
Berberis 11 654
Berg, L. 9 442 443
Berg, O. 11 545
Berg *see* Iceberg
Bergamo, Alps of 5 117
Bergamot oil 5 71
Berger, C. 10 127
Berger, H. 4 478
Bergius, F. 2 166
Bergius process 2 166*; 3 236
coal chemicals 3 236
Bergmann, M. 9 629
Bergmann, P. 11 438
Bergmann's rule 1 459
Bergschrund 3 144
Bergstrand, E. 7 502
Beribori 2 166*, 13 598
Bering Sea 2 166 168*, 9 271, 488
Bering Strait 9 166
Berkelium 2 168* 4 504, 14 66 67
Berkshire swine 13 539
Berm (beach) 12 502 503
Berm (strip mining) 8 479
Berman, R. 3 591
Bermuda grass 2 168 169
Bermuda High 14 449
Bermuda Rise 13 219
Bernard, Claude 6 467 8 604 10 210
[illegible]
[illegible]
[illegible]

Bear 2 118
gestation period 6 182
Bear Driver *see* Bootes
Bearden, J A 1 651, 14 590
Bearing, antifriction 2 118-126
Babbitt metals 1 258, 2 119
ball *see* Ball bearing
bath lubrication 2 121
bushing 2 376
cast iron 2 119
drop feed oilers 2 121
fluid-film hydrodynamic bearings 2 122
fluid film hydrostatic bearings 2 122
forced-feed lubrication 2 121
gas lubricated 2 122
lubricants 2 120, 7 601 606
materials 2 119
mean bearing pressures 2 121
noise control 9 125
oil rings 2 121
porous metal 2 120
roller *see* Roller bearing
rubber 2 119
waste packed 2 121
wick and felt feeders 2 121
wooden 2 119
Bearing (navigation) 9 11
Bearing alloys 1 258
lead 7 427
tin 13 650
Bearing power (soil) 12 458
Beat 2 126 8 661 662*
Beat frequency 2 126
Beat frequency oscillator *see* Heterodyne oscillator
Beattie, J A 14 22
Beattie-Bridgeman equation 2 126 127
for gases 13 568
Beaufort scale 14 493 496
Beaufort Sea 1 525, 9 166 271
Beaufort series 10 25
de Beaumont J 11 467
Beauveria 8 569
Beaver 2 127*, 12 61, 14 490
Beaver parasite beetle 3 276
Bêche de-mer 6 463 467
Beck, D F 7 475
Beck dyeing 4 311
Becke, F. 8 299
Becker blood group 2 269
von Beckh H 12 540
Beckman aspirator-burner 5 291
Beckmann rearrangement 3 610
lactam and lactim 7 377
oxime 9 468
Beckmann thermometer 2 420
Becquerel, (Antoine) Henri 3 47, 11 273, 14 209
Becquerel, E. 11 517
Bedbug 2 127*, 362, 6 401
Bed load longshore transport 12 304
Bedded chert 3 57
Bedding planes cave 2 571
stylolites 13 208
Bedspring antenna radar 11 203
Bee and beekeeping 2 127-129
colony reproduction 2 129
drones 2 128
female caste determination 2 128
food of honeybees 2 128
honey 2 129
honeybee colony 2 128
honeybee comb 2 129
queen bee 2 128
swarming 2 129
worker bees 2 128
Bee bird 7 361
Bee bread 12 403
Bee eater 3 473
Bee fly 4 212, 5 362
Bee louse 4 212
Bee martin 7 361
Bee moth 7 472
Bee-tree linden 2 108
Beech 2 129-130
Beef marrow 5 189
Beef tallow 5 189
Beefwood 2 545
Beehive 2 436
Beehive ovens 3 270
Beekeeping *see* Bee and Bee keeping
Beer 8 80 81
de Beer G 1 511
Beer's law 1 12 13
spectrophotometric analysis 12 581
Beeswax 2 128 7 529
Indian 14 443
ordinary 14 443
Beet 2 130* 184
Beet sugar *see* Sugar beet
Beet sugar 13 236, 238
Beetle 2 130 131
see also entries under specific names
Beggartick 12 146
Beggiatoa 2 29 63, 131, 10 64 11 47 12 65
Beggiatoa alba 2 131
Beggiatoaceae 2 131
Beggiatoales 2 131 132
Achromatiaceae 2 132
Beggiatoaceae 2 131
Leucotrichaceae 2 132
Schizomycetes 12 65 66
taxonomy 2 11
Vitreoscillacea 2 132
Begonia 5 37, 39, 8 241
Behaim, Martin 6 214
Behavior abnormal *see* Abnormal behavior
aggression 1 112
consistencies 10 30 31
Behavior, abnormal—*cont*
display 12 398
ecology 4 401
emotion 4 583
hoarding *see* Hoarding behavior
human 4 401
instinctive *see* Instinctive behavior
motivation 8 602
problem solving 10 633 636
psychology, physiological and experimental 11 75
reproductive *see* Reproductive behavior
reticular formation (brain) 11 535
sexual *see* sexual behavior
social 12 395
see also Behavior, ontogeny of
Behavior, ontogeny of 2 132 148
approaches to study of experience 2 142-143
behavioral parameters 2 133
constitutional and environmental interaction 2 132
cretinism 3 546
critical period 2 133
development in birds 2 138 139
development in mammals 2 139
developmental stages 2 135 137, 143 148
developmental stages in man 2 140 142
effect of experience in mammals 2 142 148
effect of restricting experience 2 143-144
instinctive behavior 7 146
physiological development 2 133 142
Behavior and heredity 2 148 157
alcohol consumption 2 156
brain anatomy and physiology 2 156
dominance or aggression in mice 2 154 155
effect of social isolation 2 155
emotion 2 153
endocrine systems 2 157
exploratory motivation 2 152
food motivation 2 152
genetic differences 2 148
genotype 2 155-156
Heron study 2 151 152
instinctive behavior 7 146
learning 2 149 152
links between genes and behavior 2 156
Behavior and heredity—*cont*
locomotor activity 2 152
McGill selection experiment 2 152
motivation 2 152 153
orientation responses 2 154
sexual behavior 2 155
social behavior 2 153 154
social behavior of dogs 2 155 156
sound induced seizures 2 156
Tryon study 2 149 151
Behavior strategy game theory 6 26
Behavioral psychophysics 2 157 159
example 2 158
fundamental measures 2 157
significance 2 158
Behenic acid 2 474
Behren, O 9 534
Beijerinck, M W 2 67
Beijerinckia 1 703 12 460
Beilby process 5 634
Bejel 2 159, 13 574
Bel 2 159
Belemnites 2 159, 4 107
Belemnoidea 2 159*, 5 275 4 107
Cephalopoda 2 645
Belemnoteuthis sive 2 159
Belgian process zinc 14 614
Belgian retort 11 122
Belgian stallion 6 480
Belinuracea 14 563
Bell, Alexander Graham 4 474 6 542, 13 429, 435
Bell, Sir Charles 7 349
Bell, P H 13 244
Bell, R A 11 599
Bell 2 159-160*, 8 665 667
Bell casting 2 160
Bell metal 2 159
Bell-type pressure gage 10 511
Belladonna 1 664, 2 160 161* alkaloid 1 215
Bellatrix 9 407 13 41
Bellefontia 2 426
Bellerophontacea 6 75
Bellows element pressure gage 10 582
Belon, P 1 422
Beloniformes 2 161*, 9 442
Belonolaimus 9 603
Belonolaimus gracilis 9 603
Belostoma 6 401
Belostomatidae 6 401
water bug 14 593
Belousov, V V 13 417
Belt conveyor 2 365
Belt drive 2 161-162
belt materials 2 161
belt shapes 2 161
crossed drive 2 162
o drive 2 162

Belt drive—cont
pulley 11 91 93
quarter turn 2 162
speed ratio 2 161
V belt 14 294 295
Belted coastal plains 3 245
Beltian System 9 322
Beltrami, E. 6 155
Bemidone 9 4
Ben oil 9 539
Benactyzine 14 16
Benadryl *see* Diphenhydramine hydrochloride
Bence Jones protein 5 192 202
metabolic disorders 8 257
urinalysis 14 219
Bench mining 8 472
Bench border irrigation 7 270
Bench mark 15 525
Bench plane 14 543
Bench terraces (agricultural) 15 498
Bendax plates 10 610 611
Bending 7 565 566
bending moment diagram 7 566
centroid 2 641
forging 5 470
sheet metal 12 249 250
Bending moment 2 162 165* 4 420
Bendix Weiss joint 14 295 296
Beneckea 1 59 2 19
Achromobacteraceae 1 59
Benedenia girellae 14 78
Beneficiation of ore 8 276 278 9 589 591
Benedi, H. A. 12 486
Bengal tiger 15 640
Benguela Current 1 626 9 249
Beni River 12 529
Benioff linear strain seismograph 12 149
Benioff vertical seismometer 12 148
Benito 9 18
Bennett, W. 10 235
Bennettitales 2 163* 5 639, 6 500 10 346
Benningshoff's lines bone 2 284
Bent tube boiler 14 412
Benthenheimia 4 40
Benthenemus 4 26
Benthic community 8 108
Benthic fauna 4 40
Benthic plant production 12 119
Benthic zone 5 14
Benthonic animals Black Sea 2 251
Bryozoa fossils 2 356
Foraminifera 5 430
Benthopecten pentacanthus 3 170
Benthos 5 428, 553, 7 519
Benthosaurus 4 41
Benzer, S. A. 12 391
Bentonite 2 163-164*, 3 160, 162
in black shale 2 234
circulating fluid, drilling 9 291 292
occurrence 2 165
origin 2 165
uses 2 165
Benue River 1 108
Benzal chloride 5 76
Benzaldehyde 1 229, 2 35, 164*
Benzamide 1 503
Benzazide 11 118
Benzedrine 2 164* 5 76
Benzene 2 164 165*, 6 554 10 48
chemical binding 3 25
coal chemical 3 255
gamma Benzenehexachloride 7 140
isomerism molecular 7 277
petrochemical 10 43
properties 2 164
resonance (molecular structure) 11 502
solvent 12 496
uses 2 164
Benzene hexachloride 2 165 5 75 8 518
Benzenesulfonate process 10 112
Benzenesulfonyl chloride 1 505
Benzidine 2 165
biphenyl 2 247
Benzidine yellow 10 224
Benzil 9 545
Benzimidazole 1 705
Benzoate 2 165* 5 74
benzoic acid 2 165
Benzocyclopentadiene 7 56
Benzoflavine 1 51
Benzoic acid 2 35 165* 475 10 114
benzoate 2 165
food preservation 5 426
Benzoin condensation aldehyde 1 230
condensation reaction 5 575
Benzoin gum 4 358
Benzol coal chemical 5 255
Benzophenone 2 165* 4 206 7 539
Benzoquinone 11 194
Benzothiazole 13 599 601
Benzothiazoyl 2-oxyacetic 1 125
Benzotriazole 1 705
Benzotrichloride 5 76
Benzoxazole 1 705
Benzoyl chloride 1 44 505
Benzoyl peroxide 5 576
Benzoylation 1 44 61 62
Benzoylformic acid 2 35
N Benzoylglycine 9 462
Bis(benzoylpyruvato)beryllate (II) ion 5 335
N Benzoylquinolinium cation 11 191
3 4 benzpyrene 9 324
Benzyl chloride 5 76
Benzyl halides 6 527
p,p' Benzylidenebis N,N dimethylaniline 7 60
Benzylpenicillin 9 619
6 Benzylsulfamidopenicillanic acid 9 619
Benzyltrichlorosilane 12 322 325
Benzyne 2 165 166
Beranek, L. L. 9 128
Berberine 1 248
Berberis 11 634
Berg, L. 9 442 445
Berg, O. 11 545
Berg *see* Iceberg
Bergamo Alps of 5 117
Bergamot oil 3 71
Bergen, C. 10 127
Bergen, H. 4 478
Bergius, F. 2 166
Bergius process 2 166*, 3 256 coal chemicals 3 256
Bergmann, M. 9 629
Bergmann, P. 11 459
Bergmann's rule 1 459
Bergschrund 3 144
Bergstrand, E. 7 502
Beriberi 2 166* 15 509
Bering Sea 2 166 164* 9 271 498
Bering Strait 9 166
Berkelium 2 168*, 4 504, 14 66 67
Berkshire swine 15 539
Berm (beach) 12 502 503
Berm (strip mining) 8 479
Berman, R. 3 391
Bermuda grass 2 168 169
Bermuda High 14 448
Bermuda Rise 13 219
Bernard, Claude 6 467 8 605 10 230
Bernays, P. 7 582
Bernese Alps 5 117
Bernina, Piz 5 119
Bernina group 5 117
Bernoulli, J. 7 450 10 630
Bernoulli's equation 2 575 5 523 6 539
Bernoulli numbers 12 194
Bernoulli's principle cavitation 2 573
Bernoulli's problem probability in physics 10 630 631
Bernoulli's theorem 2 169 air pressure 1 156 ship propulsion 12 278
Bernoulli trials 10 627
Bernstein, S. 7 403
Bernstein's theorem 7 403
Beroe forskålii 2 169
Beroida 2 169* 8 608
Berre, Étang de 5 115
Berriasian substage 3 543
Berrill, N. J. 4 563
Berry 5 542
Berthelot, M. P. E. 5 72 6 41, 12 486 13 539
Berthier, P. 2 112
Bertholletia 3 187
Bertholletia excelsa 2 321
Berthollide compounds *see* Nonstoichiometric compounds
Berthon color film process 10 167
Bertiella studeri 12 50
Bertrand, D. 2 239
Bertrand, G. 2 239
Bertrand's rule 1 51
Acetobacter suboxydans fermentation 1 51
Beryciformes 2 170*, 9 442
Berycomorphi *see* Beryciformes
Beryl 2 170* 173 174 8 277
beryllium ore 2 176
emerald variety 4 542
gem 8 94
Beryllia refractory 11 410
Berylliosis 2 171
Beryllium 2 170 178
alloys 2 175 176
analytical techniques 2 175
in atmospheric dust 11 270
crystal structure 5 509
in deep sea sediments 11 271
extraction and mining 2 174
extractive metallurgy 8 277
fabrication 2 177 178
heat of combustion 8 290
ionization potential 4 504
metallurgy 2 174 176 178*
as neutron source 9 84
nuclear properties 2 173
occurrence 2 170 173 174
organometallic compound 9 402 403
physical and chemical properties 2 171
principal compounds 2 173
production 2 171 4 467
in rain water 11 270
reactor moderator 11 355 356
toxicology 2 171
uses 2 174 178
Beryllium acetylacetonate 5 18
Beryllium alloys 2 175 176
beryllium base 2 176
beryllium copper 2 175
intermetallic compounds 2 176
with magnesium and aluminum 2 176
with nickel and iron 2 175
Beryllium copper 5 469
Beryllium metallurgy 2 176 178
Beryllonite 2 178
Berytidae 6 401
Berzelianite 12 163

Berzelius, J. J 1 246, 2 172, 654, 7 277, 12 163, 13 610, 654
Besktdes, Eastern 5 118
Beskides Western 5 118
Bessel, F W, 4 380, 7 505, 8 179
Bessel's differential equation 2 178, 4 127
Bessel ellipsoid 6 120
Bessel functions 2 178-181
  applications 2 178
  definition 2 178-179
  differential equation 4 127
  elementary properties 2 179
  expansions in terms 2 180
  functions related to 2 180
  gamma function 6 32
  integration 7 171
Bessemer, Sir Henry 15 94, 14 559
Bessemer matte nickel metallurgy 9 98
Bessemer process 13 94
Bessey, C E 10 345
Best, C H 7 163, 9 533
BET isotherm 1 80 81
Beta-cell metabolic disorders 8 262
  pancreas 9 531
Beta decay 11 284* 13 362 364
  delayed neutron 9 85
  Fermi theory 11 285 286
  inverse 9 83
  neutrinos 9 83, 11 284-285
  nuclear structure 9 202 204
  parity 9 565 567
  Sargent diagrams 11 284-285
  selection rules 12 162
Beta function 6 33
  see also Bessel functions
Beta interaction 4 544
Beta particle *see* Beta rays
Beta quartz 6 127
Beta rays 1 691, 2 181 183*
  beta ray spectrometers 2 182 183
  detection 2 182
  interaction with matter 2 181 182
  nuclear radiation (biology) 9 197
  radiation damage (inanimate materials) 11 223-225
  radioactive fallout 11 266
  radioactivity 11 284 286
  spectroscopy 2 182 183, 553
Beta rhythms electroencephalography 4 478
Beta taxonomy 1 425
Beta vulgaris 2 150 11 621, 13 210
Betatron 2 183, 9 573 580 581*
Betatron–*cont*
  frequency 9 575
  oscillations 9 575
  radiography 11 302-303
  relativistic electrodynamics 11 430
  x-ray tube 14 589
Betel nut 2 183
Betel pepper 2 183
Betelgeuse 2 185*, 13 41
Bethonyphyllum 3 261
Bethe, H A 4 553
Bethylid wasp 12 405
Bethylidae 6 574
Betterton Kroll process 2 249
Betterton process 7 433
Betti numbers 5 254, 8 176
Betts procedure 7 433
Betula 3 188, 5 178
Betula alleghaniensis 2 247
Betula lenta 2 247
Betula nigra 2 247, 248
Betula papyrifera 2 247, 10 12, 116
Betula pendula 2 248
Betula pubescens 2 248
Betulaceae 5 178
Betulin 14 112
Betz cells 8 615
Bevan, E J 5 243
Bevatron 9 579
Bevel gear 6 84
  spiral 6 85
  straight 6 84
  Zerol 6 85
Bevel gear differential 1 369
Beverton, R J H 12 121
Bevrich F 5 31, 9 512, 12 523
Bevrichia 9 510
Beyrichia tuberculata 9 511
Beyrichiacea 9 510
Beyrichiidae 9 510
gamma BHC 7 140
Bias (electron tube) 2 185 184
Bias (transistor) 1 348 349
Biaxial crystal 5 591 592
Biazi process nutration 9 101
Bibionidae 4 212
Bicarbonate 2 467
Bichir 10 489 12 48
Bichromate *see* Dichromate
Biconcave lens 7 451
Biconical antenna *see* Antenna (aerial)
Bicornera 11 45
Bicyclo [4 4 0] decane 1 242
  ring isomerism 7 280
Bicyclo [2 2 1] 2,5 heptadiene 1 57
Bicyclohexyl 6 551
Bicyclo (4,2,0) 2 4,7 octatriene 3 640
Bidder s canal 11 471
Bidder s organ 11 461
Biddulphia chinensis 8 128
Bidentate ligand 3 17
Biennial plants 2 184
Bierman, L F 3 313 314
Biesbosch, Lake 5 115
Bifluoride ion 6 548
Big Ben 3 205
Big Blue (Permian) 9 512
Big Dipper 3 414, 14 235
Big Four group (asteroids) 1 596-597
Big game mammals 14 490
Big-headed fly 4 212
Big Horn River 9 157
Big Spring (Missouri) 15 18
Bigelow, H 9 266
Bigeminal body 9 42 63
Bighorn Basin 9 157
Bighorn Mountains 9 157
Bighorn Range 8 617
Bihor (Bihar) 5 118
Bijvoet, J M 13 126, 14 570
Bikini Atoll 1 646, 11 389
Bilabial 10 121
Bilateral cleavage 7 230
Bilateral Laplace transform 7 165, 403
Bilateral network 13 304
Bilateria 1 184 185*, 420
Bile 5 201, 7 531
  bilirubin 2 186
  digestive system 4 150 175
Bile acid 2 185*, 13 139
Bile pigment 4 171
Bile salt 4 171
Bilge keel 12 273
Bilharzia 12 389
Biliary atresia 7 563
Biliary cirrhosis 7 562 563
Biliary colic 6 14
Biliogenesis 15 8
Bilinear transformation qua termions 11 186
Bilirubin 2 186* 266, 3 197 13 8
  digestive system 4 171
  jaundice 7 302 305
Bilsverdin 2 186 4 171 13 8
Billet split lens 7 186
Billingsella coloradoensis 11 60
Bilsted 13 336
Bimetallic plate 10 602 616
Bimolecular reaction 7 557
Bimorph structure micro phones 8 361
(1 1 Binaphthalene) 8 8' dicarboxylic acid 4 107
Binary alloys 1 260 265* 2 339
Binary codes 4 176
Binary counter 3 518 519
Binary digit 2 250
Binary fission 11 418
Binary memory elements 3 571
Binary mixtures 4 217
Binary number system 9 221 223
  see also Number systems
Binary stars 2 186 191
  dimensions 2 189
Binary stars–*cont*
  distinguishing features 2 186
  distribution of binaries 2 190
  eclipsing binaries 2 188
  information obtained from 2 189 190
  internal composition 2 190 190
  light curves 2 188 188
  masses 2 189
  multiple systems 2 190 191
  optical binaries 2 186
  origin 2 191, 3 507
  parallax 9 546
  radial-velocity studies 1 616 617
  spectroscopic binaries 2 187-188
  stellar evolution 2 190
  visual binaries 2 186 187
Binary vapor cycle 14 273 274
Binaural hearing 6 350 351, 13 128
Binaural hearing aid 6 356 357
Binaural pitch 10 244
Binaural sound 2 191
Binaural sound system 2 191*, 8 40-41, 12 521 522
Binder paint 9 493
Binding, chemical *see* Chemical binding
Binding energy (gravitational 5 504
Binding energy (nuclear) 2 191 192*, 9 204
  ground state 6 276
  neutron 9 84
  packing fraction 9 499
Binding operations book manufacture 2 287
Bindschedler's green 4 305
Binet, Alfred 7 178
Bingham body 15 418
Binocular vision *see* Vision
Binoculars 2 192* 9 536 10 624
Binodal seiche 12 146
Binomial coefficient 6 32, 10 630
Binomial distribution 4 257
  probabilis 4 257
Binomial nomenclature (zoology) 14 626
Binomial series 12 191
Binomial theorem 2 192 193
Bioassay 2 195 196* 10 97
  amino acid 1 310
  animal assay 2 198
  antibiotic assay 2 196
  biochemistry 2 199
  biological 2 218
  chlortetracycline 3 85
  disinfectant standardization 2 197
  effective dose 50 4 413

)assay—*cont*
industrial microbiology 7 85
infective dose 50 7 96
microorganism assay 2 193
nystatin 9 236
penicillin 9 619
pharmaceuticals testing 10 94
pharmacology 10 97
principles 2 193
statistics 2 198
techniques 2 198
vitamin assay 2 193 194
biochemical circulation 12 109
biochemical cycle 12 109
Biochemical genetics 6 507 509
examples 6 507 509
implication 6 508
synthesis of nonenzymatic proteins 6 508 509
Biochemical mutation 2 27
Biochemical oxygen demand (BOD) 12 209 224
Biochemical pharmacology 10 97
Biochemistry 2 199 200
amino acids 1 307 319
calcium metabolism 2 400
carbohydrate metabolism 2 458 461
carbohydrates 2 451 459
coenzyme 3 264
enzyme 5 19 26
enzyme inhibition 5 29
estrogen 5 77
gonad 6 235
hemoglobin 6 410
histamine 6 457
hormone 6 479
hyaluronidase 6 522
hypophysis 6 506
Krebs cycle 7 369
lipid 7 520
metabolism 8 261 264
methods 2 199
nutrition 9 245
oncology 9 318 326
processes 2 199
protein 11 53 59
radiation *see* Radiation biochemistry
specialized tissue 12 563 566
substances 2 199
transamination 14 17
vitamin 14 439
Biochrome Ophiuroidea 9 343
Biochmate (environment) 5 13
Bioclimatology 2 200 202
aerosol 2 200
photochemical 2 200
statistical 2 202
temperature humidity index 13 491
thermal 2 201
Biocoenosis climax community 3 182 186
Biocoweridae 11 45
Biocycle 3 325 327
Biocystin 2 215, 7 619
Bioelectric generator mechanoreceptors 8 198
Bioelectric model 2 202 204
existence of phase boundary potentials 2 205
myocardial function 2 203
nerve function 2 203
phase boundary potential differences 2 202
Bioelectric phenomena 2 239
Bioelectric point precipitation protein isolation 11 56
Biofacies 5 175, 6 141
bathyal 9 512
neritic 9 515
Biogenic carbon 8 139
Biogenic limestones 12 135
Biogenic sediments 8 133
Biogeochemical cycles ecology 4 397 398
Biogeochemical cycles of elements 2 243 244 5 13
Biogeochemical surveys 6 117 118
Biogeochemistry ecosystem 4 404
Biogeography 2 204 207
animal geography 2 205 206
human *see* human biogeography
plant geography 2 204 205
Bioherm 2 207
limestone 7 516
petroleum trap 10 64
Biohermal limestone 7 516
Biological effects of electromagnetic waves *see* Radiation biology
Biological effects of sound waves 2 207 212
acoustic velocity 2 209
biological applications 2 208
on central nervous system 2 211
sound wave parameters 2 207 208
specific acoustic impedance 2 209
ultrasonic absorption coefficient 2 210
use in medical diagnosis 2 209
Biological macromolecules 11 219
Biological oxidation 2 213 215* 4 207
bacterial metabolism 2 28
biochemistry 2 199
energy 2 213
Biological oxidation—cont
energy and phosphorylation 2 214
methods 2 214
respiratory enzymes 2 214
Biological productivity 2 215 216
circulation of matter 2 215
deep sea fauna 4 30
efficiency 2 215
energy and matter in ecosystem 2 215
energy pathway 2 215
fresh water 2 216
land 2 216
marine 2 216
measurement 2 216 12 119 120
in sea 12 118 122
Biological products *see* biologicals
Biological specificity 2 216 217
biologicals 2 217
gamma globulin 6 53
gene action 6 106 107
Biological warfare 14 629
Biologicals 2 217 219
active immunity production 2 218
blood derivatives 2 219
diagnostic agents 2 219
gangrene gas 6 58
immune serum 2 217
immunity 7 54
multiple immunization 2 219
rabies 11 197
toxoids 2 218 219
vaccination 14 239
vaccines 2 218 219
veterinary use 2 219
Biology 2 219 220 232
botany 2 306
information theory 7 102
zoology 14 627
see specific articles on various aspects of biology
Bioluminescence 1 456 2 220 222* 4 40
animals 2 220
bacterial 2 25 221
chemical basis 2 220 221
chemiluminescence 3 46
Coleoptera 3 275 288
Cypridina 2 221
evolution 2 222
firefly 5 282
periodicity 2 222
plants 2 220
symbiosis 2 220
Biomass 2 222 223* 12 572, 13 504
Black Sea 2 251 252
community 3 324 325
ecological systems energy in 4 388
energy flow 2 215
Biomass—*cont*
English Channel 12 118
food chain 5 379 380
measurement 2 223
metabolic rate 2 224
microorganisms in Black Sea 2 252
photosynthesizing in oceans 6 566 567
pyramid 2 223
pyramid of numbers 11 107
Biome 2 204 225*, 15 255
community classification 3 325 327
zoogeography 14 625
Biomechanics *see* Human engineering
Biometeorology 2 200
Biometrics 2 223 232
analysis of variance 1 547, 2 224
angular transformation 2 231
binomial *population* 2 230
chi square test 2 230 231
correlation 2 229
data description 2 224 226
data presentation 2 224 226
degrees of freedom 2 224
frequency curve 2 225
frequency table 2 224
learning theories 7 412
linear regression 2 224 229
logarithmic transformation 2 231
maximum likelihood method 2 231
median 2 225 226
mode 2 225 226
normal distribution 2 226
parameter 2 224
Poisson distribution 2 230
probit transformation 2 232
sampling 2 230
Student's *t* distribution 2 227
test of hypothesis 2 226 227
transformation (data) 2 231 232
variance 2 224
Biophotometer 14 541
Biophysics 2 232
areas 2 232
biopotentials and electrophysiology 2 235
bone 2 234
electrodiagnosis 4 475
electron *microscope* 8 372
fluorescence microscope 8 382
historadiography 6 459
information theory (biological applications) 7 102
interference microscope 8 384

Biophysics—*cont*
mechanoreceptors 8 196
micromanipulation 8 350
molecular *see* Molecular biophysics
muscle 8 636
open systems, thermodynamics of 9 332 335
optical microscope 8 387
oximetry 9 469
phonocardiography 10 121
physiological *see* Physiological biophysics
physiological action spectra 10 208 209
prosthesis 11 28
protoplasm 11 47
radiation *see* Radiation biophysics
radioisotope (biology) 11 306-307
respiration, external 11 509
space biology 12 538
thermotherapy 13 596
x ray microscope 8 401
Biophysics, mathematical 2 233-235
cells and cellular aggregates 2 233
central nervous system 2 234
conduction in peripheral nerves 2 233
excitation in peripheral nerves 2 233
general principles 2 234
Biopotentials and electrophysiology 2 235-258
action potentials 2 237
analysis 2 235-237
cell structure 2 235 237
electrocardiography 4 464
electrodiagnosis 4 475
electroencephalography 4 477
electromyogram 4 501
electrophysiology (heart) 4 528
electrotherapy 4 541
energy sources 2 235-237
mathematical biophysics 2 233
molecular biophysics 8 544
motor systems 8 610
muscle 8 637
neurophysiology 9 80
research areas 2 235 237
resting potential 2 233
resting potential analysis 2 235
taste 13 400
technical advances 2 235 237
voltage sources 2 235 237
Biosphere 1 409 2 238 250*
community classification 3 325-327
Biosphere—*cont*
ecology 4 390
ecosystem 4 404
marine microbiology 8 129
Biosphere geochemistry 2 239-244
biogeochemical cycles of elements 2 243 244
chemical composition of living matter 2 240 243
concentrations of elements 2 241
elements in living matter 2 241
influence of living matter 2 239
isotopes 2 242
living matter 2 239 240
trace elements 2 242
Biostatistics *see* Biometrics
Biostrome 2 245
Bryozoa fossils 2 357
limestone 7 516
petroleum trap 10 64
Biosynthetic processes evolution 7 498
Biot, J 2 247, 3 384
Biot Savart law 2 246 247
Biota 8 106
benthos organisms 8 107
climax community 3 182 186
marine 8 106 107
Biota, fresh water 5 526 529
Biotar lens 7 453
Biotic components ecology 4 389 391
Biotic isolation 2 245
Biotic province 5 525 527, 14 625
Biotin 2 53, 245 246*, 4 256, 13 605, 14 340
bioassay 2 194
deficiency 2 245
food 5 371
industrial synthesis 2 246
in nature 2 245
epsilon N Biotinyl L lysine (biocytin) 2 245, 7 638
Biotite 2 246*, 8 346
Biotite lamprophyre 10 86
Biotopology 2 235
Bipalium kewense 14 89
Biphenyl 2 247*, 6 555, 9 348
Biphenyl, chlorinated *see* Chlorinated biphenyl
Biphosphine 10 135
Biphyllidae 3 278
Bipinnaria larva 4 365
Biprism, Fresnel *see* Fresnel biprism
Birch, F 4 340
Birch 2 247 248
Birch dieback 14 74
Bird 2 248
aerial life 12 398
Bird—*cont*.
Aves *see* Aves and entries on specific birds
behavior development 2 138-139
coloration 12 397
communication 12 397
habitat 12 397
imprinting 12 398
localization 12 398
social behavior 12 397-398
social organization 12 398
social structure 12 399
Bird bug 6 401
Bird lice 8 77
Bird vetch 14 310
Bird wing butterfly 7 464
Birdlike dinosaur 11 484
Bireflex printing 10 166
Birefringence 2 248
circular 11 633
in gem stones 6 97
kerr effect 7 337-338
streaming 2 248
Birefringence, mechanical 10 149 151
Birefringent crystal 10 449
Birefringent filter 7 338
Birefringent materials 2 248
Birge, R T 1 651, 698
Birgus latro 5 105
Birkeland-Eyde process 9 113
Birkeniiformes *see* Anaspida
Birkhoff, G D 7 411, 13 60
Birkkar 5 119
Birsteinia writjasi 4 41
Birthmark 2 248
Birthwort 1 532
Biscalitheca musata 5 263
Biscay, Bay of 5 114
Bischler Napieralski method isoquinoline 7 289
Biscyclopentadienyl 3 641
Bisdichlorodiethyl sulfide 3 44
Bisector angle 1 405
Bismanol 8 35
Bismarck Archipelago 4 358
Bismite 2 249
Bismuth 2 248 250
analytical methods 2 250
chemical properties 2 249
electron configuration 4 504
extractive metallurgy 8 277
ionization potential 4 501
occurrence 2 249
organometallic compounds 9 403
physical properties 2 249
principal compounds 2 250
production 2 249
uses 2 248 249
Bismuth glance 2 249
Bismuthinite 2 249
Bison 1 568, 2 250* 561 5 186 192*, 14 490
Bisphenol A 10 112
Bisphenol-A—*cont*
epoxy resins 10 469
polyester resins 10 466
Bisque firing 10 512
Bissonette, T H 11 478
Bistable multivibrator 8 628 629
Bistrite Mts 5 118
Bisulfate 13 260, 264
Bisulfite 13 260
Bit (binary digit) 2 250, 9 221
Bit (drilling) 9 292
Bithionol 1 483
Biting midge 4 212
Bitter, F 5 232
Bitter powder patterns 5 233
Bitter vetch 14 310
Bittern 6 425
Bitternut hickory 6 441
Bitterroot Mountains 9 135
Bitumen 2 251
asphalt and asphaltite 1 500
creep in 3 541
paint 9 495
Bituminous black shales 2 251
Bituminous coal 3 250 251, 8 452
Bituminous sand *see* Oil sand
Biuret 6 421
Bivariable functions 1 592
Bixa orellana 2 331
Bizette, H 1 470
Bizzozero nodule 7 176
Bjerknes, J 1 643, 14 447
Bjerknes, V 1 149 14 454
Black, D 9 612
Black (color) 2 251
Black abalone 1 2 3
Black and yellow mud dauber 6 582
Black ant 1 436
Black ash 1 576
Black bass 13 291
Black bear 2 118
Black bellied tree duck 4 290
Black billed cuckoo 3 612
Black body 2 251 6 371 373
emissivity 4 582 585
gray body 6 266
incandescence 7 49 50
infrared radiation 7 105
radiation 6 371 373
Black brant 6 216
Black butterfly 2 581
Black capped chickadee 3 34
Black coral 1 480
Black Cotton soils 12 457
Black crappie 3 530
Black damp 8 402
Black diamond 4 98
Black Dragon vein 6 186
Black duck 4 290
Black Earths Australia 12 457
Black fly 4 212 5 362
Black footed albatross 1 222
Black granite 4 205

Black gum 14 144
Black headed grosbeak 6 275
Black Hills 6 455
Black ironwood 7 268
Black Jurassic 7 525
Black key scale 12 47
Black lead 6 256
Black lignite 7 515
Black locust 7 573 12 79
Black mica 2 246
Black mold 9 527
Black oak 9 237
Black opal 9 532
Black phosphorus 10 134 135
Black pigments 10 224
Black powder 5 151
Black printer 10 606
Black root disease 13 241
Black root rot 13 292 663
Black rot cabbage 2 384
grape 6 251
Black sands 12 22
garnet 6 40
rutile 11 656
thorianite 13 609
thorite 13 610
Black Sea 2 251 253* 5 114 9 249 250 271
geologic history 2 251
hydrochemical conditions 2 251
plankton 2 253
relict faunas 2 253
zoobenthos 2 251
Black shale 2 253 254
geologic *time* scale 6 135
Black shank 13 663
Black star spinel 8 99
Black tea 13 405
Black tern 13 495
Black tupelo 14 144
Black walnut 14 583
Black walnut oil 5 189
Black widow 1 498
Blackberry 2 254* 5 548 549
Blackbird 2 254 255
Blackbottle fly 8 680
Blackburnia pendulum Lissajous figures 7 541
Blackett P M S 7 506
Blackfish 4 262
Blackhead 9 476
Blackjack oak 9 237
Blackleg (cabbage) 2 384
Blackleg (cattle) 2 255* 564
Blackman M 12 577
Blackman R B 9 257
Blackriveran series 9 374
Blacksnake 2 255* 12 589
Blackstem 1 254
Blackstrap molasses 13 238
Bladder urinary *see* Urinary bladder
Bladder worm 13 595
Blade (leaf) 7 454
Blaine formation 11 589
Blake Escarpment 13 218
Blake jaw crusher 3 557
Blalock A 2 514
Blanc Mont 5 119
Blanc fixe 2 96
Blanco proof 9 6
Blank 11 6 275
Blanking sheet metal 12 255
Blanking amplifier television camera 13 450
Blanking signal television 13 450
Blarina brevicauda 12 507
Blast furnace 9 471 11 125
Blast furnace coke 5 271
Blast furnace gas 5 555
Blast furnace process 7 250 262 zinc 14 615
Blast furnace reduction lead 7 452
Blast hole drilling 2 295 298
Blast hole pattern 14 142
Blast lamp 6 263
Blast sintering 7 452
Blast wave explosion and explosive 5 146 148
nuclear explosion 9 181 184
shock wave 12 294 298
Blasting 2 255 256
blasting cap 2 255
drilling of holes 2 295
explosives 2 255
loading and firing methods 2 255
tunnel and quarry blasts 2 256
tunnels 12 141 142
Blasting cap 2 255
Blastobasis 7 467
Blastocaulis 2 10 12 65
Blastocaulis sphaerica 6 593
Blastocladiales 10 199
phycomycetes 10 200
Blastocladiella 10 200
Blastocoele 2 257
Blastoidea 2 256* 4 360 366 367
Blastomere 2 257 604 5 168
embryonic *differentiation* 4 378
Blastomyces brasiliensis 2 257
Blastomyces dermatitidis 2 256 8 678 9 256 14 602
fluorescent antibody method 8 383
Blastomycosis 2 256 257* 8 678 10 429
North American 2 256
South American 2 256
Blastomycosis keratitis 8 681
Blastophaga psenes 5 257 6 581
Blastospores 4 52 8 570
Monilliaceae 8 568
yeast 14 599
Blastostyle *Obelia* 9 242
Blastula 2 257 7 220
Coelenterata 5 255 261
Blastulation 2 257 258
blastula 2 257
blastular wall 2 257
Blatella germanica 3 251, 9 416
Blatella orientalis 3 251
Blatta orientalis 9 416
Blattidae 3 251, 9 416
Bleaching 2 258 259
cellulosic fibers 2 258 259
cotton 5 249
peroxide 10 28
pulp purification 9 540
scouring 2 258
textile chemistry 13 548
wool finishing 14 552
wool 2 259
Bleaching agent 6 505
Jewel 5 376
textile chemistry 13 548
Bleaching clay 3 162 5 550
Bleaching powder 2 258, 599 3 72 6 505
Blende 12 606
Blending 8 522 524 13 539
Blepharoceridae 4 212
Blepharisma 6 431
Blepharoplast 11 51 60
Bleb hornprosthium 11 57
Blepharospasm 3 4
Bless A A 3 335
Blest A 7 473
Blight 2 114
grape 6 252
soybean 12 534
see also Plant diseases
Blimp 2 259 261
see also Airship
Blimp (animal enclosure) 5 125
Blind seed (grass) 6 261
Blindness 2 263
Blissus hirtus 6 405
Blissus leucopterus 3 62 6 405 409
Blister beetle 2 150 151 3 277 287
Blister copper 3 465
Blister gas 3 44
Blizzard 13 161
Bloat 2 564
Blob 12 89
Bloch F 7 539
Bloch F 5 232
Bloch function 5 490
Bloch theorem 2 261
Brillouin zone 2 338
Bloch wall 5 252
Block and tackle 2 261 262* 6 469
Block brazing 2 322
Block caving (mining) 1 570 8 492 493*
asbestos 1 570
Block chain 3 5
Block copolymer 10 479
Block plane 14 543
Block printing 10 597
Block Schollen 6 208 209
Blocking forging 3 470
Blocking coalition game theory 6 29 30
Blocking oscillator 2 262 263
astable 2 262
free running 2 262
line controlled 2 263
monostable 2 262
pulse generator 11 93 94
synchronized 2 262
Blondel F 8 460
Blondel's theorem 4 436
Blood 2 263 266
biochemistry 2 169
calcium regulation 12 566
circulation 5 137 141
circulatory system 3 144
coagulation 2 266
as fertilizer 5 236
fibrinogen 5 234
formed elements 12 565
hemoglobin 6 410
hemoglobin 6 411
iron metabolism 7 257
other plasma constituents 2 265
plasma 2 264 266
plasma proteins 2 265 12 565
storage 14 29
variation in disease 2 265
Blood agar 4 208
Blood banking 3 201 202
Blood calcium parathyroid regulation of 12 566
Blood cells cell surface sonication 2 624
see also Blood groups Hematopoiesis
Blood chemistry 3 197 200
bilirubin 3 197
electrolytes 3 198 199
enzymes 3 197 198
glucose 3 197
lipids 3 197 199
nonprotein nitrogen 3 197 198
proteins 3 197 198
Blood coagulation 3 195 tests 3 195 196
Blood count 3 194 195
Blood donor 14 29
Blood fluke 4 348 12 63 14 78
Blood groups 2 266 269* 4 262 ABO system 2 267
agglutination reaction 1 112
agglutinin 1 112
antibody 1 468
Be* group 2 269
clinical pathology 3 192 202
gene action 6 108
heredity 2 267
human genetics 6 498 499 502
isoantigen 7 274

Blood groups—*cont*
MNSs system 2 268
other systems 2 269
pseudoalleles 11 62
red blood cell antigens 2 266
Rh antibody 2 268
Rh system 2 268 269
typing 14 29
Blood island hematopoiesis 6 396 398
Blood plasma volume expander 4 91 10 197
Blood-plate hemolysis 2 270
alpha 2 270
beta 2 270
Blood poisoning *see* Septicemia
Blood pressure 3 140
diastolic 3 140
hypertension 6 592
systolic 3 140
variation with age and sex 2 501
Blood serum 12 196 198*
antibodies in 1 468
differentiation from plasma 2 264
electrophoresis 4 527
see also Plasma (blood)
Blood smears microtechnique 8 408
Blood transfusion *see* Transfusion
Blood vessels 2 269 270* 3 137
aneurysms 1 403
embryogenesis 2 483
Bloodstone 6 99
Bloodworm 10 461
midge 8 426
Bloom galometer gelatin 6 91
Bloomsburg formation 11 388
Blow fly 4 212
Blow ups printing 10 608
Blower *see* Fan
Blown oil 4 200
Blowout coil 2 270
Blowout preventer oil and gas wells 9 291 295
Blowpipe 2 270
Blowpipe analysis mineralogy 8 467
Blue abalone 1 2 3
Blue baby 13 403
Blue beech 6 485
Blue catfish 2 552
Blue cheese 3 15
Blue coral 3 264
Blue crab 3 530, 4 31
Blue fox 5 490
Blue gas 5 552 553
Blue goose 6 237
Blue green algae 12 67
Blue grosbeak 6 275
Blue grouse 6 245
Blue gum 5 96
Blue Hubbard (squash) 15 28
Blue lupine 10 374
Blue mold 13 663
Blue Nile River 1 109
Blue pigments 10 224
Blue pike 14 383
Blue Ridge 9 146-147
Blue Ridge Parkway 9 146
Blue sapphire 12 26
Blue spinel 6 99
Blue tailed skink 12 373
Blue vitriol 3 472
Blue water gas 3 236
Blue whale 1 442, 2 660, 14 479
Blueback salmon 12 14
Blueberry 2 270 271* 5 548 549
Bluebill 4 291
Bluebird 2 271
Bluebottle fly 8 680
Bluefish 2 271, 10 10
Bluegill 13 291
Bluegrass 2 272
Bluejay 7 304
Blueprint 10 146
Blues (Lepidoptera) 7 464
Bluestem grass 2 272
Blumenbach J F 1 458
Blum, Axel 10 526
BMR *see* Basal metabolic rate
BMZ *see* Magnetometric zero balance
Boa 2 272, 13 25
Boar (hog) 6 460
Board foot 5 457-461
Bobt tailed grackle 6 244
Bob white 11 135
Bobbin textile 13 534
Bobcat 2 272 273
lynx 7 636
Bobolink 2 273
Bobrovnikoff N T 3 512
Bochmeria nivea 14 235
Boehner S 11 187
Bock beer 8 81
BOD *see* Biochemical oxygen demand
Boddington J 9 77
Bode J E 1 596 2 653 10 267
Bode's law cosmogony 3 507
planet 10 266 267
Bodensee Lake of Constance 5 115
Bodish tide 13 658
Bodo 11 45
Bodoni Giambattista 14 171
Bodonidae 11 45
Bodopsis godbaldi 8 169 11 548
Body, automotive *see* Automotive body
Body capacitance 2 441
Body centered cubic lattice 2 388 389 3 501 505, 508 509*
Body centered orthorhombic lattice 3 501 505
Body centered tetragonal lattice 3 501 505
Body centrode 2 641
Body heat 1 145
Body louse 5 7
Body rhythm 2 273 274
general activity level 2 274
hunger 6 518
mechanism 2 273
sexual behavior 2 273
sleep 12 375
sleep wakefulness 2 274
stabilimeter 2 274
thirst 13 608
urination 14 293
Boehm lamellae 8 681
Boehmeria nivea 11 334, 12 79
Boehmite 1 297, 2 113
in laterite 7 407
de Boer, E 4 516
Bog 13 333
doppleryte in 4 268
plants 10 525
soil 12 434
Bog iron 6 229
Bog lemming 7 450
Bogeria 8 680
Boghead cannel 3 228
Boghead coal 13 683
Bogong Mountain 1 671
Bohemian waxwing 14 445
Bohlmann F 14 341
Bohol island of 9 482
Bohr, Niels 1 652 653 3 47, 4 97 9 200 363, 11 147 14 257-258
Bohr atom 1 653 655
Bohr correspondence principle 1 653 655
Bohr frequency condition 1 653
Bohr magneton 8 66 67
Bohr Sommerfeld orbits 1 654 660
Bohr van Leeuwen theorem 4 97
Boidae 2 272, 11 152 13 25 27
Boil 2 477 12 370 13 86 88
Boiled oil 4 200
Boiler *see* Fire tube boiler Marine boiler Steam boiler Water tube boiler
Boiler feed water 2 275
pumps 2 275
raw water 11 318
Boiler water 2 275
contaminants 2 275
impurities 2 275
scale 14 402
Boiling heat convection 3 413
Boiling point 2 276* 13 486 487
distillation 4 247
molal elevation 8 557
molecular weight determination 8 557
Boiling water reactor 11 354 362
Bois de rose oil 5 71
de Boisbaudran, L 1 4 315 6 19 12 19
Boivin antigen 1 472
Bok, B J 9 173
Bokn Fiord 5 114
Bolarian series 9 374
Bolinopus 7 570
Bolinopus mikado 7 569
Bolivina 5 435
Bolivina cretosa 5 435
Bolivinoides 5 435
Bolivinoides decoratus 5 435
Boll weevil 3 297, 14 460
Boloceroides 1 52 54, 3 26
Bolometer 2 276
barretter 2 103
electric power measurement 4 458
infrared detector 7 105 106
microwaves 8 414
pyrometer 11 127
radiometrix 11 318
standing wave detector 13 56
thermistor 13 556
Bolometric electric power measurement 4 458 459
Boloria 7 471 472
Bolson 4 75-76
Bolt, R H 9 128
Bolt 2 276 277
nut 9 270 271
screw fastener 12 83
screw thread 12 84 85
Bolted joint 2 277, 13 199 203
Boltwood, B B 1 698
Boltzmann L 2 278 13 59
Boltzmann constant 1 69 2 277 278*
Boltzmann distribution 2 279 280
Fermi Dirac statistics 5 2
fission 5 288
kinetic theory 7 551 555
Boltzmann factor crystal defects 5 682
Boltzmann statistics 2 278 280
Boltzmann transport equation 2 279 282
Bose Einstein statistics 2 304
distribution function 2 278 279
Fermi Dirac statistics 5 216
fluctuations 2 280 281
H theorem 2 279
Maxwell Boltzmann distribution 2 279 280
probability 10 626
Boltzmann transport equation 2 281 282
Boltzmann statistics 2 2
kinetic theory 7 551 554
quantum mechanical a
log 2 281
solution for electrons 2 2 282
usual form 2 281

Boltzmann's relation 2 280
Bolus 1 366 4 166
Bolyai J 6 154 155
Bolyai Lobachevski Gauss geometry 8 180
Bolza problem of 2 410
Bomb *see* Atomic bomb Bomb (military) Bomb (volcanic) Hydrogen bomb
Bomb atomic *see* Atomic bomb
Bomb (military) 1 536* 541 542
air armament 1 536
armor piercing 1 536
chemical 1 536
conservation of momentum 3 408
demolition 1 536
depth 1 542
explosive 1 536
fire 1 536
fragmentation 1 536
napalm (jellied gasoline) 1 536
thermal 1 536
see also Atomic bomb
Bomb (volcanic) 14 349
Bomb bays 1 536
Bomb blast 12 294 298
Bomb calorimeter 2 420
Bomb sights 1 537
Bombacaceae 7 332 8 82
Bomber 1 534 537
Bomber armament *see* Armament air
Bomber defense systems 5 280 281
Bombidae 2 127
Bombina 9 345
Bombinator 4 570
Bombus 6 582
Bombycidae 7 464 8 600
Bombycilla 14 445
Bombycilla cedrorum 14 445
Bombycilla garrula 14 445
Bombycillidae 14 445
Bombyliidae 4 212
Bombyx 11 376
Bombyx mori 6 458 7 409 8 403 600 12 231
silk 12 523
Bonanza vein 6 186
Bonasa umbellus 6 285
Bond (chemical) 1 66 3 24 28
pi Bond 3 38 460
sigma Bond 3 38
Bond energies (molecular structure) 11 301
Bonds H 5 510 11 457
Bonding (adhesive) 2 282
Bonding (electrical) 2 282 6 280
Bonding clay 3 162
Bone 2 282 283
biochemistry 2 199
biophysics 2 284 285
cartilage 12 358
dermal 12 358
endochondral 12 358
Bone—*cont*
formation, membrane 12 352
influence of hormones 12 366
investing 12 358
marrow 12 361
membrane 12 359
metabolism 12 363
ossification centers 12 353
physiology 12 361
prosthesis 11 28
radiation injury (biology) 11 229
radioactive isotopes 12 367
replacing 12 358
resorption 12 353
Vitamin D 12 366
zone of calcification 12 353
Bone (biophysics) 2 284 286
components 2 284
Bone black (pigment) 10 224
Bone char activated carbon 1 58 13 238
Bone china 10 546
Bone fertilizer 5 237
Bone Spring black limestone 10 24
Bone turquois *see* Turquois
Bonellia 4 377
Bonellia viridis 12 255
Bonellidae 4 377
Bonin Trench 4 526
Bonito 5 416 14 156
Bonner J T 1 50
Bonnet C 11 418
Bonnet Plume Basin 9 158
Bonneville Dam 14 399
Book louse 11 70
Book manufacture 2 286 289
binding operations 2 287
printing presses 2 287
type and plates 2 286
Bookbinder's ink 7 115
Bookgill 14 566
Boole G 2 288 7 578 8 177
Boolean algebra 2 288 290
abstract relationships 2 289
combinational circuit 13 358
infinite relationships 2 289
set theoretic interpretation 2 288 290
switching theory 13 357
see also Lattice (mathematics) Topology
Boophilus 7 299
Boopidae 8 78
Boost pumps 5 358
Booster *pump* 14 241 242
Booster system spacecraft 12 550
Bootes 2 290*, 3 412 413
Bootstrap circuit 2 290 12 44*
saw tooth generator 12 43
time delay *circuits* 13 644
Bopyridae 5 34
Bopyrus 7 285
Bopyrus squillarum 5 33
Bora 13 21 14 495
Boracite 2 290
Borane 2 290 292
boron hydride 5 42
chemical fuel 3 30
preparation 2 291
properties 2 290
reactions 2 291
structure 2 291
Borate 2 292
Borate (meta) 6 421
Borate (penta) 6 421
Borate minerals 2 292 294
boron 2 301
caliche 2 416
occurrence 2 292
structural classification 2 293
Borax 2 292 300 8 277 12 409
boron minerals 2 301
soil sterilization 12 464
Boranne 2 292, 302
Boraxon 2 303
diamond 4 99
Borda mouthpiece 2 294
Border strip irrigation 7 270
Bordetella 2 332 6 412 10 424
Bordetella bronchiseptica 2 332
Bordetella parapertussis 2 332 9 554 14 489
Bordetella pertussis 2 332 461 14 489
Bore (tidal) *see* Tidal bore
Bore stroke ratio automotive engine 7 201
Boreal forest 1 525 584
Boreal region 2 294
Borel field 10 626
Borel sets 2 289 7 411
Boreopithecus darwini 10 232
Borer (animal) 2 294
Borg E 13 125 14 80
Borhyaena 8 155
Borhyaenidae 8 155
Boric acid 2 292
Boride 2 294* 302
calcium 2 599
cerium 2 635
Boring F G 10 7
Boring 2 294 295
drilling machine 4 274
electric arc 1 503
lathe 7 407 409
machining operations 8 6
Boring and drilling mineral 2 295 298* 9 291 292
air rotary drilling 2 297
auger drilling 2 295
cable tool (churn) drilling 2 297
core drilling 3 479
diamond drilling 2 295
down the hole drilling 2 298
Boring and drilling mineral—*cont*
fusion piercing methods 2 297
gas drilling 2 297
jet drilling 2 298
mining machinery 8 449
reverse circulation drilling 2 297
rotary drilling 2 295
shot (abrasive) drilling 2 298
sonic drilling methods 2 298
turbodrilling 2 298
wash boring 2 298
wire line coring 2 298
Boring sponges 2 298 299
Born Max 7 219 415 541, 12 573 13 65 *14 421*
Born approximation 12 55 53
perturbation (quantum mechanics) 10 41
Born Haber cycle 5 51 53
electronegativity 4 519
ionic crystals 7 214* 219
Born Mayer equation ionic crystals 7 219 250
Born Mayer theory ionic crystals 7 219 250
Born von Kármán theory lattice vibrations 7 415 415
specific heat 12 575
Borneo 4 356
Borneol 10 256
Bornhardt 4 76
Bornite 2 299* 3 464
Boroarsenates 2 292
Borobydrides 2 292
Boron 2 290 301
analysis 2 304
borane 2 290 292
borate 2 292
boride 2 294
electron configuration 4 504
extraction and refining 2 301 302
extractive metallurgy 8 277
fluoborate 5 537
heat of combustion 8 290
inorganic compounds 2 302 303
ionization potential 4 504
natural occurrence 2 292, *301*
organic compounds 2 303 304
organometallic compound 9 403
preparation 2 300
properties 2 300 301
uses 2 299
Boron carbide 1 9
Boron fuel 2 304 9 290 292*
Boron hydrides *see* Borane
Boron nitride 12 475

Boron nitride—*cont*
diamond 4 98
lubricant 7 604
Boron oxide glass 6 206
Boron pneumatolysis 10 425
Boronizing 8 280
Borophosphates 2 292
Borosilicate glass 6 206, 9 351-352*
Borosilicates 2 292
Boroxine 2 303
Borrelia 7 475, 9 620
Borrelia recurrentis 11 426, 13 4
Borrelia vincentii 13 4, 14 324
de Bort, Teisserenc 13 171, 14 118
Bort 4 101
Bos bubalus 2 250
Bos caffer 2 250
Bos grunniens 14 597
Bos indicus 2 561, 14 607
Bos taurus 2 561
Bose-Einstein statistics 2 304 305
applications 2 305
distribution probability 2 301 305
exclusion principle 5 137
probability 10 626
Bose gas 2 305
Bosh iron blast furnace 7 260
Boson 4 513 514*, 11 163
Bosporus 8 207, 9 250
Bosquet J 10 412
Boston fern 5 261
Boston Marrow (squash) 13 28
Boston Mountains 9 153
Bostrichidae 3 277
Bostrichoidea 3 277
Botanical gardens 2 305 306
Botanical prospecting 11 24
Botany 2 306
divisions 2 306
plant physiology 10 369
Botaurus lentiginosus 6 425 426
Bothly 4 212, 5 362, 8 680
Bothe, W 3 355
Bothnia Gulf of 5 114
Bothriocephalodea *see* Pseudophyllidea
Bothriocidaris 2 306, 4 374
Bothriocidaroida 2 306 4 360 371
Bothriolepis 1 463
Bothrium 11 66
Bothrodendron 7 457
Bothrodendrostrobus 7 458
Bothrops atrox 5 215
Botrychium 5 58, 9 342
Botryllopsis 3 117
Botrylloides 3 117
Botryllophilus brevipes 9 170
Botryllus 1 574, 12 98
Botryrococcus braunii 13 683
Botryocrinus 4 366
Botryopteris 3 263
Botryosphaerea tibis 3 626
Botryosporium 8 569
Botryosporium cinerea 8 569
Botryosporium pulchrum 8 569
Botryotinia fuckeliana 8 569
Botrytis 9 235, 603, 6 274, 10 314
Botrytis allii 6 274, 9 327
Botrytis cinerea 3 529, 7 478, 8 568, 9 408, 13 172
Botrys 11 345
Bottle bacillus 14 602
Bottle-nosed dolphin 4 262
Bottom reverberation sonar 12 504
Bottom sediments (ocean) *see* Marine sediments
Bottom signaling device (ocean ography) 8 146 147
Bottom topography *see* Sub marine topography
Botulinus antitoxin 1 487
Botulinus toxin 1 472
neutralization 9 82
Botulism 2 306 307*, 4 218
antigenic types 2 306
Bacillaceae 2 2
causal organism 2 306
exotoxin 1 472 2 306
immunization 2 306
Bouchardia 2 315
Bougainvillea spectabilis 8 243
Bouguer Lambert law 12 581
Bouguer s law *see* Lambert s law of absorption
Boulder 3 308 11 590
Boulder clay 13 611
Boulder Dam 9 160
Boule 6 100
Boultonizing 14 539
Boundary interface of phases 7 180
solid (geometric) 12 473
Boundary layer 2 307 3 440 441*
compressible flow 2 310
determination, wind tunnel 14 498
noise 1 181
prevention of separation 2 311
profile 2 307
separation 2 307
study 1 103
thickness 2 307
Boundary layer flow 2 307 311* 5 326
control 2 311
critical Reynolds number 2 309
fluid flow properties 5 312 313
heat convection 3 440 441
laminar and turbulent 2 308
noise 1 181
skin friction 2 310 12 372
Boundary-layer flow—*cont*
stability of laminar layer 2 309
subsonic flight 13 226
wake of vessels 14 580
Boundary-layer photocell *see* Photovoltaic cell
Boundary lubricants 7 604
Boundary value problems differential equation 4 126
solution 12 189-196
Boundary waves (internal) 14 418
Bounoure, L 11 463
Bourdon, Eugene 2 311
Bourdon-spring pressure gage 2 311-313*, 10 582
Bourges A R 10, 608, 611
Bourges process 10 608
Bourneville's disease 9 69
Bournonite 2 313
Boussinesq, J 12 456, 14 160
Boutakoff O 10 26
Bouteloua gracilis 3 190
Bouteloua hirsuta 3 190
Boutonneuse fever 7 299
Bouveault Blanc method (ester) 5 75
Bovers, T 3 114
Bovertia 13 602
Bovicola ovis 12 247
Bovidae 1 443 568 569, 2 250, 561, 6 226 227, 8 668
Bow tie antenna *see* Antenna (aerial)
Bow wave train 12 278
Bowen, I S 9 26
Bowen N I 5 570, 12 312
Bowen R H 6 234
Bowerbankia 6 299 10 202
Bowfin 1 304 4 260 12 355
Bowman's capsule 5 140 14 221 227
Bowman's membrane eye 5 162 171
Bowmanites (pteleobotany) 12 607
Box (Buxus) 12 26
Box camera 2 428
Box carburizing *see* Pack carburizing
Box crab 4 33 34
Box girder 6 188
Box turtle 3 25, 14 166
Boxelder 8 99
bug 6 405
Boxwood 9 408
Boyle Robert 2 313 8 539 13 567
Boyle's law 1 101 2 313 6 49 13 567
Boys C V 6 261 11 319
Boyorth R M 5 233 13 531
Brace W F 11 599
Brachial artery 2 485
Brachial plexus 1 553
Brachiata 1 420 2 313 314*
Brachiata—*cont*
Athecanephria 1 622
Pogonophora 2 313, 10 411
Thecanephria 13 545
Brachinus 3 286
Brachiolaria larva 4 363
Brachiomona 11 57 58
Brachiopoda 1 414, 420 2 314 315*, 319, 3 562, 7 585 814
Articulata 2 314
distribution 2 315
ecology 2 315
Inarticulata 2 314 7 49
morphology 2 314
Brachiosaurus 4 199
Brachistochrone cycloid 3 640
Brachycephalidae *see* Arthropodidae
Brachycephalus ephippium 10 638
Brachycera Diptera 4 211 219
Brachydactyly 5 155
Brachygnatha 4 34
Brachypodiae 13 128
Brachyspectridae 3 277
Brachyscelus crusculum 6 356
Brachyt telescope 13 451
Brachythorace 2 315
Brachyura 4 24 34
Brachyury 5 155
Brackish water demineralization 12 10
Braconid wasp 6 574
Braconidae 6 574
Bract 5 327
Bracypteraciidae 5 473
Bradley, J 1 7, 7 504
Bradshaw, B C 4 485
Bradyauxesis 1 419
Bradyodonti 2 315 316*, 4 419
Bradyornis ater 11 32
Bradypodicola hahneli 7 472
Bradypodidae 12 382
Bradypus 12 363
Bradypus griseus 12 382
Bradystelic rates macroevolution 8 14
Braga patagonica 5 291
Bragg W H 1 268, 14 568 581
Bragg W L 14 584
Bragg ionization curve 1 268
Bragg's law 14 567
reflection 14 584 585
x ray diffraction 14 571 572
Bragg reflection 14 189
microscope, x ray 8 402
Bragg spectrometer 14 574
Braggite 10 411
Brahe Tycho 2 529 3 412 4 555 12 254
Brahma 14 607
Brahmagupta 14 611
Brahman bull 2 565
Brahmaputra River 1 577
Braided channel 10 259

Brain 2 316*, 650, 3 538, 9 57 60 11 80
amnesia 1 328
anesthetic 1 405
concussion 3 573
electroencephalography 4 477
embryology 2 316, 9 45 47*
forebrain 2 316
hindbrain 2 316
hunger 6 519
meninges 2 316 8 224
midbrain 2 316
neurophysiology 9 80
paralysis agitans 9 547
serotonin 12 197
tumor *see* Oncology
ventricles 2 316
Brain embryology 9 45 47
Brain damage 1 404
cerebral palsy 2 652
Brake 2 317 318
actuators 2 318
air *see* Air brake
automobile *see* Automobile brake
band 2 317
disk 2 319
double block 2 317
electromagnetic 2 318
external shoe 2 317
internal shoe 2 317
single block 2 317
see also Dynamic braking
Brake horsepower 1 471, 6 492
Brake radiation 2 181
Bran 14 485
Branch circuit 2 319* 14 520
Branch currents 1 273
Branched chain explosion 3 306
Branched polymer 10 478
Branched tubular gland 5 45
Branchial arch 12 356
Branchial gill 11 514
Branchinecta 3 563
Branchinecta occidentalis 3 567
Branchinecta paludosa 1 435
Branching factor fission 5 289
Branchinobdellidae 9 313
Branchiocranium 12 358
Eusthenopteron 12 360
Branchiomeric musculature (anatomy) 8 636
Branchiomerism 9 62
Branchiopoda 1 560 2 319* Anostraca 1 437, 3 562 Cladocera 3 130 171 562 Conchostraca 3 562* 562 Eubranchiopoda 2 319 Lipostraca 3 562 7 595 Notostraca 3 562 9 170 Oligobranchiopoda 2 319
Branchiostoma 2 643, 7 591
Branchiostoma lanceolatum 2 644
Branchipus 1 561
Branchiura 1 319 320*, 560 561, 562
Arguloida 1 531, 3 562
nutrition 2 320
reproduction 2 320
taxonomy 2 319
Branchiuropus 5 290
Brandies 4 255
Brandon lignite 3 211 5 479
Brannerite 9 180 11 269
Branson, H R 11 40
Branta bernicla 6 236
Branta canadensis 6 236
Branta nigricans 6 236
Brasilibathynella 13 567
Brasov Mountains 5 118
Brass 2 320 3 468 470
tin alloys 13 650
velocity of sound in 12 516
Brass wind instruments 8 665 666
Brassica campestris 14 164
Brassica caulorapa 7 569
Brassica chinensis 2 583
Brassica fimbriata 7 329
Brassica hirta 8 670
Brassica juncea 8 670
Brassica napobrassica 11 635
Brassica napus 11 541
Brassica oleracea 10 484 var *acephala* 3 249, 7 329 var *botrytis* 2 569 var *capitata* 2 583 var *caulo rapa* 7 569 var *gemmifera* 2 553 var *italica* 2 541
Brassica pekinensis 2 593
Brassica rapa 14 164
Brathinidae 3 276
Brauia rocca 4 218
Braulidae 4 212
Braun C 6 264
Braun E L 13 235
Braun K F 4 519
Braun Blanquet J 10 500
Braunite 8 88
Bravais A 3 596
Bravais indices crystallography 3 607 608
Bravais lattices 3 594 597* 7 415
Bravoite 11 516
Brayton G B 2 320
Brayton cycle 2 320 321 ion propulsion 7 243 244 reverse 11 417
Brazil nut 2 321 nut crop culture 9 231
Brazil topaz crystal optics 3 501
Brazilian Current 1 626 9 247
Brazilian Highlands 12 524, 527
Brazilian Shield 10 567
Brazing 2 322 323* 14 466 alloys 2 322 fluxes 2 322 323 induction heating 7 75
Brazing—*cont* processes 2 322 tin 13 647 649 tin alloys 13 649 *see also* Soldering
Brazing atmosphere 2 323
Brazos River 13 520
Bread 3 412 413
Breadboarding 2 324
Breadfruit 2 324
Break through analysis 3 93
Breakbone fever 4 218
Breakdown gaseous 2 324
Breakdown, dielectric *see* Dielectric breakdown
Breakdown potential 2 324 12 559 560
Breakdown strength (dielectrics) *see* Dielectric strength
Breakers 12 100 300 forecasting 9 8 height 12 302 *surf* 12 301
Breaking stress 13 183
Breakwater 2 325 attack by boring sponges 2 299
Bream 13 291
Breast 2 325
Breast disorders 2 325 326 cancer 2 326 congenital defects 2 325 hormonal imbalances 2 325 inflammations 2 325
Breccia 2 326* 3 599 11 500 *14 133 519*
Breechblock (ordnance) 1 559
Breed R S 2 330
Breeding (animal) 2 326 327 agricultural science 1 119 artificial insemination 2 327 cattle production *beef* 2 561 564 cattle production *dairy* 2 564 568 genetic importance 2 326 *heterosis* 2 327 horse production 6 488 492 ideal characteristics 2 326 livestock 1 119 mating system 2 327 mule production 8 625 poultry production 10 546 550 *selection for* improvement 2 326 *selection indexes* 2 326 *sheep* 12 244 *swine* production 13 539 542
Breeding (plant) 2 327 330 alfalfa 1 233 corn 3 483 cross pollinating species 2 329
Breeding (plant)—*cont* cytoplasmic male sterility 2 329 inbred lines 2 329 plant disease control 10 516 519 polyploidy 2 330 10 497 499 recurrent selection 2 329 self pollinating species 2 329
Breeding cycles 8 427
Breeding ratio nuclear fuels 9 184 186
Breeding season 11 475
Breit, G 5 289 7 254
Breit Dirac recoil factor 3 556
Breit Wigner formula fission 5 289
Breithauptite nickel ore 9 91
Bremia lactucae 7 478
Bremsstrahlung 2 330 angular distribution 2 330 beta rays 2 181 182 cosmic rays 3 498 499 spectrum 2 330 values 10 396 397 x ray fluorescence analysis *14 578*
Brenner A 4 535
Brentidae 3 278
Brescia Alps of 5 117
Brettanomyces 8 80 Cryptococcales 3 578
Brewnderite 8 314
Brevibacteriaceae 2 330* 5 46, *Brevibacterium* Breed 1953 2 330 *Aurthia* Trevisan 1885 2 330 taxonomy 2 33
Brevibacterium Breed 1953 2 330
Brevibacterium linens 3 12 Weigmann Breed 2 330
Brevoortia tyrannus 8 225
Brewer W I 10 164
Brewer's blackbird 2 254
Brewsterite 14 611
Brian P W 6 274
Brianchon theorem 3 400
Brick 3 167, 13 204 205*, 530
Brickwedde F G 4 84
Bridge 2 331 337 bascule 2 331 beam 2 331 cantilever 2 332 composite beam construction 3 544 composite I beam 2 331 continuous 2 332 deck 2 331 drawbridge 2 334 fixed 2 331 floating 2 334 foundations 2 335 337 highway 2 335

Boron nitride—*cont*
diamond 4 98
lubricant 7 604
Boron oxide glass 6 206
Boron pneumatolysis 10 425
Boronizing 8 280
Borophosphates 2 292
Borosilicate glass 6 206, 9 351-352*
Borosilicates 2 292
Boroxine 2 303
Borrelia 7 475, 9 620
Borrelia recurrentis 11 426, 13 4
Borrelia vincentii 13 4, 14 324
de Bort, Teisserenc 13 171, 14 118
Bort 4 101
Bos bubalus 2 250
Bos caffer 2 250
Bos grunniens 14 597
Bos indicus 2 561, 14 607
Bos taurus 2 561
Bose Einstein statistics 2 304 305
applications 2 305
distribution probability 2 304 305
exclusion principle 5 137
probability 10 626
Bose gas 2 305
Bosh iron blast furnace 7 260
Boson 4 543 544*, 11 163
Bosporus 8 207, 9 250
Bosquet, J 10 412
Boston fern 5 261
Boston Marrow (squash) 13 28
Boston Mountains 9 153
Bostrichidae 3 277
Bostrichoidea 3 277
Botanical gardens 2 305 306
Botanical prospecting 11 24
Botany 2 306
divisions 2 306
plant physiology 10 369
Botaurus lentiginosus 6 425-426
Bothly 4 212, 5 362, 8 680
Bothe, W 3 355
Bothnia, Gulf of 5 114
Bothriocephaloidea *see* Pseudophyllidea
Bothriocidaris 2 306, 4 374
Bothriocidaroida 2 306, 4 360, 371
Bothriolepis 1 463
Bothrium 11 66
Bothrodendron 7 457
Bothrodendrostrobus 7 458
Bothrops atrox 5 215
Botrychium 5 38 9 342
Botrydiopsis 3 117
Botrydium 3 117
Botryllophilus brevipes 9 170
Botryllus 1 574 12 98
Botryococcus braunii 13 683
Botryocrinus 4 366
Botryopteris 3 263
Botryosphaerea ribis 3 626
Botryosporium 8 569
Botryosporium cinerea 8 569
Botryosporium fulchrum 8 569
Botryotinia fuckeliana 8 569
Botrytis 9 235, 603, 6 274, 10 311
Botrytis allii 6 271, 9 327
Botrytis cinerea 3 529, 7 478, 8 568, 9 408, 13 172
Botrytis 11 315
Bottle bacillus 14 602
Bottle nosed dolphin 4 262
Bottom reverberation sonar 12 504
Bottom sediments (ocean) *see* Marine sediments
Bottom signaling device (oceanography) 8 116 147
Bottom topography *see* Sub marine topography
Botulinus antitoxin 1 487
Botulinus toxin 1 472
neutralization 9 82
Botulism 2 306 307*, 4 218
antigenic types 2 306
Bacillaceae 2 2
causal organism 2 306
exotoxin 1 472, 2 306
immunization 2 306
Bouchardia 2 315
Bougainvillea spectabilis 8 243
Bouguer Lambert law 12 581
Bouguer's law *see* Lambert's law of absorption
Boulder 3 598, 11 590
Boulder clay 13 641
Boulder Dam 9 160
Boule 6 100
Boultonizing 14 539
Boundary interface of phases 7 180
solid (geometric) 12 473
Boundary layer 2 307 3 440 441*
compressible flow 2 310
determination, wind tunnel 14 498
noise 1 184
prevention of separation 2 311
profile 2 307
separation 2 307
study 1 403
thickness 2 307
Boundary layer flow 2 307 311* 5 326
control 2 311
critical Reynolds number 2 309
fluid flow properties 5 342-343
heat convection 3 440-441
laminar and turbulent 2 308
noise 1 184
skin friction 2 310, 12 372
Boundary layer flow—*cont*
stability of laminar layer 2 309
subsonic flight 13 226
wake of vessels 14 380
Boundary layer photocell *see* Photovoltaic cell
Boundary lubricants 7 604
Boundary value problems differential equation 4 126
solution 12 189-196
Boundary waves (internal) 14 418
Bounoure, L 11 463
Bourdon, Eugene 2 311
Bourdon spring pressure gage 2 311-313*, 10 582
Bourges, A R 10, 608, 611
Bourges process 10 608
Bourneville's disease 9 69
Bournonite 2 313
Boussinesq J 12 456, 14 160
Boutakoff, O 10 26
Bouteloua gracilis 3 190
Bouteloua hirsuta 3 190
Boutonneuse fever 7 299
Bouveault-Blanc method (ester) 5 75
Bovert, T 3 114
Bovera 13 602
Bovicola ovis 12 247
Bovidae 1 443 568 569, 2 250, 561, 6 226 227 8 668
Bow tie antenna *see* Antenna (aerial)
Bow wave train 12 278
Bowen, I S 9 26
Bowen N L 5 579, 12 312
Bowen R H 6 234
Bowerbankia 6 299 10 202
Bowfin 1 301 4 260, 12 355
Bowman's capsule 5 140 14 221 227
Bowman's membrane eye 5 162 171
Bowmanites (paleobotany) 12 607
Box (Buxus) 12 26
Box camera 2 428
Box carburizing *see* Pack carburizing
Box crab 4 33 34
Box girder 6 188
Box turtle 3 23 14 166
Boxelder 8 99
bug 6 405
Boxwood 9 408
Boyle, Robert 2 313 8 339 13 567
Boyle's law 1 101, 2 313, 6 49 13 567
Boys C V 6 264 11 319
Boxorth R M 5 233 13 331
Brace W F 11 599
Brachial artery 2 485
Brachial plexus 1 533
Brachiata 1 420, 2 313 314*
Brachiata—*cont*
Athecanephria 1 622
Pogonophora 2 313, 10 611
Thecanephria 13 545
Brachinus 3 286
Brachiolaria larva 4 363
Brachiomona 11 57 58
Brachiopoda 1 414, 420, 2 314 315*, 319, 3 562, 7 582 84
Articulata 2 314
distribution 2 315
ecology 2 315
Inarticulata 2 314, 7 49
morphology 2 314
Brachiosaurus 4 199
Brachistochrone cycloid 3 600
Brachycephalidae *see* Atelopodidae
Brachycephalus ephippium 10 638
Brachycera Diptera 4 211 219
Brachydactyly 5 155
Brachygnatha 4 34
Brachyopidae 13 128
Brachyspectridae 3 277
Brachyscelus crusculum 6 586
Brachyt telescope 13 451
Brachythorace 2 315
Brachyura 4 24 34
Brachyury 5 155
Brackish water demineralization 12 10
Bracond wasp 6 574
Bracondae 6 574
Bract 5 327
Bracypteraciidae 3 473
Bradley, J 1 7, 7 504
Bradshaw, B C 4 485
Bradyauxesis 1 419
Bradyodonti 2 315 316*, 4 419
Bradyornis ater 11 32
Bradypodicola hahneli 7 472
Bradypodidae 12 382
Bradypus 12 363
Bradypus griseus 12 382
Bradytelic rates macroevolution 8 14
Braga patagonica 5 291
Bragg, W H 1 268, 14 568, 584
Bragg, W L 14 584
Bragg ionization curve 1 268
Bragg's law 14 567
reflection 14 584 585
x ray diffraction 14 571 572
Bragg reflection 14 189
microscope, x ray 8 402
Bragg spectrometer 14 574
Braggite 10 411
Brahe, Tycho 2 579, 3 412 4 555 12 234
Brahma 14 607
Brahmagupta 14 611
Brahman bull 2 563
Brahmaputra River 1 577
Braided channel 10 259

rown rot—*cont*
fruit tree diseases 5 546 548
peach 9 601
plum 10 420
rown Sequard, C E 6 482
rown soils 12 434
rown stink bug 6 405
Brown Swiss cattle 2 365
Brown tail moth 7 472
Brown thrasher 13 612
Brownian motion process 4 257
Brownian movement 2 349 350*, 11 48 13 144
Avogadro number 1 697
cell (biological) 2 592
Langevin equation 2 350
Browning J M 1 538
Browning automatic rifle 1 537
Browning mechanism 1 534
Brownprint 10 146
Bruce J R 12 306
Brucella 1 466 467 2 351 5 67 9 173 10 428
fluorescent antibody method 8 383
Brucella abortus 1 466 467 2 351 352
Brucella bronchisepticus 13 529
Brucella melitensis 2 351 352
Brucella suis 1 466 467 2 351 352
Brucellaceae 2 350 352* 5 96
taxonomy 2 11
tularemia 14 150
Brucellergen test skin 12 372
Brucellosis 1 466 467 2 350 352 353* 4 54 10 91 13 179
in animals 2 352
diagnosis 2 352
in humans 2 352
prevention 2 353
Bruchophagus gibbus 6 581
Brucite 2 353
in chlorite 3 165
magnesium occurrence 8 19
B uguiera 8 91
Brun E 5 298
Brunauer S 1 80
Brunchorstia destruens 4 234
Brunner J S 10 36
Brunsvigia 3 182
Brunsvigs 12 434
Brunner's gland 4 150 5 204
Brunt D 3 424
Brush (electric machinery) 5 328 12 383
Brush border cell surface differentiation 2 621
Brush discharge 2 353
Brush heap structure grease 7 605
Brush heap theory gel 6 93
Brush shifting motors 1 28
Brushing lacquer 7 376
Brussels sprouts 2 913
Bryophyllum 10 314 11 451
Bryophyllum calycinum 10 333
Bryophyllum daigremontianum 10 332
Bryophyllum tubiflorum 10 332
Bryophyta 2 353 354*, 6 415 10 321, 346
alternation of generations 2 353
Anthocerotae 1 453 2 354 10 346
fossil 9 502
Hepaticae 10 346
Musci 2 354 8 632 10 346
structure 2 353
Bryozoa 1 414 420, 2 354 356* 7 583
autozooid 2 356
avicularium 2 356
Bryozoa Polyzoa problem 2 355
Cheilostomata 3 16 17
colony size 2 334
Cyclostomata 5 644
economic importance 2 354
Ectoprocta 2 355
Ectoprocta Entoprocta *problem* 2 355
Entoprocta 2 355 5 7 9
fossils 2 356 358
gonozooid 2 356
growth habit and color 2 354
heterozooid 2 356
hibernation 6 436 441
kenozooecium 2 356
morphology 2 355
Phylactolaemata 10 201
polymorphism 2 356
reproduction 2 356
Stenolaemata 13 129
taxonomic *status* 2 354 355
Treptostomata 14 80
vibraculum 2 356
Bryozoa fossils 2 356 358
BT see Bathythermograph
Btu *see* British thermal unit
Bubble cap 6 44
Bubble cap plate 3 491
Bubble cap plate column 4 250
Bubble cavitation *see* Transient cavitation
Bubble chamber 2 358 359* 8 218
liquid hydrogen 2 359
photograph of antineutron formation 1 478
propane 1 478 479
xenon 14 561 562
Bubble shell 13 406
Bubbles sea surface 12 103 105
Bubo virginianus 9 460
Bubonic plague 5 6 10 255 12 344
entomology economic 5 5 7
flea 5 209
Buccal cavity 8 619
Buccal gland 9 369
Buccinacea 6 76
Buccinidae 9 34 14 487
Buccinum 9 34
Buccinum undatum 14 488
Bucconidae 10 213
Buccopharyngeal breathing 11 528
Bucerotidae 3 473
Buchanan, F 7 407
Buchanan R E 5 95
Bucher, W 11 5 457
Bucherer reaction amine 1 506 naphthylamine 9 5
Buchia (Aucella) 7 525
Buchites 11 185
Buchloë dactyloides 5 190
Buchthal, F 8 639, 645
Bucket conveyors 2 367
Bucket ladder dredges 8 478
Buckeye 2 359 360* 381
Buckingham E 4 191
Buckland W 13 523
Buckling beam 7 567
beam web 7 567
column 3 305
Buckling (reactor physics) 11 567
Buckthorn humelia 7 268
Buckwheat 2 360* 10 374
Buckwheat tree 7 268
Bud 2 360 361* 13 112
accessory 2 361 13 113
adventitious 2 361 13 113
apical 13 112
axillary 2 361 13 112 113
bud *scale* 2 360
collateral 2 360 361
dormant 2 361 10 335
lateral 2 361 13 112 113
supernumerary 13 113
terminal 2 360 361 13 112
Bud graft 2 361
Bud mite 14 125
Budding 2 361* 11 448 449
Buenoa 6 405 11 511
Buerger M F 11 598
Buerger's disease 2 361 362* 6 39
Buettneria 1 535 13 129
Buffalo American 2 250
cape 2 250
Indian 2 250
Buffalo fish 13 236
Buffalo hide 7 415
Buffalo treehopper 6 472 14 76
Buffer amplifiers 1 354
Buffer mechanism (sea water) 12 110
Buffer solutions 1 40 2 362* acid and base 1 39 42
Buffering *agent (food)* 5 376
Buffeting *airplane* 1 91
Bufong 2 362 8 6
Buffon G L L 8 586
Bufo 10 638 12 8
Bufo americanus 13 661
Bufo marinus 12 10
Bufonidae 10 638 13 661
Bufotenine 7 63
Bug 2 362
see also entries under specific names
Bug (Polish) River 5 121
Bugula 2 354
Bugula abyssicola 9 17
Buh (Lkranta) River 5 121
Buhrstone mill 2 362 363 5 558
Buhrstone pulverizer 5 558
Building board 14 550
Building codes 2 363
Building construction 2 363 365
Building in operations book manufacture 2 284
Building materials *see* Structural materials
Building stone *see* Stone and *stone products*
Building zones climatic 1 119
Buildings 2 363 365* 3 114 architectural acoustics 1 517 520
architectural engineering 1 520 521
blast resistant structures 2 364
central heating 2 620 630
construction materials *see* Structural materials
dead load 2 364
earthquake shocks 2 364
electric wiring 14 519 522
farm 6 139 141
fire codes 13 10
fire sprinkler 14 18
floor construction 5 312
framing systems 2 364
industrial 2 365
lightning protection 7 510
live load 2 365
long span construction 2 364
noise control 9 129 130
roof construction 11 620
skeleton frame construction 2 364
steam heating 14 84
trusses 2 365
ventilation 14 296 304
wall bearing construction 2 364
wall construction 14 585
wind bracing 2 364
wind forces 2 363
see also Structures (engineering)
Bukk Mountains 5 118
Bulb (botany) 13 111 124
Bulb exposure (cameras) 2 411
Bulb of krause 12 180
Bulb of pressure pile foundation 10 227
Bulbar poliomyelitis 10 456

Bridge—*cont*
lateral bracing 2 331
loading and floor systems 2 335
movable 2 331
oscillating wind forces 7 332
piers 2 335 337*, 389
plate girder 2 331
pontoon 2 334
Pratt truss 2 332
railroad 2 335
reinforced concrete 2 335
suspension 2 334
sway bracing 2 331
swing 2 334
through 2 331
truss 2 331, 14 121
vertical lift 2 334
vibration 2 337–338
Warren truss 2 332
Bridge circuit 2 337
capacitance measurement 2 442
frequency measurement 5 507–508
impedance measurement 7 38 42, 66 69
inductance measurement 7 66 68
Kelvin bridge 7 334 335
oscillators 9 423
rectifier 11 385
Wheatstone bridge 14 485–487
Bridge-forming atoms 3 41
Bridge rectifier 11 385
Bridge vibration 2 337 338
Bridged-T network capacitance measurement 2 443
Bridges, E B 3 115
Bridgman P W 2 397 6 443 450, 12 341, 13 578 586
Bridgman method (crystal growth) 12 341
Bridgman unsupported area gasket 6 450
Bridled pressure plate 1 221
Brier, G W 7 84
Briggs, G H 1 268
Briggs, H 7 575
Bright's disease 3 141–144
Bright stock 7 602
Brightener 4 529
Brightness meter 10 171
Brightness temperature 6 373
Brighton, T B 14 20
Brightype method 10 608
Brill's disease 14 176
Brille 5 162–171
Brilliant cut facets 6 102
Brilliant view finder 2 451
Brillouin function ferromagnetism 5 230
paramagnetism 9 549
Brillouin zone 2 338 339*, 12 477
Brillouin zone—*cont*
alloy structures 1 263
application to band theory 2 338 339
Brimstone 13 255 256
Brindled gnu 6 227
Brine lithium source 7 544
magnesium occurrence 8 19
salt (food) 12 17
Brine, microbiology of 2 339 340
Brine electrolysis 3 69 72
Brinell hardness test 6 377, 8 274
Brisbane tuff 11 597
Brisungidae 1 599, 5 458
Brisson M J 3 662
Bristle-thighed curlew 3 10
Bristle worm 1 429
Bristly rose slug 6 580
Bristol Channel 5 114 11 586
Britannia metal 13 650
British anti lewisite 3 44 8 227, 10 437
British Empire Range 1 523
British gums *see* Dextrin
British thermal unit (Btu) 2 340 341
calorie relation 2 341
watthour relation 2 341
Brittany Peninsula 5 116
Brittle star 2 341* 9 545 13 53
Brittle temperature metal 8 268 269
Brittleness 2 341
plastic deformation of metal 10 498
Britton, N L 10 477
Brix hydrometer scale 6 562
Broaching 2 341 8 6
gear cutting 6 88
Broaching machine 8 7
Broad band amplifier 1 344 2 553
Broadcasters (agricultural) 1 128
Broadcasting *see* Radio broadcasting
Broadcasting high frequency amplitude modulation radio 1 363
frequency allocations 1 363
propagation 1 363
Broadcasting low frequency amplitude modulation radio 1 363
Broadcasting medium frequencies amplitude modulation radio 1 363
interference minimumization 1 363
regulations 1 363
vertical polarization 1 363
Broadcasting networks radio *see* Radio broadcasting networks
Broadcasting networks radio—*cont*
television *see* Television networks
Broadleaf evergreen forest 8 215
Broadside array (antennas) 1 447, 451–452
Broadside excitation 1 451
Broca, P 1 461
Broca's area 12 397
Broccoli 2 341
Brochantite 2 342*, 3 464
Brocken bow 2 342
Brocken specter 2 342
Brockmeyer R L 8 429
Brodsky, W 9 438
Broili F 11 484
Broken transit *see* Prism transit
Bromate 2 342 343
Bromcresol green acid base indicator 7 60
Bromcresol purple acid base indicator 7 60
Brome grass 2 342 343
Bromelain 5 27
Bromeliaceae 5 183
climax plant formations 3 186 192
Bromelin 5 376
Bromide 2 343* 14 16
sedation 12 129
organic 6 325 330
Bromination 6 325 330
Bromine 2 343 346
bromate 2 342
bromide 2 343
electron configuration 4 501
halogen elements 6 324
handling and safety 2 346
inorganic bromides and bromates 2 345
ionization potential 4 504
manufacture 2 344
natural occurrence 2 344
organic bromides 2 345
organic compounds 6 325 330
physical properties 2 344
production 2 343 344
uses 2 345 346
5-Bromo 1 aminopentane 11 113
m Bromobenzoic acid 2 475
o Bromobenzoic acid 2 475
p Bromobenzoic acid 2 475
alpha Bromobenzyl cyanide 3 45
Bromoform haloform reaction 6 325
2 Bromopyridine 11 111
Bromopyrrole 11 151
Bromosulane 12 320
Bromotrifluoromethane 5 501
Bromphenol blue 7 60
Bromthymol blue 7 60
Bromus 10 489
Bromus inermis 2 342
Bromvitrie 2 651
Bronchial asthma 2 346 348
Bronchial disorders 2 346 348
acute bronchitis 2 347
bronchial asthma 2 346 348
bronchiectasis 2 347
bronchitis 2 346 347
carcinoma 2 348
chronic bronchitis 2 347
diagnosis 2 349
etiology 2 348
incidence 2 348
Bronchiectasis 2 349
metabolic disorders 8 257
Bronchitis 2 346 349
Bronchogenic carcinoma 2 348
Bronchopneumonia 7 619
Bronchus 2 349
Bronsted J N 1 49
Brönsted Lowry theory 1 40
Bronsted theory 1 40 11 127
Brontosaurus 4 200 7 327, 11 484
Brontotheres 10 19
Bronze 2 349, 3 468
tin alloys 13 649
Bronzed grackle 2 274 6 244
Bronzite 9 419 11 129
Brook 11 581
Brook trout 3 225
Brookite 11 656
titanium ore 13 652
Brooks H 14 490
Brooks deflection potentiometer 10 543 544
Brooks Range 9 158
Brooks variable inductometer 7 80
Brookvella 5 261
Broomrape 13 661
Brotulidae 4 41, 10 10
Brousonetia 14 253
Brouwer L E J 7 582
Brouwerian logic Boolean algebra 2 289
lattice (mathematics) 7 413
Brower J 11 52
Brown A H 10 186 577
Brown F W 4 535
Brown H C 2 291
Brown, Hanburt 13 503
Brown R 10 210
Brown S C 6 505
Brown S W 4 535
Brown W L 5 211
Brown algae 10 89
Brown banded cockroach 3 251 9 416
Brown bat 2 109
Brown coal 3 290 7 515 8 432
Brown creeper 9 541
Brown Jurassic 7 325
Brown pelican 9 615
Brown pigments 10 224
Brown rot 1 574 5 547, 13 172

peach 9 601
plum 10 420
Brown Sequard C E 6 482
Brown soils 12 434
Brown stink bug 6 405
Brown Swiss cattle 2 565
Brown tail moth 7 472
Brown thrasher 13 612
Brownian motion process 4 257
Brownian movement 2 349 350* 11 48 13 144
Avogadro number 1 697
cell (biological) 2 592
Langevin equation 2 350
Browning J M 1 538
Browning automatic rifle 1 537
Browning mechanism 1 534
Brownprint 10 146
Bruce J R 12 306
Brucella 1 466 467 2 351, 5 67 9 173 10 428
fluorescent antibody method 8 383
Brucella abortus 1 466 467 2 351 352
Brucella bronchiseptica 13 528
Brucella melitensis 2 351 352
Brucella suis 1 466 467 2 351 352
Brucellaceae 2 350 352* 5 96
taxonomy 2 11
tularemia 14 135
brucellergen test skin 12 372
brucellosis 1 466 467 2 350 5 352 353* 4 54 10 91 13 179
in animals 2 352
diagnosis 2 352
in humans 2 352
prevention 2 353
Bruchophagus gibbus 6 581
Brucite 2 353
in chlorite 3 165
magnesium occurrence 8 19
Bruguiera 8 91
Brun F 5 208
Brunauer S 1 80
Brunchorstia destruens 4 234
Brunel J S 10 36
Brunfelsia 3 189
Brunizems 12 434
Brunner's gland 4 150 5 204
Brunt D 3 424
Brush (electric machinery) 5 328 12 381
Brush border cell surface differentiation 2 621
Brush discharge 2 353
Brush heap structure grease 7 605
Brush heap theory gel 6 93
Brush shifting motors 1 285
Brushing lacquer 7 376
Brussels sprouts 2 353
Bryophyllum 10 354 11 451
10 321, 340
alternation of generations 2 353
Anthocerotae 1 453 2 354 10 346
fossil 9 502
Hepaticae 10 346
Musci 2 354 8 632 10 346
structure 2 353
Bryozoa 1 414 420 2 354 356* 7 595
autozooid 2 356
avicularium 2 356
Bryozoa Polyzoa problem 2 355
Cheilostomata 3 16 17
colony size 2 354
Cyclostomata 3 644
economic importance 2 354
Ectoprocta 2 355
Ectoprocta Entoprocta problem 2 355
Entoprocta 2 355 5 7 9
fossils 2 356 358
gonozooid 2 356
growth habit and color 2 354
heterozooid 2 356
hibernation 6 436 441
kenozooecium 2 356
morphology 2 355
Phylactolaemata 10 201
polymorphism 2 356
reproduction 2 356
Stenolaemata 13 125
taxonomic status 2 354 355
Treptostomata 14 80
vibraculum 2 356
Bryozoa fossils 2 356 358
BT *see* Bathythermograph
Btu *see* British thermal unit
Bubble cap 6 44
Bubble cap plate 5 491
Bubble cap plate column 4 250
Bubble cavitation *see* Transient cavitation
Bubble chamber 2 358 359* 8 248
liquid hydrogen 2 359
photograph of antineutron formation 1 478
propane 1 478 479
xenon 14 561 562
Bubble shell 13 406
Bubbles sea surface 12 103 105
Bubo virginianus 9 460
Bubonic plague 5 6 10 255 12 344
entomology economic 5 5 7
flea 5 209
Buccal cavity 8 619
14 487
atum 14 488
213
Buccopharyngeal breathing 11 528
Bucerotidae 3 473
Buchanan J 7 407
Buchanan R E 5 95
Bucher W H 5 417
Bucherer reaction amine 1 306
naphthylamine 9 3
Buchia (Aucella) 7 525
Buchites 11 145
Buchloë dactyloides 3 190
Buchthal F 8 639 643
Bucket conveyors 2 367
Bucket ladder dredges 8 478
Buckeye 2 359 360* 581
Buckingham F 4 194
Buckland W 13 523
Buckling beam 7 567
beam web 7 567
column 3 503
Buckling (reactor physics) 11 367
Buckthorn bumelia 7 268
Buckwheat 2 360* 10 374
Buckwheat tree 7 268
Bud 2 360 361* 13 112
accessory 2 361 13 113
adventitious 2 361 13 113
apical 13 112
axillary 2 361 13 112 113
bud scale 2 360
collateral 2 360 361
dormant 2 361 10 335
lateral 2 361 13 112 113
supernumerary 13 113
terminal 2 360 361 13 112
Bud graft 2 361
Bud mite 14 115
Budding 2 361* 11 448 449
Buenoa 6 403 11 511
Buerger M F 11 508
Buerger's disease 2 361 362* 6 58
Buettneria 1 335 13 128
Buffalo American 2 250
cape 2 250
Indian 2 250
Buffalo fish 13 236
Buffalo hide 7 415
Buffalo treehopper 6 472 14 76
Buffer amplifiers 1 354
Buffer mechanism (sea water) 12 110
Buffer solution 1 40 2 362* acid and base 1 39 42
Buffering agent (food) 5 376
Buffeting airplane 1 91
Buffing 2 362 8 6
Buffon G L L 8 586
Bufo 10 638 12 8
Bufo americanus 13 661
Bufo marinus 12 10
Bufonidae 10 638 13 661
Bufotenine 7 65
Bug 2 362
see also entries under specific names
Bug (Polish) River 5 121
Bugula 2 354
Bugula abyssicola 3 17
Buh (Ukrania) River 5 121
Buhrstone mill 2 362 363 3 558
Buhrstone pulverizer 3 558
Building board 14 550
Building codes 2 363
Building construction 2 363 365
Building industry operations hawk manufacture 2 288
Building materials *see* Structural materials
Building stone *see* Stone and stone products
Building zones climatic 1 139
Buildings 2 363 365* 3 148
architectural acoustics 1 517 520
architectural engineering 1 520 521
blast resistant structures 2 364
central heating 2 629 630
construction materials *see* Structural materials
dead load 2 363
earthquake shocks 2 363
electric wiring 14 519 522
farm 1 139 141
fire codes 13 19
fire sprinkler 13 18
floor construction 3 512
framing systems 2 364
industrial 2 365
lightning protection 7 510
live load 2 363
long span construction 2 364
noise control 9 129 130
roof construction 11 620
skeleton frame construction 2 364
steam heating 13 83
trusses 2 365
ventilation 14 296 298
wall bearing construction 2 364
wall construction 14 383
wind bracing 2 364
wind forces 2 363
see also Structures (engineering)
Bükk Mountains 5 118
Bulb (botany) 13 111 121
Bulb exposure (cameras) 2
Bulb of Krause 12 180
Bulb of pressure pile foundation 10 227
Bulbar poliomyelitis 10 45

Bulbourethral gland 3 529 550 11 475 745
Bulbring, E 4 175
Bulbus cordis 2 482
Buldiya quartzite 11 597
Bulimina exigua 5 453
Buliminidea 5 451
Bulimus 3 207, 12 61
Bulk handling machines 2 365-370
backhoe 5 134
bulk material 2 365
clamshell 2 369, 5 134
conveying machines 2 365-367; 3 447-450
crane 2 368 5 134
derrick 4 69
dragline 2 369, 5 134
earthmovers 2 370, 4 352
excavation 5 134
front end loader 5 134
hoe 2 369
power shovel 5 134
scoop 2 369
shovel 2 368, 5 134 12 306
solids pump 12 482
tractor 14 12
trencher 5 134
truck 14 120
unloader 14 207
Bulk modulus 4 420
elasticity 4 420
Bulk polymerization 10 481
Bulk power substation *see* Electric power substation
Bulk sampling (mining) 8 497
Bulk Shielding Facility nuclear reactor 11 559
Bulkhead 2 370*, 12 256
Bull *see* Cattle production, beef, Cattle production, dairy
Bull bat 9 101
Bull shark 8 573
Bulla 13 406
Bullard, E C 6 123, 8 157, 552
Bulldozer 2 370* 4 351
Bullen, K E 4 339, 12 155, 13 414
Bullera 13 10
Bullet 1 639
Bullet type perforator oil and gas wells 9 297
Bulletproof glass 12 3
Bullfrog 5 537
Bullhead 2 552
Bullhorn (motor) cell 5 59
Bullinus contortus 9 447
Bullion assaying 1 595
Bullock, L L 10 615
Bullock's oriole 9 407
Bulloo River 1 671
Bullsnake 1 370 371
Bumblebee 2 127, 6 574, 582 12 406
Bumelia lycioides 7 268
Bumelia tenax 7 268
Buna *N* rubber 10 459, 11 610
Buna *S* insulation 7 157
Bunchy top disease abaca 1 1
banana 2 90
see also Plant diseases
Bundle of His 5 138
Bunostomum 13 193
Bunostomum trigocephalum 12 247
Bunsen R 2 656, 8 19 11 647, 12 586 587 589
Bunsen burner 2 374, 6 263, 12 588
Bunsen flame 5 292
Bunsen spectroscope 12 588 590
Bunt disease (smut disease) 14 235
wheat 14 481
Bunte salts 9 400
Bunter 14 81
Bunting 2 371
Buoy 2 371 372
piloting 10 230
sonobuoys 12 506
Buoyancy 2 372
Archimedes' principle 1 517
horizontal 2 372
lighter than air craft 1 101
ship design 12 268* 271
stability 2 372
Buoyant ascent method 13 213
Buphthalmus 6 211
Buprestidae 3 277
Buprestoidea 3 277
Buprorus lovemi 9 170
Bur oak 9 237
Burbidge E M 4 553
Burbidge G R 4 553
Burchell's zebra 14 607
Burdekin River 1 671
Bureau Veritas 4 280
Buret 2 372
Burg A 2 291
Burgers, J W 3 583
Burgers vector 3 583 584
Burgess shale 9 522
fossil annelids 1 431
Burglar alarm 1 222
Burgundidae 12 604
Burgundy 14 607
Burin 10 603, 610
Burke, C J 7 442
Burlap 2 372 373
Burley clay 3 161
Burma ruby 11 648
Burmanniaceae 9 373
Burn 2 373
Burn out printing 13 545
Burner, Bunsen *see* Bunsen burner
Burnet 7 461
Burning *see* Combustion
Burning feet syndrome 9 537
Burning velocity 5 295
Burning velocity measurement 2 375 375
Burning velocity measurement *—cont.*
idealized and actual flames 2 374
spectroscopy of combustion 12 592
techniques 2 374
Burnstock, G 4 175
Burr mill 1 134
Burrow 8 625
Burrower bug 6 401
Burrowing flea 12 445
Burrows, C W 8 288
Bursa 2 375
Bursa copulatrix 13 192
Bursaria 11 59
Bursitis 2 375* 7 315
Burtoning 12 259
Bus 2 375 376
air brake 1 142, 2 318
power steering 13 102
see also Automobile, Auto motive vehicle
Bus bar 2 376 3 392 14 520
Buscemi, A 13 309
Bush R R 7 443
Bush V 1 367 7 172 10 148
Bushel 8 188
Bushing 2 376
Bushmaster 2 376
Bushmen 1 459
Bushveld complex 10 567
Busy A V B 8 19
Busy, W 2 171
Bustard 6 286
Buswas 3 593 14 520
Busycon 11 611
Busycon canaliculatum 14 488
Busycon carica 14 487
Butadiene 3 629 640
nitrile rubber 11 640
perrochemical 10 45 46
polyolefin resins 10 487
synthesis 4 117
1 2 Butadiene 6 333 14 207 209
1 3 Butadiene 2 376 377* 4 118 14 207 209
functional group isomerism 7 278
polyolefin resins 10 487
Butadiene acrylonitrile rubber 10 491
Butadiene styrene rubber 11 639
Butane 1 245 249 2 376 377*
liquefied petroleum gas (LPG) 7 540
1,4 Butanediol 6 223
2,3-Butanediol 2 377 378
fermentation 2 377
industrial production 2 378
raw materials 2 378
recovers 2 378
D(−)2 3 Butanediol 1 31
L(+) 2,3 Butanediol 1 31
meso 2,3 Butanediol 1 31
Butanol 2 378 379
Butanol—*cont.*
acetone butanol fermentation 1 55
n Butanol 1 29
Butanol acetone fermentation 2 45
2 Butanone 8 345
Butaprene N 11 640
Butcher, R 5 533
Butcher bird 12 307
1-Buten 3 yne 1 245 6 533
Butenandt, A 6 235
1-Butene 1 245 14 207 209
2 Butene 1 245
cis 2 Butene 14 207 209
trans 2 Butene 14 207 209
Butenolide 7 540
Buteo lineatus 6 345
alpha [2 (2 Butoxyethoxy) ethoxy] 4,5 methylenedioxy 2 propyltoluene 7 12
Butschli, O 9 515 10 678
Butt weld 14 464
Butte 4 76
Butter 2 379 380*, 7 529
Butter churn 3 352
Butterbough 2 295
Buttercup (squash) 13 28
Butterfly 2 380 381*, 7 456
Butterfly oscillator 9 422
Butterfly type valve 14 201
Buttermilk 8 454 456
Butternut 2 360 14 383
Butternut (squash) 13 28
Buttgenbachite 9 103
Button quail 6 286
Buttonhull 13 360
Buttonwood 13 360
Butyl insulation 7 157
n-Butyl acetate 12 496
n Butyl alcohol 2 377
see Butyl alcohol 2 379
petrochemical 10 46
tert Butyl alcohol 2 379
petrochemical 10 46
n Butyl chloride 1 465 3 7 13 137
2 6 Di *tert* butyl 4 methylphenol 10 112
2 6 Di *tert* butyl *p* cresol 1 4
Di *tert* butyl peroxide 10 29
Butyl phenol salts herbicide 6 422
n Butyl radical 1 252
sec Butyl radical 1 252
tert Butyl radical 1 252
Butyl rubber 10 488 14 207
petrochemical 10 46
radiation damage 11 223
rubber 11 610
Butylene petrochemical 10 46
2 3 Butylene glycol *see* 2 3 Butanediol
2 (p tert Butylphenoxy) isopropyl 2 chloroethyl sulfite 8 5
Butyltrichlorosilane 12 522 5
1 Butyne 1 245 255 14 207 2

ityne—cont
functional group isomerism 7 278
ityne 1 245 255 14 207 209
Anediol 5 565
ramide 1 303
utyramide 1 303
Azzie 3 74
Butyribacterium 5 497
Propionibacteriaceae 11 16
Butyribacterium rettgeri 2 42 11 16
Butyric acid 2 42, 474 6 220
Butyric acid fermentation 2 42
gamma Butyrolactam 7 377
gamma Butyrolactone 7 380
Butyryl chloride acid halide 1 45
Buys Ballot's law geostrophic wind 6 173
By the wind sailor 12 346
Byelorero Lake 5 115
Bylot I 524
Byrd Deep 4 526
Byrrhidae 5 278
Byrrhoidea 5 278
Byssochlamys 5 123
Bythocypris 10 450
Bytownite 2 581*, 5 214
Byturidae 5 278

C

C band radar 11 201
C reactive protein 2 265
C supply electronic power 10 560
Ca blood group 2 269
Cabannes J 12 51
Cabbage 2 393-394
  diseases 2 393 394
  taxonomy 9 539
Cabbage butterfly 2 381 7 472
Cabbage yellows disease 2 393
Cabernet 14 507
Cabinet drawing 10 214 216
Cable electric 5 392
  coaxial *see* Coaxial cable
  high voltage 14 54
  shielded 12 254
  submarine *see* Submarine cable
  telephone 13 443
Cable (nautical measure) 8 188
Cable (wire) *see* Wire rope
Cable sheathing alloys 7 426
Cable tool drill 2 297, 384, 9 290 291
Cablegram 13 423
Cableways 2 368
Cabochon cut 6 103
Cabrito 6 227 229
Cacao 2 384 385
  theobromine 13 546
Cachaca 4 255
Cacheuta 2 385* 7 534
Cacoecia 7 472
Cacops 11 543
Cactaceae 2 386 5 190, 9 569
Cactoblastis cactorum 7 468
Cactus 2 386
Cactus wren 14 559
Cadalene 13 497
Cadastral surveys 13 529
Cadaverine 1 306
Caddis Fly 2 386* 14 86 87
Cadelle 5 287
Cadinene 13 497
Cadiz Gulf of 5 114
Cadmium 2 386 599
  crystal structure 3 599
  electron configuration 4 504
  electroplating 2 387 4 531
  extractive metallurgy 8 277
  ionization potential 4 504
  metallurgy 2 388
  organometallic compound 9 403
  physical properties 2 387
  specific heat 12 377
Cadmium—*cont*
  toxicity 2 389
  uses 2 387
Cadmium base bearing alloys 1 238
Cadmium cell 14 360
Cadmium metallurgy 2 388
Cadmium red 10 224
Cadmium standard, wave length 14 441
Cadmium standard cell 4 500
Cadmium sulfide 7 615
Cadmium sulfide cell 10 140
Cadmium yellow 10 224
Cady H P 14 21
Caecidotea 1 576, 7 283
Caecilia 6 300
Caecilian 1 333
Caenotropus 1 576
Caelum 3 413-414
Caenolambda 9 637
Caenolestidae 8 155
Caenopedina 4 376
Caenozoic *see* Cenozoic
Caffeine 2 388 389* 8 674, 11 115, 13 404
  see also Theobromine
Caffetannin 13 391
Cage inclusion compounds 3 157
Cagigal Observatory 1 610
Cagniard Latour C 5 215
Cahill T 8 667
Caicos Islands 14 473
Caiman 1 257 2 399* 3 552
  crocodile 3 553
  Crocodilia 3 551 553
Caiman niger 2 389
Cain S A 13 507
Cainothere 1 568
Cairina moschata 1 436
Caisson disease helium 6 390
  see also Decompression illness
Caisson *foundation* 2 389 390
Caisson well 14 405
Cake filters 5 272
Cake production 3 413
Cakile 4 293
Calabria Peninsula 5 116
Calabrian Apennines 5 118
Calamagrostis 4 293
Calamine 2 390* 12 387 14 612
Calamitales 2 390 392
Calamites 5 63 9 502 504
Calamoichthys 10 490
Calamophyton 5 65, 6 572 9 504
Calamopityaceae 11 87
Calamospira melanocorys 2 371
Calamostachys 2 392 9 502
Calamotilla 4 293
Calamus 5 195
Calamus calamus 14 78
Calanoida 2 319 392 3 462 562
Calanus 12 236
Calanus cristatus 2 392
Calanus finmarchicus 2 392, 3 463
Calanus hyperboreus 2 392
Calanus tonsus 2 392
Calappa sulcata 4 33
Calappidae 4 34
Calaverite 6 230 232
Calaz oil 11 541
Calcaneus 1 429 3 428
Calcarea 2 395 395*, 10 515, 519, 13 10
  Calcaronea 2 394 396 10 513
  Calcinea 10 513
Calcarenite 2 395
  coquina 3 473
  limestone 7 516
Calcareous algae beach sediments 12 305
  cementation in bioherms 2 207
  coral reef 3 474
  fossil 1 257
  limestone 7 516
  Paleozoic floras 9 504
  Solenopora 12 475
  stromatolite 13 190
Calcareous oozes abyssal 8 135 136
Calcareous petrifaction 10 42
Calcareous rock 2 571
Calcareous shales 12 241
Calcareous skeletons strontium content 9 517 518
Calcareous soils 12 427
Calcaronea 2 395 396* 10 513
  Leucosolenida 2 396 7 480 10 513
  Sycettida 2 396 10 513 13 560
Calcarone 13 255
Calciferol 5 65 371
  see also Vitamin D_2
Calcification (bone) 12 353
Calcilutite 2 395
Calcimine 9 493
Calcination 11 121
Calcinea 2 396*, 10 515
  Calcarea 2 396
  Clathrinida 2 396 3 139 10 513
  Leucettida 2 396, 7 479 10 513
  Pharetronida 2 396 10 92 515
Calcined clay 3 161
Calcined gypsum 6 301
Calcining 7 345
Calcioblasts 12 76
Calciphile 11 93
Calcirudite 2 395
Calcisols 12 435
Calcispongia 10 519
Calcite 2 396 397*, 399, 7 515
  carbonate minerals 2 467
  cementation in bioherms 2 207
  chalk 3 7
  crystal optics 3 589 591
  in dolomite rock 4 261
  geologic thermometry 6 154
  in meteorites 8 314
  petrifactions 10 42
  recrystallization experiments 11 598
Calcite marble 8 100
Calcium 2 397 400
  analytical methods 2 399
  in biogeochemical cycle 2 244
  in biosphere 2 399 400
  blood chemistry 3 197
  crystal structure 3 599
  electron configuration 4 504
  extraction 2 398
  extractive metallurgy 8 277
  ionization potential 4 504
  metabolism 2 199, 399 400*
  occurrence 2 397 398
  organometallic compound 9 402
  principal compounds 2 398 399
  production 4 467
Calcium 45 14 8 12 363
Calcium arsenate insecticide 7 140
Calcium base cooking acids wood pulp 9 539
Calcium bilirubinate 6 20
Calcium carbide acetylene production 1 37

Calcium carbonate 2 617
infrared spectrum 7 108 109
luminescence 7 615
Calcium caseinate 2 537
Calcium cyanamide 3 631, 6 421, 11 615
defoliant 4 43
nematocide 9 29
Calcium fluoride crystal structure 3 600
ionic crystals 7 248
lattice 7 248
Calcium hydride 6 547
Calcium metabolism 2 400
Calcium montmorillonite 3 162
Calcium oxalate 2 604
Calcium pantothenate 2 195
Calcium sucrate 13 258
Calculating machines 2 400-401
see also Digital computer
Calculi, renal 7 342-343, 11 27, 14 220
kidney disorders 7 342 343
prostate disorders 11 27
reproductive system disorders 11 482
urinary bladder disorders 14 220
Calculus barycentric *see* Barycentric calculus
Calculus differential and integral 2 401-403
applications of derivatives 2 403
appplications of integrals 2 403
definite integral 2 402
derivative 2 401
differentiation 4 128 132
function (calculus) 2 401-402
functions of several variables 2 403
fundamental theorems 2 402
infinity 7 97
integration 7 166-174
mean, law of the 2 402
new developments 2 403
see also Differential equation, Differentiation Integration
Calculus of tensors 2 403 407
contravariant vectors 2 404 405
covariant differentiation 2 407
dyadic 4 297
geodesics in Riemannian space 2 406-407
line element of Riemannian geometry 2 406
notation 8 174
quaternions 11 184
tensor 2 405-406
Calculus of variations 2 407-410*
Bolza, problem of 2 410
end point problems 2 409 410
multidimensional derivatives 2 408-409
single integral problems 2 410
theoretical basis 2 407-408
Calculus of vectors 2 410-414
addition of vectors 2 410 411
coordinate systems 2 411-412
curl of vector 2 413-414
differentiation 2 413-414
divergence of vector 2 413-414
dyadic 4 297
formulas 2 414
Gauss' theorem 6 80 81
gradient of scalar 2 413, 6 214
Green's theorem 6 268
integration 2 414, 7 171
Laplacian 7 401
notation 8 174
pseudovectors 2 412 413
scalar or dot product of two vectors 2 412
Stokes' theorem 13 148
vector or cross product of two vectors 2 412
Caldera 4 358, 10 84, 14 350
Caledonian orogeny 13 410 411
Calendar 2 415-416
Gregorian 2 416
reform 2 416
Calendering paper manufacture 9 541
plastics fabrication 10 403
rubber products 11 645
Calfskin 7 446
Caliber (gunnery) 1 537, 542
Calibration 2 416
electrical standards 4 458
errors 10 206
quantitative chemical analysis 11 143 144
Calibration curve 12 582
Caliche 2 416*, 12 408
California Current 9 249, 485
California flying fish 2 161
California jade 7 301
California Nebula 9 24
California quail 11 135
California red fir 5 278
California woodpecker 14 541
Californite 7 10
Californium 2 416 417*, 4 501 14 67
Caligidae 2 418
Caligo 7 471
Caligoida 2 417-418*, 3 562
Caligus 2 418
Caligus brevis 2 417
Caliper 2 418, 8 354
Caliper, tree 5 437
Caliper rule 2 418
Caliper well logging 14 472
Caliroa cerasi 6 580
Calkinsia 5 98
Callianidea laevicauda 4 30
Callianira 3 646
Callibartis 4 407, 5 53
Calliper's *Q* factor 10 164
Callinectes 3 566, 4 34
Callinectes sapidus 3 530
Calliops strasburgensis 14 105
Callipallenidae 11 106
Calliphora viridescens 4 214
Callliphora vomitoria 8 680
Callliphoridae 4 212
Callisto 7 324
Callistroga americana 8 680
Callistroga hominivorax 12 247
Callistroga macellaria 8 680
Callixylon 2 253, 3 476, 9 504
Callixylon newberryi 3 477
Callobdella lophii 11 556
Callopora aurita 3 16
Callorhinus ursinus 12 122
Callose 2 617
Callovian stage 7 325
Calluna 3 186, 5 457
Callus 12 367
Calochlyphus 12 29
Calomel 2 418
Calomel electrode 2 418 419
Calonympha 10 473
Calorereceptor 12 180
Calorie 2 341 419
Calorimeter 2 419-420
Calorimetric method electric power measurement 4 438 439
Calorimetry 2 419-420
see also thermochemistry
Calorizing 8 280
Calothrix 9 111
Calotte 4 110
Calpionella 13 651
Calutron 7 295
Calvarium 12 356
Calvasterias 1 598
Calving (iceberg) 7 6
Calymmatobacterium 2 352
Calymmatothrca hoeninghausi 11 87
Calymmidae 6 463
Calyptera 4 214
Calypteratae 4 213
Calyptoblastea 6 544
Calyptopsis larva 5 108
Calyssozoa *see* Entoprocta
Calyx 5 326 334
Cam 2 421
arbitrary function generator 1 378-379
bivariable function generator 1 382
polydyne 2 424
valve 14 263
Cam mechanism 2 420 421
cam follower 2 37, 2 421
cam profile 2 424
displacement time diagram 2 422
Camacolaimidae 10 416
Camallanida 9 30
Camarasaurus 4 290
Camarodont dentition Echinoidea 4 574
Camarodonta 2 424
Cambaridae 4 31
Cambarinae 3 559
Cambarus 1 564, 3 563
Cambarus bartoni 3 559
Camber 1 685
airfoil 4 559, 13 227
automotive steering 1 685
Cambium 13 105
cork 13 118
fascicular 13 118
interfascicular 13 118
Cambrian 2 424 427*, 6 136, 142
animal life 9 521
base of 2 424
classification 2 425
North American 2 426
plant life 9 504
stratigraphic correlation 2 426
top of 2 426
zones 2 426
Cambrian Mountains 5 118
Cambric 13 537
Camel 1 567, 2 427*
Camel cricket 9 418
Camel's hair 2 427-428
Camelidae 1 568, 2 427
Camellia 8 213, 9 408, 12 78
Camelopardalis 3 412, 414
Camelus bactrianus 2 427
Camelus dromedarius 2 427
Cameo 2 428*, 699
Camera 2 428 432*, 5 297, 13 460
astronomical 1 615 614
auxiliary equipment 2 431 432
Baker Nunn 1 613 614
ballistic 9 360 362
box 2 428
deep sea 14 193 195
diffraction 4 507
film holders and transport 2 430
focusing 2 430
folding 2 428
grid 10 160
lenses 7 452 454
miniature 2 428 429
movements 2 430
movie 5 123 124
one shot color 2 430
optical tracking instruments 9 360 362
panoramic 2 430

amera—cont
parallax 2 429
photocopying processes 10 144
pinhole 7 452
Polaroid land 10 158
press 2 429 450
rangefinder optical 11 339
rapid sequence 2 430
reflex 2 429
ribbon frame 10 160
satellite tracking 9 302
Schmidt *see* Schmidt camera
shutters 2 431
subminiature 2 429
telephoto lenses 13 447
television *see* Television camera
types 2 428 450
underwater 2 430
view 2 430
view finders 2 431
Camera tube television *see* *Television camera tube*
Camerata 2 432* 3 547 4 560 568 569
Camerina 5 435 9 229
Cameron A G 3 4 555 554
Cameron Cave 2 571
Cameroon Mountain 1 107 108
Camnula pellucida 9 416
Campanian substage 3 545
Campaniform organ 7 127
Campaniform sensilla 5 47 49
Campanulaceae 2 432
Campanulales 1 566 2 432* 4 108 8 663 10 30 546 *11* 104 13 28
artichoke 1 566
chicory 3 59
guavule 6 296
honeydew melon 6 476 477
pyrethrum 11 110
safflower 12 4
Campanule of Halles 6 169
Campbell's frequency bridge 5 508
Campbell standard mutual inductance 7 79
Campbell Stokes sunshine instrument 13 292
Cambeloma ruferum 5 51
Campephaga phoenicea *11* 52
Campephilus principalis 11 542
Camper P 1 461
Camphane 1 242
Camphor 1 587 2 442 455*
Camphor oil 5 71
Camphor tree 2 455
Campodea fragilis 4 210
Campodeiform larva 2 131
Campanotus 1 457 6 581
Camposia teragonolobus 6 297
Camptonite 7 589
Camptosaurus 4 200 11 484
Camptostrophus brunneicapillus 14 559
Camptothecaceae 4 212
Canada Northwest Passage 9 166 167
see also Arctic Ocean, Arctic and subarctic islands
Canada balsam 5 277
Canada goose 6 236
Canadia 1 431
Canadian Archipelago 1 525 7 4, 9 166
Canadian Arctic Archipelago 1 522, 523
Canadian series 9 374
Canadian Shield 9 140 141 10 566
Canadian zone 8 245
Canaima River 12 526
Canal 2 453 454* 11 586
concrete lined 2 454
conveyance canals 2 453 454
earth 2 453
inland waterways transportation 7 114 117
intakes 2 454
linings 2 453
locks 2 454
water supply engineering 14 405
weirs 2 454
Canal of Hering 7 555
Canal of Schlemm 5 162 171 *8 210 211*
Canal rays 2 454 455
Canalicule 12 565
Canalized rivers 2 454
Canals Mars 8 154 155
Canard 3 *213*
stability and control 13 228
supersonic aircraft 1 88
Canaries Current 1 626 9 249
Canary 2 455
Canary Islands 1 109
Cancellaria 9 54
Cancer 3 563 4 54
Cancer (biology) 2 455
neoplasia 9 58
oncology 9 318 326
radiation induced 11 229 231
radiology 11 316
radium 11 322
radon 11 326
tissue location 2 455
virus 14 332
see also Radiation injury (biology)
Cancer (constellation) 2 455 456* 3 412 414
Cancer magister 3 530
Cancrinite 2 426
feldspathoid 5 214
Candela 2 456
Candelaria formation 14 84
Candelilla 14 445
Candelilla wax 5 38
Candida 9 255 14 599
Cryptococcales 5 578
Candida albicans 1 541 2 456, 5 578 8 570 9 236 14 602
fluorescent antibody method 8 585
Candida guilliermondii 14 602
Candida krusei 9 236
Candida parapsilosis 14 602
Candida renkaufii 5 188
Candida tropicalis 14 602
Candida utilis 14 601
Candidiasis 1 542, 2 456*, 10 428, 12 570
nystatin 9 256
Candle 2 456
Candlepower 2 456
Candolle A de 1 422, 10 568 577
Candona hoffi 9 447
Cane sugar 13 236 237
see also Sugar
Canes Venatici 3 412 414*
Canfieldite 1 591
Canidae 2 522 4 259 5 490
wolf 14 522
Canine (tooth) 4 65
Canine distemper 8 587
Canis familiaris 2 523 4 259 11 527
Canis latrans 3 530
Canis Major 3 412 415
Canis Minor 3 412 415
Canis niger 14 522
Canis rubidus 14 522
Canister projectile 1 540
Canker disease animal 12 30
tree 14 73
see also Plant disease
Cankerworm 2 456 457* 7 464
Canna edulis 1 550 12 76
Cannabinaceae 14 235
Cannabis 5 57 12 79
Cannabis sativa 6 414 8 102, *11* 108 14 235
Cannaceae 12 76
Cannel coal 3 229 229
microfossils in 8 556
Canning 5 408
Cannizzaro S 9 593
Cannizzaro reaction 1 228 229
Cannon W B 6 467, 518 8 605 10 36 210 13 607
Cannon aircraft *see* Aircraft cannon
Cannopilus 12 317
Canoidea 2 522
Canonical ensemble 13 61
Canonical equations of motion *see* Hamilton's equations of motion
Canonical transformations 2 437-439
applications 2 438 439
Canonical transformations—cont
Hamilton Jacobi theory 6 551 552
Hamilton's principle 6 551
Canopus 2 628 15 41
Canopy ejection 1 100
Cantabrian Mountains 9 117
Cantaloupe 2 459
Canterbury bells 2 184
Cantharidae 3 277
Cantharidin 3 275 288
Cantilever 2 459
bridge 2 542
spring 13 16
wing structure 14 514
Cantor G 8 177
Cantor discontinuum real variable 11 371
Cantor's ternary set 8 178
Canvas 2 459
Canvasback duck 1 456 4 291
Canyon river cut 13 215
submarine 13 215
Canyon Diablo meteorite 8 516
Caoutchouc 6 296
Cap nut 9 251
Cap rock 10 63
in salt domes 12 19
Cap screw 12 86
Capacitance 2 440 441
body 2 441
in parallel 1 271
in series 1 271
standards 2 445 4 459
units 4 461 5 191
Capacitance box 2 441
Capacitance measurement 2 441 445
ballistic galvanometer method 2 444
bridge methods 2 442
distributed *capacitance* 2 441 4 457
resonance method 2 443
standards 2 445 4 459
time constant methods 2 444
Capacitative reactance 1 270 272, *11* 340
Capacitive input filter 10 561
Capacitivity *see* Dielectric constant
Capacitor 2 440 441*, 445 447
adjustable 2 445
air gas and vacuum 2 446
aluminum oxide film capacitors 2 447
capacitance 2 440 441
ceramic 2 446
charging and discharging 2 440
classification 2 445
cylindrical 2 440

Capacitor—*cont.*
electric distribution system 4 425
electrical standards 4 459
electrolytic 2 447
energy of charged capacitor 2 440
fixed 2 445
geometrical types 2 440
guard rings 2 440-441
liquid dielectric 2 447
mica 2 446
nonpolarized electrolytic 2 447
paper 2 447
parallel-plate 2 440 441
plastic-film 2 446
polarized electrolytic 2 447
printed circuit 10 596
properties 2 440
shield 2 441
solid-dielectric 2 446
spherical 2 440
tantalum electrolytic 2 447
three terminal 2 441
trimmer 2 445
two-terminal 2 441
variable 2 445, 12 201
Capacitor induction motor 7 78
Capacitor microphone 8 360
Capacity, electrical *see* Capacitance
Cape Blanco 1 107
Cape Bon 1 107
Cape Breton Island 9 145
Cape buffalo 2 250
Cape Cod 9 150
Cape Farewell 1 524
Cape Fear 9 150
Cape Fear River 9 150
Cape Morris Jesup 1 524
Cape Ranges 1 108
Cape Verde Islands 1 108
Cape York 1 670
Capella 6 184, 13 41
Capella gallinago 12 390
Capillarity surface tension 13 316
Capillary (anatomical) 2 447
blood vessels 2 269
Capillary analysis 3 93
Capillary buret 6 46
Capillary viscometer 14 333
Capillary wave 14 417
Capitaris 14 89
Capitan Reef complex 10 25
Capitellidae 10 462
Capitonidae 10 213
Capitosauridae 15 128
Capitulum 1 559 7 298, 12 355
Capnella rugosa 1 227
Caponidae 1 569
Capra angorensis 6 227
Capra hircus 6 227
Capra ibex 7 1
Caprella 2 418, 3 563
Caprella linearis 1 340
Caprellidea 2 447-448
Amphipoda 1 339-341
Capric acid 2 474
Capricornus 2 448*, 3 412-413
Caprifoliaceae 11 647
Caprimulgidae 2 448, 9 101
whippoorwill 14 488
Caprimulgiformes 1 694, 2 448*
nighthawk 9 101
Caprimulgus vociferus 2 448, 14 488
Caproamide 1 303
Caproate 5 74
Caproic acid 2 43, 474
Caproyl chloride 1 45
Caprylamide 1 303
Caprylic acid 2 474
Capsaloidea 8 573
Capsicum 7 436, 14 132
Capsicum annuum 9 541, 627, 10 232
Capsicum frutescens 9 627
Capsicum pendulum 9 627
Capsicum pubescens 9 627
Capsular swelling reaction 1 473
Capsule (fruit) 5 542, 9 539
Captan, pesticide see N-trichlorothiotetrahydrophthalimide
Captax 13 601
Captorhinomorpha 3 515
Captorhinus 3 515
Capture gamma rays neutron cross section 9 87-88
nuclear reactions 9 201
radiation shielding 11 240
Capture reactions 9 200-201
Capybara 2 448
Car *see* Automobile, Automotive vehicle
Carabidae 3 276
Caraborrinus 4 366
Caracara 5 178
Caracharodon carcharias 12 245
Caradocian series 9 373
Carangidae 10 10
Carapa 8 91
Carapace 3 564, 4 24, 12 48
Carat 2 448 449* 6 231
see also Karat
Carat weight 2 448 8 188
Caraway 2 449, 12 612
Carbamate 2 116 7 142
soil sterilization 12 465
Carbaminohemoglobin 12 566
Carbamyl aspartate 1 589
Carbamyl phosphate 1 516 589, 2 59
nitrogen excretion 9 112
Carbamyl succinic acid (ureidosuccinic acid) 2 59
beta-Carbamylamino acid 2 36
beta-Carbamylaminoisobutyric acid 2 36
beta-Carbamylaminopropionic acid 2 36
Carbanilide 1 408
Carbanion 2 449
halogenation 6 328
Carbazole 2 449-450*; 3 256
2 Carbethoxycyclohexanone 3 373
Carbic anhydride 3 641
Carbide 2 450-451*, 464
abrasive 1 9
acetylide 1 37
calcium 2 399
cermet 2 655
interstitial compounds 12 478
refractory 11 410
silicon 12 320
in stainless steel 13 34
tungsten 14 140
Carbine 1 537-538
Carbinol 8 339
Carbitol 10 423
Carbobenzoxychloride 9 629
Carbocyclic compounds 9 394 397
alpha-Carbodocecoxyethyl N-phenylcarbamate 10 580
Carbohydrase 5 203
Carbohydrate 2 451 458* 626, 5 184
amylase 1 365
analysis 2 452 453
animal feed composition 1 425
bacterial aerobic oxidations 2 33
bacterial biosyntheses 2 54-56
bacterial cell chemistry 2 12
biochemistry 2 199
cell protoplast 2 612 614
classification 2 451 452
color tests 2 453
deficiency 8 261
estimation 2 453
food 5 371
formulation 2 454
fructose 5 541
function 8 261
galactose 6 5
glucose 6 218
glucoside 6 219
glycoside 6 224
identification 2 452
methyl glucosides 2 458
monosaccharides 2 451 452 8 578 583
mutarotation 2 456
nonreducing sugars 2 452
nutrition 9 235
oligosaccharides 2 452, 9 315
photosynthesis 10 184
Carbohydrate—*cont*
polysaccharides 2 452, 10 490
reducing sugar 2 452
separation 2 452
starch 13 50
stereoisomerism 2 453 454
structure 8 261
Carbohydrate metabolism 2 166, 458-461*, 4 594 596, 8 261-263
abnormal 8 261 263
adenosinetriphosphate (ATP) 1 64
adrenal cortex steroid 1 71
biochemistry 2 199
dietary carbohydrates 2 4.6
disaccharides 2 460
dissimilation of simple sugars 2 459
endocrine mechanisms 4 594
epinephrine 1 77
glucose-1 phosphate 6 218
glucose-6 phosphate 6 218
glycogen 6 222
glycolysis 2 459 460
intestinal absorption 2 458
ketosis 7 340
oxidative mechanisms 2 460
polysaccharides 2 460
simple sugars other than glucose 2 460
specialized tissue 12 567
thiamine 13 598
transport 2 458
uridine diphosphoglucose (UDPG) 14 218
see also Adrenal disorders, Adrenal gland, Carbohydrate
Carbohydrate metabolism (plants) 10 349 353
cellulose 10 353
pentose and pentosans 10 352
starch 10 351 353
sucrose 10 352
Carbolic acid *see* Phenol
Carbolov 6 447
Carbomycin I 476, 2 461 462*, 5 66
antibiotic I 464 468
antimicrobial activity 2 461
chemistry 2 461
isolation 2 461
pharmacology 2 462
properties 2 461
Carbon 2 462 467, 9 392 398, 12 319
allotropic forms 2 462
analytical methods 2 464
ancient 11 294 295
carbide 2 450 451

Carbon—*cont*
carbon dioxide 2 465 467
carbonate 2 467
charcoal 3 10
chemical binding 3 25
compounds 2 463 464, 9 392 398, 12 319
contemporary 11 294 295
electron configuration 4 504
ionization potential 4 504
isotopes 11 291
native element 9 4
occurrence 2 462
organic quantitative analysis 9 398
physical and chemical properties 2 462 463
in sea 12 109
spectral emissivity 4 583
in stars 2 467
uses 2 462
see also Activated carbon Carbon black Charcoal, Diamond Graphite, Organic chemistry
Carbon 12 C^{14}/C^{12} ratio 11 294 295
nuclear reactions 9 198 200
Carbon 14 cosmic ray-produced 11 290 291
dating *see* Radiocarbon dating
piston ring wear studies 14 9
time interval measurement 12 646
Carbon arc lamp *see* Arc lamp
Carbon black 2 462 463*, 10 224
from natural gas 9 6
petrochemical 10 43 44
petroleum products 10 72
rubber 11 636
Carbon cycle in biosphere 2 242
Carbon cycle thermonuclear *see* Carbon nitrogen cycle
Carbon dioxide 2 465 467
applications 2 466
atmospheric chemistry 1 635
distribution 2 467
dry ice 4 279
exchange between sea and atmosphere 12 105
fire extinguisher 5 279
Grignard reaction 6 270
manufacture 2 466
mine gas 8 492
normal vibration *modes* 6 342 343 8 532
photosynthesis 10 190 192
refrigerant 11 415
welding 14 467
Carbon disulfide 13 257
coal chemical 5 255
fumigant 5 561
nematocide 9 28
rodenticide 11 615
solvent 12 496
velocity of sound in 12 513
Carbon microphone 8 561
Carbon monoxide 2 463 464
cryogenic properties 5 572
hydroformylation 6 542 543
metal carbonyl 8 279
mine gas 8 492
rodenticide 11 615
velocity of sound in 12 513
Carbon monoxide fuel cell 5 552
Carbon monoxide poisoning 1 696
Carbon nitrogen cycle 2 472 475* 13 107 108
Carbon star 2 467, 13 41
Carbon steel 13 206
radiation damage 11 223
Carbon tetrachloride 2 467*, 3 74
fire extinguisher 5 279
internuclear distances in 4 508 509
solvent 12 496
Carbon transducer 8 558 559
Carbonaceous sediments 12 140
Carbonate 2 467* 10 12
Carbonate apatite 1 499
Carbonate isotope thermometer 6 432 434
Carbonate minerals 2 467 468
ankerite 1 428
aragonite 1 496 497
common carbonates 2 467
diagenesis in 4 95
dissociation products 2 468
kutnahorite 7 373
in meteorites 8 514
in orthoquartzites 9 418
Carbonate rocks 4 261 12 135
dolomite 7 515
limestone 7 515
stratigraphic traps 10 63 64
Carbonate sediments 12 139
Carbonate skeletons fora miniferal tests 5 430
magnesium content of 9 517
in neritic deposits 8 135
in pelagic deposits 8 135
O^{18}/O^{16} ratios of 9 518
Carbonatite 10 86
Carbonic ice 2 466
Carbonic snow 2 465
Carboniferous 2 468 472*, 6 136, 142
climate 2 472
coal making 2 470
divisions 2 469
Carboniferous—*cont*
economic resources 2 472
life 2 472
Mississippian 8 517
mountain building 2 471 472
nature of deposits 2 469
North America 2 470
Pennsylvanian 9 622
plant life 9 504
sedimentary environment 2 469
Carbonitriding 13 313 314
Carbonium ion 2 472
organic reaction mechanism 9 400
racemization 11 199
Carbonization 5 271
Carbonyl metal 2 463 8 279
Carbonyl bromide 2 465
Carbonyl component aldol condensations 5 374
Carbonyl compound ester 5 72 77
Grignard reaction 6 270
hydrogenation 6 552
identification 9 468
Reformatsky reaction 11 402
Carbonyl derivatives nomenclature 9 396
Carbonyl fluoride 2 465
Carbonyl selenide 2 465
Carbonyl sulfide 2 465
Carborundum 12 520
gem manufactured 6 100
see also Silicon carbide
Carbowax 10 487 14 443
Carboxydomonas 8 340
Carboxydomonas oligocarbophilus 8 340
Carboxyhemoglobin 6 431 10 456
Carboxyl organic quantitative analysis 9 399
Carboxyl functions nomenclature 9 396
Carboxyl group 2 473
Carboxylase 5 23 10 370
Carboxylic acid 2 473 476
acetic acid 1 30
acid anhydride 1 43-44
acid halide 1 44 45
amide acid 1 503
benzoic acid 2 165
ester 5 71 77
formic acid 5 473
ionization and acidity 2 475
nomenclature 2 473 9 396
oxalic acid 9 461
in petroleum 10 55
phthalic acid 10 198
properties 2 475
reactions and uses 2 476
structural variations 2 476
Carboxylic acid—*cont*
structure 2 475
see also Acid anhydride, Acid halide, Ester Fat and oil, non edible, Wax, animal and vegetable
Carboxymethylcellulose 2 626
Carboxypeptidase 5 203, 204
protein metabolism 11 42
Carbuncle 1 466 467, 2 2 477*, 7, 97 98, 13 38
Carbureted water gas 5 552
Carburetor 2 477 480
aircraft carburetion 2 479
automobile carburetion 2 478 479
automotive engine 1 687
cold engine operation 2 478
engine air charge 2 477
fuel air ratio 2 479
fuel air requirements 2 477
fuel charge 2 477
icing 2 479
idling 2 477
metering valves 2 479
updraft 2 477
Carburizing of steel 13 312 313
Carbylamine *reaction* 1 505 506
Carcharhinidae 12 157
Carcharhinus *leucas* 8 575
Carchesium 11 54, 55
Carcinogen 2 548
Carcinogenesis 9 318 326
air pollution 9 325
biochemistry 9 324 326
biological response 9 324 325
cell membranes and monolayers 2 607
chemical carcinogens 9 323
diagnosis 9 323 324
extrinsic factors 9 322
food 9 325
intrinsic factors 9 322
investigations 9 325-326
irritation and *infection* 9 323
radiation 9 322 323
tobacco 9 323
treatment 9 325 326
Carcinoma 10 100 15 150
anaplastic 2 548
basal cell *see* Basal cell carcinoma
bronchogenic 2 546-549, 7 621
cervical 10 256
chorionic *see* Chorionic carcinoma

Carcinoma—*cont*
epidermoid *see* Epidermoid carcinoma
oncology 9 320
papillomatosis, infectious (rabbit) 9 541
prostate disorders 11 28
ulcer 14 179
vaginal disorders 14 256
Carcinonemertes 6 479, 11 559 560
Carcinotocarpus rotundicauda 14 564-565
Carcinosoma 5 124
Carcinotron *see* Backward-wave tube, Traveling wave tube
Carcinus 9 434
Carcinus maenas 3 531
Cardamine arenicola 10 345
Cardamine bulbosa 10 345
Cardamine douglasii 10 345
Cardamine hirsuta 10 345
Cardamine pennsylvanica 10 345
Cardamine pratensis 10 345
Cardamine rotundifolia 10 345
Cardamon 2 480*, 12 76
spice and flavoring 12 612
Cardan, (J.) Girolamo 4 462, 5 47, 487
Cardan joint 5 487, 14 204-205
Cardan's suspension 10 432, 570
Cardia 4 159
Cardiac catheter 9 470
Cardiac cirrhosis 7 562
Cardiac decompensation 6 358-362
Cardiac disease *see* Heart disorders
Cardiac edema 3 142, 4 410
Cardiac gland 4 150-175
Cardiac glycoside 6 224
Cardiac muscle 8 635
behavior, ontogeny 2 134
histology 8 635-636
mitochondria 8 519
Cardiac valve anomalies 2 515
Cardial veins, changes during development 2 485
Cardiidae 3 251
Cardinal 2 480
Cardinal points 2 480
Cardinality of sets 12 205
Carding, textile 13 532 533
Cardiocarpon 3 478
Cardioid 2 481
Cardioid condenser microscope 8 589
Cardiosoma guanhumi 3 530
Cardiospasm 6 73
Cardiovascular system 2 481-521*, 3 144
anomalies of great vessels 2 516-521
cardinal veins 2 499
circulatory system 3 144
comparative anatomy 2 497-500
comparative embryology 2 481-491
comparative physiology 2 500 505
congenital defects 2 508 516
fetal circulation at term 2 492
functional development of heart 2 491-492
heart physiology 2 505 508
histamine 6 457
partition of embryonic heart 2 485 491
postnatal circulation 2 494 497
radiation injury (biology) 11 228
shock syndrome 12 294
Carditis 6 358
Cardium edule 5 202
Cardomom hills 1 580
Care of young birds 11 460
mammals 11 460
reproductive behavior 11 460
Caretta caretta 14 166
Carex 3 190, 4 293
Carey-Foster bridge 7 67
Cargo (ships) 12 255 262
Cargo lines 1 160
Cargo submarines 13 211
Cargo transportation, air 1 160 164
Cargo vessel *see* Ship, merchant
Cariaco Trench 2 522
Caribbean Basin 2 521
Caribbean Current 1 626
Caribbean Sea 2 521 522*, 9 271
Caribosiren 12 347
Caribou 2 522*, 9 144
Caridea 4 24-34
Caridoid facies 5 97
Malacostraca 8 76
Mysidacea 8 683
Caries, dental 13 676
Carillon 2 159
electronic *see* Electronic carillon
Carina 3 412
Carinina 9 496
Carinoma 9 496 11 559
Carinomidae 9 496
Caris, D. F. 7 198
Carius method, sulfur determination 9 398
Carlisle, A. 4 453
Carlosittelia 11 128
Carlson, A. J. 6 557
Carludovica 3 186
Carludovica palmata 13 365
Carminic acid 1 457
Carnallite 6 324
potassium compounds 10 530
potassium fertilizers 5 238
rubidium ore 11 647
Carnation 4 234, 9 407
Carnation wilt 9 408
Carnauba 2 522*, 14 443
electrets 4 422
epidermis 5 37-39
Palmales 9 524
wax 7 529
Carnegiea gigantea 3 190
Carnet Mountains 5 118
Carnelian 3 6
gem 6 99
quartz 11 182
Carnevella 4 366
Carnic Alps 5 117
Carnites floridus zone 14 82
Carnivora 2 522-523* 8 82
phylogeny 2 522
structural adaptations 2 522
taxonomy 2 522 523
see also entries on specific animals
Carnivora fossils 2 523 524
Carnotine 6 457, 9 629
Carnot Sadi 2 524
Carnot cycle 2 524 527*, 13 574, 14 271 274
constant temperature heat addition 2 525
cryogenics 3 574
isentropic compression 2 525
isentropic expansion 2 525
isothermal compression 2 525
p-v diagram 2 525
with radiant energy 2 525
reversed 2 526 11 415
steam 2 525 13 79
thermodynamic principles 13 566
T-s diagram 2 525
Carnotite 2 527*, 8 278 11 269 323 14 210
ore reserves 9 186
Caro's acid 10 28, 13 262
Carob bean 8 92
Carodnia vierrizi 14 562
Carolina hemlock 6 410
Carolina parakeet 11 69
Carolinian zone 8 215
Carotene 2 54, 266 528 529, 3 92
alpha Carotene 14 340
beta Carotene 2 527, 14 340
Carotenoid 2 527-531*, 12 [illegible]
bacterial biosynthesis 2 54
biochemistry 2 527
cell protoplast 2 612
characteristics 2 528
chromatography 5 92
classification 2 528
Echinodermata 4 [illegible]
lipid 2 527
occurrence 2 527
photosynthesis 10 189
plant metabolism 10 [illegible]
vitamin A 14 340
Carothers, W. 5 242
Carotid artery 1 487
Carotid body 1 488 2 531*
circulation 3 137 141
embryology 2 531
histology 2 531
neural crest 9 78
physiology 2 531
Carotinemia 10 226
Carp 2 532*, 3 648, 5 205
Carpathians 5 118, 13 409
Carpel 5 332 333
Carpenteles 5 123, 8 569
Carpenter, J. H. 12 116
Carpenter ant 1 437, 6 581 12 407 14 538
Carpenter bee 2 127, 6 574 [illegible]
Carpenter moth 7 464
Carpenter temperature compensator 30 7 264
Carpet beetle 3 287
Carpet worm 7 464
Carpinus 5 178
Carpinus betulus 6 486
Carpinus caroliniana 6 485, 7 268
Carpocapsa pomonella 7 467 472
Carpodacus 5 273
Carpodacus cassini 5 273
Carpodacus mexicanus 5 273
Carpodacus purpureus 5 273
Carpogonium 11 555
Carpoidea 2 532* 4 360
Carpopodite 5 564
Carpus 3 564
Carrageen 11 554
Carrageenin 6 297
Carrettochelydae 3 22
Carrettochelys 3 23
Carriage bolt 2 277
Carrier (disease) *see* Disease carrier
Carrier (dye) 4 309
Carrier (nuclear chemistry) 9 179
Carrier (wave) 2 532 8 526
Carrier free procedure nuclear chemistry 9 179
Carrier gas 6 47
Carrier injection (semiconductors) 12 172

arrier injection luminescence 4 482 483
arrier suppression single-sideband modulation 1 351
arrion beetle 2 130 3 276
arrion's disease 2 532 533
arrollite 3 246
arrot 2 184, 535*; 14 189
arruthers current meter (ocean) 9 253
arrying capacity range land 11 337
arson J R. 1 551, 5 511, 11 373
arte du Ciel 1 603
arter H M 12 496
arteria 1 235 10 212
artesian coordinate system 3 454
artesian geometry 1 387
artesian surface 12 609
arthage pool 9 6
arthamnus tinctorius 12 4
artilage 2 533 534* 12 538
elastic 2 534
fibrocartilage 2 534
hyaline 2 533 534
larynx 7 406
artogram 2 535
artography 2 534 536
aeronautical chart 2 535, 9 17
atlases 2 535
cartograms 2 535
economic maps 2 536
land use maps 2 535
map collections 2 534
map compilation 2 534
map design 8 94 95
map lettering 2 534
map projections 8 95 97
map representation 2 534
map reproduction 8 97 98
map scale 8 98 99
map sets 2 534
map symbols 2 534
marine chart 2 535 9 17
relief representation 2 534
scientific maps 2 536
statistical maps 2 535
topographic maps 2 534
use of diagrams 2 535
arton filler 3 403
artridge (ordnance) 1 539
artridge brass 3 470
artridge filler 3 155
artridge fuse 3 578
arwright D 6 255
arum carvi 2 449
aruncle 12 144 14 224
arved stone (gemology) 7 164
arya 3 188 7 517
arya cordiformis 6 441
arya glabra 6 441
arya illinoensis 6 441
pecan 9 607
arya ovata 6 441
arya tomentosa 6 441
aryophanaceae 2 536
aryophanales 2 536 537
Arthromitaceae 2 537
Caryophanaceae 2 536
Oscillospiraceae 2 536
Schizomycetes 12 65 66
taxonomy 2 11
aryophanon tenue
Peshkoff 2 536
aryophyllaceae 2 643
aryophyllid corals 12 78
aryopsis 3 542 12 145
Graminales 6 217
ascade amplifier 1 345 346
direct coupled 4 219 221, 14 358
impedance coupled 14 357
RC-coupled 14 355 357
stagger tuning 1 344
transformer coupled 14 357-358
ascade Mountains 9 162
ascade particle 2 537*, 6 588
elementary particle 4 545 549
ascade pulverizers 3 560
ascara sagrada 11 543
ascode amplifier 2 537*, 13 470
ase hearer 7 464
ase hardening process *see* Surface hardening of steel
asein 2 537 538* 11 40
cyanoethylation 3 635
production 2 537
use 2 537
asein glue 14 544 545
asein paints 9 493
aseous necrosis 4 22 24
ashew 2 538*, 12 26
nut crop culture 9 232
ashmere 2 538
asimir H B G 13 299
asing well hole 2 295 296 10 58
asing in operation book manufacture 2 287-289
asinghead gas 9 5 6
asion, William 14 171
aspartan strips 10 277, 13 115
endodermis 4 598
aspian Sea 5 114 115, 7 587
assadagoan Stage 4 87
assava 2 538
asse Grand 5 119
assegrain spectrograph 1 615
assegrainian telescope 13 451
assidix mexicanus 6 244
assidulidae 2 539
Cassidulina 5 435
Cassiduloida 2 539*, 4 560, 571
assin's purple finch 5 273
assini J D 2 83
assini division (Saturn) 12 38 39
assiopea 5 255, 11 549
assiopeia 2 539*, 3 412 413 10 50
assiopeium 7 623
assiterite 2 539*, 8 278
tin ore 13 647
assowary 2 545
ast (fossil) 3 474
ast iron 2 539 541
classification 2 540
properties and uses 2 540 541
structural materials 13 205
astalia 5 58, 12 78
astanea 5 188
castanea crenata 5 58
castanea dentata 5 57
castanea mollissima 5 58
aste (social insects) 12 405
astellated nut 9 231
aster automotive steering 1 685
asting 2 541 544
aluminum alloys 1 296
centrifugal 2 543
die 1 259 2 542
foundry technology 2 543
gas evolution 2 541
grain structure 2 541
hot tearing 2 543
interdendritic porosity 2 541
investment 2 543
microshrinkage 2 541
molding processes 2 542 543
permanent mold 2 542
plaster mold 2 543
plastics 10 403 405
powder metal forming 8 296
sand 2 542
asting out nines number systems 9 221
astner cell 3 71
astner process 3 634
astniid 7 464
astnimidae 7 464
astor (star) 2 100*, 6 104 13 41
astor bean 2 544 545* 10 466 12 143
castor canadensis 2 127
astor oil 3 189 190
drying oil 4 290
astoreum gland 12 61
astoridae 2 127 11 615
astrostomidae 5 648
astration 13 526
asuaridae 2 545
asuariiformes 1 694 2 545*
asuarina 2 545
casuarina equisetifolia 2 545
asuarinales 2 545*, 4 104, 10 546
at 2 545
gestation period 6 182
vertebra 14 307
at's eye 3 116 6 94
at flea 12 515
at scratch disease 2 546
atabolism 8 263 264
bacterial *see* Bacterial catabolism
ataclasis (rock deformation) 11 598
atadioptric system 8 389, 12 69, 13 444 452*
atadromous fish 8 427
atalase 5 21, 27 28
bacterial enzyme 2 19, 5 20 21
ataldi, M 5 2 132
atalpa 13 115
catalpa bignonioides 10 179
atalysis 2 546 549
antioxidant 1 479 490
heterogeneous 2 547 549
homogeneous 2 547
mechanism 2 549
polymerization 10 483
see also Enzyme, *Inhibitor*
atalyst enzyme 2 15, 5 19 26
Fischer Tropsch process 5 283
lithium metal 7 545
platinum 10 411
atalytic cracking 2 548, 5 533
petroleum processing 10 68 69
atalytic hydrogenation 6 552
atalytic reforming 11 403 404
fuel gas supplements 5 555 556
atalytically cracked gasoline 6 71
atalytically reformed gasoline 6 71
atapochrotidae 3 276
ataract 2 549 550*, 5 171
formation 2 549
types 2 549 550
atastrophic death (ecology) 9 313 316
atatonia 12 66
atbird 2 550
atch basins 12 212
atcher technique (nobelium) 9 115
atechol 2 35 550 551*, 10 112 14 126
4 (tert butyl) Catechol 13 209
atecholamine 1 76 13 367
clinical pathology 5 192 202
see also Adrenal gland Epinephrine

Carcinoma—*cont*
epidermoid *see* Epidermoid carcinoma
oncology 9 320
papillomatosis, infectious (rabbit) 9 541
prostate disorders 11 28
ulcer 14 179
vaginal disorders 14 256
Carcinonemertes 6 479, 11 559 560
Carcinoscorpius rotundicauda 14 564-565
Carcinosoma 5 124
Carcinotron *see* Backward-wave tube, Traveling wave tube
Carcinus 9 434
Carcinus maenas 3 531
Cardamine arenicola 10 345
Cardamine bulbosa 10 345
Cardamine douglassii 10 345
Cardamine hirsuta 10 345
Cardamine pennsylvanica 10 345
Cardamine pratensis 10 345
Cardamine rotundifolia 10 345
Cardamom 2 480*, 12 76
spice and flavoring 12 612
Cardan, (J.) Girolamo 4 462, 5 47, 487
Cardan joint 5 487, 14 204 205
Cardan's suspension 10 432, 570
Cardia 4 159
Cardiac catheter 9 470
Cardiac cirrhosis 7 562
Cardiac decompensation 6 358 362
Cardiac disease *see* Heart disorders
Cardiac edema 3 142, 4 410
Cardiac gland 4 150 175
Cardiac glycoside 6 224
Cardiac muscle 8 635
behavior, ontogeny 2 134
histology 8 619 636
mitochondria 8 519
Cardiac valve anomalies 2 515
Cardial veins, changes during development 2 485
Cardiidae 3 251
Cardinal 2 480
Cardinal points 2 480
Cardinality of sets 12 205
Carding, textile 15 532 533
Cardiocarpon 3 478
Cardioid 2 481
Cardioid condenser microscope 8 589
Cardiosoma guanhumi 5 530
Cardiospasm 6 73
Cardiovascular system 2 481-521*, 3 144
anomalies of great vessels 2 516 521
cardinal veins 2 499
circulatory system 3 141
comparative anatomy 2 497-500
comparative embryology 2 481-491
comparative physiology 2 500-505
congenital defects 2 508 516
fetal circulation at term 2 492
functional development of heart 2 491-492
heart physiology 2 505 508
histamine 6 457
partition of embryonic heart 2 485-491
postnatal circulation 2 494 497
radiation injury (biology) 11 228
shock syndrome 12 294
Carditis 6 358
Cardium edule 5 202
Cardomom hills 1 580
Care of young birds 11 460
mammals 11 460
reproductive behavior 11 460
Caretta caretta 14 166
Carex 3 190, 4 293
Cares Foster bridge 7 67
Cargo (ships) 12 255-262
Cargo lines 1 160
Cargo submarines 13 211
Cargo transportation air 1 160 164
Cargo vessel *see* Ship, merchant
Caraco French 2 522
Caribbean Basin 2 521
Caribbean Current 1 626
Caribbean Sea 2 521 522*, 9 271
Caribourea 12 547
Caribou 2 522* 9 144
Caridea 4 21 31
Caridoid facies 5 97
Malacostraca 8 76
Mysidacea 8 683
Caries, dental 13 676
Carillon 2 159
electronic *see* Electronic carillon
Carina 3 412
Carinina 9 496
Carinoma 9 496 11 559
Carinomidae 9 496
Caris, D. F. 7 198
Carius method, sulfur determination 9 398
Carlisle, A. 4 453
Carlosatrella 11 128
Carlson, A. J. 6 357
Carludovica 5 186
Carludovica palmata 13 365
Carminic acid 1 457
Carnallite 6 324
potassium compounds 10 530
potassium fertilizers 5 238
rubidium ore 11 617
Carnation 4 231, 9 407
Carnation wilt 9 408
Carnauba 2 522*, 14 443
electrets 4 422
epidermis 5 37-39
Palmales 9 524
wax 7 529
Carnegiea gigantea 3 190
Carnet Mountains 5 118
Carnelian 5 6
gem 6 99
quartz 11 182
Carnerella 4 366
Carnic Alps 5 117
Carnites floridus zone 14 82
Carnivora 2 522 523*, 8 82
phylogeny 2 522
structural adaptations 2 522
taxonomy 2 522 523
see also entries on specific animals
Carnivora fossils 2 523 524
Carnosine 6 457 9 629
Carnot, Sadi 2 524
Carnot cycle 2 524 527*
13 574 14 271 274
constant temperature heat addition 2 525
cryogenics 5 574
isentropic compression 2 525
isentropic expansion 2 525
isothermal compression 2 525
p-v diagram 2 525
with radiant energy 2 525
reversed 2 526 11 415
steam 2 525 13 79
thermodynamic principles 15 566
T-s diagram 2 525
Carnotite 2 527* 8 278
11 269 525, 14 210
ore reserves 9 186
Caro's acid 10 28, 13 262
Carob bean 8 92
Carolina wrenii 14 562
Carolina hemlock 6 410
Carolina parakeet 11 69
Carolinian zone 8 245
Carotene 2 54, 266, 528 529
3 92
alpha Carotene 14 340
beta Carotene 2 527, 14 340
Carotenoid 2 527 531*, 12 99
bacterial biosynthesis 2 54
biochemistry 2 527
cell protoplast 2 612
characteristics 2 528
chromatography 3 92
classification 2 528
Echinodermata 4 162
lipid 2 527
occurrence 2 527
photosynthesis 10 189
plant metabolism 10 96
vitamin A 14 340
Carothers, W. 5 242
Carotid artery 1 487
Carotid body 1 488, 2 531*
circulation 3 137 141
embryology 2 531
histology 2 531
neural crest 9 78
physiology 2 531
Carotinemia 10 226
Carp 2 532* 3 618 8 205
Carpathians 5 118, 13 409
Carpel 5 332 333
Carpenteles 5 123, 8 569
Carpenter, J. H. 12 11b
Carpenter ant 1 472, 6 551 552 12 407 14 538
Carpenter bee 2 127 6 571 572
Carpenter moth 7 464
Carpenter temperature compensator 30 7 264
Carpet beetle 3 287
Carpet worm 7 464
Carpinus 5 178
Carpinus betulus 6 486
Carpinus caroliniana 6 485, 7 268
Carpocapsa pomonella 7 467 472
Carpodacus 5 273
Carpodacus cassini 5 273
Carpodacus mexicanus 5 273
Carpodacus purpureus 5 273
Carpogonium 11 555
Carpogonium 2 532*, 4 460
Carpogonium 3 564
Carpus 3 564
Carrageen 11 554
Carrageenan 6 297
Carrettochelyidae 5 22
Carrettochelys 3 23
Carriage bolt 2 277
Carrier (disease) *see* Disease carrier
Carrier (die) 4 309
Carrier (nuclear chemistry) 9 179
Carrier (wave) 2 532 8 526
Carrier free procedure nuclear chemistry 9 179
Carrier gas 6 47
Carrier injection (semiconductors) 12 172

equator 1 607, 5 47
latitude *see* Latitude
al
l longitude *see*
itude, celestial
l mechanics 2 579 583
al velocity 1 528
sic concepts 2 579 580
ntral force 2 629
scovery of Neptune 9 40
sturbed motion 2 582
cape velocity 5 68
ravitation 6 263 266
rbital motion 9 371 372
rbits 2 580-583
erturbation (astronomy) 10 37 39
relativity effects 2 583
retrograde motion 11 537
stability of solar system 2 582 583
undisturbed motion 2 581 582
estial meridian 2 585, 8 238
estial navigation 2 585 587*
) 12, 10 230
body selection and identity 2 583 584
celestial equator coordinate system 2 585
electronic applications 2 586 9 16
horizon system of coordinates 2 584
marine 2 586 8 129
Nautical Almanac 9 6
obtaining observed altitude 2 585
polar regions 10 445
position determination 2 584
sextant 12 234 235
sight reduction 2 585
star finder and identifier 2 585
time relationships 2 586
Celestial photography *see* Astronomical photography
Celestial sphere 1 606 607 2 587*
azimuth 1 702
celestial navigation 2 583
polar navigation 10 445
Celesticetin 1 476
Celestite 2 587* 8 278 13 255
strontium ore 13 194
Celiac artery 1 497
Celiac disease 12 369
Celiac plexus 4 160
Cell (biological) 2 587 595
ameboid movement 2 594
biological specificity 2 216
biopotentials and electrophysiology 2 235 238
chemistry *see* Bacterial cell chemistry
ciliary movement 2 595
Cell (biological)—*cont*
composition 2 587
concentration gradients 2 593
constancy *see* Cell constancy
cyclosis 2 594
cytochrome 3 652
cytoplasm 3 656-657
death 2 592
differentiation 2 590 591
division *see* Cell division
function 2 587 589
Golgi component 6 235
inclusions, noncytoplasmic 2 603 604
intercellular substances 2 589
lineage *see* Cell lineage
membranes and monolayers 2 605 607
metabolism *see Cell* metabolism
mitochondria 8 520
movements 2 594 595
multicellular organisms 2 589
nucleus 2 607 608* 9 215
number of cells 2 589
organization *see* Cell organization
permeability 2 592 593
plastids 2 611-612* 3 78
pressure temperature effects *see* Cell (pressure temperature effects)
protoplasm 11 47
protoplast 2 612 614
radiation injury (biology) 11 226
respiration model 2 233
selectivity 2 592
senescence 2 591
size 2 589
subcellular organization 2 589
theory 2 587 590
unicellular organisms 2 589
Cell (electric) 2 595, 4 458-459
dry 4 276 279
electromotive force 4 499
standard 4 458-459 14 478 479
wet 14 477-479
see also Battery, electric
Cell (mathematics) doubly periodic functions 4 562
Cell (pressure temperature effects) 2 595 601
basic cause of optimum temperature 2 596
biological action of pressure 2 599 600
biological range of pressure 2 598
Cell (pressure temperature effects)—*cont*
biological range of temperature 2 598
biological temperature optima 2 596 598
dual action of temperature 2 596
physiochemical aspects 2 595 596
quantitative theory 2 600 601
Cell constancy 2 601 602*, 13 395
Gastrotricha 6 77-78
Nematoda 9 30
Cell death 2 592
Cell differentiation 2 590, 4 568
Cell division 2 602 603
biophysics, mathematical 2 233
chromosome movement 2 603
cytokinesis 3 652
growth division cycle 2 602
initiators 2 603
meiosis 8 209 211
mitosis 8 520
mitotic apparatus 2 603
nucleolus 2 603
radiation biology 11 219, 226
radiation cytology 11 222
syngamy 13 374
Cell inclusions, noncytoplasms 2 603-604
Cell lineage 2 604 605
blastomeres 2 605
cleavage pattern 2 604
fate maps, embryonic 5 190 191
Cell membranes and monolayers 2 605 607
Cell metabolism 2 593 594
acetate 8 264
adenosinediphosphate (ADP) 1 64
endocrine control 2 594
intracellular location 2 594
Cell movements 2 594 595
Cell nucleus 2 607 608
Cell organization 2 608 611
cytoplasm 3 657
gels 2 610
mitotic spindle 2 611
permanent subcellular organizations 2 609
transient structure-assemblies 2 610
Cell plastids 2 611 612
Cell protoplast 2 612-614
Cell structures 2 614-615
Golgi component 6 233
mitochondria 8 518
Cell surface differentiation 2 620 623
brush border 2 621
cilia 2 621
cuticle 2 620
desmosome 2 622
intercalated disks 2 623
stereocilia 2 621
terminal bars 2 622
Cell surface ionization 2 623 625
bacteria 2 624
blood cells 2 624
electrophoretic mobility 2 623
variation of charge 2 623
yeast 2 624
Cell theory, composition 2 587
cell function 2 587
cellular viewpoint in biology 2 590
intercellular substances 2 589
multicellular organisms 2 589
number of cells 2 589
size of cell 2 589
subcellular organization 2 589
unicellular organisms 2 589
Cell walls in plants 2 615 620
callose 2 617
cell elongation 2 619
cellulose 2 616, 625
chemical constitution 2 616
cutin 2 617
factors governing structure 2 620
gums 2 617
hemicelluloses 2 616
lignin 2 617
pectin substances 2 616
pits 2 615
plasmodesmata 2 616
primary walls 2 617
protein 2 617
secondary walls 2 618 619
suberin 2 617
waxes 2 617
wood 14 525
Cell water relations, diffusion pressure deficit 10 287 288
imbibition 10 288
osmotic pressure and turgor pressure 10 286 287
plasmolysis 10 288
Cellfalcicula 11 65 13 2
Cello 8 666
Cellobiose 2 19 452 620*
Cellophane 2 620 10 403
food engineering 5 402
Cells of Leydig 13 525
Cells of Paneth 4 161
Cells of Sertoli 13 525

Catenary 2 551
catenoid of revolution 13 310
see also Tractrix
Catenation 3 41
Catenobacterium 7 382
Catenotaeneidae 12 30
Catenotaenia pusilla 12 29
Catenulida 11 541
Caterpillar 2 381, 551-552*, 5 5
Lepidoptera 7 459
Catfish 2 552*, 3 647
Cathartes aura 14 377
Cathartes 2 552*, 5 178
Cathartidae 14 377
Cathepsin 5 22
Cathode (electron tube) 13 555
Cathode bias 2 183
Cathode bypassing 1 347
Cathode fall 1 501
glow discharge 6 215 216
Cathode follower 2 552-553, 7 37, 14 358-359*
Cathode glow 6 215-216
Cathode luminescence 2 560-561
Cathode-modulated Class C amplifier 1 557
Cathode-potential stabilized emitron 13 465
Cathode-ray oscillograph 9 426
Cathode ray oscilloscope *see* Oscilloscope cathode-ray
Cathode-ray tube 2 554 560*, 6 496, 14 243
accelerating grid 2 555
cathodoluminescence 2 560 561
Charactron 9 219
computer applications 2 560
deflecting system 2 556, 13 334
electron gun 2 555 557
electron lens 2 555, 4 537
emission system 2 555
envelope 2 554 555
flat 2 560
focusing system 2 555
high frequency performance 2 556
kinescope 7 347-349
magnetic deflection 2 557
oscilloscope 9 426 432
persistence 2 558 559
phosphors 2 558 559
photoformer 1 581 582
photography 2 559 560*, 9 432
postdeflection acceleration 2 557
radar presentations 11 205
storage devices 13 159
sweep waveform 13 334
Cathode-ray tube—*cont*
traveling-wave 2 560
Cathode rays 2 555
sterilization 13 155
see also Cathode-ray tube
Cathode sputtering 6 216
Cathodic inhibitor 7 112
Cathodic pickling 4 532
Cathodic protection 3 491, 4 421
electric distribution systems 4 424
underground or buried cable 3 525
Cathodoluminescence 2 558-559, 560 561*
Cathomycin *see* Novobiocin
Cation 4 484
chemical binding 3 25
coordination number 3 461-462
removing from water 14 402
Cation exchange 7 241
halloysite 6 322
illite 7 22
sea water 12 108
soils 12 424-426
water softening 14 403
zeolite 14 611
Cationic surface-active agents 13 321 322
Catkin 7 98
Catoptric telescope 13 448 452
Catophygus 9 214
Catostemma 3 187
Catostomidae 13 256
Catostomus commersonnii 13 256
Catskill delta 11 387
Catskill formation 11 388
Catskill Mountains 9 149
Cattell R B 10 35
Cattle 1 567 2 561-564*, 3 107
Cattle production beef 2 561 564
dairy 2 564 568
Cattlehide 7 415
Cattleya 9 373
Cauca River 12 527 530
Caucasoids 1 458
Caucasus 1 577, 5 118
Cauchy A L 7 166
Cauchy's equation (dispersion) 5 15-16
Cauchy's integral formula 5 311
Cauchy's integral theorem 5 310 311, 7 401
Cauchy's mean formula 4 131
Cauchy's problem (differential equations) 4 126 127
Cauchy relations (elasticity) 4 421
Cauchy-Riemann equations 2 408; 3 339
Cauchy's test (series) 12 190
Caudal vertebra 12 363
Caudata 1 333, 2 568 569*; 12 364
Cryptobranchoidea 2 568, 5 578
distribution 2 569
ecology 2 569
fossils 1 336
Meantes 2 568, 8 187
morphology 2 568
physiology 2 568 569
Salamandroidea 2 568, 12 6-7
Caudate nucleus 8 615, 12 597
Caudex 13 111, 123
Cauliflower 2 569
Caulerpa 11 65, 12 65
Caulobacteraceae 2 570*, 11 66
Pseudomonadaceae 11 65
taxonomy 2 11
Causality 2 571
scientific methods 12 74
Cause and effect law of 12 73-74
Caustic 3 69
Caustic potash 10 531
Caustic soda 12 412
Caustobioliths 2 240
Cauvery River 1 580
Cave 2 571-572
karst topography 7 332-333
stalactites and stalagmites 2 572 13 35
waters 13 35
Cave (radiochemical laboratory) 11 297 299
Cave cricket 9 418
Cavendish, H 6 264 544
Cavendish experiment 6 264
Caventou J 11 190 13 207
Cavern *see* Cave
Cavernularia habereri 9 621
Cavia cobaya 6 292
Caviar 1 46 13 208
Caviidae 6 292
Caving system of mining 8 482
Cavitation 2 572 576
Bernoulli's principle 2 573
biological effects of sound waves 2 210 211
cavitation number 2 573 574
centrifugal pump 2 633
effects 2 574 575
erosion 2 575
hydrodynamics 6 539
marine propellers 11 14
physical causes 2 574
at stream velocities 5 358
supercavitating propellers 2 575 576
types 2 574
ultrasonics 14 185
Cavitation—*cont*
water tunnel 14 408 410
Cavitator: wingar profanse 14 326
Cavity radiation 6 371
Cavity resonator 2 576 577* 9 583
see also Resonant cavity
Cavy 2 448, 6 292
Cayenne 12 612
Cayley, A 6 255, 255 11 36
Cayley-Klein parameters 2 577 578*, 11 188
Cayman Basin 2 521
Cayoxanthus arbers 2 578
Cayotenia 2 578
Cayotenales 2 578*, 9 503
Cayugan series 12 327
Cenomanian Stage 4 87
C-cut plate crystal optics 3 590
CCR process fuel gas supplements 5 555
CDAA 6 421
CDEC 6 421
CDT 6 423
Ceanothus 12 127
Cebocidae 8 572 10 589
Cebrionidae 3 277
Cebu 9 482
Cebupithecia sarmientoi 10 590
Cebus monkey chromosome number 5 107
Cecropia 3 187, 12 382
Cecropidae 2 418
Cecrops 2 418
Cecum 1 492
colic 4 162
digestive system 4 162
Cedar 2 578 579*, 9 408
Cedar beetle 3 277
Cedar Creek pool 9 6
Cedar of Lebanon 2 579
Cedar waxwing 14 445
Cedaria 2 425
Cedarbluff S 9 24
Cedrella 3 187
Cedrella odorata 2 579 8 75
Cedrus 3 188
Cedrus atlantica 2 578 579
Cedrus deodara 2 579
Cedrus libani 2 579
Ceiba 3 187
Ceiba pentandra 7 332; 12 146
Ceiling (acoustical treatment) 9 129
Ceiling (weather) 14 457 458
Ceilometer 14 457 458
Celebes 4 357
Celebes Sea 4 356, 9 271
Celebes vibrio 3 84
Celeriac 2 579
Celerio lineata 7 469
Celery 2 579
spice and flavoring 12 612
Celesta 8 666 667

Cephalobus 6 436 441
Cephalocarida 1 560, 2 643*, 3 562
Cephalochordata 1 429 2 643 644*, 3 263
lancelet 7 391
life history 2 644
morphology 2 643 644
nutrition 2 644
see also Acrania
Cephalodiscus 11 87
Cephaloidae 3 277
Cephalon 3 564
Cephalonomia tarsalis 6 581
Cephalopina titillator 8 680
Cephalopoda 2 644 646*, 8 559
Ammonoidea 1 328 8 559
Coleoidea 8 559
Dibranchia 4 107
ecology 2 646
morphology 2 645
Nautiloidea 8 559
nutrition 2 645 646
taxonomy 2 645
Vampyromorpha 14 265
Cephalopoda fossils 2 646 647
Cephalopsis 8 680
Cephalopterus 3 262
Cephalosporium 8 520
Cephalosporium gregatum 12 535
Cephalosporium salmosynnematum 1 466 467
Cephalothecium see Trichothecium
Cephalothorax 1 557 3 564
Cephalothrididae 9 496
Cephalothrix 9 496 11 559
Cephalotrichous flagellation 2 63
Cephea 3 255 11 549
Cepheid variable star 14 277
Cepheromyia 8 680
Cepheus 3 412 413
Cephidae 6 574
Cephus cinctus 6 580
Ceppellini R 2 269
Ceractinomorpha 2 647* 4 54 10 513
Dendroceratida 2 647 10 513
Dictyoceratida 2 647 10 513
Halichondrida 2 647 10 513
Haplosclerida 2 647 10 513
Poecilosclerida 2 647 10 513
Cerafonia siliqua 6 297
Ceram Sea 9 271
Cerambycidae 3 278
Ceramic capacitor 2 446
Ceramic coatings 8 284 285
Ceramic microphone 8 361
Ceramic phonograph pickup 4 240
Ceramic technology 2 647 650
cermet 2 655 656
clay products, architectural 5 167 168
drying and firing 2 650
electroceramics 2 650
forming operations 2 648 650
glass and glass products 6 206 209
glazing 6 212
kiln 7 345 347
plaster 10 397 398
porcelain 10 512 515
pottery 10 546
pyrometric cone 11 127 129
raw materials 2 647 648
refractory 11 409 411
Ceramics barium titanate 2 96 97
radiation damage 11 223
spacecraft structure 12 556
Ceramide 7 529
Ceraphronidae 6 574
Cerargyrite 2 650 651* 6 324 12 529 532
Cerastoderma edule 5 100
Ceratiocaris stygia 7 476
Ceratiomyxaceae 8 687
Ceratiomyxales 8 687
Ceratiomyxetidae 8 687
Ceratium 11 59
Ceratium hirundinella 4 197
Ceratocombus 6 409
Ceratocystis 3 254 265 13 241
Ceratocystis fagacearum 14 73
Ceratocystis ulmi 14 76
Ceratodontidae 4 210
Ceratodus 13 337
Ceratoma bifurcata 3 529
Ceratomorpha 10 18 19 21
Ceratophyllus gallinae 12 545
Ceratophyllus niger 12 545
Ceratopsia 11 484
Ceratopyge 2 425
Ceratosaurus 4 199
Ceratostomella 10 513 514
Ceratostomella ulmi 9 236
Ceraurus pleurexanthemus 14 104
Ceraurus whittingloni 14 102
Cercaria 2 651* 4 149
Cercaria microura 2 651
Cercariae 5 183 6 429
Cercariaeum 2 651
Cercariaeum helicis 2 651
Cercarial dermatitis 12 389
Cercidiphyllum 9 506
Cercopidae 6 470 471 13 7
Cercopithecidae 2 1 10 590
Cercopithecoidea 8 572 10 589
Cercospora 8 440
Cercospora arachidicola 9 603
Cercospora beticola 13 241
Cercospora boehmeriae 11 534
Cercospora carthami 7 329
Cercospora cruenta 8 529
Cercospora kikuchii 12 535
Cercospora krugiana 11 534
Cercospora musae 2 90
Cercospora pennisetti 8 440
Cercospora personata 9 603
Cercospora sojina 12 535
Cercosporella 4 53
Cercosporella apii 4 53
Cercosporella beticola 4 53
Cereal 2 651*, 5 372
barley 2 98 101
buckwheat 2 560
corn 3 481 486
food manufacturing 5 421 422
oats 9 238 241
rice 11 562 563
rye 11 636 637
wheat 14 479 485
Cereal chemistry 2 651 652
milling 2 651 652
see also Agricultural chemistry
Cereal rust plant disease 19 300 315
plant disease control 10 517
see also Barley Buckwheat Corn Oats Rice Rye Wheat
Cerebellar motor paths 12 596
Cerebellum 2 316 651
nervous system 9 58
Cerebral cortex 9 80
Cerebral hemispheres 2 651
Cerebral organ 11 558
Cerebral palsy 2 652 653
types of brain damage 2 652
Cerebratulus 4 574 11 559
Cerebratulus lacteus 6 429
Cerebrose *see* Galactose
Cerebroside 6 223 7 529
glycoside 6 224
metabolic disorders 8 261
Cerebrospinal fluid 7 655 656
Cerebrotomia 2 503
Cerelose *see* Glucose
Cerenkov P A 2 655
Cerenkov counter 2 653
Cerenkov radiation 2 653
Ceres 1 596 599 2 653 654*
Ceresa bubalus 6 472 14 76
Ceresine 14 443
Ceresiosaurus calcagnii 12 41
Cereus 10 572
Cereus giganteus 2 386 9 569
Ceria 6 570
Cerianthetia 1 455, 2 654* 3 255
Cerianthid larva 1 455
Cerianthula shimifer 2 654
Cerianthus 3 255
Cerianthus solitarius 2 654
Cerianthipatharia 1 455
Cerinula larva 1 455 2 654
Ceriops 8 91
Cerithiacea 6 77
Cerium 2 654 655
crystal structure 3 599
electron configuration 4 504
extractive metallurgy 8 277
in monazite 8 566
paramagnetism 9 549
production 4 467
Cermatia forceps 2 629
Cermet 2 655 656
abrasive 1 9
boron compound 2 302
carbide 2 450 451
high temperature alloys 1 259
intermetallic compounds 7 194 195
machine tool 8 3
powder metallurgy 10 550
refractory 11 410
sintering 12 541 542
Cerophytidae 3 277
Cerotic acid 2 474
Certhia familiaris 3 542
Certhiidae 3 541
Ceruminous gland 13 534
Cerussite 2 656
carbonate minerals 2 468
lead ore 7 425
Cervical carcinomas 14 236
Cervical vertebra 9 27, 12 563
Cervicitis 6 236 14 236
reproductive system disorders 11 491
Cervidae 1 569
Cervus canadensis 4 560
Cesaro summability series 12 193
Cescaja Bay 5 114
Cesium 2 656 657
analytical methods 2 657
availability 2 657
chemical properties 2 657
electron configuration 4 504
emitter 14 245 246
extractive metallurgy 8 277
ionization potential 4 504
metallurgical extraction 2 656 657
occurrence 2 656
physical properties 2 657
principal compounds 2 657
resistivity 11 497
scintillation spectrum 6 35
uses 2 656
Cesium 137 isotopic irradiation 7 269
radioactive fallout 11 268
Cesium beryl 2 170
Cesium chloride crystal structure 3 599 600
ionic crystals 7 247
lattice 7 247

Cellular slime molds *see* Acrasiales
Cellulase 2 19, 5 203
Cellulitis 7 98
Celluloid 2 626, 5 75
Celluloid pyroxylin 5 75
Cellulomonas 3 497
Cellulose 2 589, 616, 619, 625-626*, 3 655, 6 217, 10 490, 12 67
  biochemistry 2 199
  cell walls in plants 2 616
  cellobiose 2 620
  cyanoethylation 3 631 636
  derivatives *see* Cellulose derivatives
  gum 6 296
  hemicellulose 6 399
  humus 6 517
  natural occurrence 2 625
  plant metabolism 10 352
  preparation 2 625
  properties 5 218
  solid propellant 11 8
  starch 13 51
  uses 2 625
  wood chemicals 14 526
  see also Amylose, Hemicellulose, Polymer
Cellulose acetate 2 626, 5 213, 402
  dyeing 4 310
  film 10 403
  sheets 10 407
Cellulose acetatebutyrate 5 75
Cellulose acetatepropionate 5 75
Cellulose derivatives 2 626
  cellophane 2 620
  paint 9 493
  paper and paper products 9 539 541
  see also Polymer
Cellulose epoxy cross link 13 540
Cellulose ether 7 376
Cellulose nitrate 2 626, 5 75
Cellulose propionate 2 626
Cellulose triacetate 5 75
Cellulose xanthate 2 626
Cellulosic fibers 5 213
  bleaching 2 258-259
  flameproofing 5 294
Cellulosics radiation damage 11 223
Cellvibrio 13 2
Celor lens system 7 453
Celotex insulator 6 374
Celsian 5 207, 12 476
Celsius temperature scale 15 486-487
Celtis laevigata 6 313
Celtis occidentalis 6 313
Celyphidae 4 212
Cement (adhesive) *see* Adhesive
Cement (hydraulic) 2 626 627*; 3 362
  grout 6 285
  materials 2 627
  types 2 627
  see also Air entraining Portland cement, Portland cement
Cement-asbestos 2 627
Cement copper 3 466
Cement gland 3 565, 11 634
Cemented lenses optical lenses 7 452
Cementite steel 6 379, 13 90
Cementum tooth 13 674
Cenomanian stage 3 543
Cenozoic 2 627 628
  animal life 9 521
  floras 9 506 507
Centaurus 2 628* 3 412 413
Center of activity (sun) 13 273-274
Center of buoyancy ship design 12 271
Center of force 2 629
Center of gravity 2 628*, 641
  ship design 12 269
Center of mass 2 628
  celestial mechanics 2 581-582
  coordinates 5 291
  orbital motion 9 371
  pendulum 9 616 617
  rectilinear motion 8 601
  rigid body dynamics 11 570-571
Center of oscillation 9 617
Center of percussion 9 617
Center of pressure 2 628 629
Centetes 6 440
Centigrade temperature scale 15 486 487
Centipede 1 560 2 629* Chilopoda 5 59-61
Central America 9 163 164
Central body *see* Centrosome
Central canal 12 365
Central deafness 4 22
Central fissure of Rolando 8 612
Central force 2 629
  celestial mechanics 2 580 582
  lattice vibrations 7 414
Central heating 2 629 630
  comfort control 3 516 517
Central limit theorem 4 257, 10 630
  error theory distribution 4 257
  probability 15 70
Central Lowland Province 9 154 155
Central nervous system 2 630 631* 11 74
  anesthetic 1 405
  behavior, ontogeny 2 134
Central nervous system—*cont*
  benzedrine effect 2 164
  biological effects of sound waves 2 211
  biophysics, mathematical 2 234
  brain 2 516
  spinal cord 12 616
Central nervous system depressants 2 94
Central office, telephone capacity 13 350
  crossbar system 13 352
  step by-step system 13 356
  subscriber loops 13 434
  switching function 13 434
Central pain (paresthesia) 9 564
Central quadrics quadric surface 11 154 155
Central station *see* Power plant
Central Valley of California 9 162
Centrales 3 119
Centralized automatic message accounting (CAMA) 13 355
Centrarchidae 2 107 3 539 10 10 13 291
Centrifugal casting 2 543
Centrifugal clutch 3 225
Centrifugal disk still 4 253
Centrifugal extractor 12 500
Centrifugal force 2 631*, 5 437
  as artificial gravity 1 474
  centrifugation 2 634
  frame of reference 5 492
  and gravitation 6 264
Centrifugal impeller 2 631
Centrifugal pump 2 631 633
  cavitation 2 635
  condenser vapor 3 382
  marine machinery 8 122
  multistage 2 633
Centrifugation 2 633-636
  clarification 2 634 635 3 154
  classification 2 635
  dewaxing 4 91
  filter centrifugal 2 635 646
  filtration 2 634
  isotope separation 7 296
  particle size measurement 12 349
  petroleum processing 10 67 68
  separation 2 634 12 186
  solid liquid filters 5 271
  ultracentrifuge 14 180
  see also Filtration
Centrifugation (biology) 2 636 639
  cell surface tension 2 647 658
  cellular studies 2 637
  limitations of Stokes' law 2 638 639
Centrifugation (biology)—*cont*
  other methods 2 639
  physical properties of protoplasm 2 648
  viscosity and Stokes law 2 638
  viscosity changes 2 648
Centrifuge *see* Centrifugation, Ultracentrifuge
Centriole 2 547, 611 642
Centripetal acceleration *see* Acceleration
Centripetal force 2 640 641*, 5 437
  frame of reference 5 492
Centroacinar cell 9 535
Centrode 2 641
  four bar linkage 5 491
Centroid 2 641 642*, 13 310
  by integration 2 641
  principle of symmetry 2 641
  by summation 2 641
  surface and solid of revolution 13 310 311
  see also Barycentric calculus
Centroids of areas and lines 2 641 642
Centrolecithal eggs 5 165, 9 439
Centrolenidae 10 659
Centropelma micropleurum 10 429
Centropus 5 612
Centrosome 2 614, 642 643* mitochondria 8 519
Centrospermales 2 643*, 13 35
  spinach 12 615
Centrosphere *see* Centrosome
Centrum 12 363 14 507
  acelous 12 354
  amphicoelous 12 354
  heterocoelous 12 354
  opisthocoelous 12 354
  procoelous 12 354
Centruroides gertschi 12 80
Centruroides sculpturatus 1 496 12 80
Centrurus 12 79
Cephaelis ipecacuanha 7 257
Cephalaspida 9 416
Cephalaspidiformes *see* Osteostraci
Cephalaspidomorphi 1 112 11 420 2 643
  Anaspida 1 396 2 643
  Cyclostomata 2 643
  Osteostraci 2 643
Cephalaspis 9 416
Cephalic flexure 9 45
Cephalic index 1 461
Cephalin 2 54 7 529 10 132 356
Cephaline gregarine 13 12
Cephalobaena 2 643
Cephalobaenida 2 643

Cephalobus 5 436-441
Cephalocarida 1 560 2 643*, 3 562
Cephalochordata 1 420 2 643 644*, 3 263
lancelet 7 391
life history 2 644
morphology 2 643-644
nutrition 2 644
see also Acrania
Cephalodiscus 11 87
Cephaloidae 3 277
Cephalon 3 564
Cephalonomia tarsalis 6 581
Cephalopina titillator 8 680
Cephalopoda 2 644 646* 8 559
Ammonoidea 1 328 8 559
Coleoidea 8 559
Dibranchia 4 107
ecology 2 646
morphology 2 645
Nautiloidea 8 559
nutrition 2 645 646
taxonomy 2 645
Vampyromorpha 14 265
Cephalopoda fossils 2 646 647
Cephalopsis 8 680
Cephalopterus 3 262
Cephalosporium 8 570
Cephalosporium gregatum 12 533
Cephalosporium salmonyn nematum 1 466 467
Cephalothecium see Trichothecium
Cephalothorax 1 557 3 564
Cephalothrichidae 9 496
Cephalothrix 9 496 11 559
Cephalotrichous flagellation 2 63
Cephea 3 255 11 549
Cepheid variable star 14 277
Cephenemyia 8 680
Cepheus 3 412 413
Cephidae 6 574
Cephus cinctus 6 580
Ceppellini R. 2 260
Ceractinomorpha 2 647* 4 54 10 513
Dendroceratida 2 647 10 513
Dictyoceratida 2 647 10 513
Halichondrida 2 647 10 513
Haplosclerida 2 647 10 513
Poecilosclerida 2 647 10 513
Ceralonia siliqua 6 297
Ceram Sea 9 271
Cerambycidae 3 278
Ceramic capacitor 2 446
Ceramic coatings 8 284 285
Ceramic microphone 8 361
Ceramic phonograph pickup 4 [illegible]
Cera [illegible]
3 167 168
drying and firing 2 650
electroceramics 2 650
forming operations 2 648 650
glass and glass products 6 206 209
glazing 6 212
kiln 7 345 347
plaster 10 397 398
porcelain 10 512 513
pottery 10 546
pyrometric cone 11 127-128
raw materials 2 647 648
refractory 11 409 411
Ceramics barium titanate 2 96-97
radiation damage 14 223
spacecraft structure 12 556
Ceramide 7 529
Ceraphronidae 6 574
Cerargyrite 2 650 651*, 6 324 12 329 332
Cerastoderma edule 5 100
Ceratiocaris stygia 7 476
Ceratiomyxaceae 8 687
Ceratiomyxales 8 687
Ceratiomyxetidae 8 687
Ceratium 11 59
Ceratium hirundinella 4 197
Ceratocombus 6 408
Ceratocystis 3 254 265 13 141
Ceratocystis fagacearum 14 73
Ceratocystis ulmi 14 76
Ceratodontidae 4 210
Ceratodus 13 557
Ceratoma trifurcata 3 529
Ceratomorpha 10 18 19 21
Ceratophyllus gallinae 12 345
Ceratophyllus niger 12 345
Ceratopsia 11 494
Ceratopyge 2 425
Ceratosaurus 4 199
Ceratostomella 10 513 514
Ceratostomella ulmi 9 236
Ceraurus pleurexanthemus 14 104
Ceraurus whittingtoni 14 102
Cercaria 2 651* 4 149
Cercaria micrura 2 651
Cercariae 3 183 6 429
Cercariaeum 2 651
Cercariaeum helicis 2 651
Cercarial dermatitis 12 589
Cercidiphyllum 9 506
Cercopidae 6 470 471 13 7
Cercopithecidae 2 3 10 590
Cercopithecoidea 8 572 10 589
Cercospora 8 440
Cercospora arachidicola 9 603
Cercospora beticola 13 241
Cercospora boehmeriae 11 534
Cercospora corchori 7 528
Cercospora cruenta 3 529
[illegible]
Cercospora personata 9 603
Cercospora sojina 12 535
Cercosporella 4 53
Cercosporella apii 4 53
Cercosporella beticola 4 53
Cereal 2 651* 5 372
barley 2 98 101
buckwheat 2 560
corn 3 481-486
food manufacturing 5 421 422
oats 9 259 261
rice 11 562 563
rye 11 656 657
wheat 14 479 485
Cereal chemistry 2 651 652
milling 2 651 652
see also Agricultural chemistry
Cereal rust plant disease 10 300 315
plant disease control 10 317
see also Barley, Buckwheat Corn Oats Rice, Rye Wheat
Cerebellar motor paths 12 506
Cerebellum 2 516 651
nervous system 9 58
Cerebral cortex 9 80
Cerebral hemispheres 2 651
Cerebral organ 11 558
Cerebral palsy 2 652 653
types of brain damage 2 652
Cerebratulus 4 574 11 559
Cerebratulus lacteus 6 429
Cerebrose *see* Galactose
Cerebroside 6 223 7 529
glycoside 6 224
metabolic disorders 8 261
Cerebrospinal fluid 7 635 636
Cerebrotonin 2 503
Cerelose see Glucose
Cerenkov P. A. 2 653
Cetenkov counter 2 653
Cerenkov radiation 2 633
Ceres 1 596 598 2 653 654*
Ceresa bubalus 6 472 14 76
Ceresine 14 443
Ceresiosaurus calcagnii 12 41
Cereus 10 372
Cereus giganteus 2 386 9 369
Cerex 6 370
Cerianthería 1 455 2 654* 3 255
Cerianthid larva 1 455
Cerianthula spinifer 2 654
Cerianthus 3 255
Cerianthus solitarius 2 654
Cerianthipatharia 1 455
Cerinula larva 1 455, 2 654
Cerisops 8 91
Cerithiacea 6 77
Cerium 2 654 655
crystal structure 3 599
electron configuration 4 504
extractive metallurgy 8 277
in monazite 8 566
paramagnetism 9 549
production 4 467
Cermatia forceps 2 629
Cermet 2 655 656
abrasive 1 9
boron compound 2 382
carbide 2 450 451
high temperature alloys 1 259
intermetallic compounds 7 194 195
machine tool 8 5
powder metallurgy 10 550
refractory 11 410
sintering 12 541 542
Cerophytidae 3 277
Cerotic acid 2 474
Certhia familiaris 3 541
Certhiidae 3 541
Ceruminous gland 13 534
Cerussite 2 656
carbonate minerals 2 468
lead ore 7 425
Cervical carcinomas 14 236
Cervical vertebra 9 27 12 563
Cervicitis 6 236, 14 236
reproductive system disorders 11 481
Cervidae 1 569
Cervus canadensis 4 560
Cesaro summability series 12 195
Cescaja Bay 5 114
Cesium 2 656-657
analytical methods 2 657
availability 2 657
chemical properties 2 657
electron configuration 4 504
emitter 14 245 246
extractive metallurgy 8 277
ionization potential 4 504
metallurgical extraction 2 656 657
occurrence 2 656
physical properties 2 657
principal compounds 2 657
resistivity 11 497
scintillation spectrum 6 33
uses 2 656
Cesium 137 isotopic irradiation 7 269
radioactive fallout 11 268
Cesium beryl 2 170
Cesium chloride crystal structure 3 599 600
ionic crystals 7 247
lattice 7 247

Cesium chloride crystal structure—*cont*
Madelung constant 8 15
Cesium clock *see* Atomic clock
Cestida 2 657-658*, 3 608
Tentaculata 15 491
Cestoda 2 658 659*, 10 414
Cestoidea 2 659
Diphyllidea 4 208
Eucestoda 5 97, 10 414
larval development 2 659
Lecanicephaloidea 7 448
morphology 2 658
Nippotaeniidea 9 102
phylogeny 2 659
Platyhelminthes 10 414-415
Proteocephaloidea 11 43-44
Pseudophyllidea 11 66
reproductive system 2 658 659
tapeworm 15 392
Tetraphyllidea 15 550
Trypanorhyncha 14 122
Cestodaria 2 659*, 10 414
Amphilinidea 1 358, 2 659, 10 414
Cestoidea 2 659
Gyrocotylidea 2 659, 6 306, 10 414
Cestoidea 2 659 660
Cestoda 2 658
Cestodaria 2 659
morphology 2 659
Cestum veneris 2 657
Cetacea 2 660*, 8 82
Archaeoceti 2 660
dolphin 4 262
fossils 2 660 661
Mysticeti 2 660
Odontoceti 2 660
whale *14 479*
Cetacea fossils 2 660-661
Cetane 2 661
diesel fuel 4 121
Cetane number 2 661 662, 4 121
Cetorhinus maximus 12 243
Cetunculi 4 40
Cetus 3 412 413
Cetyl alcohol 2 662
Cetyl laurate 14 444
Cetyl myristate 14 444
Cetyl palmitate 14 444
Cetyl trimethyl ammonium bromide 13 231
Cevennes *see* Massif Central
Ceylon 1 580 586
Ceylon rubs 11 648
cgs absolute system 14 203
Chabazite 3 1*- 14 611
Chablis 14 507
Chaco 12 526
Chactas vanbenedeni 1 558
Chad Lake 1 109
Chadwick, J 3 47 7 506
Chaenomeles japonica 11 190
Chaetoceros 8 107, 128
Chaetoceros atlanticus 8 106
Chaetoceros coarctatum 8 128
Chaetoceros laevis 8 128
Chaetoderma 1 490
Chaetognatha 1 420, 3 1-2*
morphology 3 1 2
natural history 3 2
Chaetomiaceae 5 124
Chaetomium 13 541
Chaetonotoidea 3 2-3
Chaetonotus 3 2, 6 77
Chaetopleura 10 487
Chaetopoda *see* Polychaeta
Chaetopteridae 10 461
Chaetura pelagica 13 336
Chaff radar FCM 4 521
Chagas' disease 3 3*, 5 6, 6 409 14 124 125
kissing bug 7 364
Protozoa 11 60
Trypanosomatidae 14 124
Chain, E 1 476
Chain 8 188
Chain balance 2 75
Chain conveyors 3 450
Chain coral 13 381
Chain drive 3 3 5
Chain form cyclohexane 1 243
Chain isomerism molecular 7 277
Chain link *see* Ring
Chain pickerel 10 213
Chain reaction chemical 3 5 6
antioxidant 1 479
combustion 3 306 307
inhibitor 7 110 112
photochemical 3 5
polymerization 10 480 483
radical substitution 13 229
thermal 3 5 6
Chain reaction nuclear 3 6* 11 364
atomic bomb 1 648
critical mass 3 550
fission 5 288
in nature 13 522
Chain ring tautomerism 13 402 403
Chain rule composite functions 4 128 129
partial differentiation 9 568 569
Chakrabarti, S K 12 147
Chalara 5 526 551
Chalcanthite 3 6
Chalcedonic quartz 1 111
Chalcedony 3 6
agate 1 111
in chert 3 56
quartz 11 182
Chalcid 6 574
Chalcididae 6 574
Chalcidice Peninsula 5 116
Chalcocite 3 6 7
copper ore 3 464
Chalcophile elements 4 546
Chalcopyrite 3 7*, 8 278, 13 254
copper ore 3 464
Chalcotrichite 3 623
Chalicotheres 10 19
Chalimus larva, Lernaeopododa 7 477
Chalk 3 7
abrasive 1 9
carbon 2 462
Cretaceous 3 542
Challenger Deep 4 326
Challengeridae 4 39
Chalonion 12 124
Chalybion californicum 14 386
Chama arcophylla 6 131
Chamaecyparis lawsoniana 2 568, 3 647
Chamaecyparis nootkatensis 2 578, 3 647
Chamaecyparis thyoides 2 578
Chamaeleontidae 3 7, 13 24
Chamaemyiidae 4 212
Chamber kilns 7 346
Chambered nautilus 9 7
Chamberlain, O 1 481
Chambers, R 9 437
Chameleon 3 7 412, 414*, 13 22
Chamois 1 443 3 7 8*
Chamois leather 7 445
Chamonix, Alps of 5 117
Champagne 14 507
Champenois, F 10 615
Champlain Lowland 9 145 147 148
Champlainian series 9 374
Champsosaurus 7 475 474
Chancre 13 374
soft *see* Soft chancre
Chancroid 15 179 14 296
Chandler, S C 6 123
Chandler motion 4 329 10 415
Chandler's period 4 346 6 123
Chandler wobble 4 337 350
Chandrasekhar, S 10 391
Channel communication 3 319
Channel open 3 8 9
canal 2 433
flow measurement 5 318 319
friction phenomena 3 8
gravity phenomena 3 8
hydraulic jump 3 9 *6 526 527*
stream gaging 3 9
types of flow 3 8
uniform flow 5 324
Channel radio 11 212 217 219
Channel catfish 2 552
Channel inclusion compounds 5 157
Channel markers 2 371
Channel migration on flood plains 5 311
Channel process carbon black 2 465
Channel sampling (mining) 8 497
Channeled pear conch 14 451
Channeled spectrum interference of waves 7 187
Channeled whelk 14 488
Channeling machines quarrying 11 181
Chao, C Y 3 357
Chaoboridae 4 212
Chaoborus 4 406
Chaoborus astictopus 4 214
Chaos 1 500
Chaos carolinensis 1 350
Chaparral climax communities 3 182-186
Chapman, L 4 143
Chapman, S 4 143
Chapman, W 4 480
Chapman Jouget analysis 6 *6*
Chapman Jouguet hypothesis 5 149
Chapman kolmogorov equations 15 142
Char 3 223, 270, *12 14*
Chara 5 528
Characidae 3 647
Characin 3 647
Characoidea 3 647
Characteristic logarithm 7 575-576
Characteristic curve 3 9 10, 11 533
Characteristic function (eigenfunction) *see* Eigenfunction
Characteristic function geometrical optics 9 363 364
Characteristic impedance, acoustic 7 36
Characteristic impedance, electrical delay line 4 47
microwave transmission line 8 423
reflection and transmission coefficients 11 396 397
transmission line 14 49
wave guides 11 397
Characteristic value *see* Eigenvalue
Characiron 9 219
Characiron display tube 2 560 9 219 13 162
Characinidae 3 10 7 345
Characiniformes 1 694 3 10*
auk 1 667
avocet 1 696 697
curlew 3 625
gull 6 296
killdeer 7 345
phalarope 10 92
puffin 11 91
sandpiper 12 23
snipe 12 390
tern 14 495
turnstone 14 165
Charadrius vociferus 7 345
Charales 5 11

Charcoal 2 463 3 10*
activated carbon 1 59
destructive distillation 4 80
wood chemicals 14 527
Chardin Teilhard de 10 232
Chardonnet H de 5 245
Charge electric 3 10
ballistic galvanometer 6 23
capacitance 2 440
in clouds 7 509 510
conduction of 3 383
conservation of see Conservation of charge
Coulomb's law 3 516
electric current 3 626
electric field 4 427
electrical units 4 460 461
electron 4 501 502
electroscope 4 535 536
electrostatic 4 539
measurement 4 498
oscillation 4 493 496
space charge 12 540
Charge conjugate particle see Antiparticle
Charge conjugation 4 545, 13 362 364
Charge density 3 10
Charge independence of nuclear forces 9 207 208
Charge multiplets 8 249
Charge parity 13 362 364
Charge reversal 13 362 364
Charge storage tube see Storage tube
Charge symmetry of nuclear forces 9 207* 13 363
Charge to mass ratio see Specific charge
Charge transfer collisions 12 56 57
Charina bottae 2 272
Charles Jacques A 3 11 13 567
Charles law 1 101 3 11 6 49 13 567
Charles Wain 14 235
Charlotte colloid mill 12 351
Charophyta 3 11
Charpy impact machine 8 273
Charpy test 8 273
Chart see Cartography
Chartreusin 1 476
Charybdea 3 255 612
Chase (printing) 10 309 14 171
Chasmatosaurus 13 545
Chassignite 8 317
Chassis automotive see Automotive chassis
Chat 3 11
Chatham C 6 101
Chattanooga shale 9 307 309
Chaulmoogra 12 122
Chaulmoogra oil 5 189 190 9 564
Chaulmoogric acid 5 190
Chauvan series 9 571
Check valve 14 260 261
Checkered beetle 3 277
Checkerwork heat exchanger 6 575
Cheddar cheese 3 14, 15
Cheek 7 529
Cheese 1 571 3 11-16*
blue 3 15
cheddar 3 14
cream 3 14
defects of 3 12 13
flora of 3 12
limburger 3 15
manufacture 3 13 16
microbiology 3 12 13
process 3 13, 15 16
Propionibacteriaceae 11 16
ripened 3 13
starter cultures 3 12
Swiss 3 14 15
unripened 3 13 14
Cheese antenna see Antenna (aerial)
Cheese mite 12 29
Chehalis River 9 162
Chelaceras 4 87
Chelosis 4 236 11 561
Cheilospirura hamulosa 13 6
Cheilostomata 2 356 3 16-17*
Anasca 3 16
Ascophora 3 16
Cheiraster richardsoni 9 170
Cheiropterygium 12 337
Chekiang 6 465 467
Chelate stability 3 19 22
Chelate systems 5 156 157
Chelation 3 17 22
complex compounds 3 554
coordination chemistry 3 457 461
hydrogen bond 6 518
see also Chemical structures Complex compounds Coordination chemistry Stereochemistry Steric effect (chemical reactions)
Chelicerata 1 496 555 557, 3 22 8 244
Arachnida 3 22
Eurypterida 5 124
Merostomata 3 22 8 244
Pycnogonida 3 22
Chelidae 3 22
Chelidonic acid 11 108
Chelidonium majus 11 108
Cheliter concrosides 1 496 11 67
Chelonariidae 3 278
Chelonethida see Pseudoscorpionida
Chelonia 3 22 24*, 11 481, 14 166
Anapsida 1 595
Cryptodira 3 22
morphology 3 23
Pleurodira 3 22
taxonomy 3 22
turtle 14 166 168
Chelonia mydas 14 166
Chelonides 11 481
Cheloniidae 3 22
Chelura 1 541
Cheluridae 6 36
Chelydra 9 45
Chelydra serpentina 3 23 14 166 167
Chelydridae 3 22
Chem groundwood process 9 539
Chemical binding 3 24 26*, 9 399
chemical structures 3 32 42
coordination chemistry 3 457 461
covalent binding 3 25 26
electrolytic 4 494
ionic binding 3 24 26
ionic crystals 7 247 250
metallic binding 3 26
polymer properties 10 475 478
resonance (molecular structure) 11 502 504
solid state chemistry 12 474 479
Van der Waals forces 3 26
see also Chelation
Chemical bond see Bond chemical
Chemical burns 2 575
Chemical carcinogens 9 523
Chemical coatings 8 285 284
Chemical colorimeter 3 301 302
Chemical compounds 3 26 27
Chemical crystallography 9 89 90
Chemical dating 3 26 27
Chemical decontamination 4 37 38
Chemical elements see Elements (chemical)
Chemical energy 3 24 27 28
Chemical engineering 3 29 29
unit operations 14 201 202
unit processes 12 202 203
Chemical equilibrium see Equilibrium chemical
Chemical exchange reactions 6 383 7 295
Chemical fossils 3 29
Chemical fuel 3 29 30
air craft 1 177 179
boron 3 304
Chemical fuel—cont
metal base 8 290 292
propellant 11 6 10
Chemical interdiffusion 4 146 148
Chemical kinetics see kinetics (chemical)
Chemical microscopy 3 30 31
Chemical motivation 8 604 605
Chemical mutagens 8 671
Chemical potential 3 49 50, 13 62 63
Chemical process control 3 31-32*, 10 637
Chemical processing 14 203
Chemical pulping (wood) 9 539
Chemical reactions acetylation 1 36 37
acylation 1 61 62
alkylation 1 253 254
catalysis 2 546
cyanoethylation 5 634 636
enthalpy change 5 4
esterification 5 75-77
half life 6 318 319
kinetics (chemical) 7 355 359
nitration 9 103 105
oxidation reduction 9 464 466
photochemistry 10 157-158
polyoxyethylation of alcohol 10 487
stereochemistry 13 125 127
tautomerism 13 401 405
thermal reactions 3 5 6
thermochemistry 13 359 361
transamination 14 17
Chemical recovery coke ovens 3 270
Chemical resistant alloys 7 426
Chemical rocks 12 135
Chemical sense see sense, chemical
Chemical structures 3 32 42
Born Haber cycle 3 34
bridge forming atoms 3 41
catenation 3 41
chemical binding 3 24-26
condensed polyhedral structures 3 39
coordination polyhedrons 3 35-36
electron deficient structures 3 41 42
formation of ions 3 33-35
homologous series 3 39 41
ionic crystals 7 248 250
ionic radii ratios 3 36 38
ionization potential 3 33 34
polyhedral structures 3 35 39
resonance (molecular structure) 3 39

Chemical structures—*cont*
solid-state chemistry 12 474
valence bond theory 3 38-39
Chemical symbols and formulas 3 42-44
Chemical ware 10 546
Chemical warfare 3 44 46*, 7 54
gas mask 6 60
lacrimator 3 45
lung irritant 3 45
nerve gas 3 45
organoarsenic compound 9 401
screening smoke 12 81 82
sternutator 3 45
vesicant 3 44
Chemical weathering geology 12 141
Chemical welding 1 67
Chemigum N 11 640
Chemiluminescence 2 220, 3 46*
Chemisorption 1 79, 2 549
Chemistry 2 232, 3 46 49*
agricultural 1 113 114
analytical 1 392-394
archeological 1 511-513
bacterial cell 2 11-12
chemical binding 3 24 26
chemical structures 3 32-42
chemical symbols and formulas 3 44
complex compounds 3 334 336
coordination chemistry 3 457-461
elements (chemical) 3 46, 4 544 546
inorganic 7 118 121
magnetochemistry 8 52-54
nuclear 9 178-180
organic 9 392 398
physical 10 202 204
radiation 11 219-221
see also entries for specific subjects
Chemoautotrophic bacteria 2 64 8 129
Chemodectoma 1 488
Chemodifferentiation 2 137
Chemoprophylaxis 7 94
Chemoreception 3 49-51
gustation 3 49 50
olfaction 3 50 51
Chemoreceptive hair 7 126
Chemoreceptor 1 488 4 166, 11 509
carotid body 2 531
Ophiuroidea 9 344
Platyhelminthes 10 413
Chemostat 2 24, 3 51-52*
Chemotaxis 5 254, 13 403
Chemotherapeutics·
animals and man 1 475
plants 1 475
Chemotherapy 3 52-53*, 4 276, 13 193
basic principles 3 52
host-parasite drug relationship 3 53
isonicotinic acid hydrazide 7 282
nitrofuran 9 108
pharmacology 10 97
sulfa drugs 13 244
sulfone (antimicrobial use) 13 253
thiosemicarbazone 13 606
Chemotropism plant movements 10 366
regeneration (biology) 11 424
Chemungian stage 4 87
Chemurgy 3 53 55
Chen caerulescens 6 237
Chen hyperborea 6 237
Chen rossi 6 237
Chenodeoxycholic acid 2 185
Chenopodiaceae 2 643
Chenopodium 4 293
Chermidae 6 474
Chernozemic soils (distribution) 12 442
Chernozems 12 435
Cherry 2 361 3 55*
diseases 3 55
production 3 55
types 3 55
Cherry, wild black 3 56
Cherry fruit sawfly 6 580
Cherry leaf spot 5 546 548
Chert 3 56 57*, 11 590
composition 3 56
diagenesis in sandstones 4 94
in dolomite rock 4 261
in limestone 7 515-516
occurrence 3 56
primary precipitation origin 3 57
replacement origin 3 57
Chert pebble conglomerates 3 399
Chesapeake Bay 5 81, 9 150
Chest *see* Thorax
Chester White swine 13 339
Chesteran stage 2 469 471
Chestnut 3 57 58
blight 1 574 14 75
nut crop culture 9 252
Chestnut oak 9 237
Chevalier C 7 454
Chevalier lens system 7 454
Chevon 6 227 229
Chevrotain 1 568
Chewing gum 3 59, 5 422-423
Chewink 14 1
Chi square distribution 13 70-72
Chi square test 2 230-231
Chianti 14 507
Chiasma 9 58
Chiasmodontidae 10 10
Chiastolite 1 397
Chicago caissons 2 389
Chichibabin aldehyde ammonia synthesis 11 112
Chick's law 12 215
Chickadee 3 58*, 13 655
Chickaree 13 31
Chicken 3 58
vertebra 14 307
Chicken flea 12 345
Chicken louse 7 593
Chicken mite 8 518
Chickenpox and shingles 3 58 59*, 12 370
Chicle 3 59*, 4 358, 5 422; 6 296
Chicory 3 59
Chief cell digestive system 4 160
parathyroid gland 9 559
Chiemsee Lake 5 115
Chigger 3 59*, 14 115, 174
see also Trombiculid mite
Chigoe 12 345
Chikungunya virus 1 499
Child C M 11 541
Child's law *see* Langmuir-Child law
Childe V G 1 513
Childhood infections, acute 4 54
Childia spinosa 1 47
Chile saltpeter 9 102
Chilean nitrate 2 416, 12 408
Chilean parroquet 11 69
Chilled iron 2 540
Chilo simplex 7 472
Chilodonella 6 500
Chilomastix mesnili 10 474
Chilomonas 8 169
Chilomonas paramecium 3 579
Chilopoda 1 564 3 59 61*
centipede 2 629
distribution 3 60
Lithobiomorpha 3 60
Myriapoda 8 682
Notostigmophora 3 60
Pleurostigmophora 3 60
taxonomy 3 60
Chilostomella mindea 5 493
Chiloxanthus 6 408
Chimaerae (plant) 3 61*
6 165 12 360
perichial 10 331 332
plant growth 10 331
sectorial 10 331 332
Chimaeridae 6 465
Chimaeriformes 6 465
Chimney 3 61 62
concrete 3 62
foundations 3 62
furnace (steam generating) 3 571
Chimney—*cont*
masonry 3 62
oscillating wind forces 7 532
steel 3 62
Chimney swift 13 336
Chimpanzee 3 62 6 182
Chin fly 8 680
Ch'in ling mountains 1 577
Ch'in ling Range 1 581
China, W 6 400
China pottery 10 346
China clay 2 648 3 160 161
China Plain 1 580
China Sea 12 531
Chinard, F 9 437
Chinawood oil 7 113
Chinch bug 3 62*, 6 405
Chinchilla 3 62 63
Chinchilla lanigera 3 63
Chinese blue 10 224
Chinese chestnut 3 57
Chinese insect wax 14 445
Chinese lacquer 7 576
Chinese vegetable tallow 5 [illegible]
Chinemaster leivs 12 500
Chiniofon 11 193
Chinle formation 10 45, 14 5
Chinook salmon 12 14
Chinook wind 3 63*, 14 46
Chinquapin 3 58
Chintz 13 537
Chiomitidae 3 10
Chip sampling (mining) 8 497
Chipmunk 3 63*, 13 31
Chipping sparrow 12 562
Chiridota 1 491
Chiridotidae 1 491
Chirognathidae 3 406
Chironomidae 8 426
Chironomus 5 530, 8 426 11 511
Chiropsalmus quadrumanus 3 612
Chiroptera 3 63*, 8 82
bat 2 109
Chiroptera fossils 3 63 64
Chirotenetes 5 33
Chirothetidae 4 40
Chitaspis 5 7
Chitin 2 617, 3 64*, 5 653 6 298 10 400
Chitinase 2 19 5 203
Chitinophoma 10 462 463
Chiton 1 559 10 487
Chittwood B G 9 30
Chive 9 326
Chlamydiaceae 11 567
Chlamydobacteriaceae 3 64 65
Chlamydobacteriales 3 64 65*, 11 64
Crenotrichaceae 3 65
Peloploraceae 3 65
Schizomycetes 12 65 66
taxonomy 2 11
Chlamydomonadidae 11 46

lamydomonads 8 128
hlamydomonas 1 235, 5 658, 10 213 275 11 58 12 235
hlamydomonas agloeformis 11 55
Chlamydomonas bicocca 11 55
Chlamydomonas braunii 11 450
[illegible] coccifera 11 55
Chlamydonsaurus 13 23
Chlamydoselache 9 458, 12 157
Chlidonias nigra 13 495
Chloragogen 9 313
Chloral hydrate 1 228 232 5 74 6 595 12 129
Chloramine hydrazine 6 530
ramine T 5 66
wamphenicol 1 475 4 276, 678 10 256 13 528
amino acids 1 308
antibiotic 1 464 468
lorangium 10 213
loranil see tetrachloro p benzoquinone
loranthaceae 10 241
lorapatite 1 489
hlorate 5 66* 72 4 466
herbicide 6 421
hlordane 5 76, 251 252 7 140
insecticide 7 140
Chlorella 5 79 80 10 188 11 60
Chlorella pyrenoidosa 12 468
Chlorenchyma 5 495 7 436 441 13 115
Chloric acid 5 66 72
Chloride 5 66 67* 72 73
organic 6 325 330
Chlorinated biphenyl 5 76
Chlorinated naphthalenes 5 76
Chlorination 6 325 330
hydrocarbons 5 73 76
pyrometallurgy nonferrous 11 121
water purification 14 401 408
Chlorine 1 475 5 67 76*
chlorate 5 66
chloride 5 67
diaphragm cell 5 69
electron configuration 4 504
halogen elements 6 324
ionization potential 4 504
lung irritant 5 45
manufacture 5 69 72
natural compounds 5 72
natural occurrence 5 68
organic compounds 5 73 76 6 325 330
perchlorate 10 9
production 4 466
properties 5 68 69
Chlorine—cont
safety precautions 5 69
in sea water 6 567, 12 117
sterilization 13 136
uses 5 67 68
velocity of sound in 12 515
Chlorine 26 in rocks 11 271
Chlorine electrode 4 472
Chlorine manufacture 5 69 72
[illegible] 5 72
[illegible] 82
alteration of biotite 2 246
authigenic 4 94
bleaching 2 258 259
peridotite 10 12
Chloritic shale 12 241
Chloritoid 5 77
Alpha Chloroacetophenone 1 36
tear gas 5 45
N-(Chloroacetyl) aniline 7 64
Chloroacetylene 5 75
9 Chloroacridine 1 51
2 Chloroallyl diethyldithio carbamate 6 421
Chloroauric acid 6 231
Chlorobacteriaceae 11 552
Chlorobacterium 11 553
Chlorobenzene 1 463 5 76 13 136
Chlorobenzene process 10 112
Chlorobenzilate 8 518
m Chlorobenzoic acid 2 475
o Chlorobenzoic acid 2 475
p Chlorobenzoic acid 2 475
p Chlorobenzylpenicillin 9 620
2 Chloro-4 6 bis(diethylamino) 5 triazine 6 423
2 Chloro 4 6 bis(dipropylamino) see triazine 6 423
2 Chloro-4 6 bis(ethylamino) see triazine 6 423
Chlorobium 11 553
Chlorobium thiosulfatophilum 2 56
Chlorobromomethane 5 280
2 Chlorobutadiene 10 487
2 Chlorobutadiene 1 3 neoprene 11 639
4 Chloro-2 butynyl N (3 chlorophenyl) carbamate 6 421
Chlorochroa 6 410
Chlorochroa ligata 6 405
Chlorochroa sayi 6 405
Chlorochromatium 11 553
Chlorochromonas 3 117
Chlorococcales 2 601
Chlorocruorin 10 464, 11 510 512
7 Chloro 6 demethyl tetracycline 13 528
2 Chloro-N,N-diallyl acetamide herbicide 6 421
2 Chloro-4 (diethyl 6 ethylamino) see triazine herbicide 6 423
Chlorodifluoromethane 5 501
2 Chloro 4 (ethyl 6 isopropylamino) see triazine 6 423
Chlorofluorohydrocarbon 5 74
Chloroform 5 75, 77
haloform reaction 6 323
infrared spectrum 7 108 109
Chlorogonium 8 169 11 58
Chlorogulanide 8 77
2 Chloro 4 (hydroxymercuri) phenol 5 564
5-Chloro-7 iodo 8 hydroxyquinoline 11 193
Chloroisoquinoline 7 289
Chloroleukemia 8 619
Chloromalonaldehyde 11 113
Chloromethane 5 73, 10 41
bis(Chloromethyl) ether 5 473
Chloromethylpyrimidine 13 599
O (5 Chloro 4 methylumbelliferone) O O diethyl phosphorothioate 7 142
Chloromonadida 5 77 78*, 5 99, 11 52
Chloromonadina see Chloromonadida
Chloromycetin see Chloramphenicol
Chloromyxum 8 689
Chloroparacide miticide 8 518
Chloropentammineplatinum (IV) chloride 5 534
bis(p Chlorophenoxy)methane 8 518
p Chlorophenyl p chlorobenzyl sulfide 8 518
5 (p Chlorophenyl) 2 4-diamino-6 ethylpyrimidine 11 114
2 2 bis(p Chlorophenyl) 1 1 dichloroethane 7 140
3 (p Chlorophenyl) 1 1 dimethylurea 1 124
herbicide 6 423
[illegible]
[illegible]
[illegible]

Chocolate tellurite agar 4 208
Choelocnema pulticaria 3 485
Choffatella 5 431
Choke (filter) 3 84, 10 561
Choke cherry 3 56
Cholaepus 12 363
Cholangiole 7 556
Cholangioma 7 563
Cholecalciferol 5 378
Cholecystitis 3 650, 6 17, 20
Cholecystokinin
digestive system 4 171
endocrine mechanisms 4 593
gallbladder 6 15-17
Cholelithiasis 6 20
Choleothreips 13 629
Cholera 1 696, 2 350, 4 102, 219, 9 594, 13 1, 340
Cholera vibrio 3 84
Cholestanol 13 137
Cholesterol 3 84-85
adrenal cortex steroid 1 71
androgen 1 398
biosynthesis 3 84 85
biosynthesis of progester one 10 644
blood chemistry 3 197
cholic acid 2 185
digestive system 4 171
distribution 3 85
ergosterol 5 65
in gallstones 6 20
lipid metabolism 7 531
liver metabolism 12 566
metabolic disorders 8 259
pantothenic acid 9 538
plasma proteins 2 265
reproductive system 11 478
simple lipids 7 529
sterol 13 139
Choline 1 251, 2 54, 3 85*, 4 236, 7 5, 34, 12 196, 14 340
Choline acetylcholine 1 37
bioassay 2 194
food 5 371
industrial production 3 85
lipid metabolism 7 534
Choline bicarbonate 11 184
Cholinergic heart beat 5 139
Cholinesterase 2 137, 156
Cholorpus 12 382
Chonchostraca 1 561
Chondodendron tomentosum 10 96
Chondracanthus 12 236
Chondrichthyes 1 414, 420, 2 315, 3 85-86*, 12 560
Chimaerae 3 61
Elasmobranchii 3 86; 4 418
Holocephali 3 86, 6 465
ray 11 518
shark 12 242-243
Chondriosomes *see* Mitochondria
Chondrite 8 314
chemical phases in 4 546
Chondrite—*cont*
primeval solar matter in 4 547
Chondroblast 12 352
Chondrocranium 12 355
Chondrocyte 2 533
Chondrodite 6 516
Chondrotin sulphate 2 534
Chondroma 9 320, 12 369
Chondromyces crocatus 8 686
Chondroneurocranium 12 355
Chondrosarcoma 9 320
Chondrostei 1 46, 57 58, 9 442 443
Chondrosteidae *see* Acipenseriformes
Chondrus crispus 6 297, 11 554
Chonotrichida 3 86*, 6 467, 11 53
Chopper 3 86, 14 325
see also Vibrator
Chopper, neutron *see* Neutron chopper
Chopper stabilized amplifiers 4 220 221*, 12 202
Choppin, G R 8 222 14 67
Chopping 3 86
Chopping bit 2 293
Chord 3 87
Chord (truss) 14 121
Chorda tympani 13 399
Chordata 1 420, 3 87 88*, 262, 538
Cephalochordata 2 643
fossil record 3 87
Tunicata 14 140
Vertebrata 14 308
Chordeiles minor 9 101
Chordodes 6 238
Chordodidae 6 238
Chorea, Huntington's *see* Huntington's chorea
Chorioallantoic membrane 1 329, 3 615
Chorioallantois 1 256, 5 241
Chorion 1 256 3 88* 5 158 241, 14 225
Amniota 1 328
extraembryonic membranes 5 158
invertebrate embryology 7 226
placentation 10 253
Reptilia 11 482
Chorionepithelioma 11 481
Chorionic carcinoma 9 320
Chorionic gonadotrophins 10 250
Chorionic villi 3 88
Chorionopteris 3 265
Choriopteс 12 30
Choristerinula 11 537
Choristida 3 88 89* 4 57, 10 515
Choristoceras marshi zone 14 82
Choristoneura fumiferana 7 467, 472
Chorochromatic map 2 535
Choroid 5 162, 169 171
anatomy 5 169
Choroid tela 9 57-58
Choropleth map 2 534 535
Choukoutienian culture 9 612
Chrétien, H 3 127
Chrétien telescope 13 451
Christiansen, C 5 266
Christiansen, R. 12 60
Christiansen filter 5 266
Christie, S H 14 485
Christmas disease 6 499
Christmas factor 2 266
Christmas tree (oil well) 9 297-298
Christmasberry thrip 13 628
Christoffel symbols 2 406, 6 160
Christy, H 3 554
Chromadoria 9 30
Chromadorida 9 30
Monhysterida 9 30
Chromadorida 9 30
Chromadoroidea 3 89
Chromaffin *see* Adrenal gland, Aortic body
Chromaffin bodies 4 588
Chromaffin cell 1 74
Chromaffin system 1 488
carotid body 2 531
Chroman 11 108
Chromate 3 89 106, 4 108
Chromatic aberration 3 89 91
color correction 3 90 91
dispersion formula 3 89 90
geometrical optics 9 363
Chromatic graph 6 254
Chromatic resolving power 11 499 500
Chromaticity diagram 3 293
Chromatids 8 521
Chromatin 2 588 607, 11 221 222
Chromatium 2 29, 11 552
Chromatogram 3 93
Chromatography 1 461 692, 2 453 527 3 91 98* 5 21
amino acid 1 309 310
biochemistry 2 196
detection methods 3 94
differential migration 3 96 97
electrochromatography 3 97 98
gas *see* Gas chromatography
mixtures 3 94
nomenclature 3 93
procedure 3 91 93
separation (chemical and physical) 12 185
solvent 3 95
sorbent 3 95 96
systems 3 94
uses 3 93
Chromatophore 2 645 3 88, 103*, 8 169 10 213 11 36
allophore 3 99
antaugophore 3 99
arthropods 3 101 102
cephalopods 3 98 99
Chrysophyta 3 117 118
control systems 3 101 102
Dinoflagellida 4 197
diurnal rhythm 3 101
embryonic origin in vertebrates 3 103
endocrine mechanism 4 594
erythrophore 3 99
functional significance 3 103
genetics 3 102
guanophore 3 99
humidity 3 100
integument 7 174 175
iridophore 3 99
leucophore 3 99
light 3 100 101
lipochrome 3 99
melanophore 3 99
morphological color change 3 102
nervous excitement 3 1
neural crest 9 78
occurrence 3 98
Phaeophyta 10 89
photophore gland 10 179 180
physiological color cha 3 102
pigmentary activity 3
pteridophore 3 99
structure and action 3 99 100
temperature 3 100
types 3 99
vertebrates 3 102
visual background 3 10
xanthophore 3 99
Chrome dyes 4 310
Chrome green 10 224
Chrome orange 10 224
Chrome refractories 12 410
Chrome tanning 7 446
Chrome yellow 10 224
Chromel 1 260
Chromel C 7 265
Chromel P alloy 9 96
Chromic anhydride 3 106
Chromic hydroxide 3 106
Chromic oxide 3 106
Chrominance 3 297 13 473
Chrominance subcarrier o television 3 297 298
Chromite 3 103* 106 8 27
chromium ore 3 105
iron ore 7 258
in meteorites 8 513
Chromium 3 103 106
alloys 3 104
analytical methods 3 1

Chromium—*cont*
chromate 3 89
chromite 3 103
crystal structure 3 599
dichromate 4 108
[illegible]
3 104
natural occurrence 3 103 104
principal compounds 3 105 106
properties 3 104 105
uses 3 104
Chromium hydride 3 105
Chromium nickel stainless steel 13 34
Chromium plating 4 531
Chromium stainless steel 13 34
Chromizing 8 280
Chromobacterium 5 95, 96
Rhizobiaceae 11 546
Chromobacterium amethystinum 11 547
Chromobacterium janthinum 11 547
Chromobacterium marismortui 11 547
Chromobacterium violaceum 11 547 12 196
Chromoblastomycosis 3 106
Chromocyte 10 515
Chromogen 4 298 12 583
Chromolipid *see* Carotenoid
Chromomere 2 264
Chromomycosis 3 106
Alpha Chromone 11 108
Chromopeptide 2 221
Chromophore 4 298 10 188
spectrophotometric analysis 12 593
Chromoplast 2 528 3 98
Chromosome 1 692 2 602 3 106 113* 654 6 497 10 132 12 233
aberration *see* Chromosome aberration
allele 1 256
chemistry 3 109
cytology (molecular basis) 3 654
deoxyribonucleic acid 4 66 9 215
fine structure 3 110 111
lampbrush 3 111 113
meiosis 8 209 211
mitosis 8 521
morphology 3 107 109
number 3 107
polyploidy 10 487
salivary gland 3 111
sex 3 107
special 3 111
theory of heredity 3 114 115
Chromosome aberration 3 113 114
heteroploidy 3 115
human genetics 6 533
mutation 8 670
radiation cytology 11 221
[illegible]
[illegible]
[illegible]

Chocolate tellurite agar 4 208
Choelocnema pulicaria 3 485
Choffatella 5 431
Choke (filter) 3 84, 10 561
Choke cherry 3 56
Cholaepus 12 363
Cholangiole 7 556
Cholangioma 7 563
Cholecalciferol 5 378
Cholecystitis 3 650, 6 17, 20
Cholecystokinin
  digestive system 4 171
  endocrine mechanisms 4 593
  gallbladder 6 13-17
Cholelithiasis 6 20
Choleothrips 13 629
Cholera 1 696, 2 350, 4 102, 219, 9 594, 13 1, 340
Cholera vibrio 3 84
Cholestanol 13 137
Cholesterol 3 84-85
  adrenal cortex steroid 1 71
  androgen 1 398
  biosynthesis 3 84-85
  biosynthesis of progesterone 10 644
  blood chemistry 3 197
  cholic acid 2 185
  digestive system 4 171
  distribution 3 85
  ergosterol 5 65
  in gallstones 6 20
  lipid metabolism 7 531
  liver metabolism 12 566
  metabolic disorders 8 259
  pantothenic acid 9 538
  plasma proteins 2 265
  reproductive system 11 478
  simple lipids 7 529
  sterol 13 139
Choline 1 251, 2 54, 3 85*, 4 236, 7 5, 34, 12 196, 14 340
Choline acetylcholine 1 37
  bioassay 2 194
  food 5 371
  industrial production 3 85
  lipid metabolism 7 534
Choline bicarbonate 11 184
Cholinergic heart beat 3 139
Cholinesterase 2 137, 156
Choloepus 12 382
Chonchostraca 1 561
Chondodendron tomentosum 10 96
Chondracanthus 12 236
Chondrichthyes 1 414, 420, 2 315, 3 85-86*, 12 360
  Chimaerae 3 61
  Elasmobranchii 3 86, 4 418
  Holocephali 3 86, 6 465
  ray 11 348
  shark 12 242 243
Chondriosomes *see* Mitochondria
Chondrite 8 314
  chemical phases in 4 546
Chondrite—*cont*
  primeval solar matter in 4 547
Chondroblast 12 352
Chondrocranium 12 355
Chondrocyte 2 533
Chondrodite 6 516
Chondroitin sulphate 2 534
Chondroma 9 320, 12 369
Chondromyces crocatus 8 686
Chondroneurocranium 12 355
Chondrosarcoma 9 320
Chondrostei 1 46, 57 58, 9 442-443
Chondrosteidae *see* Acipenseriformes
Chondrus crispus 6 297, 11 554
Chonotrichida 3 86*, 6 467, 11 53
Chopper 3 86, 14 323
  see also Vibrator
Chopper, neutron *see* Neutron chopper
Chopper stabilized amplifiers 4 220 221*, 12 202
Choppin, G R 8 222, 14 67
Chopping 3 86
Chopping bit 2 298
Chord 3 87
Chord (truss) 14 121
Chorda tympani 13 399
Chordata 1 420, 3 87 88*, 262, 538
  Cephalochordata 2 643
  fossil record 3 87
  Tunicata 14 140
  Vertebrata 14 308
Chordeiles minor 9 101
Chordodes 6 238
Chordodidae 6 238
Chorea, Huntington's *see* Huntington s chorea
Chorioallantoic membrane 1 329, 3 615
Chorioallantois 1 256 5 241
Chorion 1 256, 3 88* 5 158 241, 14 225
  Amniota 1 328
  extraembryonic membranes 5 158
  invertebrate embryology 7 226
  placentation 10 253
  Reptilia 11 482
Chorionephrithelioma 11 481
Chorionic carcinoma 9 320
Chorionic gonadotrophins 10 250
Chorionic villi 3 88
Chorionopteris 3 263
Choriotpes 12 30
Choriotrelinitis 11 537
Choristida 3 88 89*, 4 57, 10 513
Choristoceras marshi zone 14 82
Choristoneura fumiferana 7 467, 472
Chorochromatic map 2 535
Chorord 5 162, 169 171
  anatomy 5 169
Choroid tela 9 57 58
Choropleth map 2 534-535
Choukoutienian culture 9 612
Chrétien, H 3 127
Chrétien telescope 13 451
Christiansen, C 5 266
Christiansen, R 12 60
Christiansen filter 5 266
Christie, S H 14 485
Christmas disease 6 499
Christmas factor 2 266
Christmas tree (oil well) 9 297-298
Christmasberry thrip 13 628
Christoffel symbols 2 406, 6 160
Christy, H 3 554
Chromadoria 9 30
  Chromadorida 9 30
  Monhysterida 9 30
Chromadorida 9 30
Chromadoroidea 3 89
Chromaffin *see* Adrenal gland, Aortic body
Chromaffin bodies 4 588
Chromaffin cell 1 74
Chromaffin system 1 488
  carotid body 2 531
Chroman 11 108
Chromate 3 89 106, 4 108
Chromatic aberration 3 89-91
  color correction 3 90 91
  dispersion formula 3 89-90
  geometrical optics 9 363
Chromatic graph 6 254
Chromatic resolving power 11 499 500
Chromaticity diagram 3 293
Chromatids 8 521
Chromatin 2 588, 607, 11 221-222
Chromatium 2 29 11 552
Chromatogram 3 93
Chromatography 1 461 692 2 453 527 3 91 98* 5 21
  amino acid 1 309 310
  biochemistry 2 199
  detection methods 3 94
  differential migration 3 96 97
  electrochromatography 3 97 98
  gas *see* Gas chromatography
  mixtures 3 94
  nomenclature 3 93
  procedure 3 91 93
  separation (chemical and physical) 12 185
  solvent 3 95
  sorbent 3 95 96
  systems 3 94
  uses 3 95
Chromatophore 2 645 3 98 103*, 8 169, 10 213, 11 9
  allophore 3 99
  antagophore 3 99
  arthropods 3 101 102
  cephalopods 3 98 99
  Chrysophyta 3 117 118
  control systems 3 101 102
  Dinoflagellida 4 187
  diurnal rhythm 3 101
  embryonic origin in vertebrates 3 103
  endocrine mechanisms 4 594
  erythrophore 3 99
  functional significance 3 103
  genetics 3 102
  guanophore 3 99
  humidity 3 100
  integument 7 174 175
  iridophore 3 99
  leucophore 3 99
  light 3 100 101
  lipochrome 3 99
  melanophore 3 99
  morphological color change 3 102
  nervous excitement 3 100
  neural crest 9 78
  occurrence 3 98
  Phaeophyta 10 89
  photophore gland 10 179-180
  physiological color change 3 102
  pigmentary actions 3 100
  pteridophore 3 99
  structure and action 3 99 100
  temperature 3 100
  types 3 99
  vertebrates 3 102
  visual background 3 101
  xanthophore 3 99
Chrome dyes 4 310
Chrome green 10 224
Chrome orange 10 224
Chrome refractories 11 410
Chrome tanning 7 446
Chrome yellow 10 224
Chromel 1 260
Chromel C 7 265
Chromel P alloy 9 96
Chromic anhydride 3 106
Chromic hydroxide 3 106
Chromic oxide 3 106
Chrominance 5 297, 13 473
Chrominance subcarrier color television 5 297 298
Chromite 3 103* 106 8 277
  chromium ore 3 103
  iron ore 7 258
  in meteorites 8 313
Chromium 3 103 106
  alloys 3 104
  analytical methods 3 106

romium—*cont*
chromate 3 89
chromite 3 103
crystal structure 3 599
[illegible] 4 108
[illegible]
[illegible]
ionization pote[illegible]
metallurgical extraction 3 104
natural occurrence 3 103 104
principal compounds 3 105 106
properties 3 104 105
uses 3 104
Chromium hydride 3 105
Chromium nickel stainless steel 13 34
Chromium plating 4 531
Chromium stainless steel 13 34
Chromizing 8 280
[illegible]*romobacterium* 5 95 96
Rhizobiaceae 11 546
iromobacterium amethysti
mum 11 547
hromobacterium janthinum 11 547
hromobacterium marismortui 11 547
Chromobacterium violaceum 11 547 12 196
Chromoblastomycosis 3 106
Chromocyte 10 513
Chromogen 4 298 12 583
Chromolipid *see* Carotenoid
Chromomere 2 264
Chromomycosis 3 106
Alpha Chromone 11 109
Chromopeptide 2 221
Chromophore 4 298 10 188
spectrophotometric analysis 12 583
Chromoplast 2 528 3 99
Chromosome 1 692 2 602 3 106 113* 654 6 497 10 132 12 233
aberration *see* Chromosome aberration
allele 1 256
chemistry 3 109
cytology (molecular basis) 3 654
deoxyribonucleic acid 4 66 9 215
fine structure 3 110 111
lampbrush 3 111 113
meiosis 8 209 211
mitosis 8 521
morphology 3 107 109
number 3 107
polyploidy 10 497
salivary gland 3 111
sex 3 107
special 3 111
theory of heredity 3 114 115
Chromosome aberration 3 113 114
heteroploidy 3 113
human genetics 6 513
mutation 8 670
[illegible]tology 11 221
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
recombination, genetic 11 375
Chromosphere 3 116*, 7 521, 13 268 270*
Chromous hydroxide 3 106
Chromous oxide 3 106
Chronic leukemia 3 192 202
see also Leukemia
Chronograph 3 116
Chronology building 4 59
Chronometer 3 116*, 204, 457 5 69
Chronopotentiometry 10 456
Chronoscope 3 116
Chroococcaceae 14 398
Chroococcus 3 636, 12 67
Chrysomyidae 4 212
Chrysalid 2 381
Chrysalis 12 326
Chrysanthemum 9 407 10 334
Chrysanthemum cinerariaefolium 7 142 11 110
Chrysanthemum coccineum 7 142 11 110
Chrysanthemum lace bug 6 405
Chrysanthemum marschallii 11 110
Chrysemys picta 3 23 14 167
Chrysididae 6 574
Chrysiridia 7 473
Chrysiridia madagascariensis 7 469
Chrysis 6 581
Chrysoberyl 3 116* 6 98
Chrysobothris femorata 3 287
Chrysochloridae 7 143
Chrysocolla 3 116* 464
Chrysogorgia flexilis var *africana* 6 238
Chrysoidine 4 299
Chrysomelidae 3 278
Chrysomonadida 3 117* 11 52
Chrysomonadina *see* Chrysomonadida
Chrysomonads 8 128
Chrysomyia bezziana 8 680
Chrysomyia megacephala 8 680
Chrysopa perla 9 80
Chrysopetalidae 10 461
Chrysophyceae 3 117
Chrysophyta 1 237 3 117 119* 10 320 346 13 545
Bacillariophyceae 3 117
classification 3 117
Chrysophyceae 3 117
Coccolithidae 3 249
Coccolithophorida 3 249
Chrysophyta—*cont*
diatoms 3 119 4 103 104
golden brown algae 3 119
morphology 3 117
yellow green algae 3 117
Xanthophyceae 3 117
[illegible]
[illegible],8
[illegible] 135
[illegible]
asbestos 1 569, 12 197
Chrzanowski, P 6 264 13 513
Chthamalidae 2 74
Chubb T 13 272
Chubsucker 13 236
Chuckchi Sea 9 166, 271
Chuckwalla 3 119 120
Chugach Range 9 159
Chugwater formation 14 85
Chugwater group 11 388
Chum, C. 9 266
Chum salmon 12 14
Church J F 12 391, 392
Churches acceptable noise levels 9 129
Churn drill 2 297, 8 472, 9 291
Chyle 7 531
Chylomicra 7 531
Chylomicron 8 259
Chyme 1 566 5 204
Chymotrypsin 5 20 203 204
digestive system 4 170
protein metabolism 11 42
Chymotrypsinogen 5 20
digestive system 4 170
Chytridiales 10 200
Cibarium 7 459
Cibin Mts 5 118
Cicada 6 471
Cicada killer 6 582
Cicadella 3 254
Cicadellidae 6 470 472 744
Cicadidae 6 470 471
Cicer arietinum 2 116
Cichlidae 10 10
Cichorium intybus 3 59
Cicindela 3 286
Cicindelidae 3 276
Ciconiidae 7 1
Ciconiiformes 1 694 3 120
crane 3 535 536
flamingo 5 295
heron 6 425 426
ibis 7 1
Cicuta maculata 10 439 14 189
Cicutoxin 10 439
Cidaroida 3 120* 4 41 371 360
Cider vinegar 14 324
de la Cieva Juan 6 385, 14 309
Cigarbox cedar 2 579
Cigarette beetle 3 287
Cilento Mountains 5 118
Cilia 2 621
Ciliary body 5 168-169
Ciliary body *see also* Ciliary process
Ciliary process anatomy and histology 5 162 171
ciliary body 5 165
embryology 5 161 165
pars ciliaris retinae 5 165
zonula ciliaris 5 165
Ciliata 3 120
Entodiniomorphida 13 5
Heterotrichida 13 5
Holotricha 3 120 6 467, 11 53
Hypotrichida 13 5
Odontostomatida 13 5
Oligotrichida 13 5
Spirotricha 3 120 11 53, 13 5
Tintinnina 13 5, 651
Ciliatea 11 53
Ciliophora 3 120 122*, 11 53
characteristics 3 120
Ciliata 3 120
Ciliatea 11 53
ciliation 3 121
evolution 3 122
fission 3 122
infraciliature 3 121
mouth 3 121
nuclear apparatus 3 121
reproduction 3 122
systematics 3 120
Cillobacterium 7 382
Cima di Verrana 5 119
Cimbex americana 6 580
Cimbicid sawfly 6 574
Cimbicidae 6 574
Cimex 6 404
Cimex hemipterus 2 127, 6 405
Cimex lectularius 2 127, 6 405
Cimex lectularius columbarius 6 408
Cimicidae 2 127, 5 6 6 401
Cinchona 3 122
quinine 11 190
Rubiales 11 647
Cinchona alkaloids 11 193
Cinchona bark 1 475
Cinchona officinalis 3 122
Cinchona pubescens 3 122
Cinchonine 11 193
Cinchoninic acid 11 193
Cincindelidae 3 276
Cincinnati Observatory 1 596
Cincinnatian series 9 374
Cinclidae 9 589
Cincophen 11 193
Cinder cone 10 84, 14 350
CinemaScope 3 127
Cinematography 3 125 129*, 10 159
aspect ratio 3 124 129
CinemaScope 3 127
Cinemiracle 3 128 129
Cinerama 3 125 127
film 3 123 124

Cinematography—*cont*
Kinepanorama 3 129
M G-M 65 3 128
motion-picture cameras 3 123-124
motion picture projectors 3 124-125
optical projection systems 11 1-3
optical recording 9 353-358
Superscope 235 2 128
Technirama 3 128
Todd-AO 5 128
VistaVision 3 127-128
wide screen processes 3 125-129
Cinemiracle 3 128-129
Cinerama 3 125-127
Cinetheodolite 9 358-362
Cingulata 4 411
Cinnabar 3 129*, 8 278, 13 255
mercury ore 8 298
Cinnamaldehyde 3 228
Cinnamic acid (trans) 2 475
Cinnamomum camphora 14 527
camphor 2 432
Cinnamomum zeylanicum 3 129
Cinnamon 3 129
spice and flavoring 12 612
Cinnoline 4 104
Cinnomomum camphora 2 433
Ciona 1 574
CIPC 1 125 6 421
Circaea 10 12
Circassian walnut 14 381
Circinate vernation 2 361
Filicales 5 260 264
Circinus 3 415 414
Circle 1 389, 3 130*
analytic geometry 1 389
arc (mathematics) 1 500
area 1 528
chord 3 87
conic section 3 399
diameter 4 97
nine point 1 405
radius 11 521
Circle of confusion cameras 2 430
Circuit, electric 3 130 133
alternating current *see* Alternating current circuit theory
analogy to vibrating system 4 515
branch circuit 2 319
bridge circuit 2 337
conductors 3 392 394
coupled *see* Coupled circuits
direct current *see* Direct current circuit theory
equivalent circuit 5 63-64
filters, *see* Filter electric
Circuit, electric—*cont*
impedance 7 36
IR drop 7 257
Kirchhoff's laws 7 365-364
maximum power transfer theorem 7 37
networks *see* Network theory, electrical
nonsinusoidal wave forms *see* Waveform, nonsinusoidal
open 3 132, 9 332
parallel 3 132, 9 546
printed 10 593-597
protection 14 522
rectifier 11 383 386
series 3 132 12 196
series parallel 3 132
short 3 133, 12 306
stored energy 11 133
superconducting 13 296
testing 3 136 137
Thévenin's theorem 13 596-598
time constant 13 643 644
transient *see* Transient, electric
Y delta transformations 14 598 599
see also Wiring (electric)
Circuit electronic 3 133 135
amplifier *see* Amplifier
breadboard model 3 134, 2 323
cathode follower *see* Cathode follower
clamping circuit 3 152-154
clipping circuit 3 202
coincidence amplifier 3 269 270
comparator circuit 3 330 331
component ratings 3 134
design 3 133 134
detector *see* Detector
discriminator 4 255
distortion *see* Distortion (electronic circuits)
environmental factors 3 134
feedback circuit 5 198 200
frequency divider 5 503
frequency multiplier 5 515
gate circuit 6 79 80
grounding 6 281
impedance matching 7 37 38
limiter circuit 7 516 518
maximum power transfer theorem 7 37
microcircuits 8 348 350
military equipment tests 3 134
modulator *see* Modulator
molecular electronics 8 545-546
Circuit, electronic—*cont*
motorboating 8 616
multivibrator 8 628 632
noise 9 117
oscillator *see* Harmonic oscillator, electric
parasitic oscillation 9 554
phase inverter 10 101-102
power supply *see* Power supply (electronic)
printed circuit 10 593 597
prototype model 3 134
pulse generator 11 93 94
radio service testing 3 135
rectifier *see* Rectifier
relaxation oscillator 11 438-440
reliability 3 134
scaling circuit 12 48 49
solid state circuits 8 545-546
specifications 3 133-134
stability 3 134
sweep generator 13 534
tests 3 134
time-delay circuits 13 644 645
trigger circuit 14 90 91
Circuit magnetic *see* Magnetic circuits
Circuit printed *see* Printed circuit
Circuit breaker 3 135 136
arc extinction 3 136
blowout coil 2 270
contacts 3 420
electric distribution systems 4 425
substation 4 441
Circuit testing electrical 3 136 137
fault location bridge 3 137
Murray loop test 3 136
resistance measurement 11 490 495
Varley loop test 3 136
Circuit theory *see* Circuit electric
Circular accelerators 9 574 581
Circular birefringence
rotatory dispersion 11 633
Circular chart recorders 11 389
Circular cylindrical cavity resonator 2 577
Circular dichroic crystal 4 108
Circular dichroism 9 316 14 88
Circular helix 6 393
Circular inch 8 188
Circular measure 8 188
Circular mil 8 188
Circular motion 11 631 632
centripetal force 2 640 641
Circular paper chromatography 3 96
Circular plane 14 515
Circular plate structural 10 407
Circular prestress prestressed concrete 10 587
Circular saw 14 542
Circularly polarized light 9 346
Circulation 3 137 141*, 7 121
blood pressure 3 140
blood vessels 3 137
cardiac output 3 141
circulating fluid 3 137
closed circuit 3 139 140
contraction cycle 3 138
control of arteriolar diameter 3 140 141
dynamics 3 140 141
ebb and flow system 3 140
fluid transport systems 3 137 139
frictional resistance 3 140
heart 3 137-138
heart excitation 3 139
muscular actions 3 139
open circuit 3 140
phlebitis 10 115
rate of beat 3 139
reflex controls 3 141
resistance in open system 3 140
types of systems 3 139 140
venous pressure 3 141
Circulation, physiology of cerebral 2 504
Circulation physiology of hepatic 2 505
Circulation, physiology of pulmonary 2 504
Circulation postnatal 2 494
Circulation at term, fetal 2 492-494
Circulation disorders 3 141 14
Buerger's disease 2 561
deficiencies 3 142
embolism 3 143
hemophilia 6 411
hemorrhage 3 143
hyperemia 3 145
infarction 7 93 94
ischemia 3 142
plethora 3 142-143
thrombosis 3 143
vascular disturbances 3 141 143
Circulation theorem Kelvin's *see* Kelvin's circulation theorem
Circulator microwave 3 221 6 401 8 418
Circulatory system 2 447, 3 143* 7 156
blood vessels 2 270
cardiovascular 3 144
cerebral circulation 2 50
hypertension 6 592
lymphatic 3 144

Circulatory system closed 3 137
Circulatory system Insecta 7 136

Circumcenter nine point circle 3 130
Circumference 4 47
Circum Pacific belt 13 410
petrographic province 10 51
seismology 12 149
dana 5 290, 7 283
planidae 5 290
phis unicuncta 1 545 3 635
que 3 143*, 6 202 455
ratulidae 10 461
ratulus 10 461
rhosis 2 265 3 144 145*, 1 562 8 260
clinical pathology 5 199 202
ripedia 1 560 561, 3 145 146* 562
Acrothoracica 3 145 562
Apoda (Crustacea) 1 491, 3 145 562
Ascothoracica 1 575, 3 145 562
barnacle 2 101
development 3 146
ecology 3 145
Rhizocephala 3 145 562
Thoracica 3 145 562 13 608
Cirrocumulus 3 210 211
Cirrostratus 3 210 212
Cirrothauma 4 40 9 274
Cirrus 3 210 212
Cis trans effect (*genetics*) 11 61 62
Cis trans isomerism 7 279
Cisidae 5 278
Cislunar space 7 222
Cisterna chyli 7 628
Cistron 11 579
gene 6 104
gene action 6 105
Citrous juice(s) 11 62
Citrullina vegalis 7 465 469
Citraconic acid (test) 2 475
alpha Citral 3 147* 5 71 13 496
Citrate 3 146* 3 74
Citrate test 7 48
Citric acid 3 146 147* 4 435 5 370 8 303
buttermilk 8 454
fermentation 3 146
Krebs cycle 7 370
recovery 3 147
submerged production process 3 146
surface production process 3 146

Citric acid cycle *see* Krebs cycle
Citrine 6 90, 11 182, 12 521, 13 676

Citrulline 1 529 3 132-145, 9 112, 14 215
Citrullus vulgaris 14 411
Citrullus vulgaris 8 214
Citrus aurantiifolia 7 514
Citrus aurantium 9 370
Citrus canker 3 547
Citrus flavoring 3 147 148
citrus oils 3 147
spice and flavoring 12 615
Citrus fruit *see* entries on specific fruit such as Orange Lemon
Citrus grandis 6 252
Citrus limon 7 450
Citrus mealybug 8 187
Citrus medica 3 147
Citrus paradisi 6 252
Citrus reticulata 8 86 13 389
Citrus sinensis 9 370
Citrus thrips 13 628
Citrus whitefly 6 475
Cittotaenia ctenoides 12 50
Cittotaenia denticulata 12 50
City development 7 391 392
Ciucului (Csik) Mountains 5 118
Civet 3 148
Civet cat 12 61
Civet gland 12 61
Civil defense administrative and control communications 13 432
amateur radio 1 299
attack warning 13 431
telephone system *see* Telephone civil defense system
Civil engineering 3 148 149
concrete *see* Concrete
construction *see* Construction engineering
history 3 148
sanitary *see* Sanitary engineering
scope 3 148
soil mechanics *see* Soil mechanics
structures *see* Structures (engineering)
surveying *see* Surveying
transportation *see* Transportation engineering
water supply *see* Water supply engineering
see also Hydraulics Strength of materials
Civil Reserve Air Fleet air transportation 1 160

Civil time *see* Zone time
Cladding 3 149 150, 11 554
Cladida 4 369
Cladiscites ruber zone 14 82
Cladistia *see* Polypteriformes
Cladius isomerus 6 580
Cladocera 1 561 3 150 151*, 562 14 393
Cladocopa 3 151 152*, 562 9 457
Cladode 13 124
Cladodus 3 152
Cladogenesis macroevolution 8 10
Cladonia 3 457
Cladophyll 13 111
Cladorhiza longipinna 10 431
Cladoselache 3 152
Cladoselachii 3 152 4 419, 6 523
Cladosporium 8 169
Cladosporium 2 380, 13 541
Cladosporium carpophilum 9 601
Cladosporium cucumerinum 3 613
Cladosporium fulvum 4 52
Cladosporium herbarum 4 52
Cladosporium tignae 3 529
Cladothrix 3 65
Cladothrix dichotoma 3 65
Cladoxylon 3 263
Claiborne Group 5 176
Clairaut's formula for polar flattening 13 516
Clairvoyance 5 159
Claisen condensation 11 112
condensation reaction 3 374 375
ethyl acetoacetate 5 87
ketone 7 539
Claisen reaction 1 230
Clam 3 152* 5 419
Clam worm 10 461
Clambidae 3 276
Clamping circuit 3 152 154
Clamshell 2 369 5 133 134 6 243
Clanculus 8 561
Clanny W R 12 5
Clapeyron, B P E 5 55
Clapeyron equation 5 55
boiling point 2 276
melting point 8 215
Clapper relay 11 441
Clarain 3 229 232 233
Claret 14 507
Clarification 3 154 155
centrifugation 2 651 655
sedimentation (industrial) 12 143 144
separation (mechanical) 12 186 187
solid liquid filters 5 272
thickening 13 602
Clarifier circular 12 222
rectangular 12 222

Clarifying agent (food) 5 376
Clarinet 8 665 666
Clarion Fracture Zone 9 261
Clark, A 11 5 7
Clark, G L 8 567
Clark, H L 9 544
Clark, W F 1 3 478 10 232
Clark coupling 3 526
Clark's nutcracker 9 234
Clarke, F W 2 239 4 546
Clarke ellipsoid 6 120
Clarno formation 5 479
Clasper 12 215
copulatory organ 3 472 473
reproductive system 11 467
Class (*taxonomy*) 13 401
Class A power amplifier 1 544, 10 553 554
Class AB power amplifier 1 544, 10 554
Class B power amplifier 1 544 10 554
Class C power amplifier 1 544, 10 554
cathode modulated 1 557
grid modulated 1 555 557
plate modulated 1 556
vacuum tube amplifier 1 544
Classical field theory *see* Field theory classical
Classical mechanics *see* Mechanics classical
Classical navigation systems 9 18 19
Classical optics 9 563
Classical statistics *see* Boltzmann statistics
Classification, biological 3 155
animal 1 422
bacteria taxonomy of 2 10
plant taxonomy 10 577
Classification, mechanical, 3 155 156*, 12 186
Classification, scientific 12 72 73
Classification societies 4 280, 12 255
ship design 12 274
Classon elementary particle 4 543
Classrooms acceptable noise levels 9 129
Clastic rocks 12 135, 138
particle size classification 11 590
Clastic sediments 12 135 136, 138 139
Clathrate compounds 3 156-158
Clathrina 2 393 395, 3 158
Clathrina clathrus 2 396
Clathrina coriacea 2 396
Clathrinida 3 159* 10 515
Clathrochloris 11 553
Clathrodictyon 13 191
Clathrulina 6 590

Cinematography—*cont*
Kinejanorama 3 129
M-G-M 65 3 128
motion-picture cameras 3 123-124
motion-picture projectors 3 124-125
optical projection systems 11 1-3
optical recording 9 353-358
Superscope 235 2 128
Technirama 3 128
Todd-AO 3 128
VistaVision 3 127-128
wide-screen processes 3 125-129
Cinemiracle 3 128 129
Cinerama 3 125-127
Cinetheodolite 9 358-362
Cingulata 4 411
Cinnabar 3 129*, 8 278, 13 255
mercury ore 8 228
Cinnamaldehyde 1 228
Cinnamic acid (trans) 2 475
Cinnamomum camphora 14 527
camphor 2 432
Cinnamomum zeylanicum 3 129
Cinnamon 3 129
spice and flavoring 12 612
Cinnoline 4 104
Cinnomomum camphora 2 433
Cinna 1 574
CIPC 1 125, 6 421
Circaea 10 12
Circassian walnut 14 384
Circinate vernation 2 361
Filicales 5 260 261
Circinus 5 413 414
Circle 1 389, 3 130*
analytic geometry 1 389
arc (mathematics) 1 500
area 1 528
chord 3 87
conic section 5 399
diameter 4 97
nine point 1 405
radius 11 321
Circle of confusion *cameras* 2 450
Circuit, electric 3 130-153
alternating current *see* Alternating current circuit theory
analogs to vibrating system 4 313
branch circuit 2 319
bridge circuit 2 537
conductors 3 302 304
coupled *see* Coupled circuits
direct current *see* Direct-current circuit theory
equivalent circuit 5 63 64
filters, *see* Filter, electric
Circuit, electric—*cont.*
impedance 7 36
IR drop 7 257
Kirchhoff's laws 7 363 364
maximum power transfer theorem 7 37
networks *see* Network theory, electrical
nonsinusoidal wave-forms *see* Waveform, nonsinusoidal
open 3 132, 9 332
parallel 3 132, 9 546
printed 10 593 597
protection 14 522
rectifier 11 385-386
series 3 132, 12 196
series parallel 3 132
short 3 133 12 306
stored energy 11 133
superconducting 13 296
testing 3 136 137
Thévenin's theorem 13 596-598
time constant 13 643 644
transient *see* Transient, electric
Y delta transformations 14 598-599
see also Wiring (electric)
Circuit electronic 3 133 135
amplifier *see* Amplifier
breadboard model 3 134, 2 325
cathode follower *see* Cathode follower
clamping circuit 3 152 154
clipping circuit 3 202
coincidence amplifier 3 269 270
comparator circuit 3 330 331
component ratings 3 134
design 3 133 134
detector *see* Detector
discriminator 4 235
distortion *see* Distortion (electronic circuits)
environmental factors 3 134
feedback circuit 3 198 200
frequency divider 5 503
frequency multiplier 3 515
gate circuit 6 79 80
grounding 6 281
impedance matching 7 57 58
limiter circuit 7 516 518
maximum power transfer theorem 7 57
microcircuits 8 319 350
military equipment tests 3 134
modulator *see* Modulator
molecular electronics 8 545 546
Circuit, electronic—*cont*
motorboating 8 616
multivibrator 8 628 632
noise 9 117
oscillator *see* Harmonic oscillator, electric
parasitic oscillation 9 554
phase inverter 10 101-102
power supply *see* Power supply (electronic)
printed circuit 10 593 597
prototype model 3 134
pulse generator 11 93 94
radio service testing 3 135
rectifier *see* Rectifier
relaxation oscillator 11 438 440
reliability 3 134
scaling circuit 12 48 49
solid state circuits 8 545 546
specifications 3 135 134
stability 3 134
sweep generator 13 554
tests 3 134
time delay circuits 13 644-645
trigger circuit 14 90 91
Circuit, magnetic *see* Magnetic circuits
Circuit, printed *see* Printed circuit
Circuit breaker 3 135 136
arc extinction 3 136
blowout coil 2 270
contacts 3 420
electric distribution systems 4 425
substation 4 451
Circuit testing electrical 3 136 137
fault location bridge 3 137
Murray loop test 3 136
resistance measurement 11 490 495
Varley loop test 3 136
Circuit theory *see* Circuit electric
Circular accelerators 9 574 581
Circular birefringence rotatory dispersion 11 633
Circular chart recorders 11 580
Circular cylindrical cavity resonator 2 577
Circular dichroic crystal 4 108
Circular dichroism 9 546 14 88
Circular helix 6 305
Circular inch 8 188
Circular measure 8 188
Circular mil 8 188
Circular motion 11 631 632
centripetal force 2 610 611
Circular paper chromatography 3 96
Circular plane 14 585
Circular plate structural 10 407
Circular prestress prestressed concrete 10 587
Circular saw 14 542
Circularly polarized light 9 546
Circulation 3 137 141*, 7 158
blood pressure 3 140
blood vessels 3 137
cardiac output 3 141
circulating fluid 3 137
closed circuit 3 139 140
contraction cycle 3 139
control of arteriolar diameter 3 140 141
dynamics 3 140 141
ebb and flow system 3 137
fluid transport systems 3 137 139
frictional resistance 3 137
heart 3 137 138
heart excitation 3 139
muscular *activity* 3 138
open circuit 3 140
phlebitis 10 115
rate of beat 3 139
reflex controls 3 141
resistance in open system 3 140
types of systems 3 139 141
venous pressure 3 141
Circulation, physiology of cerebral 2 501
Circulation, physiology of hepatic 2 505
Circulation, physiology of pulmonary 2 504
Circulation, postnatal 2 494
Circulation at term, fetal 2 492 494
Circulation disorders 3 141
Buerger's disease 2 561
deficiencies 5 142
embolism 3 144
hemophilia 6 411
hemorrhage 5 143
hyperemia 3 143
infarction 7 93 94
ischemia 3 142
plethora 3 142 143
thrombosis 5 143
vascular disturbances 3 141 143
Circulation theorem Kelvin *see* Kelvin's circulation theorem
Circulator microwave 5 22 6 303 8 418
Circulatory system 2 447 3 144* 7 156
blood vessels 2 270
cardiovascular 3 141
cerebral circulation 2 hypertension 6 592
lymphatic 3 140

Climatology—*cont*
temperature measurements 1 158 159
windflow patterns 3 174
world wide water cycle 3 177
see also Bioclimatology Meteorology
Climatopathology 2 200
Climatophysiology 2 200
Climax ecosystem 4 408
Climax community 3 182 186
climatic climax 3 185, 13 234
disclimax 3 184 185
edaphic modifiers 3 184
fire 3 185
fog 3 185 186
kinds of climax 3 185
lumbering 3 185
monoclimax 3 185
overgrazing 3 185
polyclimax 3 185 184
salt spray 3 185
topographic modifiers 3 184
wind 3 185
limax formation 2 204
limax plant formations 3 186 192* 10 299
dry desert 3 190 191
evergreen hardwood forest 3 186 192
forest formations 3 186
needle leaved forest 3 188 189
savanna 3 189
shrub grassland 3 190
summergreen deciduous forest 3 188
tall grassland 3 190
temperate rainforest 3 187
thorn forest 3 189 190
tropical deciduous (monsoon) forest 3 187 188
tropical rainforest 3 186 187
tundra 3 191
limb indication see Rate of climb indicator
line 12 572
linical pathology 3 192 202
agglutination reactions 3 201
agglutinins 3 201
antitoxins 3 201
bacteriology and parasitology 3 200
blood banking 3 201 202
blood chemistry 3 197 200
cold hemagglutination 3 201
complement fixation tests 3 201
cross matching 3 201
fecal analysis 3 200
feces 3 200
Clinical pathology—*cont*
hematology 3 194 197
heterophil agglutination tests 3 201
lysins 3 201
metabolic studies 3 202
opsonins 3 201
precipitins 3 201
protein bound iodine 3 200
Rh factor 3 201
serology 3 201
special urinary examinations 3 193 194
sputum 3 200 201
toxin antitoxin reactions 3 201
urinalysis 3 192 194 14 219
Clinical pharmacology 10 97
Clinoenstatite 4 616 11 129
Clinoferrosilite 11 129
Clinohumite 6 516
Clinometer 3 202 13 324
Clinozoisite 3 40
Clinton *hematite* 11 588
Clinton iron ore 9 379
Clintonia 13 123
Clintonite 3 77
Clona celata 2 298
Clonidae 2 298
Clipping circuit 3 202 203
see also Limiter circuit
Clitellata 1 429
Clitellum 4 355
Clitoris 11 467 474
Clivia 5 38
Cloaca 4 152
Cloacal bladder 14 219 220
Clock 3 202 205
atomic 1 649 650
balance wheel 3 204
basic movement 3 203
clock paradox 3 206 207
escapement 3 204 5 68 69*
hysteresis motor 6 600
power supply 3 204
quartz see Quartz clock
Shortt 3 205
sidereal 13 612
temperature compensation 3 205
Clock *control* systems 3 205 206
Clock paradox 3 206 207
experimental verification 3 207
implications for space travel 3 207
relativity 11 434
theory 3 206 207
Clone 12 573
Clonorchiasis 3 207 208* 10 428
Clonorchis sinensis 3 207
Clonus cybernetics 3 637
Cloos E. 13 417
Cloos H. 10 421
Clorachne 5 99
Closed circuit television 3 208 209
image dissector 13 466
networks 13 469
vidicon 13 465
Closed loop control system 3 209 429 438*
see also Feedback control system
Closed system (geology) lithosphere processes in 7 550
radioactive decay 4 427
Clostridium 2 6 14 65, 5 67, 8 432 9 111, 620 12 460
Bacillaceae 2 2
gangrene 6 38
Clostridium aceticum 2 37
Clostridium acetobutylicum 2 2, 43
acetone butanol fermentation 1 34
Clostridium acidi urici 2 37 47
Clostridium bifermentans 6 38
Clostridium botulinum 2 2 45, 46 506 461 3 424 425, 9 594
type A 14 6
Clostridium butylicum 2 44
Clostridium butyricum 2 42 8 432
Clostridium chauvoei 2 255
Clostridium felsineum 13 542
Clostridium feseri 2 255
Clostridium kluyveri 2 42
Clostridium nigrificans 2 37, 5 424
Clostridium novyi 6 38
Clostridium oedematiens 6 38
Clostridium parabotulinum 2 506
Clostridium pasteurianum 2 2
Clostridium perfringens 2 19 45 5 425 6 38
virulence 14 530
Clostridium propionicum 2 42 11 15
Clostridium septicum 6 38
Clostridium sporogenes 2 45 46 197 8 432
Clostridium tetani 1 466 467 2 45 197 461 13 257 14 6
Clostridium tetanomorphum 2 45 6 220
Clostridium thermoaceticum 2 37
Clostridium thermosaccharolyticum 3 424
Clostridium tyrobutyricum 3 13 milk 8 432
Clostridium welchii 4 24
see also Clostridium perfringens
Clot retraction time blood 3 196
Cloth beam 13 535
Clothes moth 7 464
Clothing 3 15, 16
see also articles on specific clothing materials
Clothing disinfectants 1 475
Clotting blood 3 195
Cloud 3 209 212
classification 3 210 212
electrification 7 509
formation 3 209
frontal zone types 5 539
in hurricane 6 521
physics *see* Cloud physics
precipitation types 10 573
radiation from 6 269
satellite observations 8 322 329
solar energy absorption 7 141
thunderstorm types 13 616
WMO cloud classification 3 211
Cloud chamber 3 212 214
Cloud forest 3 186 192
Cloud physics 3 214 218
aerosol 1 99 101, 3 214
artificial stimulation of rain 3 217 218
cloud droplets 3 215
cloud formation 3 214 215
coalescence process 3 215
condensation nuclei 3 214
ice crystal process 3 215
ice nuclei 3 215 216
mechanisms of precipitation release 3 215
multilayer cloud precipitation 3 215
production of showers 3 215
raindrop size 3 216
salt nuclei 3 214 215
Cloud point 10 550
Cloud prediction 14 451
Cloud seeding 3 217 218
rainfall 14 457
Clouding agent (food) 5 376
Clove 3 218* 8 685, 12 612
Clove oil 3 71
Clover 3 218 222
chromosome number 3 218
diseases 3 222
important species 3 220
species characteristics 3 220
sweetclover 3 221
true clovers 3 218
Clover seed chalcid 6 581
Clover seed midge 5 562
Cloverleaf highway 14 14
Clown beetle 3 226
Club foot 8 658
Club moss 12 137
Lycopsida 7 626
Clubroot disease cabbage 2 393
Clupea harengus 6 426, 12 121
Clupea pallasi 6 426
Clupeidae 3 225

Clatrolitan andersoni 7 139
Claudette 1 550
Claus method sulfur 13 255
Clausius Clapeyron equation sublimation 13 210
thermochemistry 13 559
Clausius Mosotti equation dielectric constant 4 112
Claustrophobia 10 119
Clavia 3 255
Clavatoraceae 3 11
Clavaxinellida 3 158-159*, 4 57, 10 513
Axinellina 3 158
boring sponges 2 298 299
Epipolasina 3 158
Hadromerina 3 158
Clavicepa purpurea 1 574, 10 313, 359, 431, 440
Clavicle 12 306, 358
see also Collarbone
Clavicornia 3 278
Clavularia 1 226, 3 255, 13 148
Clavularia chunni 1 227
Clavularia garciae 13 148
Claw integument 7 175
Clay (geology) 3 159-160
agriculture 3 160
chlorite group 3 165
clay-mineral composition 3 160
composition of materials 3 159 160
concept of materials 3 164
on continental shelf 8 133-135
on deep sea floor 8 135 137
drilling mud 3 162
mineral impurities 3 160
particle size term 3 159
properties of materials 3 160
rock term 3 159
see also Clay minerals
Clay commercial 3 160 161
architectural 3 167 168
attapulgite clay 3 162
ball clay 3 161
bentonite 3 162
bleaching clay 3 162
bonding clay 3 162
burles clay 3 161
ceramic technology 2 647 650, 3 160
china clays 3 160 161
color 3 163
diaspore clay 3 161
dry strength 3 163
drying shrinkage 3 163
fireclay 3 161
firing shrinkages 3 163
flint clay 3 161
foundry industry 3 161
green strength 3 163
illite 7 22 23
ink 3 161
insecticides 3 161
Clay, commercial—*cont*
kaolin 3 160-161
kaolinitic clays 3 160 161
lightweight aggregate 3 163
mullite 3 161
oil industry 3 160
paint 3 161
paper industry 3 160
petroleum refining 3 161
plastics 3 161
pottery 10 546
properties 3 163
refractories 3 161
rubber manufacture 3 161
shrinkage 3 163
strength 3 163
underclays 3 163
uses 3 163 164
vitrification range 3 163
whitewares 3 161
see also Collarbone
Clay technology Clay products
Clay Belt (Canada) 9 142
Clay contact adsorption treatment 10 70 71
Clay minerals 3 164-167
allophane 3 165
amorphous constituents 3 164-165
anauxite 3 165
attapulgite 3 165
bentonite 2 163
ceramic technology 2 647 650
chain structure types 3 165
chlorite 3 77
classification of 3 164
clastic sediments 12 139
clay mineral concept 3 164
dehydration 3 166
diagenesis in shales 4 91 95
dickite 3 165
endellite 3 165
fuller's earth 5 559
geologic thermometry 6 128
halloysite group 3 165, 6 322
hectorite 3 164
illite 3 165
ion exchange 3 166 12 424 426
kaolinite 3 165, 7 330
metahalloysite 3 165
mixed layer combinations 3 165
montmorillonite group 3 165, 8 587 588*
nacrite 3 165
nomenclature 3 164
nontronite 3 165
optical properties 3 167
organic reactions 3 167
origin 3 167
palygorskite 4 165
properties 3 166-167
Clay minerals—*cont*
regular mixed-layer types 3 164
saponite 3 165
sauconite 3 164
sedimentary rocks 12 134
sepiolite 3 165
shale 12 241
shape 3 166
soil composition 12 423-424
soil texture 12 419
structure 3 165 166
three-layer type 3 164
two layer type 3 164
vermiculite 3 165, 14 305
water holding capacity 3 166
weathering processes 14 459
Clay pipe 3 167
Clay products, architectural 3 167-168
brick 2 330, 13 204 205
terra cotta 13 205, 498
tile 13 205, 640
Claypan 12 439
Claypool, L. L. 10 373
Claystone 1 529
Claytonia 3 188
Clean bomb 1 648
Clear air turbulence 1 97
Clear channel (radio) 1 363, 11 249
Clearance test clinical pathology 3 192 202
Clears 14 484
Clearwing moth 7 464
Clearwinged grasshopper 9 416
Cleavage embryonic 2 257, 3 168 169* 7 229
blastomere differentiation 3 168
cleavage types 3 168
chromosomal behavior 3 168
embryology 4 568
holoblastic 13 52
Cleavage rock 3 169
fold and fold systems 3 367
rock fabric studies 13 205
slate 12 374
Cleavelandite 5 215
Cleaving enzyme 5 25
Cleft lip 7 529 9 168
Cleft palate 6 339 9 168, 498 13 492
Cleidocranial dysostosis 12 368
Cleidoic egg Reptilia 11 482
Cleistothecia 5 125
Clenthra 12 358
Clematis 13 122
Clementine nuclear reactor 11 358
Clements, F. 10 375, 13 234
Clemmys guttata 5 23, 14 167 168
Clemmys inculpata 5 23, 10 127, 14 168
Clemmys marmorata 14 167
Clepsidropsis 3 265
Clerodae 3 277
Clerk, Dougald 7 196
Clerodea 3 276 277
Cleve P. T. 6 465, 13 616
Cleve's acid 9 3
Clevis pin 3 169 170
Click beetle 2 151, 3 277
Cliff chalk 3 7
escarpment 2 326, 3 69
ice 1 459
talus 13 588
Cliftonia monophylla 7 268
Climacograptus 2 253, 6 250
Climacograptus typicalis 6 250
Climacostomum 6 431, 432
Climacteric 8 224
Climate 3 171-182
change in 3 170 171
chronologies carbon 14 11 297
circulation of marginal seas 9 249 250
dendrochronology 4 58 60
moderating effect of ocean 8 116
of past ages *see* Paleoclimatology
postglacial 10 525
prediction 3 171
regional patterns 4 581 584
regions 3 179 182
and soil erosion 12 451 452
stratification with altitude South America 12 527
types (map) 4 585
see also Climatology
Climatic bubo *see* Lymphogranuloma venereum
Climatic change 3 170 171
Climatic climax 3 183, 13 236
Climatic disease 2 200 202
Climatic prediction 3 171
Climatius 1 25
Climatological snow line 12 39
Climatology 3 171 182
air pressure patterns 3 177
atmosphere effects 3 172
climatic change 3 170 171
climatic prediction 3 171
climatic regions 3 179 182
continental precipitation patterns 3 177
continentality 3 423 424
global scale 3 171
land sea distribution 3 174 176
marine atmospheric influences 3 175
pressure systems 3 177
regional climatic types 4 581 584
solar radiation 3 172

Cobalt—*cont*
electron configuration 4 504
extractive metallurgy 8 277
ferromagnetism 5 230 232
ionization potential 4 504
metallurgical extraction 3 246 247
natural occurrence 3 246
properties 3 246
uses 3 247
Cobalt 60 3 247
as tracer 14 7 8
isotopic irradiation 7 260 11 289
parity 9 566
snowfall measurement 10 576
Cobalt 60 furnace 13 135
Cobalt catalysis 6 543
Cobaltite 3 248*
arsenic ore 1 550
cobalt mineral 3 246
Cobb H A 4 616
Cobble 3 398 11 590
Cobitidae 3 648
Coblentz W W 7 107
Coblentzian Stage 4 87
Cobra 3 248
Coca 3 249* 6 174
Cocaine 1 403 3 248 249* 6 174, 9 4 10 454
Cocarboxylase 13 598
Cocci 2 5
Coccidae 8 187 12 49
Coccidia 3 249* 11 52 13 11
Adeleida 3 249
Eimeriida 3 249 4 416
Telosporidea 13 495
Coccidioides immitis 3 249
Coccidioidomycosis 1 342 466 467, 3 249* 6 589 10 428
antigens 3 249
forms 3 249
growth media 3 249
Coccinellidae 3 278
Coccinellidea 3 276 278
Coccobacillus 6 413
Coccolithidae 3 249
Coccolithophorida 3 249* 8 128
Chrysomonadida 3 117
Coccoloba uvifera 10 472
Coccomyces 8 213
Coccomyces hiemalis 3 55 5 546 8 213
Coccomyxa ophiurae 9 343
Coccostromorpha 1 529
Coccosteus 1 555 10 255
Coccus cacti 1 457
Coccygeal bones 14 309
Coccyx 9 616 12 617 14 308
Coccyzus americanus 3 612
Coccyzus erythrophthalmus 3 612
Coccyzus minor 3 612
Cochin (chicken) 3 58
Cochineal dye 1 457
Cochineal insect 2 386, 6 476
Cochiobolus 4 53
Cochlea 6 351, 10 124
Cochlear duct 4 322-325
Cochlear potential hearing 6 352
Cochliodontidae 2 515
Cochliomyia americana 4 216
Cochliomyia macellaria 4 216
Cockatoo 3 249 250
Cockcroft Walton accelerator 3 250 251* 9 573*
Cockle 3 251* 3 100, 202
Cocklebur 12 146
Cockroach 3 251 252
Cocoa 3 252 253
caffeine 2 388
theobromine 13 546
Cocoa butter 2 384 3 253, 5 185, 189
Cocoa powder and chocolate 3 252 253
cocoa butter 3 253
cocoa powder manufacture 3 253
confectioner's coatings 3 253
milk chocolate 3 253
processing technique 3 252
sweet chocolate 3 253
Cocoanut 3 253 254
coir 3 270
diseases 3 253
importance 3 253
nut crop culture 9 232
Coconut crab 5 105
Coconut palm 9 524
Cocoon 12 526
Lepidoptera 7 459
Cocos nucifera 3 253 9 524
Cocozelle 13 28
Cocurrent spray dryer 4 287
Cod 3 416 8 113
Cod liver oil 5 189
Codе *A D* 6 10
Code *electrical see Electrical codes*
Code wheel 1 386
Codehydrogenase I *see Diphosphopyridine nucleotide (DPN)*
Codehydrogenase II *see Triphosphopyridine nucleotide (TPN)*
Codeine 1 386 9 4 345 10 498
Codeonal 9 4
Codfish 3 254* 6 2
Codiaceae 1 237 6 319
Coding information theory 7 99 102
Codling moth 7 472
Codominance 6 500
Codonellopsis 13 631
Codonophilus 3 291
Codonga 11 45
Codonigidae 11 45
Coefficient matrix dual coordinates 6 135
Coelacanth 3 254
Coelacanthidae 3 254
Coelacanthiformes 3 254 255*, 555 9 442
Coelacanthini *see Coelacanthiformes*
Coelastrum 1 235
Coelenterata 1 415, 420, 3 255 261*, 11 213
Anthozoa 1 455
asexual reproduction 3 260
Conularida 3 439
digestive system 3 260
epithelial system 3 258
geologic distribution 3 261
Hydrozoa 6 571 572
Medusa 3 256
Mesoglea 3 259
morphology 3 256 257
muscular system 3 259
nematocyst 3 257
nervous system 3 258 259
polyp 3 256
regeneration 11 419
reproduction and *development* 3 260 261
Scyphozoa 12 90 91
sexual reproduction 3 260 261
skeletal system 3 259 260
spirocyst 3 257
taxonomy 3 255
Coelenterata fossils 3 261 263
Coelenteron 3 256
Coeloblastula 5 9
Coeloblastula larva 2 594
Coelolepida 1 420 3 262*
Coelom 3 88, 262 263* 5 97, 12 64
Enterocoela 5 2 3
Coelomic cavity 6 174 175
Coelomocyte 5 140
Coelophasis 4 198
Coelopidae 4 212
Coeloplana 3 610
Coeloplana borki 10 412
Coelopleurus 1 499
Coeloseris 12 76
Coelosphaerium 3 636
Coenagrionidae 9 275
Coenobitidae 4 31
Coenobium cell constancy 2 601
Coenomyidae 4 212
Coenopteridales 3 263 264* 9 505 10 346
Coenothecalia 1 455 3 255, 264*
Coenurosis 3 264*, 641 642
Coenurus 3 264 641-642
Coenzyme 2 13 3 264* 529 13 598
Coenzyme—*cont*
adenosinediphosphate (ADP) 1 61
adenosinetriphosphate (ATP) 1 61
adenylic acid 1 65
bacterial *see Bacterial coenzyme*
biochemistry 2 199
biological oxidation 2 215
niacin 9 92
riboflavin 11 561
triphosphopyridine nucleotide (TPN) *14 110*
vitamin B_6 14 311
Coenzyme A 1 56 2 13 14
lipid metabolism 7 531
metabolic disorders 8 259
pantothenic acid 9 537
Coenzyme I *see Diphosphopyridine nucleotide (DPN)*
Coenzyme II *see Triphosphopyridine nucleotide (TPN)*
Coercive force 6 599
Coercivity 6 599
Coes, L 6 443
Coes type high temperature-high pressure apparatus *6 444*
Coffea 3 265
Coffea arabica 3 265
Coffea canephora 3 265
Coffea excelsa 3 265
Coffea liberica 3 265
Coffee 3 265-267
caffeine 2 388
diseases 3 265
processing 3 265 269
Rubiales 11 647
Cofferdam 3 267 268
cast in place 3 267
cellular 3 268
construction equipment 3 418
filled crib 3 268
nautical 3 268
sheeted 3 267
use 3 268
Coffinite 11 269 *14 210*
Cogging polyphase induction motors 7 75
Coghill G E 2 135 8 605
Cognitive concept 7 445
Cogonium 1 574
Cohen E R 1 651
Cohenite 8 313
Coherent light 7 184 185*, 9 363
Coherent radar 11 211
Doppler 4 266
maser amplification 8 156

Clupeiformes 2 170, 3 222-223*, 9 442
Clupeoidei 3 223
Esocidae 3 223
herring 6 426
menhaden 8 224
pickerel 10 213
Salmonoidei 3 223
shad 12 238
smelt 12 386
Stomiatoidei 3 223
tarpon 13 398
trout 14 119
Clupeoidei 3 223
Clusia 3 187
Clusiidae 4 212
Cluster integrals 13 64
Clutch 3 223 226
automotive vehicle 1 688
centrifugal 3 225
cone 3 224
disk 3 224
eddy current 3 225
electromagnetic 3 225, 4 489
friction 3 224
hydraulic 3 225
hysteresis 3 226
magnetic fluid and powder 3 225
overrunning 3 225
positive 3 223
rim 3 225
spiral jaw 3 224
square jaw 3 224
Clutha River 1 671
Clyde G D 12 302
Clydesdale stallion 6 489
Clypeasteroida 3 226*, 4 360 371
sand dollar 12 22-23
Clypeus 3 275 288
Clythridae 4 212
CMR *see* Contact *microradiography*
CMU 1 121
Cnemidophorus 7 564
Cnidaria *see* Coelenterata
Cnidoblast 3 257
Cnidosporidea 3 226 227*, 11 52 15 11
Actinomyxida 11 52
Actinomyxidia 3 226
asexual reproduction 3 227
Helicosporida 11 52
Helicosporidia 3 226, 6 389 390
Microsporida 11 52
Microsporidia 3 226 8 403, 688, 11 52
Myxosporidia 3 226, 8 688 11 52
CNO cycle 4 553
Coacervate particles first organisms 7 497
Coacervation 3 227 228
Coachella eye gnat 4 215
Coachwhip 2 255
Coaction ecology 5 13
community 3 324 325
Coactivator luminescence 7 617
Coagulase 2 20
Staphylococcus 13 37
Coagulation 3 228
water treatment 14 407
Coagulation necrosis 4 22-24
Coagulation time blood 3 196
Coal 3 228-235
Antarctic 1 440
anthraxylon 3 232
Arctic 1 440
ash fusion temperature 3 230
attritus 3 232
bed thickness 3 231
botanical entities 3 231-232, 240
calorific values 3 230
carbon 2 462
carboniferous 2 469-470
carbonification 3 229
chemical analysis 3 229-230
claram 3 232-233
classification 3 229, 230
coal bearing cycles 3 644 645
coke 3 272
durain 3 232 233
energy sources 4 602
evaluation 3 232
formation 3 228 229
fusain 3 232 233
high fusion ash 3 230
ion exchange 7 242
lignite 7 513
lithotypes 3 232 240
low fushion ash 3 230
major fields of world 8 448 456
microscopy 3 232 233
mineral matter 3 230
occurrence 3 232
paleobotany 3 230 242
petrologic entities 3 231 232 240
petrology 3 232 240 242
physical characteristics 3 231
plant fossils in 3 240
proximate analysis 3 229 230
pyrolysis 11 118
reserves 8 452 454
seams 3 240
texture 3 231
torbanite 13 683
ultimate analysis 3 229 230
uses 3 232
vitrain 3 232 233
world production by countries and grades
Coal—*cont.* 8 450 451
Coal balls 3 235
concretion 3 373
paleobotany 3 240
petrifaction 10 42
Coal chemicals 3 235 236
coke 3 272
creosote 3 541-542
destructive distillation 4 80
Coal gas fuel gas 5 552, 553
methane 8 339
Coal gasification 3 236 237
Coal hydrogenation 2 166
Coal Measures 3 477
carboniferous 2 468
Coal mining 3 237 239
artificial ventilation 3 239
cleaning 3 239
continuous mining system 3 237 238
conventional mining system 3 237 238
drainage 3 239
equipment 3 237
grading 3 239
gunning 3 238
hydraulic mining 3 237
longwall mining 3 237
new developments 3 239
power source 3 237
property development 3 237
prospecting 3 237
room and pillar system 3 237
shaft 3 239
shipping 3 239
slope 3 239
transportation in mines 3 238 239
types 3 237
Coal paleobotany 3 239 242
Coal plow 8 486
Coal preparation plant 8 496
Coal Sack 3 242
Coal tar 3 235 236
creosote 3 541 542
naptha 9 92
Coal tar creosote 14 539
Coalition game theory 6 29
Coarctate pupa 3 283
Coast Rangers 8 618 9 162
Coastal currents *see* Shore processes
Coastal deposition processes 12 299 306
sediment characteristics 8 152 153
Coastal dunes 4 293
Coastal engineering 3 242 14 64
beach erosion 3 242
breakwater 2 525
bulkhead 2 370
groin 6 275
Coastal engineering—*cont.* jetty 7 311
littoral drift 3 242
littoral transport 3 242
longshore transport 12 304 305
navigation channels 12 304 350
pier 10 216
sand by passing plans 12 305
sea wall 12 101
waves and wave forces 3 242
wharf 14 479
Coastal landforms 3 242 244
constructional landforms 3 242
deltas 4 50
destructional landforms 3 243
Eastern United States 9 150
emergent shorelines 3 245
estuaries, geomorphological classification 8 479 48
fiord 3 277
fiord coasts 3 243
flood plains 3 310
karst coasts 3 243
lapiés surface 7 333
new shorelines 3 245
ria coasts 3 243
submergent shorelines 3 243
Coastal marshes 13 333
Coastal plain 3 244 245
fall line 5 179
Southeastern United States 9 150 152
Coastal plain estuaries 5 80
Coastal water bodies *see* Estuarine oceanographi
Coastline 5 79
shore processes 12 299 306
wave attack 12 300
Coated stones (gem) 4 68
Coatings plastics fabrication 10 401 404
Coats Land 1 440
Coaxial cable 3 245 8 422, 14 48 58
connectors 3 404
impedance standards 7 58
stub supports 8 422
Coaxial cavity resonator 2 577
Coaxial planes 10 206
Coaxial transmission lines *see* Coaxial cable
Cobalamin *see* Vitamin B12
Cobalt 3 246 248
analytical methods 3 248
cobaltite 3 248
compounds 3 247 248
crystal structure 3 [illegible]
defer (paints) 4 [illegible]

Cobalt—cont
electron configuration 4 504
extractive metallurgy 8 277
ferromagnetism 5 230 232
ionization potential 4 504
metallurgical extraction 5 246 247
natural occurrence 5 246
properties 5 246
uses 5 247
Cobalt 60 5 247
as tracer 14 7 8
isotopic irradiation 7 269 11 289
parity 9 566
snowfall measurement 10 576
balt 60 furnace 13 135
balt catalysts 6 543
baltite 5 248*
arsenic ore 1 550
cobalt mineral 5 246
bb H A 4 616
bble 5 398 11 590
bbitidae 5 648
bblentz W W 7 107
Coblenzian Stage 4 87
Cobra 5 248
Coca 5 248* 6 174
Cocaine 1 405, 5 248 249* 6 174 9 4 10 434
Cocarboxylase 13 598
Cocci 2 5
Coccidae 8 187 12 48
Coccidia 5 249* 11 52 13 11
Adeleida 5 249
Eimeriida 5 249 4 416
Telosporidea 13 485
Coccidioides immitis 5 249
Coccidioidomycosis 1 342 466 467 5 249* 6 589 10 428
antigens 5 249
forms 5 249
growth media 5 249
Coccinellidae 5 278
Coccinelloidea 5 276 278
Coccobacillus 6 413
Coccolithidae 5 249
Coccolithophorida 5 249* 8 129
Chrysomonadida 5 117
Coccoloba uvifera 10 472
Coccomyces 8 213
Cocromyces hiemalis 5 55 5 346 8 213
Coccomyxa ophiurae 9 549
Coccosteomorphi 1 528
Coccosteus 1 555 10 255
Coccus cacti 1 457
Coccygeal bones 14 309
Coccyx 9 616 12 617 14 308
Coccyzus americanus 5 612
Coccyzus erythrophthalmus 5 612
Coccyzus minor 5 612
Cochin (chicken) 5 58
Cochineal dye 1 457
Cochineal insect 2 386 6 476
Cochliobolus 4 53
Cochlea 6 351, 10 124
Cochlear duct 4 322 323
Cochlear potential hearing 6 352
Cochliodontidae 2 315
Cochliomyia americana 4 216
Cochliomyia macellaria 4 216
Cockatoo 5 249 250
Cockcroft Walton accelerator 5 250 251* 9 573*
Cockle 5 251* 5 100, 202
Cocklebur 12 146
Cockroach 5 251 252
Cocoa 5 252 253
caffeine 2 388
theobromine 13 546
Cocoa butter 2 384, 5 253 5 183, 189
Cocoa powder and chocolate 5 252 253
cocoa butter 5 253
cocoa powder manufacture 5 253
confectioner's coatings 5 253
milk chocolate 5 253
processing technique 5 252
sweet chocolate 5 253
Coconut 5 253 254
coir 5 270
diseases 5 253
importance 5 253
nut crop culture 9 232
Coconut crab 5 105
Coconut palm 9 524
Cocoon 12 326
Lepidoptera 7 459
Cocos nucifera 5 253 9 524
Cocozelle 13 28
Cocurrent spray dryer 4 297
Cod 5 416 8 113
Cod liver oil 5 189
Code A D 6 10
Code electrical *see* Electrical codes
Code wheel 1 386
Codehydrogenase I *see* Diphosphopyridine *nucleotide (DPN)*
Codehydrogenase II *see* Triphosphopyridine nucleotide (TPN)
Codeine 1 366 9 4 343 10 498
Codeonal 9 4
Codfish 5 254* 6 2
Codiaceae 1 237 6 319
Coding information theory 7 99 102
Codling moth 7 472
Codominance 6 500
Codonellopsis 13 651
Codonophilus 5 291
Codonga 11 45
Codosigidae 11 45
Coefficient matrix dual coordinates 6 155
Coelacanth 5 254
Coelacanthidae 5 254
Coelacanthiformes 5 254 255*, 555, 9 442
Coelacanthini *see* Coelacanthiformes
Coelastrum 1 233
Coelenterata 1 413, 420 5 255 261*, 11 213
Anthozoa 1 455
asexual reproduction 5 260
Conularida 5 439
digestive system 5 260
epithelial system 5 258
geologic distribution 5 261
Hydrozoa 6 571-572
Medusa 5 256
Mesoglea 5 259
morphology 5 256 257
muscular system 5 259
nematocyst 5 257
nervous system 5 258 259
polyp 5 256
regeneration 11 419
reproduction and development 5 260 261
Scyphozoa 12 90 91
sexual reproduction 5 260 261
skeletal system 5 259 260
spirocyst 5 257
taxonomy 5 255
Coelenterata fossils 5 261 263
Coelenteron 5 256
Coeloblastula 5 9
Coeloblastula larva 2 394
Coelolepida 1 420 5 262*
Coelom 5 88, 262 263* 5 97 12 64
Enterocoela 5 2 3
Coelomic cavity 6 174 175
Coelomocyte 5 140
Coelophysis 4 198
Coelopidae 4 212
Coelopiana 5 610
Coelopiana bockt 10 412
Coelopleurus 1 499
Coeloseris 12 76
Coelosphaerium 5 636
Coenagrionidae 9 275
Coenobitidae 4 31
Coenobium cell constancy 2 601
Coenomyidae 4 212
Coenopteridales 5 263 264* 9 505 10 346
Coenothecalia 1 455 5 255 264*
Coenurosis 5 264* 641-642
Coenurus 5 264 641-642
Coenzyme 2 13 5 264* 520, 13 598
Coenzyme—cont
adenosinediphosphate (ADP) 1 61
adenosinetriphosphate (ATP) 1 61
adenylic acid 1 63
bacterial *see* Bacterial coenzyme
biochemistry 2 199
biological oxidation 2 213
niacin 9 92
riboflavin 11 561
triphosphopyridine nucleotide (TPN) 14 110
vitamin B_{12} 14 341
Coenzyme A 1 36 2 13 14
lipid metabolism 7 531
metabolic disorders 8 259
pantothenic acid 9 537
Coenzyme I *see* Diphosphopyridine *nucleotide (DPN)*
Coenzyme II *see* Triphosphopyridine *nucleotide (TPN)*
Coercive force 6 599
Coercivity 6 599
Coes, L 6 443
Coes type high temperature high pressure apparatus 6 444
Coffea 5 265
Coffea arabica 5 265
Coffea canephora 5 265
Coffea excelsa 5 265
Coffea liberica 5 265
Coffee 5 265 267
caffeine 2 388
diseases 5 265
processing 5 265 269
Rubiales 11 647
Cofferdam 5 267 268
cast in place 5 267
cellular 5 268
construction equipment 5 418
filled crib 5 268
nautical 5 268
sheeted 5 267
use 5 268
Coffinite 11 269 14 210
Cogging polyphase induction motors 7 75
Coghill, G E 2 135 8 605
Cognitive concept 7 445
Cogonium 1 374
Cohen E R 1 651
Cohenite 8 513
Coherent light 7 184 185*, 9 565
Coherent radar 11 211
Doppler 4 266
maser amplification 8 156

Coherent radar—*cont*
moving target indication
8 420 421
Coherent scattering 12 57
Coherent waves
(electromagnetic) 7 184 185
Coherson (physics)
1 66, 3 268 269*
gases 3 268
ionic crystals 7 248-250
liquids 3 268
solids 3 268 269
Cohesive energy ionic
crystals 7 248 250
solids 3 268 269
Cohn E. J 5 254
Cohn, F 2 66
Coho (coherent oscillator)
8 620
Coho salmon 12 14
Coil 3 269
blowout 2 270
degaussing 4 43
Helmholtz 6 394
induction 7 71 72
inductometer 7 79 80
measurement of *Q*
11 133
solenoid 12 472-473
see also Inductor;
Reactor, electric
Coil spring, automotive
1 685 686
Coin, chemical dating 5 27
Coin tossing, probabilities
10 626
Coinage metal, copper 3 466
gold 6 230
silver 12 329 333
Coincidence 6 153-154
Coincidence amplifier
3 269 270
see also Comparator
circuit
Coincidence counting 12 75
Geiger Muller counter
6 92
Coincidence rangefinder
11 339 340
Coining 3 270
sheet metal 12 252 253
Coir 3 270*, 5 250
Coitus, reproductive system
11 476
Coke 2 462 3 270 272
coal chemicals 3 236
destructive distillation
4 80
iron (extraction from
ore) 7 260
petroleum 3 272, 6 257,
10 72
production 3 271
properties 3 271-272
uses and types 3 270-271
Coke oven 3 271
Coke oven crude light oil
3 235
Coke oven gas 5 555
Coking (petroleum
refining) 3 272 273
catalytic 2 519
destructive distillation
4 80
Cola 3 273
Cola acuminata 3 273
Cola nuts 9 232
Colacium 5 98, 11 55
Colaptes 14 511
Colaptes auratus 5 300
Colchicine 3 273*, 7 514,
10 332, 14 117
Colchicum autumnale 3 273,
7 514, 14 117
Cold, common 3 273 274
Cold cathode tube 3 274-275
diode 3 274, 4 203
field emission tubes
3 274 275
gas tube 6 60 61
triode 3 274
voltage regulator 3 274,
14 367 368*
Cold composition 14 170
Cold emission *see* Field
emission
Cold extrusion forging 5 161
Cold finger still 4 253
Cold forging 5 161
Cold front 5 539 8 330
squall 13 21
Cold heading 5 472
Cold junction
thermocouple 13 563
Cold pressing 4 91, 5 161
Cold rolling, metal 11 618
Cold sawing 12 41
Cold seal pressure vessel
13 248
test tube pressure
vessel 6 445
Cold shortness, malleability
10 401
Cold soda process, wood
pulp 9 539
Cold storage 3 274
packing house 9 489
refrigeration 11 415
Cold type 10 601, 14 170
Cold welding 14 468
Cold working processes
8 286 287
Colebrook C F 10 240
Colemanite 2 293
ferroelectrics 5 225
soil sterilization
12 464
Coleodontidae 5 406
Coleoidea 3 275* 8 559
Belemnoidea 3 275
Cephalopoda 2 645
Octopoda 3 275
Sepioidea 3 275, 12 187
Coleoidea—*cont*
Teuthoidea 3 275, 13 531
Vampyromorpha 3 275
Coleonyx variegatus 6 91
Coleophoridae 7 464
Coleoptera 3 275 288*; 7 134
anatomy 3 275 283
beetle 2 150
classification 3 275 278
common species 3 286 288
digestion 3 281
ecology 3 283 285
embryology 3 282 283
firefly 5 282
fossils 3 285 286, 7 139
nervous system 3 282
paleontology 3 285 286
7 139
parasitism 3 285
preferred habitats 3 284
protective devices
3 281 285
reproduction 3 282
respiration 3 281
sense organ 3 282
social life 3 285
symbiosis 3 285
Coleoptile 12 145
Coleorhiza 12 145
Coleorhynchea 6 469
Coleosporaceae 14 217
Colias 7 473
Colias eurytheme 7 471-472
Colic, biliary 6 14
Colic, cecal 4 162
Colic 3 288
Coliform group, taxonomy
5 2 69
as index of water pollution
12 215
Coliidae 5 288
Coliiformes 5 288
Colimaitu (kelemen) Mts
5 118
Colinus virginianus 11 135
Coliphage 2 69, 5 288*
Colistin 1 476
Colitis 3 288 289* 6 73
ulcerative 14 179
Coll, Alto 5 119
Collagen 3 656 12 365, 564
bone (biophysics) 2 284
disease 7 622
fibrils 2 283, 13 491
gelatin 6 93
glue 6 219
protein fibrous 11 40
Collagenase 2 20
Collagenous fiber 3 402 403
Collarbone 3 289
Collard 3 289
Collared lemming 7 450
Collateral bud 2 360
Collateral points 2 480
Collator, punched card data
processing system 4 14
Collecting lens, optical 7 451
Collective model of nucleus
9 206
Collembola 1 495, 565,
5 289 290, 7 131
springtail 13 14
Collenchyma 5 290*, 495
13 115
cell walls in plants 2 615
leaf anatomy 7 456 41
plant tissue systems 10 37
Collenette 10 514
Collenia 9 503
Colletes 6 582
Colletid bee 6 574
Colletidae 6 574
Colletotrichum 5 295, 8 212
9 237
Colletotrichum agaves 12 36
Colletotrichum boehmeriae
11 334
Colletotrichum capsici 7 325
Colletotrichum circinans
10 310
Colletotrichum gloeosporioides
8 212
Colletotrichum lagenarium
8 215
Colletotrichum
lindemuthianum 8 212
Colletotrichum lunicola 8 21
Colletotrichum piri 9 600
Colletotrichum graminicola 8 2
2 4, 6 Collidine 11 110
Collier 12 255
Collimator sight 6 299
Collineation 6 156
Collinite 3 232
Collip J B 7 163
Collision 3 290 291
atomic 12 53 57
Bose Einstein statistics
2 305
Boltzmann statistics
2 279 281
center of mass coordinates
3 291
classification 3 291
coefficient of restitution
3 291
cross section 12 53 57
molecular 12 55 57
nonradiative 12 53
radiative 12 55
rearrangement 12 53
and scattering 12 53 57
superelastic 12 53
Collision number assumption
2 279 280
Bose Einstein statistics
Colloblast 3 609
Collodermataceae 8 647
Collodictyon 8 169
Colloid 3 291 292
adsorption 1 78 82
aerosol 1 99 101
coacervation 3 228
coagulation 3 228

Colloid—cont.
and color centers 5 295
Donnan equilibrium 4 263
electroosmosis 4 525 526
electrophoresis 4 526 527
emulsion 4 586 587
flocculation 5 310
gel 6 95
gum 6 296
isoelectric point 7 275 276
micelle 8 347
solvation 12 494
colloid mill 5 292 12 550
colloidal dispersion 10 57
colloidal hydrocarbon 10 57
collophane 1 489
collophore 13 18
Collotheca 8 575
Collotheca hoodi 8 575
Collotheciidae 8 575
Collotype plate 10 616
Collotype printing 10 603
Collozoum serpentinum 11 52
Collyritidae 6 463
Colobathristidae 6 401
Colobocentrotus atratus 4 575
Coloboma 5 163
Colobomella 4 89
Colocasia esculenta 4 13
Colocasia esculenta antiquorum 4 13
Cologne spirits see Ethyl alcohol
Colon 1 292
anus 1 487
appendix 1 492
defecation 4 42
digestive system 4 162 173
disorders of 5 289 7 225
Color 5 292 294
chromaticity diagram 5 293
colorimetry 5 295 301 302*
filters 5 266
gray 6 266
pigment 10 223 225
selective absorption 1 11 12
Color blindness 5 300
genetics 6 499
Color burst 5 298
Color centers 5 294 297* 10 140
F centers 5 295 297
origin 5 294 295
I centers 5 295 297
Color change endocrine mechanisms 4 594
Color correction masks 10 607
Color discharge printing 13 542
Color dispersion see Dispersion
Color film 5 124
Color filters 5 266
Color index (stars) 8 73 13 41
Color ink 7 115
Color matching see Colorimetry
Color motion pictures 10 168
Color photography see Photography, color
Color plates 10 612 613
Color printing see Printing in color
Color stabilizer (food) 5 576
Color television 5 297-299
cameras 5 297, 13 460
chrominance 5 297 13 473
chrominance subcarrier 5 297
color burst 5 298
color decoding circuits 13 473
colorplexer (encoder) 13 460
compatible 5 297 299*, 13 473
convergence circuits 13 474
filters 13 460
hue 5 298 13 473
image orthicon 13 462-464
kinescope 5 298 7 349*, 13 474
luminance 5 297
modulation standards 13 477
multiplexing color components 1 355
receivers 13 472 475
saturation 5 298 13 475
scanning standards 13 477
sidebands 5 298
subcarrier sideband frequency 13 477
Color temperature 5 299
heat radiation 6 373
incandescence 7 30
of sun 13 267
Color transparencies 10 167
Color vision 5 299 301*
14 354
central factors 5 301
color blindness 5 300
gray 6 266
Hering theory 5 300
sex linked inheritance 12 235
theories 5 300
Young Helmholtz theory 5 300
Colorado blue spruce 13 19
Colorado Piedmont 9 156
Colorado Plateaus system 8 618 9 161
Colorado potato beetle 2 150 5 297
Colorado River 9 157 160 163 13 520 14 593 595 599
Colorado River delta 9 160
Colorado tick fever 7 299
Coloradoite 13 482
Colorants ink 7 113
Colorimeter 5 301 302
Colorimetric analysis 5 301 302
Colorimetry 5 293, 301 302*
color 5 293
hydrogen ion determination 6 551
pigment 10 223
Coloring agent (food) 5 576
Colorplexer (encoder) 13 460
Colossendeidae 4 41, 11 106
Colostrum immunity 7 34
lactation 7 377 378
mammary gland 8 85
Colpi (pollen) 9 525
Colpidium 11 229
Colpitts oscillator 9 422
Colpoda 14 87
Colpoda cucullus 6 439 11 58
Colpoxylon 11 85 86
Coluber constrictor 2 255, 12 289
Colubridae 13 27
Columba 5 412 414* 12 361
Columba fasciata 4 270
Columba guinea 6 108
Columba livia 5 302, 4 270 6 109, 12 362
Columba fast black G 4 300
Columbia Plateaus system 8 618 9 159 160
Columbia River 9 157 160 12 527 13 520 14 593 599
inland waterways transportation 7 116
Columbidae 4 270
Columbiformes 1 694 5 302* dove 4 270
Columbite 5 302* 8 277
tantalite 13 391
tantalum 13 391
Columbites parisianus zone 14 82
Columbium 5 302
extractive metallurgy 8 277
see also Niobium
Columbotantalate 13 342
Columella 4 320
Columella auris 12 557
Column 5 302 305
base plates 5 305
batten plates 5 304
concrete 5 370 371
eccentrically loaded 5 305
elastic buckling 5 303
Engresser formula 5 303
Euler's formula 5 303
inelastic buckling 5 303
lacing 5 304
local buckling 5 304
shear 5 304
twist buckling 5 305
Column fractionating see Fractionating column
Column chromatography 5 92, 96
lipid 7 550
protein isolation 11 36
Column matrix 8 185
Columnar epithelium 5 42
Columella 8 575
Colydiidae 5 278
Colymbus auritus 6 269
Coma (aberration) see Aberration optical
Coma (of comet) 5 512
Coma Berenices 5 412, 6 12
Coma Berenicieds 8 308
Coma cluster 6 8
Comal Springs, Texas 13 18
Comasteridae 5 549
Comatulida 4 567
Comb antenna see Antenna (aerial)
Comb claw beetle 5 276
Comb footed spider 1 498
Comb-plate 5 609
Combat airplane 1 534 537
Combe Capelle skull 5 554
Combinational circuits 13 344 345 357-358
AND function 4 177, 13 358
Boolean algebraic expressions 13 358
memory 4 177
minimization 13 358
NOT function 4 177, 13 358
OR function 4 177, 13 358
Combination and permutation 5 305
binomial theorem 2 195
Combinatorial analysis 6 253
Combinatorial product 10 627
Combine harvester 1 130
self propelled 1 117
Combing textile 13 553
Combining volumes law of 5 305 306
Combining weight, chemical 1 662
see also Equivalent weight, Gram-equivalent weight
Combs A W 10 33
Combustion 5 306 307
aerothermodynamics 1 102 104
burning time 5 307
burning velocity measurements 2 373 375
chimney requirements 5 61
coal gasification 5 236
fire extinguisher 5 278-280
flame 5 291 293
flame velocity 5 307
flameproofing 5 294 295
fuel 5 549 550
furnace construction 5 575
heat of see Heat of combustion
match 8 170
metal base fuel 8 290
smoke 12 387
spectroscopy of see

Combustion—*cont.*
Spectroscopy of combustion
spontaneous 3 306
Combustion chamber
3 307-308
compression ignition engine 3 308
compression ratio 3 349
gas dynamics 6 53
gas turbine 6 65
spark ignition engine 3 307
valves 3 308
Combustion engine *see* Engine
Combustion knock 3 308-310
aircraft fuel 1 178
antiknock agents 1 474 475
combustion chamber 3 308
compression ratio 3 349
effect of engine 3 309
effect of fuel 3 309
octane number 3 309 310 9 275*
Combustion method gas analysis 6 45
Combustion smokes 12 81
Combustion wave measurement 3 310, 6 56
Combustor *see* Combustion chamber
Comet 3 310 316
Biela 3 312
brightness 3 312
D'Arrest 3 315
Encke's 4 587
families 3 311
groups 3 311 312
Halley's 6 322
Jupiter's effect on orbits 3 314 315
meteors 8 307
Mrkos 3 313 314
orbits 3 311 315*, 9 372
spectra 3 312 313
tails 3 313 314
Taylor 3 312
Whipple Fedtke 3 314
Wirtanen 3 311
Wolf I 3 315
Comfort, human *see* Air conditioning, Comfort control Heating, comfort
Comfort control 3 316 317
air conditioning 1 145
air cooling 1 146-147
central heating 2 630
dehumidification 3 317, 4 44 46*
heat pump 6 367 369
heating, comfort 6 375 377
hot water heating system 6 493-494
panel heating and cooling 9 536
psychrometrics 11 82 84
radiant heating 11 213
Comfort control—*cont*
self contained systems 3 317
steam heating 3 82 83
summer 3 317
ventilation 14 296 298
winter 3 316
Comfort equation 1 141
Comfort index 12 180
Comic color ink 7 113
Command guidance system 6 286, 289
missiles 8 515-516
Commander Islands 1 581
Commensalism 4 394, 5 12 15
Commensurability perturbation (astronomy) 10 38
Commercial clay *see* Clay, commercial
Commercial stone 13 151 153
Communiting machine 5 390
Commission Internationale de l'Eclairage 12 586
Common base amplifier 1 349 14 359
Common-base connection, transistor 1 349 14 39
Common bile duct 4 153
Common cardinal veins 2 485
Common cathode amplifier 2 537
Common cold 1 466 467
heinadsorption viruses 6 349
Common-collector amplifier 14 358 359
Common collector connection transistor 1 350 14 39-40
Common emitter connection transistor 1 350 14 38 39
Common furniture beetle 3 287
Common loon 6 81
Common opal 9 332
Common shiner 12 253
Common shrimp 12 308
Common skunk 12 374
Common snipe 3 10
Common sucker 13 236
Common tern 13 495
Common toad 13 661
Common vetch 14 310
Communication channel *see* Channel communication, Channel radio
Communication science cybernetics 3 637 638
Communication switching systems *see* Switching systems (communications)
Communication theory modulation 8 526 529
Communications, electrical 3 317 320
amateur radio 1 299
bandwidth requirements 2 93 94
crosstalk 3 555-556
Communications, electrical—*cont*
data transmission 4 16-17
early developments 4 453
facsimile 5 177 178
filters 5 267 271
flow of information 3 317
information theory 3 319, 7 99 102*
modulation 3 318, 8 526
multiplexing 1 352 353, 8 626, 14 60 61
noise 3 318 9 117-120*
privacy systems (scrambling) 10 624
radar 11 199 212
radio 11 241 243
radio relay 5 520
signal to noise ratio 12 310
sound reproduction systems 12 518-522
space 12 544
space relay station 12 545
space vehicle 1 605
static 13 54
switching systems 13 350 357
telegraphy 13 421-425
telephony 13 445 447
telephotography 13 447
television 13 456 459
transmission theory and methods 14 54 61
Communications systems (traffic) design 3 320 322
congestion probability 3 321
Erlang E_1 congestion formula 3 321
Erlang E_2 delay formula 3 321
grade of service 3 321
probability of delay 3 322
Communications systems protection 3 322 324
cathodic protection 3 323
electrolysis of underground cables 3 323
inductive coordination 3 323
overhead lines 3 323
underground lines 3 323
Community 2 204 215
3 324 325*
balance 3 324 325
changes 3 324
density 3 325
dominance 3 325
dominants 3 324
food chain 3 324
organismic concept 3 325
parts of biosphere 2 239
population dynamics 3 325
species composition 3 324
structure 3 324
succession 3 325
trophic balance 3 325
Community classification 3 325 327
aquatic biocycle 3 326 327
ecological association 3 326
ecosystem 3 325 327
fresh water biocycle 3 326
marine biocycle 3 326
stage of ecological succession 3 326
terrestrial biocycle 3 325 326
Community dial offices (CDO) telephone systems 13 34
Community differentiation ecosystem 4 406
Commutation 3 327
ac motor 14 296
ac series motor 14 296
electric rotating machine 3 327
Commutative law for addition 3 337
for multiplication 3 337
Commutator 3 327 328
ac motor 14 296
electric rotating machine 3 327
Commutator motors 1 284 2
ac series motor 14 296
dc motors 4 225 229
repulsion motor 11 434
universal motor 14 296
Commutator ripple 4 225
Commutator watt hour meter 14 413
Como Lake 5 115
Compandor 3 556
Companion cell 10 116
Comparator 3 328 330
contact 3 328 329
electrical 3 328
gage blocks 6 3
mechanical 3 328
optical 3 329 330
pneumatic 3 329
Comparator circuit 3 330 33
see also Coincidence amplifier
Comparison microscope 8 39
Compass magnetic 5 331 33
4 20 21
aircraft compass system 1 166
dead reckoning 4 20 21
declination 3 332 4 20
deviation 3 332, 4 20
errors 3 332, 4 20
limitations in polar regi 10 443
local magnetic effects 3
principle of operation 3 331
remote indicating 4 20
uses 3 332
variation 3 332, 4 20

Compass radio 5 332, 4 251 252*
see also Direction finding equipment
Compass declinometer 4 36
Compass error 5 332, 4 20
Compass saw 14 542
Compass system aircraft see Aircraft compass system
Compatible color television see Color television
Compatible single sideband system 11 265
Compatibility (phonograph systems) 4 244
Compatibility equations elasticity 4 421
Compensating eyepiece see Eyepiece
Compensation frequency response 1 546 4 238 259
Compensation depth 12 106
Compensation intensity 12 106
Compensation level fresh water ecosystem 5 521 534
Competence (stream) 13 173
Competition (ecology) 4 585 586
environment 5 12 15
Complement 1 473
immunity 7 55
serum 5 333
Complement fixation reaction 1 473
Complement fixation test 5 201 333 13 575 630 631
Complemental male 12 237
Complementarity principle of 11 156 157
Complementary genes 6 109
Complementary minor determinant 4 83
Complementary symmetry transistor 14 40
Complemented distributive lattices 7 410
Complete flower 5 525
Completely randomized design 5 144
Complex (ionic) catalysis 10 482
Complex compounds 5 554 556
chemical structures 5 39
coordination chemistry 5 457 461
nomenclature 5 553
structures 5 554
synthesis 5 556
see also Chelation
Complex dewaxing 4 93
Complex formation reactions titration 13 656
Complex numbers 1 249, 5 336 343*
Complex numbers and complex variables 5 336 343
complex number system 5 337
conformal mapping 5 395
differentiation 5 339
geometric representation 5 337 338
integration 5 340
logarithms 7 576
notation 8 175
phasors 5 46
Complex power series 12 192
Complex representation of ac quantities 1 273 274
Complex salt 12 16
Complex series 12 192
Complex sounds masking (sound) 8 160
Complex variables 5 336 343
analytic functions 5 339 340
Cauchy's integral theorem 5 340, 341
limits of sequences 5 338
Morera's theorem 5 341 342
representation of ac quantities 1 273 274
Taylor's theorem 5 342
Compliance acoustic 7 36
Compliance elasticity 4 421 422
Component design environmental design 13 379
functional specifications 13 378
maintainability of equipment 8 75 13 379
miniaturization of equipment 8 468 471* 13 379
packaging of equipment 9 488 489* 13 379
reliability of equipment 11 443 445* 13 379
systems engineering 13 378 380
Component electric fuses 5 577 579
switches 13 542
thermistor 13 553 556
transformer 14 23 29
transmission line elements 14 50
vacuum tubes 14 243 254
Component electronic transistor 14 35 58
Component testing design test process 13 379
development 13 379
environmental test 5 17 19* 13 379
production testing 13 379
qualification tests 11 156 13 380
Composing machines printing 10 593
Composing stick 5 344 14 171
Compositae 2 432, 5 190 6 286 7 223 124
Composite beam 5 343 344
Composite columns 5 371
Composite wake 14 381
Composition (type) 5 344 348
American Type Founders Hadego 5 348
American Type Founders Typesetter 5 348
book manufacture 2 287
Electro Typesetter 5 345
Elrod 5 345
Fotosetter 5 346
hand composition 5 344
Intertype 5 345
justifying typewriter 5 348
Linofilm 5 347 348
Linotype 5 344 345
Ludlow 5 345
machine composition 5 344 346
Monophoto 5 347
Monotype 5 345
Photon 5 346 347
phototypesetting 5 346 348
relief printing 10 598
Teletypesetter 5 345
type (printing) 14 169 172
Composition of forces 5 436 437
Composition resistor 11 498
Compositron 2 560
Compost 5 236, 8 94
Compound 1080 11 615
Compound chemical see Chemical compounds
Compound DC generator 4 225
Compound DC motor 4 228
Compound interest 4 130
Compound lens 7 451-452
Compound nucleus hypothesis 9 209
Compound pendulum 9 617
Compressed air drilling 2 296
Compressed air conveyor 5 430
Compressed air illness see Decompression illness
Compressible flow 5 349 349*, 5 325 14 162
fluid flow properties 5 345
lavers 2 310
Mach number 5 349
Compressibility 4 420
Compressibility factor 6 43
Compression ignition engine see Diesel engine Diesel cycle
Compression molding plastics 10 404 405
Compression ratio 5 349 7 201
Compression ratio diesel 5 349
Compression wave seismology 12 151
streamlining 13 175
thunder 13 616
velocity for soils 12 455
wave motion in fluids 14 430
see also Shock wave, Sound wave
Compressive stress 4 419 11 182 185
Compressor 1 143 5 349 353*
air 1 142 145
axial flow 5 349 352 353
capacity 5 349
centrifugal 5 349 352
displacement 5 349
double acting 5 350
dynamic 5 349
gas turbine 6 65
jet 1 143, 5 349
liquid piston 5 352
lobe 5 351
marine machinery 8 122
multistage 5 350
noise control 9 123-124
positive displacement 5 349
radial flow 5 352
reciprocating 1 145, 5 349
refrigeration 11 413
rotary 1 145 5 349
single stage 5 350
sliding vane 5 351
supersonic diffuser 13 306
thermodynamics 5 351
turbojet 14 155 156
two stage 5 350
vacuum pump 4 246
volumetric efficiency 14 375
Compressor valve 14 262
Compsognathus 7 527
Compton A H 5 353 356, 10 263 11 332, 14 567 581
Compton Debye effect see Compton effect
Compton effect 5 353 359*, 7 503
Compton's model 5 354 355
Doppler shift 5 356 358
electron momentum 5 357 359
Klein Nishina formula 5 356 357
light 7 503
photoemission 10 152
quantum mechanics 11 154 155
radiation shielding 11 239
Schrodinger's model 5 355

Combustion—*cont*
spectroscopy of combustion
spontaneous 3 306
Combustion chamber
3 307-308
compression ignition engine 3 308
compression ratio 3 319
gas dynamics 6 53
gas turbine 6 65
spark ignition engine 3 307
valves 3 308
Combustion engine *see* Engine
Combustion knock 3 308 310
aircraft fuel 1 178
antiknock agents 1 471 475
combustion chamber 3 308
compression ratio 3 319
effect of engine 3 309
effect of fuel 3 309
octane number 3 309-310, 9 273*
Combustion method gas analysis 6 45
Combustion smokes 12 81
Combustion wave measurement 3 310 6 56
Combustor *see* Combustion chamber
Comet 3 310 316
Biela 3 312
brightness 3 312
D'Arrest 3 315
Encke's 4 587
families 3 311
groups 3 311 312
Halley's 6 322
Jupiter's effect on orbits 3 314 315
meteors 8 307
Orkos 3 313 314
orbits 3 311 315*, 9 372
spectra 3 312 313
tails 3 313 314
Taylor 3 312
Whipple Fellke's 3 314
Wirtanen 3 311
Wolf 1 3 315
Comfort, human *see* Air conditioning, Comfort control, Heating, comfort
Comfort control 3 316 317
air conditioning 1 145
air cooling 1 146 147
central heating 2 630
dehumidification 3 317, 4 44 46*
heat pump 6 367-369
heating, comfort 6 375 377
hot water heating system 6 493-494
panel heating and cooling 9 536
psychrometrics 11 82 84
radiant heating 11 213
Comfort control—*cont*
self-contained systems 3 317
steam heating 3 82 83
summer 3 317
ventilation 14 296 298
winter 3 316
Comfort equation 1 144
Comfort index 12 180
Comic color ink 7 113
Command guidance system 6 286 289
missiles 8 515 516
Commander Islands 1 581
Commensalism 4 581, 5 12 15
Commensurabilities perturbation (astronomy) 10 38
Commercial clay *see* Clay, commercial
Commercial stone 13 151 153
Communiting machine 5 990
Commission Internationale de l'Eclairage 12 586
Common base amplifier 1 349, 14 359
Common base connection transistor 1 349 14 39
Common bile duct 4 153
Common cardinal veins 2 485
Common cathode amplifier 2 537
Common cold 1 466 467
hemadsorption viruses 6 349
Common collector amplifier 14 358 359
Common collector connection transistor 1 350 14 39 40
Common emitter connection transistor 1 350 14 38 39
Common furniture beetle 3 287
Common loon 6 81
Common opal 9 332
Common shiner 12 235
Common shrimp 12 308
Common skunk 12 374
Common snipe 3 10
Common sucker 13 236
Common tern 13 495
Common toad 13 661
Common vetch 14 310
Communication channel *see* Channel communication
Channel radio
Communication science cybernetics 5 637 638
Communication switching systems *see* Switching systems (communications)
Communication theory modulation 8 526 529
Communications, electrical 3 317 320
amateur radio 1 299
bandwidth requirements 2 93 94
crosstalk 3 535 536
Communications electrical—*cont*
data transmission 4 16 17
early developments 4 453
facsimile 5 177-178
filters 5 267 271
flow of information 3 317
information theory 3 319, 7 99 102*
modulation 3 318, 8 526
multiplexing 1 352 353, 8 626 14 60 61
noise 3 318 9 117-120*
privacy systems (scrambling) 10 624
radar 11 199 212
radio 11 241 243
radio relay 5 520
signal to noise ratio 12 310
sound reproduction systems 12 518 522
space 12 544
space relay station 12 545
space vehicle 1 605
static 13 54
switching systems 13 350 357
telegraphy 13 421 425
telephony 13 445 447
telephotography 13 447
television 13 456 459
transmission theory and methods 14 54 61
Communications systems (traffic) design 3 320 322
congestion probabilities 3 321
Erlang E_1 congestion formula 3 321
Erlang E_2 delay formula 3 321
grade of service 3 321
probability of delay 3 322
Communications systems protection 3 322 324
cathodic protection 3 323
electrolysis of underground cables 3 323
inductive coordination 3 323
overhead lines 3 323
underground lines 3 323
Community 2 201 215
3 324 325*
balance 3 324 325
changes 3 324
density 3 325
dominance 3 325
dominants 3 324
food chain 3 324
organismic concept 3 325
parts of biosphere 2 259
population dynamics 3 325
species composition 3 324
structure 3 324
succession 3 325
trophic balance 3 325
Communits classification 3 325 327
aquatic biocide 3
ecological associations 3 326
ecosystem 3 325 32
fresh water biocide
marine biocide 3
stage of ecological
cession 3 326
terrestrial biocide
3 325 326
Community dial offices
telephone systems
Community differentia
ecosystem 4 406
Commutation 3 327
ac motor 14 206
ac series motor 14
electric rotating m
3 327
Commutative law
for addition 3 317
for multiplication
Commutator 3 327 328
ac motor 14 206
electric rotating m
3 327
Commutator motors
ac series motor 14
dc motors 4 226 2
repulsion motor 1
universal motor 1
Commutator ripple 4
Commutator watt hou
14 413
Como, Lake 5 115
Compandor 3 556
Companion cell 10 11
Comparator 3 329 330
contact 3 329 329
electrical 3 329
gage blocks 6 3
mechanical 5 888
optical 3 329 330
pneumatic 3 329
Comparator circuit 3
see also Coincidence amplifier
Comparison microscop
Compass magnetic 3
4 20 21
aircraft compass
1 166
dead reckoning 4
declination 3 332
deviation 3 332 4
errors 3 332 4 20
limitations in pola
10 443
local magnetic effe
principle of opera
3 331
remote indicating
uses 3 332
variation 3 332 4

onductivity, electrical—*cont*
at high pressures 6 447
International Annealed Copper Standard 3 467
ionic conductivity 7 250 251
metals 4 452 455
of sea water 12 102 106 107
semiconductors 12 166 168
superconductivity 13 295 301
Conductivity thermal *see* Thermal conductivity
Conductor, electric 3 392 394
aluminum 3 392
bare 3 392
bus bar 2 376 3 392
busway 3 395
connectors 3 405 406
copper 3 392
copper loss 3 472
current capacity 14 521
current density in 4 452
insulated 3 392
insulated wire and cable 14 521
insulation 7 335 350
joule heating 7 316
magnet wires 3 392 8 26 27
power cables 3 393
residential wiring 3 395
size 14 521
transmission line 14 52 53
voltage drop 3 393
voltage (IR) drop 14 522
wiring system design 14 521 522
see also Wiring (electric)
Conductor-cooled generators 3 293
Conduit
electric 14 451
water 12 459
Conduplicate vernation 2 361
Condylarthra 3 394* 8 82 10 18
Condyloid articulation 7 415
Condyloma 9 320
Condylotoma 6 492
Cone 3 394 395* 13 310 311
Cone clutch 3 224
Conenose bug 6 405 7 361
Conepatus 12 374
Coneyangnan stage 4 87
Confections 3 409 411
aerated 3 410 411
chews 3 410
hard candies 3 410
usage factors 3 406 411
Confidence interval 13 71
Configural conditioning 11 394
Configuration coordinate curves luminescence 7 612 613
Configuration space kinematics 7 347
Confocal coordinates, spherical harmonics 12 610
Conformal mapping 3 395 397
coordinate systems, graphical 3 456
geometry differential 6 150 152
linear transformations 3 395 396
multiply connected regions 3 396 397
notation 8 172
Riemann surfaces 3 397
Riemann's theorem 3 396
Conformal transformations, wave equation 14 419
Conformational analysis 3 397-398
asymmetric synthesis 1 620 621
see also Stereochemistry
Confused flour beetle 5 287
Congealing point 10 550
Congenital hemolytic *anemia* 3 195
Congenital hemolytic jaundice 15 9
Congenital hypotonia 8 659
Congenital metabolic defect 1 110
Conglomerate 3 398*, 11 590, 12 158
Conglutination 3 399
Conglutinin 1 112
Congo eel 12 7
Congo floor maggot 4 217, 8 680
Congo red 4 299
Congo River 1 109
Congruence *geometry* euclidean 6 153 154
number theory 9 224
Congruent transformation 8 184
Coniacian substage 3 543
Conic linkage 5 487
Conic section 3 399 400
analytic geometry 1 389 390
celestial mechanics 2 380
circle 3 150
cone 3 394 395
ellipse 4 560
hyperbola 6 583 584
optical surfaces 12 609
parabola 9 541 542
projective geometry 3 400
Conical antenna *see* Antenna (aerial)
Conical map projection 8 96
Conical refraction 3 592
Conical scan radar 11 204
Conical surface 3 394
Coniconchia 3 400 401
Conida 9 85
Conidia 12 605
Conidiophore 4 53 8 568, 12 606
Conidium 1 574 8 568
Conifer sawfly 6 574
Coniferales 3 401*; 6 300, 9 503, 10 321, 346
arborvitae 1 500
distribution 3 401
economic importance 3 401
reproduction 3 401
stem types 13 121
Coniferophytae 3 401*, 10 346
Coniferous forest 2 205, 8 245
Conifers 14 595
Coniine 10 440
Coniomis 6 426
Coniosporium 4 55
Coniothyrium 12 604
Coniothyrium fuckelii 13 172
Coniothyrium hellebori 12 605
Coniothyrium wernsdorffiae 12 604
Conium maculatum 10 434, 440 14 189
Conjugate quaternions 11 185
Conjugate acid base pairs 1 41
Conjugate complex number 3 538
Conjugate momentum harmonic oscillator 6 543
Lagrange's equations 7 383
Conjugated diene 4 117
addition reaction 1 63
Conjugated polyene 10 460
Conjugated protein 1 224
Conjugation 2 22 11 449 450
Chlorophyta 3 80 83
Ciliophora 3 120-122
Paramecium 9 552
Protozoa 11 58
Conjunctiva embryology 5 166
Conjunctivitis 2 352, 3 401* 10 238
inclusion blennorrhea 7 55
keratoconjunctivitis (epidemic) 7 357
moraxella lacunata 8 597
Newcastle disease 9 91
Connate water 6 277
petroleum reservoir engineering 10 76
thermal springs 13 551
Connecticut Lowland 9 145
Connecting circuits 13 347
Connecting rod 3 401 402
Connective tissue 2 265, 3 402 403* 6 458 522, 13 651
adipose tissue 1 70 3 403, 12 564
biochemistry 2 199
bone 2 282
Connective tissue—*cont*
bursitis 2 373
cartilage 2 334
cellular components 3 402
classification 3 403
collagen 12 564
elastic 3 403
elastin 12 564
extracellular components 3 402 403
function 3 402
irregular 3 403
ligament 7 499
lupus erythematosus 7 622
mucopolysaccharides 12 563
muroproteins 12 564
mucous 3 403
pigment 3 403
regular 3 403
reticular 3 403
Connector electric 3 403-405
coaxial connectors 3 404
common receptacles 3 404
expansion connectors 3 404
flexible connectors 3 404
grounding receptacles 3 405
industrial and power connectors 3 405
locking connectors 3 404
multioutlet assemblies 3 405
multiwire connectors 3 404
separable connectors 3 404
soldered 3 403
solderless 3 403
split bolt connectors 3 404
stud connectors 3 404
T connector 3 404
terminal 3 404
weatherproof receptacles 3 405
Connector mechanical taper pin 13 392
Connochaetes taurinus 6 227
Conocephalus strictus 10 129
Conocliptidae 6 463
Conocyema admirabilis 4 110
Conocyema dicra 4 110
Conocyema (*Microcyema*) *vespa* 4 111
Conocyeminae 4 111
Conoderus 3 297
Conodont 3 405-406
Annelida fossils 1 432
classification 3 405 406
composition 3 406
guide fossils 3 406
internal structure 3 406
occurrence 3 406
origin of 3 406
Conodontiformes 3 406

Compton effect—*cont*
Thomson's theory
¶ 353 354
wave particle duality
¶ 355
Compton interactions 11 239
Compton scattering 6 31 35
Computer ¶ 359 360
accuracy 3 359
analog *see* Analog computer
automation 1 677
digital *see* Digital computer
simulator 12 340
speed 3 359
see also Calculating machines
Computer control system 3 360
see also Sampled data system
Concentrated milk 8 456
Concentration cell
corrosion 3 490
potentials 14 22
Concentration dilution test, urine 3 192 202
Concentration overvoltage 9 457
Concentration quenching luminescence 7 616
Concentration scales 3 360 361
formality 3 361
molality 3 361
molarity 3 361
mole fraction 3 361
mole per cent 3 361
normality 3 361
percentage 3 361
titration 13 658
Concentric lens 7 451
Concentric vane ac repulsion voltmeter 14 372
Conch 3 361 14 487
Conchidium 12 329
Conchiolin 9 613
Conchocoecidae 8 682
Conchoderma auritum 3 145
Conchorhagae 7 362
Conchostraca 3 362*, 562
Conchuela 6 405
Conchyolin 8 560
Concrete 3 362 366
accelerators 3 364
admixtures 3 364
aggregate 3 362
air-entraining 1 198, 3 364
batch mixers 3 365
cavitation 2 575
cementing material 3 362
color pigments 3 365
compressive strength 3 362
Concrete—*cont*
conveying and placing 3 365
creep 3 541
curing 3 366
damp proofing 3 361
durability 3 361
finishing 3 365
Gunite 3 365, 6 299
hydration reaction 3 362
mixing 3 365
pavement 9 596 598
permeability agents 3 364
placement under water 3 365
portland cement 10 522 523
pozzolans 3 365
precast *see* Precast concrete
Prepakt process 3 365
prestressed *see* Prestressed concrete
proportioning 3 363
puddling 3 365
reinforced *see* Reinforced concrete
retarders 3 364
tensile strength 3 362
tremie 3 365
vibration 3 365
water cement ratio law 3 363
workability agents 3 364
Concrete beam 3 367 370
compression reinforced rectangular beams 3 368 369
elastic design 3 367
prestressed 10 585
rectangular 3 367 369
shear and bond 3 369
steel reinforcing 3 367
stirrups 3 370
stress distribution 3 367
T beams 3 368 369
ultimate load design 3 368
Concrete column 3 370 371
axially loaded reinforced 3 370
combined bending and axial load 3 371
composite 3 371
plain concrete 3 370
spiral reinforced 3 370
tied 3 370
Concrete dam 4 3 6
Concrete slab 3 371-373
composite beam 3 343-344
flat slab 3 372
one way slab 3 371
two way slab 3 371
Concretion 3 375*, 12 134
Condar 9 18
Condensate (liquefiable hydrocarbons) 10 59
Condensation
alcohol 1 225
dew 4 90
heat convection 3 443
Condensation nuclei
cloud 3 209
cloud physics 3 214 218
fog 5 367
Condensation polymerization 10 113 479 480*
see also Polymerization
Condensation reaction ¶ 373-377
acyloin condensations 3 375
aldol condensations 3 374
alkylations of organometallic compounds 3 376
benzoin condensations 3 375
Claisen condensations 3 374 375
cyanoethylation 3 375
ethyl acetoacetate 5 87 89
ethyl malonate 5 93
Friedel Crafts reaction 3 376
Mannich reaction 3 375
Michael condensations 3 375
organic chemical synthesis 9 392
pinacol formation 3 375
Reformatsky reaction 3 376
see also Addition polymerization
Condensed polyhedron chemical structures 3 42 43
Condenser contact *see* Contact condenser
Condenser electrical 3 377
see also Capacitor
Condenser vapor 3 377 382
capacity 3 378
condensate reheating 3 378
contact *see* Contact condenser
heat balance equation 3 378
heat flow equations 3 379
heat-sink fluid 3 377
marine 8 121
process condensers 3 377
pumps 3 382
refrigeration 11 415
removal of noncondensables 3 377
Condenser, vapor—*cont*
steam jet ejector 3 379
surface *see* Surface condenser
vapor contamination 3 377
Condenser lens system 11 2
Condenser microphone 8 540
Condensing enzyme 5 25
Condensing steam plants 10 558
Condiments 5 420
Conditional equations 1 230
Conditional probability 10 626 627
Conditioner (food) 5 377
Conditioner (soil) 12 420
Condon, E. U. 5 495, 8 255, 11 282
Conductance 3 382 385*, 4 481, 8 346
Conductance cell 4 483
Conductimetric titration *see* Titration conductimetric
Conduction (electricity) 3 393
electric current 3 626
extrinsic 12 167
in gases 4 449 452
intrinsic 12 167 168
ionic conductivity (solids) 7 250 251
in metals 4 452 453
semiconductors 12 166 168
superconductivity 13 295 301
Conduction (heat) 3 385 391
allovs 3 391
and convection 3 443 444
differential equation 3 385-386 10 538
Fourier equation 3 384
glass 3 390 391
heat transfer 6 374 375*, 13 566
insulators 3 390
internally generated heat 3 387 388
metals 3 389 390
non steady state 3 384 394
in stars 13 107 108
steady-state 3 386 387
superconductors 3 391*, 13 298
thermal conductivity of solids 3 384 391
Conduction band 3 391
band theory of solids 2 95
semiconductors 12 166
Conduction current
electric 3 626
Conduction deafness 4 22
Conduction electrons 3 391
Conductivity 3 391 392
Conductivity, electrical 3 391 392* 4 452 453
earth (heat flow)

Contagious abortion 2 564
Contagious agalactia
Mycoplasmatales 8 679
Contagious polyarthritis 2 70
Contamination, air *see* Air pollution
Contamination, food *see* Food microbiology
Contamination, radioactive *see* Radioactive contamination
Contamination, water *see* Water microbiology, Water pollution, Water purification
Continent 3 422
Africa 1 104
Antarctica 1 440
Asia 1 576 588
Australia 1 669 675
Europe 5 108 125
formation 9 409
North America 9 138 164
sial and sima 13 412 413
South America 12 524 531
submarine topography 13 216
Continental crust 12 155-156
Continental drift 13 223 224
orogeny 9 412
polar wandering 10 445
rock magnetism 11 596 597
tectonophysics 13 418 419
Continental fracture system 13 414
Continental heat flow 4 552
Continental islands 7 275
Continental rise *see* Continental shelf and slope
Continental shelf and slope 3 422 423*, 13 215
Gulf of Mexico 6 293
neritic sediments 8 133 135
North Sea 9 164 165
submarine canyon 13 215
submarine topography 13 216 218
Continental telegraph code 13 421
Continentality, weather and climate 3 423 424
Asia 1 581
Contingency table statistics 13 73
Continuity equation
gas dynamics 6 50
gas undergoing chemical changes 6 50
global 6 50
species 6 50
steady flow 6 50
Continuous beams prestressed concrete 14 546
Continuous countercurrent leaching 7 423 424
Continuous electrochromatography 3 97
Continuous games 6 30
Continuous group 6 282
Continuous map 13 680
Continuous melter (iron foundry) 1 502
Continuous spectrum 12 593
Continuous vinegar process 14 326
Continuous wave radar 3 424-425*, 4 266
coherent observation time 3 425
Doppler radar 4 266
FM CW 3 425
frequency modulation 3 425
power 3 425
pulse compression radar 3 425
range measurement 3 425
velocity measurement 3 425
Continuous zone electrophoresis 3 97
Continuum hypothesis 12 205
Continuum mechanics 13 548
see also Field theory, classical
Continuum physics 13 548
Contopus sordidulus 10 88
Contopus virens 10 88
Contour 2 534, 3 425, 13 677
Contour irrigation 7 270
Contracid 2 175
Contractile proteins 2 491 492
Contractile vacuole excretion 5 138
Contracting earth hypothesis 9 411-412*, 15 419
Contraction cycle, heart 5 138
Contractional polygons 10 472
Contracts, engineering and architectural *see* Engineering and architectural contracts
Contradiction, law of 7 578
Contrast (image) 15 449
Contrast (photography) 10 164
Contravariant vectors 2 404 405
Control (automation) *see* Control systems
Control chart 3 425 429
average and range 3 426
c chart 3 426
control limits 3 427
defects per unit 3 428
fraction defective units 3 427
p chart 3 426
quality control 11 140
special charts 3 428
statistical theory 3 426
$\bar{x}$ and R chart 3 426
Control grid triode 14 106 107
Control grid modulation amplitude 1 355
Control knob calibration 2 416
Control reversal aeroelasticity 1 90
Control switchboards electric power substation 4 441
Control systems 3 429 438*, 12 20
air traffic 14 12 15
analysis 3 431
applications 3 430
automatic pressure control 10 580
automation 1 676 679
automobile traffic 14 15
chemical process control 3 31 32
closed loop control systems 3 429-438
compensating networks 3 438
computer 3 560
controlled quantity 3 429
controlled system 3 429
controller 3 429
creation of model 3 431
criteria of stability 3 436
cybernetics 3 657 658
damping 3 435
drag-cup generators 15 584
eddy-current damper 3 437
feedback circuit 5 198 200
feedback control system 3 429-438
fire control systems 5 280-281
flight controls 5 306 309
function generation, analog 1 376
guidance systems 6 286
hunting 3 435, 6 520
instability 3 430
linear 3 431
man as element 3 431
manipulated quantity 3 429
marine boiler 8 103
mathematical tools 3 431
measuring device 3 429
minor decision making 3 431
multiple capacity systems 3 434
Nyquist stability criterion 3 438
open loop control system 3 429 9 535*
open loop transfer characteristic 3 430
Control systems—*cont.*
optimum performance 3 430
oscillation 3 435
overshoot 3 430
performance objectives 3 430
pressure 10 580
principles of operation 3 429
process control 10 637
proportional controller 3 432
railroad traffic 14 12 15
regulator 11 425
remote-control system 11 446-447
replacement of humans 3 431
Routh criterion of stability 3 436
sampled-data 12 20-21
servomechanism 12 198 205
single capacity system 3 431-434
solution of differential equations 3 434
speed of response 3 430, 433
stability-frequency-response analysis 3 436
stability of physical systems 3 435
stabilization 3 437
steady-state error 3 430, 433
steady-state frequency response 3 434
system response 3 430
systems engineering 15 378
tachometer 15 582-585
tachometric feedback 3 438
temperature 15 487, 488
traffic 14 12 15
transfer characteristics 3 429
viscous damper 3 437
zero errors 3 430
Control systems, Automatic electric power substation 4 440-441
Control volume, gas dynamics 6 49
Controllable-pitch propellers 1 14
Controlled quantity, control systems 3 429
Controlled rectifier 3 438 439, 11 385-386
Controller 3 429
Conularia 3 261
Conularida 3 261, 439*
Conulidae 6 465
Conuropsis carolinensis 9 567, 11 69
Conus 5 75 8 561

Conodontophoridia 3 405-406
Conopidae 4 212
Conoryctes 13 386
Conoryctinae 13 386
Conotrachelus nenuphar 3 287
Conover, J H 3 170
Conpernik, magnetic alloy 7 261
Conrad, Frank 11 247
Conrad Limpach method 11 192
Conrady, H G 9 352
Consecutive reactions
kinetics (chemical) 7 358
Consequent poles (magnet) 8 26
Consequent stream 5 357
Conservation river management 11 582 583
Conservation, wildlife *see* Wildlife conservation
Conservation equations
gas dynamics 6 49
Conservation laws (physics) 9 199 200*, 13 362-364*
Conservation of baryons 2 105*, 13 363-364
Conservation of charge 13 362-364
law of 4 540
in nuclear reactions 9 199
Conservation of energy 3 406-407
application to life processes 3 407
Bernoulli's theorem 2 169
conservation of mass energy 3 407
conservation of mechanical energy 3 407
heat balance 6 362 363
Lenz's law 7 454
mechanical equivalent of heat 3 407
in nuclear reactions 9 199
perpetual motion 10 29
rigid body dynamics 11 575
Conservation of leptons 13 363 364
Conservation of mass 3 407
Conservation of mass energy 3 407
Conservation of momentum 3 407 408
angular momentum 1 406-407
collision 3 290 291
in nuclear reactions 9 199
Conservation of parity *see* Parity (quantum mechanics)
Conservation of resources 3 408 411
federal legislation 3 411
fresh-water fisheries 5 281-287
forests 3 411, 5 414 448*
human 3 410
marine fisheries 8 115-116
minerals 3 411, 8 460 463*
nature of 3 409
policies 3 410 411
recreation 3 410
soil 3 411, 12 413 419*
trends 3 409 410
water 3 411, 14 391 395*
wildlife 3 411, 14 490-492*
see also Land use planning
Conservation of strangeness *see* Strangeness conservation
Conservative force
energy 4 600
Conservative force *see* Force
Consol 9 15, 20, 11 255 256*
Consolan 9 15, 11 255
Consolute temperature 5 56
Consonance 8 661
Consonants phonetics 10 121
Constant angular velocity joint 14 205-206
Constant bandwidth analyzer 9 132
Constant-current electrolysis electrodeposition analysis 4 475
Constant-horsepower drive induction motor 1 286
Constant k filter 5 269
Constant-load balance 2 73
Constant of aberration 1 7
Constant percentage bandwidth filter 9 132 133
Constant potential electrolysis electrodeposition analysis 4 474 475
Constant speed motor shunt dc motor 4 227
Constant stimuli, method of 11 78-79
Constant-torque drive induction motor 1 286
Constantan 1 260 13 583
Constellation 3 411 414
Aquarius 1 496
Aries 1 532
Bootes 2 290
Cancer 2 435-436
Capricornus 2 448
Cassiopeia 2 539
Centaurus 2 628
Crux 3 569
Cygnus 3 646
Gemini 6 104
Leo 7 455
Libra 7 494
Lyra 7 637
Constellation—*cont*
Orion 9 407
Pegasus 9 610
Pisces 10 242
Sagittarius 12 4
Scorpius 12 79
Taurus 13 401
Constipation 5 415
Constitutive equations
continuum mechanics 5 255
Constraint 3 415
kinematics 7 347
Lagrange's equations 7 383 384
moving 3 415
stationary 3 415
virtual work, principle of 14 328
Constrictor constrictor 2 272
Construction engineering 3 415-416
airports 1 216
arches 1 507
cofferdam 3 267-268
construction equipment 3 416-418
cost control 3 416
execution 3 416
launching pad complex 7 415-421
masonry 8 161
master schedule 3 415
planning 3 415
progress control 3 416
structural connections 13 199-203
structures 13 206
telephone systems *see* Telephone systems construction
tunnels 14 *141-141
Construction equipment 3 416-418
backhoe 5 134
clamshell 5 134
combination excavators and haulers 3 417
crane 3 536 5 134
dragline 5 134
drilling equipment 3 417
earthmover 4 351 352
economic considerations 3 418
excavating equipment 3 416
excavation 5 134
front end loader 5 134
hauling equipment 3 417
hoisting equipment 3 418
marine excavators 3 417
pile driver 3 418, 10 226*
power shovel 5 134 12 306
standard land excavators 3 416
trencher 5 134
Construction materials *see* Structural materials
Construction methods 3 418 420
asphalt paving 3 420
blasting 2 255 3 419
compaction 3 419
concrete 3 419
dewatering 3 419
earth moving 3 419
electroosmotic dewatering 4 526
foundation treatment 3 419
precast concrete 10 567 568
preparation of site 3 418
steel erection 3 419
wellpoint systems 14 472-473
Construction surveys 13 328 329
Constructional apraxia 1 491
Constructive interference (electromagnetic waves) 7 184-187
Contact, electric 3 420
Contact angle 5 314
interface of phases 7 181
surface tension 13 315 5 6
Contact aureole 1 668 669
Contact barrier (semiconductors) 12 170
Contact bias 2 184
Contact catalysis surface phenomenon 13 315
Contact comparators 3 528-529
Contact condenser 3 377, 420-421*
Contact dermatitis 4 408
Contact metamorphism 8 304, 11 591
Contact microphone 8 361
Contact microradiography 8 365*, 401
Contact noise 9 117
Contact poison 7 140
Contact potential difference 3 421
Contact printing photography 10 159 161, 166
Contact process carbon black 2 465
sulfuric acid 13 280 283
Contact rectifier 3 422 12 172 *see also* Semiconductor rectifier
Contact thermography *see* Thermography
Contact transformation Hamilton Jacobi theory 6 332
Contacting device fractionating column 5 491
Contactor blowout coil 2 270

Contagious abortion 2 564
Contagious agalactia
Mycoplasmatales 8 679
Contagious polyarthritis 2 70
Contamination, air *see* Air pollution
Contamination, food *see* Food microbiology
Contamination, radioactive *see* Radioactive contamination
Contamination, water, *see* Water microbiology Water pollution Water purification
Continent 3 422
Africa 1 104
Antarctica 1 440
Asia 1 576 588
Australia 1 669 673
Europe 5 108 123
formation 9 409
North America 9 138 164
sial and sima 13 412 413
South America 12 524 531
submarine topography 13 216
Continental crust 12 155 156
Continental drift 13 223 224
orogeny 9 412
polar wandering 10 445
rock magnetism 11 596 597
tectonophysics 13 418 419
Continental fracture system 13 414
Continental heat flow 4 332
Continental islands 7 273
Continental rise *see* Continental shelf and slope
Continental shelf and slope 3 422-423* 13 215
Gulf of Mexico 6 293
neritic sediments 8 133 135
North Sea 9 164 165
submarine canyon 13 215
submarine topography 13 216 218
Continental telegraph code 13 421
Continentality, weather and climate 3 423 424
Asia 1 581
Contingency table
statistics 13 73
Continuity equation
gas dynamics 6 50
gas undergoing chemical changes 6 50
global 6 50
species 6 50
steady flow 6 50
Continuous beams
prestressed concrete 10 586
Continuous countercurrent leaching 7 423 424
Continuous electrochromatography 3 97
Continuous games 6 30
Continuous group 6 292
Continuous map 13 680
Continuous melter (iron foundry) 1 502
Continuous spectrum 12 593
Continuous vinegar process 14 326
Continuous wave radar 3 424 425*, 4 266
coherent observation time 3 425
Doppler radar 4 266
FM CW 3 425
frequency modulation 3 425
power 3 425
pulse compression radar 3 425
range measurement 3 425
velocity measurement 3 425
Continuous zone electrophoresis 3 97
Continuum hypothesis 12 205
Continuum mechanics 13 548
see also Field theory, classical
Continuum physics 13 548
Contopus sordidulus 10 88
Contopus virens 10 88
Contour 2 534, 3 425, 13 677
Contour irrigation 7 270
Contracid 2 175
Contractile proteins 2 491 492
Contractile vacuole excretion 5 138
Contracting earth hypothesis 9 411-412* 13 419
Contraction cycle, heart 5 138
Contractional polygons 10 472
Contracts engineering and architectural *see* Engineering and architectural contracts
Contradiction law of 7 578
Contrast (image) 13 449
Contrast (photography) 10 164
Contravariant vectors 2 404 405
Control (automation) *see* Control systems
Control chart 3 425 429
average and range 3 426
c-chart 3 426
control limits 3 427
defects per unit 3 428
fraction defective units 3 427
p chart 3 426
quality control 11 140
special charts 3 428
statistical theory 3 426
x and *R* chart 3 426
Control grid triode 14 106 107
Control grid modulation amplitude 1 555
Control knob calibration 2 416
Control reversal aeroelasticity 1 90
Control switchboards electric power substation 4 441
Control systems 3 429 438*, 12 20
air traffic 14 12 13
analysis 3 431
applications 3 430
automatic pressure control 10 580
automation 1 676 679
automobile traffic 14 13
chemical process control 3 31 32
closed loop control systems 3 429 438
compensating networks 3 438
computer 3 560
controlled quantity 3 429
controlled system 3 429
controller 3 429
creation of model 3 431
criteria of stability 3 436
cybernetics 3 637 638
damping 3 435
drag cup generators 13 584
eddy-current damper 3 437
feedback circuit 5 198 200
feedback control system 3 429 438
fire control systems 5 280 281
flight controls 5 306 309
function generation analog 1 576
guidance systems 6 286
hunting 3 435, 6 520
instability 3 430
linear 3 431
man as element 3 431
manipulated quantity 3 429
marine boiler 8 103
mathematical tools 3 431
measuring device 3 429
minor decision making 3 431
multiple capacity systems 3 434
Nyquist stability criterion 3 438
open loop control system 3 429 9 535*
open-loop transfer characteristic 3 430
Control systems—*cont*
optimum performance 3 430
oscillation 3 435
overshoot 3 430
performance objectives 3 430
pressure 10 580
principles of operation 3 429
process control 10 637
proportional controller 3 432
railroad traffic 14 12 13
regulator 11 425
remote control system 11 446 447
replacement of humans 3 431
Routh criterion of stability 3 436
sampled-data 12 20 21
servomechanism 12 198 205
single capacity system 3 431 434
solution of differential equations 3 434
speed of response 3 430, 433
stability frequency response analysis 3 436
stability of physical systems 3 435
stabilization 3 437
steady state error 3 430 433
steady state frequency response 3 434
system response 3 430
systems engineering 13 3
tachometer 13 382 385
tachometric feedback 3 4
temperature 13 487, 488
traffic 14 12 13
transfer characteristics 3 429
viscous damper 3 437
zero errors 3 430
Control systems, Automati electric power substat 4 440 441
Control volume gas dyna 6 49
Controllable pitch propel 1 14
Controlled quantity cont systems 3 429
Controlled rectifier 3 43 11 385 386
Controller 3 429
Conularia 3 261
Conularida 3 261, 439*
Conulidae 6 463
Conuropsis carolinensis 11 69
Conus 5 75 8 561

Conodontophoridia 3 405-406
Conopidae 4 212
Conoryctes 13 386
Conoryctinae 13 386
Conotrachelus nenuphar 3 287
Conover, J H 3 170
Conpernik magnetic alloy 7 264
Conrad, Frank H 247
Conrad Limpach method 11 192
Conrady, H G 9 352
Consecutive reactions, kinetics (chemical) 7 358
Consequent poles (magnet) 8 26
Consequent stream 5 357
Conservation river management 11 582-583
Conservation, wildlife *see* Wildlife conservation
Conservation equations gas dynamics 6 49
Conservation laws (physics) 9 199 200*, 13 362 364*
Conservation of baryons 2 105*, 13 363-364
Conservation of charge 13 362-364
law of 4 540
in nuclear reactions 9 199
Conservation of energy 3 406-407
application to life processes 3 407
Bernoulli's theorem 2 169
conservation of mass energy 3 407
conservation of mechanical energy 3 407
heat balance 6 362-363
Lenz's law 7 454
mechanical equivalent of heat 3 407
in nuclear reactions 9 199
perpetual motion 10 29
rigid body dynamics 11 575
Conservation of leptons 13 363-364
Conservation of mass 3 407
Conservation of mass energy 3 407
Conservation of momentum 3 407 408
angular momentum 1 406-407
collision 5 290 291
in nuclear reactions 9 199
Conservation of parity *see* Parity (quantum mechanics)
Conservation of resources 3 408 411
federal legislation 3 411
fresh-water fisheries 5 284-287
forests 3 411, 5 444-448*
human 3 410
marine fisheries 8 115 116
minerals 3 411, 8 460-465*
nature of 3 409
policies 3 410 411
recreation 3 410
soil 3 411, 12 443 449*
trends 3 409 410
water 3 411, 14 391 395*
wildlife 3 411, 14 490 492*
see also Land use planning
Conservation of strangeness *see* Strangeness conservation
Conservative force energy 4 600
Conservative force *see* Force
Consol 9 15, 20, 11 255 256*
Consolan 9 15, 11 255
Consolute temperature 5 56
Consonance 8 661
Consonants phonetics 10 121
Constant angular velocity joint 14 205-206
Constant bandwidth analyzer 9 132
Constant-current electrolysis electrodeposition analysis 4 475
Constant horsepower drive induction motor 1 286
Constant-k filter 5 269
Constant load balance 2 73
Constant of aberration 1 7
Constant percentage band width filter 9 132-133
Constant potential electrolysis electrodeposition analysis 4 474 475
Constant-speed motor shunt dc motor 4 227
Constant stimuli, method of 11 78 79
Constant-torque drive induction motor 1 286
Constantan 1 260 15 583
Constellation 3 411-414
Aquarius 1 496
Aries 1 532
Bootes 2 290
Cancer 2 435-436
Capricornus 2 448
Cassiopeia 2 539
Centaurus 2 628
Crux 3 569
Cygnus 5 646
Gemini 6 104
Leo 7 455
Libra 7 494
Lyra 7 637
Constellation—*cont*
Orion 9 407
Pegasus 9 610
Pisces 10 242
Sagittarius 12 4
Scorpius 12 79
Taurus 13 401
Constipation 3 415
Constitutive equations continuum mechanics 5 255
Constraint 3 415
kinematics 7 347
Lagrange's equations 7 383-384
moving 3 415
stationary 3 415
virtual work, principle of 14 328
Constrictor constrictor 2 272
Construction engineering 3 415-416
airports 1 216
arches 1 507
cofferdam 3 267-268
construction equipment 3 416 418
cost control 3 416
execution 3 416
launching pad complex 7 415-421
masonry 8 161
master schedule 3 415
planning 3 415
progress control 3 416
structural connections 13 199 203
structures 13 206
telephone systems *see* Telephone systems construction
tunnels 14 *141 141
Construction equipment 3 416 418
backhoe 5 134
clamshell 5 134
combination excavators and haulers 5 417
crane 5 536 5 134
dragline 5 134
drilling equipment 3 417
earthmover 4 351 352
economic considerations 3 418
excavating equipment 3 416
excavation 5 134
front-end loader 5 134
hauling equipment 3 417
hoisting equipment 3 418
marine excavators 3 417
pile driver 3 418, 10 226*
power shovel 5 134 12 306
standard land excavators 3 416
trencher 5 134
Construction materials *see* Structural materials
Construction methods 3 418 420
asphalt paving 3 420
blasting 2 255, 3 418
compaction 3 419
concrete 3 419
dewatering 3 419
earth moving 3 419
electroosmotic dewatering 4 526
foundation treatment 3 419
precast concrete 10 567 568
preparation of site 3 419
steel erection 3 419
wellpoint systems 14 472 473
Construction surveys 13 328 329
Constructional apraxia 1 494
Constructive interference (electromagnetic wave) 7 184 187
Contact, electric 3 420
Contact angle 5 514
interface of phases 7 181
surface tension 13 315 316
Contact aureole 1 668 669
Contact barrier (semiconductors) 12 170
Contact bias 2 184
Contact catalysis surface phenomenon 13 315
Contact comparators 3 328 329
Contact condenser 3 377, 420 421*
Contact dermatitis 4 408
Contact metamorphism 8 504, 11 591
Contact microphone 8 561
Contact microradiography 8 365* 401
Contact noise 9 117
Contact poison 7 140
Contact potential difference 3 421
Contact printing photography 10 159 161 166
Contact process carbon black 2 465
sulfuric acid 13 260 265
Contact rectifier 3 422, 12 172 *see also* Semiconductor rectifier
Contact thermography *see* Thermography
Contact transformation Hamilton Jacobi theory 6 332
Contacting device fractionating column 5 491
Contactor blowout coil 2 270

Contagious abortion 2 564
Contagious agalactia
Mycoplasmatales 8 679
Contagious polyarthritis 2 70
Contamination, air *see* Air pollution
Contamination, food *see* Food microbiology
Contamination, radioactive *see* Radioactive contamination
Contamination, water, *see* Water microbiology Water pollution, Water purification
Continent 3 422
Africa 1 104
Antarctica 1 440
Asia 1 576 598
Australia 1 669 673
Europe 5 108 123
formation 9 409
North America 9 138 164
sial and sima 13 412 413
South America 12 524 551
submarine topography 13 216
Continental crust 12 155 156
Continental *drift* 12 221 224
orogeny 9 412
polar wandering 10 445
rock magnetism 11 596 597
tectonophysics 13 418 419
Continental fracture system 13 414
Continental heat flow 4 332
Continental islands 7 273
Continental rise *see* Continental shelf and slope
Continental shelf and slope 3 422 423* 13 215
Gulf of Mexico 6 293
neritic sediments 8 135 135
North Sea 9 164 165
submarine canyon 13 235
submarine topography 13 216 218
Continental telegraph code 13 421
Continentality weather and climate 3 423 424
Asia 1 591
Contingency table statistics 13 73
Continuity equation
gas dynamics 6 50
gas undergoing chemical changes 6 50
global 6 50
species 6 50
steady flow 6 50
Continuous beams
prestressed concrete 10 586
Continuous countercurrent leaching 7 423-424
Continuous electrochromatography 3 97
Continuous games 6 30
Continuous group 6 282
Continuous map 13 680
Continuous melter (iron foundry) 1 502
Continuous spectrum 12 593
Continuous vinegar process 14 326
Continuous wave radar 3 424 425*, 4 266
coherent observation time 3 425
Doppler radar 4 266
FM-CW 3 425
frequency modulation 3 425
power 3 425
pulse compression radar 3 425
range measurement 3 425
velocity measurement 3 425
Continuous-zone electrophoresis 3 97
Continuum hypothesis 12 205
Continuum mechanics 13 548
see also Field theory *classical*
Continuum physics 13 548
Contopus sordidulus 10 88
Contopus virens 10 88
Contour 2 534, 3 425, 13 677
Contour irrigation 7 270
Contracid 2 175
Contractile proteins 2 491-492
Contractile vacuole *excretion* 5 158
Contracting earth hypothesis 9 411-412*, 13 419
Contraction cycle, heart 3 138
Contractional polygons 10 472
Contracts engineering and architectural *see* Engineering and architectural contracts
Contradiction, law of 7 578
Contrast (image) 13 449
Contrast (photography) 10 164
Contravariant vectors 2 404 405
Control (automation) *see* Control systems
Control chart 3 425 429
average and range 3 426
c chart 3 426
control limits 3 427
defects per unit 3 428
fraction defective units 3 427
p chart 3 426
quality control 11 140
special charts 3 428
statistical theory 3 426
$\bar{x}$ and *R* chart 3 426
Control grid triode 14 106 107
Control grid modulation amplitude 1 355
Control knob calibration 2 416
Control reversal aeroelasticity 1 90
Control switchboards electric power substation 4 443
Control systems 3 429 438*, 12 20
air traffic 14 12 13
analysis 3 431
applications 3 430
automatic pressure control 10 580
automation 1 676 679
automobile traffic 14 13
chemical process control 3 31 32
closed loop control systems 3 429 434
compensating networks 3 433
computer 3 360
controlled quantity 3 429
controlled system 3 429
controller 3 429
creation of model 3 431
criteria of stability 3 436
cybernetics 5 637 638
damping 3 435
drag-cup generators 13 584
eddy-current damper 3 437
feedback circuit 3 198 200
feedback control system 3 429 438
fire control systems 5 280 281
flight controls 5 306 309
function generation analog 1 576
guidance systems 6 286
hunting 3 435, 6 520
instability 3 430
linear 3 431
man as element 3 431
manipulated quantity 3 429
marine boiler 8 103
mathematical tools 3 431
measuring device 3 429
minor decision making 3 431
multiple capacity systems 3 434
Nyquist stability criterion 3 438
open loop control system 3 429 9 335*
open loop transfer characteristic 3 430
optimum performance 3 430
oscillation 3 435
overshoot 3 430
performance objectives 3 430
pressure 10 580
principles of operation 3 429
process control 10 637
proportional controllers 3 432
railroad traffic 14 12 13
regulator 11 423
remote control system 11 446 447
replacement of humans 3 431
Routh criterion of stability 3 436
sampled-data 12 20 21
servomechanism 12 194 205
single capacity system 3 431 434
solution of differential equations 3 434
speed of response 3 430, 433
stability frequency response analysis 3 436
stability of physical systems 3 435
stabilization 3 437
steady state error 3 430 433
steady state frequency response 3 434
system response 3 430
systems engineering 13 378
tachometer 13 382 385
tachometric feedback 3 438
temperature 13 497, 488
traffic 14 12 13
transfer characteristics 3 429
viscous damper 3 437
zero errors 3 430
Control systems Automatic electric power substation 4 440 443
Control volume gas dynamics 6 49
Controllable pitch propellers 1 14
Controlled quantity control systems 3 429
Controlled rectifier 3 438 439 11 585 586
Controller 3 429
Conularia 3 261
Conularida 3 261 439*
Conulidae 6 469
Conuropsis carolinensis 9 567 12 69

Conus arteriosus 2 497
Conus papillaris 5 169
Convection (bulk flow) 4 144
Convection (heat) 3 439-444*, 6 374 375, 13 566
  aerodynamic heating 3 442 443
  boiling 3 443
  condensation 3 443
  forced convection 3 441 442
  heat-transfer coefficient 3 442
  mass transfer 3 443-444
  momentum transfer 3 443 444
  natural convection 3 439 441
  in stars 13 107-108
  turbulent flow 3 440, 442
Convection current theory (earth) 9 412 413, 13 419
Convection ventilation 14 297
Convectors 11 241
Convenience outlets, electrical 3 404
Convergence 12 189 191
  Fourier series and integrals 5 488
Convergent evolution 8 13
Conversion printing in color 10 608
Conversion formulas plane trigonometry 14 96
Conversion processes *see* Unit processes
Conversion ratio nuclear fuels 9 184 186
Converter copper 3 465
  analog-to digital *see* Analog to digital converter
  digital to analog *see* Digital to analog converter
  steel manufacture 13 94
Converter, synchronous 3 444
  inverter 7 235
  slip rings 12 381
Convertible automobile 1 681
Convertin 3 195
Convertiplane 3 445-447
  direct type 3 445
  fixed wing 3 446
  forward propulsion 3 447
  indirect type 3 445
  loading of rotors and propellers 3 445
  rotary wing 3 447
  shrouded devices 3 445
  vertical thrust generators 3 445
  see also Vertical take off and landing (VTOL)
Convex polygon 10 471
Convex polyhedron 10 471
Conveyance canals 2 433 434
Conveying machine 3 447-450
  chain 3 450
  compressed air 3 450
  gravity 3 447-448
  gravity chutes 3 448
  live-roller 3 450
  overhead trolley 3 450
  powered 3 448
  pusher bar 3 450
  roller 3 448
  vertical 3 450
Conveyor 2 365-367, 3 450-452, 8 475
  belt 2 365-367
  bucket 2 367
  cableway 2 368
  flight 2 367-368
  mining machinery 8 489
  pneumatic 2 368
  screw 2 368, 12 83
  vibrating 2 368
  see also Bulk-handling machines
Conveyorized line 1 594
Convolute vernation 2 361
Convolution transform 7 165
Convoy (naval) 1 484
Convulsive disorders 3 452
Conway, E J 1 630
Cony 3 452*, 6 598
Cook Mountain 1 671
Cooke lens objective 1 613
Cool flame 3 307, 5 291
Coolant cutting fluids 8 8
  liquid cooling system 4 604
  nuclear reactors 11 350 351* 358
Coolidge, W D 14 588
Cooling *see* Air cooling, Engine cooling, Refrigeration Thermoelectric cooling
Cooling agent dry ice 4 279
Cooling curve 5 58
Cooling power formulas 12 180
Cooling tower 3 452 454
  atmospheric 3 452
  components 3 453
  cooling means 3 452
  humidification 6 514
  mechanical draft 3 453
  natural draft 3 453
  performance 3 454
  types 3 452
Coombs, R R 2 267
Coombs serum 3 192 202
Cooper, L N 13 301, 14 186
Cooper load railroad bridge design 2 335
Cooperation (ecology) 5 12 15
Cooperative game 6 29
Cooperia 13 193
Coordinate bond chemistry 3 458 459
Coordinate converter 13 569
Coordinate covalent bond 3 26
Coordinate system converters analog computer 1 583 584
  electromechanical 1 583
  mechanical 1 583
Coordinate systems, astronomical *see* Astronomical coordinate systems
Coordinate systems, graphical 1 587, 2 411-412, 3 454 456*
  cartesian 3 454
  curve fitting 3 629 631
  cylindrical 3 455 456
  polar 3 454-455
  spherical 3 455
  transformation 3 456
Coordinate systems, surveying 13 324
Coordinate systems, terrestrial 3 456-457
Coordinate transformation 3 456
Coordinates, spherical *see* Spherical coordinates
Coordination chemistry 3 457 461
  chemical structures 3 35-36
  complex compounds 3 334
  coordinate bond 3 458-459
  solid state 12 474
  see also Chelation
Coordination compounds iron 7 258-259
Coordination number 3 461 462
  chemical structures 3 35
  complex compounds 3 334
  crystal structure 5 599 600
Coordination polygons 3 36
Coordination polyhedrons 3 35 36
Coosa River 9 148
Coot 3 462* 6 286 11 326
Cootie 7 593
Copelata 14 140
Copepognatha *see* Psocoptera
Copepoda 1 560 561 2 319 3 462 463* 562
  Calanoida 2 392 3 462, 562
  Caligoida 2 417 418 3 562
  classification 3 462 463
  Cyclopoida 3 462 562 642 643
  economic biology 3 463
  habitats 3 463
  Harpacticoida 3 462 562 6 343 344
  Lernaeopodoida 3 562, 7 477
  life history 3 463
  Monstrilloida 3 562 8 585
  Notodelphioida 3 562
  structure 3 462
Copernicia cerifera 2 522 5 98
Copernicus N 1 552
Copernicus Institute 1 596
Copidosome gelechiae 6 581
Coping saw 14 542
Copodontidae 2 516
Copolymer 10 478
Copper 3 463 472
  alloys 3 468 471
  bornite 2 299
  brass 2 329
  bronze 2 349
  compounds 3 471 472
  corrosion resistance 3 [illegible]
  electric conductors 3 392
  electron configuration 4 504
  electroplating of metals 4 530
  extraction and refining 11 120
  extractive metallurgy 8 [illegible]
  fabrication 3 469
  ionization potential 4 506
  in meteorites 8 313
  natural occurrence 3 464
  ores *see* Copper ore
  principal compounds 3 [illegible]
  properties 3 466 467
  resistivity 11 497
  self diffusion rate 11 [illegible]
  thermal conductivity 3 391
  velocity of sound in 12 51
  whiskers 14 488
Copper alloys 3 468 471
  cast 3 471
  wrought 3 470 471
Copper Basin 9 159
Copper beech 2 350
Copper chemistry 3 471 472
Copper dihydrazinium sulfate 6 530
Copper loss 3 472
  electric rotating machine 4 449
  wiring (electric) 14 522
Copper nickel phase diagram 7 194
Copper ore azurite 1 705
  bournonite 2 315
  chalcopyrite 5 7
  chrysocolla 3 116
  cuprite 3 623
  enargite 4 587
  malachite 8 75
  tetrahedrite 13 529
Copper oxide rectifier 12 175
Copper zinc system 3 468
Copperhead 3 472
Copperite 10 411
Copperplate engraving 10 607 617
  printing plate 10 610
Copperplate ink 7 114
Copperplate printing press 10 622
Copperplating 4 530
Coppers (butterfly) 7 464
Copperweld wire 8 280
Coprecipitation 10 572
Coprolite 5 474 12 134

Coproporphyrin 10 520
Coprostanol 13 137, 139
Copulation 11 476
Copulatory organ 3 472 473*, 9 621, 11 456 466 467
Copsifo 10 148
Coquillettia 6 400
Coquina 3 473
Coquina limestone 6 276
Coquinoid limestone 3 473 7 516
Coracidium 11 66
Coracinidae 3 473
Coraciiformes 1 694 3 473* kingfisher 7 561
Coragyps atratus 14 377
Co-Ral 7 141
Coral 3 474
atoll 1 646 647
beach sediments 12 303
black 1 455
Cretaceous 12 78
deep sea forms 12 78
Jurassic 12 78
Permian 12 78
reef 12 92
reef building 3 474 475
scleractinian forms 12 76 77
Coral horny 1 455 490 12 92
stony 1 455 12 76
Tabulata 13 391
Tertiary 12 78
Triassic 12 78
true 12 76
Coral island 12 76
Coral reef 1 456 3 474 475* 12 76
atoll 1 646 647
barrier 2 105
bryozoans 2 356
Calcichordata 4 357
Coelenterata fossils 3 262
coral 3 474
flank breccias 2 326
fringing 3 474
geographic distribution 3 475
geologic occurrence 12 78
geologic range 3 475
islands 3 475
kinds 3 474
origin 3 474
Timor 4 537
zonation of 3 475
Coral reef studs, ecology 4 389
Coral Sea 9 271
Coral snake 3 475 476* 13 27
Corallamidae 5 291
Corallidae 6 298
Corallimorpharia 3 255 476*
Corallimorphus 3 255 476
Corallina 3 476
Corallinaceae 1 257 3 476
Coralline 2 354
Coralline algae 3 476 Cordaitaceae 3 476 478
Coralliochama 9 614
Corallium 3 255
Corallium konojoi 6 238
Corallum 12 76
Corangamite Lake 1 672
Corbicula 6 576
Corbiculidae 5 101
Corbino effect electrical conductivity 4 455
Corchorus 12 79
Corchorus capsularis 7 327
Corchorus olitorius 7 327
Cord factor glycolipid 6 223
Cord grass 8 127
Cordage 1 1
Cordaicarpus 3 478
Cordaitaceae 3 476 478
Cordaitales 3 401 476-478*, 6 300 9 503, 10 346 Pityaceae 3 476 Poroxylaceae 3 478
Cordaites 3 476 478
Cordials 4 256
Cordierite 2 650 3 478*
Cordillera Alpine 13 407-409 Himalayan 13 410 Middle East 13 409 410 North American 13 410 411 South American 13 411
Cordilleran belt 3 478 479
Cordilleran geosyncline 6 173
Cordoba 2 626 5 75
Cordovan leather 7 446
Cordulegasteridae 9 275
Cordyline terminalis 6 297
Cordylobia anthropophaga 8 686
Core (earth) chemical composition of 7 546 549
Core drill sizes 2 296
Core drilling 2 295 296 3 479* oil and gas wells 9 293
Core logging 14 470
Core loss 3 470 480* 4 449 eddy current loss 3 479 electric rotating machinery 4 449 hysteresis 3 479 8 599* measured 3 480 synchronous motor 13 372
Core of earth *see* Earth (core of)
Core sampling oil and gas wells 9 292 293 tunnels 14 142
Coregonidae 14 489
Coregonus clupeiformis 14 489
Coreid bug 6 401
Coreidae 6 401 13 29
Corella parallelogramma 9 169
Coremia 13 140
Coremium glaucum 13 141
Corer mining machinery 8 489
Corey R. B. 11 34 40 41
Cori, C. F. 6 214, 222
Cori, G. T. 6 218 222
Cori ester 6 218
Coriander 3 480*, 12 612
Coriandrum sativum 3 480
Corisella 5 7
Corixmelaena 6 410
Coring devices (marine sediments) 8 145 146
Corinth, Gulf of 5 114
Coriolis, G. G. de 1 27
Coriolis acceleration and force 3 480 481 atmospheric low 1 632 estuarine circulation 5 81 frame of reference 3 402 hurricane 6 321 ocean currents 9 217 ocean tide 13 635
Coriolis component of acceleration 1 27
Coriolis effect ballistics exterior 2 82 seiche 12 146
Corixidae 6 401 water boatman 14 501
Cork 10 12 13 118 periderm 10 11 velocity of sound in 12 516
Cork cambium 2 97 13 118 meristem lateral 8 249 periderm 10 11
Corkboard insulator 6 374
Corkwood 7 419
Corliss, G. H. 5 445
Corliss, J. O. 11 52
Corliss valve 13 79 14 261
Corm 4 15 13 111 121
Cormorant 3 481
Corn 3 481 486* 10 571 12 256 13 50 cultivation 3 485 description 3 481 diseases 3 484 food 5 372 harvesting 3 484 heterosis 6 430 hybrids 3 483 maize spontaneous mutation frequencies 8 675 origin 3 481 planting 3 485 processing 3 485 486 smut 12 386 types and varieties 3 482
Corn Belt American 9 154
Corn crib 1 140
Corn earworm 7 472
Corn bull gum 6 297
Corn oil 7 529
Corn picker 1 129
Corn root aphid 6 474
Corn starch hydrolysis 6 559
Corn sugar 6 217
Corn thrips 13 628
Cornaceae 14 149
Cornea 3 167, 12 546 anatomy and histology 3 167 embryology 3 166 glaucoma 6 210 211
Corner reflector antenna 1 449 3 486* FCM 4 521
Cornet 8 666
Corniculate cartilage 7 406
Cornish (chicken) 3 58
Corno, Monte 5 119
Cornu's spiral 4 139 159
Cornularia 3 226 13 148
Cornus 12 79
Cornus florida 4 260
Cornus kousa 4 260
Cornus nuttallii 4 260
Cornuspira 12 28
Cornu allium 4 80
Corolla 5 326 331
Corona (mineral) 8 296
Corona Ratifera 11 633
Corona, solar 3 486 487 13 270 272* coronagraph 3 488 13 289 observation during eclipses 4 381
Corona Australis 3 412 413
Corona Borealis 3 412 413
Corona discharge 3 487 brush discharge 2 353 electrostatic precipitator 4 518 power loss 3 487 Saint Elmo's fire 12 6 transmission line 14 53
Corona radiata reproductive system 11 469 474
Coronagraph 3 488* 13 289
Coronal prominences 13 294
Coronary artery 5 137 141
Coronary sclerosis 6 360 361
Coronary thrombosis 6 358 362
Coronary vein 5 137 141
Coronatae 3 255 488*
Coronation Gulf 9 166
Coronilla 13 150
Coronidopsis 13 150
Coronilla varia 14 310 311
Coronula diadema 3 145
Coronympha octonaria 11 54
Corophiidae 6 36
Corophium crassicorne 6 36
Corpora allata 3 99 103
Corpora cavernosa 9 621 11 473
Corpora lutea 3 39
Corpora nigra 5 162 171
Corporal missile 1 540
Corpospore 11 555
Corpus allatum endocrine mechanisms 4 596 Hemiptera 6 409 410

Corpus allatum endocrine mechanisms—*cont*
insect physiology 7 123
Corpus callosum 9 60
Corpus cardiacum endocrine mechanisms 4 596
Hemiptera 6 400-410
Corpus cavernosum 11 472
Corpus luteum 6 235, 480
ovary 9 453
progesterone 10 644
Corpus penis 11 473
Corpus spongiosum 9 621
Corpus spongiosum penis 11 473
Corpuscle of Pacini 9 532
Corpuscular radiation, canal rays 2 434-435
see also Particle radiation statistics 15 74
Correlation biometrics 2 229
Correlation coefficient 10 630
Bohr 1 653-655
Correspondence principle: quantum mechanics 11 161
Corresponding states, principle of gas 6 42 43
Corrib, Lake 5 115
Corrodentia *see* Psocoptera
Corrodkote test electroplating 4 534
Corrosion 3 488-494
aircraft engine 1 188
cathodic protection 4 469
concentration cell corrosion 3 490
crystal structure 3 493-494
demineralization 3 490
electric distribution systems 4 424
electroplating of metals 4 529
erosion 3 490
galvanic 3 489-490
by gases 3 491-494
inhibitor (chemical) 3 491, 7 112
intergranular 3 490
iron alloys 7 265-266
liquids and solutions 3 488-491
metallography 8 293
oil and gas field exploitation 9 287
petroleum engineering 10 59
pitting 3 490
primer (surface coating) 10 592 593
reduction 3 490 491
refractory 11 411
ship hulls 4 279
stress 3 490
tests 4 535 536
Corrosion prevention 3 490 491
alloying 3 491
cathodic 3 491
copper 3 469
inhibitor (chemical) 3 491, 7 112
lead alloys 7 426
metal coatings 3 491
surface coating 3 491
Corrosion resistant materials 3 491
alloy 1 258 259
chromium 3 103
stainless steel 13 34
Corrosion resistant paints 9 494
iron alloys 7 265 266
Corrugation 7 270
Corsica 5 116, 8 207
Corson, D R 1 595
Corson, M G 2 171
Cort, C 5 7
Cort, H 14 559
Cortex· stele 13 105
stem 13 114, 115
Cortex, adrenal *see* Adrenal gland
Cortex, plant 3 496-496
chlorenchyma 3 495
collenchyma 3 495
endodermis 3 495
exodermis 3 495
hypodermis 3 495
parenchyma 3 495
sclerenchyma 3 495
Corticium 3 254, 6 476
Corticoid *see* Corticosteroid
Corticospinal tract *see* Pyramidal tract
Corticosteroid 1 71, 6 480, 482, 13 188
see also Adrenal cortex steroid, Adrenal gland
Corticosterone 6 483-484
endocrine mechanisms 4 590
see also Adrenal gland
Corticotropin *see* Adrenocorticotropic hormone
Cortisol 1 71, 399, 6 483 383
see also Adrenal gland
Cortisone 1 71, 4 590, 6 483 484, 9 35
see also Adrenal gland
Corundum 1 297, 3 496*
abrasive 1 9
aluminum ore 1 290
emery 4 582
gem 6 98
Madelung constant 8 15
ruby 11 618 649
sapphire 12 26
Corvidae 7 304, 8 74, 9 254
Corvus brachyrhynchos 3 556
Corvus 3 412 413
Corvus corax 11 347
Corvus ossifragus 3 556
Corycium 9 503
Corydalidae 6 394
Corydalus cornuta 6 394
Coryell, C 11 5
Corylophidae *see* Orthoperidae
Corylus 5 168, 260
Corymb 7 98
Corynactis 3 255, 476
Corynebacteriaceae 2 11, 3 496-497*, 5 96
Corynebacterium 3 496
diphtheria 4 208
Erysipelothrix 3 497
Listeria 3 497
listeriosis 7 543
Corynebacterium 3 496, 5 66, 9 620
Corynebacterium acnes 3 497
Corynebacterium diphtheriae 1 466-467, 2 12, 3 497, 4 207; 12 188, 14 6
type *gravis* 4 207 208
type *intermedius* 4 207-208
type *mitis* 4 207-208
virulence 14 330
Corynebacterium equi 3 497
Corynebacterium insidiosum 3 497
Corynebacterium michiganense 3 497
Corynebacterium poinsettiae 3 497
Corynebacterium pseudotuberculosis 3 497
Corynebacterium sepedonicum 10 314
Corynebacterium tritici 3 497
Corynepteris 3 263
Corynespora cassiicola 3 529; 12 535
Coryneum beijerinckii 1 495, 9 602
Corynosoma 1 19
Corynosoma reductum 9 495
Corypha cerifera 14 444
Corvphaena 4 262
Corvphaenidae 10 10
Corvphaenoididae 6 2
Corvphodon 9 537
Corvphodontidae 9 537
Corvstes cassiodaunus 3 531
Corythucha 6 409
Corythucha ciliata 6 405
Corythucha marmorata 6 405
Coscinasterias 1 598
Coscinoscera hercules 7 469
Cosecant 14 93
Cosecant-squared pattern radar 11 204
Cosine 14 93
Cosine function analog generation 1 376 378
Cosine sequence 10 647
Cosines, law of 14 97, 101
Cosmasterias dyscrita 1 599
Cosmic electrodynamics 3 498
astronomical geophysics 1 608
Cosmic electrodynamics—*cont*
magnetohydrodynamics 9 55
Cosmic rays 3 498 502
atmospheric 3 498 506
cascade processes 3 499
cloud chamber 5 213 214
energy and mass spectrum 3 500 501
geomagnetic effects 3 500
nuclear stars 3 499 500
nucleonic component 3 499
nuclides produced by 11 269
origin 3 502
probable future uses 3 502
radio astronomy 11 244
radioactive species produced by 11 269 271
showers 3 500
Cosmic space vehicle 12 516
Cosmical constant cosmogony 3 505
Cosmical constant Einstein 3 505
Cosmocerus 9 520
Cosmocerzidae 1 571, 9 475
Cosmochemistry 3 503
elements, cosmic abundance 4 546 549
elements and nuclides, origin of 4 552 558
see also Cosmogony; Earth (origin of); Geochemistry; Solar system
Cosmogony 3 503 509
age of star clusters 3 505
age of the universe 3 503-504
formation of solar system 12 471
galactic rotation and angular momentum 3 506 507
galaxies and galaxy clusters 3 505 506
nebular hypothesis 3 508
origin of double stars 3 507
origin of hierarchic structure 3 504 505
origin of Saturn's rings 3 509
origin of solar system 3 507 509
Cosmoid scale zoology 12 48
origin of stars and star clusters 3 506
Cosmology 3 509 510
alternative cosmologies 3 510
cosmogony 3 505 505
cosmological principle 3 509
expanding universe 3 510
possible motions of universe 3 509
radio astronomy 11 246 24

Cosmology—*cont*
relativistic theories 5 509 510
steady state hypothesis 5 510
Cosmotron 9 579
Cossidae 7 464
Cosslett V E 8 366
Cossyphodidae 5 277
Cost *control* 5 415
Coster, L. J 10 597
Cotangent 14 95
Cothurnia 11 55
Cotidal chart 13 655
Cotinazin *see* Isonicotinic acid hydrazide
Cottagridae 9 589
Cott H B 11 33
Cottage cheese 5 13
Cotter pin 5 510
Cottian Alps 5 117
Cottidae *12 89*
Cotton 2 459 3 511 515* 12 79
bleaching 5 249
cultivation 5 511
defoliation 4 43
diseases 5 515
distribution 5 511
dyeing 5 249
fiber natural 5 246-249
harvesting 5 131 5 511
microbiology of 13 541
processing 5 511
production 5 511 512
products 5 511
wild cotton 5 513
Cotton boll weevil 2 131
Cotton bollworm 7 472
Cotton effect 9 546
Cotton flea hopper 6 405
Cotton lap 13 532
Cotton Mouton effect mag netooptics 8 68
Cotton picker 1 131
Cotton stainer 6 405
Cottonmouth 5 535
Cottonseed oil 5 189 7 529
drying oil 4 290
printing ink vehicles 7 113
Cottonseed stearin 5 189
Cottonwood 12 8
Cottony-cushion scale 6 475
insect *control* biological 7 122
Cottony rot 5 546 548
Cottrell F G 4 538
Cottrell precipitator *see* Electrostatic precipitator
Cottrell visibility meter 10 173
Cottus cognatus 12 89
Cottus scorpius 13 556
Cotunnite 6 325
Corallospira virgins 14 78
Corbicula 12 144
Cordilosaurus 5 515* 11 484 12 562
anapsida 1 395
Corlpe *see* Syntype
Coucal 5 612
Coudé spectrograph 1 615 616
Couette flow 9 92
Cougar 5 515
Coulomb C A 4 462, 8 48
Coulomb 5 516*, 14 317
absolute 4 458 459
Coulomb barrier nuclear *structure* 9 205
Coulomb damping 14 317
Coulomb electrostatic attraction 9 202 207
Coulomb force 9 202 207
nuclear structure 9 202 207
Coulomb friction *see* Friction
Coulomb's law 5 516
electrostatics 5 516*, 4 601 7 249 250
magnetostatics 8 31
Coulomb sensitivity galvanometer 6 23
Coulometer 5 516 517
Coulometric analysis 5 517
Coulometric titration 5 517
Coumarin 2 266, 5 374 10 343, 11 108 14 271
Coumarin glycoside 6 224
Coumarone 6 536
coal chemical 5 235
Coumarone-indene resins 6 536
Counter digital 5 517 518
binary 5 518
decimal 5 518
electronic 5 502
ratchet wheel 5 517
ring 5 517
scaling circuit 12 48 49
see also Counting circuit, Frequency counter
Counter mining effect 1 484
Counter shaft 12 240
Counter tube x ray fluorescence analysis 14 580
Countercurrent extraction 5 158 7 425
fuel reprocessing 9 *190-190*
protein isolation 11 36
Countercurrent mass transfer operation 5 518 519
extraction 5 156 158
solvent extraction 12 300
Countercurrent mixer settler *extractor* 12 408
Countercurrent spray dryer 4 287
Countercurrent wet magnetic separator 8 47
Counter emf 1 544
Counterexample 8 177 178
Countermeasures, electronic *see* Electronic countermeasures
Counting circuit 5 519 520
binary counter 5 519
Counting circuit—*cont*
digital voltmeter 4 191
frequency counter 5 502
relay 5 519
scaling circuit 12 49
transistor 5 519
see also Counter, digital
Couple 5 520 521
equivalent couples 5 521
scalar moment 5 521
vector properties 5 520
Coupled circuits 5 521 525
capacitance coupling 5 521
coefficient of coupling 5 522
combination coupled 5 521
direct coupled 5 521
driving point and transfer impedances 5 523
equivalent circuit 5 524
inductance coupling 5 521
inductive coupled 5 521
leakage inductance 5 522
magnetic coupling 5 521
mutual inductance 5 522
mutual and leakage fluxes 5 521
resistance coupling 5 521
self inductance 5 522
solution of coupled circuits 5 522
transformer 14 23 29
voltages of mutual induction 5 522
Coupler directional *see* Directional coupler
Coupling 5 525 526
Coupling, fluid *see Fluid* coupling
Coupling mechanical 5 525 526
Ajax flexible coupling 5 526
clamping 5 525
Clark 5 526
clutch 5 223 226
Falk flexible 5 526
fast 5 525
flange 5 525
flexible 5 525
flexible pin 5 526
Francke 5 526
Oldham's 5 525, 9 511
rigid 5 525
spring 5 526
universal joint 5 526
Westinghouse Nuttall flexible 5 526
Coupling capacitor vacuum tube amplifier 1 343
Coupling coefficient electromagnetic induction 7 70 71
Coupling factor, transmission *see* Transmission coupling factor
Coupling reaction diazotization 4 106
Course navigation 4 18
Course line computer 5 526
Courtship reproductive behavior 11 455 456
Courtship gland 12 61
Covalent binding 3 25 26*, 12 475, 14 257 258
Covalent hydrides 6 551
Covariance (*probability*) 10 629
Covariance, principle of 11 456
Covariant differentiation 2 407
Covellite 5 526
copper ore 5 464
Cover crops 5 526 529
annual winter legumes 5 527
large seeded legumes 5 529
Cover ink 7 113
Covered smut 2 99
Cow gestation period 6 182
see also Cattle production
Cow killer (*numblebee*) 6 581
Cowan, C. L. 9 83
Cowbird 5 528 529
Cowboy *vein 6 186*
Coxdria 11 567
Coxdria ruminantium 6 562
Cowhage (*itch*) 7 298
Cowhide 7 446
Cowlitz Valley 9 162
Cowpea 5 529
Cowper's gland 5 529 530*; 11 470 743
Coxal gland 5 105
Coxiella 11 567, 569
Coxiella burnetti 8 432, 11 153 567, 569
fluorescent antibody method 8 383
Coxite 5 275-288
Coxopodite 5 564
Coxsackie virus 5 530*, 5 5
Coyote 5 550
Coyoting 8 481
c p s emitron *see* Cathode-potential-stabilized emitron
CPT theorem 15 362 364
Crab 1 560 5 530 531; 14 563 567
common varieties 4 31 34
Crab louse 1 434 7 595
Crab nebula 5 531 532*; 4 555 9 24 26*, 11 246, 15 303
Crab plover 5 10
Crab spider 1 498
Crabapple 5 532
Crabmeat 5 419

Cracidae 6 18
Crack willow 14 493
Cracked asphalt 1 591
Cracked tars fuel oil 5 557
Cracking 3 532-535
  alkane 1 250
  catalysis 2 549
  catalytic 3 533
  coking (petroleum refining) 3 273
  depolymerization 4 67
  fluidization 5 346
  fuel gas supplements 5 553-556
  furnace construction 5 576-577
  petroleum processing 10 68 69
  thermal 3 532 533
  see also Reforming (petroleum refining)
Cracking catalyst 2 548
Cradle Mountain 1 671
Cradle printing 10 597
Craftint 10 611
Crag 1- herbicide 6 423
Crago 3 563, 12 308
Crago septemspinosus 12 307
Craig, L C 3 80, 5 158, 11 36
Craig W 8 603
Cramer's rule linear systems of equations 7 521
Cranberry 3 535*, 5 548-549
Cranchiidae 2 645
Crane 5 134
  excavating equipment 3 416, 5 133-134*
  hoisting equipment 3 418, 6 462
Crane (zoology) 3 535-536
Crane fly 4 212
Crane hoist 3 536
  crawler crane 3 536
  excavator 5 133-134
  floating crane 3 536
  hook 3 536-537
  locomotive crane 3 536
  truck crane 3 536
  wheeled crane 3 536
Crane hook 3 536 537
Crangon 4 29
Crangonobdella 11 556
Crania antiqua 9 38
Craniacea 9 38
Cranial nerve 3 537-538*, 9 60 63
  abducens nerve 3 537, 9 60
  accessory nerve 3 538, 9 60
  auditory nerve 3 538
  embryology 9 47
  facial nerve 3 537, 9 60
  glossopharyngeal nerve 3 538 9 60
  hypoglossal nerve 3 538 9 60
Cranial nerve—*cont*
  oculomotor nerve 3 537, 9 60
  olfactory nerve 3 537, 9 60
  optic nerve 3 537, 9 60
  parasympathetic nervous system 9 557
  statoacoustic nerve 9 60
  trigeminal nerve 3 537, 9 60
  trochlear nerve 3 537, 9 60
  vagus nerve 3 538, 9 60
Craniata 1 420, 3 538, 14 308
Craniometry 1 461
Craniosacral system *see* Parasympathetic system
Craniscus 2 315
Cranium 2 630 3 538*, 6 315
Crank 3 538 539
Crank and rocker mechanism 3 402, 5 481
Crank mechanism, slider *see* Slider crank mechanism
Cranshaw, T H 11 38
Cranston, J A 11 30
Crape ring (Saturn) 12 39
Crapper, G D 14 417
Crappie 3 539*, 13 291
Craspedacusta 3 255, 14 10
Craspedochilus 10 487
Crassius auratus 6 233
Crassostrea virginica 12 236
Crataegus 4 62
Crater (constellation) 3 412 413
Crater Lake volcanic caldera 14 350
Craterostigmomorpha 3 60
Craters of the Moon (Columbia plateau) 9 160
Craton 12 142, 13 413
Cratoselache 10 255, 13 104
Cravenechinus 9 406
Crawford, A 13 194
Crawling water beetle 3 276
Crayfish 1 560
  3 539-540* 563, 4 24
Cream *see* Milk
Cream cheese 3 14
Cream separator 4 2
Crease resistance textile 15 539
Creatine 6 221
Creatine-creatinine 3 540
Creatine phosphate 12 563
Creatinine 1 266, 7 33
  blood chemistry 3 197
Creatinine phosphate 4 362
Creek 11 581
Creep of materials 3 540 541
  plastic deformation of metal 10 400-401
  prestressed concrete 10 586
  primary creep 3 541
Creep of materials—*cont*
  relaxation 3 541
  secondary creep 3 541
  soil and rock 8 166-167
  tertiary creep 3 541
  thermal stress 13 552
Creeper 3 541
Creeping water bug 6 401
Crenodonta 5 100
Crenosoma 13 193
Crenothrix 10 64
Crenotrichaceae 3 65
Creodonta 2 522 523
Creophilus maxillosus 3 286
Creosote 3 541-542
  wood preservation 14 539
Creosote bush 3 190
Creosote oil 3 236 541
Crepidula 2 605, 11 19, 12 235
Crepuscular species communities 3 324 325
Creslan 4 310, 5 244
Cresol 1 476 3 542*
  coal-tar chemical 3 236
  creosote 3 541 542
m-Cresol 10 113
p Cresol 2 33
Cresol red 7 60
m Cresolsulfonphthalein 7 60
o-Cresolsulfonphthalein 7 60
Cress 3 542
Cretaceous 3 542 546*, 6 136 142
  animal life 9 521
  Lower Cretaceous 3 543-544
  natural gas reservoir rock 9 6
  paleogeography 3 542
  plant life 9 505
  subdivision 3 543
  Upper Cretaceous 3 545 546
Crete 5 116 8 207
Cretinism 3 546 547*
  4 235, 13 621 627
Crevasse deposit 5 311
Cribrariaceae 8 687
Cricetidae 6 332 7 449
  8 618 668, 11 615
Cricetus cricetus 6 332
Crick, F H C 2 62 8 672
Cricket 3 547
Criconema 14 169
Crimson clover 3 220 10 374
Crinoid 3 547
Crinoidal biostromes 7 516
Crinoidea 1 566 3 547-550*, 4 360 368 369
  alimentary system 3 549 550
  Articulata 1 566 3 547 4 360
  calyx 3 549
  Camerata 2 432 3 547 4 360
  coelom 3 549
Crinoidea—*cont*
  crinoid 3 547
  discovery 3 548
  ecology 3 548
  Flexibilia 3 547, 4 360 5 300
  Inadunata 3 547 4 360 7 49
  morphology 3 549 550
  muscular system 3 549
  nervous system 3 550
  reproduction 3 550
  water vascular system 3 549
Crista 3 644
Crista 4 321 322
Cristae mitochondriales 8 319
Cristallo Monte 5 119
Cristatella mucedo 10 201
Cristatellidae 10 201
Cristispira 13 4
Cristobalite 12 321
  in bentonite 2 163
  from calcined kaolins 3 161
  refractory 11 409
Cristovomer namaycush 14 119
Crithidia 1 700, 14 125
Critical band 8 160 161*, 9 126-127
Critical constant (gases) 2 276, 3 550*
Critical damping 4 12
Critical field (superconductivity) 13 295-300
Critical frequency of fusion (vision) 14 339
Critical illumination microscope 8 594
Critical mass 3 6, 550*
Critical point (gases) 6 42
Critical shear stress for slip 3 589
Critical solution temperature 5 56
Criticality reactor physics 11 364 367
Croaker 2 271 3 550*, 12 249
Crocco's equation 3 550 551
Crochet Lepidoptera 7 461
Crocin 6 219
Crocodile 1 257, 3 551 553*
Crocodilia 3 551 553*, 11 481 13 22
  alligator 1 257
  Archosauria 1 521
  biology 3 552 553
  caiman 2 389
  classification 3 552
  crocodile 3 551
  feeding 3 552
  fossils 3 553
  hibernation 6 436 441
  morphology 3 551 552
  reproduction 3 552

Crocodilia fossils 3 553 554
Crocodilidae 3 552
Crocodylus 3 552 554
Crocodylus americanus 3 551
Crocodylus intermedius 3 552
Crocodylus niloticus 3 551
Crocodylus palustris 3 553
Crocodylus porosus 3 551
Crocoite 3 554
Crocus sativus 7 514 12 4
Croixan epoch 2 425
Cro Magnon man 3 534*
3 478
Crompton S 12 618
Cromwell Current 9 485
Cronartium ribicola 3 626
10 312 11 654 14 73 74, 217
Cronstedt A F 9 97
Crooke triplet lens system
7 455
Crookes W 5 123 6 100 391
Crookes dark space 6 215 216
Crookes radiometer 11 317
Crookes tube 4 462
Crookesite 12 163
Crop digestive system
3 275 289 4 150 175 5 70
Crop and soil practices
agricultural *see*
Agricultural soil and crop
practices
Crop drying 1 131
Crop gland digestive system
4 150 175
Crop irrigation 14 302
Crop processing 1 133 134
Crop storage 1 131
Cropping system soil
management 12 428
Cross B E 6 184
Cross C F 5 243
Cross bedding 1 532 12 134
Cross linking polymers
10 475
Cross modulation 3 555
4 257
Cross pointer instrument
10 578
Cross polytope 10 492
Cross product of vectors
2 412
Cross ratio geometry
6 156 157
Cross resistance 13 528
Cross sea 12 100
Cross section collision 12 53 57
Cross section neutron *see*
Neutron cross section
Cross section nuclear
2 101 5 592 9 200*
Crossaster japonicus 12 619
Crossbar switch 13 352
Crossbar switching system
13 352 356
crossbar tandem system
13 355
Crossbar switching system—
cont
4A toll crossbar system
13 354
5 crossbar system 13 352
Crossbill 3 554 555
Crosscut saw 14 542
Crossed coil meter 10 102
Crossing over (genetics)
cytological observations
11 379
interference 11 379
mechanism 11 378
mitotic crossing 11 378
multiple exchanges
11 378
strand relations 11 379
Crossopterygii 1 415, 3 555*,
9 442 443, 446
Crossota 4 39
Crossover network 3 555
Crosstalk 3 555 556
antennas 1 455
compandor 3 556
crosstalk units 3 555
Crotalaria 3 526
Crotalidae 11 347 13 25 27
Crotalus adamanteus 11 347
Crotalus atrox 11 347
Crotalus horridus 11 347
12 389
Croton bug 3 251
Crotonaldehyde 1 29 228
3 374
Crotonase 7 532
Crotonic acid 1 63
cis-Crotonic acid (cis) 2 475
Crotonic acid (trans) 2 475
Crotyl chloride 6 326
Crow 3 556 557
Crow blackbird 2 254
Crowe process 6 233
Crown tooth 13 674
Crown fire 5 451 455
Crown gall 5 546 548 6 252
11 345
Crown glass 9 351 352
Crown rot fungi alfalfa
1 234
Crown vetch 14 310 311
Crowned pigeon 3 302
Crucible 6 262
Crucible furnace 2 543
Cruciferae 9 538 539
Crude oil 5 557 9 289
analysis 9 279
see also Petroleum
Crude oil processing *see*
Petroleum processing
Crude oil products *see*
Petroleum products
Crude scale 14 445
Crude wax 14 444 445
Cruise control autopilot
1 689
Cruise missile 8 512
Cruiser 12 263 264
Cruising vehicle flight
regime 1 89
Crura penis 11 473
Crushed stone 11 181,
13 152
Crushing and pulverizing
3 557 562*, 12 351
Blake jaw crusher 3 557
buhrstone mill 2 563
direct fired pulverizers
for coal 3 562
Gates gyratory crusher
3 557
grinding mill 6 274
hammer crusher 3 558
primary crusher 3 557
Symons cone crusher
3 557
tumbling mill 14 155
Crust (earth) chemical
composition of 7 547
Crust of earth *see* Earth
(crust of)
Crustacea 1 560 2 319
3 562 569*
alimentary tract 3 564
appendages 3 564
autotomy 3 566 569
bionomics and economics
3 569
Branchiopoda 2, 319
3 562
Branchiura 3 562
carapace 3 564
carpopodite 3 564
carpus 3 564
Cephalocarida 2 643
3 562
cephalon 3 564
cephalothorax 3 564
characterization 3 562
circulatory system 3 565
Cirripedia 3 145 146 562
Copepoda 3 462-463 562
Decapoda (Crustacea)
4 24 34
development 3 566
Eumalacostraca 5 102 105
Euphausiacea 5 108
exoskeleton 3 564
food 5 416
frontal organ 3 566
gastric mill 3 565
general morphology
3 563 569
glands and glandular
systems 3 565 566
hemocyanin 3 565
Hoplocarida 6 479
Malacostraca 3 562 8 75
molting (ecdysis) 3 566
Mystacocarida 3 562
8 685
nervous system 3 565
organs of special sense
3 565
Ostracoda 3 562 9 447
parthenogenesis 3 566
phylogeny 3 569
regeneration 3 566 569
reproductive system 3 566
respiratory system 3 565
sinus gland 3 566
statocyst 3 565
Syncarida 13 567
taxonomy 3 562 563
Crux 3 569
Cryochem process 4 288
Cryogenic engineering
3 569 572
chemical engineering
applications 3 570
cryopump 3 571
isotope separation 3 571
liquefaction of gases
7 535 540
metal industry
applications 3 570 571
military applications 3 570
nuclear applications 3 570
production of high mag
netic fields 3 571 572
solid state amplifiers 3 57
solid state memory and
switching devices 3 57
space applications
3 569 571
Cryogenics 3 572 575
adiabatic demagnetizati
1 70, 3 573
atmospheric gases, pro
duction of 1 637 640
cooling by refrigeratio
3 574 575
cooling of gases 3 573
cryogenic engineering
3 569 572
liquefaction of gases
3 575, 7 535 540*
maintenance of low
temperatures 3 575
principles of cold
production 3 573 5
production of low
temperatures 3 57
Cryolite 3 575
aluminum metallurg
1 292
fluorine ore 5 351
insecticide 7 140
Cryompump 3 571
Cryosar 3 575 576
Cryoscopic method mo
weight 5 57
Cryostat 3 575*, 9 193
Cryostatic movement 1
Cryotron 3 571 576-57
Cryptic coloration 11
Cryptobia 11 45
Cryptobiidae 11 45
Cryptobranchidae 3 5
Cryptobranchoidea 2
3 578*

Cracidae 6 18
Crack willow 14 493
Cracked asphalt 1 591
Cracked tars fuel oil 5 557
Cracking 3 532 535
  alkane 1 250
  catalysis 2 549
  catalytic 3 533
  coking (petroleum refining) 3 273
  depolymerization 4 67
  fluidization 5 546
  fuel gas supplements 5 553 556
  furnace construction 5 576 577
  petroleum processing 10 68 69
  thermal 3 532 533
  see also Reforming (petroleum refining)
Cracking catalyst 2 548
Cradle Mountain 1 671
Cradle printing 10 597
Craftint 10 611
Crag 1 herbicide 6 423
Crago 3 563, 12 308
Crago septemspinosus 12 307
Craig, L. C. 3 80, 5 158, 11 36
Craig, W. 8 603
Cramer's rule linear systems of equations 7 524
Cranberry 3 535*, 5 548-549
Cranchiidae 2 645
Crane 5 134
  excavating equipment 3 416, 5 133-134*
  hoisting equipment 3 418, 6 462
Crane (zoology) 3 535-536
Crane fly 4 212
Crane hoist 3 536
  crawler crane 3 536
  excavator 5 133 134
  floating crane 3 536
  hook 3 536-537
  locomotive crane 3 536
  truck crane 3 536
  wheeled crane 3 536
Crane hook 3 536 537
Crangon 4 29
Crangonobdella 11 556
Crania antiqua 9 38
Craniacea 9 38
Cranial nerve 3 537-538*, 9 60 63
  abducens nerve 3 537, 9 60
  accessory nerve 3 538, 9 60
  auditory nerve 3 538
  embryology 9 47
  facial nerve 3 537, 9 60
  glossopharyngeal nerve 3 538, 9 60
  hypoglossal nerve 3 538 9 60
Cranial nerve—*cont*
  oculomotor nerve 3 537, 9 60
  olfactory nerve 3 537, 9 60
  optic nerve 3 537, 9 60
  parasympathetic nervous system 9 557
  statoacoustic nerve 9 60
  trigeminal nerve 3 537, 9 60
  trochlear nerve 3 537, 9 60
  vagus nerve 3 538, 9 60
Craniata 1 420, 3 538, 14 308
Craniometry 1 461
Craniosacral system *see* Parasympathetic system
Craniscus 2 315
Cranium 2 630, 3 538*, 6 345
Crank 3 538 539
Crank and rocker mechanism 3 402, 5 481
Crank mechanism, slider *see* Slider crank mechanism
Cranshaw, T. 11 438
Cranston, J. A. 11 30
Crape ring (Saturn) 12 39
Crapper, G. D. 14 417
Crappie 3 539*, 13 291
Craspedacusta 3 255 14 10
Craspedochilus 10 487
Crassius auratus 6 233
Crassostrea virginica 12 236
Crataegus 4 62
Crater (constellation) 3 412 413
Crater Lake volcanic caldera 14 350
Craterostigmomorpha 3 60
Craters of the Moon (Columbia plateau) 9 160
Craton 12 142 13 413
Cratovelache 10 255, 13 101
Cravenechinus 9 496
Crawford, A. 13 191
Crawling water beetle 3 276
Crayfish 1 560, 3 539 540* 563, 4 24
Cream *see* Milk
Cream cheese 3 14
Cream separator 4 2
Crease resistance textile 13 539
Creatine 6 221
Creatine creatinine 3 540
Creatine phosphate 12 563
Creatinine 2 266, 7 33
  blood chemistry 3 197
Creatinine phosphate 4 362
Creek, H. 581
Creep of materials 3 540 541
  plastic deformation of metal 10 400 401
  prestressed concrete 10 586
  primary creep 3 541
Creep of materials—*cont*
  relaxation 3 541
  secondary creep 3 541
  soil and rock 8 166 167
  tertiary creep 3 541
  thermal stress 13 552
Creeper 3 541
Creeping water bug 6 401
Crenodonta 5 100
Crenosoma 13 193
Crenothrix 10 61
Crenotrichaceae 3 65
Creodonta 2 522-523
Creophilus maxillosus 3 286
Creosote 3 541 542
  wood preservation 14 539
Creosote bush 3 190
Creosote oil 3 236, 541
Crepidula 2 605, 11 19, 12 235
Crepuscular species communities 3 324 325
Creslan 4 310, 5 244
Cresol 1 476, 3 542*
  coal tar chemical 3 236
  creosote 3 541 542
m Cresol 10 113
p Cresol 2 35
Cresol red 7 60
m Cresolsulfonphthalein 7 60
o Cresolsulfonphthalein 7 60
Cress 3 542
Cretaceous 3 542 546*, 6 136, 142
  animal life 9 521
  Lower Cretaceous 3 543 544
  natural gas reservoir rock 9 6
  paleogeography 3 542
  plant life 9 505
  subdivision 3 543
  Upper Cretaceous 3 545 546
Crete 5 116 8 207
Cretinism 3 546-547*
  4 235 13 621 627
Crevasse deposit 5 311
Cribrariaceae 8 687
Cricetidae 6 332, 7 449, 8 618 668, 11 615
Cricetus cricetus 6 332
Crick, F. H. C. 2 62 8 672
Cricket 3 547
Criconema 14 169
Crimson clover 3 220 10 374
Crinoid 3 547
Crinoidal biostromes 7 516
Crinoidea 1 566 3 547 550* 4 360 368 369
  alimentary system 3 549 550
  Articulata 1 566 3 547 4 360
  calyx 3 549
  Camerata 2 432 3 547 4 360
  coelom 3 549
Crinoidea—*cont*
  crinoid 3 547
  discovery 3 548
  ecology 3 548
  Flexibilia 3 547, 4 360 5 300
  Inadunata 3 547 4 360 7 49
  morphology 3 549 5 6
  muscular system 3 549
  nervous system 3 550
  reproduction 3 550
  water vascular system 3 549
Crista 3 644
Crista 4 321 322
Cristae mitochondriales 8 518
Cristallo Monte 5 119
Cristatella mucedo 10 291
Cristatellidae 10 291
Cristispira 13 4
Cristobalite 12 521
  in bentonite 2 165
  from calcined kaolin 3 161
  refractory 11 409
Cristovomer namaycush 14 119
Crithidia 1 700, 14 125
Critical band 8 160 161*, 9 126-127
Critical constant (gases) 2 276, 3 550*
Critical damping 4 12
Critical field (superconductivity) 13 295-300
Critical frequency of fusion (vision) 14 339
Critical illumination microscope 8 394
Critical mass 3 6, 550*
Critical point (gases) 6 42
Critical shear stress for ship 5 584
Critical solution temperature 5 56
Criticality reactor physics 11 364 367
Croaker 2 271, 3 550*, 12 249
Crocco's equation 3 550 551
Crochet Lepidoptera 7 461
Crocin 6 219
Crocodile 1 257, 3 551 553*
Crocodilia 3 551 553*, 11 481 13 22
  alligator 1 257
  Archosauria 1 521
  biology 3 552 553
  caiman 2 589
  classification 3 552
  crocodile 3 551
  feeding 3 552
  fossils 3 553
  hibernation 6 436 441
  morphology 3 551 552
  reproduction 3 552

Ctenophora—cont
phylogeny 3 610
physiology and ecology 3 610
Tentaculata 13 491
Ctenoplana 10 412
Ctenophyllus segnis 12 345
Ctenosaura 13 23
Ctenostomata 2 556, 3 611*
Ctenostomatida 11 53
Cuba 14 474 475
Cube 3 611*, 10 475
polytopes, regular 10 492
Cubé 7 142
Cubeb 3 611*, 10 241
Cubex 7 264
Cubic crystal system 3 604-605
Cubic expansion, coefficient of *see* Volume expansion, coefficient of
Cubic graph 6 255
Cubic lattice 3 594 595
Cubodal epithelium 5 42
Cuboides zone 4 88
Cubomedusae 3 255, 612*
Cuckoo 3 612
Cuckoo roller 3 473
Cuckoo-shrike 11 32
Cuckoo wasp 6 574 581
Cucujidae 3 278
Cucujoidea 3 278
Culicidae 3 612 11 588
Culiciformes 1 694, 3 612*, 11 589
Culicidonidae 3 278
Culicuius canorus 3 612
Cucumaria 4 58, 6 466
Cucumaria planci 6 467
Cucumariidae 4 58
Cucumber 3 612 613
diseases 3 612 613
Cucumber mosaic virus 1 1
Cucumber tree 8 74
Cucumber virus 9 210
Cucumis melo 2 439 6 476, 8 214, 668, 10 30
Cucumis sativus 3 612
Cucurbita 14 284
Cucurbita maxima 13 28
Cucurbita mixta 11 104
Cucurbita moschata 11 104 13 28
Cucurbita pepo 11 104, 13 28
Cucurbitaceae 2 432, 13 116
Cud 4 359
Cudbear 7 495
Cue function motivation 8 607
Cuesta 3 69 10 258
coastal plain 3 245
Culcita 1 598
Culeolous 4 41
Culex 4 218 6 515
Culex fatigans 5 258
Culex molestus 12 229
Culex pipiens 8 599
Culex tarsalis 4 587
Culex univittatus 14 477
Culicidae 4 212 8 599
Culicine mosquito 4 587
Culicoides furens 5 258
Cullet 6 207
Culm 13 123
Culm facies 2 469
Culmination (geology) 13 408
Cultivator 1 128
Cultural evolution human 4 401
Culture (archeology) 1 514
Culture (bacteriology) 3 615
Culture, elective 3 614
direct isolation 3 614
Culture, embryonated egg 1 424, 3 614 615*
Culture media components of 3 615
Culture, pure 2 10, 3 615 617*
bacteria 2 6
isolation 3 615-616
isolation of anaerobic bacteria 3 616
maintenance 3 617
single cell isolation 3 617
Culture, tissue 1 424, 3 617 622*
other techniques 3 621
plant growth 10 538
quantitation 3 618
radiation studies 3 620
study of hereditary mechanisms 3 619
virus studies 3 620
Culture technique 3 622
Cultured pearl 1 3 9 607
Cultured sour cream 8 434
Cumacea 1 563, 3 563, 622*
Cumberland Mountains 9 149-150
Cumene oxidation 1 480 10 46
Cumene hydroperoxide 1 34 10 29
Cumin 3 622*, 12 612
Cumingia 11 49
Cuminum cyminum 3 622
Cummings, E R 2 207
Cummingtonite 1 556, 3 625*
Cumulative ionization 4 450
Cumulene 10 460
Cumulonimbus 3 211 212
Cumulus 3 210 212, 214
Cumulus convection 8 354
Cumulus oophorus 9 460, 11 469 474
Cuneiform cartilage 7 406
Cuneo 8 35
Cunife 7 263, 8 35
Cunina 3 255
Cunningham B B 1 501, 2 168, 14 66
Cup anemometer 1 402
air velocity measurement 1 221
Cupedidae 3 276
Cupellation 1 593
Cupping sheet metal 12 251 252
Cuprammonium cellulose 5 243
Cupreine 11 193
Cupressus 3 188
Cupressus arizonica 3 647
Cupressus macrocarpa 3 647
Cupressus sempervirens 3 647
Cupric ion 3 471
Cuprite 3 623*, 464, 8 15
Cupronickel 3 469
Cuprous ion 3 466, 471
Cupuloerinus 4 366
Curare 10 434, 13 207
alkaloid 1 248
Gentianales 6 115
pharmacognosy 10 96
Curassow 6 18
Curatives rubber 11 636
Curculionidae 3 278, 10 488
Curculionoidea 3 278
Curcuma angustifolia 3 550
Curcuma longa 12 76 14 165
Curie, Irene 11 275, 310
Curie, J 7 506 11 273
Curie M 10 457
Curie, P 9 548
Curie 3 623
Curie (unit) 3 623
Curie constant ferroelectrics 5 226
Curie law, paramagnetism 9 548
Curie point second-order transition 12 126
Curie temperature, ferroelectric 5 225 228
Curie temperature magnetic 3 623 13 330 331
ferrite 5 221
ferromagnetic 3 623*, 5 229 230
paramagnetic 3 623
Curie-Weiss law 3 623 624
antiferromagnetism 1 469 470
Curie temperature 3 623 624
ferroelectrics 5 226
ferromagnetism 5 229 230
magnetic susceptibility 13 330 331
paramagnetism 9 548
Curium 3 624 625*, 14 66
californium production 2 417
electron configuration 4 504
Curl 10 541
Curl of a vector 2 413-414
Curlew 3 625
Curling's ulcer 14 179
Curly top disease 2 118, 13 240
Currant 3 625 626*, 5 548 549
diseases 3 625
Current (earth) *see* Terrestrial electricity
Current (ocean) *see* Ocean currents
Current (tidal) *see* Tidal currents
Current, electric 3 626
ampere 1 331 332
conduction current 3 626
conductivity 3 391 392
conductors 3 392 394
dark 4 15, 10 194 195
direct *see* Direct current
displacement *see* Displacement current
eddy *see* Eddy current
electrical units 4 460 461
Joule's law 7 316
Kirchhoff's law 7 363
lightning 7 509 510
Ohm's law 9 277
saturation 12 32
skin effect 12 371
transient *see* Transient, electric
see also Alternating current
Current balance 3 626 627
Ayrton Jones 3 627
Pellat 3 627
Rayleigh 3 627
Current density 3 627 628*, 4 483
electrical conductivity of metals 4 452
electroplating of metals 4 530
Current efficiency electrolysis 4 493
Current limiting fuse 5 578
Current limiting reactor 11 549
Current measurement 3 628 629
ammeter 1 320 323*, 3 628
current transformers 3 628
direct and low frequency currents 3 628
electrodynamic instrument 4 477
galvanometer 6 21 24
high-frequency currents 3 629
shunt 3 628
standards 3 628, 4 458
transfer instrument 4 477
very small currents 3 628
Current multiplication transistor 14 37
Current photon interaction *see*

Cryptobranchus 3 578, 11 518
Cryptobranchus alleganiensis 2 569, 6 393
Cryptobranchus bishopi 6 394
Cryptocarya 3 189
Cryptocephala 10 461
Cryptocerata *see* Hydrocorisae
Cryptochaetidae 4 212
Cryptochaetum iceryae 4 216
Cryptochitin 10 487
Cryptococcales 3 578-579*, 5 563, 14 601
Cryptococcosis 1 342, 3 578, 579*
Cryptococcus 10 428, 14 601
Cryptococcales 3 578
Cryptococcus hominis 14 602
Cryptococcus neoformans 1 341, 3 578, 579, 5 563, 9 236, 14 602
fluorescent-antibody method 8 383
Cryptoconchus 8 561
Cryptocrinus 5 32
Cryptodiaporthe salicina 4 234
Cryptodira 3 22
Cryptohelia 13 208
Cryptomonadida 3 579*; 5 99, 8 128, 11 52
Cryptomonadina *see* Cryptomonadida
Cryptomonas 11 55
Cryptomonas erosa 3 579
Cryptonisticum 5 33
Cryptoperthites 5 207, 10 37
Cryptophagidae 3 278
Cryptopidae 3 60
Cryptopora 2 315
Cryptoparas couesi 7 583
Cryptorchism 13 526
Cryptosporidium enigmatica 4 109
Cryptosporella viticola 6 252
Cryptosporiopsis 8 213
Cryptosporiopsis corticola 8 213
Cryptostemma 1 496, 6 408
Cryptostomata 2 356; 3 579*, 10 27
Cryptotholeanic structures 10 84
Cryptovanthin 2 528, 530
Cryptozoic Eon 9 522, 13 169
Cryptozoon 3 579-580*, 9 504
Crypts of Lieberkühn 4 150, 5 204
Crysoprase 6 99
Crystal 3 580
biaxial 3 591-592
color centers in 3 294 297
defects *see* Crystal defects
electron diffraction 4 506-507
ferroelectrics 5 224-229
form 3 608
geometric description 3 601-608
Crystal—*cont.*
grain boundaries 6 245
growth 3 585 587*, 12 341
imperfections 12 480-481
ionic *see* Ionic crystals
lattice *see* Crystal lattice
Kronig-Penney model 7 371
neutron diffraction 9 88-91
nuclear moments in 9 191-193
optics *see* Crystal optics
piezoelectric *see* Piezoelectric crystal
quartz *see* Quartz crystal
single 12 341
structure *see* Crystal structure
symmetry 3 593-598, 602 603*
systems 3 604 605*, 8 464
uniaxial 3 588 591
vibrations 7 412-415
x ray diffraction 14 570-575
Zeeman effect in 14 609
Crystal analyzer 14 579
Crystal assimilation 10 51
Crystal counter 3 580
Crystal defects 3 581-585*, 12 479 481
color centers 3 294-297
dislocations 3 585 585
disorder 3 581
Frank-Read generator 3 584 585
free surfaces 3 581
Frenkel defects 3 583
grain boundaries 6 245
impurities 3 581-582
interstitials 3 582-583
ionic conductivity 7 251
nonstoichiometric compounds 9 138
plastic slip 3 585 584
resistivity effects 11 497
Schottky defects 3 583
vacancies 3 582 583
Crystal faces mineralogy 8 464
Crystal fractionation 10 50 51
Crystal growth 3 585-587*, 12 341
Crystal lattice Brillouin zone 2 338-339*, 7 412
Crystal microphone 8 360-361
Crystal optics 3 587-592
biaxial crystals 3 591 592
birefringence 2 248*, 11 405-407
conical refraction 3 592
dichroism 4 107 108
index ellipsoid 3 587-591
interference in polarized light 3 589 591
Crystal optics—*cont.*
mineralogy 8 466
negative and positive crystals 3 591
ordinary and extraordinary indices 3 590-591
pleochroism 10 417
Pockels effect 7 337-338
ray ellipsoid 3 588 589
rotatory dispersion 11 632-633
Crystal oscillator 5 504, 9 423
Crystal pickup 4 240
Crystal plates crystal optics 3 590 591
Crystal pressure transducer *see* Piezoelectric transducer 10 584
Crystal rectifier 1 359
Crystal spectrometer 3 355 356
Crystal structure 3 592 600
alloys 1 261-265
Bravais lattices 3 594-597
Brillouin zones 2 338 339
calcium fluoride structure 3 600
cesium chloride structure 3 600
chemical composition of minerals 8 466-467
concepts and terminology 3 592-597
coordination number 3 461-462
corrosion 3 493-494
crystalline compounds 3 599-600
diamond structure 3 600*, 498
feldspars 5 208 209
ferrites 5 219 220
ferroelectrics 5 227
glide mirror planes 3 596
ionic crystals 7 247 248
isomorphism 7 282
metals 3 597-599
morphotropism 8 508 509
polymorphism 10 483
screw axes 3 595 596
sodium chloride 3 599 600
solid solutions 12 474
solid-state chemistry 12 474
space groups 3 596 597
space lattices 3 592 600
x-ray crystallography 14 568 570
zinc blende structure 3 600
Crystal transducer 8 358, 10 584
Crystal tuff 14 134
Crystal twins *see* Twinning (crystallography)
Crystal whiskers 14 488-489
Crystalline anisotropic energy *see* Anisotropic energy, crystalline
Crystalline coating materials 8 285
Crystalline inclusion compounds 3 157
Crystalline materials 12 479
Crystalline schist 12 62
Crystalline solid *see* Crystal
Crystallite 7 10 11
Crystallization 3 600-601
crystal growth 3 585 586
fractional 3 601
precipitation 10 573
prilling 10 587
separation (chemical and physical) 12 183
Crystallization cleavage 12 61
Crystalloblast 8 296
Crystalloblastic structure 8 296
Crystallography 3 601-608
Bravais indices 3 602-603
crystal form 3 608
crystal optics 3 587 592
crystal structure 3 592-600
crystal symmetry 3 602-605
crystal systems 3 604-605
formal description of crystals 3 601-608
group theory 6 282 285
lattice constant 7 412
Miller indices 3 601-603
mineralogy 8 463 465
morphotropism 8 508 509
neutron diffraction applications 9 89 90
practical crystal description 3 608
x-ray crystallography 14 568 570
zone indices 3 606 607
Csethat Mountains 5 118
Ctenacanthus 3 152
Ctenicera 5 287
Ctenidium Protobranchia 11 18 19
Ctenobranchia 12 589
Ctenocephalides canis 12 344
Ctenocephalides felis 12 345
Ctenocephalus canis 5 299, 14 124
Ctenodrilidae 10 461
Ctenoid scale (zoology) 12 47 48
Ctenoloculina 9 510
Ctenoloculina cicatricosa 9 37
Ctenopharyngodon idellus 3 207
Ctenophora 1 420, 3 603 610*
II 213
Cestida 2 657
Colloblast 3 609
Cydippidea 5 646
embryology 5 610
morphology 5 609
Nuda 9 218

Cyclophyllidea 3 641-642*; 4 359, 10 414
Cestoidea 2 659
Coenurosis 3 264
Cysticercosis 3 649
Cyclopoida 2 319 3 462 562 642 645*
Cyclosporium 11 59
Cyclopropane 1 241, 6 534
isomerism, molecular 7 277 278
Cyclorrhapha 4 212
Cyclosorine 1 464 468, 3 643 644*
Cyclosis 2 594
Mastigophora 8 170
Cyclosphaeroma 7 283
Cyclosporeae 10 90
Cyclostigma 9 504
Cyclostomata (Bryozoa) 3 644
Stenolaemata 13 125
Cyclostomata (Chordata) 1 420 2 356 643 3 644
lamprey 7 388 389
Myxiniformes 8 685
Petromyzontiformes 10 88
urinary system 14 227
Cyclostomi *see* Cyclostomata (Chordata)
Cyclotetradecane 1 243
Cyclothem 3 644 645
black shale 2 253
Cyclotrimethylenetrinitramine 3 151
Cyclotron 9 571 577
fixed field 9 576 577
relativistic electrodynamics 11 430
Cyclotron frequency 9 575 578
cyclotron resonance experiments 3 645 646
electron motion in vacuum 4 512
Larmor precession 7 405
Cyclotron resonance experiments 3 645 646* 9 575 576
Cydippid larva 2 169 3 610
Cydippidea 3 608 646*
Tentaculata 13 491
Cydnidae 6 401
Cydonia oblonga 11 190
pear 9 606
Cydonia vulgaris 6 297
Cyemidae 4 40
Cygnet 13 333
Cygninae 13 333
Cygnus 3 412 414* 646, 7 505 9 24 26
Cygnus olor 1 436, 13 333
Cylinder 3 646
geometry 13 310 311
quadric surface 11 135
Cylinder dryer 4 289
Cylinder functions *see* Bessel functions
Cylinder press 10 600, 620
Cylindrical bark beetle 3 278
Cylindrical caissons 2 389
Cylindrical capacitor 2 440
Cylindrical coordinates 3 455 456
[illegible] 4 128
Cylindrogloea 11 [illegible]
Cylindropsyllus laevis 6 344
Cylindrospermum 3 636
Cylindrosporium 8 213
Cylindrosporium padi 8 213
Cymbal 8 665 666
Cymbites 1 328
Cymbopogon nardus 3 147
Cyme 7 98
Cymnothoa 7 283
Cymophane 3 116
Cymothoidae 5 291
Cynara scolymus 1 566
Cynipidae 6 574
Cynocephalus 4 68
Cynodon dactylon 2 168
Cynognathus 11 484
Cynomys leucurus 9 452
Cynomys ludovicianus 10 564
Cynoscion parvipinnis 2 271
Cypaecea 6 76
Cyperaceae 6 247
Cyphanthropus rhodesiensis 11 550
Cyphocaris 4 39
Cyphophthalmi 10 92
Cyphopod 4 209
Cypraeidae 9 609
Cypreidae 11 19
Cypress 3 646 647
Cypria maculata 5 31
Cypria ophthalmica 9 447
Cypria turneri 9 447
Cypricercus tuberculatus 9 447
Cypridae 9 448, 10 429
Cypridina 2 221
Cypridinidae 8 682
Cypridopsinae 10 429
Cypridopsis hartwigi 9 447
Cypridopsis vidua 9 448
Cyprinidae 2 532 3 648 4 1 6 233 8 505 12 254
Cypriniformes 3 647 648*, 9 442
catfish 2 552
Characoidea 3 647
classification 3 647
Cyprinoidea 3 648
Cyprinoidei 3 647
Cypriniformes—*cont*
goldfish 6 233
Gymnotoidea 3 648
minnow 8 505
phonoreception 10 125
Siluroidei 3 648
[illegible]dontidae 7 345
[illegible] (CDP)
Cyprinoidei 3 647
Cyprinus carpio 2 532, 3 648
Cypripedium 9 373
Cypris 1 561
Cypris larva 3 145, 566, 13 609
Cypronotus 5 33
Cypronotus ovalis 5 33
Cyprus 8 207
Cypselurus californicus 2 161
Cyrilla 3 241
Cyrilla racemiflora 3 241 7 268
Cyrtodonta hindi 13 404
Cyrtograptus 6 259
Cyrtolite 6 317
Cyrtonyx montezumae 2 205
Cyrtopeltis notatus 6 405
Cyrtopia larva 3 108
Cyrtopleurites bicrenatus zone 14 82
Cyrtorhinus mundulus 6 409
Cyst balantidiasis 2 75
Cystacanth 3 30
Cysteine 2 45, 3 649* 650, 11 233, 12 196
amino acids 1 308 319
plant metabolism 10 357
Cysteine sulfinic acid 3 649
Cystenecte 10 514
Cystic disease 2 325
Cystic duct 4 153 6 15
Cystic hyperplasia 2 325
Cysticercoid 3 641 642
tapeworm disease 13 393
Cysticercosis 3 649* 13 394
Cyclophyllidea 3 641-642
Cysticercus cellulosae 3 649
nervous system disorders 9 70
Cysticercus 3 641 642 13 393
Cysticercus bovis 13 393
Cysticercus cellulosae 3 649, 13 394
Cystidea 3 649
Diploporita 3 649, 4 209-210, 360
Rhombifera 3 649 4 360 11 556
Cystine 3 649 650*, 7 164
amino acids 1 308 319
histone 9 217
plant metabolism 10 357
protamines 9 217
Cystinuria 8 258
Cystisoma 6 586
Cystitis 3 650*, 14 220
Cystocele 11 481
Cystoidea 4 365 366
Cystolith 5 39
Cystoscope 10 18
Cytae 7 585
Cytheracea 10 430
Cytherella 10 412
[illegible] 10 412
9 214
Cytidine 5′ phosphate 2 59
Cytidylic acid 9 209
Cytisus 10 332
Cytochemistry 3 650 652
biochemical methods 3 651
cytology (molecular basis) 3 653
visualizing methods 3 650 651
Cytochrome 3 562
bacterial carbohydrate synthesis 2 35
bacterial nitrite reduction 2 37
biological oxidation 2 214 4 207
cell protoplast component 2 612
enzyme 5 21
insect physiology 7 122 1[illegible]
physiological action spect 10 209
porphyrin 10 520
Cytocrine gland 5 43
Cytogamy Ciliophora 3 120 122
Cytogenous gland 6 204
Cytokinesis 3 652 653
cell division 2 602
Cytology 3 653
cell 2 587
cell division 2 602
cell inclusions noncyt plasmic 2 603
cell nucleus 2 607
cell organization 2 6[illegible]
cell plastids 2 611
cell protoplast 2 612
cell structures 2 614
cell surface different 2 620
centrosome 2 642
chromosome 3 106
coacervation 3 228
cytoplasm 3 656
meiosis 8 209 211
Cytology (molecular ba 3 653 656
cellular elements 3
cytochemistry 3 65
methods 3 653
Cytolysis 2 592
Cytomegalic inclusion *see* Salivary gland disease
Cytophaga 8 685-687

Current regulator, automotive 14 366
Current-scan polarography 10 456
Current surge 13 323
Current transformer 5 628, 7 149 151*
Currier, N 10 615
Curry 3 629
Curtain array (antennas) 1 447
Curtis, C G 8 120
Curtis, J. 6 184
Curtis analyzer 10 167
Curtius reaction amine 1 307
Curtius rearrangement steric aspects 13 127
Curvature of field *see* Aberration, optical
Curve fitting 3 629-631
  analytic geometry 1 388
  coordinate systems, graphical 3 456
  graphic methods 6 256
  interpolation 7 216
Curve readers, electromechanical 1 382
Curve tracing differentiation 4 131
Curved bars 3 631-632
  combined axial and bending stresses 3 632
  crane hook 3 536-537
  deflection 3 632
  pure bending 3 632
  ring 11 577 578
  stresses 3 631
  Winkler Bach formula 3 632
Curvicorma 6 586
Curvilinear coordinate system 3 454-455
Curvilinear motion 8 601
Curvularia 8 440
Curvularia subulata 7 328
Cuscuta 11 621, 13 661, 14 152
Cushing's syndrome 6 597
  obesity 9 242
  see also Adrenal disorders
Cushion gall 2 385
Cushion material shock isolation 12 291-294
Cushny, A 14 229
Cutaneous anthrax 1 457
Cutaneous leishmaniasis 7 449
Cutaneous sensation 3 632 633
  cutaneous nerve endings 3 632
  itch 7 297 298
  punctate sensibility of skin 3 633
  touch 13 690
Cutch *see* Tannin
Cuterebra 8 680
Cuterebridae 4 212
  myiasis 8 680
Cuticle cell surface differentiation 2 620
  wood fiber 14 547
Cuticle cell walls in plants 2 617
  leaf anatomy 7 436 441
Cuticula 3 232
Cutleaved beech 2 130
Cutleria 10 90
Cutoff lake 5 311
Cutout relay, automotive 14 366
Cutter, phonograph 4 237-238
Cutting diamond 4 98, 100-101
  reproduction, plant 11 452
Cutting fluids machinability (metals) 8 3
  machining operations 8 9
Cutting of metals *see* Welding and cutting of metals
Cutting tools machinability (metals) 8 2 3
Cuttlebone 12 187, 13 30
Cuttlefish 2 644, 4 34, 13 30
Cutworm 3 633 634*, 7 472
Cuvier G 7 269, 11 425
CW radar *see* Continuous-wave radar
Cyamidae 2 418
Cyamus boopsi 1 341
Cyan 10 606
Cyanamid 6 421
Cyanamide 3 634
Cyanamide process 2 399, 5 237, 9 109
Cyanate 3 634
Cyanea 12 165
Cyanea capillata 7 303
Cyanic acid 3 634
Cyanidation gold 6 232 233
  silver 12 332
Cyanide 3 634
Cyaniding surface hardening of steel 13 315
Cyanine dye 11 191
  synthesis 13 600
Cyano complex cyanide 3 634
Cyanocitta cristata 7 304
Cyanocobalamine *see* Vitamin B_{12}
Cyanoethylation 3 575, 634 636*
  acrylonitrile 1 52
  condensation reaction 3 575
  substrates 3 635
Cyanogas 5 561
Cyanogen 3 636
  band spectrum (photograph) 2 90
Cyanogenetic glycosides 6 224
Cyanohydrin 1 229
Cyanohydrin synthesis 8 579
3 Cyanomethylindole 7 63
Cyanomycin 1 476
Cyanophyceae 2 151, 537
Cyanophyta 1 237, 3 636 637*, 10 189, 320 346, 12 67, 13 545
Cyanophyta—*cont.*
  distribution 3 636
  economic importance 3 637
  origin and relations to other organisms 3 636
  reproduction 3 636
Cyanopsin 10 183
3 Cyanopyridine 9 92
4 Cyanoquinolinium salt 11 191
Cyanosis 13 244
  respiratory system disorders 11 532
Cyanotype 10 146
Cyathoceridae 3 278
Cyathocrinites 4 366
Cyathocrinus 7 49
Cyathomonas 3 579
Cybernetics 3 637-638
  biological applications 7 102
  equipment design 3 638
  feedback 3 637
  history 3 637
  instrumentation 7 154
  microcircuitry 8 349
  scope 3 637
  systems engineering 13 378
Cycad 1 549
Cycadales 3 638* 6 300, 9 503, 10 321, 346
  stem types 13 121
Cycadeoidaceae 3 639
Cycadeoidales 3 639*, 9 503
Cycadofilicales 3 639*, 6 300, 10 346
Cycadophytae 3 639*, 10 346, 11 85
  Bennettitales 3 639, 10 346
  Cycadales 3 639, 10 346
  Cycadofilicales 3 639, 10 346
Cycas 13 120
Cycas revoluta 3 638 8 240
Cyclammina cancellata 5 432
Cyclamycin *see* Triacetyloleandomycin
Cyclanthaceae 15 365
Cycle graph theory 6 253
  population dynamics 10 506
  wave motion 5 501
Cyclic acetal 1 29
Cyclic coordinate 7 385
Cyclic petrochemical 10 48
Cyclic sedimentation 2 470, 3 644 645, 12 142
Cyclichna 13 406
Cyclization 11 401
  Diels Alder reaction 4 118
  dienes 4 118
  petroleum processing 10 69
Cycloacetylene 6 534
Cycloaliphatic compound 1 241
Cycloalkadiene 6 534
Cycloalkene 1 241, 6 534
Cycloalkenylbenzene 6 534
Cycloalkylbenzene 6 534
Cycloalkyne 6 534
Cyclobutadiene 1 547
Cyclobutane 1 242 243
  isomerism, molecular 7 277 278
Cyclochore 10 499
Cyclodecane 1 243
Cyclododecane 6 531
Cyclododecatriene 3 639 640
Cycloheptane 1 243
Cycloheptatrienylium ion 1 547
1,3 Cyclohexadiene 11 397 398
  synthesis 4 117
1,4 Cyclohexadiene 6 534
Cyclohexane 1 242 243*, 10 69
  isomerism 7 277
Cyclohexene 14 207 209
Cyclohexenone 1 464 468
Cyclohexyl methacrylate 10 6
Cyclohexylamine 1 468
Cycloid 3 640*, 9 553
Cycloid scale zoology 12 47
Cycloidal propellers 11 14 1
Cyclomorphosis 5 521 534
Cyclone 3 640*, 14 486
  atmospheric low 1 642
  extratropical 8 332
  tornado occurrence 13
  tropical 6 520 521, 8 332 334
Cyclone dust separator 4 29
Cyclone furnaces 3 570
Cyclone separators 1 152
Cyclone tracks 13 164
Cyclonic circulation wind 14 493 494
Cyclonic disturbances 13 16
Cyclonic spray scrubber 1
Cyclonite 5 151, 6 435, 9 10
Cyclooctane 1 243
Cyclooctatetraene 1 547 3
Cycloocytne 1 243
Cycloolefin 1 241, 6 531
Cycloparaffin 1 241, 6 531
  in petroleum 10 55
Cyclopentadiene 1 243, 5
  3 640 641, 14 207 209
  coal chemical 3 235
  Grignard reaction 8 2
Cyclopentadienyl ion 1 548
Cyclopentadienylindium 9
Cyclopentane 1 242 243
  isomerism, molecular 7
Cyclopentanone 7 339
Cyclopentanoperhydrophenanthrene system steroid 13 137
Cyclopentene 6 534 14 207
1 2 Cyclopentenophenanthr 10 110
Cyclopentylbenzene 6 535
Cyclophoracea 6 77
Cyclophoridae 9 609

D

2,4 D *see* 2 4 Dichlorophenoxyacetic acid
D layer 1 629
D nickel 9 95
D Ribose 8 582
D slide valve 14 261
D T reaction (deuterium tritium reaction) 5 592 594
D'arsonval galvanometer 6 21
Dace 4 1
Daceria 6 400
Dachstein 5 119
Dacite 4 1*, 7 16, 10 86, 14 547
Dacodon 4 259
Dactromyces 13 10
Dactylocetales 6 427
Dacron 4 310, 5 244
Dactylidium 5 187
Dactylanthus 3 255 11 88
Dactylis glomerata 6 261 10 499
Dactyloscalyx 7 625
Dactylometra 3 255, 12 165
Dactylopius coccus 6 476
Dactylopodite 3 564
Dactylosoma 6 315
Dactylus 3 564
Darus 4 219
Dadoxylon 3 477
Dagor fens system 7 453
Dahl E. 12 305
Dahlia 6 107
Dairella 6 586
Dairy barn 1 140
Dairy cattle *see* Cattle production *dairy*
Dairy machinery 4 1 3
cream separators 4 2
milk pasteurizer 4 2
milking machines 4 1
Dairy products *see* specific entries as Butter Cheese Milk
Dalapon 6 423
D Alembert J 8 194 9 221
D Alembert's paradox 4 3
D Alembert's principle 4 5
D Alembert's theorem 5 341
complex *number* 3 356
D Alembert's wave equation 4 428
Dali Salvador 1 552
Dalkey N 5 26
Dalla Torre C G 10 377
Dalla pectoralis 6 437
Dallingeria 10 473
Dallingeria drysdali 10 474
Dallis grass 4 5
Dalradian series 10 567
Dalton, J 11 144
Dalton's law 1 101, 4 5
of additive pressures 13 568
atomic theory 5 47
Dam 4 5 11
allowable concrete stresses 4 4
arch dam 4 4
concrete 4 5 6
concrete temperature control 4 5
contraction joints 4 6
diversion of river 4 8
earth 4 6
impervious zone 4 6
pervious zones 4 7
forces acting on 4 4
foundation treatment 4 8 9
gravity dam 4 4
hollow 4 4
inland waterways transportation 7 115
outlet control gates 4 9
penstocks 4 10
reservoir 13 487
reservoir outlet works 4 9
river development areas 11 583
selection of site 4 8
selection of type 4 8
spillway 4 9
spillway gates 4 9
Damage risk criteria for noise 9 126 127
Damkohler number gas dynamics 6 57
Damp hare 5 367
Damped balance 2 73
Damped oscillation *see* Oscillation damped
Damped wave electromagnetic radiation 4 494
Dampier Mountain 1 671
Damping 4 11 13
anelasticity 1 401
control *systems* 3 435
coulomb 14 317
critical 4 12
damped oscillations 4 11 12
distributed systems 4 12
[illegible]
inherent 14 317
Damping—*cont*
instrument 7 153 *10 206*
magnetic 4 13 14 317
oscillating electrical *circuits* 4 12
overdamping 4 12
periodic motion 10 15
Q 4 12
reading of meters 4 12 13
servomechanisms 3 435
shock isolation 12 293 294
time constant 13 644
vibration *see* Vibration damping
viscous 4 13, 14 316 317
wave (capillary) 14 417
Damping constant 4 11
Damping-off 9 408
Damselbug 6 491
Damselfly 9 275
Damson plum 10 419
Dana, J D 9 266
Danais 7 473
Danaus plexippus 2 291 7 460 8 427
Danburite 6 128
Dance fly 4 212
Dandruff 3 578 14 602
Danian stage 3 543
Daniell cell 4 471
Dansereau P 10 375
Dante 1 552
Dantzig, G B 6 50 7 523
Danube River 5 120 121
Danyz reaction 14 7
Daphnia 3 563, 4 406 5 201, 11 511 14 395
Daphnia magna 3 150
Darapskite 9 103
[illegible]
Dar
fl
Dar
Dar
Dark adaptation 14 536
Dark current 4 13
corona discharge 5 487
multiplier phototube *10 196*
phototube 10 104 196
Dark field examination 13 575
Dark field illumi[illegible] *89
interstellar matter 7 221 222
Darkling beetle 5 276
Darkroom equipment 10 165-166
Darling River 4 671
Darlingtonia 10 245
D'Arsonval movement; ammeter 1 320
galvanometer 6 21
Darsser Rise 9 250
Darter 4 13
Darvan 5 244
Darwin, C. 1 425, 491, 647, 3 474 4 546, 569 5 87, 132, 537, 6 430 7 496, 9 265, 10 577, 578, 12 567, 13 634
Darwin C H 3 508
Darwinella australiensis 4 58
Darwinism 5 132
geographic isolation 5 133
reproductive isolation 5 133
Darwin's frog 12 10
Darwin's tidal constituents 13 634 635
Darwinula stevensoni 9 448, *10 429*
Darwinulidae 10 429
Darzens condensation 5 374
Das Gupta, K. 5 359
Das Pflanzenreich 10 377
Dascillidae 5 278
Dascilloidea 5 278
DASH (Destroyer Anti Submarine Helicopter) 1 497
Dasheen 1 497, 4 13*
Dashpot 6 241
viscous-drag 12 202
Dasya 11 534
Dasymutilla occidentalis 6 581
Dasyonygidae 8 78
Dasypodidae 1 534 4 411
Dasypus novemcinctus 1 534 *11 449*
Dasytidae 5 277
Data collection 13 425
Data processing (weather) 14 456
Data processing systems 1 197, 386, 4 13 15*
automation 1 676 679
counting circuit 5 519 520

Cytophagaceae 8 687
Cytophotometric methods 3 651
Cytoplasm 2 587, 642, 3 656-658*
cytoplasmic matrix 3 658
endoplasmic reticulum 3 658
ground substance 3 657
Cytoplasm—*cont*
microsomes 3 658
plasma membrane 3 657
ribonucleoprotein (RNP) particles 3 658
Cytoplasmic inheritance 3 658-661
interaction with genes 3 659 660
Cytoplasmic inheritance—*cont*
maternal influence 8 171
plasmon 3 658 659
Cytoplasmic male sterility plant 2 329
Cytoplasmic matrix 3 658
Cytopyge 11 51-60
Cytosine 4 66, 10 359, 11 115
Cytospora 12 604
Cytospora kunzei 14 74
Cytospora leucostoma 12 64
Czapak-Dox solution 8 92
Czech Forest 5 118
Czochralski, J 12 341
Czochralski method (crystal growth) 12 169, 341*

Defecation 4 42
body rhythm 2 273
cathartics 2 552
colon 3 292
constipation 3 415
Defect solid state chemistry 12 479
Defects in solids see Crystal defects
Definite composition law of 4 42 43
Definite integral 2 402
Deflagration 6 56
combustion wave 6 56
explosion and exposive 5 148
Deflecting tool 9 294 295
Deflection beam 7 567
Deflection factor cathode-ray tube 2 556
Deflections structural see Structural deflections
Deflocculation sedimentation (geology) 12 137
Defoliant 4 43
DeForest Lee 4 454 519, 524
Deformation metal 8 267 269
structures 13 203
see also Strain
Deformation errors geometrical optics 9 367
Degaussing 4 43 44
Degeneracy (quantum states) 4 44* 601 11 177
Degenerate central quadric 11 135
Degenerate elliptic functions 4 563
Degenerate Fermi distribution 5 216
Degenerate perturbation theory 10 40 41
Degenerative feedback 5 198
amplifier 1 347
Degenerative voltage regulator 14 562
Deglet Noot 4 47
Deglutition 4 166
Degradation of energy 5 10
Degras grease 14 444
Degree 8 188
Degree-day 4 44
Degree of freedom (mechanics) 1 387 2 224 4 44
constraint 3 415
kinematics 7 347
plasma physics 10 395
vibration 14 311 313
Degree of polymerization 10 479
Degrees of frost 5 540
Dehumidification 5 517 6 516
adsorption 6 516
comfort control 5 517
humidification 6 514 515
humidistat 6 515
see also Drying
Dehumidifier 4 44 46
compression type 4 46
cooling type 4 45 46
sorbent type 4 44 45
Dehydration clay minerals 5 165, 166 167
definition 4 242
halloysite 6 322 323
illite 7 22
kaolinite 7 331
montmorillonite 8 588
petroleum processing 10 70
see also Drying, Dehumidifier Food engineering Lyophilization
Dehydration catalyst 2 549
Dehydroascorbic acid 1 575
Dehydrochlorination (epoxidation) 5 45
7 Dehydrocholesterol 14 343
11 Dehydrocorticosterone 1 73 6 493 494
Dehydroepiandrosterone 1 599 13 526
Dehydrogenase 2 16, 4 207
Dehydrogenation 4 46 47
alkane 1 250 251
petroleum processing 10 69
thermodynamics 4 47
types 4 46
see also Hydrogenation Reforming (petroleum refining)
Dehydrohalogenation diene synthesis 4 117
Deichmann E 6 465
Deimos 8 152
Deinotherioidea 10 636
Deionization of water 7 255 257
Del operator 2 413
Del square 7 403
Delaborne prism see Dove prism
deLacaille N L 3 412
Delaware Bay 9 150
Delaware River 9 148 13 520
Delay line 4 47 48
characteristic impedance 4 47
pulse-forming networks 11 94
reflection 4 47
storage devices 13 159
time delay 4 47
transmission line 4 47
velocity of propagation 4 47
see also Time delay circuits
Delayed allergic reaction 1 475
Delayed coking 3 272
Delayed hypersensitivity 6 589
Delayed neutron see Neutron delayed
Delbrück scattering 11 150
Delepine reaction 6 435
Delgado J M R 8 605
Deliquescence 4 48
desiccant 4 77
drying 4 299
Delnav insecticide 7 141
Delocrinus 4 366
Delphinidae 4 262
Delphinium 1 217, 10 440
Delphinus 3 412 414
Delta 4 48 51*, 10 259
Alaska 9 158
in arid regions 12 305
of Asia 1 580
characteristics 4 48
coastal landforms 3 242 243
flood plains 5 310
formation 4 48
pattern of deposition 4 50
sand deltas 12 305
sediments 4 50 51
tidal stream effect 9 251
Delta Aquarids 8 309
Delta cell 9 531
Delta connection 1 277
Delta Max 8 28
Delta rays 1 267
Delta rhythms electroencephalography 4 478
Delta section 9 75
Delta wing flight 13 309
Delta Y transformations see Y delta transformations
Deltaic sediments 4 50 51
Deltatheridioidea 7 144
Deltatherium 9 537
Delthyrium 11 61
Deltidium 11 61
Delusion 4 51* 12 177
Huntington's chorea 6 520
paranoid state 9 553
paresis general 9 564
types 1 51
Demagnetization 1 70 3 572 574, 4 52*
Demagnetizing fields 8 51
Demand, electrical 4 426
Demantoid 6 40
Demarcay, E 5 125 12 20
Dematiaceae 4 52 53* 5 563 8 567
Dematophora necatrix 1 495
Deme 10 507, 12 572
Dementia praecox see Schizophrenia
Demerol 3 76 9 4, 11 115
Demersal species 8 115
6 Demethyl tetracycline 13 528
Demethylchlortetracycline 4 53 54
clinical use 4 54
comparison with tetracyclines 4 53
industrial production 4 53
structure 4 53
Demeton 7 141
Demineralization of water 7 241
Democritus 1 422
Demodex canis 14 115
Demodex folliculorum 14 115
Demodicidae 14 115
Demodulation 3 518
Demodulator 4 54, 13 429
see also Detector
DeMoivre Laplace theorem 4 257
DeMoivre's formula 4 517
Demolition underwater see Underwater demolition
Demolition bomb 1 536
Demolition materials 1 540
Demon Star 10 50
Demospongia 10 519
Demospongiae 4 54 57, 10 515, 519, 13 10
Ceractinomorpha 2 647, 4 54, 10 515
Dendroceratida 4 57 58
Dictyoceratida 4 108
Halichondrida 6 319
Haplosclerida 6 333 334
Poecilosclerida 10 430
skeleton 4 56
Tetractinomorpha 4 55 10 515
Demulcent 6 220
Demyelination 9 68
Denatured alcohol 5 89
Dendraster 9 518
Dendrilla ractus 4 58
Dendrite 8 54, 294, 9 55, 11 400
Dendritic drainage 11 591 593
Dendritic microsegregation 8 293
Dendrobates auratus 10 638
Dendrobium crumenatum 10 537
Dendrobranchia 1 481 3 255
Dendrobranchiate gill 4 26
Dendrocalamus giganteus 2 89
Dendroceratida 2 647, 4 56 57-58*, 10 515
Dendrochirota 4 58* 560
Dendrochronology 4 58 60*, 11 295
Dendrocoelum infernale 10 488
Dendrocolaptidae 9 589
Dendrocrinus 7 49
Dendrocygna autumnalis 4 290
Dendrocygna bicolor 4 290
Dendrocygninae 4 290
Dendrohyrax 6 598
Dendroica coronata 14 384
Dendroica petechia 14 384
Dendroidea 6 258
Dendrology 4 60 62
classification 4 61
distribution 4 62
identification 4 62
Dendronephthya 1 226
Dendrophoma obscurans 13 172
Dendrophyllid corals 12 78
Dendrostoma 12 346
Dendya 3 158

Data processing systems—*cont*
digital computer 4 175-188
magnetic-tape systems 4 15
punched card systems 4 14-15
storage devices 13 159
switching circuit 13 344-349
switching theory 13 357
Data reduction 4 15-16
Data transmission 4 16-17
Date 4 17
Dating methods 4 17-18
Datolite 4 18
Davis Strait 1 524
Davy, Sir Humphry 1 246, 2 95, 99, 3 67, 7 545, 8 19, 10 530, 12 3, 408, 13 194
Day 4 18
Day's multiplexing system 1 353
DC *see* Direct current
DC restorer 3 153
DCU herbicide 6 423
DD mixture fumigant 5 561
D-D reaction 5 592-594
DDS 13 253
DDT *see* Dichlorodiphenyltrichloroethane
DDTA *see* Differential thermal analysis
DDVP insecticide 7 141
De Broglie, L 3 355, 4 18, 7 503, 9 363
De Broglie wavelength 4 18
De Haas, W 7 598
de la Vallée Poussin, C J 9 226
De Morgan formulas logic 7 571
Deacon, G E R 9 484
Deacon, H 3 69
Deacon process 3 72
Dead reckoning 4 18 21*, 9 12
computing 4 19
determination of position 4 19
direction measurement 4 19
directional gyro 4 21
distance or speed measure 4 21
Doppler radar 9 16
electronic systems 9 16
gyrocompass 4 21
magnetic compass 4 20 21
marine navigation 8 129
mechanical computer 4 19
parameters 4 18
piloting 10 230
plotting 4 19
in polar regions 10 443
systems 4 21
uncertainties, offset, and errors 4 19
Dead reckoning computer 6 281
Dead room (anechoic chamber) 1 400
Dead Sea 1 580, 7 387
Deadly nightshade 2 160
Deadweight (ships) 12 268
Deafness 4 21-22*, 6 356 357, 9 126
Dease Strait 9 166
Deasphalting petroleum processing 10 71
Death 4 22 24
autolysis 4 23
necrobiosis 4 23
necrosis 4 23
occurrence 4 23-24
from poison 14 5
somatic 4 22 23
Death Valley 9 160
Death watch beetle 3 277, 287
Debaryomyces 14 602
Debierne, A 1 55
Debris-avalanche 8 167
Debris-fall 7 398
Debris-slide 7 397
Debris transport (stream) 13 173-174
Debye, P 3 353-354, 4 486, 5 51, 7 195, 413, 599, 12 52, 494, 575
Debye characteristic temperature 12 576-577
Debye continuum theory 7 413-414
Debye-Falkenhagen effect 4 487
Debye frequency 12 576
Debye-Huckel theory 1 61, 4 486
Debye screening distance 10 385-386
Debye temperature 13 549 550
Debye theory of specific heat 12 575-577*, 13 576
Debye unit 4 211
Decaborane 2 290
Decachlorotetrasilane 12 321
Decagon 10 471
Decahydroisoquinoline 7 289
Decahydronaphthalene 1 242, 6 534
Decalin 1 242, 7 278
Decamethonium 10 436
Decamethylcyclopentasiloxane 12 323
Decamethyltetrasiloxane 12 323
Decane 1 249
n-Decane 10 65
Decapoda (Crustacea) 1 563 3 530 531, 4 24 34*, 539 540, 7 570
alimentary system 4 26
Anomura 4 31
appendages 4 24 26
Brachyura 4 33
Caridea 4 29
circulatory system 4 26
classification 4 28
Decapoda (Crustacea)—*cont*
development 4 28
excretion 4 28
Macrura 4 29
nervous system 4 26
Penaeidea 4 28
phylogeny 4 28
reproductive system 4 28
respiration 4 26 28
sense organs 4 26
Stenopodidea 4 29
Decapoda (Mollusca) 2 645, 4 34, 107, 13 30
Decarboxylase 2 17
Decarboxylation acid 2 476
ethyl acetoacetate 5 88
Decay (organic) *see* Soil microbiology
Decay, radioactive *see* Radioactive decay
Decay constant radioactivity 11 272 274
Decca (navigation system) 4 34-36*, 9 15
in aeromagnetic surveys 1 94
Dectra 4 38
Deccan plateau 1 580
Decerebrate rigidity 10 527
Decibel 4 35
loudness 7 587
relation to sone 12 505
Deciduous forest 8 245
Deciduous plants 4 35-36
Deciduous teeth 13 674
Decimal counter 5 518
Decimal number system 4 36, 9 220 221*
Decision making automation 1 679
Deck truss 14 121
Declination (astronomy) 1 607
Declination, magnetic *see* Magnetic declination
Declination variometer 14 279 280
Declinometer 4 36*, 6 149
Declomycin 4 53
Decoder 7 100
Décollement 5 368
Decolorizing agent 5 559
Decolorizing carbons 1 58
Decometer 4 35
Decomposer organism 2 215, 4 390
Decomposition (organic) *see* Soil microbiology
Decomposition potential 4 37*, 9 456
electrolytic conductance 4 37
Decompression space flight 12 543
Decompression illness 1 696, 2 390, 4 37*
skindiving 12 371
Decontamination (radioactive contaminants) 4 37 38
air 4 38
methods 4 37
personnel 4 38
water 4 38
Decorator crab 4 34
Decoupling filter 5 268
Decrement logarithmic *see* Logarithmic decrement
Decstra 4 38 39*, 9 20
Decubitus 4 23
Decyltrichlorosilane 12 322 323
Dedekind, J W R 9 225, 11 371
Dedekind, R 7 409
Dedekind cut 7 411
real variable 11 371
Dedekind ideal theory 11 374
Deductive theory 7 581 582
Deep, ocean *see* Submarine topography
Deep drawing 12 251 252
Deep etch plate 10 602 616
Deep-focus earthquakes 12 14
Deep scattering layer 12 60 61
Deep sea clays 7 23
Deep sea corals 12 78
Deep-sea fauna 4 39 42
bathypelagic 4 39 40
benthic 4 40 41
bioluminescence 4 40
Echinodermata 5 365 366
nekton 4 40
Romanche Trench 4 394
sound scatters 12 60 61
zooplankton 4 39
Deep-sea floor 12 216 15 223
sediments on 8 135 137
Deep-sea research Atlantis Ocean 1 622
bathyscaph 2 109
expeditions 4 39
Deep-sea photography 14 195
Deep sea soundings 4 378 15 216
Deep-sea stereo camera 14
Deep sea trenches 12 149
fault occurrence 12 149
submarine topography 13 222 223
tectonic seismic structure 12 149
Deep-sea waste disposal 8 131
Deep-well pump 2 633
Deer 1 567, 4 42*
mouse 1 568
musk 1 568, 12 61
Deer fat 5 189
Deer fly 4 212, 5 362
Deerfly fever 14 155
Deerparkian Stage 4 87
Defant, A 9 250, 266

Design standards—*cont*
Underwriters' Laboratory 4 79
work standardization 14 557 558
Design test process 13 379
Desmacyte 4 56, 10 514
Desmarella 8 169
Desmatodon 11 484
Desmatolagus 7 583
Desmatosuchus 13 545
Desmia funeralis 7 468, 472
Desmochore 10 499
Desmodonta 9 614
Desmodoroidea 4 79
Desmodus 2 109
Desmognathus quadramaculatus 12 7
Desmokontae 11 132
Desmophyllum dianthus 12 77
Desmoscolecidae 4 79
Desmoscolecoidea 4 79
Desmosome 2 588, 622
Desmostylia 4 79 80
Desmostylidae 4 80
Desmostylus 4 80
Desnoyers J 11 185
Desor ♀ *larva* 11 558
Desorber 13 186
Desorption 1 81
11 Desoxycortisol 3 599
Dessert manufacture 5 420
Destriau G 4 482
Destriau effect 4 482
Destroyer 12 264 265
Destroyer escort 12 265
Destroyer tender 12 267
Destructive distillation 4 80*, 11 117 118
acetic acid 1 30
charcoal 5 10
coal chemicals 5 236
coal gasification 5 236 237
coke 5 272
wood 14 550 551
Destructive interference 7 185 187
Desulfovibrio 8 129 10 61 12 465 13 2
Desulfovibrio aestuarii 2 253
Desulfovibrio desulfuricans 2 37 13 2
Desulfurization 10 70
Detail drawings 4 611
Detailed balancing theory of 12 55
Detector 4 80 91
amplitude modulation *see* Amplitude modulation detector
detection fidelity 4 81
frequency modulation *see* Frequency modulation detector
infrared *see* Infrared detector
Detector—*cont.*
microwave 8 414
nonlinear devices 4 81
particle *see* Particle detector
phase modulation *see* Phase modulation detector
scintillation *see* Scintillation counter
Detergent 4 81, 12 393 394*
emulsifying agent 4 586
nonionic 10 470
petrochemical 10 46
phosphate 10 156
surface active agent 13 321 322
textile chemistry 13 538
unsaturated hydrocarbon 14 207
Detergent oils 7 604
Determinant 4 81 84
Determinate cleavage 2 604 5 168
Determinate errors analytical chemistry 1 594
Determination analytical chemistry 1 595
Determinism 2 571
Deto 7 283
Detonating fuse 2 255
Detonation blasting 2 255
combustion knock 5 309
combustion wave 6 56
explosion and explosive 5 148
fuel air ratio 2 477
nuclear *see* Nuclear explosion
wave motion *in fluids* 14 430
Detonator 5 152
see also Primer (explosive)
Deuteranomaly 5 500
Deuteranopia 5 500
Deuteric alteration (minerals) 8 444
Deuterium 4 84 85
cryogenic properties 5 572
hydrogen isotope 6 544
isotope separation 7 295
low temperature distillation 5 571
nuclear fusion 5 591-595
nuclear reactions 9 198 201
as tracers 14 8
see also Hydrogen, Tritium
Deuterium deuterium reaction 5 592 594
Deuterium oxide *see* Heavy water
Deuterium tritium reaction 5 592 594
Deuteron 4 85
Deuterophlebiidae 4 212
Deuterostomia 1 413; 4 85*
Deutomerite 5 100
Deutoplasm 9 458
Developer Z 11 110
Development, flower 5 328
Devil's walking stick 14 382
Deville, H Sainte Claire 12 112
Devitrification 6 208
Devon Island 1 525
Devonian 4 85 90*, 6 156, 142
animal life 9 521
climate 4 90
divisions 4 86
European 4 87
North American 4 87
physical history 4 89
plant life 9 504
DeVries, H 7 594, 10 210, 11 292, 294
Dew 4 90
DEW line radar stations 9 166
Dew point 4 90*, 6 516
Dew point *elements* 6 573
Dew point indicator 8 534
Dew point temperature 11 83
Dewar, Sir James 4 91
Dewar flask 4 90 91
Dewatering electroosmotic *see* Electroosmotic dewatering
Dewaxing (petroleum) 4 91* 14 444 445
centrifugation 10 67 68
Dewberries 5 548 549
Dexaminidae 6 57
Dexigraph 10 144
Dextran 4 91 92
gum 6 298
Lactobacillaceae 7 582
mechanism 4 92
production process 4 92
Dextransucrase 4 92
Dextrin 1 365 2 461, 4 91 93* 5 410, 8 82, 13 52
mucilage 8 621 622
starch 13 52
alpha Dextrin iodine compound 5 158
Dextro form definition 13 126
Dextrocardia 2 515
Dextrose 1 575, 5 410, 13 52
see also Glucose
Denitrification 5 470, 490, 8 293
Dharwar *system* 10 567
Di *neutron* 9 207
Di (*p* Chlorophenyl) methylcarbinol 8 518
Di Syston 7 141
Di* blood group 2 269
Diabase 4 93*, 7 16 10 86
Diabetes 2 266 4 93 235 7 340, 9 535
insulin 7 163 164
saccharin 12 1
Diabetes insipidus 4 93, 10 251, 252
Diabetes mellitus 1 404, 3 192 202 8 262 9 534
Diablastic structure 8 296
Diabrotica undecimpunctata howardi 5 287, 9 603
Diacetone alcohol 1 34, 7 339
1,2 5,6 Diacetone D glucofuranose 8 581
Diacetone gulosonic acid 1 575
Diacetone sorbose 1 575
Diacodon 7 143
Diadectes 5 515
Diadectomorpha 5 515
Diadema 4 95
Diadematacea 4 93*, 360 370 371, 5 97, 11 106
Diadematoida 4 93, 360
Echinothurioida 4 360, 376
Pygasteroida 4 360
Diadematidae 4 93
Diadematoida 4 93*, 360, 371
Diadiaphorus 8 33
Diadumene 1 52 54
Diadumene luciate 1 52 54
Diadumenidae 1 52 54
Diagenesis 4 93 95
authigenic processes in 3 674
carbonates 4 95
chert 5 57
coal 5 228
glauconite formation 6 212
lithosphere, geochemistry of 7 552
sandstones 4 94
sedimentation (geology) 12 140
shales 4 94
stages of 4 94
Diagnostic agents 2 219
Diagonal matrix 8 183
Diakinesis 8 211
Dialeurodes citri 6 475
Dialister granuloformens 2 71
Dialister pneumosintes 2 71
Dialkylarsine 9 401
Dialkylarsinic acid 9 401
Dialkylarsinous acid 9 401
Dialkylarsinoxide 9 401
1,3 Dialkylimidazolium 7 52
Dialkylmercury compounds 9 403
Dialkylphosphine 9 404
Dialkylphosphinic acid 9 404
Dialkylphosphinous acid 9 404
Dialkylphosphinous chloride 9 404
Diallage 1 667
Diallyl carbonate 10 468
Diallyl phenyl phosphonate 10 468
Diallyl phthalate 10 468
Diallyl succinate 10 468
Dialuric acid 9 533
Dialysis 4 95 96
Donnan equilibrium 4 263
ion-permeable membrane 7 255 257
protein isolation 11 36

Deneb 5 646, 13 41, 302
Denebola 7 455
Dengue fever 1 424, 499, 4 62*, 218
  mosquito 8 599
Denitrification 9 111
Denjoy's integral 7 169
Dennis, W 9 438
DeNora cell 3 71
Densitometer 10 164, 12 579
Density 4 62
  earth 4 325
  hydraulics 6 530
  igneous rocks 7 18
  ionosphere 7 255
  optical *see* Optical density
  specific gravity 12 574
Density balance 2 74
Density current *see* Turbidity current
Density function (statistics) 13 67
Density matrix 7 352, 13 65 66
  transformation theory 14 23
Density measurement 4 62 63
  gamma-ray 4 63
  hydrometer 6 562 563
  liquids 4 63
  pycnometer 4 63
  solids and gases 4 62
  Westphal balance 4 63
Dental amalgam 12 351
Dental caries 13 676
Dental consonant 10 121
Dental formula 4 65-66
Dentalidae 12 50
Dentalium pretiosum 13 676
Dentin 13 673
Dentistry 4 63 65
  research 4 65
  restorative 4 64
  specialization 4 64
Dentition 4 65 66*, 68, 13 26, 675 674
  acrodont 4 65
  Allotheria 1 258
  Carnivora 2 522
  dental formula 4 65 66
  digestive system 4 165
  diphyodont 4 65, 13 673
  Eutheria 5 125
  heterodont 4 65, 13 673
  homodont 4 65
  Metatheria 8 305
  monophyodont 4 65
  pleurodont 4 65
  polyphyodont 4 65, 13 673
  thecodont 4 65
Dentoalveolar abscesses 13 676
Deodar cedar 2 579
Deoxidizer 2 398
Deoxyadenosinetriphosphate 9 213
Deoxycholic acid 2 185
Deoxycorticosterone 1 74-78, 6 483-484
11-Deoxycortisol 1 75
Deoxycytidinetriphosphate 9 213
Deoxyguanosinetriphosphate 9 213
Deoxynucleotide 9 213
Deoxypolynucleotide 4 66
Deoxyribonucleic acid 4 66-67
  animal virus 1 423
  bacteria, lysogenic 2 9
  bacterial cell chemistry 2 12
  biosynthesis 9 213-215
  cell nucleus 2 608
  chromosome 3 106-113
  coliphage 3 288
  cytoplasmic inheritance 3 659
  effect of light 10 208
  gene 6 104
  gene action 6 107
  gene mutation 8 672
  generative nucleus 5 531
  genetic role 4 66 67
  metabolic disorders 8 258
  nuclear radiation (biology) 9 198
  nucleic acid 9 208
  pneumococcus 10 427
  recombination, genetic 11 380
  sperm nucleus 12 602
  structure 9 212 213
  virus 14 331
Deoxyribonucleoproteins 9 215 216
Deoxyribose 8 258, 583
2 Deoxystreptamine 7 330
Dependent trials probability 10 628
Dephnodon davidum 2 661
Dephlogisticated air 9 471
Dephlogisticated muriatic acid 5 67
Depolymerization 4 67
Depression (emotion) 4 583
Depression (physical geography) barrier formed 7 387
  glacially formed 7 387
  Rift valley 11 570
  tectonic *see* Tectonic patterns
  volcanic 14 550
  see also Basin
Depression rangefinders 11 340
Depside tannin 13 391
Depth bomb 1 542
Depth charge 1 484 486
Depth measurement (ocean) 13 216
  echo sounder 4 378 379*, 15 216
  thermometric 12 116
  wire line 13 216
Derivative 2 401, 4 125 152
Dermacentor 1 560, 13 631
Dermacentor andersoni 7 299, 13 14, 560, 14 155
Dermacentor parumapertus 13 14
Dermacentor variabilis 1 496 7 299, 13 14
Dermacentroxenus 13 15
Dermal papilla 6 317-318
Dermanyssus gallinae 8 255, 518
Dermaptera 4 67*, 355, 7 134
Dermasterias 4 365
Dermatemydidae 3 22
Dermatitis 2 245, 552, 4 54, 67-68
  contact 4 67
  seborrheic 4 68
  stasis 4 68
  vitamin B_6 deficiency 14 341
Dermatobia hominis 4 216, 8 680
Dermatoglyphics 5 36, 7 177-178
Dermatomes 12 501
Dermatomyositis 7 625, 8 658
Dermatophytosis 4 68*, 6 274
Dermatoses 4 54
Dermestes lardarius 3 287
Dermestidae 3 277
Dermestoidea 3 277
Dermis 7 174
Dermitron 4 553
Dermochelyidae 3 22
Dermochelys 3 22
Dermoid cyst 11 480
Dermoptera 4 68*, 8 82
Dermoptera fossils 4 68-69
Dero 9 313
Deroceras agreste 12 383
Derocheilocaris typicus 8 685
Derodontidae 3 277
Derrick 3 418, 4 69, 6 462
  oil well 9 300 303
Derris 4 69*, 7 142
Derris elliptica 4 69, 7 142, 11 108
Derris malaccensis 7 142
Derris root 4 69
Derwent River 1 671 672
Desalting 10 70
Desargues G 5 54, 11 5
Descartes R 1 387, 8 175
Descartes rule 5 47
Descemet's membrane 5 162 171
Descending node orbital motion 9 372*, 10 268
Descriptive geometry 4 69 74
  angle between lines 4 73
  direct method 4 70 72
  geometrical elements of structures 4 72
  intersection and development of surfaces 4 73
  orthographic view 4 70
  parallel lines 4 72
  perpendicular lines 4 72
  perspective view 4 70
Descriptive geometry—cont.
  projection method 4 69
  reading 4 71
  reference planes 4 71
  topographical problems 4 73
  true length of line 4 72
  see also Engineering graphics
Deseado River 14 399
Desensitization 1 595
Desert 1 387 388, 4 74*, 9[illegible]
  10 26 27, 12 530
  Caliche 2 416
  Libyan 4 327
  natural nitrates 9 102 103
  12 407 408
  niter deposits 9 102
  North America 9 150
  oasis 9 233
  Sonora 9 160
Desert erosion features 4 [illegible] 77
  erosion cycle 4 75
  erosional agents 4 74
  physiographic features 4
Desert flat 4 76
Desert formations 3 191
Desert horned lark 12 398
Desert pavement 4 76
Desert soils 12 435
Desert varnish 4 76
Desert vegetation distribution 14 289
  sage 1 587
  saxaul 1 587
  wormwood 1 587
Desertic soils (distribution) 12 442 443
Desiccant 4 48, 77*, 289, 6 515
  food 5 576
Desiccation breccias 2 326
Desiccator 6 263
Design completely random 5 144
  experimental *see* Experimental design
  incomplete block 5 145
  latin square 5 144
  product *see* Product design
  randomized complete block 5 144
  split plot 5 145
Design displacement (ship) 12 268
Design layout 4 611
Design standards 4 77 79
  American Standards Association 4 79
  engineering societies 4
  government 4 78
  manufacturers' 4 79
  production methods 10 642 645
  trade associations 4 78

4 (2 4 Dichlorophenoxy)-butyric acid 6 422
2 (2 4 Dichlorophenoxyethyl) *benzoate* 6 425
2,4 Dichlorophenoxypropionic acid 6 422
O 2 4 Dichlorophenyl *O* diethylphosphorothioate 9 29
3 (3,4 Dichlorophenyl) 1,1-dimethylurea 6 423 12 465
3 (3 4 Dichlorophenyl) 1 methyl 1 *n* butylurea 6 425
Dichloropropene 5 561
1 3 Dichloropropene 9 28
2 5 Dichloropyrimidine 11 113
Dichlorosilane 12 320
Dichlorotetrammineplatinum (IV) chloride 3 334
Dichobunid 1 567
Dichobunidae 1 568
Dichroic crystals 10 449
Dichroism 3 158 4 107 108*
circular 14 88
linear 14 89
Dichromate 4 108
Dichromats 3 500
Dichromic acid 4 108
Dichuchwa 13 374
Dick test 1 497, 12 372 13 178
Dickcissel 4 108
Dicke R H 1 649
Dickite 3 165 7 331
Dicksonia 13 116 117
Dicobalt octacarbonyl 6 543
Dicotyledoneae 3 404 4 108* 10 346
Angiospermae 1 404
Archichlamydeae 1 517, 10 346
Aristolochiales 1 552
Balanopsidales 2 75
Campanulales 2 432
Casuarinales 2 545
Centrospermales 2 645
Ebenales 4 358
Ericales 5 65
Fagales 5 178
Geissolales 6 115
Geraniales 6 174
Juglandales 7 316 317
Leitneriales 7 449
Malvales 8 82
Myricales 8 685
Myrtales 8 685
Opuntiales 9 369
Papaverales 9 558
Parietales 9 564
Piperales 10 241
Plantaginales 10 585
Polygonales 10 472
Primulales 10 595
Proteales 11 31
Rhamnales 11 543
Rosales 11 628
Rubiales 11 647
Salicales 12 8
Santalales 12 25
Dicotyledoneae—*cont*
Sapindales 12 25
Sarraceniales 12 31
Sympetalae 10 346, 13 365
Tubiflorales 14 132
Urticales 14 235
Dicranella 9 510
Dicranella bicornis 9 511
Dicranographus 6 229
Dicranophorus 11 634
Dicraspedella 8 169
Dicrostonyx rubricatus 7 450
Dicrurus 11 32
Dictyid Hyalospongia 10 519
Dictyoblastospores 4 52
Dictyocalyx 6 433
Dictyocaulus 13 193
Dictyoceratida 2 647, 4 56 108-109*, 10 513
Dictyocha 12 317
Dictyonema flabelliforme 2 425
Dictyosomes 6 231
Dictyosporae 5 563
Dictyostele 5 260 264 13 105 106, 116
Dictyostelaceae 1 50
Dictyostelium 8 677
Dictyostelium discoideum 1 50
Dictyota 10 90
Dicumarol 11 108 14 345
Dicyandiamide 13 607
Dicyclohexylmethane 4 206
Dicyclopentadiene 3 235 641
Dicyclopentadienyl iron 7 259 9 405
Dicyclopentylmethane 6 534
Dicyema 4 110
Dicyema schulzianum 4 110
Dicyema (Pseudicyema) truncatum 4 110
Dicyemennea 4 110
Dicyemida 3 226 227, 4 109 111* 8 253
Dicynodon 11 484
Didelphidae 8 155 9 345
Didelphis 7 564 12 361
Didelphis marsupialis 9 345
Didelphis virginiana 9 345
Didicas Volcano 14 352
Didimium 6 300 439 11 59
Didion Bernoulli *method (trajectories)* 2 81
Didolodontidae 5 394
Didolodus 5 394
Didymella applanata 11 345
Didymiaceae 8 687
Didymium 9 54 10 564
Didymograptus 6 259
Didymosporae 5 563
Die 13 670
see also Jig, fixture, and die design
Die casting 2 542
alloys 1 259
Die design *see* Jig, fixture *and* die design
Die stamping ink 7 114
Diebold, John 1 677
Dieckman condensation 3 373 7 339
Diel cycle 13 24
Dieldrin 3 251 252, 7 *140* 11 615
Dielectric absorption 4 115
Dielectric breakdown 4 114
Dielectric constant 4 111 113 7 156
applications in analysis 4 112 113
barium titanate 2 97
capacitance 2 440
ferroelectrics 5 226 228
frequency dependence 4 115
insulating materials 7 156
measurement 4 111, 113
solution 12 486
theory 4 111 112
thermal hysteresis 6 600
Dielectric crystals 10 217 223
Dielectric currents (earth) 1 453
Dielectric heating 4 113 114*, 6 377
applications 4 113
frequencies used 7 75
heating process 4 113
heating *rate* 4 113
radiation shielding 4 114
Dielectric hysteresis 4 115
Dielectric loss 4 113 114 115*
Dielectric materials 4 116
insulation resistance testing 7 161
titanium dioxide 13 653
Dielectric polarization *see* Polarization (dielectric)
Dielectric rod antenna 1 449
Dielectric rod transmission line 14 57
Dielectric strength 4 114
insulating materials 7 155
Dielectric wave guide antenna 1 449
Dielectrics 4 114 116* 7 162
in antennas 1 448
artificial 1 449
breakdown 4 114
constant *see* Dielectric constant
dispersion 4 115
electret 4 422
electroceramic 2 650
electrostriction 4 541
ferroelectrics 5 224 229
hysteresis 4 115 116
as insulators 7 162
loss 4 113 115
materials see Dielectric *material*
phonon conductivity 4 533
pyroelectricity 11 116 117
reflectivity 11 391-394
strength 4 114*, 7 155
Dielectrics—*cont*
thermal conductivity 3 590
wavelength in 3 448
Diels Alder reaction 4 116 117
1,3 butadiene 2 576
diene 4 118
diene component 4 116
dienophile component 4 116
reaction conditions 4 116
steric effect 13 127, 131
Diemictylus 12 7
Diencephalon 2 516 9 46
Diene 4 117 118
1,3 butadiene 2 576
cyclopentadiene 3 640 641
Diels Alder reaction 4 116 117
Isoprene 7 294
polyolefin resins 10 487
preparation 4 117
reactions 4 117-118
synthesis reaction *see* Diels Alder reaction
Dienophile 4 116
Dientamoeba fragilis 1 300 331
Diepoxide 8 674
Diepoxy compound 10 469
Diepoxybutane 8 674
Diesel R 4 119 7 200
Diesel cycle 4 118 119
Diesel electric drive locomotive 7 532, 11 527
marine engine 8 111
Diesel engine 3 508 4 119 121*, 7 200
automotive vehicle 1 688
combustion chamber 3 509
compression ratio 3 349 4 121
cooling systems 4 121
diesel cycle 4 118 119
direct drive marine 8 110
efficiency 4 120 7 200
fuel 4 119 120* 121
fuel air mixing 3 504
fuel consumption 7 207
fuel injection 5 556*, 7 200
governor 6 239
ignition system 7 19 20
marine 8 118 119
performance 4 120, 10 591
practical attainments 7 200
pre chamber 3 508
sizes 4 120
supercharger 7 208, 13 295
truck 14 120
Diesel fuel 4 119-120*, 121
additives 4 121
cetane 2 661
cetane-number scale 2 662, 4 121
compression ratio 4 121
distillate fuel 4 246
petroleum products 10 72

Dialysis—*cont.*
saline water reclamation 12 13
Diamagnetic Faraday effect 5 182
Diamagnetic materials 10 23
Diamagnetic susceptibility 13 331-332
Diamagnetism 4 96-97
Bohr–van Leeuwen theorem 4 97
bound electrons 4 97
diamagnetic susceptibility 13 331-332
free electrons 4 97
ionic crystals 4 97
Landau theory 4 97
Langevin theory 4 96-97
magnetochemistry 8 52-53
Meissner effect 8 211
molecules 4 97
plasma physics 10 388
superconductors 13 296-297
Diamantina River 1 671
Diamanus montanus 12 345
Diameter 4 97
Diamine orange D 4 301
alpha, gamma Diamino butyric acid 10 483
3,9 Diamino 7 ethoxyacridine 1 51
3,6-Diamino 10 methylacridinium chloride 1 51
Diamino triarylmethane dye 4 301
4,4'-Diaminodiphenylsulfone 13 253
Diaminopimelic acid 2 12, 7 638, 12 67
2,4 Diaminopyrimidine 11 114
4,4' Diaminosulfone 7 314
Diamond 4 97-101
abrasive 1 9
carbon 2 462
cleaving 4 100
crystal structure 3 600*, 4 98
cutting 4 100
drill core 3 479
gem 6 98
history 4 99
industrial 4 101
inspection 4 100
in meteorites 8 313
occurrence 4 98
physical properties 4 97
polishing 4 100
recovery 4 99-100
sawing 4 100
separation of concentrates 4 99 100
synthesis 6 447-448
synthetic 4 101
thermal conductivity 5 591
weight 4 100
Diamond alkali cells 3 70
Diamond back terrapin 3 23, 13 502
Diamond drilling 2 295-296
core 3 479
rock 3 418
Diamond Head Volcano 14 350
Diamond pyramid hardness number (DPH) 13 314
Diamond saw 13 152
Dianemaceae 8 687
Diapause 7 123
Diapedesis 5 141-141
Diaphanocephalidae 13 193
Diaphteromera femorata 9 416, 14 382
Diaphorase 4 207
Diaphragm 1 3, 14 314
Diaphragm cell alkali chlorine processes 4 466
chlorine 3 69
Diaphragm element pressure gage 10 582
Diaphragm flow meters 5 318
Diaphragmatic hernia 6 425
Diaphtoresis 8 504
Diaphysis 12 365
Diapsric structures 4 101 102
Diapophysis 12 355
Diaporthe phaseolorum var *caulivora* 12 535
Diaprudae 6 574
Diaptomus 2 392 11 66, 13 394, 14 395
Diarrhea 4 102*, 219
amebic *see* Amebiasis
infant 7 93
Diarthrosis 7 314 12 352
Diarylmercury derivatives 9 403
Diarylphosphinous chlorides 9 405
Diasone 13 253
Diaspore 1 297
bauxite 2 113
clay 3 161
Diaspore (population dispersal) 10 498
Diastase 1 466
Diastem 4 102
Diastereoisomer 4 102*, 11 198
Diastereomer *see* Diastereoisomer
Diastole 3 138
Diastrophism 4 102 103
effect on sedimentation 12 142
see also Orogeny
Diatherm 4 541 542 13 595
Diatom 4 103 104
in Black Sea 2 251
in boreal regions 8 128
Chrysophyta 3 117, 119
microfossil 8 355
in pelagic sediments 8 135-136
see also Diatomaceous earth
Diatom ooze 4 104, 8 135 136*, 12 140
Diatomaceous earth 4 103, 104*, 6 374, 12 139
Diatomaceous earth filters 14 408
Diatomic molecule 8 547 556
Diatomite 4 104, 8 335; 12 139
abrasive 1 9
opal in 9 332
Diatomic scale 12 47
Diatryma 4 104
Diatryma steini 4 104
Diatrymidae 4 104
Diatrymiformes 1 694; 4 104*
Diazine 4 104-105*, 11 113
Diazinon 7 141
Diazo 10 160
Diazo compound 4 105
Diazo oxides 4 106
Diazo print 10 146
p Diazobenzenesulfonate 13 245
1 2 Diazole 1 702
1,3 Diazole 1 702, 7 31
Diazomethane 4 105, 5 73
Diazonium salt 4 105
Diazotization 4 105 107
benzidine 2 165
coupling reactions 4 106
preparation of diazonium salts 4 105 106
reduction and displacement reactions 4 106 107
Diazotized *p* nitroaniline 4 300
Dibamidae 13 24
Dibasic acid 1 40
Dibenzilacetone 3 374
1,2 3,4 Dibenzanthracene 9 325
1,2 5 6 Dibenzanthracene 9 324
Dibenzenechromium (II) 9 401
Dibenzoperrole *see* Carbazole
Dibenzoyl peroxide 10 29
meso Dibenzylamino-succinic acid 2 246
Dibenzildichlorosilane 12 322 323
Diborane 2 290 6 532
Dibothriocephalus 2 659
Dibothriocephalus latus 3 643, 11 66 12 559, 13 393
Dibothryon morbosum 3 55
Dibranchia 4 107
Belemnoidea 2 159
Cephalopoda 2 645
Decapoda 4 107
Decapoda (Mollusca) 4 44
Octopoda 4 107 9 274
protective mechanisms 4 107
Vampyromorpha 4 107
Dibranchiata *see* Coleoidea
1,2 Dibromo 3 chloropropane fumigant 5 563
nematocide 9 28
Dibromo *o* cresolsulfon phthalein 7 60
1,2 Dibromo-1 1,2,2 tetra fluoroethane 5 561
Dibromochloropropane 2 90
1,2-Dibromoethane 9 28
Dibromodiphenylmercurin fluorescein 1 493
6,6'-Dibromoindigo 7 84
Dibromosilane 12 329
Dibromothymolsulfon phthalein 7 60
Dibucaine 1 405
Dibutyl ether of ethylene glycol 10 423
Dibutyl ether of tetraethylene glycol 10 423
Dibutyl phthalate 12 296
Dicamptodon 12 6
Dicamptodon ensatus 9 38
Dicarboxylic acid 2 473 6 9 461
Dice, J W 8 288
Dice, L R 14 623
Dicellographus 6 259
Dicentra 3 188
see also Papaverales
Dicerantherium annectens 10 19
Diceratotherps 13 628
Dichelesthiidae 2 418
Dichlamydous flower 3 329
Dichlone *see* 2,3 Dichloro-1,4 naphthoquinone
Dichloral urea 6 423
2,5 Dichloro 3 aminobenzoic acid 6 421
2,3 Dichloro-1,4 naphthoquinone 5 564, 6 422
2,3 Dichloro 4 naphthoquinone 6 422
2,5 Dichloro 3 nitrobenzoic acid 6 421
1,2-Dichloro 1 1,2,2 tetra fluoroethane 5 561
Dichloroacetylene 3 73
N,N Dichloroaniline 1 408
Dichlorobenzene 2 164, 3 76
p Dichlorobenzene 5 561
1 4 Dichlorobutane 3 75
Dichlorodiammino platinum 10 412
Dichlorodifluoromethane 5 9
Dichlorodioxane 4 206
Dichlorodiphenyltrichloroethane 1 124 4 276, 7 11 8 518 11 426
agricultural science (plu 1 124, 8 77
Dichloroethane 1 463, 13 13
1 2 Dichloroethane 10 491
Dichloroethyl ether 5 561
1 2 Dichloroethylene 7 279
Dichloropentanes 3 75
Dichlorophene 1 485
Dichlorophenol 3 76
Dichlorophenolsulfonphthal 7 60
2 4 Dichlorophenoxyacetic a (2 4 D) 1 121, 693, 3 76 6 422 10 112 12 465
herl qe 6 422

Digenea 4 148 150*, 10 414, 14 77
classification 4 149
morphology 4 148
Digermane 6 177
Digestion bile acid 2 185
extracellular 5 203
gravimetric analysis 6 262
intracellular 5 203
and nutrition 7 124
Digestive enzymes 5 202 203
Digestive gland 4 150
intestine 4 150, 7 223
Digestive system 4 150 175* 7 136
absorption 4 175
anatomy and histology 4 155 164
anomalies 4 155
bile 4 171
causal relations 4 154
colon 4 175
deglutition 4 166
development of digestive tract 4 151
development of function 4 154
digestive tube proper 4 152
embryology 4 151 155
esophagus 4 156 158 165
foregut 4 151 152
foregut derivatives 4 152
gustation 4 166
histology 4 155 156
intestinal secretion 4 171
intestine 4 152 160
large intestine 4 162 164
liver 4 153
motility 4 172
mouth 4 164
movements of colon 4 174
nervous control of colon 4 174
pancreas 4 153
pancreatic secretion 4 170
pharynx 4 165
physiology 4 164 175
research development 4 175
small intestine 4 160 161 169
stomach 4 152 158 160, 166
suspension of digestive organs 4 153
tongue 4 165
Digging machine see Excavator
Digital codes translating circuits 13 348 349
Digital computer 3 359 4 175 189*
addition 4 182
address register 4 186
analog to digital converter 1 586
arithmetic devices 4 182 185
binary counter 12 49
bit 2 250
Digital computer—cont
computer instructions 4 186
control 4 186
control systems 12 20
counter, digital 5 517 518
counting circuit 5 519 520
data processing systems 4 15
digital representation 4 176 177
digital to analog converter 4 191 192
diode switching 4 180
division 4 185
ferrite cores 5 222
memory devices 4 185 186
multiplication 4 184
programming *see* Digital computer programming
relay switching 4 178
scale-of two circuit 12 49
simulator 12 340
storage devices 4 177 182* 13 159
subtraction 4 182
switching circuit 13 344 349
switching devices 4 177 182
switching theory 13 357
use of codes 4 176 177
vacuum tube switching 4 179
see also Calculating machines
Digital computer programming 4 188 192
addresses 4 188
coding of instructions 4 189
flow charts 4 190 191
instructions 4 188
loop programming 4 189 190
programming aids 4 190 191
subroutine 4 190
Digital controller 12 20
Digital counter *see* Counter *digital*
Digital sampler 1 196
Digital to analog converter 4 191 192
Digital voltmeter 4 191
Digitalin 4 193
Digitalis 4 191* 13 122
Digitalis purpurea 4 193 192
Digitalis decumbens 3 528
Digitoxigenin 4 192*, 13 139
Digliveride 2 20
Digraph 6 254
Dihedral angle 4 192
Dihedral wing shape 13 228
Dihedron 4 192
Dihogmochilus gigantea 9 510
Dihogmochilus latimarginata 9 510 511
Dihydrazide formaldehyde resins 6 530
2 3 Dihydro 1,4 oxathiine 6 428
Dihydro alpha terpineol 10 236
9,10 Dihydroanthracene 1 456
Dihydrocholesterol 13 137
Dihydroimidazole 7 52
2 3 Dihydroindole 7 62
Dihydroisoindole 7 62
Dihydroisoquinoline 7 289
1,4 Dihydronaphthalene 9 2
Dihydroorotic acid 2 59
Dihydropyran 5 566
delta^{2,3} Dihydropyran 11 107
Dihydropyrazole 11 109
1,2 Dihydropyridazine 5 6 dinone, diethanolamine salt 6 422
Dihydropyridine 11 112 113
Dihydropyrimidine 2 56
Dihydropyrrole 11 131
1,2 Dihydroquinoline 11 191
Dihydrosphingosine *see* Phytosphingosine
Dihydrostreptomycin 1 464 468
Dihydrothiazoles 13 599 601
Dihydroxy acetone 8 578
1 1 Dihydroxy alcohol 1 29
2,5 Dihydroxy 1,4 benzoquinone 12 50
11 beta 21 Dihydroxy 3,20 diketo 4 pregnene 18 al 1 232
2,2' Dihydroxy 3,5 6,3',5', 6' hexachlorodiphenylmethane 4 206
Dihydroxyacetone phosphate 2 16 38, 458 5 23 10 570
5,6 Dihydroxyindole 7 63
Dihydroxyitatonic acid *see* Itatartaric acid
Dihydroxylation 8 571
2,5 Dihydroxynicotine 2 37
1 (3 4 Dihydroxyphenyl) 2 methylaminoethanol 5 41
3,4 Dihydroxyphenylalanine 4 236
2 6 Dihydroxypurine 14 218
2,6 Dihydroxypyridine 11 111
4 6 Dihydroxyquinaldimic acid 11 193
2,4 Dihydroxyquinoline 11 194
Diiodosilane 12 320
3,5 Diiodotyrosine 7 240
Diisobutylene 10 46
Diisocyanate 10 493
Diisopropylfluorophosphate 5 43 5 20
Dike (geology) 10 84 421 12 198 13 417
Diketene 7 338
2 4 Diketotetrahydroimidazolidine 7 32
beta Diketone 3 18, 375
2,5 Diketopiperazine 4 105
Dilan 7 140
Dilantin 5 41
Dilantin sodium 7 32
Dilatance (petrology) 10 84
Dilatation of time cosmic rays 3 498 499
Dilatational wave seismology 4 352, 12 151
Dilatometric measurement 2 419
Dilaudid 9 4
Dileptus 6 300, 11 56
Dill 4 192*, 12 612
Dillon, J F 5 233
Dilthey, W 10 54
Dilution processes (estuaries) 5 82
Dilworth's theorem lattice (mathematics) 7 411
Dimastigamoebae 1 529
Dimension checking 3 328 330
Dimension stone 13 151-152
quarrying 11 180 181
Dimensional analysis 4 192 196*, 10 205 12 74
applications 4 191 196
dimensional formulas 4 193 194
model theory 4 195
pi theorem 4 194 195
theory 4 193
Dimensional formulas dimensional analysis 4 192 196
table 4 193
Dimensioning 4 196
datum or reference line 4 196
point to point or chain 4 196
Dimensions (mechanics) 4 192 196
Dimercaptopropanol 5 44 10 437
2,3 Dimercaptopropanol *see* British anti lewisite
Dimerization molecular association 8 538
Dimeyerperiodic 10 13
Dimetan 7 142
Dimethoate 7 142
Dimethoxydimethylurea 14 216
3 3 Dimethyl allyl pyrophosphate 2 54
N',N Dimethyl 1 azidopropionamide 1 620
Dimethyl carbinol 11 6
Dimethyl dichlorosilane 11 641
3,5 Dimethyl 1,3,5,2*H* thiadiazine 2 thione 6 423
2 4 Dimethyl 4 heptene 4 67
O O Dimethyl *O* (2,2 dichlorovinyl) phosphate 7 141
O,O Dimethyl O (3 chloro-4 nitrophenyl) phosphorothioate 7 143
O O Dimethyl O (*p* nitrophenyl) phosphorothioate 7 141

Diesel hammer 10 227
Diesel locomotive 7 571-572
Diesel power plant *see* Power plant
Diester 1 229
Diestrus 5 79
Dietary allowances 5 372
Dieterici, F. 6 41
Diethanolamine 1 251
bis[S (Diethoxyphosphinothioyl) mercaptol]methane 7 141
Diethyl cyclobutane-1,1-dicarboxylate 5 93
Diethyl ether 5 89
Diethyl ketone 7 339
Diethyl malonate 3 375
O,O-Diethyl *O*-(2 isopropyl-4-methylpyrimidyl (6)] phosphorothioate 7 141
O,O-Diethyl *O* (*p* nitrophenyl) phosphorothioate 7 141
O,O Diethyl *O*(and *S*) (2-ethylthio)ethyl phosphorothioates 7 141
Diethyl pimelate 3 373
O,O Diethyl S-(2 ethylthio) ethyl phosphorodithioate 7 141
O,O Diethyl S-(ethylthiomethyl)-phosphorodithioate 7 141
Diethyl sulfate 3 75
Diethyldichlorosilane 12 322 323
Diethyldiphenylsilane 12 322
Diethylene glycol 10 467, 470, 12 496
Dietrich, G 2 521, 4 351, 13 635
Dietzeite 12 408
Difference set theory 12 206
Difference amplifier *see* Differential amplifier
Difference calculus 10 646
Difference equations 7 218 219, 402
Difference rings' ring theory 11 579
Differential 4 121-122 partial 9 568
Differential, automotive 4 121-122
Differential adder linkage 1 368 369
rack and gear 1 368 369
screw 1 368-369
Differential amplifier 14 359, 360
Differential analyzer 4 122-124*; 7 172
scale factors 4 123
setup diagrams 4 122
standard symbols 4 122
see also Analog computer
Differential calculus 2 401-403, 407
Differential cross section (collisions) 12 53-57
neutron cross section 9 86
Differential detection 6 48
Differential-difference equations 11 189
Differential enthalpic analysis 13 558
Differential equation 4 125-128*, 7 400, 402, 8 181
analog solution by integration 1 374
boundary value problems 4 126
classification 4 125
computer solution 1 366, 368, 384, 4 122
ordinary differential equations 4 126
ordinary linear second order equations 4 127
partial differential equations 4 127
perturbation 10 39
series 12 195
see also Bessel functions
Differential erosion 5 359
Differential geometry *see* Geometry, differential
Differential leveling 13 325-326
Differential mechanism, automotive 4 121 122
Differential migration chromatography 3 96 97
Differential operator 7 403
Differential pistons micromanipulation 8 352
Differential pressure manometer measurement 8 92 93
Differential synchro 13 368 369
Differential thermal analysis 13 558
Differential threshold sensation 12 178
Differential transformer 10 584, 12 201*
Differentially compounded generator 4 225
Differentiating circuit 14 90
RC differentiator 1 374
RL differentiator 1 374
Differentiation 4 128 132
acceleration 4 130-131
algebraic and transcendental functions 4 129-130
analog computer solution 1 373-374
applications 4 130 132
calculus of vectors 2 413 414
complex numbers and complex variables 3 339
curve tracing 4 131
embryonic *see* Embryonic differentiation
exponential 4 129-130
Differentiation—*cont*
l'Hospital, rule of 4 131
logarithm 4 129-130
mean, law of the 4 131
partial *see* Partial differentiation
principles 4 128-129
sexual 4 596-597
simple harmonic motion 4 131
Taylor's formula 4 131
trigonometric functions 4 129
velocity 4 130-131
see also Calculus, differential and integral, Differential equation
Differential 4 121 122
Differentiator, analog ac generator 1 374
dc generator 1 374
RC circuit 1 374
RL circuit 1 374
spring dashpot 1 374
tachometer 1 374
viscous-drag 1 373-374
Difflugia 12 28, 13 398
Diffraction 4 132-139*, 7 499
apodization 4 137
Babinet's principle 4 139
Cornu's spiral 4 138-139
determination of resolving power 4 135-136
effect on radio telescopes 11 261
electron *see* Electron diffraction
Fraunhofer 4 132-139
Fresnel 4 132 133, 137 139
fringes 5 537
geometrical optics 9 363, 369*
grating *see* Diffraction grating
Huygens' principle 6 521 522
microscopic imaging 4 136
of microwaves 4 139 8 417*
neutron 9 88 91
photographs of patterns 4 132 133
quantum mechanics 11 154
radio wave propagation 11 320
resolving power 11 499 500
ripple tank study 11 580
sound 12 515 516
vibration curve 4 132 139
wave motion 14 425 429
x-ray *see* X ray diffraction
in x ray microscopes 8 367 368
zone plate 4 138
Diffraction camera 4 507
Diffraction grating 4 139 141
advantages over prisms 4 139
Diffraction grating—cont.
astronomical spectroscopy 1 615
concave 4 141
Echelle 4 141
echelette 4 140 141
grating spectroscope 4 [illegible]
mountings 4 141
production 4 139 140
resolving power 11 500
spectroscopy 12 500
vibration curve 4 135
Diffractometer x ray fluorescence analysis 13 580
x-ray powder methods 14 585
Diffractometer goniometer 14 582 583
Diffuse nebula 9 24 27
Diffused base drift transistor 7 320
Diffuser 4 141 142
supersonic *see* Supersonic diffuser
Diffusion 4 142 148
amperometric titration 13 658
atmospheric pollution 1 644
crystal growth 3 585
dialysis 4 95
diffusion coefficient 4 [illegible] 148
Fick's laws 4 147
in gases and liquids 4 [illegible] 146
glow discharge 6 216
heat convection 3 444
in ionic crystals 7 251
of ions in gases 4 451
isotope separation 7 [illegible]
in liquids 4 142 146
mass transfer 8 167 168
reactor physics 11 567
semiconductors 12 171
in solids 4 146 148*, 5 [illegible] 156
sound 1 518
thermal *see* Thermal fusion
turbulent 14 162
Diffusion cloud chamber 3 [illegible] 214
Diffusion flame 5 292
Diffusion in gases and liquids 4 142 146
see also Diffusion
Diffusion in solids 4 146 [illegible] 5 155 156
see also Diffusion
Diffusion process photoengraving 10 145
Diffusion theory of rectification 12 171
Diffusivity, thermal *see* Thermal diffusivity
m-Digallic acid 13 391

Digenea 4 148 150*, 10 414, 14 477
  classification 4 149
  morphology 4 148
Digermane 6 177
Digestion bile acid 2 185
  extracellular 5 203
  gravimetric analysis 6 262
  intracellular 5 203
  and nutrition 7 124
Digestive enzymes 5 202 203
Digestive gland 4 150
  intestine 4 150, 7 225
Digestive system 4 150 175*, 7 136
  absorption 4 175
  anatomy and histology 4 155 164
  anomalies 4 155
  bile 4 171
  causal relations 4 154
  colon 4 173
  deglutition 4 166
  development of digestive tract 4 151
  development of function 4 154
  digestive tube proper 4 152
  embryology 4 151 153
  esophagus 4 156 158 165
  foregut 4 151 152
  foregut derivatives 4 152
  gustation 4 166
  histology 4 155 156
  intestinal secretion 4 171
  intestine 4 152 160
  large intestine 4 162 164
  liver 4 153
  motility 4 172
  mouth 4 164
  movements of colon 4 174
  nervous control of colon 4 174
  pancreas 4 153
  pancreatic secretion 4 170
  pharynx 4 165
  physiology 4 164 175
  research development 4 175
  small intestine 4 160 161 169
  stomach 4 152 158 160 166
  suspension of digestive organs 4 153
  tongue 4 165
Digging machine *see* Excavator
Digital codes translating circuits 13 348 349
Digital computer 3 359 4 175 188*
  addition 4 182
  address register 4 186
  analog to digital converter 4 396
  arithmetic devices 4 182 185
  binary counter 12 49
  bit 2 250
Digital computer—*cont*
  computer instructions 4 186
  control 4 185
  control systems 12 20
  counter, digital 3 517 518
  counting circuit 3 519 520
  data processing systems 4 15
  digital representation 4 176 177
  digital to analog converter 4 191 192
  diode switching 4 180
  division 4 185
  ferrite cores 3 222
  memory devices 4 185 186
  multiplication 4 184
  programming *see* Digital computer programming
  relay switching 4 178
  scale-of two circuit 12 49
  simulator 12 340
  storage devices 4 177 182*, 13 159
  subtraction 4 182
  switching circuit 13 344 349
  [illegible]
  vacuum tube switching 4 179
  see also Calculating machines
Digital computer programming 4 188 192
  addresses 4 188
  coding of instructions 4 189
  flow charts 4 190 191
  instructions 4 188
  loop programming 4 189-190
  programming aids 4 190 191
  subroutine 4 190
Digital controller 12 20
Digital counter *see* Counter digital
Digital sampler 1 196
Digital to analog converter 4 191 192
Digital voltmeter 4 191
Digitalin 4 191
Digitalis 4 191* 13 122
Digitalis *purpurea* 4 191 192
Digitaria decumbens 3 528
Digitoxigenin 4 192*, 13 139
Diglyceride 2 20
Digraph 6 254
Dihedral angle 4 192
Dihedral wing shape 13 228
Dihedron 4 192
Dihogmorhina gigantea 9 510
Dihogmorhina latimargmata 9 510 511
Dihydrazide *formaldehyde* resins 6 550
2 5 Dihydro 1,4-oxathine 6 428
Dihydro alpha terpineol 10 256
9 10 Dihydroanthracene 1 456
Dihydrocholesterol 13 137
Dihydroimidazole 7 32
2 3 Dihydroindole 7 62
Dihydroisoindole 7 62
Dihydroisoquinoline 7 289
1,4 Dihydronaphthalene 9 2
Dihydroorotic acid 2 59
Dihydropyran 5 566
delta[2,3] Dihydropyran 11 107
Dihydropyrazole 11 109
1,2 Dihydropyridazine 3 6 dinone diethanolamine salt 6 422
Dihydropyridine 11 112 113
Dihydropyrimidine 2 36
Dihydropyrrole 11 151
1,2 Dihydroquinoline 11 191
Dihydrosphingosine *see* Phytosphingosine
Dihydrostreptomycin 1 464 468
Dihydrothiazoles 13 599 601
Dihydroxy acetone 8 [illegible]78
1 1 Dihydroxy alcohol 1 29
[illegible]
2 50
[illegible]roxy-3,20
diketo 4 pregnene 18 al 1 232
2,2' Dihydroxy 3,5 6,3',5', 6' hexachlorodiphenylmethane 4 206
Dihydroxyacetone phosphate 2 16 38 459, 3 23 10 370
5 6 Dihydroxyindole 7 65
Dihydroxyitaconic acid *see* Itatartaric acid
Dihydroxylation 6 571
2,5 Dihydroxymicotine 2 37
L (3 4 Dihydroxyphenyl) 2 methylaminoethanol 5 41
3 4 Dihydroxyphenylalanine 4 236
2 6 Dihydroxypurine 14 218
2 6 Dihydroxypyridine 11 111
4 8 Dihydroxyquinaldinic acid 11 193
2 4 Dihydroxyquinoline 11 194
Diodosilane 12 320
3,5 Diiodotyrosine 7 210
Diisobutylene 10 46
Diisocyanate 10 493
Diisopropylfluorophosphate 5 45 5 20
Dike (geology) 10 84 421 12 198 13 417
Diketene 7 338
2,4 Diketoimidazolidine 7 32
beta Diketone 5 18 375
2,5-Diketopiperazine 4 105
Dilan 7 140
Dilantin 5 41
Dilantin sodium 7 52
Dilatance (petrology) 10 84
Dilatation of time cosmic rays 3 498 499
Dilatational wave seismology 4 352, 12 151
Dilatometric measurement 2 419
Dilaudid 9 4
Dilepitus 6 300, 11 56
Dill 4 192*, 12 612
Dillon, J F 5 255
Dilthey, W 10 34
Dilution *processes (estuaries)* 5 82
Dilworth's theorem lattice (mathematics) 7 411
Dimastigamoebae 1 329
Dimension checking 3 328 330
Dimension stone 13 151 152
  quarrying 11 180 181
Dimensional analysis 4 192 196*, 10 295, 12 74
  applications 4 194 196
  dimensional formulas 4 193 194
  model theory 4 193
  pi theorem 4 194 195
  theory 4 193
Dimensional formulas *dimensional analysis* 4 192 196
  table 4 193
Dimensioning 4 196
  datum or reference line 4 196
  point-to-point or chain 4 196
Dimensions (*mechanics*) 4 192 196
Dimercaptopropanol 3 44, 10 437
2 3 Dimercaptopropanol *see* British anti lewisite
Dimerization molecular association 8 538
Dimesoperiodic 10 13
Dimetan 7 142
Dimethoate 7 142
Dimethoxydimethylurea 14 216
3 5 Dimethyl allyl pyrophosphate 2 54
N,N Dimethyl 1 azidopropionamide 1 620
Dimethyl carbinol 11 6
Dimethyl dichlorosilane 11 641
3,5 Dimethyl 1 3,5,2*H* thiadiazine 2 thione 6 425
2 4 Dimethyl 4 heptene 4 67
O O Dimethyl *O* (2 2-dichlorovinyl) phosphate 7 141
O,O Dimethyl O (3 chloro 4 nitrophenyl) phosphorothioate 7 141
O O Dimethyl *O* (*p* nitrophenyl) phosphorothioate 7 141

O,O Dimethyl *O*-(2,4,5-trichlorophenyl) phosphorothioate 7 142
3,7-Dimethyl-2,6-octadiene 1-al *see* alpha Citral
2,6 Dimethyl-2,4,6 octatriene 6 533
3,6 Dimethyl 4 octyne-3,6 diol 6 223
O,O Dimethyl (2,2,2-trichloro 1-hydroxyethyl) phosphonate 7 141
Dimethyl polysiloxane 11 641
O,O Dimethyl *S* (1,2 dicarbethoxyethyl) phosphorodithioate 7 141
O,O-Dimethyl *S* (*N*-methylcarbamoylmethyl) phosphorodithioate 7 142
O,O Dimethyl *S*-(4 oxo 3H 1,2,3-benzotriazine-3 methyl) phosphorodithioate 7 141
Dimethyl silanol 11 641
Dimethyl siloxane 11 641
Dimethyl succinate 3 374
Dimethyl sulfate 5 75
N,N Dimethylacetamide 1 302
bis(Dimethylamino phosphoric anhydride) 7 141
p-Dimethylaminoazobenzene 9 326
Dimethylaminoazobenzene-*o* carboxylic acid 7 60
3 Dimethylaminomethylindole *see* Gramine
6-Dimethylaminopurine 9 209
Dimethylberyllium 2 172 9 403
2 3 Dimethylbutadiene 14 207 209
Dimethylcyclohexane 1 243
Dimethyldichlorosilane 12 322 323
Dimethyldiethylsilane 12 322
5,5 Dimethyldihydroresorcinol dimethylcarbamate 7 142
Dimethyldioctadecylammonium chloride 11 184
Dimethylglyoxime 9 95
1,1 Dimethylhydrazine 6 530
Dimethylolurea 14 215 216
3,5 Dimethylpyrazole 11 109
Dimethylpyridine 11 110
3 5 Dimethyltetrahydro 1,3,5-thiadiazine 2 thione 5 561
3,5 Dimethyltetrahydro-1,3,5,2*H* thiadiazine 2 thione 9 209
Dimethylthiocarbamoyl 5 564
1,3 Dimethylxanthine 14 218
3,7 Dimethylxanthine 14 218
Dimetric drawing 10 214 216
Dimetrodon 11 481
Dimetric lake 5 523
Dimorpha mutans 8 169
Dimsdale 7 143
DIN speeds photography 10 165
Dinantian (Carboniferous) 2 469
Dinara Planina 5 118
Dinaric Alps 13 407, 409
Dinarides 5 118, 13 409
Dindymus sanguineus 6 404
Dingy cutworm 3 633
Dinilysia 7 474
4,6 Dinitro o-sec-butyl 6 422
Dinitrobenzene 9 103
3,5-Dinitrocresol 6 422
Dinitrogen pentoxide 9 113 114
Dinitrogen tetroxide 9 114
Dinitrogen trioxide 9 113 114
Dinoben 6 421
Dinobryon 3 117, 11 53
Dinocerata 4 196 197*, 8 82
Dinoflagellata *see* Dinoflagellida
Dinoflagellates 2 251, 8 128, 10 434
Dinoflagellida 4 197* 11 52
Dinopithecus 10 590
Dinophilidae 1 517
Dinophysis 8 107
Dinornithiformes 1 694, 4 198
Dinosaur 4 198 202
Ornithischia 4 200 201
Saurischia 4 198 200
Dioctophymatida 9 30
Dioctophyme renale 4 202
Dioctophymoidea 4 202
Diode, gas 3 274, 6 60 63*
cold cathode 3 274, 6 60 61
Rectigon 6 61
thermionic 6 61-62
Tungar 6 61
voltage regulator 14 367 368
Diode, semiconductor 4 202-203
Esaki tunnel 5 67
germanium 6 178
junction *see* Junction diode
point contact *see* Point contact diode
silicon 12 324
varactor 14 276
see also Semiconductor rectifier
Diode vacuum 4 203 205*
14 243-244
applications 4 205
construction 4 203
Langmuir Child law 4 204, 7 398 399*
operation 4 204
space charge 4 204, 12 540*
temperature saturation 4 204
three halves power law 4 204 7 398 399*
voltage saturation 4 204
see also Vacuum tube
Diode detector amplitude modulation detector 1 357 358
Diode rectifier-amplifier meter 14 254-256
Diode resistance networks generation of bivariable functions 1 379 382
Diode theory of rectification 12 171
Dioecious flower 5 326
Diogenite 8 315
Diol *see* 2,3-Butanediol
Diolefin 6 534, 14 207 208
Diomedea albatrus 1 222
Diomedea exulans 10 637
Diomedea nigripes 1 222
Diomedeidae 1 222, 10 637
Dionaea 12 128
Dionaea muscipula 12 31 14 301
Dione 12 40
Dionine 9 4
Dioon 13 120
Diophantine approximations 9 227
Diophrys 3 122, 6 598
Diopsidae 4 212
Diopside 4 205*, 11 129
Diopter 4 205
Dioptric telescope 13 448-452
Dioptrie 4 205
Diorite 4 205 206* 7 16, 10 86 11 590
Dioscorea 10 536
Dioscoreaceae 7 514, 10 345
Diospyros 3 187
Diospyros virginiana 4 358
Dioxane 4 206
Dioxindole 7 62 64
2,3 Dioxoindoline 7 64
Dioxolane 1 29
1 3 Dioxolane 6 428
Dip (geology) 5 192
Dip brazing 2 322
Dip circle 6 149
Dip inductor 6 149
Dip needle survey 11 22
Dip separation fault structures 5 192
Dip slip fault 5 192
Dip slope 10 258
Dip well logging 14 472
Diphacin 11 615
Diphascon 13 497
Diphenhydramine hydrochloride 1 474
Diphenic acid 11 191
Diphenyl *see* Biphenyl
Diphenyl 2,2' dicarboxylic acid 11 191
Diphenyl ketone *see* Benzophenone
Diphenyl naphthyl methane dye 4 302
N,N Diphenyl *p* phenylene diamine 1 480
Diphenylaminechloroarsine 3 45
s Diphenylcarbazide 3 106
Diphenylchloroarsine 3 45
Diphenylcyanoarsine 3 45
Diphenyldichlorosilane 12 322 323
1,2 Diphenylethylene 6 535
Diphenyliodonium bisulfite 7 240
Diphenyliodonium chloride 7 240
Diphenylmercury 9 402
Diphenylmethane 4 206*, 10 6
Diphenylmethane (ketone imine) dye 4 301
1,4 Diphenylsemicarbazide 6 530
Diphenylthiourea 1 408
Diphenylurea 1 408
Diphogene 5 45
1,3 Diphosphoglyceric acid 2 39, 51, 459, 9 92
Diphosphopyridine dinucleotide *see* Diphosphopyridine nucleotide (DPN)
Diphosphopyridine nucleotide (DPN) 4 206 207*, 9 112
activation of a substrate fatty acid 2 51
bacterial coenzyme 2 151
in biological oxidation 2 213
coenzyme 3 264 9 112
enzyme action on 5 22
niacin 9 92
oxidation of higher fatty acids 7 532
reduced (DPNH) 7 535
Diphtheria 4 207 208, 8 82
antibiotics active against 1 466 467
antigen 1 472
antitoxin 1 487
biological 2 218
Schick test 12 372
toxoid 4 207
Diphyllidea 2 659 4 209*, 10 414
Diphyodont dentition 13 673
Dipicolinic acid 2 14
Diplacinus 4 22
Diplasiocoelı 4 209 209
Diplazon laetatorius 6 581
Diplobathrida 4 369
Diplocarpon earliana 13 122
Diplocarpon rosae 8 215 9 4
Diplocaulus 9 28
Diplococcus 2 45, 5 67 7 581
gram negative 6 217
Diplococcus pneumoniae 1 466 467 2 461 7 581 610 10 45
Diplocynodon 5 554
Diplodia 3 251, 5 547, 9 601 12 601 15 541
Diplodia corchori 7 524
Diplodia zeae 3 441 12 604
Diplodocus 4 199 11 444
Diplolepis rosae 6 581
Diplonema 8 211

Diplopia 8 626
Diplopoda 1 564 4 209
classification 4 209
distribution 4 209
Millipede 8 441
Myriapoda 8 642
reproduction 4 209
Diploporita 4 209 210*, 360, 365
Diplosomite 4 209
Diplospondyli 12 355
Diplozoon 8 574
Diplura 1 495, 566 4 210*, 7 154
Dipneumonomorphae 1 498
Dipneusta 4 210 211
Dipnoi 4 210 211* 5 205 7 621 9 442 445 446 12 360
Dipodomys 11 345
Dipole 4 211
antenna *see* Antenna (aerial)
biopotentials and electrophysiology 2 235
directivity 4 233
electric 1 444 4 211
geomagnetic 5 500 501
interaction 12 486
magnetic 1 444 4 211
molecular 4 211
moment see Dipole moment
radiation see Dipole radiation
see also Electric dipole
Dipole moment 4 211
electrical units 4 461
molecules 4 112 8 548
nuclear *see* Nuclear moments
solutions 12 486
Dipole radiation 1 444
electromagnetic 4 495
multipole 8 627
Dipole selection rule *see* Selection rules (physics)
Dipole transition 12 160 162
Diporpa larvae 8 574
Dipping sonar 1 486 487
Diprion 10 484
Diprion hercynae 6 580
Dipronidae 6 574
Dipropyldichlorosilane 12 322 323
Diprotodon 8 155
Dipsacaceae 11 647
Dipsocoridae 6 401
Diptera 4 211 219* 7 134 139
adults 4 215
antennae 4 213
biology 4 215 218
Cyclorrhapha 4 212
eggs 4 214 216
fly 5 361 362
importance 4 218 219
larva 4 214 216
life cycle 4 215
mides 8 491, 492
morphology 4 213 215
mosquito 8 599
mouthparts 4 213
nutrition 4 215
Orthorrhapha 4 212
pupa 4 214, 217
setae 4 214
taxonomy 4 212 215
thorax 4 213
wings 4 214
Dipterex 7 141
Dipteriformes 4 210
Dipterocarp 1 587
Diptery x odorata 14 270
Dipylidium caninum 5 642 5 6
Dirac G A 6 254
Dirac P A M 1 481, 655 3 356 510, 4 502 5 215, 230, 273 7 507, 9 363 495, 550 10 524 11 148, 179 14 424
Dirac delta function 12 126
integral transform 7 165
Dirac equation 11 179 180
Dirac field 11 149
Dirac relativistic quantum theory *see* Quantum theory relativistic
Direct acting steam pumps 4 245
Direct arc furnace 4 427
Direct black 19 4 300
Direct black 36 4 299
Direct black EW 4 299
Direct coupled amplifier 1 543 4 219 221* 14 359 360
carrier dc amplifier 4 220
chopper stabilized amplifiers 4 220 221
dc amplifiers 4 219
dc cathode-coupled amplifier 4 220
gas tube coupling 4 219
vacuum tube amplifier 1 543
Direct coupled circuits 3 521
Direct current 3 626 4 219* 422 423
conversion to alternating current 3 444
measurement 3 628
ripple 4 219 11 580
transients 14 31 33
Direct current *ammeter* 1 520 523
Direct current *amplifier see* Direct coupled amplifier
Direct-current armature windings 14 505
Direct current circuit theory 4 221 223
Kirchhoff's laws 4 222
Ohm's law 4 222
parallel circuit 4 221
physical laws 4 221
power 4 223
RC circuit 4 225
Direct current circuit theory—cont
RL circuit 4 223
series circuit 4 221
series parallel circuit 4 222
transients 14 30 33
Direct current distribution systems 4 422 423
Direct current generator 4 223 225
air gap flux distribution 1 545
armature reaction 1 545, 4 224
brushes 3 328, 4 223
commutation 3 327, 4 224
commutator 3 328
commutator ripple 4 225
compound 4 225
cumulative compound connection 4 225
differentially compounded 4 223
diverter pole 4 223
diverter resistance 4 225
flat *compounded* 4 225
generated voltage 4 224
homopolar 4 225
interpoles 4 224
long shunt connection 4 225
magnetomotive force 4 224
overcompounded 4 225
residual magnetism 4 224
Rosenberg 4 223
separately excited 4 225
series 4 224
short shunt connection 4 225
shunt 4 224
tachometer 13 585
third brush 4 225
undercompounded 4 225
voltage regulation degradation 1 545
windings 14 504 508
Direct current motor 4 226 231
air gap flux distribution 1 545
armature reaction 1 545
brushes 3 328
commutation 3 327
commutator 3 328
compound 4 228
counter emf 4 227
dynamic braking 4 311-312
enclosures 4 226
horsepower rating 4 226
instability 1 545
motor speed 4 227
power output 4 227
principles 4 227 229
separately excited 4 228
series 4 228
servomotor 12 204
shunt 4 227
Direct current motor—cont
speed control 4 229
speed current curves 4 228
speed regulation 12 600
stabilized shunt motor 4 228
starting 4 229
torque 4 227
universal 14 206
Ward Leonard speed control system 4 229
windings 14 504 506
Direct current transients 14 31 33
Direct distance dialing (DDD) 13 350
No 5 crossbar system 13 353
general switching plan 13 437
standard routing pattern 13 436
telephone service interurban 13 436
No 4A toll crossbar system 13 354
Direct dyes 4 307 309
Direct fired evaporators 5 126
Direct lithography 10 600
Direct metal 2 540
Direct orange 15 4 301
Direct ratio discrimination methods 11 70
Direct red 28 4 299
Direct reduction processes 7 259
Direct vision spectroscope 12 589
Direct yellow 59 4 303
Directed angle 1 405
Direction cosine 1 392, 6 151
optical 9 364
Direction finding equipment 4 231 232
antisubmarine warfare 1 495
automatic direction finder 4 231 232
high frequency direction finder 4 232
loop antennas 9 13
nondirectional beacons 4 231
radio compass 4 231 232
radiophares 4 231
Direction numbers (analytic geometry) 1 392
Direction theodolite *see* Theodolite
Directional coupler 4 231
electric power measurement 4 439
microwave reflectometer 11 397
wave guide 14 423
Directional drilling 9 293 294
Directional gyro 4 21 6 309

Directional surveying (well logging) 14 470-471
Directivity 1 446 453, 4 233*
  antennas 1 446 453
  microphones 8 359
  microwave antennas 8 415
  noise control 9 121
  sound 12 511-515
Directivity factor (sound) 12 511
Directivity index 12 512 515
Directivity pattern 4 233
Director (antenna) 1 447
Dirichlet, P G L 8 178, 9 226
Dirichlet formula 7 165
Dirichlet problem 2 408
Dirichlet series 7 403
Dirigible 1 217, 4 234, 6 390, 544
  see also Airship
Dirofilaria immitis 5 260
Dirty bomb (atomic) 1 648
Disaccharide 2 620
Disannealing glass 6 207
Disasteridae 6 463
Disazo dye 4 299
Discalcy 7 265-266
Discellaceae 4 234*, 5 563, 12 606
Discharge, arc *see* Arc discharge
Discharge channel 13 616
Discharge in gases *see* Electrical conduction in gases
Discharge lamp *see* Vapor lamp
Discharge printing 13 542
Dische carbazole test 2 453
Discinacea 9 38
Discinites 9 116
Discipline 12 72
Discimax 3 184 185, 13 233
Discocephali *see* Echeneiformes
Discocyclina 5 434 435
Discocyclinidae 5 435
Discodermia ornata 4 57
Discoglossidae 9 345
Discoglossus 9 345, 12 602
Discoid lupus 7 623
Discoidal cleavage 2 645
Discoididae 6 465
Discolomidae 3 278
Discomfort index *see* Temperature humidity index
Discomycetes 4 234
Disconformity (geology) 14 191
Discontinuity Mohorovicic 8 531-533
  seismology 12 151
  sial 15 412
  sima 15 412
  thermal wind shear 1 97
  in troposphere 5 538
Discontinuous function (mathematics) 11 372
Discophyllites patens zone 14 82
Discosoma 4 584
Discospirulina 12 23
Discrete variable statistics 13 67
Discrimen 7 459 473
Discriminant 4 234 235
Discriminator 4 235, 5 516
  automatic frequency control 1 675
  frequency modulation detector 5 516
Disease 4 235-236*, 9 594
  biochemistry 2 199, 4 235
  biochimatology 2 200-202
  carrier 4 236
  epidemic 5 34
  epidemiology 5 35
  epilepsy 5 40
  fever 5 212
  germ 6 174
  hormones causing 4 235
  inborn errors of metabolism 4 236
  ketosis 7 340
  pathogen 9 593
  vitamin deficiency 4 236
  see also entries under specific diseases
Disease, bacterial anthrax 1 457
  bacillary dysentery 2 2
  bejel 2 159
  blackleg 2 255
  botulism 2 306
  brucellosis 2 552
  cholera vibrio 3 84
  diphtheria 4 207
  gangrene, gas 6 58
  gonorrhea 6 235
  granuloma inguinale 6 250
  hemorrhagic septicemia 6 413
  jaundice 7 300 303
  Johne's disease 7 314
  leprosy 7 475
  listeriosis 7 543
  mastitis (cows) 8 170
  melioidosis 8 214
  moraxella lacunata 8 597
  osteomyelitis 9 446
  parapertussis 9 554
  paratyphoid fever 9 561
  paratyphoid gastroenteritis 9 562
  paresis, general 9 564
  pink eye 10 238
  pinta 10 238
  plague 10 255
  pneumonia 10 428
  pseudotuberculosis 11 67
  rat bite fever 11 315
  relapsing fever 11 426
  rheumatic fever 11 545
  scarlet fever 12 50
  soft chancre 12 413
  syphilis 13 374
  tetanus 13 527
  tuberculosis 14 129
  tularemia 14 154
Disease, bacterial—*cont*
  typhoid fever 14 173
  Vincent's angina 14 324
  Weil's disease 14 464
  whooping cough 14 489
  yaws 14 597
Disease, mycotic aspergillosis 1 589
  blastomycosis 2 256
  candidiasis 2 436
  chromomycosis 3 106
  coccidioidomycosis 3 249
  cryptococcales 3 578
  cryptococcosis 3 579
  dermatophytosis 4 68
  fungistat and fungicide 5 563 564
  histoplasmosis 6 458
  mycology, medical 8 678
  nocardiosis 9 116
  pneumonia 10 428
  sporotrichosis 13 11
Disease, noninfectious Addison's disease 1 62
  adrenal disorders 1 73-74
  agnosia 1 113
  allergy, atopic 1 257
  amnesia 1 328
  aneurysms 1 403
  angina pectoris 1 403-404
  aphasia 1 489 490
  appendicitis 1 492
  apraxia 1 494
  arthritis 1 554
  astereognosis 1 595 596
  asthma 1 601
  beriberi 2 166
  blindness 2 261
  bronchial disorders 2 346 349
  bronchiectasis 2 349
  Buerger's disease 2 361 362
  bursitis 2 375
  cachexia 2 385
  cancer 2 435
  circulation disorders 3 141 144
  cirrhosis 3 144 145
  clinical pathology 3 192 202
  colitis 3 288 289
  concussion 3 373
  constipation 3 415
  convulsive disorders 3 452
  cretinism 3 546 547
  decompression illness 4 37
  delusion 4 51
  diabetes 4 95
  dyschondroplasia 4 314
  eczema 4 408 409
  embolism 4 565
  embolus 4 565 566
  endocarditis 4 589
  esophagus disorders 5 70 71
  eye disorders 5 171 172
  gallbladder disorders 6 17 18
Disease, noninfectious—cont
  gallstones 6 20
  gangrene 6 58
  gastrointestinal tract disorders 6 72 74
  glaucoma 6 210 211
  goiter 6 229 230
  gout 6 239
  hallucination 6 325
  headache 6 345 346
  heart disorders 6 354 362
  hematologic disorders 6 395 396
  hemophilia 6 411
  hemorrhage 6 412 413
  hemorrhoids 6 413 414
  Hodgkin's disease 6 448 460
  Huntington's chorea 6 529
  hyperplasia 6 598
  hypersensitivity 6 564 566
  hypertrophy 6 593
  hypoplasia 6 597
  ileitis 7 22
  infarction 7 93
  insulin shock 7 161
  intestine disorders 7 223
  involutional melancholia 7 236
  itch 7 297 298
  jaundice 7 302 303
  joint disorders 7 315 316
  keratitis 7 336
  ketosis 7 340
  kidney disorders 7 342 346
  larynx disorders 7 476
  leukemia 7 480 485
  leukopenia 7 495 496
  liver disorders 7 561 564
  lung disorders 7 618 621
  manic depressive psychosis 8 91
  mental illness 8 226 227
  metabolic disorders 8 254 265
  metaplasia 8 304
  mongolian idiocy 8 566 567
  mouth disorders 8 619 620
  muscular dystrophy 8 643 644
  muscular system disorders 8 657 660
  myiasis 8 679 681
  neoplasia 9 37 38
  nephritis 9 40
  nervous system disorders 9 67 72
  nose disorders 9 168 169
  obesity 9 242
  obsessive compulsive reaction 9 245 246
  oncology 9 318 326
  pancreas disorders 9 534 536
  paranoia 9 553
  paranoid state 9 553 554
  Parkinson's disease 9 567

ase, noninfectious—*cont*
pathology 9 594 595
peptic ulcer 9 628 629
pharynx disorders 10 100
phenylpyruvic oligophrenia *10* 114 115
phobic reaction 10 119
pituitary gland disorders *10* 252
pregnancy disorders *10* 579
prostate disorders 11 27 29
psoriasis *11* 71
reproductive system disorders *11* 480-482
respiratory system disorders 11 552
retinitis 11 537
rheumatism 11 545
rickets 11 566 567
schizophrenia 12 66
scurvy 12 89 90
senile dementia 12 177
skeletal system disorders 12 367 369
skin disorders 12 369 370
spinal cord disorders 12 616-617
spleen disorders 13 8 9
stomach disorders 13 149 150
thyroid gland disorders *13* 627
tooth disorders 13 675 676
toxemia *14* 4 5
trachoma 14 9
urinary bladder disorders 14 220 221
uterine disorders 14 256
vaginal disorders 14 256
Disease parasitic amebiasis *1* 300
ascariasis 1 571
balantidiasis 2 75
Chagas disease 3 3
clonorchiasis 3 207
fascioliasis 3 183
fasciolopsiasis *3 183*
filariasis 5 257
guinea worm infection 6 292
heterophyiasis 6 429
hookworm disease 6 478
leishmaniasis 7 449
malaria 8 77
paragonimiasis 9 544
pinworm infection 10 239
pneumocystosis 10 427
pneumonia 10 428
schistosomiasis 12 63
sleeping sickness African 12 373
strongyloidiasis 13 193
tapeworm disease 13 395
toxoplasmosis 14 7
trichinosis 14 85
trichomoniasis 14 86
whipworm disease 14 488
Disease, rickettsial Carrion's disease 2 552
fièvre boutonneuse 5 257
Q fever 11 133
rickettsialpox 11 567
spotted fever, Rocky Mountain *13* 13
spotted fever group 13 14
tick bite fever, South African 13 630
tick typhus, North Queensland 13 631
tick typhus Siberian 13 631
trench fever 14 80
typhus scrub 14 173
typhus fever, endemic (flea borne) 14 175
typhus fever epidemic (louse borne) 14 175
Disease viral *avian leukosis* *1* 695
cat scratch disease 2 546
chickenpox and *shingles* 3 58
cold, common 3 273
Coxsackie virus 3 530
dengue fever 4 62
encephalitis, equine 4 587
exanthem subitum 5 155
foot and mouth disease 5 429
German measles *5 175*
herpes simplex 6 426
inclusion blennorrhea 7 55
infectious mononucleosis 7 95
influenza 7 98
keratoconjunctivitis (epidemic) 7 337
louping ill 3 595
lymphocytic choriomeningitis 7 636
lymphogranuloma venereum 7 636
measles 8 168
molluscum contagiosum 8 561
mumps 8 632
myxovirus 8 689
Newcastle disease 9 91
phlebotomus fever 10 115
pneumonia 10 428
pneumonitis 10 429
poliomyelitis 10 456 457
psittacosis 11 69
rabies 11 197
salivary gland *virus* 12 14
smallpox 12 383
tick fever, Colorado 13 630
trachoma 14 9
West Nile fever 14 476
yellow fever 14 604
Disease agent, filterable *see* Virus
Disease carrier 4 235 256
Disease control infectious *see* Infectious disease control
Disease rate 5 36
Disease transmission, infectious *see Infectious disease* transmission
Disilane 12 519 520
Disiloxane 12 520
Disinfectant bioassay 2 197
gaseous 1 475
water treatment 14 408
see also Antimicrobial agents
Disintegration, nuclear *see* Nuclear disintegration
Disk centrifuge 2 636
Disk clutch 5 224
Disk colorimeter 5 301
Disk harrow 1 127
Disk recording 4 236 244
commercial phonograph records 4 241
cutters 4 237 238
distortion and noise 4 241 243
flutter and wow 5 356 357
monophonic 4 237 239
pickups 4 240 241
record manufacture 4 239
recorders 4 237
recording characteristics *4 238 239*
recording system 4 237
reproducing system 4 239 241
stereophonic 4 243 244
Disk records *see* Records, phonograph
Disk seal tube 8 426
Disk spring 13 17
Disk telescope 15 288 289
Dislocation metamorphism 8 304
Dislocations in crystals 5 583 585
Disodium 3 6-endoxohexahydrophthalate 6 421
Disodium methylarsonate 6 421
[illegible]
300
Dispersal (sedimentary petrology) 12 140 142
Dispersant 7 603 604
Disperse dyes 4 308
Disperse red 9 4 305
Dispersed phase 3 291
Dispersing prism 10 623
Dispersion colloid 3 291 292
emulsion 4 586
population 10 500 503
rotatory *see* Rotatory dispersion
Dispersion (radiation) 1 15 17* *4 244*
Dispersion (radiation)—*cont*
anomalous 1 16
chromatic aberration 3 89 90
color 1 15
gratings 4 140
light 7 502 503
optical materials 9 350 352
quartz 1 16
rainbow 11 531
Dispersion alloys 10 550
Dispersion forces *see* Van der Waals *forces*
Dispersion gratings 4 140
Dispersion processes esterries *5 82*
Dispersoid 9 585
Dispharynx nasuta 13 6
Displacement (mechanics) 4 244
Displacement (ships) 12 268
Displacement, electric *see* Electric displacement
Displacement current 3 626, 4 244 245*
Displacement development 6 47
Displacement pickup 14 321
Displacement pump 4 245 246*, 11 103
air lift 4 246
direct acting steam 4 245
reciprocating 4 245
rotary 4 246
vacuum 4 246
Displacement reactions chemical synthesis 9 591
Displacement series oxidation reduction reaction 9 465
Display devices aircraft instrument panel 1 180
cathode ray tube 2 554 560
human engineering 6 496
number indicator tube 9 219
storage tube 15 161
Display type 3 344
Disse space liver [illegible]
Dissipative force 5 457
Dissociation bacteria 2 9
equilibrium, ionic 5 54
Dissociation constant acid and base 1 40
Dissolution 6 262
Dissolving 8 522 524
Dissosteira longipennis 9 416
Dissotrocha 2 114
Dissymmetric conditions asymmetric synthesis 1 620
Distarodidae 3 406
Distance measurement 9 20
electronic methods 15 325
microwave 15 325
stadia 15 32 324-325

Distance measurement—*cont*
subtense bar 13 325
surveying 13 324
Tacan 13 382
taping 13 324
trig traverse 13 325
Distephanus speculum 8 169
Distichlis 8 127
Distillate fuel 4 246
diesel fuel 4 121
kerosine 7 537
Distillation 4 246 252*, 14 346
atmospheric gases 1 638-639
azeotropic mixture 1 702
crude oil 10 65
destructive *see* Destructive distillation
drying 4 282
fractional 4 219
fractionating column 5 491 492
heavy water preparation 6 382
isotope separation 7 295
molecular 4 252 253
petroleum processing 10 67
petroleum separation 10 54
plate efficiency 4 251
salt water conversion 8 123 12 11
separation (chemical and physical) 12 186
simple 4 248
steam 4 218
vapor liquid equilibria 4 247
see also Gas absorption operations Sublimation
Distillation, molecular 4 252 253
Distilled spirits 4 253 256
brandies 4 255
cachaca 4 255
distillation process 4 254
fermentation 4 254
gin 4 255
liqueur 4 256
pulque 4 255
rum 4 255
tequila 4 255
vodka 4 255
whiskey 4 255
Distilled vinegar 14 324
Distome 4 148 150
Distorted grains metallography 8 293
Distortion (aberration) *see* Aberration optical
Distortion (electronic circuits) *1* 347, 4 256 257*, 12 519
amplitude distortion 4 256
bottoming 4 256
cross modulation 4 257
crosstalk 3 555
frequency distortion 4 256
grid current 4 256
Distortion (electronic circuits) —*cont.*
harmonic distortion 4 256
intermodulation 4 257
nonlinear devices 4 256
phase distortion 4 256 257
reduction by feedback 4 257
saturation 4 256
transformer 14 28
Distortion and noise meter 6 340
Distortionless transmission line 14 49
Distributary streams 4 50
Distributed capacitance 2 444
Distributed parameters transmission line 14 49
Distributed parameters (electrical measurement) 4 457
capacitance 2 444-445
inductance 7 69
Distribution (probability) 4 257 258
binomial distribution 4 257
binomial theorem 2 193
central limit theorem and error theory 4 257
multivariate normal distribution 4 258
normal distribution 4 257
Poisson *see* Poisson distribution
t Distribution 2 227
see also Biometrics Statistics
Distribution effects 5 60
Distribution function 13 59 66
Boltzmann statistics 2 278 279
Boltzmann transport equation 2 281 282
Bose Einstein statistics 2 305
Fermi Dirac statistics 5 215 216
lattice vibrations 7 414 415
Distribution law extraction 5 156
Distribution photometer 10 172
Distribution reservoir 14 406
Distribution substation *see* Electric power substation
Distribution switchboards 14 520
Distribution system water 14 405 407
Distribution systems electric *see* Electric distribution systems
Distribution transformer 4 421 425 14 23
Distributive lattices 7 410
Distributive law for addition and multiplication 3 337
Distributive vector 6 244
Distributor 4 258-259
ignition 7 19
Disturbance climax 3 182 186
Disturbance community 3 185
Disulfide 4 259*; 9 405
Disulfone 13 263
Disyringa dissimilis 3 89
Ditchburn, R. W. 4 133
Diterpene 6 536
see also Terpene
Dithiazanine 1 571
2,5 Dithienylthiophene 13 605
Dithio acid 13 603
6,8 Dithio n-octanoic acid (Lipoic acid) 2 13 14
Dithiocarbamate 13 603
Dithioester 13 603
Dithionites 13 260
Dittmar, W. 12 116
Ditungsten carbide 14 140
Ditylenchus 14 169
Ditylenchus dipsaci 1 234, 9 29
Ditylum brightwellii 8 128
Ditylum sol 8 128
Diuresis 14 252
Diurnal aberration (light) 1 7
Diurnal effect cosmic rays 3 502
Diurnal inequality (tides) 13 635
Diurnal parallax 9 545
Diurnal pressure variation (meteorology) 1 157 158
Diurnal species 3 324 325
Diurnal tide 13 634
Diuron 6 423
Div 10 541
Divalent metals 2 339
Divergence aeroelasticity 1 90 series 12 189 191
Divergence of a vector 2 413 414
Divergence speed 1 90
Divergence theorem of Gauss *see* Gauss' theorem
Diverging lens 7 451
Diversity reception (radio) 11 259
Diverter hole 4 225
Divide (drainage area) 6 453 11 581
Divider analog linear tapped potentiometer 1 373
position servo 1 374
servo divider 1 372
Diving duck 4 291
Diving petrel 10 637
Diving planes (submarine) 13 212 215
Divinyldichlorosilane 12 322 323
Divisibility (number theory) 9 224
Division 4 259
analog computer 1 372 373
Division—*cont.*
digital computer 4 145
polynomial 1 349
quaternions 11 145
Division algorithm 3 46
Dixidae 4 212
Dixon, H. B. 10 292
Djadokhta sandstone 11 354
Djawa 4 457
Djerassi, Carl 13 126
DME (dropping mercury electrode) 10 455
DMET 14 375
DMTT 6 423
DN 6 422
DNA *see* Deoxyribonucleic acid
DNBP 6 422
Dnieper 5 121
Dniester 5 121
Dobner-Miller synthesis 11 192
Dobrin, M. B. 9 310
Dobson fly 6 394
Dock, dry *see* Drydocking
Dockum Group 11 85
Docodonta 4 259
Docoglossate radula *8 %1*
Docosane 1 249
Doctor's Dilemma (game theory) 6 24
Doctor sweetening petroleum processing 10 70
Document copying *10 166*
Documentary reproduction 10 142
Dodder 13 664
Dodecahedron 10 471, 492
Dodecamethylcyclohexasiloxane *12 323*
Dodecanedioic acid 3 649
Dodecane 1 249
Dodecene (tetramer) *10 46*
Dodo 5 302
Doering, W. 11 190
Dog 4 259 260
gestation period *6 182*
Dog flea 12 344
Dog salmon 12 14
Dog tick 13 630
Dog whelk 14 488
Dogfish 4 260* 12 243
Dogger (Jurassic) 7 525
Dogger Bank *9 165*
Dogwood 4 260* 14 144 145
Doms, F. 4 6 235
Dokdrum belt 14 494 495
Dolerotheca 11 86 87
Dolerite 4 98
Dolgimus 5 14 265
Dolichonyx oryzivorus 2 273
Dolichophyteus 10 390
Dolichopsyllidae 4 212
Dolichosoma 1 223
Dolichothorax 1 528
Dolichus tepula 12 407
Doline 7 353

Doliolid 14 140
Doliolida 13 545
Doliolum 13 545
Dollar unit reactor physics 11 367
Dollard J 1 112, 5 549, 10 52, 11 80
Dolly industrial trucks 7 86
Dolly Varden trout 14 119
Dolomite 4 260 261* 7 515, 11 590
calcium mineral 2 398
carbon 2 462
carbonate minerals 2 467
lime (industrial) 7 515
magnesium occurrence 8 19
refractory 15 153
in stylolites 13 209
weathering 14 460
Dolomite marble 8 100
Dolomite refractories 11 410
Dolomite rock 4 261
chert in 5 56
composition 4 261
limestone 7 515
metasomatism 8 505
occurrence 4 261
origin 4 261
texture 4 261
Dolomites 5 117
Dolomitization 7 516
Dolostone 4 261
Dolphin oil 5 189
Dolphin 4 262
Domack G 3 476 13 606
Domain (crystallography) 4 262
antiferroelectric 5 229
ferroelectric 5 229 226
ferromagnetic 2 98 5 229 234* 8 24 26 50
Dominance environment 5 12 15
Dominance tetrasomeness, blending 2 327 4 262* 6 107 108
Dominance hypothesis 6 450
Dominant Mendelism 8 223
Dominion Observatory 1 610
Dom 5 121
Donau/Danube 6 196
Donau Gunz (interglacial) 6 495
Donax gouldii 12 306
Donets 5 121
Donkey 4 262 263* 6 488 8 [illegible]
[illegible]
Dons [illegible]
Dons [illegible]
Dont [illegible]
7 243 235 10 279
Donthas J D 11 5 497
Donnell J R 8 449
Donot atom 4 265* 12 167
Donovan bodies 6 250
Donovania granulomatis 6 250
Doodlebug 1 437 2 362
Doodson A T, 4 348, 15 654, 658
Door sound transmission 1 519
Dootsen, F W 4 143
Dop (gem cutting) 6 102
Dopa (3,4 dihydroxyphenlalanine) 4 236
Dope dyeing 4 310
Doping (semiconductors) 12 169
Doppler broadening (spectral lines) 1 662
Doppler effect 4 264 265
acoustical 4 264
binary stars 2 187 188
Compton effect 5 556 558
galaxies 6 9 12
Ives Stilwell experiment 3 207
moving target indication 8 620
optical 4 264 265
radar 4 265 268
radial 4 265
red shift 11 587
satellite tracking 12 56
sonar 12 504
transverse 4 265
Doppler frequency shift 4 264
binary stars 2 187 188
radar 3 425, 4 266
Doppler principle 1 165
Doppler radar 4 265 268* 9 19 20
antenna stabilization 4 266
dead reckoning 9 16
frequency shift 4 266
moving target indication 8 620
navigation 4 266
Doppler width (spectral lines) 1 662
Dopplerite 4 268
Dorado 3 412 414*
Dorididae 4 212
Dorippidae 4 34
Doris 9 218
Dormant bud 2 561
Dorn F E 11 525
Dorn effect 4 479
Doropygus pallus 9 170
Dorosoma cepedianum 12 238
Dorr agitator 7 423
Dorr clarifloculator 12 223
Dorr classifier 3 156
Double-base diode 14 88
Double blind technique 10 97
Double bond chemical 3 25
Double bond shift isomerization 7 281 282
Double-cone air separator 3 156
Double crested cormorant 3 481
Double effect pans 8 456
Double focusing spectrometer 2 182 183
Double Hooke's mechanical joint 14 205
Double mirror 7 185, 8 506 507*
Double mirror, Fresnel *see* Fresnel double mirror
Double pain 9 491
Double pipe heat exchanger 6 375
Double refraction *see* Birefringence
Double salt 12 16
Double slit *experiment: interference of waves* 7 184 185
Double stars *see* Binary stars
Double-sulfate theory 13 134
Double weighing 2 74
Doublet flow 4 269
Doublet sound source 12 511 513
Doubletone boards 10 611
Doubly magic nuclei 9 205
Doubly periodic functions 4 562
Doudoroff M 2 56
Dougherty E 1 698 700, 9 20
Douglas, E. R 9 346
Douglas fir 4 269 270
Dourine 14 124
Douville H 9 614
Dove 4 270
Dove prism 8 508 10 18
mirror optics 8 508
Dow diaphragm cells 3 70
Dow process catechol 2 550
phenol 10 112
Dow 17 process 4 535
Down 5 195
Down the hole drilling 2 298
Downdraft (air) 1 151 13 616
Downdraft kilns 7 346
Downs cell 3 71, 12 410
Downtonian series 12 327
Downtonian Stage 4 87
Downy mildew 6 251 9 327, 601 13 292
see also Plant disease
Downy woodpecker 14 541
Doyle rule forestry 5 460
Dozer *see* Bulldozer
2 (2 4 DP) 6 422
DPN *see* Diphosphopyridine nucleotide
Dracaena 13 120
Draco 3 412 413*, 6 8 13 23
Draconids 8 498
Dracunculoidea 4 270 271
Dracunculus medinensis 3 613 4 270 6 292 14 431
Dracunulosis *see* Guinea worm infection
Draft (ships) 12 255-256, 269*
Drafting 4 271
see also Engineering drawing
Drafting machine 4 271
Drag aerodynamic *see* Aerodynamic wave drag
Drag bit 2 295, 9 293
Drag coefficient 2 80 81
Drag cup tachometer 13 584
Drag force 2 80 81
induced 13 175
pressure 13 175
skin friction 13 175
wave 13 175
Drag link mechanism 5 495
Dragline 2 368 3 416 5 133 134, 8 474
Dragline dredges 8 478
Dragonfly 4 271* 9 274
Drain casting 2 649
Drain tile 3 167
Drainage 3 239 14 393
airfield 1 216
of mines 8 491 495
patterns 5 360
retaining wall 11 534
Drainage basin 2 107, 11 581 583
runoff characteristics 13 318 319
Drainage canal 2 433 434
Drake bud failure 1 495
Drake Passage 9 483
Drakensberg 1 107
Draper catalog 13 41
Drawbridge 2 334
Drawdown well 14 470
Drawing, engineering pictorial 10 214 216
schematic 12 61 62
see also Engineering drawing
Drawing of metal 4 271 272
forging 5 470
powder metal forming 8 286
rod and wire drawing 4 272
tube drawing 4 272
see also Tempering
Drawing out *textile* 15 533 534
Dreby, E. C. 14 22
Dredge 3 417, 4 272
Dredge sampler (marine sediments) 8 144 145
Dreikanters 6 262
Drepanaspis 6 451
Drepanellidae 9 510
Drepanidae 7 464
Drepanoptera ribis 8 212

Dresbachian age 2 425
Dressing (food) 5 387
Dreyer, J L E 9 24
Dried milk 8 437
Drier (paint) 3 248, 4 275*
  drying oil 4 290
Drierite 4 77
Driesch, H 4 576
Drift (instrument) 7 153, 10 206
Drift bottle 9 251
Drift ice *see* Sea ice
Drift mining 8 478
Drift transistor diffused base 7 320
  high frequency characteristics 14 37
Drift velocity (charge carriers) 12 167
  Hall effect 6 320
Driftmeter airborne radar 1 165
Drilidae 3 277
Drill *see* Drilling machine
Drill bit 2 295
Drill bort 4 101
Drill hole logs 14 470
Drill jumbo 14 142
Drill pipe 2 295
Drill rig 2 295
Drill rod 2 295
Drill steel 2 295
Drill stem 2 295
Drilled caissons 2 389
Drilled pile 10 228
Driller's log 14 470
Drilling agriculture 1 128
  boring 2 294-295
  cable-tool drill 2 384
  exploration 8 489
  jet flame 8 489
  jet piercing 9 471
  machining 8 6
  mineral prospecting 11 21
  mining machinery 8 488
  oil and gas wells 2 384
  petroleum prospecting 10 57-58 11 25
  rock drill 3 417, 8 489
  turbodrill 14 154
  water-jet 8 489
  see also Boring
Drilling machine 4 273 274, 8 7
Drilling methods, mineral *see* Boring and drilling, mineral
Drilling mud attapulgite 3 162
  barite 2 94
  bentonite 2 163
  fuller's earth 5 560
  petroleum engineering 10 57 58
  removal of cuttings 2 295
Drimys 3 187, 8 240
Drin, Gulf of 5 114
Dripstone 13 55
Drive, organic (behavior) 8 603
Drive beetle 3 278
Driven caissons 2 389
Driving-point impedance mechanical 7 37
Drizzle 10 573
Drogden rise 9 250
Drogue 9 251
Dromadidae 3 10
Dromaeidae 2 545
Dromaeus novaehollandiae 2 545
Dromia 8 76
Dromia erythropus 4 33
Dromiacea 4 34
Dromid crab 4 33
Dromoran 9 4
Drone (aircraft) 4 274-275*, 12 406
  antisubmarine warfare 1 487
  applications 4 275
  autopilot 1 689
  electronic countermeasures 4 522
  guidance system 4 274, 6 286
  propulsion 4 274
  telemetering 13 426
  underwater 1 487
Drone (bee) 2 128
Drop forging 5 470 471
Drop hammer forging 5 470 471
  pile driving 10 227
Drop-out (magnetic recording) 8 41
Drop out fuse 5 578
Dropping mercury electrode 10 455
Dropping point 10 550
Drosera 12 28, 31, 13 290
Droseraceae 12 31
Drosophila 1 700, 3 111, 658, 5 5, 6 498, 7 478 8 408, 676, 12 232, 13 492, 14 602
  spontaneous mutation frequencies 8 675
Drosophila melanogaster 3 107, 115, 4 216, 5 362, 6 108 9 618, 10 110, 12 230
  chromosome number 3 107
Drosophila virilis 3 112
Drosophilidae 4 212
Drossing 11 125
Drought 4 275
Drought resistance plant 10 297
Drowned valleys 5 277
Drug 2 552
  para Aminosalicylic acid 1 320
  effect 10 97
  hypnotic 6 595
  isonicotinic acid hydrazine 7 282 283
  narcotic 9 3
  pharmaceutical chemistry 10 92
Drug—*cont*
  psychic energizers 11 71-72
  psychopharmocolozic *see* Psychopharmacolic drugs
  sources 10 94 96
  sulfa drugs 13 244
  sulfone (antimicrobial use) 13 253
  tranquilizer 14 16-17
Drug addiction 9 4
Drug overdosage 14 6
Drug resistance 4 275-276*, 13 528
Drugstore beetle 3 287
Drum 8 665 666
Drum (fish) 10 10
Drum dryer 4 289
  marine 8 103
Drum-type boiler 14 412
Drumlin 4 276
Drupe 1 265, 5 542
Drupelet 12 146
Dry adiabatic lapse rate 1 632
Dry-bulb thermometer 6 515, 11 82
Dry cell 4 276-279*, 8 233-234
  black mix 4 277
  carbon electrode 4 277
  cell chemistry 4 277
  construction 4 276 277
  deterioration 4 278
  electrolyte 4 277
  enclosure 4 277
  gelatinous paste 4 277
  Leclanche 10 587-588
  operating characteristic 4 278
  shelf life 4 278
  temperature effect 4 278
  voltage 4 278
  zinc electrode 4 277
Dry chemical fire extinguisher 5 279
Dry desert 5 190
Dry dock 4 280 282
  floating 4 280 281*, 7 393
  graying 4 281 282
  marine railway 4 280
Dry-fungus beetle 3 278
Dry gangrene 4 25
Dry gas 9 5
  fields 9 6
  pools 9 6
Dry haze 5 367
Dry ice 2 466, 4 279
  in cloud seeding 5 217
Dry measure 8 188
Dry offset process 10 601 615
Dry pressing ceramic technology 2 649
Dry snow avalanche 1 693
Dry spinning (fiber) 5 212
Dry wash 4 76
Drydocking 4 279 282
  see also Marine fouling
Dryer 4 283 289
Drying 4 282 290
  ceramic technology 2 650
  classification of dryers 4 283 289
  dehumidifier 4 46
  deliquescence 4 48
  desiccant 4 77
  direct batch dryers 4 285
  direct continuous dryers 4 285
  of gases 4 289
  gravimetric analysis 8 52 263
  indirect batch dryers 4 288
  indirect continuous dryers 4 288
  infrared lamp 7 101
  leather and fur processing 7 447
  prilling 10 587
  pyrometallurgy, nonferrous 11 121
  of solids 4 282 283
  see also Dehydration
Drying oil 4 290
Drying oil linoleum 7 529
  linseed oil 7 528
  paint 4 273, 290*, 9 693 13 587
Drying oil alkyd 10 466
Drying rate curve 4 285
Drying time curve 4 283
Dryinidae 6 574
Dryocopus pileatus 14 541
Dryolestidae 9 558
Dryomyzidae 4 212
Dryopidae 3 278
Dryopithecus 10 590
Dryopoidea 3 276 278
Dryopteris 13 116
Dryprint 10 617
Drysdale ac potentiometer 10 544 545
DTA (differential thermal analysis) 13 558
Dual coordinates geometry noneuclidean 6 155 156
Dual cycle engine 14 139 140
Dual objects (geometry) 6 156
Duality geometry, noneuclidean 6 156
Duality principle lattice (mathematics) 7 409
  projective geometry 11 3
Dual trace oscilloscopes 9 440
Dubbe 14 255
DuBois, C. 10 32
Dubois, E 7 303
DuBois R 2 25, 221
DuBois Reymond, lemma of 2 409
Dubos R J 14 177
DuBridge, L A 10 155
Duck 1 436, 4 290 291*
Duck billed dinosaur 11 454
Duck billed platypus 11 51 13 673

:kweed 1 497
:kworth H E 2 191
crey skin test 12 372
crey's bacillus 2 352
ct of Custer 2 499
ct of Santorini 4 153
ct of Wirsung 9 529
cted fan 4 291 292
icted flow 4 292
icted propeller 4 291
ictile iron 2 541
ictility 8 268 10 398 400
icting 11 291
ictless gland *see* Endocrine gland
uctuli efferentes testis 11 473
uctus arteriosus 2 484, 491 494
uctus choledochus 6 13
uctus deferens 11 471
uctus venosus 2 485
Dudley H W 14 346
Dudley W M 2 424
Duero River 5 121
duFay C F 4 462
Dufaycolor film 10 167
Duffy blood group factors 2 269
Dufour 5 119
Dufour L 6 400
Dufour effect 13 576
Dufrénoy A 2 112
Dugesia tigrina 14 89
Duggar B M 5 83
Dugong 12 347
DUKW (landing craft) 7 396
Dulcitol 1 52
Dulong P 12 574
Dulong Petit law 12 574 575
Dulse 11 554
Dulzgen process 10 604
Dumas J B A 9 393
Dumas method nitrogen determination 9 398
Dumatella carolinensis 2 550
Dumet 7 265
DuMond J W M 1 651 3 358
Dumont A B 8 288
Dumortierite 4 202
Dumped packings 6 45
Dumpy level (surveying) 7 497
Dunaliella 14 398
Dunaliella viridis 2 340
Dune 4 292 293* 12 442
form 4 292
migration 4 293
plains 10 264
stabilization 4 293
vegetation 4 293
Dung beetle 2 431
Dung fly 4 212
Dungeness crab 3 530 4 54
Dunite 8 517* 12 198
composition of mantle 8 532
heat production in 4 332
peridotite 10 12
Dunkle P B 12 232
Dunkleosteus 2 515
Dunlap, W L 8 429
Dunn, E 14 625
Dunn J 9 535
Dunn R B 15 270
Duocrimin 4 172
Duodenal gland 4 150
Duodenum 4 154, 161, 7 223, 531, 9 628
Duodiode 4 265, 14 252
Duodiode high mu triode 14 252
Duograph 10 608, 613
Duotone 10 608 613
Duotype 10 609
Dupin F 6 494
Duplexer gyrator 6 303
iron foundry, direct arc furnace 1 502
radar 11 200 211
Duplicate printing plate 10 614
Duplication chromosome 8 671
Duplicidentata 7 582
Dura mater 8 224
Durain 3 229 232 235
Duran Reynals, F 6 522, 14 330
Duranickel 9 95
Durer A 10 617
Durham J 2 424, 4 359, 370, 375, 5 97, 7 269 456 11 141 425
Durham fermentation tube 14 389 390
Durham Heights 1 523
Durichlor 7 266
Duriron 2 540 7 266
Duroc swine 15 339
Durum wheat 14 480
Dushman Richardson equation *see* Richardson equation (thermionic emission)
Dusky stink bug 6 405
Dust 4 296 297
aerosol 1 99
atmospheric pollution 1 645
electrical discharge in clouds of 4 297
interplanetary 7 222
interstellar 7 221 222
sky color 8 521
Dust, mining operations coal 8 492 493 500
diseases and health 8 503
explosions 8 500 501
preventive measures 8 495 500 501*
rock dusting 8 500 501
Dust and mist collection 4 294 296
aerosol 1 99 101
air filter 4 296
cloth collector 4 295
electrostatic precipitator 4 295 296*, 538 539
gravity settling chamber 4 294
Dust and mist collection—*cont*
inertial device 4 294
miscellaneous equipment 4 296
packed bed 4 295
scrubber 4 295
separation (mechanical) 12 187
smoke 12 387
Dust collector electrical 5 571
furnace (steam generating) 5 572
mechanical 5 571
Dust explosion and explosive 5 155
mine 8 500 501
Dust storm 4 296 297
electrical effects 4 297
mechanics of dust raising 4 296
optical effects 4 297
Dutch elm disease 1 574, 14 75
Dutch Harbor 1 523, 9 158
Dutchman's pipe 1 532
Duty cycle radar 11 200
Duvetyn textile 15 537
Du Vigneaud, V 4 235, 6 495 10 251
Dvina 5 121
Dwarf, athelotic 12 368
Dwarf star 4 297* 15 39 44
Dwarf tapeworm 3 642
Dwarfism 1 37 38 10 252, 15 493, 625
Dwiggins, W A 14 171
Dwight Lloyd machine 7 435
nickel metallurgy 9 98
sintering 11 121
Dworkin, M T 8 340
Dwyka tillite 10 25 26
Dyadic 4 297
Dye 4 297 308*, 15 32 14 528
chemical structure 4 298
color or hue 4 298
diazotization 4 107
flavone 5 296 297
ink 7 115
methods of application 4 307
mordant 8 597
origin 4 298
textile printing 15 542
utilization 4 298
see also Dyeing Stain (microbiological)
Dye retarders 4 309
Dyeing 4 308 311
animal fibers 4 309 310
assistants 4 309
cellulose fibers 4 309
cotton 5 249
dope 4 310
leather and fur processing 7 447
man made fibers 4 310
Dyeing—*cont*
nontextile materials 4 311
pigment dyeing 4 310
spin dyeing 4 310
textile chemistry 13 537-541
textile dyeing equipment 4 310 311
textile printing 15 542
wool 5 252
see also Dye
Dyeline 10 146
Dyestuff *see* Dye
Dyna Soar 5 500
Dynamic braking 4 311 312
electric locomotive 7 571
Dynamic computation (ocean currents) 9 215
Dynamic loudspeaker 7 589
Dynamic metamorphism 8 301
Dynamic meteorology *see* Meteorology, dynamic
Dynamic microphone 8 359 360
Dynamic optimization 3 31
Dynamic pickup 4 241
Dynamic plate resistance *measurement* 14 128
vacuum tube 14 248
Dynamic similarity 4 312 313
Froude number 5 541
Dynamic stereotypy 11 394
Dynamic tranducer 8 357 358
Dynamical analogies 4 313
anelasticity 1 401
Dynamical friction, plasma physics 10 595
Dynamic-pressure pickup electrokinetic transducer 4 491
Dynamics 4 313 314
contrasted to kinematics 7 347
fluid *see* Fluid dynamics
gas *see* Gas dynamics
kinetics 7 339
mechanics 8 193 194
moment of inertia 8 565 566
Newton's laws of motion 9 91
population *see* Population dynamics
rigid body 11 570 577
Dynamite 5 151
blasting 2 255
open pit mining 8 473
Dynamite cotton 5 75
Dynamo 4 314
see also Electric rotating machinery
Dynamo theory (geomagnetism) 4 341 13 510
Dynamometamorphism 8 296
Dynamometer 4 314
absorption 11 5
deep sea 8 347
prony brake 11 5 6
tests 4 314

Dresbachian age 2 425
Dressing (food) 5 387
Dreyer, J. L. E. 9 24
Dried milk 8 437
Drier (paint) 3 248, 4 273*
  drying oil 4 290
Drierite 4 77
Driesch, H 4 576
Drift (instrument) 7 153, 10 296
Drift bottle 9 251
Drift ice *see* Sea ice
Drift mining 8 478
Drift transistor, diffused base 7 320
  high frequency character istics 14 37
Drift velocity (charge carriers) 12 167
  Hall effect 6 320
Driftmeter: airborne radar 1 165
Drilidae 5 277
Drill *see* Drilling machine
Drill bit 2 295
Drill bort 4 101
Drill-hole logs 14 470
Drill jumbo 14 142
Drill pipe 2 295
Drill rig 2 295
Drill rod 2 295
Drill steel 2 295
Drill stem 2 295
Drilled caissons 2 389
Drilled pile 10 228
Driller's log 14 470
Drilling agriculture 1 128
  boring 2 294-295
  cable-tool drill 2 384
  exploration 8 489
  jet flame 8 489
  jet piercing 9 471
  machining 8 6
  mineral prospecting 11 21
  mining machinery 8 483
  oil and gas wells 2 584
  petroleum prospecting 10 57-58, 11 25
  rock drill 3 417, 8 489
  turbodrill 14 154
  water-jet 8 489
  see also Boring
Drilling machine 4 273-274, 8 7
Drilling methods, mineral *see* Boring and drilling, mineral
Drilling mud attapulgite 3 162
  barite 2 94
  bentonite 2 163
  fuller's earth 5 560
  petroleum engineering 10 57-58
  removal of cuttings 2 295
Drimys 3 187, 8 240
Drin Gulf of 5 114
Dripstone 13 35
Drive, organic (behavior) 8 603
Drive beetle 5 278
Driven caissons 2 389
Driving point impedance mechanical 7 37
Drizzle 10 573
Drogden rise 9 250
Drogue 9 251
Dromadidae 3 10
Dromaeidae 2 545
Dromaeus novaehollandiae 2 545
Dromia 8 76
Dromia erythropus 4 33
Dromiacea 4 34
Dromiid crab 4 33
Dromoran 9 4
Drone (aircraft) 4 274 275*, 12 406
  antisubmarine warfare 1 487
  applications 4 275
  autopilot 1 689
  electronic countermeasures 4 522
  guidance system 4 274 6 286
  propulsion 4 274
  telemetering 13 426
  underwater 1 487
Drone (bee) 2 128
Drop forging 5 470-471
Drop hammer (forging 5 470-471
  pile driving 10 227
Drop-out (magnetic recording) 8 41
Drop-out fuse 5 578
Dropping mercury electrode 10 455
Dropping point 10 550
Drosera 12 28 31 13 290
Droseraceae 12 31
Drosophila 1 700 3 111, 658, 5 5, 6 498 7 478 8 408 676, 12 232, 13 492, 14 602
  spontaneous mutation frequencies 8 675
Drosophila melanogaster 3 107 115 4 216 5 362 6 103 9 618, 10 110 12 230
  chromosome number 5 107
Drosophila virilis 5 112
Drosophilidae 4 212
Drossing 11 123
Drought 4 275
Drought resistance plant 10 297
Drowned valleys 5 277
Drug 2 552
  para Aminosalicylic acid 1 320
  effect 10 97
  hypnotic 6 595
  isonicotinic acid hydrazine 7 282-283
  narcotic 9 3
  pharmaceutical chemistry 10 92
Drug—*cont*
  psychic energizers 11 71-72
  psychopharmacologic *see* Psychopharmacologic drugs
  sources 10 94 96
  sulfa drugs 13 244
  sulfone (antimicrobial use) 13 253
  tranquilizer 14 16-17
Drug addiction 9 4
Drug overdosage 14 6
Drug resistance 4 275-276*; 13 528
Drugstore beetle 3 287
Drum 8 665-666
Drum (fish) 10 10
Drum dryer 4 289
  marine 8 105
Drum type boiler 14 412
Drumlin 4 276
Drupe 1 265, 5 542
Drupelet 12 146
Dry adiabatic lapse rate 1 652
Dry-bulb thermometer 6 515, 11 82
Dry cell 4 276-279*, 8 233-234
  black mix 4 277
  carbon electrode 4 277
  cell chemistry 4 277
  construction 4 276-277
  deterioration 4 278
  electrolyte 4 277
  enclosure 4 277
  gelatinous paste 4 277
  Leclanche 10 587-588
  operating characteristic 4 278
  shelf life 4 278
  temperature effect 4 278
  voltage 4 278
  zinc electrode 4 277
Dry chemical fire extinguisher 5 279
Dry desert 3 190
Dry dock 4 280 282
  floating 4 280 281* 7 395
  grazing 4 281 282
  marine railway 4 280
Dry fungus beetle 5 278
Dry gangrene 4 23
Dry gas 9 5
  fields 9 6
  pools 9 6
Dry haze 5 367
Dry ice 2 466, 4 279
  in cloud seeding 3 217
Dry measure 8 188
Dry offset process 10 601 615
Dry pressing ceramic technology 2 649
Dry snow avalanche 1 693
Dry spinning (fiber) 5 242
Dry wash 4 76
Drydocking 4 279 282
  see also Marine fouling
Dryer 4 283 289
Drying 4 292 299
  ceramic technology 2 649
  classification of dryers 4 283 289
  dehumidifier 4 46
  deliquescence 4 68
  desiccant 4 77
  direct batch dryers 4 287
  direct continuous dryers 4 288
  infrared lamp 7 104
  leather and fur process 7 447
  milling 10 557
  pyrometallurgy nonferrous 11 121
  of solids 4 292 293
  see also Dehydration
Drying oil 4 290
Drying oil linoleum 7 528
  linseed oil 7 528
  paint 4 275, 299*, 9 6 15 587
Drying oil-alkyd 10 466
Drying rate curve 4 283
Drying time curve 4 283
Dryinidae 6 574
Dryocopus pileatus 14 341
Dryolestidae 9 539
Dryomyzidae 4 212
Dryopidae 5 278
Dryopithecus 10 590
Dryopoidea 5 276 278
Dryopteris 13 115
Dry-print 10 617
Drysdale ac potentiometer 10 544-545
DTA (differential thermal analysis) 13 558
Dual coordinates geometry noneuclidean 6 155 156
Dual cycle engine 14 150-151
Dual objects (geometry) 6 155
Duality geometry, noneuclidean 6 156
Duality principle lattice (mathematics) 7 409
  projective geometry 11
Dual trace oscilloscope 9 9
Dubhe 14 255
DuBois, C. 10 32
Dubois, E. 7 303
DuBois, R. 2 25, 221
DuBois Reymond lemma 6 2 409
Dubos, R. J. 14 177
DuBridge, L. A. 10 153
Duck 1 436 4 290 291*
Duck billed dinosaur 11 644
Duck billed platypus 11 31 13 673

E

17
ogarithm 7 575
rons 13 270 272
er 1 628
ieronomy 1 99
radio-wave propagation
11 323
ckoff 12 201
rocess steric effect 13 132
rocess 13 132
process 13 153
les imperialis 7 469
le 4 317 318* 6 345
le mounting 4 141
le ray 2 111
le test 13 375
4 318 324* 12 180
development 3 323 324
drum 6 351
musculature 4 318 319
osteology 4 319
sensory areas 4 322 323
r protectors 4 324
r shell 1 2 3
r trumpet 6 356
rdrum 6 351
rmuff 4 324
rphone hearing aid
6 355 357
rplug 4 324
rth 4 324 330
atmosphere 1 627 629
biosphere 2 238
curvature of surface
6 121 122
density 4 324 325
dimensions determination
of 6 119 121
distribution of elevations
13 216
electrical properties of
13 506
electromagnetic radiation
11 214 215
element abundances
5 549 552
equilibrium tide 13 633
force fields 13 511
geochemical processes
6 118 119
atmosphere 1 629 631
biosphere 2 259 264
hydrosphere 6 565 568
lithosphere 7 546 553
gravitation 4 324 325
13 515 521
Earth—cont
hydrosphere 6 565
isostatic equilibrium of
13 519
land distribution 4 325
life zone *see* Biosphere
lithosphere 7 546
oblateness 6 264, 10 59
planetary relationships
4 329
principal layers 4 328
proof of rotundity 4 382
rock composition 4 327 328
rotation of 4 334 335
shape 4 324 325
spheroid 13 518
surface waves in 12 152
temperatures 4 327
tidal friction effect 13 640
water distribution 4 325
see also Geochemistry, Geology Geophysics Natural resources
Earth (age of) 4 330 331
absolute time scale 6 135
fully accreted stage 3 503
maximum age 4 330
meteorite lead age 4 331
minimum age 4 330
oldest geologic events 6 137
ore lead age 4 331
Earth (core of) composition
7 548 549
defined 7 546
electric currents in 6 150
features of 4 338 341
lithosphere geochemistry
of 7 546 553
tectonophysics 13 414
Earth (crust of) age 4 330
composition 7 547 549
defined 7 546
deformation 4 102
density 13 519
elements 4 549 552 9 376
features 4 338 341
internal patterns 4 328
lithosphere geochemistry
of 7 546 553
mass distribution
13 518 519
oceanic crust 13 220 223
ore elements 9 585
seismic waves 12 152
sial 13 412
sima 13 412
surface gravity anomalies
13 518 519
Earth (crust of)—cont
tectonic patterns
13 406 413
tectonophysics 13 414
uplift 14 386
warping 14 385 386
Earth (heat flow) 4 331-334
conduction transfer 4 333
continental heat flow 4 332
convection systems 13 419
convective transport 4 334
energy sources 4 602
geothermal gradient 4 332
heat transfer 4 333
oceanic heat flow 4 332
radiative transfer 4 333 334
radioactive heat production 4 332 333
surface heat flow 4 332
thermal conductivity
4 332 334
Earth (mantle of) composition
7 547 548, 8 532
defined 7 546
interior, features of
4 338 341
lithosphere, geochemistry
of 7 546-553
seismic waves in 12 152
suboceanic 13 221
tectonophysics 13 414
Earth (orbital motion)
4 334-337
eccentricity of orbit 4 337
Foucault pendulum 5 480
mean radius of orbit 4 336
orbital velocity 4 336 337
period of revolution 4 336
revolution along orbit
4 336 337
rotation about axis
4 334 335
tidal friction 4 335
Earth (origin of) 4 330
continuous production
theory 4 332
cosmogenic theory 4 330
initial creation theory
4 332
ocean basins 13 223
temperatures at accumulation 4 340
Earth-current measurement
13 507 508
Earth-current storms 13 507 508
Earth currents *see* Terrestrial electricity
Earth dams 4 6
Earth deformations and vibrations 4 337 338
volcanic 14 354 355
see also Volcanology
Earth fill embankments 4 6
Earth inductor 4 338*; 6 149
Earth inductor compass 6 150
Earth interior 4 338 341
density variation 4 339
depth of compensation
13 519
incompressibility 4 340
magnetism 4 341
mean density 4 339
moment of inertia 4 339
pressure variation
4 339 340
rigidity 4 340
seismic data 4 339
seismology 12 154 155
spherical stratification
4 338
tectonophysics 13 413 420
travel time curves 12 152
Earth magnetic field *see* Geomagnetism
Earth resource patterns
4 341 345
Africa and Australia 4 345
employed resources 4 344
Eurasian continent 4 345
humid macrothermal
regions 4 342
humid mesothermal
regions 4 342
humid microthermal
regions 4 342
land resources 4 345
marine resources 4 344 345
North America 4 345
potential resources 4 344
rock composition 4 344
South America 4 345
surface configuration 4 344
water-deficient regions
4 342
Earth satellite *see* Satellite, artificial
Earth sciences 4 345-346
Earth surface; hypsographic curve 4 327
Earth tides 4 346 351*, 13 638
gravitational potential
4 347
gravity tide observations
4 348 350
harmonic constituents
4 348

Dynastes tityrus 2 130
Dynatron 9 425, 14 252
Dyne 4 314
Dyne centimeter of energy (erg) 5 65
Dynel 5 244
  dyeing 4 310
Dynode phototube, multiplier 10 196
Dypnone 1 56
Dysarthria 12 598
Dyschondroplasia 4 314 315*, 12 568
  epiphyseal cartilage 4 314
  skeletal system disorders 4 314
Dysdercus 6 400, 409
Dysdercus minutus 6 405
Dysdercus suturellus 6 405
Dysentery 1 466 467, 4 102, 219, 9 594, 13 340
  amebic *see* Amebiasis 1 300
Dysentery—*cont*
  bacillary *see* Bacillary dysentery
Dysentery bacilli *see Shigella*
Dysesthesia 9 564
Dysgenesis 11 465
Dysideidae 4 109
Dysodonta 9 614
Dyson, F J 13 486
Dyson, G M 3 43
Dyson microscope 8 385
Dysphagia 2 520
Dyspnea 2 349 437, 11 372
Dysprosium 4 315
  electron configuration 4 504
  extractive metallurgy 8 27
Dysstrophic lake 5 528
Dystrophy, muscular *see* Muscular dystrophy
Dytiscidae 3 276
Dytiscus 3 282, 286

e, astronomical—*cont*
inar 4 382
dar 4 380 382
annular 4 390
total 4 380
ie year 4 380
ied conformation 3 397
sing binaries see Binary
rs
tic 4 383
celestial navigation 2 583
orbital motion 9 572
plane of 6 125 10 268
tic coordinate system
stronomy) 1 607
gite 4 383 384
composition of mantle
8 332
occurrence 4 383
properties 4 383
gite amphibolites 4 383
sion Hemiptera 6 400 410
f see Electronic counter
easures
logic interactions
384 387*, 8 129
competition 4 385-386
mutualism 4 384 385
neutralism 4 385
parasitism 4 387
logical action 5 13
ological reaction 5 13
ological systems energy in
4 387 388
ology 4 388 398
applied 4 398 401
biogeochemical cycles
4 397 398
biotic components
4 389 391
coral reef study 4 389
ecosystem 4 389 392, 404
408*
energy flow 4 392 397
energy transfer 4 392 394
environment 5 12 15
food chain 5 379 380
forest 5 449 452
fresh water ecosystem
5 521 534
geologic past see
Paleoecology
homeostatic mechanisms
4 391
human 4 401 402
marine ecosystem 8 104 109
population approach
4 384 389
primary production in
the world 4 395 396
productivity controls
4 395 396
species individuals and
energy flow 4 394 395
standing crop and energy
flow 4 393 394

Ecology—cont
structure and species
composition 4 394
taxonomic approach 4 388
terrestrial ecosystem
13 502 506
types of cycle 4 397
Ecology applied 4 398 401
agriculture 4 400
fisheries management 4 400
forestry 4 399
range management 4 400
water resource manage
ment 4 400 401
wildlife management 4 400
Ecology, forest 5 448 451
Ecology, human 4 401 402
Ecology physiological
4 402 403
Economizer 4 405 404, 8 103
Economizer and air heater
4 403 404
Ecosystem 1 408, 2 215 4 389
392 404 408* 5 13 13 502
biosphere geochemistry of
2 239
climax 4 408
community classification
3 325 327
community differentiation
4 406
complexity and interrela
tions 4 405
cycling and the functional
kingdoms 4 407
energy flow and steady
state conditions 4 408
environmental dependence
and modification 4 405
food chains 4 406 407
forest and forestry
5 441 444
fresh water 4 404 5 521
marine 4 405, 8 104
productivity relations
4 406
pyramids 4 406 407
rhythms 4 406
spatial patterning
4 405 406
succession 4 408
terrestrial 4 401 13 502 506
trophic levels 4 406 407
see also Terrestrial
ecosystem
Ectone 1 409
Ectins, Barre des 5 119
Ectemnius 6 579
Ectenocoelia 1 415
Ectocarpus 10 89
Ectocion 3 394
Ectoconus 3 394
Ectoderm gastrulation 6 78 79
derivatives 6 174 175
Ectonedemia 7 466
Ectohormone 12 405
Ectohumus 5 464 465

Ectomorph 10 34
Ectomorphy (anthropology)
1 461
Ectophloic siphonostele 13 105,
117, 121
Filicales 5 260 264
Ectopia cordis 2 515
Ectopic pregnancy 10 579
11 480 481
Ectopistes migratorius 3 302,
4 270
Ectoplasm 3 657
Ectoprocta 1 414 2 554 555
Gymnolaemata 6 299 300
Ectrephidae 3 277
Ectylurea 14 16
Ecotypes 12 571
Ecrema 4 69 408 409*, 12 370
see also Infantile ecrema
ED_{50} *see* Effective dose 50
Edaphic climax 5 184
Edaphosauria 9 616
Edaphosphere 11 548
Eddington Sir Arthur 5 505,
11 187 14 278
Eddy current 4 409*, 8 30
armature 1 544
causes 4 409
induction heating 7 72
laminations 3 479 4 409*
metal inspection 8 288
particle accelerators
9 578 579
see also Eddy *current loss*
Eddy current clutch 3 225
Eddy current *damper* 3 437
Eddy-current loss 3 479
Eddy diffusion atmospheric
pollution 1 643
in gases and liquids 4 143
sea water fertility 12 120
Eddy resistance 12 270 276 279
Edema 4 37, 409 411*
beriberi 2 166
increased capillary hydro-
static pressure 4 410
lymphatic obstruction
4 410
nephrotic 3 143
osmotic pressure of plasma
proteins 4 410
permeability of capillary
wall 4 409
Edenite 1 536 569
Edentata 4 411* 8 82
anteater 1 442
armadillo 1 534
sloth 12 382
Edentata fossils 4 411 412
Edge dislocation 3 583 584
Edgerton Harold E 13 189
Edging forging 5 470
Edison Thomas A 4 422 454
519 524 5 363
Edison battery 4 412

Edison battery—*cont*
see also Nickel iron
alkaline battery
Edison effect 4 521
see also Thermionic
emission
Edison 3 wire system 4 422
Edith River volcanics 11 507
Edlén, B 13 271
Edmontosaurus 12 362
Edrioaster 4 412
Edrioasteroidea 4 360 367 368,
412*
Edriocrinus 5 300
Edsall, J T 8 642
EDTA *see* Ethylenediaminete
traacetic acid
Educational television systems
3 208
Edward, Lake 1 107 109
Edwards, A B 9 581
Edwards Plateau 3 244
Edwardsia 1 52 54, 3 255
Eel 4 412 413
Eery 13 615
Effective dose 50 4 413
Effective mass (charge
carriers) 2 92
cyclotron resonance
experiments 3 645 646
free electron theory of
metals 5 499 501
holes in solids 6 463 464
semiconductors 12 166 167
Effective particle velocity
12 510
Effective radiated power
(ERP) 13 479
Effective sound pressure
12 510
Effective stack height 1 644
Effective temperature
biochimatology 2 202
Effector systems 4 413 414*,
13 366
motor systems 8 609 615
movement 4 413
secretion 4 414
Efficiency 4 414
Efflorescence 4 414
deliquescence 4 48
Effusion gaseous 8 557
Eft 12 6
Egg (cell) 7 225
Egg (fowl) 4 414 415* 5 373
microbiology 5 424
incubation 11 459
Egg processing 4 415-416
commercial egg
production 4 415
constituents 4 415
egg white drying 4 415
industry use 4 415
nutrition 4 415
production 10 548 549
white 4 414
whole egg drying 4 416

Earth tides—*cont*
love numbers 4 348
observational results 4 350
observations of 4 346
k/h ratio 4 349
tidal dissipation of energy 4 350-351
Earthenware 10 546
Earthflow 8 167
landslide 7 397
Earthmover 2 370, 4 351-352
Earthquake 4 352 354*, 12 149-150
aftershocks 4 353
belts (world) 12 150
classification 4 352
effects 4 352
foreshocks 4 353
historical earthquakes 4 353
intensity 4 353, 12 150
island arc positions 13 412
magnitude 4 355, 12 150
seismic waves 12 147
seismic zones 4 354
size of 4 353, 12 150
source of shock 4 352
tectonophysics 13 414
types 12 150
volcanic eruptions with 14 355
Earthstar 6 469
Earthworm 1 428, 3 354 355*
Earwig 4 67, 355*
European 5 6
East, E M 6 430
East Australia Current 9 247
East Australian Highlands 1 672
East China Sea 9 271
East Coast fever 7 *299*
East Greenland Current 1 524, 626, 9 249
East Iceland Current 9 249
East Indian ox 14 607
East Indies 4 355 358
Borneo 4 356
Celebes 4 357
Java 4 357
New Britain 4 358
New Guinea 4 357
New Ireland 4 358
Sumatra 4 357
Timor 4 357
East Siberian Sea 9 271
Easter Islands 9 263
Easterlies 14 495
Eastern boundary currents 9 249
Eastern Caucasus 5 118
Eastern equine encephalitis (EEE) 1 499, 4 587
Eastern hemlock 6 410
Eastern red cedar 2 578
Eastman E D 4 485
East-west effect cosmic rays 3 501
Eau de vie de marc 4 255
Ebbinghaus, Hermann 8 216
Ebenaceae 4 358
Ebenales 4 358*, 10 316
chicle 3 59
Ebert mounting 4 141
Ebony 3 187, 4 358*
Ebro Europe 5 121
Ebulliometry 2 276
Ecca formation 10 26
Ecca series 10 25
Eccentric anomaly (celestial mechanics) 2 581
rotating machines 12 239 240
orbital motion 9 371-372
Eccentricity (rotational motion) Earth's orbit 4 337
Ecchymoses 6 412 413
Eccles-Jordan multivibrator 8 628
Eccrine gland 13 331
Ecdysis 3 539-540
Ecdyson endocrine mechanisms 4 590 596
Ecdysone 7 123
Ecesis population dispersal 10 499
Echelette grating 4 140 141
Echelle grating 4 141
Echeneidae 4 359
Echeneiformes 4 358 359* 9 442
Echeneis naucrates 4 358
Echeveria subrigida 5 38
Echidna 2 500, 5 472 13 590
Echidnophaga gallinacea 12 345
Echinacea 4 359*, 360 370 371
Arbacioida 1 *499*, 4 360
Cassiduloida 4 360
Clypeasteroida 4 360
Echinoida 4 360 372
Euechinoidea 5 97
Hemicidaroida 4 360, 6 399
Holasteroida 4 360
Holectypoida 4 360
Nucleolitoida 4 360
Phymosomatoida 4 360 10 202
Spatangoida 4 360
Temnopleuroida 4 360, 13 485
Echinarachnius parma 12 22
Echinaster larquhari 12 619
Echinidae 4 372
Echinisoidea 6 431, 13 395
Echinisoides 13 395
Echinisoides sigismundi 6 431, 13 397
Echinocardium cordatum 5 202, 12 563
Echinochloa crusgalli frumentacea 8 440
Echinochrome Echinodermata 4 362
Echinoidea 4 373
Ophiuroidea 9 343
Echinococcosis 4 359
Cyclophyllidea 3 641-642
tapeworm disease 13 391
Echinococcus 10 415
Echinococcus granulosus 3 642, 4 359, 13 393
liver disorders 7 563
Echinocystis 4 359
Echinocystitoida 4 359*, 360, 371
Echinodera *see* Kinorhyncha
Echinoderella 7 362
Echinodermata 1 414, 420, 3 262, 4 359 363*, 5 363-364
alimentary system 4 361
biochromes 4 362
coelom 4 361
Eleutherozoa 4 360 557
embryology 4 362-363
fossils 4 363-372
morphology 4 360 362
nervous system 4 361 362
Pelmatozoa 4 360, 9 615
phospagens 4 362
phylogeny 4 363
physiology 4 362
regeneration 11 421
reproductive system 4 361
skeleton 4 360 361
skin 4 360
symmetry 4 361
water vascular system 4 361
Echinodermata fossils 4 363 372
Arriculata 4 368
Asteroidea 4 371 372
Blastoidea 4 366 367
Camerata 4 368
classification 4 364
Crinoidea 4 368 369
Cystoidea 4 365 366
Echinoidea 4 369 371
Edrioasteroidea 4 367 368
Eleutherozoa 4 364-365
Eocrinoidea 4 368
Flexibilia 4 368
general morphology 4 364
Holothuroidea 4 372
Homalozoa 4 365
Inadunata 4 368 369
Ophiocistioidea 4 372
Ophiuroidea 4 371
origin 4 372
Paracrinoidea 4 368
Pelmatozoa 4 364
phylogeny 4 372
Somasteroidea 4 372
Echinoencrinus 4 366
Echinoida 4 360 371, 4 372 373*
Echinoidea 4 360, 369 371, 373 376*
alimentary system 4 376
Echinoidea—*cont*
ecology 4 373
Euechinoidea 4 390 397
lantern 4 374 375
nervous system 4 376
Perischoechinoidea 4 30 10 17
radiole 4 374
relation to man 4 373
reproduction 4 376
sea urchin 12 100 101
skeleton 4 373
test 4 373 374
water vascular system 4 375 376
Echinolaelaps echidninus 1 61, 8 253
see also Mesostigmata
Echinolampadidae 2 330
Echinometridae 4 372
Echinomycin 1 476
Echinoneidae 6 463
Echinoneus 6 463
Echinopluteus larva 4 376
Echinopora 12 77
Echinorrinus 4 369
Echinosigra paradoxa 6 463
Echinostelaceae 8 687
Echinostelales 8 687
Echinothurioida 4 93, 360, 371 376*
Echinuria uncinata 13 6
Echium vulgare 10 459
Echiurida 1 428 429
Echiuridae 4 377
Echiuroidea 1 420, 4 376 377*
Echiuroinea 4 377
Echiurus 4 377
Echo 4 377 378
anechoic chamber 1 400
architectural acoustics 1 519
echo sounder 4 378 379
flutter echo 4 377
radar 11 209 210
reverberation 11 537 539
ultrasonic echo techniques 4 377 378
Echo, Lake 1 672
Echo box 4 378
Echo free chamber *see* Anechoic chamber
Echo ranging sonar 12 503
Echo sounder 4 378-379*, 13 216
slope corrections 13 216
underwater sound 14 199
velocity corrections 13 216
ECHO virus 1 424 4 379 380*, 5 3
Eclipta 6 581, 12 406
Eckermannite 1 336
Eclampsia 14 4
Eclipse astronomical 4 380 385
of Jupiter's moons 4 382 383

Electric field—cont
potential difference 10 537
ial electric 10 536
ple of superposition
7
ced by separations
harges 4 427
ing 12 253 254
th 4 427
nderstorms 1 636
rnace 4 427
e furnace 1 503
nium 3 105
t arc furnace 1 502
ect arc furnace 1 503
ance heating
487 488
n spectroscopy 12 588
manufacture
99 102
nerged arc furnace
502
images method of
541
metallic tubing
) 14 521
mica 8 347
moment nuclear *see*
ar moments
organ (biology)
432
ntrol mechanism and
ensory system 4 431 432
ctroplaque 4 428 429
ternal stimulation
4 429 431
neration 4 431
ural and chemical
stimulation 4 429
apiformes 13 331
y 11 343
rastructure 4 431
ic plants *marine* gen
ors 8 126
ic potential *see* Potential
tric
ic power 4 435 436
553
c circuits 1 274
pparent 1 274 4 436
verage 1 274 4 435
dc circuits 4 223
nstantaneous 1 274
reactive 1 274 4 436
real 4 436
ric power generation
432 435
atomic electric plants
4 432
fossil fuel-electric plants
4 432
fusion reaction plants
4 433
generators 6 113 114
hydraulic turbines
6 527 529

Electric power generation—cont
hydroelectric plants 4 432
load graphs 4 432-433
paralleled prime movers
6 242
power plant circuits 4 433
steam turbines 15 87
synchronization of
generators 4 434
synchroscopes 15 373
voltage regulation 4 434
water power 14 399 400
wind power 14 496
Electric power measurement
4 435-439
audio frequencies
4 437 439
barretter 2 103
Blondel's theorem for
polyphase circuits 4 436
bolometric methods
4 438 439
calorimetric method
4 438-439
dc and ac power
frequencies 4 435 437
directional coupler 4 439
microwave frequencies
4 439
polyphase 4 436
power output meters
4 437
pyrometric techniques
4 438
radio frequencies
4 436 439 14 415 416
sinusoidal ac waves 4 435
standard-signal generator
4 438
standing wave detector
4 439
thermistor 13 556
thermocouple method
4 438
three phase three wire
circuit 4 436 437
three phase four wire
circuit 4 436 437
volt ampere measurement
14 368 369
voltmeter ammeter
method 4 435
wattmeter 4 435
14 414 417
see also Electrical
measurements
Electric power substation
4 440 443
automatic control
4 440 441
control switchboard 4 441
grounding 4 442
lightning protection
4 442 443 7 510 513
overhead ground wires
4 443

Electric power substation—cont
protective relay systems
4 441
remote control 4 440
short-circuit protection
4 441
supervisory control 4 441
voltage regulators
14 364-366
Electric power systems
4 443 445
abnormal conditions
4 445-448
demand 4 426
distribution 4 422 425*,
444
early developments 4 434
generation 4 432 435
grounding 4 442
load 4 432 433
overcurrent protection
4 446 447
overvoltage protection
4 447
paralleled prime movers
6 242
power plants 4 443
protective devices
4 445-449
reverse current protection
4 447
reverse-phase rotation
protection 4 447
sources of electric power
4 443
substation 4 440 443
telemetering 13 426
three phase systems 4 443
transmission 4 443
14 47 54
transmission lines 14 47 54
underfrequency protection
4 447
undervoltage protection
4 447
utility industry 4 444
voltage regulators
14 364 366
Electric protective devices
4 445 448
circuit breaker 3 135 136
communications protec
tion 3 322 323
fuses 5 577 579
generator protection 4 434
lightning and surge
protection 7 510 513
overcurrent protection
4 446 447
overvoltage protection
4 447
relays 4 446 13 440 442*
reverse current protection
4 447

Electric protective devices—cont.
reverse phase rotation
protection 4 447
underfrequency protection
4 447
substation protection
4 440 443
undervoltage protection
4 447
Electric quadrupole moment
see Nuclear moments
Electric rotating machinery
4 448-449
armature 1 544
armature reaction 1 545
commutation 5 527
commutator 5 527
construction 4 448
copper loss 5 472, 4 449
core loss 5 479 480 4 449
dynamometer tests 4 514
early developments 4 453
generators *see* Generator
electric
insulation 4 448,
7 158 160*
motors *see* Motor, electric
principles of electrical
mechanical energy con
version 4 448
protection 4 445 448
slip rings 12 581
ventilation 4 448
windage and friction loss
4 449
windings 14 504 506
Electric tank analogy *see*
Electrolytic tank
Electric utility industry
4 444 445
Electric well logging 14 471
Electrical burns 2 373
Electrical codes 4 449
Electrical conduction in gases
4 449 452
arc discharge 1 500 502
breakdown potential
2 524
cathode rays 2 553
corona discharge 3 487
dark current 4 15
electric insulator 7 163
electric spark 12 559 561
free charge removal 4 451
gas tube 6 60
glow discharge 6 215 217
ion diffusion 4 451
ionization 4 450 452
motion of charges 4 451
saturation current 12 37
striations 13 185
Townsend discharge 14 4
vapor lamp 14 274
see also Magnetohydrody
namics Plasma physics

Egg processing—*cont*
yolk drying 4 416
Eggplant 4 416
Eggplant lace bug 6 405
Egmont Mountain 1 671
Egret 6 425
Egypt 101 virus 8 383
Egyptian cobra 3 218
Eh 4 93
Ehlers E 1 432
Ehrenberg, C G 2 66, 555
Ehrenfest model for heat exchange 10 628
Ehrlich, Paul 1 475, 550, 3 52, 7 463
Ehrlichia 11 567
Eichhornia 8 210
Eicosane 1 215, 219
Eider 1 436 4 291
Eifelian Stage 4 87
Eigenfrequency (acoustics) 1 518
Eigenfunction 4 416*, 11 165 166
Eigenmannia virescens 4 428
Eigenvalue 4 416
perturbation (mathematics) 10 40
quantum theory, nonrelativistic 11 165 166
Eijkman test 14 389
Eimeria 3 249
Eimeria schubergi 13 12
Eimeria stiedai 4 417
Eimeria tenella 4 417
Eimeria truncata 4 417
Eimeria wenzejshi 13 11
Eimeriids 3 219, 4 416-417*
importance 4 417
life cycle 4 416 417
Einstein, Albert 1 632 697, 2 403 5 290 6 152 9 563 10 151 265, 12 52, 14 568
Brownian movement 2 350
gravitation 6 265, 11 435 438
Lorentz transformations 7 585
photoelectric effect 10 152
relativity 11 433 438
space time 12 536
specific heat of solids 12 575
tensor calculus 8 175
unified field theories 14 200
Einstein, H A 13 174
Einstein (unit) 10 137
Einstein characteristic temperature 12 575
Einstein condensation 2 305
Einstein equation (Brownian motion) 9 587
Einstein equations Bose Einstein statistics 2 305
Einstein frequency (lattice vibrations) 12 575
Einstein–de Haas method 6 306 307
Einstein law of gravitation 6 265*, 11 435-437
atomic weight 1 663 7 90
mass defect 8 163
Einstein photoelectric law 10 152
Einstein shift 4 417
inertia of energy 7 90
light 7 505 506
relativity 11 438
Sirius 7 505
Einstein de Sitter universe 3 509 510
Einstein Planck law of motion 11 432
Einstein Rosen gravitational waves 11 437
Einstein summation convention 2 104 6 161
Einstein theory of specific heat 12 575
Einstein universe 3 505
Einsteinium 4 417-418*, 14 67
electron configuration 4 501
Einwetok Atoll 1 647
Eisenberg H 4 487
Eisenerz Alps of 5 117
Eisrattmeris 7 3
Ejectors marine machinery 8 122
Ekman G 9 266
Ekman S 9 266
Ekman V W 9 245
Ekman current meter 9 252 253
Ekman spiral 9 245
Ektachrome film 10 167
Ektacolor 10 168
El Tor vibrio *cholera vibrio* 3 84
Elaeagnus 5 39
Elaephora schneideri 5 260
Elaidic acid (trans) 2 475
Eland 1 443
Elaphe obsoleta 2 255
Elaphiodella bidens 6 344
Elaphomycetaceae Eurotiales 5 124
Elaphrothrips 13 628
Elapidae 3 218 475 13 27
Elaspoda 4 41 360 418*
Elasmidae 6 374
Elasmobranchii 3 86 4 418*
Cladoselachii 3 152
fossils 4 418-419
Hybodontoidea 6 523
Rajiformes 4 418, 11 331
Squaliformes 4 418, 13 20
Elasmobranchii fossils 4 418-419
Elasmosaurus 12 41 363
Elastance 4 12
Elastic collision 3 291
Elastic constants 4 419 420
Elastic fiber connective tissue 3 402 403
Elastic limit 4 419 420*, 8 271, 13 185
Elastic medium 12 509
Elastic memory polymer properties 10 476
Elastic potential energy 4 600, 6 342
Elastic rebound theory 12 149
Elastic scattering 12 51 56
Elastic shear strain energy 8 269
Elastic spring 6 311 342
Elastic wave 14 419
Elasticity 4 419-422
analog solution of equations 1 385
elastic constants 4 419 420
elastic limit 4 419, 8 271 13 185
Hooke's law 4 421-422*, 6 477
hydraulics 6 530
resilience 11 487
stress and strain 13 182 185
surface elasticity of liquid films 5 365 366
Young's modulus 14 606
Elastin 12 564
Elastomer adhesive 1 66
adhesive structural 1 67
shock absorber cord 12 291
Elater 5 69
Elateridae 3 277
Elateriform larva 2 141
Elaterite 4 422
Elateroidea 3 277
Cebrionidae 3 277
Cerophytidae 3 277
Elateridae 3 277
Eucnemidae 3 277
Perothopidae 3 277
Rhipiceridae 3 277
Throscidae 3 277
Elbe River 5 121
Elbow telescope 6 299
Elbrus 5 119
Elburz 1 577
Elder Mountain sandstone 11 597
Elective culture *see* Culture elective
Electra 2 554
Electret 4 422
Electric arc *see* Arc discharge
Electric charge *see* Charge, electric
Electric circuit *see* Circuit, electric
Electric current *see* Alternating current, Current electric, Direct current
Electric dipole 1 445*, 4 201 495, 14 420
Electric dipole antenna *see* Antenna (aerial)
Electric dipole moment 3 26 10 417
Electric discharge lamp 14 276
Electric displacement 4 427, 461
Electric distribution system 4 422 425*, 444
alternating current 4 422
cathodic protection 4 426
continuity of service 4 425
corrosion 4 421
direct current 4 422 425
duplicate feeds 4 425
galvanic currents 4 421
good voltage 4 425 426
overhead construction 4 424
primary feeders 4 425
rural electrification 11 652 653
secondary mains 4 425
sectionalizing 4 425
underground construction 4 424
utilization voltages 4 425
voltage regulators 14 364 366
Electric eel 4 413
Electric energy measurement 4 425 426
demand 4 426
electric instruments and timing means 4 425
electricity meters 4 426
var hour 4 426
volt ampere hour 4 426
watt hour meter 4 426 14 413 414*
see also Electrical measurement
Electric eye *see* Phototube
Electric field 4 427
antenna 1 444 445, 449 453
in cavity resonator 2 5
by changing magnetic field 4 427
electric displacement 4 427
electrical units 4 461
electroluminescence 4 482 483
as electron lens 4 510
electron motion in vacuum 4 510 514
electrooptics 4 525
electrostriction 4 541
Kerr effect 7 337-339
lines of force 7 526
measurements 4 456

Electrodeless discharge
12 589
Electrodeposition
electroplating of metals
4 529 535
separation (chemical and physical) 12 185
Electrodeposition analysis
4 473 475
coulometric analysis
3 517
see also Electrolysis
ectrodiagnosis 4 475 476
electrocardiography
4 475
electroencephalography
4 475
electromyogram 4 501
electromyography 4 475
lectrodialysis 4 96
ion exchange 7 242
saline water reclamation
12 12 13
ion permeable membranes 7 256
ac voltmeter 14 371 372
ammeter 1 321, 4 476
Electrodynamic instrument
4 476 477
torque developed 4 477
transfer instrument 4 477
wattmeter 4 477
14 414 415
Electrodynamic vibration machine 14 521
Electrodynamics 4 477*
13 549
classical 4 477
cosmic 5 498
magnetohydrodynamics
8 56
particle accelerators
9 374
quantum 11 148 150
relativistic 11 428 431
lectrodynamometer *see* Electrodynamic instrument
lectroencephalogram *see* Electroencephalography
Electroencephalography
4 477 479* 8 605
alpha rhythms 4 479
beta rhythms 4 478
delta rhythms 4 478
diagnostic use 4 479
electrodiagnosis 4 475
electroencephalograms
4 478
epilepsy 5 40
neurophysiology 9 80
relationship to learning
4 478
sleep 12 376 377
theta rhythms 4 478
Electrolax 10 146 161
Electroforming 4 469
electroplating of metals
4 534
powder metal forming
8 286
Electrogalvanizing 4 531, 14 612
Electrogenesis 13 566
Electrogravimetry *see* Electrodeposition analysis
Electrojet, upper air 4 479
geomagnetic storm 6 143
Electrokinetic phenomena
4 479-481* 13 174
Electrokinetic transducer
4 481-482
Electroluminescence 4 482-483
carrier injection luminescence 4 482 483
electroluminescent lamps
4 482
Gudden Pohl effect
4 483
light amplifiers 4 482*
7 507
light panels 7 507 508
Electrolysis 4 483 484
chlorine manufacture
3 69 72
coulometric analysis
3 517
decomposition potential
4 37
electrochemical equivalent 4 465
electrochemical processes 4 465 467
electrodeposition analysis
4 473 475
electroplating of metals
4 529 535
electrorefining 4 496 497
heavy water preparation
6 382
isotope separation 7 295
magnesium 8 19
overvoltage 9 456
photocopying processes
10 147
polarographic analysis
10 454
underground cable 5 323
zinc 14 615
Electrolyte 4 484
activity coefficients 14 22
dry cell 4 277
freezing 13 159
mercury battery
8 233 234
primary battery
10 547 549
reserve battery 11 485 487
solution 12 494
storage battery 13 153 159
transference number
14 19 22
Electrolyte—cont
wet cell 14 477 479
Electrolyte activated batteries 11 486
Electrolyte metabolism 1 232
Electrolytic capacitor 2 447
Electrolytic chromium 3 105
Electrolytic cleaning of metals 4 532
Electrolytic conductance
4 484 487
decomposition potential
4 37
electrophoresis 4 526
equivalent conductance
4 485 486
ion conductance 4 486
ion permeable membranes 7 255 257
ionization constants
4 486 487
measurement 4 484 485
nonaqueous system
4 487
titration amperometric
13 658 659
titration conductimetric
13 660
see also Ionic conductivity Transference number
Electrolytic copper 3 467
Electrolytic oxidation 9 462
Electrolytic polishing
4 469 8 293
Electrolytic slimes refining of 12 332 333
Electrolytic tank 4 487 489
Electrolytic tough pitch copper 3 467
Electromagnet 4 489
blowout coil 2 270
invention 4 453
lifting or holding magnet 4 489
magnet wire 8 26
solenoid 12 472 473
traction magnet 4 489
see also Electromagnetism
Electromagnetic clutch 3 225
Electromagnetic field
4 489 490
antenna 1 444 445 449 453*
quantum electrodynamics
11 148 150
in sea water 12 106 107
shielding 12 253 254
see also Electromagnetic wave Electromagnetism
Electromagnetic flow meter
5 316 319
Electromagnetic horn *see* Antenna (aerial)
Electromagnetic induction *see* Induction electromagnetic
Electromagnetic interaction
13 362 363
electron capture 4 503
elementary particle
4 544
nuclear scattering 12 60
parity 9 565 566
selection rules 12 160 162
Electromagnetic motor generator effect 4 12
Electromagnetic oscillations
2 576 577
see also Electromagnetic wave
Electromagnetic pendulum seismograph 12 147
Electromagnetic potentials
10 541
Electromagnetic propulsion
4 490 492
arc magnetohydrodynamic (MHD) engine 4 491
electropulsed systems
4 490
magnetogas dynamics
8 54 55
magnetohydrodynamic shock tube 4 491
magnetopulsed systems
4 490
partial plasma engine
4 490
propellant fluids 4 492
spark accelerator 4 491
steady flow systems
4 490
thrust 4 490
Electromagnetic pumps
4 492-493*, 11 104
Electromagnetic radiation
4 493 496
absorption 1 11 17
antenna radiation
1 449 453
bremsstrahlung 2 330
damped waves 4 494
detection of 4 493
detection of nuclear explosions 9 183 184
diffraction 4 132 139
dispersion 1 15 17
electric dipole 4 495
free space waves
4 493 494
gamma rays 6 34 35
heat radiation 6 369 373
infrared radiation
7 104 110
interference 7 183 189
light 7 490 507
Maxwell's equations
8 185 187
microwaves 8 412-416
plane waves 4 494
polarization of waves
10 448

Electrical conductivity *see* Conductivity, electrical, Electrical conductivity of metals
Electrical conductivity of metals 4 452-453
  Boltzmann transport equation 2 281-282
  copper 3 467
  free electron theory 5 500 501
  kinetic theory 7 353-354
  relation to thermal conductivity 3 589 591
  resistivity 11 496-497
Electrical degree 4 453
Electrical discharge in gases *see* Electrical conduction in gases
Electrical double layer 4 479, 15 174
Electrical engineering 4 453-455
  batteries 2 111-112
  circuits 3 130-133
  communications *see* Communications, electrical
  computers 3 359 360
  control systems 3 429-438
  electronic devices and circuits *see* Electronics
  heating 6 377-378
  historical development 4 453-455
  illumination 7 23 29
  measurements 4 455 458
  power systems 4 443-445
  rotating machinery 4 448 449
  scope 4 453 455
  societies 4 455
  wiring 14 519 522
  see also Electricity
Electrical measurements 4 455-458
  ac 4 455
  accuracy 4 455
  capacitance 2 441 445
  circuit loading 4 456
  current 3 628 629
  dc 4 455
  distributed parameters 4 457
  earth currents 15 507 508
  electric energy 4 425 426
  electric power 4 435-439
  frequency 5 503 511
  frequency considerations 4 456
  galvanometer 6 21-24
  impedance measurements, high frequency 7 38-47
  inductance 7 68 69
  instrument transformers 7 149-151
  lumped parameters 4 457
  oscilloscope 9 426-432
Electrical measurements—*cont*
  phase-angle 10 106-109
  power-factor 10 561-562
  Q 11 133-134
  recording instruments 11 380-383
  resistance 11 490-495
  time dependence 4 456
  voltage measurement 14 360-361
  waveform determination 14 438
  wavelength measurement 14 439 441
Electrical musical instruments 8 667
Electrical potential energy 4 601
Electrical-resistance alloy 8 265
Electrical resonator (tank) *see* Tank circuit
Electrical standards 4 458-460
  absolute 4 458-459
  capacitance 4 459
  emf 4 459
  frequency 4 459-460
  inductance 4 459
  International 4 458
  resistance 4 458 459, 11 493
  United States 4 458 460
Electrical storms 1 635 636, 7 509 510 15 616 617
Electrical surveys (geophysical) 6 166-167*, 10 58, 11 22-23
Electrical telemetry 13 426
  current balance systems 13 426
  frequency systems 13 426
  pulse systems 13 426
  voltage balance systems 13 426
  see also Telemetering
Electrical transcription 4 238
Electrical units 4 460-461
  absolute 3 626
  ampere 1 331-332
  ampere-turn 1 333
  cgs electromagnetic system 4 460 461
  cgs electrostatic system 4 460 461
  coulomb 3 516
  dimensional analysis 4 194
  electrical degree 4 453
  farad 5 181
  Gaussian system 4 460 461
  henry 6 414
  ohm 9 276 277
  rationalized mks system 4 460 461
  volt 14 355
  watt 14 413
Electricity 4 461-463
  atmospheric electricity 1 635-636
  conduction of *see* Conduction (electricity)
  electric charge 3 10
  electric current 3 626
  electrical engineering 4 453
  electrical units 4 460-461
  electrodynamics 4 477
  electromagnetism 4 496
  electromotive force 4 501
  electron 4 501-502
  electrostatics 4 539-541
  generation 4 432 435
  historical development 4 462
  Maxwell's equations 8 185-187
  one-fluid theory 4 462
  photoelectricity 10 151-152
  piezoelectricity 11 217 223
  pyroelectricity 11 116-117
  resistance 11 487
  resistivity 11 496-497
  sources of 4 462 463
  terrestrial 15 506 511
  thermoelectricity 13 577-585
  two-fluid theory 4 462
  static *see* Electrostatics
Electricity meter *see* Watt hour meter
Electrification 4 539
Electro Typesetter 3 345
Electroacoustics 4 463
  see also Acoustical engineering
Electroanalytical chemistry 3 517
Electrocardiogram 2 507, 3 138
  see also Electrocardiography
Electrocardiography 4 464
  clinical analysis 4 464
  electrocardiographic leads 4 464
  electrodiagnosis 4 475
  electrophysiology (heart) 4 528 529
  vectorcardiography 14 286
Electrocauterization 4 541
Electroceramics 2 650
Electrochemical corrosion 3 488
Electrochemical deposition 4 453
Electrochemical equivalent 1 650-651; 4 464-465*
Electrochemical process 4 465-469
  chlorine manufacture 3 69-72
Electrochemical process—*cont*
  electrolysis in aqueous solutions 4 465 466
  electrothermics 4 467
  fused salt electrolysis 4 466 467
  inorganic processes 4 469
  nitrogen fixation 9 115
  organic processes 467-469
  processes in gases 4 467
  separation, electric 4 467
Electrochemical series 4 469 470
  corrosion 3 489
  oxidation reduction 9 464 466
Electrochemistry 4 470 473
  coulometer 3 516 517
  dry cell reactions 4 478
  electrochemical processes 4 465 469
  electrode potential 4 471
  electrolysis 4 483 484
  electrolytic conductance 4 484 487
  electrometallurgy 4 496 498
  electromotive force (cells) 4 500
  electroplating of metals 4 529 535
  overvoltage 9 456 458
Electrochromatography 3 97-98
Electrode 4 471
  calomel 2 418 419
  gas 4 472
  glass 6 209 210, 551
  hydrogen 6 549 550
  metal metal ion 4 471
  silver chloride 12 332
Electrode potential 4 471 473
  calomel electrode 2 418 419
  decomposition potential 4 37
  electrochemical series 4 469
  electromotive force (cells) 4 499
  gas electrode 4 472
  glass electrode 6 209 210
  hydrogen electrode 6 549 550
  metal-metal ion electrodes 4 471
  overvoltage 9 456
  salt bridge 12 18
  silver chloride electrode 12 332
  titration, potentiometric 15 660 661
Electrodynamics 4 477
  electromagnetic induction 4 477
  electromagnetic waves 4 478
  Lorentz force 4 477
  Maxwell's equations 8 185-187
Electrodynamometer 4 478
Electroencephalography 4 478
  clinical applications 4 479
  electrodes 4 478
  instrumentation 4 478
  normal EEG 4 479
Electrofishing 4 480
Electrogravimetry 4 480
Electrohydraulic forming 4 480
Electrokinetic phenomena 4 480
  electrokinetic potential 4 481
  electroosmosis 4 481
  electrophoresis 4 481
  streaming potential 4 481
Electroluminescence 4 481
Electrolysis 4 483 484
  aqueous solutions 4 465 466
  electrothermics 4 467
  fused salt electrolysis 4 466 467
  inorganic processes 4 469
  nitrogen fixation 9 115
  organic processes 467-469
  processes in gases 4 467
  separation, electric 4 467
Electrolytic conductance 4 484 487
Electrometallurgy 4 496 498
Electromotive force (cells) 4 500
Electroplating of metals 4 529 535
Electrorheology 4 536
Electrostatic generator 4 537
Electrostatic precipitation 4 538
Electrostatics 4 539-541
  charge 3 10
  electric field 5 501
  electrostatic generator 4 537
  electrostatic precipitation 4 538
  Gauss's law 5 501
  Maxwell's equations 8 185-187
  potential 5 501
Electrostriction 4 541
Electrosurgery 4 541
Electrothermics 4 467
Electrotherapy 4 542
Electrotonus 4 542
Electrotype 4 542
Electrowinning 4 543
Elementary particles 4 543-545
  antiparticles 4 544
  baryons 4 544
  bosons 4 544
  fermions 4 544
  hadrons 4 544
  leptons 4 544
  mesons 4 544
  quarks 4 544
Elements, chemical 4 545-547
  abundance 4 546
  atomic number 4 545
  atomic weight 4 545
  classification 4 545
  discovery 4 546
  electronic configuration 4 545
  isotopes 4 545
  periodic table 4 545
  properties 4 546
Elevator 4 547-548
  control 4 548
  drive 4 548
  hydraulic 4 548
  safety 4 548
Elevator, grain *see* Grain elevator
Elevator, hydraulic *see* Hydraulic elevator
Elevator, mine *see* Mine hoisting
Elevator, passenger *see* Passenger elevator
Elevator, service *see* Service elevator
Elevator, vertical reciprocating *see* Vertical reciprocating elevator
Elevator, vertical transportation *see* Vertical transportation
Elevator, warehouse *see* Warehouse elevator
Elevator, wharf *see* Wharf elevator
Elevon 4 548
Elfving, Gustav 4 548
Elfving test 4 548
Elimination reaction 4 548
Elkins, Stephen B. 4 548
Ellipse 4 548
Ellipsoid 4 548
Elliptic function 4 548
Elliptic integral 4 548
Elliptic partial differential equation 4 548
Elliptic regulator 4 548
Elliptical gear 4 548
Elliptical orbit 4 548
Elliptical polarization 4 548
Elliptical wing 4 548
Ellis, Havelock 4 548
Ellis, Robert Leslie 4 548
Ellsberg, Edward 4 548
Elm 4 548
Elmer, Otto Hilding 4 548
Elongation 4 548
Elsasser, Walter Maurice 4 548
Elsberg, Charles Anthony 4 548
Elsberg syndrome 4 548
Elsholtz, Johann Sigismund 4 548
Elsholtzia 4 548
Elsinoë 4 548
Elsinoë fawcetti 4 548
Elsinoë leprosa 4 548
Elsinoë phaseoli 4 548
Elsinoë randii 4 548
Elsinoë rosarum 4 548
Elsinoë veneta 4 548
Elsinoë ampelina 4 548
Elsinoë australis 4 548
Elsinoë batatas 4 548
Elsinoë canavalia 4 548
Elsinoë canavalia 4 548
Elsinoë canavalia

Electrodeless discharge 12 589
Electrodeposition
electroplating of metals 4 529 535
separation (chemical and physical) 12 185
Electrodeposition analysis 4 473 475
coulometric analysis 5 517
see also Electrolysis
Electrodiagnosis 4 475-476
electrocardiography 4 475
electroencephalography 4 475
electromyogram 4 501
electromyography 4 475
Electrodialysis 4 96
ion exchange 7 242
saline water reclamation 12 12 13
ion permeable membranes 7 256
ac voltmeter 14 371 372
ammeter 1 321 4 476
Electrodynamic instrument 4 476 477
torque developed 4 477
transfer instrument 4 477
wattmeter 4 477 14 414 415
Electrodynamic vibration machine 14 321
Electrodynamics 4 477* 13 548
classical 4 477
cosmic 3 498
magnetohydrodynamics 8 56
particle accelerators 9 574
quantum 11 148 150
relativistic 11 428-431
Electrodynamometer *see* Electrodynamic instrument
Electroencephalogram *see* Electroencephalography
Electroencephalography 4 477 479*, 8 605
alpha *rhythms* 4 478
beta rhythms 4 478
delta rhythms 4 478
diagnostic use 4 479
electrodiagnosis 4 475
electroencephalograms 4 478
epilepsy 5 40
neurophysiology 9 80
relationship to learning 4 478
sleep 12 376 377
theta rhythms 4 478
Electrofax 10 146 161
Electroforming 4 469
electroplating of metals 4 529
powder metal forming 8 286
Electrogalvanizing 4 531, 14 612
Electrogenesis 13 566
Electrogravimetry *see* Electrodeposition analysis
Electrojet, upper air 4 479
geomagnetic storm 6 143
Electrokinetic phenomena 4 479 491*, 13 174
Electrokinetic transducer 4 491 492
Electroluminescence 4 492 493
carrier injection luminescence 4 492 493
electroluminescent lamps 4 492
Gudden Pohl effect 4 493
light amplifiers 4 492* 7 507
light panels 7 507 508
Electrolysis 4 493 494
chlorine manufacture 3 69 72
coulometric analysis 5 517
decomposition potential 4 57
electrochemical *equivalent* 4 465
electrochemical *processes* 4 465 467
electrodeposition analysis 4 473 475
electroplating of metals 4 529 535
electrorefining 4 496 497
heavy water preparation 6 592
isotope separation 7 295
magnesium 8 10
overvoltage 9 456
photocopying processes 10 147
polarographic analysis 10 454
underground cable 5 525
zinc 14 615
Electrolyte 4 484
activity coefficients 14 22
dry cell 4 272
freezing 13 159
mercury battery 8 253 254
primary battery 10 587 589
reserve battery 11 485 487
solution 12 404
storage battery 13 158 159
transference number 14 19 22
Electrolyte—*cont*
wet cell 14 477 479
Electrolyte activated batteries 11 486
Electrolyte metabolism 1 252
Electrolytic capacitor 2 447
Electrolytic chromium 3 105
Electrolytic cleaning of metals 4 532
Electrolytic conductance 4 494 497
decomposition potential 4 57
electrophoresis 4 520
equivalent conductance 4 495 496
ion conductance 4 496
ion permeable membranes 7 255 257
ionization constants 4 496 497
measurement 4 494 495
nonaqueous system 4 497
titration amperometric 13 659 660
titration conductimetric 13 660
see also Ionic conductivity Transference number
Electrolytic copper 3 467
Electrolytic oxidation 9 462
Electrolytic polishing 4 469 8 293
Electrolytic slimes refining of 12 332 333
Electrolytic tank 4 497 499
Electrolytic tough pitch copper 3 467
Electromagnet 4 499
blowout coil 2 270
invention 4 453
lifting or holding magnet 4 499
magnet wire 8 26
solenoid 12 472 473
traction magnet 4 499
see also Electromagnetism
Electromagnetic clutch 3 225
Electromagnetic field 4 489 490
antenna 1 444 445 449 453*
quantum electrodynamics 11 148 150
in sea water 12 106 107
shielding 12 253 254
see also Electromagnetic wave Electromagnetism
Electromagnetic flow meter 5 316 319
Electromagnetic horn see Antenna (aerial)
Electromagnetic induction *see* Induction electromagnetic
Electromagnetic interaction 13 562 563
electron capture 4 503
elementary particle 4 544
nuclear scattering 12 60
parity 9 565 566
selection rules 12 160 162
Electromagnetic motor generator effect 4 12
Electromagnetic oscillations 2 576 577
see also Electromagnetic wave
Electromagnetic pendulum seismograph 12 147
Electromagnetic potentials 10 541
Electromagnetic propulsion 4 490 492
arc magnetohydrodynamic (MHD) engine 4 491
electropulsed systems 4 490
magnetogas dynamics 8 51 53
magnetohydrodynamic shock tube 4 493
magnetopulsed systems 4 490
partial plasma engine 4 490
propellant fluids 4 492
spark accelerator 8 49
steady flow systems 4 490
thrust 4 490
Electromagnetic pumps 4 492 493* 11 104
Electromagnetic radiation 4 495 496
absorption 1 11 17
antenna radiation 1 449 453
bremsstrahlung 2 530
damped waves 4 494
detection of 4 495
detection of nuclear explosions 9 185 186
diffraction 4 132 139
dispersion 1 15 17
electric dipole 4 495
free space waves 4 493 494
gamma rays 6 54 55
heat radiation 6 560 573
infrared radiation 7 104 110
interference 7 185 189
light 7 499 507
Maxwell's equations 8 185 187
microwaves 8 412 416
plane waves 4 494
polarization of waves 10 448

Electromagnetic radiation—*cont*
radar propagation 11 201-202
radiation pressure 11 238
radio astronomy 11 243 244
radio communication 11 241 243
radio spectrum allocations 11 259 261
radio-wave propagation 11 319 322
radiometry *11 317 318*
reflection 11 391-395
reflection coefficients 11 396 397
refraction 11 406 408
relativistic electrodynamics 11 451
scattering 12 51 53
in sea water 12 106-107
spectroscopy 12 586 591
spherical waves 4 494
terrestrial 11 214-215
transmission coefficients 11 396 397
transmission theory and methods 14 54 61
ultraviolet radiation 14 186-187
upper atmosphere 1 98
wave guides 14 420-424
wave impedance 4 494 495*; 9 276-277
wave motion 14 425-429
x-rays 14 567 568
Electromagnetic separation of isotopes 7 295
of mineral fractions 10 52
Electromagnetic spectrum 4 493
Electromagnetic surveys 11 22 23
Electromagnetic units 4 460 461
Electromagnetic wave 4 496
electromagnetic radiation 4 493 496
propagation 7 502
propagation in atmosphere 8 320
propagation over earth 14 56 57
radiation from antennas 14 55 56
transmission 14 54 61
in wave guides 14 57 58
wave motion 14 425 426
see also Electromagnetic radiation; Electromagnetism
Electromagnetic well logging 14 471
Electromagnetism 4 496
Ampere's law 1 332
Electromagnetism—*cont*
electrodynamics 4 477
electromagnetic induction 7 69-71
Faraday's law of induction 5 183
magnetic induction 7 71
magnetic field 8 30-33
magnetic flux 8 33
magnetomotive force 8 66
Maxwell's equations 8 185-187
Lenz's law 7 454
see also Electricity, Magnetism
Electromechanical transducer 12 509-510
Electrometallurgy 4 496 498
electrochemical processes 4 469
electrorefining 4 496 497
electrowinning 4 497-498
Electrometer 4 498, 536, 14 371
fiber 4 268
Electromotance *see* Electromotive force (emf)
Electromotive force (cells) 4 498 500*, 12 18
Electromotive force (emf) 4 501
electromagnetic induction 7 69 70
inductance 7 65 66
standards of 4 458 459
Electromotive force series *see* Electrochemical series
Electromyogram 4 501
Electromyography 4 475
Electron 4 501 502
beta rays 2 181 183
Boltzmann transport equation 2 282
bremsstrahlung 2 330
capture 4 502 503
as cathode ray 2 553
charge *1 652*, 4 501 502*
Compton effect 3 353 359
conduction electrons 3 391
configuration *4 503 506*
density in ionosphere 7 255
diffraction 4 506 509
electricity 4 461 463
electron optics 4 514
electrons and matter 4 502
elementary particle 4 543 544
emission 4 509 510
exclusion principle 5 137
free electron theory of metals 5 499 501
ionization 7 252
Larmor precession 7 405
Electron—*cont*
magnetic moment 4 502, 516 518*, 8 36
magnetism 8 47-48
mass 1 652
motion in solids (band theory) 2 91 93
motion in vacuum 4 510-514
pair production 9 495
particle accelerators 9 571-581
positron 4 502
proof of motion in atoms 3 358
relativistic electrodynamics 11 428-431
relaxation time 11 430
scattering 9 202
spin 4 502, 516 518*
thermionic emission 13 553-554
Electron affinity 4 519
Born-Haber cycle 7 248
Electron-atom collisions 12 54-55
Electron avalanche counters 6 92
Electron beam cathode-ray tube 2 555 557
cathodoluminescence 2 560 561
electron lens 4 510
electron motion in vacuum 4 510 514
electron optics 4 514
Electron beam etching 8 349
Electron beam recording 8 282
Electron beam switching tube 13 359
Electron capture 4 502 503
alpha rays 1 267
K capture 4 503
L capture 4 503
radioactivity 11 286
Electron cloud 3 21 26 7 195
Electron compounds *1 263 264**, 12 478
Electron configuration 1 658 661, 3 32 42, 4 503 506* 10 257
Electron counter 12 349
see also Particle detector
Electron coupled oscillator 9 422
Electron deficient structures 3 41 42
Electron diffraction 4 506 509
in gases and liquids 4 507 509
in solids 4 506 507
Electron emission 4 509 510
cathode rays 2 553
Electron emission—*cont*
cesium emitter 14 245 246
field emission 5 254 25
field-emission microsc 5 256
field enhanced emissio 5 256
filament voltage effect 14 248
oxide coated emitters 14 246
photoemission 10 152
secondary emission 12 124 126
space charge limitation 14 248
tantalum emitter 14 2
thermionic emission 13 553 554
thoriated tungsten emitter 14 246
tungsten emitter 14 2
vacuum tube emitters 14 245 246
Electron gas 5 499 501
Electron gun cathode ray tube 2 555 557
kinescope 7 348
traveling wave tube 14 68 69
Electron injection 4 510
Electron lens 2 555 4 510*
see also Electron optic
Electron microscope *see* Microscope, electron
Electron molecule collisions 12 56
Electron motion in vacuum 4 510 514
combined fields with symmetry 4 512 51
effect of space charge 4 513 514
electrostatic deflection high frequencies 4 513 514
electrostatic lens 4 556 558
magnetic fields 4 511
paraxial ray equation 4 511
particle accelerators 9 572 574
path equation 4 510
relativistic electrodynamics 11 429 43
static electric fields 4 510 511
time varying fields 4 513 514
Electron nucleon scatterin 12 59 60
Electron nucleus scattering 12 59

ectron optics 4 514
electron diffraction 4 506 509
electron lens 4 510
electron microscope 8 372 382
electron motion in vacuum 4 510 514
electrostatic lens 4 536 538
magnetic lens 8 33 34
lectron pair bond 5 25
lectron paramagnetic resonance spectroscopy 4 514 516* 8 52 54
lectron ray indicator tube 14 253 254
lectron spin 4 516 519
atomic beam measurements 4 518
atomic structure and spectra 1 655
electron magnetic moment 4 516 518
electron paramagnetic resonance spectroscopy 4 514 516
energy level splitting 4 518
ferromagnetism 5 229 231
magnetic moment 8 36
magnetism 8 47-49
paramagnetism 9 547 550
quantum electrodynamics 11 150
Electron synchrotron 9 573 576 578*
Electron tube 4 518 519
bias 2 193
cathode ray tube 2 554 560
classes 4 518
cold cathode tube 5 274 275
electron transit time 8 426
filament structures 13 555
gas tube 6 60-65
historical development 4 519
interelectrode capacitances 8 426
lead inductances 8 426
limitations of conventional tubes 8 426
microphonic tubes 8 364
microwave tubes 8 424 426
noise 9 117
number indicator tube 9 219
operating point 2 185
photocube 10 192 195
stem capacitances 8 426
storage tube 13 460
switching tube 13 359 360
television camera tube 13 461
thermionic tube 13 535
tube tester 14 129
vacuum tube 14 243 254
Electron tube—*cont*
x ray tube 14 597 590
see also Vacuum tube
Electron volt 4 519*, 9 572
Electron wave optics 4 514
Electron wave rector *see* Wave rector, electron
Electronegativity 4 519 520
Born Haber cycle 7 249
chemical structures 5 54
electrochemistry 4 470
electrode potential 4 475
hydrogen bond 6 548 549
molecular association 8 537 538
oxidation reduction 9 464 466
Electronic band spectra 8 554 555
see also Band spectrum
Electronic carillon 8 667
Electronic circuit *see* Circuit electronic
Electronic compressor 4 237 9 554
Electronic countermeasures 4 520 523
active systems 4 521
antennas 1 446
counter ECM 4 522 523
decoys 4 522
drone 4 522
heterodyne jamming 4 522
jamming 4 521 522 7 302
passive systems 4 521
radar signal analysis 4 521
reconnaissance systems 4 521
spark jamming 4 521
sweep through jamming 4 522
white noise 4 522
Electronic engravers printing plate 10 613 614
Electronic music synthesizer 8 667
Electronic musical instruments 8 667
Electronic navigation systems *see* Navigation systems electronic
Electronic organ 8 667
Electronic paramagnetism *see* Paramagnetism
Electronic polarization 10 447
Electronic radiographs 11 395
Electronic shutter photography 10 160
Electronic switch *see* Switch electronic
Electronic work function 10 132 154
Electronic writing 4 523 524
cathode ray tube reproduction 4 523
character producing wave forms 4 523
Electronic writing—*cont*
flying spot scanner 4 523
Electronics 4 524 525
circuits 5 133 135
communications *see* Communications electrical
electrical conduction in gases 4 440 452
electrical measurements 4 455 459
electron emission 4 509 510
electron motion in vacuum 4 510 514
electron optics 4 514
electron tubes 4 518 519
growth of industry 4 524
history 4 524
industrial applications 4 525
molecular electronics 8 545 546
photoelectricity 10 151 152
semiconductors 12 165 172
transistors 14 35 38
see also Control systems
Electroluminescence *see* Cathodoluminescence
Electrooptical Kerr effect 7 337 338
Electrooptical shutter 7 338* 10 160
Electrooptics 4 525
Kerr effect 7 337 338
Stark effect 13 53 54
Electroorganic processes 4 467 469
Electroosmosis 4 525 526
electrokinetic phenomena 4 479
soil mechanics 12 455
see also Streaming potential
Electroosmotic dewatering 4 526
Electroosmotic driver solion 12 449
Electroosmotic transport 7 256
Electropherographs 5 97
Electrophilic and Nucleophilic reagent 4 526* 13 229
Electrophilic substitution 13 131 229 230
Electrophoresis 4 526 527* 5 21 6 53
biochemistry 2 199
electrokinetic phenomena 4 479
ion permeable membrane 7 255 257
isoelectric point 7 275 276
protein isolation 11 57
zone 11 57
Electrophorous 4 428 539 540*
Electrophorus electricus 4 413 428
Electrophysiology *see* Biopotentials and electrophysiology
Electrophysiology (heart) 4 528 529
electrocardiography 4 464 528
excitability of heart muscle 4 529
heart cell potentials 4 528
spread of excitation over heart muscle 4 529
vectorcardiographs 4 528
Electrophysiology (muscle) *see* Electromyogram Muscular system
Electrophysiology (nerve) *see* Neurophysiology Nervous system Nervous system (invertebrate)
Electrophysiology and biopotentials *see* Biopotentials and electrophysiology
Electroplaque 4 428 429 13 546
Electroplating of metals 4 529 535
adhesion 4 533
alloy deposition 4 532
anodic pickling 4 532
anodizing 4 534
cadmium plating 2 547 4 531
cathodic pickling 4 532
chromium plating 5 104 4 531
cleaning 4 532
copper plating 4 530
corrosion tests 4 533 534
electrochemical processes 4 469
electroforming 4 534
electrolytic cleaning 4 532
electropolishing 4 532 535
electrotyping 4 534
gold plating 4 531
lead plating 4 531
nickel plating 4 531 532
pickling 4 532
porosity 4 533
silver plating 4 530 531
solvent cleaning 4 532
tin plating 4 531
zinc plating 4 531
Electropolishing 4 535
Electropulsed systems (electromagnetic propulsion) 4 490
Electrorefining 4 496 497
Electroretinogram 10 185
Electroscope 4 535 536
gold leaf 4 535
ionization chamber 7 252
Electroseparation 4 474
Electroshock therapy 4 541 542
Electrostatic accelerator 9 572 574
Cockcroft Walton accelerator 3 250 251
resonance transformer 11 504 505

Electrostatic accelerator—*cont*
Van de Graaff generator 14 266 268
Electrostatic Coulomb force 9 202 207
Electrostatic deflection 4 510 511
cathode-ray tube 2 556
electrostatic lens 4 510, 536 538
oscilloscopes 9 428
particle accelerators 9 572 574
Electrostatic field 4 427
electron motion in vacuum 4 510-514
electrostatic lens 4 536-538
electrostatics 4 540-541
shielding 12 253-254
in triode 14 107-108
see also Electric field
Electrostatic generator 4 539 540
see also Electrostatic accelerator
Electrostatic induction *see* Induction, electrostatic
Electrostatic lens 4 536 538*, 9 572, 574
Electrostatic loudspeaker 7 589, 591
Electrostatic microphone 8 360
Electrostatic motor generator effect *see* Motor-generator effect, electrostatic
Electrostatic precipitation 1 147, 153 4 538 539*
Electrostatic precipitator 4 295-296
dust and mist collection 4 295-296
separation (mechanical) 12 187
Electrostatic separation
diamond 4 100
mineral fractions 10 52
Electrostatic storage 13 159
Electrostatic theory coordination chemistry) 3 438
Electrostatic transducer 8 358
Electrostatic units 4 460 461
Electrostatic voltmeter 4 536, 14 370 371
Electrostatic wattmeter *14 416*
Electrostatics 4 539-541
capacitance 2 440 441
conservation of charge 4 540
Coulomb's law 5 516
electric charge 5 10
electrification 4 539
electroscope 4 535 536
electrostatic generator 4 539 540
electrostatic induction 4 539 540
Electrostatics—*cont*
fields *see* Electric field, Electrostatic field
method of electric images 4 540-541
potential 1 536 537
shielding 12 253-254
Electrostriction 4 541
Electrostrictive transducer 8 358
Electrosurgery 4 541
Electrotherapy 4 541 542
electroshock therapy 4 542
high-frequency currents 4 541
Iontophoresis 4 542
low frequency currents 4 542
Electrothermal phenomena 13 577
Electrothermics 4 467 14 614 615
Electrotropism 10 365
Electrotype 10 599 614
Electrotyping 4 534
Electrovalence 3 25 33 35 12 474
Electrowinning 4 497 498
Elektra 9 15
Elektron 8 21
Element cone 3 394
Element abundances *see* Elements (cosmic) abundance, Elements (geochemical distribution)
Elementary particle 4 542 544
antineutrino 9 85
antineutron 1 478 479
antiproton 1 481 482
baryon 2 105
cascade particle 2 537
decay modes 4 543 544
electric charge 5 10
electron 4 501 502
graviton 6 266
hyperon 6 587 588
indistinguishability 11 161 162 178 179
interactions 4 543 544
invariance principles 13 362 364
isotopic spin 7 296 297
lepton 7 475
lifetime 4 543 544
meson 8 247-251
neutrino 9 83
neutron 9 83 91
parity 9 565 567
particle accelerators 9 571-585
particle detectors 9 581 585
photon 10 175
positron 10 520
proton 11 46-47
quantum field theory 11 150 155
quantum numbers 11 162
Elementary particle—*cont*
relativistic quantum theory 11 180
rest mass 4 543 544
specific charge 12 573
spin 12 615
stability 4 543 544
strange particle 13 168
V-particle 14 376 377
Elements (chemical) 4 544 546
actinide 1 54 55
in atmosphere 1 627, 629, 634
biogeochemical cycles 2 243 244
in biosphere 2 239 244
chemical binding 3 24 26
chemistry 3 46
concentrations in sea water 12 108
cosmic abundance 4 546-549
electron configuration 4 503-506
geochemical distribution of 4 549-552
in hydrosphere 6 565-568
inert gases 7 90
ionic potential 2 241 242
ionization potential (table) 4 504 505
in lithosphere 7 546 553
in living matter 2 241
magnetic susceptibility 13 331
in marine organisms 12 109
native 9 4
in the oceans 6 565
origin of 4 552 556
periodic table of 10 13 15
radioactive 11 273 289
rare earth 11 342 344
residence times in oceans 5 565
in soils 12 422 423
structure 3 32 42
in sun 13 267
in terrestrial vegetation 2 241
transition 14 41 42
transuranium 14 65 67
uncombined in nature 9 4
Elements (cosmic abundance) 4 546 549
earth 4 546
meteorites 4 546
nuclear 4 547
primeval 4 547
stars 4 546
sun 4 546 13 267
universe 4 552
Elements (geochemical distribution) 4 549 552
crust of earth 4 550
deep sea sediments 4 550
igneous rocks 4 550
Elements (geochemical distribution)—*cont*
sedimentary rocks 4 550
Elements and nuclides (origin) 4 552 556
alpha process 4 553
continuous production theory 4 553
e-process 4 554
helium burning 4 553
hydrogen burning 4 553
initial creation theory 4 552
p process 4 555
r process 4 554
s process 4 554
x process 4 555
Elephant 4 557, 6 182
Elephant fish 3 225
Elephant shrew 7 142
Elephant tusk shell 13 676
Elephantiasis 4 218, 5 258 Filarioidea 5 258 260 mosquito 8 599
Elephantidae 10 656
Elephantulus 11 476
Elephas indicus 4 557
Elettaria 12 76
Elettaria cardamomum 2 490
Eleutherodactylus 10 638
Eleutherozoa 4 560, 557 Asteroza 1 601 Echinoidea 4 373 378 fossils 4 364 365 Holothuroidea 6 465 467 Ophiocystioidea 9 342
Elevating machines 4 557 559
Elevation (land surface) 4 325 327 contour lines 5 425 measurement 15 525 526 677 679
Elevator, aircraft 1 215 4 559 560*, 13 386
Elevator, lifting 4 557
Elgidos 2 175
Elgrima 10 613
Elias H 7 555
Elimination reactions organic chemical synthesis 9 392 steric effect 13 152
Eliot Charles 7 306
Elk 4 560
Elkington G R 15 331
Elkington, H *12 331*
Ellagic acid 14 527
Ellagitannin 13 591
Ellesmere Lake 1 672
Ellesmere Island 1 525
Ellipse 1 390 4 560* area 1 528 conic section 3 399
Ellipsoid and spheroid 4 560 561* 11 155
Ellipsoid index 3 587 591
Ellipsoid of wave normals 3 587 591

Ellipsoidal reflector 11 5
Ellipsoidal surface harmonics 12 610
Elliptic cylinder 11 135
Elliptic function and integral 4 561 563
Elliptic geometry 6 157
Elliptic integrals 4 561-563
Elliptic motion 2 580
Elliptic paraboloid 9 542* 11 135
Elliptic reflectors 7 27
Elliptical galaxies *see* Galaxy, external
Elliptical mirror 12 608
Elliptical orbit 9 371 372
Elliptical plate, structural 10 408
Elliptical trajectory 2 82
Elliptical wing 1 198 201
Elliptically dichroic crystal 4 108
Ellipticity effect (binary stars) 2 188
Elpis 5 100
Elm 2 560 4 563 564*, 13 113 14 255
Elm leaf miner 6 580
Elm sawfly 6 580
Elmidae 3 276
Elodea 5 37 6 394 8 240
Elodea gigantea 12 229
Elona nasus 10 638
Elphidium 12 28
Elphidium arcticum 5 434
Elpidia 4 418
Elpidia glacialis 4 41
Elrod 3 343
Elsinoë 8 213
Elsinoë ampelina 6 252
Elsinoe fawcetti 8 682
Elsinoe veneta 8 682, 11 344
Elton C. 5 379 11 107
Elution diagram 6 48
Elutriation 12 349
Elymus 3 290
Elytra Coleoptera 3 275-288
Elytrophora 2 418
Embden Meyerhof Parnas pathway 10 331
bacterial metabolism 2 38 40
see also Glycolysis
Embioptera 4 564 565* 7 334
Embolism 3 144 4 565*
Embolomeri 1 334, 4 563*, 7 373
Embolus 4 565-566* 13 615
circulation disorders 3 141 144
infarction 7 93 94
phlebitis 10 115
Embolv 6 79
Embossing printed circuits 10 397
Embossing—cont
sheet metal 12 252 253
Embrithopoda 4 566*, 8 82
Embryo sac 5 333
Embryogenesis 4 566
Embryology 4 566 569
cell differentiation 2 590, 4 568
cleavage 4 569
fertilization 4 567 568
gametogenesis 4 567
gastrulation 4 568
morphogenesis 4 568
skeletal histogenesis 12 352
tissue culture 4 567
Embryology, experimental 4 569 578
fate maps embryonic 5 190 191
fertilization 4 572
fertilization abnormal 4 573 574
merogony 4 575
parthenogenesis artificial 4 575
zygote and embryo 4 574 577
Embryonated egg culture *see* Culture embryonated egg
Embryonic blood cell development 6 597
Embryonic differentiation 4 578 580
Embryonic induction 4 580 581
Embryonic organizer 4 581
Embryophore 2 659 5 9
Embryophyta 4 582*, 10 320 346
Bryophyta 2 323 554
Tracheophyta 14 9
Emden R. 13 171
Emerald 2 170 174, 4 582*, 6 93
Emergent shorelines 5 243
Emericella 5 123
Emericella falpoida 4 31
Emerson J. 2 520
Emery 1 9 4 582*
Emetic ipecac 7 237
Emetine 1 248 475
Emf *see* Electromotive force (emf)
Emf thermoelectric 13 580-585
Emiliani, C. 8 142
Emission electron *see* Electron emission
Emission, secondary *see* Secondary emission
Emission, thermionic *see* Thermionic emission
Emission spectrum 12 592
Emissivity 4 582 583*, 6 571
Emitter, electron atomic film 14 246
cathode ray tube 2 555
Emitter, electron—cont
metal 14 245 246
oxide-coated 14 246
phototube 10 104
vacuum tube 14 245 246
see also Electron emission
Emmer 14 480
Emmerich, R. 1 476
Emmert's law 14 539
Emmetropia 5 172
Emmett, P. 1 81
Emodin 1 457
Emollient 6 220
Emotion 4 585 586
behavior and heredity 2 153
clinical studies 4 593
human engineering 6 496
lie detector 7 495
neurological and endocrine involvement 4 589
quantitative response pattern 4 591
theories 4 585
Emperor goose 6 237
Emperor penguin 12 607
Emphysema 2 347 349 3 142 7 620
Empididae 4 212
Empidonax virescens 5 362
Empirical method 4 586
Emplectonema 6 479 11 539
Empoa rosea 7 441
Empoasca fabae 9 603
Empusa 13 179
EMT *see* Electric metallic tubing (EMT)
Emu 2 545 4 199
Emulsification soap and detergent 12 595 596
surface active agent 13 321 322
see also Size reduction
Emulsifying agent *detergent* 4 81
food 5 370 379
Emulsifying oils petroleum products 10 71 75
Emulsion 4 586 587
adsorption 1 79
polymerization 10 480
Emulsion photographic 10 156 157, 168
Emydae 6 436 441
Emydidae 13 502
Enamel paint 9 495
surface coating 13 311 312
Enamel nonsilicous 4 587
Enamel (tooth) 13 674
Enameled ware 8 285
Enantiomorph 4 587 9 346
amino acid 1 308
biosphere, geochemistry of 2 241
Enantiomorph—cont
racemization 11 195
Enantiomorphic pair *see* Diastereoisomer
Encapsulation of electronic components 8 470
Enargite 3 461 4 587*, 8 277
Enceladus 12 40
Encephalartos 13 120
Encephalitis 3 67 9 70 75*
Encephalitis equine 1 425, 499 4 597*
Encephalomalacia 14 344
Encephalomyelitides 9 70
Encephalomyocarditis 3 550
Enchondromatosis 4 314
Encke, J. F. 4 597
Encke's comet 3 515 516 4 597*
Encke division (Saturn) 12 39
Encoder 7 100
Encrinite 3 473
Encrinites 3 549
Encystidae 6 574
Encystment 6 439
End launching 12 299 300
End moraine 8 507
End organ of Ruffini 12 190
End point titration 13 636
End point problems 2 409 410
Endamoeba histolytica 1 466 467 3 560 14 411
see also Entamoeba
Endamoebidae 1 531
Endarch siphonostele Equisetales 5 62 63
n Endecane 10 65
Endeidae 11 306
Endellite 3 165
Endemic goiter 6 229, 13 627
Endemic typhus 12 344
Endemium 4 209, 7 215
Endocarditis 4 599*, 6 559 560
and gonorrhea 8 236
and Lupus erythematosus 7 622
Endocarditis lenta 6 559
Endocardium 4 588, 6 557
Endocarp, fruit 5 545
Endochondral ossification *see* Ossification
Endocrine gland 4 589 589*, 5 45
adipose tissue 1 70
adrenal gland 1 74-78
chromaffin bodies 4 589
endocrinology 4 598
epithelium 5 41-45
gonad 6 235
hormone 6 479-480
kidney 4 588
liver 4 588
ovary 9 451-455

Electrostatic accelerator—*cont*
Van de Graaff generator
14 266 268
Electrostatic Coulomb force
9 202 207
Electrostatic deflection
4 510 511
cathode-ray tube 2 556
electrostatic lens 4 510, 536 538
oscilloscopes 9 428
particle accelerators
9 572 574
Electrostatic field 4 427
electron motion in vacuum
4 510-514
electrostatic lens 4 536 538
electrostatics 4 540-541
shielding 12 253-254
in triode 14 107-108
see also Electric field
Electrostatic generator
4 539 540
see also Electrostatic accelerator
Electrostatic induction *see* Induction, electrostatic
Electrostatic lens 4 536 538*, 9 572, 574
Electrostatic loudspeaker
7 589, 591
Electrostatic microphone 8 360
Electrostatic motor generator effect *see* Motor generator effect, electrostatic
Electrostatic precipitation
1 147, 153, 4 538-539*
Electrostatic precipitator
4 295-296
dust and mist collection
4 295 296
separation (mechanical)
12 187
Electrostatic separation
diamond 4 100
mineral fractions 10 52
Electrostatic storage 13 159
Electrostatic theory coordination chemistry) 3 458
Electrostatic transducer 8 358
Electrostatic units 4 460 461
Electrostatic voltmeter 4 536
14 370 371
Electrostatic wattmeter 14 416
Electrostatics 4 539 541
capacitance 2 440 441
conservation of charge
4 540
Coulomb's law 5 516
electric charge 5 10
electrification 4 559
electroscope 4 555 556
electrostatic generator
4 539 540
electrostatic induction
4 539 540
Electrostatics—*cont*
fields *see* Electric field, Electrostatic field
method of electric images
4 540-541
potential 1 536-537
shielding 12 253-254
Electrostriction 4 541
Electrostrictive transducer
8 358
Electrosurgery 4 541
Electrotherapy 4 541 542
electroshock therapy 4 542
high frequency currents
4 541
Iontophoresis 4 542
low frequency currents
4 542
Electrothermal phenomena
13 577
Electrothermics 4 467, 14 614 615
Electrotropism 10 365
Electrotype 10 599, 614
Electrotyping 4 534
Electrovalence 5 25 33 35, 12 474
Electrowinning 4 497-498
Elektra 9 15
Elektron 8 21
Element cone 5 394
Element abundances *see* Elements (cosmic) abundance
Elements (geochemical distribution)
Elementary particle 4 542 544
antineutrino 9 83
antineutron 1 478 479
antiproton 1 481 482
baryon 2 105
cascade particle 2 537
decay modes 4 543 544
electric charge 5 10
electron 4 501-502
graviton 6 266
hyperon 6 587 588
indistinguishability
11 161 162 178 179
interactions 4 543 544
invariance principles
13 362 364
isotopic spin 7 296 297
lepton 7 475
lifetime 4 543 544
meson 8 247 251
neutrino 9 83
neutron 9 83 91
parity 9 565 567
particle accelerators 9 571 585
particle detectors 9 584 585
photon 10 175
positron 10 520
proton 11 46 47
quantum field theory
11 150 153
quantum numbers 11 162
Elementary particle—*cont*
relativistic quantum theory
11 180
rest mass 4 543-544
specific charge 12 575
spin 12 615
stability 4 543 544
strange particle 13 168
V particle 14 376-377
Elements (chemical) 4 544 546
actinide 1 54 55
in atmosphere 1 627, 629, 634
biogeochemical cycles
2 243 244
in biosphere 2 239 244
chemical binding 3 24 26
chemistry 3 46
concentrations in sea water
12 108
cosmic abundance
4 546 549
electron configuration
4 503-506
geochemical distribution of 4 549 552
in hydrosphere 6 565 568
inert gases 7 90
ionic potential 2 241-242
ionization potential (table)
4 504 505
in lithosphere 7 546 553
in living matter 2 241
magnetic susceptibility
13 331
in marine organisms
12 109
native 9 4
in the oceans 6 565
origin of 4 552 556
periodic table of 10 13 15
radioactive 11 273 289
rare earth 11 342 344
residence times in oceans
5 565
in soils 12 422 423
structure 3 32 42
in sun 13 267
in terrestrial vegetation
2 241
transition 14 41 42
transuranium 14 65 67
uncombined in nature 9 4
Elements (cosmic abundance)
4 546 549
earth 4 546
meteorites 4 546
nuclear 4 547
primeval 4 547
stars 4 546
sun 4 546, 13 267
universe 4 552
Elements (geochemical distribution) 4 549 552
crust of earth 4 550
deep sea sediments 4 550
igneous rocks 4 550
Elements (geochemical distribution)—*cont*
sedimentary rocks 4 5 4
Elements and nuclides (origin
4 552 556
alpha process 4 553
continuous production theory 4 553
e process 4 554
helium burning 4 553
hydrogen burning 4 553
initial creation theory
4 552
p process 4 555
r process 4 554
s process 4 554
x-process 4 555
Elephant 4 557, 6 182
Elephant fish 3 293
Elephant shrew 7 342
Elephant tusk shell 13 676
Elephantiasis 4 215, 5 258
Filaroidea 5 258 260
mosquito 8 599
Elephantidae 10 636
Elephantulus 11 476
Elephas indicus 4 557
Elettaria 12 76
Elettaria cardamomum 2 490
Eleutherodactylus 10 633
Eleutherozoa 4 560 557
Asterozoa 1 601
Echinoidea 4 573 576
fossils 4 564 565
Holothuroidea 6 463 467
Ophiocystioidea 9 542
Elevating machines 4 557 559
Elevation (land surface)
4 325 327
contour lines 3 425
measurement 13 325 329 677 679
Elevator, aircraft 1 213, 4 559 560* 15 386
Elevator lifting 4 557
Elgilov 2 175
Elgrdma 10 615
Elias H 7 555
Elimination reactions organic chemical synthesis 9 592 steric effect 13 132
Eliot, Charles 7 396
Elk 4 560
Elkington G R 12 331
Elkington H 12 331
Ellagic acid 14 527
Ellagitannin 13 591
Ellesmere Lake 1 672
Ellesmere Island 1 525
Ellipse 1 390 4 560*
area 1 529
conic section 3 399
Ellipsoid and spheroid 4 560 561* 11 135
Ellipsoid, index 5 587 591
Ellipsoid of wave normals 5 587 591

Engine electrical system *see* Ignition system
Engine fuel system *see* Fuel system
Engine lathe 7 407
Engine lubrication *see* Lubrication engine
Engine nacelles 14 509
Engineering 4 603-606
acoustical *see* Acoustical engineering
aeronautical 1 95
agricultural 1 114 116
architectural 1 520 521
astronautical 1 603 606
ceramic *see* Ceramic technology
chemical 5 28 29
civil 3 148 149
control system *see* Control systems
cryogenic 5 569 572
education 4 606
electrical 4 453 455
electronic *see* Electronics
food 5 380 405
human 6 494-497
illumination *see* Illumination
industrial 7 82 83
instrumentation *see* Instrumentation
integrating influences 4 605
licensing 4 606
marine 8 112
mechanical 8 189
metallurgical *see* Metallurgy
mining *see* Mining
nuclear 9 180 181
optical *see* Optics
petroleum 10 57 60
sanitary 12 25
specialization 4 605
systems 13 375 380
traditional 4 605
see also index entries for these and other engineering fields
Engineering and architectural contracts 4 606 609
defective plans 4 607
defects in contractor's work 4 609
improper supervision of work 4 608
knowledge of zoning laws 4 606
licensing 4 606
ownership of plans 4 606
payment for plans 4 606
percentage-of-cost contracts 4 607
right to vary quantity of work 4 609
Engineering and architectural contracts—*cont*
satisfactory work provision 4 607
settlement of disputes 4 608
stipulated cost contracts 4 606
Engineering drawing 4 271, 609 612*
aircraft master layouts 4 611
assembly drawings 4 611
conventional symbols 4 610
design layout 4 611
design standards 4 78
detail drawing 4 611
dimensioning 4 196, 610
drafting machine 4 271
flow diagram 4 612
layout drawings 4 611 7 422
orthographic representation 4 609
pictorial drawing 10 214 216
plant layout drawing 4 611
schematic drawings 4 612 12 61 62*
sectional views 4 610
structural drawings 4 612
wiring diagram 14 522
see also Engineering graphics
Engineering geology 4 612 615
compressive strength of rocks 4 613
earthquake effects 4 552
fault and fault structures 5 191 195
frost action 5 541
in soils 12 455
geotechnical investigations 4 614
landslide 7 397 398
residual stress in rock 4 615
rock construction material 4 614
rock properties and behavior 11 591
rock sampling 4 612
shear in rocks 4 615
soils geotechnical significance 4 614
tunnel surveys 14 142
use of aerial photographs 1 83
see also Construction engineering Rock mechanics Soil mechanics Surveying Water supply engineering
Engineering graphics 4 615
descriptive geometry 4 69 74
engineering drawing 4 609 612
graphic methods 6 276
nomographs 10 133 137
pictorial drawing 10 214 216
Engineering psychology *see* Human engineering
Engler 8 10 298, 377
Engler Prantl system 10 298
English Channel 5 109, 114 9 251
English elm 4 561
English filter 14 407 408
English holly 6 464
English ivy 13 121
English oak 9 238
English sparrow 12 562 572
English walnut 4 615 616* 14 594
crop culture 9 232
English yew 14 605
Engraved stone (gemology) 7 164
Engraving 10 617
intaglio printing 10 603
printing plate 10 610
Engresser formula 3 303
Enhydra lutris 8 251 9 419
Enicocephalidae 6 401
Enif 9 610
Eniwetok Atoll 1 617, 3 475
Enlargement printing 10 148
Enlarger *photographic* 10 166 lens 7 434
Enol 3 87 11 198 13 402
Enol keto tautomerism 13 402
Enol phosphopyruvic *acid* 2 16
Enolase 2 16 10 570
Enolate ion 11 198
Enolization 8 580
Enopla 4 616
Bdellomorpha 2 114
Hoplonemertini 6 479
Enoplia 9 30
Enoploidea 4 616
Enoploteuthidae 4 40
Enoploura popei 2 532
Enrichment *media* 3 615
Ensemble (physics) 10 633 13 60 66*
Ensign 8x 6 574
Ensiling 1 132
Ensis directus 5 100
Enstatite 4 616* 9 419 11 129
Ensternite 9 419
Entamoeba coli 1 300 330 fluorescent antibody method 8 395
Entamoeba histolytica 1 300 3 200 9 557 11 60
Entamoeba histolytica—*cont*
fluorescent antibody method 8 385
see also Endamoeba
Entamoeba invadens 1 330
Entelodont 1 567
Enteric bacilli 5 1
Enteric cytopathogenic human orphan virus *see* ECHO virus
Enteric fever 14 173
Enteritis 1 466 467
Johne's disease 7 314
regional 6 73
Enterobacteriaceae 5 1 3* 56
Aerobacter 1 84 5 1 2
Albimonas 5 1 2
bacteria, taxonomy of 2 33
Erwinia 5 1 2
Erwinieae 5 2
Escherichia 5 1 2 56
Escherichieae 5 2
fermentation reactions 5 2
IMViC test 7 48
Klebsiella 5 1 2
Klebsiella pneumoniae 7 363
Proteae 5 2
milk 8 431
Paracolobactrum 5 1 2
Proteus 5 1 2 11 44
Salmonella 5 1 2 12 14
Salmonelleae 5 2
Serratia 5 1 2
Serratieae 5 2
Shigella 5 1 2 12 254
typhoid fever 14 173
Enterobiasis *see* Pinworm infection
Enterobius 9 475
Enterobius vermicularis 10 258 259
Enterocoela 1 420 5 2 3*
Enterocoelia 1 413
Enteroerinin 4 172 503
Enterogastrone 5 206
Enterohepatitis 9 476
Enterokinase 5 204
digestive system 4 170 171
protein metabolism 11 42
Enteromorpha 8 107, 13 398
Enteron 5 256
Enteropneusta 5 3
Enterotoxin 13 37
Enterovirus 5 3 4
infections 1 425
Enteroma 5 4
Enterprise 11 363 12 263
Enthalpy 5 4* 13 559 573
enthalpy entropy diagram 13 77
psychrometrics 11 81
steam 13 76
thermodynamic principles 13 566
Entocolax 6 466

Endocrine gland—*cont*
pancreas 9 529-534
paraganglia 4 588
parathyroid 9 557-561
pineal body 10 237
pituitary gland 10 216 251
suprarenal body 4 588
testis 13 521-527
thymus 13 617-619
thyroid 13 621-627
Endocrine mechanisms 4 589-598
amphibians 4 595 596
arthropods 4 596
carbohydrate metabolism 4 591-593
differentiation, sexual 4 596-597
hormone 4 589
neurohumors 4 593 594
plants 4 596
stress 4 595
water balance 4 595
Endocrine system 2 157, 4 598*
biochemistry 2 199
parental behavior 11 460-462
radiation injury 11 228
Endocrinology 4 598
Endocyclic echinoid 4 374
Endoderm derivatives digestive system 4 150 175
gastrulation 6 78 79
germ layers 6 174 175
Endodermis 3 495, 4 598 599*, 13 105, 115
Endoenzyme 2 15
Endocrgic reaction 9 199
Endohumus 5 464 465
Endolimax gingivalis 1 300
Endolimax nana 1 300 331
Endolymphatic duct ear 4 319
Endometrial polyps 14 236
Endometritis 11 481
Endometrium 11 474
Endomorphy 1 461
Endomyces 12 1, 14 601
Endomyces vernalis 5 188
Endomycetales *see* Saccharomycetales
Endomycetoideae 12 1
Endomycetidae 3 278
Endomycopsis 12 1, 14 600
Endomycopsis fibuliger 14 602
Endomyxum 8 636
Endopeptidases 5 203
Endophyte 1 236
Endoplasm 3 657
Endoplasmic reticulum 2 588
cytoplasm 3 657-658
plant *metabolism* 10 347
Endopolite 3 564
Endopterygota 4 509
Endoscope 10 18
Endosperm 12 145
Endospores, bacterial *see* Bacterial endospores
Endosteum 12 361
Endothal 4 43, 6 421
Endothecium 5 326 334
Endothelochorial placenta 10 254
Endothelium 5 41-43
Endotheriidae 7 144
Endotherium 7 144, 9 538
Endothermic reaction 5 51, 13 559
nuclear reactions 9 199
Endothia parasitica 3 57, 9 236, 10 513
Endothyranella armstrongi 5 432
Endothyridae 5 431
Endotoxins 14 6
toxemia 14 4 5
virulence 14 330
3, 6 Endoxohexahydrophthalic acid 4 43
Endrin 7 141, 11 615
Energy 4 599 601
absorption 1 11 19, 8 116
atomic 1 652
British thermal unit 2 340
calorie 2 419
chemical 3 27-28
conservation of 3 406 407
for cyclone formation 8 116
degradation 5 10
dissipation by tides 13 640
electrical potential energy 4 601
forms of 13 565
gravitational potential energy 4 600 601
heat 6 362
inertia of 7 90
internal 4 599
kinetic 4 599 600
mass 8 163
nuclear *see* Nuclear power
nuclear fusion 5 591-595
ocean source for atmospheric processes 8 116
potential 4 600 601
of quantum state 4 601
rigid body dynamics 11 575-576
sea-atmosphere exchange 12 103 105
sound 12 518
stored 13 565
thermonuclear 13 590 590
in transition 13 566
units electron volt 4 519
erg 5 64 65
Energy—*cont*
foot-pound 5 429
joule 7 316
work 14 552
Energy bands in solids 2 91-93
Energy conversion atomic to electric 4 432 433
chemical to electric 2 111, 5 550-552
electric to acoustic 7 587-593
electric to heat 6 377 378
electric to mechanical 8 608 609
electric to sound 12 518-522
electric ac to mechanical 1 284-287
electric dc to mechanical 4 226-229
engine 4 603 604
fuel to mechanical 4 603-604
heat (steam) to mechanical 13 78, 85
heat to electric 2 526, 4 432
mechanical to electric 6 113 114
mechanical to electric ac 1 282-284
mechanical to electric dc 4 223
nuclear to electric 9 176 178
power plants 10 554 559
principles of electrical mechanical energy conversion 4 418
solar to electric 12 465 466 469 470 465 466 469 470
solar to mechanical 12 468 469
sound to electric 12 518 522
steam to electric 4 432
thermodynamic cycle 13 564 565
water to electric 4 432
water to mechanical 6 527 529
Energy distribution curves (heat radiation) 6 370 371
Energy flow, ecology 4 592 597
Energy integral (gravitation) 6 265
Energy level (quantum mechanics) 4 601
Energy metabolism (plant) 10 347 349
Energy operator (quantum chemistry) 11 145
Energy pyramid 4 587
Energy sources 4 601-605
atmospheric electricity 4 602
chemical energy 3 27-28
coal 4 602
natural gas 4 601
nuclear energy 4 602
oil shale 4 602
petroleum 4 601
shift in U S sources 8 445
solar energy 12 468
tar sands 4 602
terrestrial heat 4 602
vegetation 4 602
water power 14 396 400
Energy state (quantum mechanics) 13 37
Energy surface 13 59
Energy transfer (plants) 10 371
Enfire array (antenna) 1 447, 451 452
Enfleurage 5 71
Engadine 13 408
Engelhardt, A V 8 642
Engelmann, T W 12 67
Engelmann spruce 13 19
Engine 4 605 604
aerothermodynamic effects 1 103
aircraft *see* Aircraft engine
applications 4 603
automotive *see* Automotive engine
diesel *see* Diesel engine
external combustion 4 605
free piston 14 152
internal combustion *see* Internal combustion engine
marine 8 109 112
mufflers 8 623 624
propulsion 4 605
pulse jet 11 94 95
reciprocating 1 183
rocket 11 601 617
solar 12 468 470
steam *see* Steam engine
supercharger 13 205
thermodynamic cycles 4 604
tractor 14 11
truck 14 129
volumetric efficiency 14 375
wear 7 607
working fluid 4 605
Engine cooling 4 604 605
air cooling system 4 605 604
antifreeze mixture 1 471 472
automotive vehicle 1 688
liquid cooling 4 604

Epigeneticists 7 147
Epiglottis 7 406
Epigyny 5 326 334
Epilachna varivestis 3 287
Epilepsy 5 40 41
convulsive disorders 3 452
electroencephalogram 5 40
etiology 5 40
treatment 5 40
types 5 40
Epileptiform convulsions 14 341
Epilimnion 5 521 534
Epilobium 3 659
Epilobium angustifolium 10 299
Epilobocera sinuatifrons 4 33
Epimartyria 7 460 462
Epimeletic behavior 12 395
Epimerase 2 16
Epimerization 8 580 11 199
Epimeron 3 562 569
Epimorpha 3 61
Epinasty 10 566
Epinephrine 5 41* 6 479 13 565
aortic paraganglia 1 488
in carbohydrate metabolism 1 77
endocrine mechanisms 4 590
hormone adrenal medullary 6 494
synthesis 1 77
tyrosine 14 176
see also Adrenal gland
Epipetaly 5 329
Epiphanes 12 235
Epiphanes (*Hydatina*) *senta* 2 601 11 634
Epiphragm 11 93
Epiphyseal plate 12 353
Epiphysis 9 58 12 365
Epiphyte 1 236 13 565
climax plant formations 3 186 192
orchid 9 572
Epipolasma 3 158
Episepaly 5 329 330
Epistasis 2 327
gene action 6 108
Episternum 12 355
Epistilbite 14 611
Epistome 6 300
Epistroma 4 375
Epistylis 10 20
Episulfide 9 312
Epitheliochorial placenta 10 254
Epitheliocystida 4 349
Epithelium 5 41-45* 6 458 13 631
peritoneum 10 20
Epizootic 5 429 10 256
EPN 7 141
Epoch (astronomy) 13 641
Epoxidation 5 45-44*, 10 469 470
Epoxide 4 117, 5 94
Epoxy ester 9 493
Epoxy resin 5 44*, 10 469
insulation, electric 7 158
lamination 10 466
polyether resins 10 469
Epoxyethane 5 94
Epoxysuccinic acid 5 44
trans L Epoxysuccinic acid 5 44
EPR spectroscopy *see* Electron paramagnetic resonance spectroscopy
Epsilon cell 9 552
Epsom salt 13 254
see also Epsomite
Epsomite 5 44 45
Eptam 6 421
EPTC 6 421
EPUT meter *see* Events per unit-of time meters
Equal arm balance 2 73 74
Equal loudness contours *see* Fletcher Munson contours
Equality algebra 1 239
Equalization frequency response 5 45* 12 520
Equalizer 4 237 5 45*, 8 37
Equanil 6 595
Equation 1 239 240 584
algebra 1 238 240
analytic geometry 1 388
Equation of continuity 5 45 46
relativistic electrodynamics 11 429
Equation of state 14 328
gases 2 126, 6 41 42
statistical mechanics 13 63-65
thermodynamic principles 13 567
Equation of time 4 537
Equations theory of 5 46-47
determinants 4 81 84
linear systems of equations 7 523 525
matrix theory 8 182 184
polynomial systems of equations 10 485
roots 11 626
Equator 5 47
Equator celestial *see* Celestial equator
Equator, galactic *see* Galactic circle
Equatorial bulge 4 349
Equatorial coordinate system (*astronomy*) 1 606-607
Equatorial Countercurrent 1 626 9 247 249
Equatorial gravity value 13, 516
Equiangular spiral antenna *see* Antenna (aerial)
Equidae 4 262 6 488
Equilateral hyperbola 6 585
Equilateral triangle 14 81
Equilenin 5 77, 9 453
Equilibration ear 4 318
Equilibrium, biological 5 47 49
Equilibrium, chemical 5 49 55*, 13 560
activity 5 50
chemical potential 5 49 50
equilibrium constant 5 50 52
extraction 5 156 158
free energy 5 495
heterogeneous equilibria 5 52 55
homogeneous equilibria 5 52
standard states 5 50
see also Chelation Thermodynamics (chemical)
Equilibrium ionic 2 562 5 55 56*
acid and base 1 59
acid base indicator 7 59 61
amphoterism 1 542
electrolyte 4 484
hydrogen ion 6 550 552
hydrolysis 6 557 558
pK 10 252
solubility product constant 12 484
Equilibrium mechanical 13 569
Equilibrium phase 5 54 60* 13 574 575
binary systems 5 55 59
boiling point 2 276
distillation 4 248
efflorescence 4 414
fused salt phase equilibria 5 579-586
interface of phases 7 181
liquid gas equilibrium 5 55 56
liquid liquid phase equilibrium 5 56 57
melting point 8 215
multicomponent systems 5 59 60
phase change at high pressures 6 447
second-order transitions 12 127
silicate phase equilibria 12 312 317
solid liquid phase equilibria 5 57 58
solid solid phase equilibria 5 58-59
Equilibrium phase—cont
solid solutions 12 474
sulfide phase equilibria 13 246 251
see also Thermoanalysis
Equilibrium, thermal 13 569
Equilibrium, thermodynamic 5 10
Equilibrium constant 5 50 52
Equilibrium of *forces* 5 60 61
body equilibrium 5 61
equations of equilibrium 5 61
equilibrium of a particle 5 60
force interaction of bodies 5 61
Newtonian particle laws 5 60
statics 13 54
structural analysis 13 196
in three dimensions 13 56 57
virtual work principle of 14 529
Equilibrium point game theory 6 29
Equilibrium tide 13 633
Equine encephalitides 4 218
Equine encephalitis *see* Encephalitis, equine
Equinox 5 61-62*, 6 125, 10 570 571
Equinoxes precession of *see* Precession of equinoxes
Equipartition theorem kinetic theory 7 555
Equipment obsolescence 10 643
Equipollent displacement 6 165
Equipotential surface 4 541, 10 537
Equisetales 5 62 63*, 10 346
Equisetineae 5 63*, 10 346
Equisetales 5 62-63*, 10 346
Hyenales 5 63 6 572*, 10 346
Sphenophyllales 10 346, 12 607*
Equisetum 4 295, 8 239, 12 607
Equisetum arvense 5 62
Equisetum hiemale 5 63
Equivalence, principle of 11 436
Equivalence point 13 636
Equivalent circuit 5 524, 5 63 64*
transmission line 14 51 52
Equivalent conductance 4 485-486
Equivalent exposure time (noise) 9 127
Equivalent weight 5 64*, 6 247
Equuleus 5 412 413

Entoconcha 6 466
Entocythere 9 447; 10 429
Entodiniomorphida 5 4-5*, 11 53, 13 5
Entodinium 5 5
Entomobrya cubensis 3 290
Entomogenous microorganism 7 122
Entomology 5 5
  see also Insecta
Entomology, economic 5 5-7
Entomophilus flower 5 326
Entomophthora 10 200
Entomophthorales 10 200
Entomostraca 1 560
Entoniscidae 5 34
Entoprocta 1 414, 420, 2 356, 5 7-9*
Entosiphon 5 99
Entosiphon sulcatum 5 99, 8 169
Entropy 5 9 12
  Boltzmann statistics 2 280
  chemical thermodynamics 13 574
  cryogenics 3 573
  degradation of energy 5 10
  information theory 7 101
  liquefaction of gases 7 536
  open systems (biology) 9 333
  of solutions 12 490
  statistical thermodynamics 5 10
  steam 13 77
  thermodynamic equilibrium 5 10
  thermodynamic principles 13 567
Environment 5 12-15
  abiotic 5 13-15
  biotic 5 15
  estuarine 5 82 83
  of past ages *see* Paleoecology
  vegetation 14 287-288
Environment (geological)
  ecology of 9 512-516
  petrographic province 10 50
  petroleum, origin of 10 56-57
  sedimentary deposits 10 87
Environmental design
  component design 13 379
  systems engineering 13 379
Environmental protection 5 15-17
  see also Bioclimatology
Environmental test 5 17-19
  acceleration 5 18
  aircraft *see* Aircraft testing
Environmental test—*cont*
  fungus 5 18
  guided missile 6 291
  humidity 5 18
  immersion 5 18
  pressure 5 18
  sand 5 18
  shock 5 18
  spray 5 18
  temperature 5 18
  vibration 5 18
  see also Rocket-sled testing
Enypnastes 4 40
Enzymatic reduction 1 621
Enzyme 1 365, 3 197-198, 5 19 26*, 8 81
  alcohol dehydrogenase 5 20 22
  amylase 5 20-22
  autolytic 2 20
  bacterial *see* Bacterial enzyme
  biochemistry 2 199
  biological oxidation 2 213
  biological specificity 2 217
  catalase 5 20-24
  classification 5 22
  cleaving 5 23
  condensing 5 23
  food 5 377
  food spoilage 5 428
  gene action 6 105 115
  hyaluronidase 6 522
  hydrolase 5 22
  isomerase 5 24
  kinetics 5 25 26
  lactase 7 377
  nature 5 19 20
  nomenclature 5 20 21
  oxidation reduction enzymes 5 23
  pepsin 5 20 21, 9 628
  phosphohexose 5 20
  phosphorylase 5 20
  protein 11 35 39
  proteolytic 4 167
  purification 5 21
  pyruvic carboxylase 5 20
  radiation effect on 11 217
  specificity 5 21-22
  Streptomycetaceae 13 179
  transaminase 5 20
  transferase 5 24
  urease 5 20 22
  xanthine oxidase 5 20 24
  from yeast 14 604
Enzyme (industrial production) 1 574, 5 26 29*
  applications 5 29
  enzyme recovery 5 28
  production in semisolid culture 5 28
  production by submerged fermentation 5 27
  standardization 5 28
Enzyme inhibition 5 29 30
  antibiotics 5 30
  antimetabolites 5 29 30
  classification 5 29
  in poison 10 436
Enzymes and activators, extracellular 14 350
Eoanthropus dawsoni 10 232
Eobelemnites 4 107
Eocambrian 2 425
Eocanthocephala 5 30-31
Eocene 5 31-32*; 6 136, 142
Eocrinoidea 4 560, 568, 5 32*
Eogyrinus 4 565
Eohippus 5 32
Eoperipatus 9 529
Eosentomidae 11 61
Eoses triassica 7 473
Eosinophil 2 263, 6 484
Eosinophilia 3 192 202
Eosuchia 7 473, 11 484, 13 22
Eotheroides 12 347
Eothrips 13 629
Eotvös, R 11 435
EP agents lubricant 7 605
Epactophanes 6 344
Epalxis 9 276
Epargyreus clarus 7 470
Epaxial musculature 8 652
Epaxial muscles 8 646
Epeirogeny 4 103, 9 409
Ependymal cell 9 42 63
Epeyrthrozoon 11 567
Ephaptic transmission 5 32
Ephedra 5 32*, 6 226, 8 240, 13 121
Ephedra equisetina 5 32
Ephedra sinica 5 32
Ephedrine 5 32
Ephelota 13 237
Ephemerida Insecta fossils 7 139
  mayfly 8 187
Ephemeris 5 32
Ephemeris time 4 535, 13 645*
Ephemeroptera 5 32-33*, 7 134, 8 187
Ephestia 8 171, 676
Ephestia kuehniella 7 468, 472
Ephialtes 6 581
Ephippium 3 151
Ephydatia fluviatilis 10 515
Ephyra 7 304 305, 12 165
Ephyridae 4 212
Epibasidium 6 427
Epibiont 1 341
Epiblast 6 78-79
Epiboly 6 79, 12 90
Epibranchial placode 9 47
Epicanidea 5 33 34
Epicaridium 5 33
Epicauta 3 287
Epicenter *see* Earthquake, Seismology
Epichlorohydrin 3 75
Epichlorohydrin—*cont*
  epoxy resins 10 469
  petrochemical 10 43, 46
Epicoccum 14 628
Epicoccum nigrum 14 629
Epicotyl 12 145, 13 114
Epicyclic gear train 6 91
  automobile differential 6 91
  planetary 10 273
Epicyclic straight line mechanism 13 166
Epicycloid 5 34
Epidemic 5 34*; 11 426
Epidemic typhus 1 434, 10 428
Epidemiology 5 35 36
  case fatality ratio 5 36
  disease rate 5 36
  epidemic 5 34
  experimental 5 36
  foot and mouth disease 5 429
  infectious disease control 7 94
  infectious disease transmission 7 94 95
  morbidity rate 5 35
  mortality rate 5 35
  parasitology, medical 9 556
  poliomyelitis 10 456
  public health 11 90
  tuberculosis 14 130 131
  zoonoses 14 628 629
Epidermal ridges 5 36 37
  arch fingerprint 5 36
  loop fingerprint 5 36
  whorl fingerprint 5 36
Epidermin 5 655
Epidermis 5 41, 7 174
  12 369, 13 114
Epidermis, plant 5 37 39
  bulliform (motor) cells 5 39
  cell walls in plants 2 615
  cuticle 5 37
  cutin 5 37
  leaf anatomy 7 436 441
  multiple epidermis 5 37
  root hairs 5 39
  stomata 5 38
  trichome 5 39
Epidermoid carcinoma 2 348, 8 620, 9 520
Epidermophyton floccosum 6 275
Epidiascope 11 1
Epididymis 11 471, 13 324
Epididymitis 11 482
Epidinium 5 5
Epidiorite 5 39
Epidosite 5 39
Epidote 5 39-40
  allanite 1 255
Epigastric vein 2 500
Epigenesis 4 574

Esox masquinongy 10 213
Esox niger 10 213
Esox vermiculatus 10 213
Esparto 14 443
Espernopsis challengeri 10 431
Essen L. 7 502
Essential oils 5 147, 5 71 72*
clove 5 218
pine oil 10 256 257
plant metabolism 10 350
wood chemicals 14 527
Essexite 10 86, 13 549
Ester 5 72 77
acetate 1 30
citrate 5 146
esterification 5 72 77
ethyl acetate 5 87
fat and oil, nonedible 5 188 190
Grignard reaction 6 270
hydrogenation 6 552
hydrolysis 5 75 75
lactam and lactim 7 577
lactide and lactone 7 580
orthoester 9 413 414
salicylate 12 8
stearate 13 89
see also Carboxylic acid
Ester interchange 14 18
Ester oil 7 604
Ester waxes 14 443
Esterase 5 22
Esterification 5 75 77* 14 18 19
Estes W. K. 7 442
Esthesiometer 13 692
Esthonyx 13 641
Estivation 6 437 440
Estradiol 4 236
17(beta)-estradiol 5 77 6 235 9 455
endocrine mechanisms 4 591
reproductive system 11 477
see also Estrogen
Estragole 10 256
Estriol endocrine mechanisms 4 591
Estrogen 5 77 79* 6 479 11 477 12 367
gonad 6 235
mammary gland 8 85
menstruation 8 225
ovary 9 455
prostate disorders 11 28
reproductive system 11 474
ring B unsaturated 5 77
sex determination 12 228
sterol 13 139
Estrone endocrine mechanisms 4 591
estrogen 5 77
ovary 9 455
reproductive system 11 477
Estrous cycle 5 79
Estrus 5 79 6 255 11 475 476
Estuarine crocodile 5 551
Estuarine oceanography 5 79 84
bar built estuaries 5 82
classification of estuaries 5 79
coastal plain estuaries 5 80 81
deep-basin estuaries 5 81 82
estuarine environments 5 85, 8 108
estuarine sediments 5 83
flushing of estuaries 5 82
halocline 6 525
partially mixed estuaries 5 81
physical structure and circulation 5 80
pollution in estuaries 5 82
salt wedge estuaries 5 80
vertically homogeneous 5 81
Estuarine sediments 5 83 84
Estuarine shipworm 12 291
Estuarine waters (ecology) 5 85* 8 108
clams in 3 152
crabs in 5 550 551
mussels in 8 669 670
oysters in 9 476
shipworms in 12 291
shrimp in 12 508
Estuary *see* Estuarine oceanography Estuarine waters (ecology) Fiord
Eta Aquarids 8 308
Etalon 7 191 192
Etch pits 8 293
Etch printing 13 545
Etching 10 617
metallography 8 294
printed circuit 10 594
Ethane 1 245 249 5 84 85* 6 533
chemical binding 3 25
cryogenic properties 5 572
natural gas 9 5
Ethanol *see* Ethyl alcohol
Ethanol acetone fermentation 2 44
Ethanolamine 1 251, 2 54 7 534
Ethanolamine salt of dinitro *sec* butyl phenol 6 422
beta Ethanolamine 7 534
Etheostoma nigrum 4 13
Ether 5 85 86
dioxane 4 206
ethylene oxide 5 94
nomenclature 9 396
Ether (physics) 5 86
Ether concept *see* Ether hypothesis
Ether drag 5 86
Ether hypothesis 5 86
light 7 500
parity 9 567
Ethion 7 141
Ethionic acid 13 254
Ethiopian Region 14 621 622
Ethoxide 5 86
Ethoxycrotonate 9 414
Ethylenediaminetetraacetic acid 5 41 43
ET *see* Effective temperature
Ethmoid bone 9 167, 12 575
Ethmoid sinus 12 342
Ethoxymethyleneacetoacetic ester 11 112
Ethoxypropylmagnesium bromide 2 246
Ethusa 4 41
Ethusa mascarone americana 4 33
Ethyl acetate 5 86 87*, 12 496, 14 326
Ethyl acetoacetate 5 86 87
condensation reaction 5 373 377
sodioacetoacetate reaction 5 87 88
Ethyl acrylate 10 458
Ethyl alcohol 5 89 91
acetone ethanol fermentation 1 35
Achromobacteraceae 1 39
as antiseptic 1 493
bacterial metabolism 2 58 42
distilled spirits 4 254
fermentation 2 377
industrial fermentation 5 90 91
molasses alcohol 5 90
niacin 9 92
petrochemicals 10 43, 45
phycomycetes 10 201
solvent 12 496
synthetic production 5 90
Ethyl carbinol 11 6
Ethyl cellulose 2 626, 5 85
Ethyl chloride 3 74 10 43 45
Ethyl chloroacetate 5 374
Ethyl crotonate 14 326
Ethyl cyanoacetate 5 374
Ethyl *p, p'* dichlorobenzilate 8 518
Ethyl 2 5-dimethylpyrrole 3 carboxylate 11 131
Ethyl esters 5 74
Ethyl ether 5 86 12 496
2 Ethyl 1, 2 hexanediol 6 223
Ethyl hydroxide *see* Ethyl alcohol
Ethyl indoleacetate 10 340
Ethyl malonate 5 91 93
alkylation reactions 5 92 93
condensation reactions 5 93 5 375-377
Ethyl malonic acid 5 92
Ethyl mercaptan 8 581
Ethyl mercury thiosalicylic acid 1 493
Ethyl *N, N*-di *n* propylthiol carbamate 6 421
O Ethyl *O* (*p* nitrophenyl) phenylphosphonothionate 7 141
Ethyl phosphoralmethyla midocyanidate 9 405
Ethyl radical 1 232
Ethyl salicylate 5 87
Ethyl sorbate 14 326
Ethyl beta aminocrotonate 11 112
bis Ethyl xanthogen 6 423
Ethylaniline 1 305
Ethylate 5 86
Ethylbenzene 6 335, 10 48 coal chemical 3 235 styrene 10 490
meta Ethylbenzoic acid 2 475
ortho Ethylbenzoic acid 2 475
para Ethylbenzoic acid 2 475
ortho Ethylcyclohexylamine 7 63
Ethyldichloroarsine 9 401
Ethylene 1 245 5 93*, 6 533 14 207 209
chemical binding 3 25
infrared spectrum of 7 108 109
petrochemicals 10 45
polyolefin resins 10 486
velocity of sound in 12 515
Ethylene chlorohydrin 5 74 5 93 94*
diene synthesis 4 117
Ethylene dibromide 2 343 344
fumigant 5 561
petrochemical 10 45
Ethylene dichloride 3 74
petrochemical 10 45
Thiokol rubber 11 641
1, 1 Ethylene 2 2'-dipyridylium dibromide 6 423
Ethylene glycol 3 74, 5 93 94* antifreeze mixture 1 471
Ethylene oxide 1 475 5 94* 10 470, 13 136
antibacterial agents 1 463
fumigants 5 561
Grignard reaction 6 270
liquid propellants 11 6
petrochemicals 10 43 45
polyacrylonitrile resins 10 459
see also Dioxane
Ethylene oxide alpha beta dicarboxylic acid *see* Epoxysuccinic acid
Ethylenediamine 5 17
Ethylenediamine cadmium (II) 5 17
Ethylenediaminetetraacetic acid 5 18 5 94 95*
2 Ethylhexanol 1 225

Equus 8 13
Equus asinus 4 262, 8 625
Equus burchelli 14 607
Equus caballus 6 488, 8 625; 11 527
Equus chapmani 14 607
Equus libycus 6 488
Equus przewalskii 6 488
Equus quagga 14 607
Erbium 5 64
electron configuration 4 504
extractive metallurgy 8 277
Erbon 6 425
Erdos, P 9 226
Erebia 7 471
Eremascoideae Saccharomycerales 12 1
Eremascus 12 1
Eremascus albus 14 602
Eremobates pallipes 1 496
Eremophila alpestris 7 405
Eremothecium ashbyi 14 604
riboflavin production 11 561
Erethizon dorsatum 10 513
Erethrontidae 10 513
Erg 5 64 65*, 14 552
Ergasilidae 3 642
Ergastic substance 2 603
Ergastoplasm 2 588 610; 3 654; 9 216
Ergocalciferol 5 378
Ergodic theorem 13 60
Ergodicity 9 118
Ergonomics *see* Human engineering
Ergosterol 5 65*, 7 529, 13 138, 14 343
Ergot 1 248, 574, 4 3, 10 359, 451, 460
Erian Continent 4 86
Erian series 4 88
Erica 3 186
Ericaceae 3 189, 5 65, 12 523
Ericales 5 65*, 10 346
Erichthus 13 151
Erichthus larva 3 566
Ericson, D 8 142
Fridanus 3 412 413
Erikson, E 10 32
Erinaceidae 7 142, 143
Erinnyidae 4 212
Eriocrania semipurpurella 7 461
Eriocraniid 7 461
Eriocraniidae 7 464
Eriopeltocon 13 665
Eriophiidae 14 115
Eriosmatinae 4 291
Eristalis tenax 3 562, 8 680
Erisiphe cichoracearum 13 664
Erlang, A. K. 9 220, 11 188
Erlang, unit of traffic load 3 320, 11 188
Erlang E_1 congestion formula 3 321
Erlang E_2 delay formula 3 321
Erlenmeyer formula 9 3
Ermine moth 7 464
Ernst, E 8 638
Ernst effect 8 638
Eros 1 596-597, 5 65*
measurement of solar parallax 4 356
Erosion 5 65 66*, 6 139-140
along coasts 3 243
cycle of 5 357
in deserts 4 74 77
glacial 3 273, 12 444
gully 12 430 431
processes of 6 164
by rainfall 12 432
rill 12 430 431, 444
off river mouths 4 50
by runoff 12 432
sheet 12 430-431, 444
soil 12 430 433, 435 445
splash 12 444
terracing (agricultural) 13 499
tidal stream effect 9 231
water 12 430 432 444
wind 12 432 444
see also Desert erosion features, Fluvial erosion cycle, Fluvial erosion landforms, Soil erosion
Erosion corrosion (metals) 3 490
Frotsiidae 3 278
Erpodella punctata 1 532
Errantia 1 431 10 461
Error 12 310
Gauss error law 10 632
probability 10 632
Error detector (servomechanisms) 12 200 202
in analytical chemistry 1 394
Error theory 4 247
Erthrocyte 2 263
Erthropus 11 55
Erucic acid 5 190
Erwinia 2 19 5 1 2
Erwinia amylovora 5 546
Erwinia (Bacillus) aroideae 13 663
Erwinia atrosepticа 10 533
Erwinia carotovora 7 478
9 327, 10 307 534
Erwinia nimipressuralis 14 76
Erwinia tracheiphila 3 613
Erwinia vitivora 6 252
Erwiniеae Enterobacteriaceae 5 2
Erwood 4 29
Erwonidae 4 41
Erwonidea 4 30
Eryops 1 335, 11 543, 12 360
Eryopus 12 357
Erysipelas 1 466 467, 12 369, 13 178 340
Erysipelothrix 3 497
Erysipelothrix insidiosa 3 497
Erysipelothrix rhusiopathiae 1 466-467, 2 461
Erysiphaceae Erysiphales 5 66
Erysiphe aggregata 5 66
Erysiphe cichoracearum 5 66, 8 215
Erysiphe graminis 2 99, 5 66
Erysiphe polygoni 5 66, 9 601
Erythema 12 370, 14 186
ultraviolet radiation (biology) 14 188
vesicant 3 44
Erythrinus 13 337
Erythrite 3 246
Erythroblast 6 396 398
Erythroblastosis 1 695
Erythroblastosis fetalis 13 492
blood groups 2 266 269
jaundice 7 302 303
Erythrochampsa 3 553
Erythrocin *see* Erythromycin 1 466
Erythrocruorin 6 411
Erythrocrution 3 565
Erythrocyte 12 565
abnormalities 6 395
blood 2 263
circulation disorders 3 142
hematopoiesis 6 396-398
iron metabolism 7 267
Erythrocytopoietic organ 7 632
Erythrovirosis 3 141 144
Erythrogenic toxin *see* scarlet fever toxin
Erythromycin 1 464 468 475 5 66 67*
antimicrobial spectrum 5 67
dose 5 67
formula 5 66
pharmacology 5 67
therapeutic use 5 67
Erythronium 3 188
Erythrophore 3 99, 9 78
Erythropoiesis 7 630
D Erythrose 1 31, 8 678
D Erythrose 4 phosphate 1 316 10 114, 14 125 176
D(-) Erythrose 2 455
Erythrotrichia 13 545
Erythroxylon coca 3 218
Esaki tunnel diode 5 67
Escalators 5 67 68
Escape system (submarines) 15 215
Escape velocity 5 68
orbital motion 9 372
space vehicles 1 604
Escapement 3 204, 5 68 69*
anchor 3 204, 5 68
balance wheel 5 69
Escapement—*cont*
dead beat 3 204, 5 68
detached lever 5 69
see also Ratchet
Escarpment 5 69
beach scarp 12 392
buried 5 179
coastal plain 5 245
continental slopes 5 423
dissected 10 258
fault line scarp 5 191
fault scarp 5 191
submarine 6 293, 13 216 224
tableland regions 10 264
undissected 10 258
Eschar 11 569
Escherichia 3 1, 69 70*, 7 65*, 9 173
Enterobacteriaceae 5 2
IMViC test 7 49
Pseudomonadaceae 11 64
serological types 5 69
Escherichia coli 1 316 446 467 2 12, 24, 60, 69, 624, 3 229 5 1, 69, 7 530, 8 431, 9 215 11 229, 376, 13 528, 14 178 389
bacteriophage 3 212, 13 85
cell (pressure temperature effects) 2 596
fluorescent antibody method 8 383
RNA nucleotide composition 9 210
spontaneous mutation frequencies 8 675
staphylococcus 13 39
Escherichia coli bacteriophage T 2r 9 212
Escherichia coli bacteriophage T5 9 212
Escherichiese 5 2
Escherichiella californica 2 527
Eschscholtzxanthin 2 527
Escribed circle 1 405
Esdaille, J. 6 594
Esenine *see* Physostigmine
Esker 5 70
Eskimo curlew 5 625
Eskola, P. 4 384, 8 299 301, 12 25
Esocidae 5 225, 10 213
Esophageal gland 4 150 173
Esophageal hiatus hernia 6 4
Esophagus 4 150, 155, 165 5 70*, 9 27
embryology 4 156
Esophagus disorders of 5 70 71
congenital defects 5 70
inflammatory defects 5 71
mechanical lesions 5 71
neoplastic 5 71
vascular lesions 5 71
Esox americanus 10 213
Esox lucius 10 213

pean earwig 4 67, 5 6
pean glossy ibis 7 1
pean gypsy moth 7 472
pean larch 7 404
pean porcelain 10 512
pean rat flea 12 345
pean spruce sawfly 6 580
pean starling 13 54
pean tree sparrow 12 562
pium 5 123
electron configuration 4 504
extractive metallurgy 8 277
ionization potential 4 504
paramagnetism 9 549
otiaceae 5 123
otiales 5 123 124
Elaphomycetaceae 5 124
Eurotiaceae 5 123
Gymnoascaceae 5 123
Onygenaceae 5 123
Terfeziaceae 5 124
Trichocomaceae 5 123
see also Sarcosporidia
urotium 5 123 8 569
uryalae 4 560, 5 124* 9 542
uryapsida 5 124
Protorosauria 11 50 51
urycea 9 38
urycea bulineata 11 470
urycea lucifuga 12 7
Eurychilina subradiata 9 510, 511
Eurychilinidae 9 510
Eurycope 4 41
Eurydice 5 290
Eurygaster 6 410
Eurymylidae 7 382 383
Eurymylus 7 382 383
Eurypanopeus abbreviatus 4 33
Euryphoridae 2 418
Eurypterida 1 557 5 124, 8 244
Eurypygidae 6 286
Eurytomidae 6 574
Euschemon 7 470
Euschemon rafflesiae 7 470
Euschistus 6 410
Euschistus servus 6 405
Euschistus tristigmus 6 405
Euschistus variolarius 6 405
Eusiridae 6 36
Euspongia 13 10
Eustachian tubes 13 613
Eustele 13 105 116
Eusthenopteron 12 360, 361
Eustrongylides 4 202
Eusuchia 5 554
Eutardigrada 5 124 125
Eutectic crystallization of minerals 6 128
Eutectic freezing 5 57
Eutectic systems example of 8 16
Eutely 2 601
Euteuthrynchus 14 122
Euthenics 5 98
Eutheria 1 415 5 125*, 8 82, 13 549
Artiodactyla 1 567 568
Artiodactyla fossils 1 568 569
Astrapotheria 1 601-602
Carnivora 2 522, 525
Carnivora fossils 2 523 524
Cetacea 2 660
Cetacea fossils 2 660 661
Chiroptera 3 63
Chiroptera fossils 3 63 64
Condylarthra 3 394
Dermoptera 4 68
Dinocerata 4 196 197
Edentata 4 411*, 8 82
Edentata fossils 4 411-412
Embrithopoda 4 566
Hyracoidea 6 598
Hyracoidea fossils 6 598 599
Insectivora 7 142 143
Insectivora fossils 7 143 144
Lagomorpha 7 382
Lagomorpha fossils 7 382 383
Litopterna 7 553
Notoungulata 9 171 172
Pantodonta 9 536 537
Perissodactyla 8 82 10 18
Perissodactyla fossils 10 18 20
Pholidota 10 119
Pholidota fossils 10 120
Primates 10 589
Primates (fossil) 10 589 590
Proboscidea 10 636
Proboscidea fossils 10 636 637
Pyrotheria 11 128
Rodentia 11 614
Rodentia fossils 11 614-615
Sirenia 12 346 347
Sirenia fossils 12 347
Taeniodonta 11 386
Tillodontia 13 641
Tubulidentata 14 133
Tubulidentata fossils 14 133
Euthyroidism 6 229
Eutreptia 5 98 99, 8 170
Eutrichosomatidae 6 574
Eutrombicula alfreddugesi 5 59
Eutrophic lake 5 529
Eutypella 14 73
Euxenite 11 342
tantalum 13 591
Euxenite polycrase 14 210
Euxoa 7 470-472
Evadne 5 151
Evania appendigaster 6 581
Evaniidae 6 574
Evans, Oliver 13 166
Evans R M 10 164
Evans, W R 3 434
Evaporated films microcirculatry 8 949
Evaporated milk 8 436
Evaporation 4 247, 5 125*
air cooling 1 146
atmospheric 1 636 637
cooling towers 3 432
from land surfaces 1 637
hydrometeorology 6 561 562
measurement of 1 637
ocean meteorological relations 9 264
over the Mediterranean 8 208
saline water reclamation 12 11
salt lakes 7 557
see also Drying, Sublimation
Evaporator 5 126 127*, 11 415
Evaporite (saline) 5 127 129*, 11 590
anhydrite 1 407
geologic distribution 5 129
gypsum 6 501
halogen minerals 6 524
marine basin evaporites 5 128
mineral formation 8 442
nonmarine evaporites 5 129
ore and mineral deposits 9 380
Permian deserts 10 26
redbed sequences 11 387 388
rock salt 11 599 600
shelf evaporites 5 129
theory of origin 5 128
Evaporite dolomite 4 261
Evapotranspiration 5 129 130
irrigation of crops 7 269 271
mesophytes 5 130
Evasterias troschelii 1 599
Even-even nuclei 9 204
Even-odd nuclei 9 204
Evening grosbeak 6 275
Eventognathi see Cypriniformes
Events per unit-of time meters 13 384 385
Everest 1 577
Everglades 9 151
Evergreen date palm 4 17
Evergreen hardwood forest 5 186-192
Evergreen plants 5 130
Evocator 8 677
Evolution see Animal evolution, Evolution, organic Geochemical evolution, Plant evolution
Evolution, cultural 4 401
Evolution human 1 458
Evolution, organic 5 130 133
animal evolution 1 411 416
biochemical and physiological homology 5 131
Darwinism 5 132
embryonic homology 5 131
evidences of evolution 5 130
fossils 5 132
genetic evidences 5 132
geographic isolation 5 133
geographical distribution 5 131
Lamarckism 5 132
life, origin of 7 496
macroevolution 8 10
microscopic homology 5 131
paleontology 9 520
plant evolution 10 319
population genetics 10 507 512
recombination genetic 11 375
reproductive isolation 5 133
scleractinian corals 12 77
speciation 12 567 571
structural homology 5 130
vestigial structures, homology of 5 131
Evolution plant see Plant evolution
Evolution, stellar see Stellar evolution
Evolution theories earth 4 330
Ewing M 8 142, 146, 552, 13 414, 514
Ewing piston corer 8 146
Ewing s tumor 12 369
Exact science 12 72
Exanthem subitum 5 133
Exarate pupa 5 293
Exarch protostele 5 62
Excavation 5 419
archeological 1 514
blasting 2 255
caisson foundation 2 399
cofferdam 5 267 268
electroosmotic dewatering 4 526
landslide 7 397 398
mining see Mining excavation
tunnels 14 142
wellpoint dewatering 14 472 473
Excavator 5 416 5 133 134
backhoe 5 416, 5 133
bulldozer 2 370 5 417
clamshell 5 133 134
crane 5 416, 5 133 134
dragline 5 416 5 133
dredges 5 417, 4 272
front end loader 5 41 5 134

Ethyllithium 9 402
Ethylphenyldichlorosilane 12 322-323
Ethylsilane 12 320
Ethyltrichlorosilane 12 322 323
Ethynylation 1 37
Etioporphyrin 10 520 521
Etna 5 119, 120
Ettingshausen coefficient 13 586
Ettingshausen effect 6 21, 320
Ettingshausen-Nernst effect 13 586
Eubacteriales 2 70, 5 95-96*
  Achromobacteraceae 1 38
  Axotobacteraceae 1 703
  Bacillaceae 2 1
    bacteria, taxonomy of 2 11
  Brevibacteriaceae 2 330
  Brucellaceae 2 350
  Corynebacteriaceae 3 496
  Enterobacteriaceae 5 1
  Lactobacillaceae 7 580
  Micrococcaceae 8 350
  Neisseriaceae 9 28
  Propionibacteriaceae 11 15-16
    relationship with other orders 5 95
  Rhizobiaceae 11 546
  Schizomycetes 12 65 66
Eubacterium Lactobacillaceae 7 582
Eubasidiomycetes *see* Homobasidiomycetidae
Euboea (Evvoia) 5 116
Eucaine 9 4
Eucairite 12 163
Eucalypt forests 1 671
Eucalyptus 3 189 5 96*, 11 326
Eucalyptus globulus 5 96
Eucalyptus regnans 5 96
Eucarida 3 563, 5 96 97*
  Decapoda (Crustacea) 4 24 34
  Euphausiacea 5 108
Eucaryota 10 320
Eucestoda 5 97*, 10 414
Eucharitidae 6 574
Eucheira socialis 7 471
Euchlora 3 646
Euchromatin 5 108
Eucinetidae 5 278
Eucken, A 12 576
Eucleidae 7 464
Euclemensia 7 467
Euclid 6 152, 154, 7 578, 8 175, 9 224, 623, 13 28
Euclid's books of elements 6 154-155
Euclid's lemma 9 224
Euclid's parallel postulate 6 155
Euclidean algorithm 5 46
Euclidean geometry *see* Geometry, euclidean
Euclidean *n* space 13 681-683
Euclidean space 3 454, 6 150
Eucnemidae 3 277
Eucoelomata 1 420, 5 97
Eucopepoda 2 319
Eucopia 4 40
Eucosmodontinae 8 628
Eucrite 8 315
Eucryptite 13 10
Eucypris 3 563
Eudactylinidae 2 418
Eudaemonema 7 143
Eudimocera 9 537
Eudiplodinium 11 56, 57
Eudocimus albus 7 1
Eudoxus 6 154
Euechinoidea 4 360, 5 97*
  Aulodonta 1 667
    Camarodonta 2 424
    Cassiduloida 2 539
    Clypeasteroida 3 226
    Diadematacea 4 93, 360
    Echinacea 4 359
    Holasteroida 6 463
    Holectypoida 6 463
    Nucleolitoida 9 214-215
    Spatangoida 12 562 563
    Stirodonta 13 141
Eugenia caryophyllata 3 218, 8 683
Eugenia confusa 7 268
Eugenics 5 97-98
  euthenics 5 98
  man's genetic future 5 97
Eugenol 5 71
Euglena 1 235, 699 5 98*, 8 170, 10 181 11 55
Euglena acus 5 98, 8 169
Euglena agilis 8 169
Euglena ehrenbergii 5 98
Euglena gracilis 1 699 2 241, 8 169, 11 58
Euglena haematoides 8 169
Euglena mutabilis 5 99, 8 170
Euglena oxyuris 5 98
Euglena pisciformis 5 99
Euglena polymorpha 5 100
Euglena spirogyra 5 99, 8 169
Euglenida 5 98 100*, 11 52,
Euglenidae 5 277
Euglenoidina *see* Euglenida
Euglenomorpha 5 99
Euglenophyta 1 237, 5 100*, 10 346, 13 545
Euglobulin 2 221, 5 533, 6 215
Euglypha 12 28
Euglyphidae 13 524
Eugregarinida 5 100*, 6 269, 11 52
Euhedral crystal 7 11
Euheterochlorina 6 427
Eukalyptorhynchia 11 542
Eukrohnia fowleri 4 40
Eukrohnia hamata 3 2
Eulamellibranchia 5 100-101*; 8 559
Euler, Leonhard 3 303; 5 34, 6 253, 8 176; 9 224
Euler angles 5 101
  Cayley Klein parameters 2 577
Euler's constant 2 179
Euler's equations of motion 5 101-102
  gas dynamics 6 50
  hydrokinetics 6 539
  rigid body dynamics 11 574
Euler's formula 3 303, 4 317
Euler's function 9 224
Euler's gamma function 4 127
Euler-Lagrange equations 2 406
Euler line 3 130
Euler's momentum theorem 5 102
Euler's parameters 11 186
Euler's period 6 123
Euler's theorem on homogeneous functions 7 444
Eulerian angles quaternions 11 186
Eulerian motion 4 329, 6 123
Eulittoral zone 8 107
Eulophidae 6 574
Eulycopersicon 13 665
Eumalacostraca 5 102 105
  Eucarida 5 96-97
    Hoplocarida 6 479
    Pancarida 9 527 529
    Peracarida 10 1-2
    Syncarida 13 367
Eumeces 12 373
Eumelibranchia 3 251
Eumenes 6 582 12 405
Eumetazoa 1 420 5 105*
  11 213
Eumetopias jubata 12 98
Eumycetes 5 105-108*, 8 678, 10 198
  Ascomycetes 1 574, 5 106-108
    asexual reproduction 5 106
    Basidiomycetes 2 107, 5 106 108
    Fungi 5 561
    Fungi Imperfecti 5 106-108 562
    heterokaryosis 5 108
    mycelium 5 106
    parasexuality 5 108
    pattern of sexuality 5 107
    Phycomycetes 5 106-108
    product of sexual fusion 5 107
    sexual reproduction 5 107
Eumycophyta 5 105, 561, 10 346, 13 545
  see also Eumycetes
Eumycota 10 320
Eunectes murinus 2 272, 12 390
Eunice 1 432, 10 461
Eunicidae 10 461
Funicites 1 432
Eunicites avitus 1 432
Eunuchoidism 11 481
Euomphalacea 6 76
Euonymus 7 437, 12 25
Eupatagus 4 359
Eupelmidae 6 574
Eupharynx bairdi 12 2
Euphausia 5 105
Euphausia diomedeae 12 122
Euphausia gibba 12 121
Euphausia hemigibba 12 121
Euphausia lucens 12 122
Euphausia superba 5 108
Euphausiacea 3 563, 4 25 39 5 108
Euphausiid 12 121 122
Euphorbia antisyphilitica 5 35
Euphorbiaceae 2 538 544 3 190, 11 646
  tung tree 14 137
Euphotic zone 5 14
  sea water fertility 12 120
Euphrasia 10 536
Euphrosinidae 10 461
Euphydryas 7 471
Euplanaria 11 420
Euplectella 6 432, 7 638
Euplectella oweni 6 435
Euplerus 11 19
Eupleura caudata 2 294
Euploidy 5 113
Euplotes 6 595 11 54 59
Eupnea 11 526
  respiratory system 11 526
Eupodidae 1 24 14 113
Eupronoe 6 586
Euproopacea 14 563
Euproops *lasca* 14 565
Eupteryx 7 469
Eurasian land mass 1 576
Eureka Station Artic 1 524
Eurete 6 434 435
Europa 7 324
Europe 5 108 123
  climate 5 109
  climatic regions of 5 113
  coal fields (location) 8 448 449
  coal fields (maps) 8 453 455
  coal resources (table) 8 454
  drainage patterns 5 129
  geoid of 13 518
  land patterns 5 109
  maritime patterns 5 109
  oil and gas fields (locations) 8 447
  physical map 5 110 113
  physiographic regions 5 111-112
  resources of 4 345
  rivers 5 121 122
European ash 1 567
European beech 2 150
European chicken flea 12 345
European cuckoo 5 612

remely high frequency band 1 260
rinsic conductivity 12 167
nsse scalar muscles, natomy 8 654
rinsic semiconductor *see* emiconductor
rorse 5 530
rusion 5 160 162
ceramics 2 648
plastics 10 404-406
powder metal forming 8 296
rusive rock 7 10
petrology 10 84
pyroclastic rocks 11 116
structures 14 553
Exudates (petroleum) *10 60*
Eye 5 162 171
anatomy and histology 5 *167-170*
biochemistry 2 199
choroid 5 169
ciliary body 5 168 169
cornea 5 167
disorders *see* Eye disorders
embryology 5 162 167
glasses *see* Eye glasses
iris 5 164, 168
lens 5 168
luminosity curve 7 25
metabolism 12 566
photoreception 10 180
radiation injury (biology) 11 227
retina 5 169
Eye—cont
sclera 5 169
spectral sensitivity 12 586
vision 14 554 559
Eye disorders 5 171 172
blindness 2 261
cataract 2 549 550
conjunctivitis 3 401, 5 171
inclusion blennorrhea 5 171 7 55
Iridocyclitis 5 171
keratitis 7 556
optic atrophy 5 171
optic neuritis 5 171
pink eye 5 171
Eye glasses 5 172 173
correction of astigmatism 1 6
diopter 4 205
Eyeglass hearing aid 6 556
Eyepiece 5 173
compensating 5 173
gun sights 6 298
Huygens 5 173
Kellner 5 173
orthoscopic 5 173
Ramsden 5 173
Eyespot 12 180
Eyeworm 5 254 260
Eyler, R W 8 367
Eyre Lake 1 671 672
Eyring C. 12 60
Eyring H 7 557
Eyring equation 7 557
Eysenck, H J 10 53

Excavator—*cont.*
power shovel 3 416, 5 133 134, 12 306
scraper 3 417
suction dredge 3 417
trencher 3 416, 5 134
Excelsior formation 14 84
Excenter 1 405
Excess 3 binary code 4 176
Exchange energy, Heisenberg 5 230 231
Exchange forces inter molecular 7 195
Exchange integral ferromagnetism 5 230 231
Exchange reaction 11 300
Excipulaceae *see* Discellaceae
Excitation 5 134
acetylcholine 3 139
myogenic 3 139
neurogenic 3 139
spectrochemical analysis 12 587
Excitation energy 5 134
Excitation potential 5 134 135
Excitation radiation 10 396
Excitation-transfer collisions 12 56 57
Excited state 5 135
heat radiation 6 369-370
isomerism 7 280 281
Exciton 5 135-136
earth (heat flow) 4 333
photoconductivity 10 141
photoemission 10 154
Exciton induced photo conductivity 10 141
Exciton 5 136 137
Excluded middle, law of 7 578
Exclusion principle 5 137
cohesion in solids 3 269
electron 5 137
electron configuration 4 503
Fermi Dirac statistics 5 215 216
ferromagnetism 5 230 231
free electron theory of metals 5 500
nuclear structure 9 203, 207
Excretion 5 137 143
aglomerular kidnes 5 140
endocrine mechanisms 4 595
insect physiology 7 125
Exfoliation rock 5 143
Exhaust, automotive 8 623 624
Exhaust fan *see* Fan
Exhaust noise aircraft 1 187
Exhaust ventilation 14 293
Exhaustion range (semiconductors) 12 167
Exhaustive methylation amine 1 306
diene synthesis 4 117
Exine wall 5 330-332
Exocarp 5 514
Exotrolana 5 290
Exocoetidae 5 363
Exocorallanidae 5 291
Exocrine cell 4 589, 9 529
Exocrine gland 5 41-43
Exoctelic echinoid 4 374
Exoderms *see* Hypoderms
Exoenzymes 2 19
Exoergic reaction 9 199
Exoerythrocytic form (Haemosporidnda) 6 313 317
Exogeosynclines 6 174
Exogone 1 428, 10 462
Exoniorphism (petrology) 10 84
Exopeptidases 5 203
Exopodite 4 564
Exophyphus 12 363
Exopterygota 5 143, 11 88
Exophthalmic goiter 4 235, 6 229 13 626, 627
see also Hyperthyroidism, Thymus gland
Exophaeroma thermophilum 7 283
Exosphere 1 608, 629
formation of 1 631
geochemical significance 1 630
Exosporium 2 14 14 128
Exosporium palmariarum 14 128
Exosporium tiliae 14 128
Exostosis 12 368
Exothea paniculata 7 268
Exothermic reaction 9 199 13 559
Exotoxin *Staphylococcus* 15 37
toxemia 14 4 5
toxin, bacterial 14 6
virulence 14 329 330
Expanding universe 3 510* 6 9
Expansion, thermal *see* Thermal expansion
Expansion fan Prandtl Meyer 10 564
Expansion joints thermal 13 552
Expansion tank hot water heating system 6 491
Expansion valve refrigeration 11 415
Expansion waves 14 430
Expectation values 11 170 172
Expectations probability 10 629 630
Experiment 5 143 145, 12 73
analysis 5 145
design of 13 75
error 5 143
experimental designs 5 144 145
experimental error 5 145
interpretation 5 145
Experiment—*cont.*
planning experiments 5 144
Experiment, factorial 5 145
Experimental designs completely randomized design 5 144
factorial experiment 5 145
incomplete block 5 145
latin square design 5 144
randomized complete block design 5 144
split-plot design 5 145
Experimental stress analysis 10 149 151
Exploded view illustration 10 215
Explorer I 14 265
Explorer III 14 265
Explorer IV 14 265
Explosion 5 145-153
blast wave 5 146 148
detonation wave 5 148 150
dust explosion 5 153
gas explosion 5 153
seismic wave 12 147
shock wave 12 294 298
Explosion, nuclear *see* Nuclear explosion
Explosion and explosive 5 145 153
azide 1 702
blasting 2 255
combustion 3 306 307
deflagration 5 148
detonation 5 148
detonator 4 81 5 152
mining excavation 8 484
primer 10 592
propellant 5 152 153
shaped charge 12 241 242
Explosive bomb 1 530
Explosive forming 5 153 154
shaped charge 12 241 242
sheet metal 12 251
Explosive fuse *see* Fuse explosive
Explosive shattering machine 12 351
Exponent 5 154 155
algebra 1 239
differentiation 4 120 130
logarithms 7 574 575
Exposure photography 10 161
Exposure index 10 157
Exposure meter 2 431 5 155
see also Photovoltaic cell
Express highway 14 13 15
Expressing (food) 5 588
Expressivity gene 5 155*, 6 512 9 618
Expressway 14 14
Expulsion fuse 5 578
Exterior ballistics *see* Ballistics exterior
External combustion engine 4 603
External galaxy *see* Galaxy external
External gear pump 9 495
Externalization of time 3 506
Exteroceptor 12 177, 179
Extinction coefficient 1 12, 12 582
Extracellular enzymes and activators 14 330
Extraction 5 156 158
gas chromatography 6 46 49
leaching 7 422 423
see also Solvent extraction
Extractive distillation 4 2-3
Extraembryonic membrane 5 88, 5 158, 241
allantois 1 256, 5 158
amnion 1 329*, 5 158
Amniota 1 329 329
chorion 5 88, 5 158
placentation 10 2-3
Reptilia 11 492
serosa 5 158
volk sac 5 158, 14 665
see also Fetal membrane
Extragalactic nebula *see* Galaxy external
Extraordinary index 5 500
Extraordinary ray 5 500
Extrapolation 3 620 631, 5 158 159
see also Interpolation
Extrapyramidal systems corticopallidal system 8 615
corticopontine systems 8 615
corticotectular systems 8 615
corticostriatal system 8 615
motor systems 8 615 12 590
Extrasensory perception (ESP) 5 159 160
clairvoyance 5 159
criticism of 5 160
clairvoyance 5 160
forms 5 159
mental telepathy 5 159
precognition 5 159
psychokinesis 5 160
Extraterrestrial radio waves 11 215 247
Extratropical cyclones 13 162 164
atmospheric flow 1 642
hurricane 6 521
life cycle of 8 342
Extrauterine pregnancy 11 480 481
Extraxylary fiber 12 70
Extreme pressure additives lubricant 7 603

Extremely high frequency band 11 260
Extrinsic conductivity 12 167
Extrinsic ocular muscles, anatomy 8 654
Extrinsic semiconductor *see* Semiconductor
Extrorse 5 530
Extrusion 3 180 182
ceramics 2 648
plastics 10 404-406
powder metal *forming* 8 286
Extrusive rock 7 10
petrology 10 84
pyroclastic rocks *11 316*
structures 14 353
Exudates (petroleum) 10 60
Eye 5 162-171
anatomy and histology 5 167-170
biochemistry 2 199
choroid 5 169
ciliary body 5 168 169
cornea 5 167
disorders *see* Eye disorders
embryology 5 162 167
glasses *see* Eye glasses
iris 5 164 168
lens 5 168
luminosity curve 7 23
metabolism 12 566
photoreception 10 180
radiation injury (biology) *11 227*
retina 5 169
Eye—*cont*
sclera 5 169
spectral sensitivity 12 586
vision 14 551 559
Eye disorders 5 171 172
blindness 2 261
cataract 2 549 550
conjunctivitis 5 401, 5 171
inclusion blennorrhea 5 171, 7 55
iridocyclitis 5 171
keratitis 7 536
optic atrophy 5 171
optic neuritis 5 171
pink-eye 5 171
Eye glasses 5 172 175
correction of astigmatism *1 6*
diopter 4 205
Eyeglass bearing and 6 556
Eyepiece 5 175
compensating 5 175
gun sights 6 294
Huygens 5 175
Kellner 5 175
orthoscopic 5 175
Ramsden 5 175
Eyespot 12 180
Eyeworm 3 259 260
Eyler, R W 8 367
Eyre, Lake 1 671 672
Eyring C 12 60
Eyring H 7 557
Eyring equation 7 557
Eysenck, H J 10 53

Excavator—*cont*
power shovel 3 416, 5 133-134, 12 306
scraper 3 417
suction dredge 3 417
trencher 3 416, 5 134
Excelsior formation 14 84
Excenter 1 405
Excess-3 binary code 4 176
Exchange energy, Heisenberg 5 230 231
Exchange forces' intermolecular 7 195
Exchange integral
ferromagnetism 5 230-231
Exchange reaction 11 300
Excipulaceae *see* Discellaceae
Excitation 5 134
acetylcholine 3 139
myogenic 3 139
neurogenic 3 139
spectrochemical analysis 12 587
Excitation energy 5 134
Excitation potential 5 134-135
Excitation radiation 10 396
Excitation transfer collisions 12 56-57
Excited state 5 135
heat radiation 6 369 370
isomerism 7 280 281
Exciton 5 135 136
earth (heat flow) 4 333
photoconductivity 10 141
photoemission 10 154
Exciton induced photoconductivity 10 141
Exciton 5 136 137
Excluded middle, law of 7 578
Exclusion principle 5 137
cohesion in solids 3 269
electron 5 137
electron configuration 4 503
Fermi-Dirac statistics 5 215 216
ferromagnetism 5 230 231
free electron theory of metals 5 500
nuclear structure 9 203, 207
Excretion 5 137 143
aglomerular kidney 5 140
endocrine mechanisms 4 595
insect physiology 7 125
Exfoliation, rock 5 143
Exhaust automotive 8 625 624
Exhaust fan *see* Fan
Exhaust noise aircraft 1 187
Exhaust ventilation 14 298
Exhaustion range (semiconductors) 12 167
Exhaustive methylation amine 1 306
diene synthesis 4 117
Exine wall 5 330 332
Exocarp 5 541
Exocetoidea 5 290
Exocoetidae 5 363
Exocoetallandae 5 291
Exocrine cell 4 589, 9 529
Exocrine gland 5 41 43
Exocyclic echinoid 4 374
Exoderms *see* Hypoderms
Exoenzymes 2 19
Exoergic reaction 9 199
Exoerythrocytic form (Haemosporoinida) 6 313 317
Exogeosynclines 6 174
Exogone 1 428, 10 462
Exomorphism (petrology) 10 84
Exopeptidases 5 203
Exopodite 5 564
Exopophysis 12 363
Exopterygota 5 143, 11 88
Exophthalmic goiter 4 235, 6 229, 13 626 627
see also Hyperthyroidism, Thymus gland
Exosphaeroma thermophilum 7 283
Exosphere 1 608, 629
formation of 1 631
geochemical significance 1 630
Exosporium 2 14, 14 128
Exosporium palmivorum 14 128
Exosporium tiliae 14 128
Exostosis 12 368
Exothea paniculata 7 268
Exothermic reaction 9 199, 13 559
Exotoxin Staphylococcus 13 37
toxemia 14 4 5
toxin bacterial 14 6
virulence 14 329 330
Expanding universe 5 510*, 6 9
Expansion thermal *see* Thermal expansion
Expansion fan Prandtl Meyer 10 564
Expansion joints thermal 13 552
Expansion tank hot water heating system 6 491
Expansion valve refrigeration 11 415
Expansion waves 14 470
Expectation values 11 170 172
Expectations probability 10 629 630
Experiment 5 143 145 12 73
analysis 5 145
design of 13 75
error 5 145
experimental designs 5 144 145
experimental error 5 145
interpretation 5 145
Experiment—*cont*
planning experiments 5 144
Experiment, factorial 5 145
Experimental designs completely randomized design 5 144
factorial experiment 5 145
incomplete block 5 145
latin square design 5 144
randomized complete block design 5 144
split-plot design 5 145
Experimental stress analysis 10 149 151
Exploded-view illustration 10 215
Explorer I 14 265
Explorer III 14 265
Explorer IV 14 265
Explosion 5 145 153
blast wave 5 146 148
detonation wave 5 148-150
dust explosion 5 153
gas explosion 5 153
seismic wave 12 147
shock wave 12 294-298
Explosion nuclear *see* Nuclear explosion
Explosion and explosive 5 145 153
azide 1 702
blasting 2 255
combustion 3 306 307
deflagration 5 148
detonation 5 148
detonator 4 81 5 152
mining excavation 8 484
primer 10 592
propellant 5 152 153
shaped charge 12 241 242
Explosive bomb 1 536
Explosive forming 5 153 154
shaped charge 12 241 242
sheet metal 12 251
Explosive fuse *see* Fuse explosive
Explosive shattering machine 12 451
Exponent 5 154 155
algebra 1 239
differentiation 4 120 130
logarithms 7 574 575
Exposure photographs 10 161
Exposure index 10 157
Exposure meter 2 431 5 155
see also Photovoltaic cell
Express highway 14 13 15
Expressing (food) 5 388
Expressivity gene 5 156*
6 512 9 618
Expressways 14 14
Expulsion fuse 5 578
Exterior ballistics *see* Ballistics exterior
External combustion engine 4 603
External galaxy *see* Galaxy external
External pair production 9 495
Externalization of time laws
Exteroceptor 12 177 179
Extinction coefficient 12 12 592
Extracellular enzymes and activators 14 353
Extraction 5 156 158
gas chromatography 6 46 49
leaching 7 422 424
see also Solvent extraction
Extractive distillation 4 82
Extraembryonic membrane 5 88, 5 159 241
allantois 1 256, 5 159
amnion 1 258*, 5 159
Amniota 1 258 259
chorion 5 88, 5 158
placentation 10 253
Reptilia 11 492
serosa 5 159
yolk sac 5 158 14 665
see also Fetal membrane
Extragalactic nebula *see* Galaxy external
Extraordinary index 5 590
Extraordinary ray 5 588
Extrapolation 3 629 631 5 158 159
see also Interpolation
Extrapyramidal systems corticopallidal system 8 615
corticopontine system 8 615
corticorectticular system 8 615
corticostriatal system 8 615
motor systems 8 615 12 506
Extrasensory perception (ESP) 5 159 160
clairvoyance 5 159
criticism of 5 160
telepathy 5 160
forms 5 159
mental telepathy 5 159
precognition 5 159
psychokinesis 5 160
Extraterrestrial radio waves 11 243 247
Extratropical cyclone 15 162 164
atmospheric low 5 642
hurricane 6 521
life cycle of 8 532
Extrauterine pregnancy 11 480 481
Extravalvate fiber 12 70
Extreme pressure additives lubricant 7 603

y high frequency band

: conductivity 12 167
: ocular muscles
ny 8 654
c semiconductor *see*
onductor
e 5 530
on 5 160 162
amics 2 648
astics 10 404 406
wder metal forming
8 286
ive rock 7 10
etrology 10 84
yroclastic rocks
11 116
tructures 14 353

Exudates (petroleum) 10 60
Eye 5 162 171
anatomy and histology
5 167 170
biochemistry 2 199
choroid 5 169
ciliary body 5 168 169
cornea 5 167
disorders *see* Eye disorders
embryology 5 162 167
glasses *see* Eye glasses
iris 5 164 168
lens 5 168
luminosity curve 7 23
metabolism 12 566
photoreception 10 180
radiation injury (biology)
11 227
retina 5 169

Eye—*cont*
sclera 5 169
spectral sensitivity 12 586
vision 14 534 539
Eye disorders 5 171 172
blindness 2 261
cataract 2 549 550
conjunctivitis 5 401, 5 171
inclusion blennorrhea
5 171; 7 55
iridocyclitis 5 171
keratitis 7 536
optic atrophy 5 171
optic neuritis 5 171
pink eye 5 171
Eye glasses 5 172 173
correction of astigmatism
1 6
diopter 4 205

Eyeglass hearing aid 6 556
Eyepiece 5 173
compensating 5 173
gun sights 6 298
Huygens 5 173
Kellner 5 173
orthoscopic 5 173
Ramsden 5 173
Eyespot 12 190
Eyeworm 5 259 260
Eyler, R. W 8 567
Eyre, Lake 1 671 672
Eyring, C. 12 60
Eyring, H 7 357
Eyring equation 7 357
Eysenck, H J 10 53

F

F actin 8 642
$F B_2$ herbicide 6 425
F band 3 295 297
F band (color centers) 3 294 297
F centers 3 294 297, 582
F corona 4 381 13 270 271
F distribution statistics 13 74
F_1 layer 1 628
F_2 layer 1 628
f number optical lenses 7 451-453
F region 1 99, 628 629
F_1 region 1 99
F_2 region 1 99, 608
F test of significance 1 387 *11 142*
F9F 8 12 262
F 89 1 536
F 101 1 536
F 102 1 536
F 105 1 534 535
F 106 1 536
Faber O 12 457
Fabric diagram (rock) 10 49
Fabrica 10 462
Fabricated parts design standards 4 78
Fabricating process, *metal* 8 286
Fabrication polymer properties 10 477
Fabrication processes sheet metal parts 12 249 253
Fabricius 8 506
Fabry Perot filter 7 182 183
Fabry Perot interferometer 7 192 193
Face 1 596
Face (mining) 8 486
Face centered cubic lattice 2 338 339 3 594 595
Face centered orthorhombic lattice 3 594 595
Faceted cuts (*gem*) 6 182
Facial ganglion 9 47
Facial nerve 3 537, 9 557
embryology 9 47
Facies (geology) 5 175 177
bathyal facies 9 512
biofacies 5 175
facies maps 5 175
lithofacies 5 175
metamorphic 10 87
mineral (defined) 8 299
nerisse *facies* 9 513
petrology 10 83
sedimentary 12 142
Facing (lathe) 7 407-409, 8 6
Facsimile 2 94, 5 177-178*
see also Telephotography
Factor theorem algebra 1 240
Factorial experiment 5 145
Factoring 1 240
Factorization 5 46
Facula (astronomy) 13 279
Facultative anaerobic bacteria 13 1
Fading 1 363 11 320, 13 458
Faecal pellets 12 134
Fagaceae 2 129, 5 178, 10 480
Fagales 5 178*, 10 346
beech 2 129
Betulaceae 5 178
birch 2 247 248
Fagaceae 5 178
Fagaras Alps 5 118
Fagopyrum esculentum 2 360
Fagopyrum sagittatum 10 472
Fagus 5 188
Fagus grandifolia 2 129
Fagus pendula 2 130
Fagus sylvatica 2 130
Fagus sylvatica purpurea 2 130
Fahrenheit temperature scale 13 486 487
Faience 10 546
Fail safe principle 1 165
Failure (rock) 5 191 195, 11 593
compressive strength at *4 613*
earthquake 12 149
fault and fault structures 5 192
Fairbairn H W 11 599
Fairchild Scanagraver *10 613*
Fairchild Teletype-setter 5 545
Fairwater planes 13 212
Fairy fly 6 574
Fairy shrimp 1 435
Fake color work 10 608
Falciform ligament 4 154
Falconidae 5 178 6 345
Falconiformes 1 694, 5 178 179*
eagle 4 318
hawk 6 345
vulture 14 377
Falk flexible coupling 3 526
Falkland Currents 1 626 12 530
Falkland Islands 12 530
Fall cankerworm 7 472
Fall line 5 179*, 9 147
Fall line peneplain 5 179
Fall salmon 12 14
Fall webworm 7 472
Falling film still 4 253
Falling sphere viscometer 14 333
Fallopian tube 5 179*, 14 236
histology 11 474
Fallout, radioactive *see* Radioactive fallout
Fallout shelter *see* Radiation shelter
False ant loving flower beetle 3 277
False blister beetle 3 277
False chinch bug 6 405
False click beetle 3 277
False clown beetle 3 276
False darkling beetle 3 277
False firefly beetle 3 277
False ladybird beetle 3 276
False longhorn beetle 3 277
False metallic wood boring beetle 3 277
False powder-post beetle 3 277
False scorpion 1 496
False skin beetle 3 278
False snout beetle 3 278
False stripe 2 99
False tiger beetle 3 276
Falsifusus 9 54
Falsipollex 9 510
Falsipollex laxivelatus 9 511
Family (taxonomy) 13 404
Fammenian Stage 4 87
Fan 5 179 181
axial 5 179
blower 5 179
centrifugal 5 179
ducted *see* Ducted fan
exhaust 5 179
marine 8 122
noise control 9 124
propeller 5 180
warm air heating *system* 14 385
Fan beam radar 11 204
Fanconi's syndrome 8 258
Fanglomerate 1 533, 5 599
Fankhauser G 2 602
Fannia canicularis 8 680
Fannia scalaris 8 680
Fanning equation (fluid flow) 5 343, 6 54
Fanning friction factor 4 145
Fanning mill 1 133
Fanno flow: gas dynamics 6 54
Far infrared radiation 7 105
Farad 5 181
absolute 4 458
Faraday, Michael 4 454, 462, 5 86, 181, 8 19 9 363, 369
Faraday constant 1 650 651*, 4 464 465
Faraday dark space 6 215-216
Faraday effect 5 181 183
as birth of physical optics 9 369
diamagnetic 5 182
ferrites 5 221
gyrators 6 303
magnetooptics 8 67
microwaves 8 418
observation of domains 5 253
paramagnetic 5 182 183
Faraday's law *of electrolysis* 3 517, 4 464, 473
Faraday's law *of induction* 5 183*, 9 572
Faraday rotation *see* Faraday *effect*
Farallon de Pajaros 14 348, 352
Farinales 5 183*, 10 346
Farm electrification *see* Rural electrification
Farm machinery *see* Agricultural machinery
Farm structures *see* Agriculture (structures)
Farming *see* Agriculture
Farnesol 13 497
Farnesyl bromide 13 20
Farrar, J 4 175
Farrea 6 432, 434
Farrow 6 460
Farrowing stall 13 340
Farsightedness *see* Hyperopia
Fascicles 4 52, 13 140
Fascicular cambium 13 118
Fasciculus muscle 8 636
Fasciola hepatica 5 183
Fasciolasis 5 183
Fasciolopsiasis 5 183 184
Fasciolopsis buski 5 183
Fast breeder reactor 11 356
Fast color 4 297
Fast coupling 3 525
Fast reactors 9 186
Fast red GG salt 4 300
Fastener, adhesive 1 68

F

F actin 8 642
F B_1 herbicide 6 423
F' band 3 295 297
F band (color centers) 3 294 297
F centers 3 294 297, 582
F corona 4 381, 13 270 271
F distribution statistics 15 74
F_1 layer 1 628
F_2 layer 1 628
f number optical lenses 7 451 453
F region 1 99 628 629
F_1 region 1 99
F_2 region 1 99 608
F test of significance 1 587 11 142
F2F 8 12 282
F 89 1 536
F 101 1 536
F 102 1 536
F 103 1 534 535
F 106 1 536
Faber, O 12 457
Fabric diagram (rock) 10 49
Fabrica 10 462
Fabricated parts design standards 4 78
Fabricating process metal 8 286
Fabrication polymer properties 10 477
Fabrication processes sheet metal parts 12 249 253
Fabricius 8 506
Fabry Perot filter 7 182 183
Fabry Perot interferometer 7 192 195
Face 1 396
Face (mining) 8 486
Face-centered cubic lattice 2 338 339 3 594 598
Face-centered orthorhombic lattice 3 594 595
Faceted cuts (gem) 6 102
Facial ganglion 9 47
Facial nerve 3 537 9 537
embryology 9 47
Facies (geology) 5 175 177
bathyal facies 9 512
biofacies 5 175
facies maps 5 175
lithofacies 5 175
metamorphic 10 87
mineral (defined) 8 299
neritic facies 9 513
petrology 10 85
sedimentary 12 142
Facing (lathe) 7 407-409, 8 6
Facsimile 2 94, 5 177-178*
see also Telephotography
Factor theorem algebra 1 240
Factorial experiment 5 145
Factoring 1 240
Factorization 5 46
Facula (astronomy) 13 279
Facultative anaerobic bacteria 13 1
Fading 1 363 11 320, 13 438
Faecal pellets 12 134
Fagaceae 2 129, 5 178, 10 480
Fagales 5 178*, 10 346
beech 2 129
Betulaceae 5 178
birch 2 247 248
Fagaceae 5 178
Fagaras Alps 5 118
Fagopyrum esculentum 2 360
Fagopyrum sagittatum 10 472
Fagus 3 188
Fagus grandifolia 2 129
Fagus pendula 2 130
Fagus sylvatica 2 130
Fagus sylvatica purpurea 2 130
Fahrenheit temperature scale 13 486 487
Faience 10 546
Fail safe principle 1 163
Failure (rock) 5 191 195, 11 591
compressive strength at 4 613
earthquake 12 149
fault and *fault* structures 5 192
Fairbairn, H W 11 599
Fairchild Scanagraver 10 613
Fairchild Teletype setter 3 545
Fairwater planes 13 212
Fairy fly 6 574
Fairy shrimp 1 435
Fake color work 10 608
Falciform ligament 4 154
Falconidae 5 178 6 545
Falconiformes 1 694, 5 178 179*
eagle 4 518
hawk 6 545
vulture 14 577
Falk flexible coupling 3 526
Falkland Currents 1 626 12 530
Falkland Islands 12 530
Fall cankerworm 7 472
Fall line 5 179*, 9 147
Fall line peneplain 5 179
Fall salmon 12 14
Fall webworm 7 472
Falling film still 4 253
Falling sphere viscometer 14 553
Fallopian tube 5 179*, 14 256
histology 11 474
Fallout, radioactive *see* Radioactive fallout
Fallout shelter *see* Radiation shelter
False ant loving flower beetle 3 277
False blister beetle 3 277
False chinch bug 6 405
False click beetle 3 277
False clown beetle 3 276
False darkling beetle 3 277
False firefly beetle 3 277
False ladybird beetle 3 276
False longhorn beetle 3 277
False metallic wood boring beetle 3 277
False powder post beetle 3 277
False scorpion 1 496
False skin beetle 3 278
False snout beetle 3 278
False stripe 2 99
False tiger beetle 3 276
Falsifusus 9 34
Falsipollex 9 510
Falsipollex laxivelatus 9 511
Family (taxonomy) 13 404
Fammenian Stage 4 87
Fan 5 179 181
axial 5 179
blower 5 179
centrifugal 5 179
ducted *see* Ducted fan
exhaust 5 179
marine 8 122
noise control 9 124
propeller 5 180
warm air heating system 14 385
Fan beam radar 11 204
Fanconi's syndrome 8 258
Fanglomerate 1 533, 5 399
Fankhauser, G 2 602
Fannia canicularis 8 680
Fannia scalaris 8 680
Fanning equation (fluid flow) 5 343, 6 54
Fanning friction factor 4 145
Fanning mill 1 353
Fanno flow gas dynamics 6 54
Far-infrared radiation 7 105
Farad 5 181
absolute 4 458
Faraday, Michael 4 454 462, 5 86, 181, 8 19 9 563, 569
Faraday constant 1 650 651*, 4 464-465
Faraday dark space 6 215 216
Faraday effect 5 181 185
as birth of physical optics 9 569
diamagnetic 5 182
ferrites 5 221
gyrators 6 303
magnetooptics 8 67
microwaves 8 418
observation of domains 5 255
paramagnetic 5 182 183
Faraday's law of electrolysis 5 517, 4 464, 475
Faraday's law of induction 5 183*, 9 572
Faraday rotation *see* Faraday effect
Farallon de Pajaros 14 548, 552
Farinales 5 183*, 10 346
Farm electrification *see* Rural electrification
Farm machinery *see* Agricultural machinery
Farm structures *see* Agriculture (structures)
Farming *see* Agriculture
Farnesol 13 497
Farnesyl bromide 13 20
Farrar, J 4 175
Farrea 6 452, 454
Farrow 6 460
Farrowing stall 13 340
Farsightedness *see* Hyperopia
Fascicles 4 52, 13 140
Fascicular cambium 13 118
Fasciculus muscle 8 636
Fasciola hepatica 5 183
Fasciolasis 5 183
Fasciolopsiasis 5 183 184
Fasciolopsis buski 5 183
Fast breeder reactor 11 356
Fast color 4 297
Fast coupling 3 525
Fast reactors 9 186
Fast red CC salt 4 300
Fastener, adhesive 1 68

Fastener, mechanical bolt 2 276
clevis pin 3 169 170
cotter pin 3 510
coupling 3 525 526
key 8 5
screw *see* Screw fastener
snap ring 12 300
taper pin 13 392
Fat absorption 7 531
animal feed composition 1 427
digestion 7 531
chemurgy 3 54
hydrogenation 6 553
hydrolysis 6 559
microbial *see* microbial fat
necrosis 4 22 24
steatorrhea 7 531
synthesis 8 265
see also Adipose tissue, Connective tissue, Lipid
Fat and oil, edible 5 184-188
alcohol 1 225
animal fats 5 187
animal feed composition 1 426
butter 2 379
chemical constitution 5 184
cotton 3 511
glycerol 6 220 221
margarine 8 101
mayonnaise 5 187
microbial fat 5 188
nutritive value 5 184
olive 9 317
production methods 5 186
salad dressing 5 187
spoilage factors 5 185
testing procedures 5 185
vegetable oil 5 187
Fat and oil, nonedible 4 290, 5 188 190*
alcohol 1 225
analysis 5 188 189
hydrogenation 5 190
glycerol 6 220 221
lanolin 7 399
sources and isolation 5 189 190
structure 5 188
see also Carboxylic acid
Fat cell 3 402 403
Fate maps, embryonic 5 190 191*, 2 257
embryology 4 568
gastrulation 6 78 79
Fathom 8 188
Fathometer 14 429
Fathometer *see* Echo sounder
Fatigue, bone 2 284 286
stress concentration 13 185
Fatigue, human *human engineering* 6 496
Fatigue, metal 5 191, 275 276
aircraft 1 92 93
Fatigue, metal—*cont*
repeated loads 7 569
springs 13 17
Fatra, Great 5 118
Fatra, Little 5 118
Fatty acid 5 188
bacterial aerobic oxidation 2 30
bacterial biosyntheses 2 52 60
change in length of chain 7 533
degradation of 7 534
essential fatty acids 7 533
pantothenic acid 9 538
transport of 7 533-534
triglyceride 14 91
unsaturated fatty acid formation 7 533
see also Carboxylic acid, Metabolism, Nutrition
Fatty alcohols hydrogenation 6 552
production 12 408
Fauces 8 619
pharyngeal 4 165
Faucial tonsil *see* palatine tonsil
Faulkner, William 1 552
Fault and fault structures 5 191 195
classification 5 192, 13 416 417
dynamics of 13 416 417
earthquake 4 352
fault line 5 191
fault line scarp 5 191
fault scarp 5 69 191
fault zones 12 149
graben 6 243 244
gravity faults 5 193
horst 6 493
mechanics of 5 192
petroleum reservoirs 10 67
rift valley 11 570
strike slip faults 5 193
thrust faults 5 194
underground water flow 13 18
Fault breccia 2 326 5 191
Fault location bridge 3 137
Fauna (marine) 4 59 60
Fauna 12 76
Fauna pallida 12 77
Fauld corals 12 77
Faunites 12 76
Faunoturbo 5 261 12 329 13 381
Faxa Fiord 5 114
Fayalite 9 317 11 129
Fcc *see* Face centered cubic lattice
Fear 4 585 585
Feather (bird) 5 195 197
after feather 5 195
barbicel 5 195
barbule 5 195
calamus 5 195
Feather (bird)—*cont*
color 5 197
contour 5 195
development 5 195
down 5 195
filoplume 5 195
lipochrome 5 197
Melanins 5 197
molting 5 196
plumule 5 195
rhachis 5 195
structural colors 5 197
teleoptile 5 195
vane 5 195
Feather duster worm 10 461
Feather key 8 5
Feather mite 12 29
Feather star 1 567, 5 547, 4 559
Feather-winged beetle 3 276
Feathering (air propeller) 11 10
Feathertop Mountain 1 671
Fecal analysis 5 200
Fecal urobilinogen 5 199
Fecal wastes 4 42
Feces 5 200, 5 198*
Fechner, G 11 77
Feder, H 1 599
Federow, R S 3 596
Feed additive *see* Feed supplement
Feed supplement 2 2
animal feed composition 1 426
chlortetracycline 3 85
swine production 13 341
see also Antibiotic
Feed water 5 198
see also Boiler feed water
Feedback, acoustic 1 520
current 5 199
cybernetics 3 637
degenerative 5 198 200
distortion reduction 4 257
motivation 8 606 607
negative 5 198 200
positive 5 198 200
regenerative 5 198 200
Feedback circuit 5 198 200
amplifier feedback 1 147 666 5 198
control systems 3 429
effect on frequency response 5 199
oscillator feedback 5 200 9 439 440
parasitic oscillation 9 558
servomechanisms 5 200 12 198
voltage 5 199
Feedback control system 5 200
chemical process control 3 31
heat exchanger 3 32
negative *see* Negative feedback
servomechanism 12 198 205
Feedback control system—*cont*
see also Control system, Servomechanism
Feeding and digestion 10 93
Feeding mechanisms and digestion 5 200 206
Feedstuffs, livestock 1 120 121
animal feed composition 1 426
chemical composition 1 12
digestibility 1 121
formulation 1 121
proximate analysis 1 120
see also Antibiotic
Chlortetracycline
Feger sums 8 179
Fehling's reagent 1 293 2 42
Fehrenbach, C 1 616
Fejér theorem 12 191
Fejér transformation bounds 7 165
Feldhofer cave 9 21
Feldman, W H 13 179
Feldspar 5 206 214
abrasive 1 9
albite 1 225 5 211 213
alkali feldspars 5 209 212
analbite 5 211
andesine 1 397, 5 213
anorthite 1 451 5 211
anorthoclase 1 451 5 212
antiperthite 5 211 212
in arkose 1 532
authigenic 1 674 5 206
bytownite 2 581 5 214
ceramic technology 2 818
chemical composition 5 207
color 5 207
crystal structure 5 206 209
gem stone 6 98
labradorite 5 213
lead, isotopic composition 7 428
mechanical properties 5 207
melting point 5 208
in meteorites 9 355
microcline 5 209 8 340
microcline type twinning 5 208
monalbite 5 211
morphology 5 207
occurrence 5 207
oligoclase 5 213, 9 315
optical properties 5 207
orthoclase 5 210 9 415
perthite 5 211 212
plagioclase feldspars 5 212 214
properties 5 207 209
sanidine 5 209
twinning in 5 207 208
solid state chemistry 12 476
species 5 207
Feldspathic shale 12 241
Feldspathoid 5 214*, 7 422
Feldspathoidal monzonite 7 443

dspathoidal syenite 7 480
idae 2 523, 545 7 391, 455, 28, 636 640
is 8 693
is celsus 2 545
is concolor 5 515
is domestica 2 523
is leo 7 529
is onca 7 391
is pardalis 9 272
is pardus 7 455
is tigris 13 640
l H B 4 362
oidea 2 522
ric minerals 5 214, 7 17 18
sinotherium 12 547
site 5 214*, 11 590
t 5 252
ting 13 540 541
noral artery 2 485
noral gland 12 61
noral hernia 6 425
nonnen Lake 5 215
nur 13 602
sac 6 425
ace lizard 7 564
achyl alcohol 10 236
nestellidae 2 558
nestra vestibuli 4 319
nn W O 8 640 641
nn effect 8 643
nnel 5 214 215* 12 615
nnoscandian stage 10 525
nske M R 4 251
nster fault and fault structures 5 194
nusa ulmi 6 380
s-de lance 5 215
rham 5 564
rberite 5 215* 14 138
ré C 11 75
restromatopora 13 191
rgusonite 11 342
rhat Akat S 10 126
· Fermat P 9 225 362
rmat s last theorem 9 225
rmat s principle electron optics 4 514
light 7 503
minimal principles 8 471
rmat's theorem 9 224
rmentation 2 7 4 254
5 215* 13 527
Acetobacter suboxydans see *Acetobacter suboxydans fermentation*
Acetone butanol see Acetone butanol fermentation
Acetone-ethanol see Acetone ethanol fermentation
alcohol see Ethyl alcohol
antibiotic 1 464
bacteria 2 7
2 3 Butanediol 2 377
chlortetracycline 3 83
Fermentation—*cont*
citric acid 3 146
cocoa powder and chocolate 3 252
cycloserine 3 643
diphosphopyridine nucleotide (DPN) 4 207
enzyme (industrial production) 5 27
epoxysuccinic acid 5 44
food engineering 5 397 398
food manufacturing 5 411
fumaric acid 5 560
gallic acid 6 18
gluconic acid 6 217
itaconic acid 7 297
itatartaric acid 7 297
kojic acid 7 369
lactic acid 7 378 379
plant 10 325
riboflavin 11 561
sewage solids 12 219
tea 13 405
vinegar 14 324
wine 14 506
yeast 14 601
Fermi E 2 171 3 48 502 5 215 9 550 11 365 12 162
Fermi Dirac statistics 5 215 217
applications 5 216 217
distribution function 5 215 216 12 166
exclusion *principle* 5 137
free electron theory of metals 5 499
Fermi distribution 5 216
Fermi energy 13 301 554
exclusion *principle* 5 137
free electron theory of metals 5 499
semiconductors 12 166
Fermi gas 5 217
Fermi interaction 4 543 544
Fermi level 5 255
Fermi plots 11 286
Fermi selection rules 12 162
Fermi statistics see Fermi Dirac statistics
Fermi surface 2 338 339
Fermion 4 543 544 11 163
Fermium 4 504 5 217* 14 67
Fern 2 561 5 264
Fernald M L 10 377
Fernando Island 1 107
Fernleaved beech 2 130
Fernow B E 5 461
Fernulina 2 315
de Ferranti S Z 4 462
Ferran L 5 47
Ferrate ion 7 259
Ferret 5 217
Ferret aircraft 4 521
Ferriamphiboles 1 336
Ferribacterium 12 309
Ferric compound 5 217 218
Ferric ion 7 258
Ferric oxide ferrite 5 219, 9 552
Ferricyanic acid 5 218
Ferricyanide 5 218
Ferrimagnetic garnets 5 219
Ferrimagnetic resonance 8 46
Ferrimagnetism 5 216 219*
Curie temperature 5 623
ferrimagnetic garnets 5 218
ferrites 5 219 220
ferromagnetism 5 231
Néel theory 5 219
neutron diffraction 9 90 91
Ferrite 2 650, 5 219 220*, 7 258
in antennas 1 445
applications 5 220 222
commercial types 5 219 220
ferrimagnetism 5 218 219
lattice positions 5 220
magnetic ceramics 2 650
magnetic materials 8 34 35
in stainless steel 13 34
steel 6 379 13 90
superexchange forces 5 219 220
Ferrite devices 5 220 222
antenna cores 5 221
attenuators 5 221
circulators 5 221, 6 303
computer elements 5 222
duplexer 6 303
ferrimagnetic garnets 5 218
filter inductors 5 221
flyback transformers 5 221
gyrator 6 303
i f transformers 5 221
inductors 5 221
isolators 5 221 6 303
loading coils 5 221
memory cores 5 221
modulators 5 221
recording heads 5 221
spinel crystal structure 5 220
switching cores 5 221
temperature controls 5 221
wide band transformers 5 221
yttrium iron garnet 5 218
Ferritic steels 13 89
Ferroalloy 5 222 224
ferrochrome 5 104
ferromanganese 8 86
manganese 8 87
steel manufacture 13 93-102
Ferroamphiboles 1 336
Ferroan boracite 2 290
Ferrobacillus 12 309
Ferrobacillus ferrooxidans 2 28 12 309
Ferrocarril 2 222
Ferrocene 3 548, 5 641, 6 550 7 259, 9 403
Ferrochromium 5 104, 5 223
Ferrocinium ion 7 259
Ferrocyanic acid 5 224
Ferrocyanide 5 224
Ferroelectric material barium titanate 13 653
Ferroelectricity see Ferroelectrics
Ferroelectrics 5 224 229
antiferroelectric crystals 5 227 229
barium titanate 2 96 97
crystal structure 5 227
Curie Weiss law 5 623 624
dielectric properties 5 226
ferroelectric domains 5 224 226
ferroelectric hysteresis 5 225 226
pieroelectric properties 5 226 227, 10 219
pyroelectricity 11 117
spontaneous polarization 5 223 224
Ferromag magnetic alloy 7 265
Ferromagnet see Ferromagnetism
Ferromagnetic materials 10 23
Ferromagnetic relaxation magnetic 8 43
Ferromagnetic resonance 8 45 46
ferrite 5 221
yttrium iron garnet 5 218
Ferromagnetic susceptibility 13 330 332
Ferromagnetism 5 229 234
Barkhausen effect 2 98
Bitter powder patterns 5 232 233
Bloch wall 5 232
contrasted with antiferromagnetism 1 470
crystalline anisotropy energy 5 231
Curie temperature 5 623
ferromagnetic domains 5 229 234
ferromagnetic susceptibility 13 330 332
ferrimagnetism 5 219
Hall effect 6 321
Heisenberg theory 5 230
hysteresis 6 509
magnetic materials 8 34
magnetochemistry 8 54
neutron diffraction 9 90 91
particle shape anisotropy 5 233 234
second-order transition 12 127
Weiss theory 5 229 230
Ferromanganese 5 223, 8 86
Ferromolybdenum 5 223, 8 563
Ferrophosphorus 10 135
Ferropyr electrical resistance alloy 7 265
Ferrosilicon 5 223
Ferrosilicon process 8 19 20

Ferrosilite 9 419
Ferrottanium 5 223
Ferrotungsten 14 138
Ferrous chromite 3 105
Ferrous compound 5 234
Ferrous ion 7 258
Ferrous oxide 9 352
Ferrovanadium 5 223, 14 268
Ferroxcube 5 220
Ferroxdur 5 220, 8 35
Ferruginous bauxite 2 113
Ferruginous laterite 7 407
Ferruginous sediments 12 140
Fertile isotopes nuclear fuels 9 184-187
Fertile materials nuclear fuels 9 184 187
Fertility reproductive system 11 479
Fertility, sea water *see* Sea water fertility
Fertility, soil (defined) 12 429
Fertilization 4 415, 5 234-236*, 333, 6 302, 7 227, 11 450 454
biological specificity 2 217
embryology 4 567 568
embryology, experimental 4 571
fecundity 5 235
gestation period 6 182
menstruation 8 225
ovum 5 235
pregnancy *10 578-579*
process of 5 235
prostate gland 11 28
reproductive behavior 11 456
reproductive system 11 462
syngamy 5 234, 13 373
variations in fertilization 5 234
zygote 5 234
Fertilization, abnormal 4 573 574
Fertilization, plant 5 333, 11 454
Fertilization membrane embryology, experimental 4 571
ovum 9 460
Fertilizer 1 122, 5 236 239*
gypsum 6 301
lime (industrial) 7 514 515
manufactured fertilizers 5 236 239
methods of application 12 430
mixed 5 238
natural 5 236
nitrogen 5 237
nutrient supply in soil 12 429 430
phosphate 10 135
phosphate rock 1 489
phosphorus 5 237 238
potassium 5 238
Fertilizer—*cont*
trace elements 5 239
urea 14 215
Fertilizin 5 235
Fertilizing (agriculture) 5 239-241
application methods 5 239
effect on growth and yield 5 240
equipment 5 240
fertilizers 5 241
grades 5 239
physical forms 5 239
value 5 239
Ferto, Neusiedler, Lake 5 115
Fescue 5 241
Festuca 5 190
Festuca arundinacea 5 241
Fetal hemoglobin hematopoiesis 6 396 398
Fetal hydrops 2 268
Fetal membrane 5 241 242
allantois 1 256, 5 241
amnion 1 328, 5 241
chorioallantois 5 241
chorion 3 88, 5 241
yolk sac 5 241, 14 605
see also Extraembryonic membrane
Fetch 9 8, 259
Fetometamorphism Coleoptera 3 275-288
Feuerbach's theorem nine point circle 5 130
Feulgen reaction 13 53
Fever 5 242
thermotherapy 13 596
Feynman, R P 4 462 11 148
FFAG synchrotron *see* Fixed field, alternating gradient synchrotron
FIA analysis oil 9 279
Fiber, animal 5 250-253
Fiber, man made 5 242 246
cellulosic 5 243
dyeing 4 311
inorganic 5 245
polyacrylic 5 244 245
polyacrylonitrile resins 10 459
polyamide 5 245 244
polyamide resins 10 460
polyester 5 244
polyolefin 5 244 245
polyvinyl 5 244 245
specialty 5 245
textiles 13 532 541
see also Polymer
Fiber, natural 5 246 253
animal 5 250 253
bast 5 249 250 12 79
bleaching 2 258 259
cashmere 2 538
coir 3 270
cotton 5 511, 5 246 249
dyeing 4 311
flax 5 297
Fiber, natural—*cont*
linen 7 526
llama 7 564
mohair 8 530
pina 10 252
ramie 11 334
silk 5 252 253
textiles 13 532-541
vegetable fibers 5 246 250
vicuna 14 323
wool 5 250-252
see also Polymer
Fiber, optical *see* Optical fibers
Fiber, wood 12 79, 14 528 531
Fiber bundle (algebraic) 5 253-254
Fiber crops 5 254
Fiber electrometer 4 268
Fiber flax 5 297
Fiber K 5 215
Fiber metal forming 8 286
Fiber-reactive dye 4 308 309
Fiber tracheid 12 79, 14 524
Fiberboard flameproofing 5 294
Fibonacci, Leonardo 14 611
Fibrin 3 195, 655, 5 254
Fibrinogen 2 264, 3 195, 5 254*, 12 198, 565, 13 614
Fibrinogen level, blood 3 195
Fibroadenoma 2 525
Fibroblast 2 264, 5 402 403
Fibrocartilage 2 554
Fibroid tumor 11 481, 14 236
Fibrolite 12 326
Fibroma 9 320
Fibromyositis 11 545
Fibrosarcoma 9 320
Fibrosis 2 525 3 141 144
Fibrositis 11 545
Fibula 1 428, 7 448
Ficaria 10 532
Ficin 5 27
Fick, A 4 143
Fick's laws of diffusion 4 147* 11 300 367
Ficus 3 187 5 37, 12 129
Ficus carica 5 257
Ficus elastica 5 38
Ficus sycamorus 7 441
Fiddler crab 3 531, 536, 4 53
Fidelity 5 254
Fido fog control 14 457
Fiducial probability statistics 13 71
Fieber, F 6 400
Fiedler's myocarditis 6 360
Field (oil and gas) *see* Oil and gas field development
Field (physics) *see* Electric field, Electromagnetic field, Electrostatic field, Gravitational field, Magnetic field
Field artillery 1 535 539
Field cricket 9 416
Field cultivator 1 129
Field effect transistor 14 38
Field emission 5 254 256
Field-emission microscope 5 255 256
Field-emission tubes 5 254 255
Field-enhanced emission 5 256
Field equations relativistic gravitation 11 457 458
Field gray slug 12 343
Field intensity, electric 4 457, magnetic 8 30, measurement (radio broadcasting) 11 219
Field ion microscope 5 256
Field sparrow 12 562
Field theory, classical 5 253 256
Field theory, quantum *see* Quantum field theory, unified *see* Unified field theories
Field winding 14 504 505
direct-current generator 4 223
direct-current motor 4 226
Fieraster 1 598, 6 466
Fiery serpent 4 270
Fièvre boutonneuse 5 257*, 10 428, 13 15
Fig 5 257
Fig insect 6 574
Fig wasp 6 581
Fighter aircraft 1 531 532
Fighting conch 3 361
Fighting stromb 3 361
Figitidae 6 574
Fiji disease 13 243
Filament fiber, man made 5 242
Filament structures electron tube 13 555
Filar micrometer 1 612 615
Filariasis 4 218, 5 257 258*, 10 428
biology 5 258
diagnosis 5 258
epidemiology 5 258
mosquito 8 509
occurrence 5 258
pathogenesis 5 258
Filaroidea 5 258 260
diagnosis 5 259
diseases 5 259
life cycle 5 259
mansonellosis 5 258 260
microfilaria 5 259
morphology 5 258
Filbert 5 260* 9 232
File test hardness hardness scales 6 337
Filicales 5 260 264*, 10 346
alternation of generation 5 262
sporangium 5 260
structure 5 260
Filicineae 5 264*, 10 346
Coenopteridales 10 346
Filicales 10 346
Marattiales 10 346

ese—cont
phioglossales 9 542,
10 346
mia 6 536
s 1 476
milk 8 436
1 67, 5 264*
sum 9 495
aper manufacture 9 540
olymer properties 10 477
ubber 11 636
itanium dioxide 13 653
metal brazing 2 322 323
weld 14 464
g fabric 13 534
(photographic) 10 156-
5
Agfacolor 10 167
Anscocolor 10 167
cameras 2 428 431
color 10 166 168
Ektachrome 10 167
emulsions 10 156-157
high speed 10 157
Kodachrome 10 167
motion picture 3 123 129,
9 353 358
orthochromatic 10 157
panchromatic 10 157
radiography 11 302
roll 10 157
safety 10 156
X ray 10 157
see also Photographic
materials
lm (plastics fabrication)
10 403 404
lm badge 5 264 265
lm deposition processes
printed circuits 10 594 597
lm flow liquid helium 6 593
lm Library Instantaneous
Presentation 10 148
lm magazine *see* Magazine
film
ilm packs 2 430
ilm radiography 11 304
ilm type resistor 11 498
Filmotype 3 348
Filoplume 5 195
Filopodia 11 31 60
Filter, acoustic 5 265 266*
8 623 624
Filter air *see* Air filter
Filter Christiansen *see*
Christiansen filter
Filter color 3 301 302 5 266*,
13 460
Filter electric 5 266 271
band pass 5 267
band stop 5 267
constant k 5 269
decoupling 5 269
high pass 5 267
image parameter 5 270
L section 5 268
LC 5 268
Filter, electric—*cont*
low pass 5 266
m-derived 5 270
mechanical 5 271
microwave 5 271
noise measurement 9 132
133
pass band 5 267
power supply 10 561
radio noise 9 130
RC 5 268
recurrent ladder structures
5 268
ripple voltage 11 580
smoothing 5 271
stagger tuned 5 271
stop band 5 267
tapped delay line 5 271
transmission characteristics
5 267
twin T 5 269
Filter optical 7 181 185
see also Birefringent
filter Filter, color; Interfer-
ence filter, optical
Filter photometry 12 585
Filter press 5 272
Filter sand 12 22
Filtering (food) 5 387
Filtrable viruses animal 1 424
taxonomy 14 527 528
Filtration (industrial) 5 271
273
cake filters 5 272
centrifugation 2 634
clarification 5 134
dust and mist collection
4 295
filter press 5 272
gas solid filters 5 271
gravimetric analysis 6 262
ore dressing 9 391
petroleum processing 10 68
rotary vacuum filters 5 272
separation (mechanical)
12 186
solid liquid filters 5 271
272
water treatment 14 407 408
Filtration sterilization 13 136
Fimbriae 5 179
Fimbriae tubae reproductive
system 11 474
Fin fold theory 12 357
Finch 5 273* 12 562
Finding circuit see Lockout
circuit
Findland Gulf of 5 114
Fine grained soils electroos
motic dewatering 4 526
Fine structure (spectral lines)
5 273
hydrogen atom 1 657-658
molecular structure and
spectra 8 549 550
Fine structure (spectral lines)
—cont
quantum electrodynamics
11 148 150
Fine structure constant atomic
constants 1 651
precise value 5 273
quantum electrodynamics
11 149
Fineness 12 550
Finger lakes 5 273*; 9 149
Finger lakes stage 4 87
Fink truss 14 121
Fingerprint 5 273 276
classification 5 275
epidermal ridges 5 57
forensic medicine 5 441
hand 6 533
human genetics 6 507
integument 7 174 177
latent prints 5 276
patterns 5 274
Fining glassmaking 6 206
Finishing (leather and fur)
7 447
Finishing (metal) buffing
2 362
forging 5 470
grinding 6 271
spinning 12 618
Finishing (textile) 13 536 539
Finishing (wood) 14 533
Finite differences 7 217 218
Finite dimensional case
9 539 540
Finite series 12 189
Finite spaces 10 625 626
Finland M 4 54 13 244
Finsler geometry 6 164
Finsteraarhorn 5 119
Fiord 5 277
circulation in *marginal sea*
9 250
coasts 3 215 244
deep basin estuary 5 81 82
Europe 5 114 115
Greenland 1 524
New Zealand 3 672
Newfoundland 1 524
North America 9 159
South America 12 526
Fiordland 3 672
Fir 5 277 278*, 13 113
Fire 5 12 15 278
see also Flame
Fire ant 1 437 6 581
Fire assaying 1 593
Fire beetle 5 277
Fire blight disease 5 546 549
9 606, 11 190
Fire bomb *see* Incendiary bomb
Fire brick 2 330
Fire cherry 3 56
Fire clay 3 161* 11 409
kaolinite 7 330
Fire colored beetle 3 277
Fire control systems 5 280 281
air armament 1 537
antiaircraft system 5 280
autopilot 1 690
bomber defense systems
5 281
computing optical sight
5 280
interceptor aircraft systems
5 281
mechanisms 1 537
naval artillery systems
5 291
see also Missile guidance
systems
Fire detector 5 278
Fire extinguisher 5 278 280
dry chemical 5 279
Fire hydrant 14 406
Fire lane 5 451 455
Fire line 5 451 455
Fire opal 9 332
Fire point 5 296
Fire refined copper 3 467
Fire resistance in wood 14 538
Fire resistant coatings 5 295
Fire sprinkling system *see*
Sprinkler automatic
Fire tube boiler 5 282
feed water 2 275
gas tube 5 282
locomotive 5 282
marine 8 102
Scotch marine 5 292
Fireball atomic bomb 1 648
flying saucers 5 363 364
nuclear explosion 9 181 185
Firebrat 12 533, 13 629
Firecracker fuse 5 579
Firedamp 8 339
detection 12 3
Firefly 5 282
Firefly beetle 3 277
Firestone 13 152
Fireworks 11 128
Firing ceramic technology
2 650 7 349
Firn snow field 12 391
First aid poisoning 14 6
skin decontamination
(radioactive) 4 38
First degree burn 2 373
First law of thermodynamics
adiabatic processes (mete
orology) 1 633
First order *reaction* 7 355
First order transition 5 283*
12 126
Firth of Forth 5 114
Firth of Lorne 5 114
Fischer E 2 454, 5 242, 13 126
402
Fischer F 5 283
Fischer indole synthesis 2 450
7 62
Fischer Tropsch process 5 283
284* 6 542 12 467

Fischer-Tropsch process—*cont*
alcohol 1 225
alkane 1 249
catalysts 3 248, 5 283
see also Bergius process
Fish 5 284
adaptation 12 395
agonistic behavior 12 397
allelomimetic behavior 12 396
behavior 12 395
breeding behavior 12 396
communication 12 396
migration 12 396
school 12 397
social behavior 12 396
social life 12 396
see also entries on specific fish
Fish (oil well) 9 293
Fish and seafood products
canned 5 418
cured 5 419 420
fish meal and oil 5 420
fresh 5 416
frozen 5 417
Fish collagen glue 6 219
Fish crow 3 556
Fish hawk 6 345
Fish louse I 531, 2 319 320
Fish maggot 7 476
Fish meal and oil production 5 420
Fish oil vitamin A source 14 340
vitamin D source 14 343
Fish tapeworm II 66, 13 393
Cyclopoida 3 642 643
Fishbone antenna *see* Antenna (aerial)
Fisher, R A I 461, 6 498, 505
Fisher, W 4 377, 10 431
Fisher 5 284
Fisheries Baltic Sea 2 89
Bass Strait 7 59
management 4 400
North Sea 9 165
production of 8 112 115
world catch 8 112
Fisheries conservation 5 284 287
management 5 286 287
marine 8 115 116
problems 5 285 286
Fisheries management geology 4 400
Fishes, the *see* Pisces (constellation)
Fishing tools (oil well) 9 293
Fishing vessel 12 262
Fishlike reptile II 484
Fissility 12 213
argillite 1 529
black shale 2 253
diagenesis in shales 4 94 95
metamorphic rocks 8 298
in slate 12 374
Fissility parameter 5 287
Fission, nuclear 5 287-290
atomic bomb 1 648
chain reaction 3 6, 5 288
critical mass 3 550
delayed neutrons 9 85-86
electron capture 4 503
neutrons 9 84
nuclear explosions 9 184
nuclear fuels 9 184-186
nuclear power 9 193 196
nuclear reactors 11 349
nuclear structure 9 204-205
radioactive fallout 11 266-268
radioactivity 11 273-275
radioisotope production 11 313
reactor physics 11 364-370
Fission bomb *see* Atomic bomb
Fission fungi 2 5, 5 475, 9 525-527, 12 65 66
Fission-fusion bomb 1 648
Fissionable material 9 184-187
Fissipeda 2 522 523
Fissium alloy nuclear reactor 11 360
Fissure polygons 10 472
Fissure of Rolando 12 502
Fissurellidae I 591, 7 519
Fistula 1 492
bladder 14 220
Fistuliporidae 2 358
FitzGerald, G F 5 290
FitzGerald Lorentz contraction 5 290*, 11 434
Fix navigation *see* Navigation fix
Fixation nitrogen *see* Nitrogen fixation
Fixative microtechnique 8 405
Fixed altitude radiosondes 8 318
Fixed bias 2 185
Fixed coil voltmeter 14 370
Fixed communications radio telephony 1 564
Fixed field alternating gradient synchrotron 9 573 581*
Fixed field accelerator 9 573 581*
Fixed field cyclotron 9 576 577
Fixing photography 10 163
Fixture design *see* Jig, fixture and die design
Fizeau H L 7 502, 504
Flabellifera I 462 5 290 291*
Flabelligeridae 10 462
Flabellum distinctum 12 77
Flacherie Lepidoptera 7 469
Fladen Ground 9 165
Flagellata *see* Mastigophora
Flagellum 2 63 8 168 169
Flagging stone 13 152
Flame 5 291 293
Bunsen flame 5 292
burning velocity 5 293
Flame—*cont*
combustion 3 306-307
electrical conduction in 4 450
flameholder 5 292-293
flameproofing 5 294 295
Flame cell 5 139
Flame cutter machining operations 8 7, 14 469
Flame front combustion chamber 3 307
Flame fusion process 6 100 101, 12 169
Flame hardening 13 514
Flame machining 13 685
Flame photometry 5 294
Flame plating 9 472
Flame resistance textile 13 540
Flame safety lamp 12 3
Flame spectroscopy 12 591 592
Flame spinel 6 99
Flame-spray process 8 283, 285
Flame thrower 7 54
Flameholder 5 292-293
Flameproofing 5 294-295
Flamina Gorge 9 157
Flamingo 5 295
Flannel moth 7 464
Flannelette 13 537
Flaps wing 14 517
Flare (optics) 6 184
Flare (solar) 13 280 287
Flaser rock 5 295 296*, 8 296
Flash aging textile printing 13 542
Flash attachments cameras 2 431 432
Flash bulb *see* Photoflash lamp
Flash distillation saline water reclamation 12 11 12
Flash lamp stroboscopic photography 13 187 188
Flash pasteurization 4 2
Flash photography 2 431 432
Flash point 5 296
Flash-roaster 11 121
Flash smelting 11 119
Flash spectrum (sun) 13 270
Flash welding 5 296*, 11 495 14 468
Flat bark beetle 3 278
Flat bed presses 10 599 600 620
Flat blade turbine 8 523
Flat bug 6 401
Flat color work printing 10 608
Flat finish 4 587
Flat footed fly 4 212
Flat horned beetle 3 276
Flat spring 13 16
Flat wall paint 9 495
Flathead catfish 2 552
Flathead sandstone II 388
Flatheaded apple tree borer 3 287
Flatworm *see* Trematoda
Flavicin 1 468
Flavin adenine dinucleotide (FAD) 2 13 14 30 3 24 5 23, 7 532 535 10 56* 11 561
Flavin adenine nucleotide 2 1
Flavin mononucleotide (FM 2 13 14 25, 221, 3 24 11 5
Flavin nucleotide 2 35
Flavobacterium I 58 1064
Flavobacterium pseudo I 8
Flavone 5 296 297
glucoside 6 224
plant metabolism 10 54
Flavoprotein 5 23
riboflavin 11 561
Flavoring agent (food) 5 1
Flaw detection in metals 8 287 290
Flax 2 439 5 297 299*, 12 73
cultivation 5 297
diseases 5 298
fiber, natural 5 299 5
Geraniales 6 171
harvesting 5 297
linen 7 526
linseed oil 7 529
Flaxseed 6 298, 10 371
Flea 5 299* 12 345 34
tapeworm vector 5 29
Flea beetle 2 151
Fleawort 10 385
Fleece, *see* Wool
Fleece worm 8 680
Fleet, naval 12 262 26
Fleming, Sir A I 464 9 61
Fleming, J A 4 321
Fleming, R H 12 102
Fleming salve 4 324
Flemmger A I 531
Flemingites flemingeanus
14 82
Flemming W 8 520 13 52
Flesh fly 4 212 8 680
Fletcher H 5 299
Fletcher, J O 7 4
Fletcher Munson contours 5 299 300
Fletcher's Ice Island 7 4
Flexibilia 5 547 4 360 5 5
5 300*
Flexible coupling 5 525
Flexible die method sheet metal 12 251 252
Flexible pavements 9 35
Flexible pin couplings 5 52
Flexion reflex II 401
Flexner's bacillin 12 254
Flexographic ink 7 515
Flexography 10 600 620
Flexure elasticity 4 429
Flexure theory for plates 10 407
Flicker 5 300* 14 543
Flicker noise 9 117
Flicker photometer 10 170
Flight 5 300 302
aerodynamics 1 89

ight—*cont*
aeronautical engineering 1 95
aircraft propulsion 1 184 188
all weather 1 95 97
itude loss 3 151
allistic 5 301
eating wings 9 408 409
owndraft 1 151
iding 6 213
ypersonic *see* Hypersonic flight
nsect 7 129
atural 5 301
cience and technology 1 695
oaring *see* Soaring flight
onic barrier 12 505
pace *see* Space flight
ubsonic *see* Subsonic flight
upersonic *see* Supersonic flight
ransonic *see* Transonic flight
wing motion 5 301
ht characteristics 5 302 306
aircraft testing 1 188 197
ceiling 5 304
dive 5 305
endurance 5 305
equations of motion 5 303
glide 5 305
handling characteristics 5 306
high speed *aircraft* 5 302 305
jet range and *endurance* 5 305
landing 5 306
low speed aircraft 5 302 305
performance 5 305
range 5 304
rate of climb 5 304
subsonic aircraft 5 302 303
supersonic aircraft 5 302 305
take-off 5 306
Flight controls 5 306 309
ailerons 5 306 308 14 517
automatic 5 308 309
cockpit 5 307
computers 5 308
elevator 4 559
pitch 5 306 308
primary 5 307 308
roll 5 306 308
rudder 11 619
sensing devices 5 308
servomotors 5 309
stabilizers 15 52
transmission and amplification 5 307 308
yaw 5 306 308
Flight converter 2 367 368
Flight dynamics 5 309
Flight envelopes 1 176
Flight instruments 14 163 164 597
see also Aircraft instrumentation
Flight loads wing structure 14 511
Flight planning meteorology 1 95 97
Flight principles 1 97 98
Flight range 1 185 186
Flight regimes 1 88 89
Flight science 5 309 310
Flight simulator 12 340
Flight testing 1 191 194
captive 11 612
instrumentation 1 181 182 192 197
Flinders range 1 671
Flinders River 1 671
Flint R F 1 521, 6 200, 15 511
Flint 3 56 57
abrasive 1 9
artifact 1 514, 3 56
silicon dioxide 12 321
Flint clay 3 160 161 11 409
Flint glass 9 351 352
FLIP (Fleet [illegible]
Flood basalts 10 50
Flood control 4 3 11
Flood forecasting 14 453
Flood irrigation 7 270
Flood plains 5 310 312*; 10 259
coastal landforms 3 233
Flood wave liquids 14 451
Flooding of mines 8 501-502
Floodlight 11 4
Floodplains 10 259
Floor construction 5 312*, 10 569
Flora plant geography 10 325
taxonomy 10 377
Floral charts 10 345
Floral diagram 10 345
Floral formulas 10 345
Floral parts 5 327
Floral symbols 10 345
Floral tube 5 326 334
Flores Sea 9 271 12 531
Floret 5 334
lemma 5 334
palea 5 334
rachilla 5 334
spikelet 5 334
Florey Sir Howard 1 464
[illegible]
memory function 4 180 15 346
multivibrator 8 628
sequential circuit 15 346
storage devices 15 159
Float prospecting 11 21
Float textile 15 536
Float mechanisms liquid level measurement 7 488
Floating arithmetic 9 220
Floating body stability 2 372
Floating bridge 2 334
Floating caisson 2 390
Floating crane 5 556
Floating dry dock 4 280 281* 7 395
Floating floor construction 9 130
Floatoblast 10 201 13 75
Floc *water treatment* 14 407
Flocculation 5 310
sedimentation (geology) 12 137
sedimentation (industrial) 12 144
Flocculation test 13 375
Floccuti (astronomy) 13 279 280
Flock textile chemistry 13 543
Flock printing *textile* 13 545
Flood 15 318 319
crevasse deposits 5 311
expectance 15 318
potential 15 318 319
tributary contributions 15 319
ornamental *plant* 9 408
Florida Current 1 626 2 231 6 294
Florida pallimule 6 18
Florida Peninsula 9 151
Florida Straits 6 294
Floridean starch 11 554
Flonn Rudolf 3 478
Floristic plant geography *10* 325 328
Floristic region 10 326
Florkin M 5 142
Florman E F 7 502
Floscelle 4 375
Floscularia 11 631
Flosculariidae 8 575
Flotation 5 312 315
interface of phases 7 181
separation (mechanical) 12 186 187
surface *active agents* 13 322
Flotation oils 10 72
Flounder 5 315* 416 417
Flour milling 14 483 495
Flow brazing 2 322
Flow cleavage schist 12 63
Flow diagram 4 612 10 322
Flow-duration curves 13 318
Flow field Eulerian 6 536
hydrodynamics 6 536
Lagrangian 6 536
Flow fold (geology) 5 369
Flow measurement 5 315 321
acoustic velocity 5 316 319
diaphragm meters 5 318
Flow measurement—*cont*
differential pressure devices 5 318
electromagnetic meter 5 316, 319
Impeller 5 320
Leloux bell 5 319
mercury float meter 5 318
nutating disk 5 316 320
orifice 5 315 317, 9 406*
pipe elbow 5 316 318
piston 5 316 318 319
pitot tube 5 316 317 10 216
positive displacement *meters* 5 319
propeller 5 316, 320
quantity meters 5 316
rate of flow mass meters 5 316
rate of flow volume meters 5 315 319
rotameter 5 316 318 319
salt velocity 5 316, 319
thermistor 15 536
U-tube manometer 5 318
V notch rectangular weirs 5 316
variable area constant head meters 5 318
variable head variable area meters 5 318 319
venturi or Parshall flume 5 316
venturi tube 5 315 317, 14 298 299
vortex cage 5 316, 320
Flow meter *see* Flow measurement
Flow net soil *mechanics* 12 454
Flow nozzle 5 316 317
Flow of fluids 5 321 326
adiabatic flow 5 325
aerothermodynamics 1 102 104
boundary layer flow 2 307 311* 5 326
cavitation 2 572 576
compressibility 5 322 323
compressible flow 5 349 349* 5 325
Couette *flow* 9 92
density 5 322
diffuser 4 141
doublet flow 4 269
ducted flow 4 292
dynamical properties 6 536
electrical analogy 4 487 *489*
flow fields 15 147
flow measurement 5 315 321
hydrodynamics 6 536 542
ideal 5 321 323
incompressible flow 7 55 56
inviscid flow 5 325
irrotational flow 5 325

Fischer-Tropsch process—*cont*
alcohol 1 225
alkane 1 249
catalysts 3 245, 5 253
see also Bergius process
Fish 5 284
adaptation 12 295
agonistic behavior 12 297
allelomimetic behavior 12 296
behavior 12 295
breeding behavior 12 296
communication 12 296
migration 12 296
school 12 297
social behavior 12 296
social life 12 296
see also entries on specific fish
Fish (oil well) 9 293
Fish and seafood products
canned 5 418
cured 5 419 420
fish meal and oil 5 420
fresh 5 416
frozen 5 417
Fish collagen glue 6 219
Fish crow 3 556
Fish hawk 6 545
Fish louse 1 531, 2 819-820
Fish maggot 7 476
Fish meal and oil production 5 420
Fish oil vitamin A source 14 340
vitamin D source 14 343
Fish tapeworm 11 66, 13 293
Cyclopoida 5 642-643
Fishbone antenna *see* Antenna (aerial)
Fisher, R. A. 1 461, 6 498 505
Fisher W. 4 377, 10 451
Fisher 5 284
Fisheries Baltic Sea 2 89
Bass Strait 2 59
management 4 400
North Sea 9 165
production of 8 112 113
world catch 8 112
Fisheries conservation 5 284-287
management 5 286 287
marine 8 115 116
problems 5 285-286
Fisheries management ecology 4 400
Fishes, the *see* Pisces (constellation)
Fishing tools (oil well) 9 293
Fishing vessel 12 262
Fishlike reptile 11 484
Fissility 12 241
argillite 1 529
black shale 2 855
diagenesis in shales 4 94 95
metamorphic rocks 8 298
in slate 12 374
Fissility parameter 5 287
Fission, nuclear 5 287 290
atomic bomb 1 648
chain reaction 3 6 5 288
critical mass 3 550
delayed neutrons 9 65 86
electron capture 4 503
neutrons 9 84
nuclear explosions 9 154
nuclear fuels 9 184-186
nuclear power 9 193 196
nuclear reactors 11 349
nuclear structure 9 204 205
radioactive fallout 11 266 268
radioactivity 11 273-275
radioisotope production 11 313
reactor physics 11 364-370
Fission bomb *see* Atomic bomb
Fission fungi 2 5 5 478
9 525-527, 12 65-66
Fission fusion bomb 1 648
Fissionable material 9 184 187
Fissipeda 2 522 523
Fissium alloy nuclear reactor 11 360
Fissure polygons 10 472
Fissure of Rolando 12 502
Fissurellidae 1 591 7 519
Fistula 1 492
bladder 14 220
Fistulariopidae 2 558
FitzGerald, G. F. 5 290
FitzGerald Lorentz contraction 5 290* 11 436
Fix navigation *see* Navigation fix
Fixation nitrogen *see* Nitrogen fixation
Fixative microtechnique 8 405
Fixed-altitude radiosondes 8 318
Fixed bias 2 185
Fixed-coil voltmeter 14 370
Fixed communications radiotelephony 1 564
Fixed field alternating-gradient synchrotron 9 573 581*
Fixed field accelerator 9 573 581*
Fixed field cyclotron 9 576 577
Fixing photographs 10 365
Fixture design *see* Jig fixture and die design
Fizeau, H. L. 7 502, 504
Flabellifera 1 462, 5 290-291*
Flabelligeridae 10 462
Flabellum distinctum 12 77
Flachene Lepidoptera 7 469
Fladen Ground 9 165
Flagellata *see* Mastigophora
Flagellum 2 63, 8 168, 169
Flagging stone 13 152
Flame 5 291 293
Bunsen flame 5 292
burning velocity 5 293
Flame—*cont*
combustion 5 306 307
electrical conduction in 4 450
flameholder 5 292-293
flameproofing 5 294 295
Flame cell 5 139
Flame cutter machining operations 8 7, 14 469
Flame front combustion chamber 5 307
Flame-fusion process 6 100 101, 12 169
Flame hardening 13 514
Flame machining 13 685
Flame photometry 5 294
Flame plating 9 472
Flame resistance textile 13 540
Flame safety lamp 12 5
Flame spectroscopy 12 591-592
Flame spinel 6 99
Flame-spray process 8 293 295
Flame thrower 7 54
Flameholder 5 292 295
Flameproofing 5 294-295
Flamma Gorge 9 157
Flamingo 5 295
Flannel moth 7 464
Flannelette 13 537
Flaps wing 14 517
Flare (optics) 6 184
Flare (solar) 13 280 287
Flaser rock 5 295 296*, 8 296
Flash aging textile printing 13 542
Flash attachments cameras 2 431-432
Flash bulb *see* Photoflash lamp
Flash distillation saline water reclamation 12 11 12
Flash lamp stroboscopic photography 13 187 188
Flash pasteurization 4 2
Flash photographs 2 431 432
Flash point 5 296
Flash roaster 11 121
Flash smelting 11 119
Flash spectrum (sun) 13 270
Flash welding 5 296* 11 495 14 468
Flat bark beetle 3 278
Flat bed presses 10 599 600 620
Flat blade turbine 8 523
Flat bug 6 401
Flat color work printing 10 608
Flat finish 4 587
Flat-footed fly 4 212
Flat horned beetle 3 276
Flat spring 13 16
Flat wall paint 9 493
Flathead catfish 2 552
Flathead sandstone 11 388
Flatheaded apple-tree borer 3 287
Flatworm *see* Trematoda
Flavicin 3 468
Flavin adenine dinucleotide (FAD) 2 13-14 30 3 34 5 23, 7 522 533 10 57 11 561
Flavin adenine nucleotide 2 30
Flavin mononucleotide (FMN) 2 13 14, 25, 221 3 34 11 561
Flavin nucleotide 2 25
Flavobacterium 1 35 11 64
Flavobacterium pyocide 1 38
Flavone 5 296 297
glycoside 6 224
plant metabolism 10 59
Flavoprotein 5 25
riboflavin 11 561
Flavoring agent (food) 5 57
Flaw detection in metals 8 297 299
Flax 2 439 5 297 299*, 13 70
cultivation 5 297
diseases 5 298
fiber natural 5 299 300
Geraniales 6 174
harvesting 5 297
linen 5 298
linseed oil 5 298
Flaxseed 6 299*, 10 574
Flea 5 299*, 12 345 346
tapeworm vector 5 300
Flea beetle 2 251
Fleawort 10 565
Fleece, *see* Wool
Fleece worm 8 680
Fleet, naval 12 262 268
Fleming, Sir A. 1 464, 8 616
Fleming, J. A. 4 504
Fleming, R. H. 12 302
Fleming valve 4 504
Flemminger, A. 1 531
Flemingites flemingianus zone 14 82
Flemming, W. 8 520 13 302
Flesh fly 4 212, 6 680
Fletcher, H. 5 299
Fletcher, J. O. 7 4
Fletcher Munson contours 5 299 300
Fletcher's Ice Island 7 4
Flexibilia 3 547, 4 360 368 96 5 300*
Flexible coupling 3 525
Flexible die method sheet metal 12 271 272
Flexible pavements 9 507
Flexible pin couplings 3 526
Flexion reflex 11 401
Flexner's bacillus 12 254
Flexographic ink 7 513
Flexographs 10 600 620
Flexure elasticity 4 420
Flexure theory for plates 10 407
Flicker 5 300*, 14 543
Flicker noise 9 117
Flicker photometer 10 170
Flight 5 300 302
aerodynamics 1 68

luorine 5 351 355
cryogenic properties 5 572
dating fossil man 5 477
electron configuration 4 504
fluosilicate 5 355
halogen elements 6 324
hydrogen fluoride 6 549 550
inorganic compounds 5 352 353
ionization potential 4 504
natural occurrence 5 351 352
organic compounds 5 353 355 6 328 329
production 4 466 5 552
properties 5 352
uses 5 351
uorite 5 324, 355*
chromatic aberration 5 90 91
Madelung constant 8 15
occurrence with skarn 12 351
ro Fluorobenzoic acid 2 475
tho-Fluorobenzoic acid 2 475
ra Fluorobenzoic acid 2 475
uorocarbon 5 353 354 355* 501
uoroscopy 11 315
electroluminescence 4 492
radiography 11 301
radiography of metals 11 305
uorosulfonic acid 13 263
uorothene 6 329
uorspar *calcium mineral* 2 398
crystal optics 5 590
fluorine ores 5 351
hydrogen fluoride preparation 6 549
uosilicate 5 355
uosilicic acid 5 355
ushing time (estuary) 5 82
ute 8 665 666
utter aeronautical 1 192 5 355 356* 8 495
aeroelasticity 1 91
analysis 5 356
mechanism 5 356
prevention 5 356
utter and wow 4 245 5 356 357*
utter echo *see* Echo
utter testing rocket sled 11 613
uvial erosion cycle 5 357 358
uvial erosion landforms 5 359 361
ux magnetic *see* Magnetic flux
ux metallurgical 11 123 12 48,
brazing 2 322 323
Flux, metallurgical—*cont*
iron extraction 7 259
soldering 12 472
Flux closure domains 5 232-233
Flux density, magnetic *see* Induction magnetic
Flux linkage, inductance 7 65 66
Fluxgate magnetometer 1 93, 6 150
Fluxmeter 5 361
Fly 5 361 362* 4 211
life history 5 362
tularemia 5 362
Flycatcher 5 362
Flying animals wing motion 5 301
Flying boat 12 125
Flying fish 2 161, 5 363
Flying lemur 4 68
Flying platform *see* Air cushion vehicle
Flying reptile 11 494
Flying saucers 5 363 364
Flying spot scanner electronic *writing* 4 523
Flying squid 13 50
Flying squirrel 13 51
Flysch sedimentation (geology) 12 142
Flywheel 5 364 365
allowable peripheral speed 5 365
design 5 365
energy 5 364
theory 5 364
typical structures 5 365
FM see Frequency modulation
FS smoke 12 82
Foam 5 365 366* 10 493
Foam glass 6 208
Foam regulator (food) 5 377
Foaming surface active agent *13 121*
Foaming agents fire extinguisher 5 278
Focal length 5 366
electrostatic lens 4 536 538
geometrical optics 9 365
motion picture camera lenses 8 123
Focal point (optics) 5 366 9 365
Focal *ratio* (telescopes) 13 450 452
Foche Achgelis 4 309
Focusing (cameras) 2 430 431
Focusing irradiator four beam 2 209
reflector type 2 208
Fodder yeast 14 605
Foehn sickness 5 63
Foehn wind 5 63 *14 495*
Foeniculum vulgare 5 214
Fog 5 366 367
aerosol 1 99
Fog—*cont*
Atlantic Ocean 1 624
formation of 5 367
photography 10 162
polar regions 10 441
related phenomena 5 366
smog 12 387
weather modification 14 457
Fog climax 3 186
Fog nozzle fire extinguisher 5 279
Foil plastics fabrication 10 405
Foil systems hydrofoil craft 6 542
Fol, H 13 373
Fold and fold systems 5 367 369
anticline 1 469
behavior with depth 5 368
cleavage and folding 5 367
distortion in folds 5 368
dynamics of folding 13 417
elements of folds 5 367
geometry of folds 5 367
syncline 13 373
see also Rock Mechanics
Folded dipole antenna *see* Antenna (aerial)
Folding camera 2 428
Folding fin rocket 1 541
Foliage contact sprays herbicide 6 420
Foliage disease alfalfa 1 234
Foliage translocated sprays herbicide 6 420
Folic acid 1 575, 5 30, 369 370 14 340
analogs 4 236
bioassay 2 194
food 5 371
para Aminobenzoic acid 1 319
Folinic acid 1 575
Folkers, K 14 342
Folkers J P *2 61*
Folland *H 4 274*
Follicle (fruit) 5 541
Follicle (*ovary*) 9 453
Follicle stimulating hormone (*FSH*) 6 480, 13 526
endocrine mechanisms 4 591
hypophysis 6 596
oogenesis 9 331
ovary 9 454
pituitary gland 10 250
reproductive system 11 477
Folliculi ovarici vesiculosi 11 474
Folliculina 6 432
Fomalhaut 1 496 13 41
Fomes 3 254 265
Fomes noxius 11 335
Fomite borne infection 7 95
Font 14 171
Fontéchevade man 5 370*, 478
Fontinalis 5 528
Food 5 370 379
additives 5 375 379
of animal origin 5 373 374
essential components 5 371 372
plant origin 5 372 373
processed 5 374
refined 5 374
spoilage 5 374 375
Food additive 5 375
Food chain 5 379 380
algae 1 236
biological productivity 2 215 216
biomass 2 222 225
community 5 524
deep sea fauna 4 39
ecology 4 392
ecosystem 4 406 407
food web 5 379
limnology 7 519
pyramid of numbers 11 107
quantitative studies 5 379 380
in the sea 12 119
shrimp 12 308
Food cycle limnology 7 519
Food engineering 5 380 405
bacteria 2 5
brine 2 340
buckwheat 2 360
butter 2 379
casein 2 537-538
cheese 3 11 16
citric acid 3 146
citrus flavoring 3 147
cocoa powder and *chocolate* 3 252
coffee 3 265
corn 3 485
dyeing 4 311
egg processing 4 415
enzyme (industrial production) 5 26
fat and oil, edible 5 184
food 5 370
food packaging 5 400
food science 5 427
food technology 5 428
ice *cream* 7 1 5
milk 8 428
monosodium glutamate 8 583
packaging materials 5 400 405
packaging methods 5 403-404
peanut 9 604 605
raw materials conversion 5 389 401
raw materials preparation 5 385 389

Flow of fluids—*cont.*
isentropic flow 7 271 272
isothermal flow 5 325
jet flow 7 305 306
Karman vortex street 7 332
kinematic viscosity 5 322
laminar flow 5 324, 7 388
Laplace's irrotational flow 7 401-402
mixing 8 522
Navier-Stokes equations 9 9
nozzle 9 174-175
open channels 5 8 9
orifice 9 406
parameters 6 49
perfect gas 5 323
pipe flow 10 239-241
potentials (mathematics) 10 538-539
regimes 6 51
regions 15 176
resistance 14 332 334
Reynolds number 11 540
rotational flow 5 325
Schlieren photography 12 67-68
separation 12 505
shadowgraph 12 258-259
shock-wave display 12 298-299
sink flow 12 341
skin friction 12 372
source flow 12 522
specific weight 5 322
steady flow 5 324
streamline flow 5 324, 13 175
supersonic aerodynamics 13 293-295
throttled 13 615
turbulent flow 5 324, 14 160-163
uniform flow 5 324
unsteady flow 5 325
valves 14 260 262
viscosity 5 321, 14 333
viscous flow 5 324, 14 334
wake flow 14 382
water tunnel 14 409 410
wind tunnel visualization 14 489 499
see also Fluid flow principles, Fluid-flow properties
Flow testing rubber 11 637
Flower (botany) 5 326-334
anatomy 5 328-334
apetaly 5 327
characters 5 326-328
floral parts 5 327
gamopetaly 5 327
nectary 5 334
petal 5 329
plant growth 10 355
plant organs 10 368-369
pollen 5 330-332
Flower (botany)—*cont*
polypetaly 5 327
receptacle 5 329
reproduction, plant 11 454
sepal 5 329
stamen 5 329 330
sympetaly 5 327
vascular system 5 328
Flower bud 2 361
Flower bug 6 401
Flower characters 5 326 328
Flower development 5 328
Flower fly 4 212
Flower thrip 13 615
Flowering ash 1 576
Flowers of sulfur 13 255
Flowstone 2 572, 13 35
Fluchthorn 5 119
Fluctuation phenomena *see* Stochastic process
Flue gases 5 571-575
Fluid gas 6 41-44
heat convection 3 439 444
liquid 7 540-541
potentials (physics) 10 540 541
Fluid-bed dryer 4 287 288
Fluid-bed roaster 11 120
Fluid catalytic cracking process 5 533
Fluid coking 3 272
Fluid coupling 5 334 336
Fluid-coupling transmission 14 45
Fluid dynamics 5 336
fluid-flow principles 5 338-340
Kelvin's circulation theorem 7 335
Prandtl hypothesis 5 336
see also Gas dynamics
Fluid-flow principles 5 338 340
Bernoulli's theorem 2 169
Crocco's equation 5 550 551
D'Alembert's paradox 4 3
eddy diffusion 4 145
of energy conservation 5 339
entropy 5 340
flow continuity 5 339
heat transfer 5 339
of mass conservation 5 339
of momentum conservation 5 339
Navier-Stokes equations 9 9
Newtonian fluid 9 91-92
Prandtl-Meyer expansion fan 10 564
Stokes stream function 13 147-148
thermal equation of state 5 340
venturi tube 14 298 299
Fluid flow principles—*cont*
vortex 14 375 376
see also Flow of fluids
Fluid flow properties 5 340-345
analysis of fluid flow 5 340
boundary-layer flow 5 342 343
dynamic similarity 5 343
flow past an airfoil 5 344
flow past a streamlined body 5 344
fluid flow in pipes 5 343
forced convection 5 345
form drag 5 344
gas dynamics 5 345
laminar flow 5 341
model tests 5 343
relativistic mechanics 11 432-433
shock wave 5 345
skin friction drag 5 344
sonic velocity 5 345
steady flow 5 341
supersonic velocities 5 345
turbulent flow 5 341
unsteady flow 5 341
see also Flow of fluids
Fluid mechanics 5 336 338
aeroelasticity 1 89 93
aeromechanics 1 94
basic equations 5 337
D'Alembert's paradox 4 3
dynamics 5 336
Euler's momentum theorem 5 102
flow of fluids 5 321 326
Froude number 5 541
gas dynamics 6 49-58
hydraulics 6 529 530
hydrodynamics 6 536 542
Kelvin's minimum energy theorem 7 335 336
Knudsen number 7 368
model studies 5 337
Reynolds number 11 540
similitude 5 337
statics 5 338
Torricelli's theorem 13 687
wave motion in *see* Wave motion in fluids
Fluid mixing 8 522 524
Fluid statics 5 338
aerostatics 1 102
Archimedes' principle 1 517
buoyancy 1 372
equilibrium 5 338
fluid force 5 338
forces on curved surfaces 5 338
forces on plane surfaces 5 338
Pascal's law 9 588
see also Hydrostatics
Fluidity 14 334
Fluidization of solids 5 345 347
Fluidized bed technique 5 [illegible]
Fluidized catalyst 5 533
Fluidized reactor process 2 547
Fluke 4 148, 6 429
flounder 5 315
paragonimiasis 9 564
Platyhelminthes 10 401
Flume flow measurement 5 318 319
Fluoborate 2 303, 5 347*
Fluoborite 10 425
Fluogermanate 6 177
Fluor *see* Phosphor
Fluorphor *see* Phosphor
Fluor crown glass 9 351
Fluor edenite 1 570
Fluor richterite 1 570
Fluor tremolite 1 570
Fluorapatite 1 489
fluorine ore 5 353
phosphorus 10 133
Fluorene 5 256
Fluorescein 4 302, 11 66 108
Fluorescence 5 347*, 7 610 611
cathode ray tube phosphors 2 558 559
compared to phosphorescence 5 347
fluorimetric analysis 5 [illegible]
relation to absorption 1 14 15
resonance 1 14
Stokes' law 1 15
x ray analysis 14 576
Fluorescence analysis 2 [illegible] 14 576
Fluorescence method ultraviolet photography 10
Fluorescence microscope *see* Microscope, fluorescence
Fluorescence process color printing 10 609
Fluorescence spectroscopy 1
Fluorescent antibody technique 8 582 584
Fluorescent lamp 5 347 5
ballast 5 348
fluorescence 5 347
high-frequency 5 349
instant start circuit 5
preheat circuit 5 348
rapid-start circuit 5
sunlamp 15 292
Fluorescent materials 5 3
Fluoride 5 350*, 352 355
hydrogen fluoride 6 5
550
organic 6 325 330
Fluoride method chemical dating 5 27
Fluoride process beryllium metallurgy 2 276
Fluorimeter 5 350
Fluorimetric analysis 5 3
351
Fluorination 6 525-530

Forest tree diseases 14 71-74
Forest tree nursery management 5 465 567
Forest tundra 1 523
Forest vegetation 5 467 468
Forestburg mammals 9 538
Forested Carpathians 5 118
Forester 7 464
Forestry 5 441 444
ecology 4 399
see Forest and forestry
Forestry farm 5 468 470
Forficula auricularia 4 67, 355 5 6
Forge welding 14 468
Forging 5 470-472
bending 5 470
blocking 5 470
cold heading 5 472
drawing 5 470
drop forging 5 470-471
edging 5 470
finishing 5 470
fullering 5 470
hammer forging 5 470
impact forging 5 471
powder metal forming 8 286
press forging 5 471
punching 5 470
roll forging 5 471
swaging 5 471
trimming 5 470
upset 5 470-471
Forklift trucks 7 88
Form drag 5 544
Form factor neutron diffraction 9 88 89
Form wound field winding 14 505
Formaldehyde 1 475, 5 472 473*, 8 674 13 136
fumigant 5 561
hexamethylenetetramine 6 435
Formalin 5 472
Formality concentration scales 5 361
Formamide 1 303
alpha Formamido L glutamic acid 6 457
Formants sound 10 121
Formate 5 74
Formation constants coordination compounds 3 459
Formative cell 11 420
Formic acid 2 37 473-474 5 20 5 473*
Formic dehydrogenase 2 596
Formica exsectoides 6 582 12 406
Formica fratensis 12 406
Formica rufa 12 406
Formicariidae 9 589
Formicidae 1 436 8 574, 12 405
Forming rubber products 11 645
Forming, metal *see* Metal forming
sheet metal *see* Sheet metal forming
Formregelung 12 63
Formula chemical 3 42
mathematical 8 175
Formula weight 8 556
Formvar 8 27
Formylaspartic acid 6 457
Formylkynurenine 2 35, 14 126
Fornax 3 413 414
Forrest R W 6 232
Forrestal 12 262
Forskalia 3 255
Forssman J 6 429
Forssman antigen 6 429, 10 427
Forsteria 9 317
Forsythia suspensa 6 219
Fort Charles 5 363
Fort Union formation 7 513
Fortisan 5 243
Fortunella 7 373
Fortunella japonica 7 373
Fortunella margarita 7 373
Fosenhalvön Peninsula 5 116
Fossa vestibuli vaginae 11 474
Fossil 5 473-476
chemical 3 29
in chert 3 56
index 7 56
in limestone 7 516
living 7 564
microfossils 8 335
organic constituents 9 498 499
organic evolution 5 132
sedimentary rocks 12 134
spores and pollen 9 525 527
thermal history of 6 130 135 9 516 518
see also Paleobotany Paleoecology
Fossil algae *see* Algae fossils
Fossil assemblage 6 141
Fossil forests 10 42
Fossil fuel 5 476
compared to nuclear fuels 9 193 194
Fossil man 5 476-479
classification of 5 478
Cro Magnon man 3 554
dating of 5 476-477
Fontechevade man 5 370 478
Heidelberg man 6 385
Java man 7 303
line of development 5 479
lower Pleistocene record 5 477
middle Pleistocene record 5 477
Neanderthal man 9 21-22
Peking man 9 612
Piltdown man 10 232
Fossil man—*cont.*
Rhodesian man 11 549 550
Solo man 3 478, 12 485
Steinheim man 13 104
Swanscombe man 13 533
Ternifine man 13 495
upper Pleistocene record 5 478
Fossil seeds and fruits 5 479 480
coal paleobotany 3 239 242
cordaitean seeds 3 478
Fossipedes *see* Dasilloidea
Fossorial wasp 6 574
Foster, Curtis 13 55
Foster, J S 13 53
Foster, J W 2 55 8 540
Foster Seeley discriminator 5 516
Fotosetter 3 546
Foucault, J B L 5 480, 7 502
Foucault current *see* Eddy current
Foucault pendulum 5 480, 9 618
Fouling (ship hulls) 4 279
Fouling, marine *see* Marine fouling
Fouling organism 1 427
Foundations 5 480 483
arch 1 508
caisson *see* Caisson foundation
construction equipment 5 418
continuous footing 5 482
dam 4 8 9
floating 5 482
footings 5 480
grade beams 5 481
mats 5 482
needling 5 483
pilasters 5 481
pile 10 226-229
retaining wall 11 534 535
ribbed mats 5 482
shoring 5 483
soil mechanics 12 449 458
soil and rock 5 480
underpinning 5 483
uniform mats 5 482
walls 5 481
waterproofing basements 5 492
Foundering 12 275
Foundry coke 3 271
technology 2 543 544
type 3 344, 10 598
Fountain effect (superfluidity) 13 301
Fountain sandstone 11 387-388
Fouquieria 3 190
Four bar linkage 5 483-487* 7 527
acceleration analysis 1 26
angular velocity 5 434
cardan joint 5 487
Four bar linkage—*cont.*
centrode 5 484
conic linkage 5 487
crank and rocker mechanism 5 484
dead center 5 484
drag link mechanism 5 485
equivalent linkage 5 484
inversion of linkage 5 484
isosceles linkage 5 486
Oldham's coupling 5 487
pantograph 9 537
parallel crank linkage 5 485
quick return mechanism 5 486
scotch yoke 5 486
slider crank mechanism 5 493, *12 379*
sliding pair and linkage 5 485
sliding slot linkage 5 486
slow motion linkage 5 485
universal joint 5 487, 14 204 206*
Four boson interaction 4 543 544
Four-color conjecture 6 254 255
Four dimensional continuum 12 557-559
Four footed butterfly 7 464
Fourchite 7 389 390
Fourdrinier machine 4 289 9 540
Fourier J 3 384
Fourier Bessel series 2 180
Fourier Bessel transform 2 180
Fourier heat equation 3 384, 4 128
Fourier Legendre series 12 195
Fourier series and integrals 5 487 490*, 12 195
periodic motion 10 13
waveform nonsinusoidal 14 435-436
Fourier Stieltjes transform 5 489
Fourier transform 7 165, 405, 11 167
Fournier G 8 154
Fournierechinus 4 359
Fourth-degree burn 2 575
Fourth dimension 5 490
Fouta Jallon Mountains 1 109
Fovea centralis 5 162 171 14 336
Foveal vision 14 336
Fowl leukosis 7 482
Fowl plague 8 585
Fowl tick 7 299
Fowl typhoid 13 179
Fowler, R 10 159
Fowler W A 4 553
Fowler Nordheim formula 5 255
Fowler plot 10 155
Fowlerite 11 554
Fox, C S 2 113

Food engineering–*cont*
refined food processing 5 381
rice 11 565-566
rye 11 657
salt 12 18
soybean 12 535 537
spice and flavoring 12 612
tea 13 405
unit operations and processes 5 382 405
vanilla extract 14 270
wheat 14 483
Food manufacturing 5 405 422
animal feed 1 425 427, 5 405 406
bakery products 5 411-413
cereal products 5 421
chewing gum 5 422 423
cocoa powder and chocolate 3 253
condiments 5 420
confections 5 409 411
dessert 5 420
fish and seafood products 5 416 420
fruit products 5 408 409
gum 6 298
jams 5 408
meat products 5 414 415
packing house 9 489
pet foods 5 406 407
poultry products 5 414
sauces 5 413
soft drinks 5 421
soups 5 414
vegetable products 5 407 408
see also Cereal chemistry
Food microbiology 2 5, 66 5 423 425*
canned food spoilage 5 425
eggs 5 424
fermented food 5 423
food poisoning, bacterial 5 425
food preservation 5 425
food spoilage 5 427
fruits and vegetables 5 424
meat 5 424
shellfish 5 424
yeast 14 602
Food poisoning, bacterial 2 306 4 102, 5 425*, 13 37
Food preservation 5 425-427
brine, microbiology of 2 340
cold storage 3 274
dehydration 5 426
food manufacturing 5 419 420
packing house 9 489
preservatives 1 475
refrigeration 5 426
sterilization 5 425
use of chemicals 5 426 427
Food pyramid 1 410
Food resources of the ocean 8 112 116 131; 9 269
Food science 5 427
Food spoilage 5 374 375, 427-428*
abnormal or unusual spoilages 5 428
bacterial 5 428
mold 5 428
perishable foods 5 427
shelf stable foods 5 427
spoilage mechanism 5 428
yeast 5 428
Food sterilization 5 392
Food technology 5 428
Food vacuole 5 203
Food yeast 14 603
Fool duck 4 291
Fool's gold 3 7 11 116
Foolish seedling disease 6 184
Foot 5 428 429
Foot (unit) 5 429* 8 188
Foot and mouth disease 2 564 5 429* 14 328
Foot candle 5 429
Foot lambert 5 429
Foot pound 5 429*, 14 552
Foot poundal 5 429*, 14 552
Foot rot 1 468
Foot wall fault 5 192
Footings 5 480 481
Forage 1 129 131 132
Foramen ovale 2 490 496
Foramina of Monro 9 57
Foraminifera fossils 5 429 435
classification 5 431
climatic history of oceans 8 142 143
ecology 5 430
foraminiferal tests 5 430
Fusulinidae 5 595
globigerina ooze 8 135 136
in limestone 7 516
Nummulites 9 229
pelagic sediments 8 135 136
uses 5 435
see also Foraminiferida
Foraminiferida 5 435* 11 52, 12 27
Forbes log ship's speed measurement 4 21
Forbidden bands 2 91 92
Forbidden transition 9 25 26, 12 160 162
Forbush, S 3 501
Forbush effect 1 608 3 501-502
Force 5 435 437
absolute standards 5 436
adhesive 1 66
angular 7 414
central 2 629 7 414
centrifugal 2 631 5 437
centripetal 2 640-641, 5 437
Force–*cont*
cohesive 1 66
composition of 5 436 437, 13 55
conservative 5 437
couple 3 520
force fields 5 437
graphic representation 13 55
gravitational 6 263-266
gravitational standards 5 436
impulse 7 47
impulsive (impact) 7 35
interatomic 1 407
intermolecular 1 66, 7 195 196
kinetics 7 359
lines of 7 526
Lorentz 4 511
measurement of 5 437, 13 15
moment of 13 55-56
Newton's laws of motion 9 91
nonconservative (dissipative) 5 437
nuclear 9 207 208
principle of superposition 13 55
principle of transmissibility 13 55
rectilinear motion 8 602
resultant of forces 11 533 534
shearing 12 243
standard 5 436
statics 13 54
statics in space 13 56 57
tensor 7 414
types 13 547
units 5 437
as a vector 13 54 55 436 437
volume 7 414
Force, aerodynamic *see* Aerodynamic force
Force, Coriolis *see* Coriolis acceleration and force
Force-feed lubrication 7 607
Force fields, earth 13 511
Force fields, terrestrial *see* Terrestrial force fields
Force fit 5 437
allowance 1 258
shrink fit 12 308
Force of gravity 6 266
Forced convection 5 441*, 6 374
Forced diffusion, gases and liquids 4 143 144
Forced oscillation 1 17 5 437 438*
Forced vibration *see* Forced oscillation
Forces, equilibrium of *see* Equilibrium of forces
Forcipulata 1 598, 4 360 372, 5 438*
Asteriidae 5 438
Brisingidae 5 438
Zoroasteridae 5 438
Ford, F B 7 473
Ford, R W 6 255
Fore plane 14 543
Forebrain 2 316
Forecasting, weather *see* Weather (forecasting and prediction)
Forel F 5 523
Forensic chemistry 5 438 440
Forensic medicine 5 440 441
cardiac disease 5 441
current legal status 5 441
injury and disease relations 5 440
medical experts 5 441
procedures 5 441
Forerunning, coal chemical 3 235
Foreshock 4 355
Foreshore (beach) 12 302
Forest, petrified *see* Petrified forests
Forest and forestry 5 441 444
tree 14 71 76
Forest conservation 5 441 443
forest formations *see* Forest formations
forest products 5 443
forest regions, United States 5 441 443
Forest ecology 5 443 451
forest hydrology 5 446
forest succession 5 450 451
Forest fire control 5 451 453
Forest formations 5 186
boreal conifer forests 5 186
evergreen hardwood 5 187
needle leaved forest 5 186
savanna 5 189
summergreen deciduous forest 5 188
temperate hardwood 5 188
temperate rainforest 5 186
thorn forest 5 189
tropical deciduous forest 5 187
tropical hardwood 5 187
tropical rainforest 5 186
Forest management 5 442 12 333 339
Forest mapping 5 455 457
aerial surveys 5 456
Forest mensuration 5 447 455
Biltmore stick 5 450
diameter tape 5 453
tree caliper 5 452
Forest regions, United States 5 444
Forest regions, world 14 72
Forest seeding and planting 5 461 464
Forest soil 5 464 465

ency measurement—cont
beat-comparison methods 5 508
frequency counter 5 501-505 508
harmonics 6 539 540
Lissajous figures 5 508, 7 542
microwave frequencies 5 509 511
primary standard 5 504
radio frequencies 5 509
secondary standard 5 504
spectrum analyzer 12 593
standards of time and frequency 5 504
standing wave detector 13 36
station WWV 5 504
transfer oscillator methods 5 510
by wavelength measurement 5 510, 14 439
Wien frequency bridge 5 508
quency meter 5 505 511
audio 5 505 509
beat note detector 5 508
deflection 5 505
direct comparison methods 5 508
electrodynamometer 5 506
heterodyne meters 5 510
moving-coil 5 506
moving iron 5 506 507
mutual inductance 5 506
radiometer 5 505
reed 5 505
resonant 5 505
requency modulation 5 511 514*, 8 527
angle 1 405
Armstrong circuit 10 104 105
detectors 5 513 520
FM radio 5 520 521 11 242
microwaves 8 414
modulators 5 513 515
noise advantage 5 512
noise bandwidth relation 5 512
side frequencies 5 511
spectrum 5 511
see also Phase modulation
Frequency modulation detector 5 513 520
discriminator 4 235 5 516
ratio detector 5 517 519
Frequency modulation radio 5 520 521
broadcasting 5 531 11 247 251
receivers 11 258
transmitter 11 264 265
Frequency modulator 5 514 515
Frequency multiplier 5 513
Frequency polygon 2 225
Frequency response amplifier 1 545 546, 665, 14 556
RC coupled amplifier 14 356 357
Frequency shift transmission 11 242, 13 423
Frequency standard 4 459 460, 5 504*, 8 157
Frequency table (statistics) 2 224
Fresh water biocycle 3 526
Fresh water crab 4 53, 54
Fresh water drum 12 249
Fresh water ecosystem 4 404, 5 521 534*
biota 5 526 529
chemistry 5 529 532
lentic *ecosystem* 5 522 532
lentic habitat 5 521
limnology 7 519
lotic ecosystem 5 532 534
lotic habitat 5 521
Fresh water habitat 5 521
Fresh water mussel 5 100
Fresh water pearls 9 606
Fresh water shrimp 12 307
Fresh water supply (at sea) 5 182
Fresnel, A J 4 132 6 521-522, 7 504, 9 363
Fresnel 4 132 133 137 139*
Fresnel biprism 7 185 186
Fresnel coefficient 7 187 188
Fresnel diffraction 8 581
see also Diffraction
Fresnel double mirror 7 185
Fresnel reflection law 11 931
Fresnel rhomb 10 451 452
Fresnel zones 4 137 138
Freud, Sigmund 1 112, 328 552, 4 583 5 549 6 600 8 602 9 553 10 32, 11 74 80
Freudenstein F 8 196
Freudianism 5 534-535
amnesia 1 328
premises 5 534
psychoanalysis 5 555
theory 5 534
Freundlich isotherm 1 59, 80
Friction 5 535-536
bearing antifriction 2 118
brake 2 317 318
clutch 5 224
Coulomb (dry) 5 535
drive 11 619-620
electrification by 4 539
fluid (viscous) 5 536
layer *see* Boundary layer
lubricant 7 602
rigid body dynamics 11 376
sawing 12 41
skin *see* Skin friction
viscosity 14 352 354
Friedel, J 1 263
Friedel Crafts reaction 5 525, 536
acetophenone 1 36
and anhydride 1 44
acid halide 1 44-45
acylation 5 536
alkylation 5 536
condensation reaction 3 376
ketone 7 339
quinone 11 194
Friedländer's bacillus *see* *Klebsiella pneumoniae*
Friedländer method 11 192
Friedländer pneumonia 7 619
Friedman H 13 272
Friedman test 5 192 202
Friedmann, G A 5 509
Friedmann universe 5 509 510
Friedreich's ataxia 9 69
Friedrich, W 5 592 14 567
Frieleia halli 13 435
Fries rearrangement ketone 7 339
Fries' rule 1 548
Frigate 12 265 266
Frigate bird 5 536 537
Frigidoreceptor 12 180
Frigone 13 666
Frigorigraph 12 181
Frigorimeter 12 181
Fringe (optics) 5 537
diffraction fringes 4 132 139
interference fringes 7 184 189
interferometry 7 190-194
Fringe worm 10 461
Fringillidae 5 554, 5 275, 7 517, 12 562
Fringing reef 5 537
Frink O 7 411
Frit 5 537* 8 285
Frit china 10 546
Frit porcelain 10 546
Fritillaria 7 406
Fritillary 5 381
Frobenium, G 7 412
Froehlich's syndrome 10 252
Frog 5 537 538
Frogeye disease (soybean) 12 534
Froghopper 6 471 13 7
Frogmouth 2 448
Frome, Lake 1 672
Fromm E 11 74, 80
Frond 5 261
Front (meteorology) 5 538 540*, 8 326 329
air mass 1 148 8 326-329
barroclinic field 2 102
frontal waves 5 538
frontogenesis 5 539, 8 329-331
polar front 5 539
wind field 14 494
Front-end loader 3 416
Frontal analysis 3 93, 6 47
Frontal bone 12 373
Frontal lobe 9 57
Frontal organ 3 566, 11 558
Frontal storms 13 162
Frontogenesis 5 539 540, 8 329 331
Frontonia 11 55
Froome, K D 7 502
Frorlep's ganglion 9 65
Frost 5 540
dew 4 90
growing season 6 285
Frost action 5 540 541
cirque 3 144
permafrost 10 22
soil mechanics 12 455
Frost grassmeter 13 516
Frost point 4 90
Frost protection 14 457
Frothing agents flotation 5 314
Froude, William 12 278, 14 2 3
Froude's law of comparison 12 280
Froude number 3 541*, 12 279 280
dynamic similarity 4 312
model theory 8 526
ship propulsion 12 279 280
Frozen precipitation 6 317
Frucht, R 6 255
D Fructopyranose *see* Fructose
Fructose 5 541
dextran 4 91
dietary carbohydrates 2 458
glucose 6 217
gum 6 297
Monosaccharide 8 578
plant metabolism 10 352
plant translocation (organic solutes) 10 380
sugar 13 297
D-Fructose *see* Fructose
Fructose diphosphate 10 371
Fructose-1,6-diphosphate 2 16, 58, 55, 459, 5 23, 8 582, 10 370
D Fructose-1,6-diphosphate *see* Fructose-1,6-diphosphate
Fructose 1-phosphate 10 352
Fructose 6 phosphate 2 16 38, 459 6 219, 8 582, 10 370
D Fructose 6 phosphate *see* Fructose 6 phosphate
Fruit (fossil) *see* Fossil seeds and fruits
Fruit (botany) 5 541-544
abscission 5 545
anatomy 5 542
endocarp 5 545
exocarp 5 544
mesocarp 5 544 545
pericarp 5 543 544
plant organs 10 368 369
vascular system 5 545
Fruit (tree) 1 606 8 585 586

Fox, D L 4 362
Fox, F E 12 514
Fox, H. M 10 464
Fox Island I 523
Fox S 490
Fox-fire 2 220
Fox maggot 8 680
Fox squirrel 13 51
Foxglove 2 184; 4 191
Fraction I 238, 240
Fractional crystallization 5 601
  in magmatic differentiation 10 51-52
  silicate phase equilibria 12 314
Fractional distillation 4 249, 11 119
Fractional (Weyl form) formula 7 165
Fractionating column 5 491-492
  see also Distillation
Fractionation processes 5 518 519, 12 185
Fracture brittleness 2 541
  cast iron 2 540
  metal 8 267-269
Fracture (rock) *see* Failure (rock)
Fracture cleavage schist 12 65
Fracturing process oil and gas wells 9 299
Fradicin I 476
Fraenkel, G. 13 403
Fragaria chiloensis 15 171
Fragaria elatior 12 229
Fragaria virginiana 13 171
Fragillaria 8 106
Fragipan 12 459
Fragmentation (reproduction) 11 448
Fragmentation bomb 1 536
Fragmentation process 8 484-486
Frambesia 14 597-598
Frame of reference 5 492-493
  accelerated (noninertial) frames 5 492
  astronomical frames 5 493
  Galilean frames 4 493
  Galilean transformations 6 13
  inertial frames 5 492
  invariance 13 362
  Lorentzian 12 557
  Newtonian frames 5 492
  relative motion 11 426-427
  relativistic electrodynamics 11 428
  relativity 11 433-434
  rotating frames 5 492
  space-time 12 556 559
Francis hydraulic turbine 10 591
Francium 4 504, 5 493
Franck, J 5 493, 8 555
Franck-Condon principle 5 493 494*; 8 554-555; 10 137
Francke coupling 3 526
Francolin 9 587
Francolite 1 489
Franconian age 2 425-427
Frank, C. 5 584
Frank, F. C 5 586
Frank, I. 2 693
Frank-Read generator crystal defects 5 584-585
Frankel, S 5 287
Frankland, E 6 391
Franklin, Benjamin 4 540, 453, 462
Franklin, E. C. 1 40, 14 21
Franklin's gull 6 296
Franklin Mountains 9 158
Frankliniella fusca 9 603
Frankliniella tritici 13 615, 628
Franklinite 5 491*, 14 612
Franquil 6 595
Franseria 3 190
Franz Josef Land (archipelago) 1 523
Fraser Plateau 9 157
Frary metal 2 95
Frasch, H 13 255
Frasch process 13 255
Fraser fir 5 277
Fraser River 9 162
Frasnian Stage 4 87
Fratercula arctica 11 91
Fratercula corniculata 11 91
Fraunhofer, J 1 615
Fraunhofer corona 14 618-619
Fraunhofer diffraction 4 132-139
Fraunhofer lines 6 9, 13 267
Fraxinus 5 188, 10 380
Fraxinus americana 1 576
Fraxinus excelsior 1 576
Fraxinus nigra 1 576
Fraxinus ornus 1 576
Fraxinus pennsylvanica 1 576
Frazer Plateau 9 159
Fredericella sultana 10 201, 13 75
Frederiscellidae 10 201
Fredholm, I 10 40
Free-cutting brass 3 470
Free diving *see* SCUBA, skin diving
Free electron 5 499 501
Free-electron theory of metals 5 499 501*, 15 554
  alloy structures 1 263 264
  conductivity theory 5 500
  density of states 5 499 500
  effective mass 5 499
  electrical conductivity of metals 5 500-501
  electronic specific heat 5 500
  exclusion principle 5 157
  Fermi energy 5 499
Free-electron theory of metals —*cont.*
  thermal conductivity 5 589-590
  wave vector 5 499 501
Free energy 5 494 496*, 14 553
  electromotive force (cells) 4 499
  partial molal quantities 5 495
  thermodynamics (chemical) 13 575
Free enthalpy 5 494
Free fall 5 496*; 11 435
Free-fall corer (oceanography) 8 145
Free field (acoustic) 1 400, 5 496*
Free-field room 1 400
Free oscillation (physics) 5 437, 9 419
Free oscillation (tide) in atmospheric pressure 13 639
  in lakes 13 636
  in the ocean 13 635
  of solid earth 13 638
Free piston engine 14 152
Free radical 5 496 498
  antioxidant 1 479 480
  catalysis addition polymerization 10 480
  chain reaction, chemical 3 6, 7 110
  combustion 3 306 307
  detection and estimation 5 497-498
  EPR spectroscopy determination 4 514-516
  hexaphenylethane 6 435
  hydroxyl 14 587
  inhibitor (chemical) 7 110-111
  mechanisms 5 498
  organic reaction mechanism 9 400
  photochemistry 10 137-138
  production 5 497
Free surfaces crystal defects 5 581
Freeboard 12 269 274
  deck 12 255
Freedom, degree of (mechanics) *see* Degree of freedom (mechanics)
Freedom, degrees of 5 55
Freeman, G L 8 607
Freeman, M 11 80
Freeways 14 13
Freeze drying 4 288
Freeze evaporation process saline water reclamation 12 13
Freezing drizzle 10 573
Freezing point 8 216, 8 557
Freezing rain 10 573
Fregata magnificens 5 536
Fregatidae 5 530
Frei test 12 372
Freiberguite 13 529
Freight car 11 327
Freighter *see* Ship, merchant
Frenatae *see* Heteronoma
French, T. M 12 501
French alpine goat 8 227
French combing wool 14 548-549
French curve 2 216
French horn 8 666
French vinegar process 14 [illegible]
Frenching tobacco 13 663
Frenckel Brunswik, E. 10 36
Frenet equations 6 151
Frenkel, J 3 583
Frenkel defect 5 583, 12 479
Frenulum (Lepidoptera) 7 459 473
Frenulum linguae 4 165
Frenzel, J 8 254
Freon 5 501*, 6 550, 11 415
Frequency (wave motion) 5 501
  angular 1 406
  audio 1 664 665
  electrical measurement 5 503 511
  fundamental 3 561
  harmonic motion 6 [illegible]
  infrasonic (subsonic) 12 506
  standards of 4 459 [illegible] 5 504, 8 157
Frequency changer, induction generator 1 284
Frequency control, automatic *see Automatic* frequency control (AFC)
Frequency converter heat 6 436
  motor generator set 8 [illegible]
  radio receiver 11 [illegible]
Frequency counter 5 507 508
  frequency measurement 5 508-509
  scaling circuit 12 49
  as tachometer 13 [illegible]
Frequency curve 2 225
Frequency distortion 4 [illegible]
Frequency-diversity reception 13 423
Frequency divider 5 503
Frequency-division multiplexing 1 352, 14 60
Frequency function (statistics) 13 67
Frequency measurement 5 503 511
  audio frequencies 5 503-509
  Campbell's bridge 5
  cathode ray oscilloscope 5 508, 9 431

...ency measurement—cont
503, 508
harmonics 6 339 340
Lissajous figures 5 509, 7 542
microwave frequencies 5 509 511
primary standard 5 504
radio frequencies 5 509
secondary standard 5 504
spectrum analyzer 12 593
standards of time and frequency 5 504
standing wave detector 13 36
station WWV 5 504
transfer oscillator methods 5 510
by wavelength measurement 5 510 14 439
Wien frequency bridge 5 508
requency meter 5 505 511
audio 5 505 509
beat note detector 5 508
deflection 5 505
direct-comparison methods 5 508
electrodynamometer 5 506
heterodyne meters 5 510
moving-coil 5 506
moving iron 5 506 507
mutual inductance 5 506
radiometer 5 505
reed 5 505
resonant 5 505
Frequency modulation 5 511 514*, 8 527
angle 1 405
Armstrong circuit 10 104 105
detectors 5 513 520
FM radio 5 520 521 11 242
microwaves 8 414
modulators 5 513 515
noise advantage 5 512
noise bandwidth relation 5 512
side frequencies 5 511
spectrum 5 511
see also Phase modulation
Frequency modulation detector 5 515 520
discriminator 4 235 5 516
ratio detector 5 517 519
Frequency modulation radio 5 520 521
broadcasting 5 531 11 247 251
receivers 11 258
transmitter 11 264 265
Frequency modulator 5 514 515
Frequency multiplier 5 515
Frequency polygon 2 225
...response amplifier 5
...ier
...
Frequency shift transmission 11 242, 13 423
Frequency standard 4 459-460 5 504*, 8 157
Frequency table (statistics) 2 224
Fresh water biocycle 3 326
Fresh water crab 4 33, 34
Fresh water drum 12 249
Fresh water ecosystem 4 404, 5 521 534*
biota 5 526 529
chemistry 5 529-532
lentic ecosystem 5 522-532
lentic habitat 5 521
limnology 7 519
lotic ecosystem 5 532 534
lotic habitat 5 521
Fresh-water habitat 5 521
Fresh-water mussel 5 100
Fresh water pearls 9 606
Fresh-water shrimp 12 307
Fresh water supply (at sea) 5 182
Fresnel A J 4 132, 6 521-522, 7 504 9 363
Fresnel 4 132 133 137 139*
Fresnel biprism 7 185-186
Fresnel coefficient 7 187 188
Fresnel diffraction 8 581
see also Diffraction
Fresnel double *mirror* 7 185
Fresnel reflection law 11 391
Fresnel rhomb 10 451-452
Fresnel zones 4 137 138
Freud Sigmund 1 112 328, 552, 4 583 5 549 6 600 8 602 9 553 10 32, 11 74 80
Freudenstein F 8 196
Freudianism 5 534 535
amnesia 1 328
premises 5 534
psychoanalysis 5 535
theory 5 534
Freundlich isotherm 1 59, 80
Friction 5 535 536
bearing antifriction 2 118
brake 2 317 318
clutch 3 224
Coulomb (dry) 5 535
drive 11 619 620
electrification by 4 539
fluid (viscous) 5 536
layer *see* Boundary layer
lubricant 7 602
rigid body dynamics 11 576
sawing 12 41
skin *see* Skin friction
viscosity 14 332 334
Fréedel J 1 265
Friedel-Crafts reaction 5 525, 536
acetophenone 1 36
acid anhydride 1 44
acid halide 1 44 45
acylation 5 536
alkylation 5 536
condensation reaction 5 576
ketone 7 339
quinone 11 194
Friedländer's bacillus *see* *Klebsiella pneumoniae*
Friedländer method 11 192
Friedländer pneumonia 7 619
Friedman, H 13 272
Friedman test 3 192 202
Friedmann, G A 3 509
Friedmann universe 3 309 310
Friedreich's ataxia 9 69
Friedrich, W 3 592 14 567
Frieleia halli 13 485
Fries rearrangement ketone 7 339
Fries rule 1 548
Frigate 12 265-266
Frigate bird 5 536 537
Frigidoreceptor 12 180
Frigorie 13 666
Frigorigraph 12 181
Frigorimeter 12 181
Fringe (optics) 5 537
diffraction fringes 4 132 139
interference fringes 7 184 189
interferometry 7 190 194
Fringe *worm* 10 461
Fringillidae 3 554, 5 273, 7 517, 12 562
Fringing reef 5 537
Frink *O* 7 411
Frit 5 537* 6 285
Frit china 10 546
Frit porcelain 10 546
Fritillaria 7 406
Fritillary 2 381
Frobenium, G 7 412
Froehlich's syndrome 10 252
Frog 5 537 538
Frogeye disease (soybean) 12 534
Froghopper 6 471, 13 7
Frogmouth 2 448
Frome, Lake 5 672
Fromm, E 11 74, 80
Frond 5 261
Front (meteorology) 5 538-540*, 8 326 329
air mass 1 148, 8 326 329
barodinic field 2 102
frontal waves 5 538
frontogenesis 5 539, 8 329 331
polar front 5 539
wind field 14 494
Front end loader 3 416
Front Range 9 156
Frontal analysis 5 93, 6 47
Frontal bone 12 373
Frontal lobe 9 57
Frontal organ 3 566, 11 558
Frontal storms 13 162
Frontogenesis 5 539 540, 8 329 331
Frontonia 11 55
Froome, K D 7 502
Froriep's ganglion 9 63
Frost 5 540
dew 4 90
growing season 6 285
Frost action 5 540 541
cirque 5 144
permafrost 10 22
soil mechanics 12 455
Frost gravimeter 13 516
Frost point 4 90
Frost protection 14 457
Frothing agents flotation 5 514
Froude, William 12 278, 14 2 3
Froude's law of comparison 12 280
Froude number 5 541*, 12 279 280
dynamic similarity 4 312
model theory 8 526
ship propulsion 12 279 280
Froten precipitation 6 317
Frucht, R 6 255
D Fructopyranose *see* *Fructose*
Fructose 5 541
dextran 4 91
dietary carbohydrates 2 458
glucose 6 217
gum 6 297
Monosaccharide 8 578
plant metabolism 10 352
plant translocation (organic solutes) 10 380
sugar 13 237
D Fructose *see* Fructose
Fructose diphosphate 10 371
Fructose 1,6 diphosphate 2 16, 38, 55, 459 5 23, 8 582, 10 370
D Fructose 1 6-diphosphate *see* Fructose-1 6 diphosphate
Fructose-1-phosphate 10 352
Fructose 6 phosphate 2 16, 38, 459, 6 219, 8 582, 10 370
D Fructose 6 phosphate *see* Fructose 6 phosphate
Fruit (fossil) *see* Fossil seeds and fruits
Fruit (botany) 5 541-544
abscission 5 545
anatomy 5 542
endocarp 5 545
exocarp 5 544
mesocarp 5 544 545
pericarp 5 543-544
plant organs 10 368-369
vascular system 5 545
Fruit (tree) 1 696 5 545 546
apple 1 493-494

Fruit (tree)—*cont*
apricot 1 494 495
avocado 1 696
banana 2 90
cherry 3 55
citrus 5 545-546
date 4 17
fig 5 257
grapefruit 6 252 253
kumquat 7 373
lemon 7 450
lime 7 514
mandarin 8 86
nectarine 9 28
olive 9 317
orange 9 370 371
peach 9 601-602
pear 9 605-606
plum 10 419-420
subtropical fruits 5 546
tangerine 13 389
temperate-zone fruits 5 545
tropical fruits 5 546
Fruit (tree) diseases 5 546 548
cherry 3 55
citrus 5 546 547
temperate-zone fruits 5 546
Fruit anatomy 5 542
Fruit bat 2 109
Fruit bud 2 361
Fruit eating bat 3 63
Fruit fly see *Drosophila melanogaster*
Fruit growing (small) 5 548-549
blackberry 2 254
blueberry 2 271
cranberry 3 535
currant 3 625 626
gooseberry 6 237
melon 8 214
pineapple 10 238
Fruit products canning 5 408
dehydration 5 408
freezing 5 408
glacéd 5 409
jams, jellies, and preserves 5 408
juices 5 408-409
purees 5 409
Fruiting body Myxobacterales 8 686
Frustrated reflection 7 182 185
Frustration 5 549
aggression 1 112
Freudian concept 5 549
frustration extinction concept 5 549
intermittent reinforcement 5 549
Frustum 3 395, 11 107
FS smoke 12 82
FSH *see* Follicle-stimulating hormone
Fuadin 12 64
Fucales 10 89
Fuchsin aldehyde test 1 230
Fuckel, L. 5 562
Fucoidan gum 6 297
Fucose (Monosaccharide) 8 578
L-Fucose (gum) 6 297
Fucoxanthin 2 528, 10 89
Fucus 6 297, 8 107
Fuel 5 549 550
additives 1 178
aircraft *see* Aircraft fuel
boron 2 304
chemical 3 29
coke 3 272
combustion 3 306
cost 10 558
diesel *see* Diesel fuel
distillate *see* Distillate fuel
flame 5 293
furnace 5 575
gas turbine 6 66
gasoline 6 68-71
liquefied petroleum gas 7 540
metal base *see* Metal base fuel
methane 8 339
nuclear *see* Nuclear fuels
octane number 9 273
propellant 11 6-10
solar energy 12 468
Fuel air mixture aircraft engine 1 178
furnace 5 575
internal combustion engine 2 477
Fuel cell 5 550-552
Fuel consumption, specific *see* Specific fuel consumption
Fuel gas 5 552-553
coal gasification 3 237
coking (petroleum refining) 3 272
petroleum products 10 72
Fuel gas supplements 5 553-556
Fuel injection 1 687 688, 5 556*, 7 200
Fuel oil 5 556-557*, 10 72
distilled 5 557
Fuel pump 5 557
Fuel reprocessing *see* Nuclear fuels
Fuel system 5 558
Fugacity 5 50, 559*, 13 575
Fugitive dye 4 297
Fugitive emulsifiers paint 9 493
Fugue state 6 600
Fulcrum (Rotifera) 11 634
Fulgoroidea 6 470
Fulgur canaliculatus 14 488
Fulgur carica 14 487
Fulica americana 3 462
Full wave antenna 1 451
Full wave rectifier 11 384
Full wave voltage doubler 14 366-367
Fullering forging 5 470
Fuller's earth 3 162, 5 559 560
Fulmar 10 637
Fulminate 5 560
detonator 4 84
Fulminate of mercury 8 228
Fulminic acid 5 560
Fulton, Robert 8 119
Fulvous tree duck 4 290
Fumagillin 5 560
antimicrobial activity 5 560
formula 5 560
therapeutic use 5 560
toxicity 5 560
see also Antibiotic
Fumarase 5 23
Fumaric acid 1 589, 2 31, 35, 37, 56, 475, 5 23, 560 561*
Krebs cycle 7 370
nitrogen excretion 9 113
Fumarin 11 615
Fumarole 14 351
geologic thermometry 6 127
Fumaryl acetoacetic acid 8 258
Fumaryl glycidic acid 5 44
4-Fumarylacetoacetic acid 2 35
Fumigant 5 561
soil sterilization 12 464
Function (calculus) 2 401-402
Function generation, analog 1 376-383
Functional diagram 12 61 62
Functional group organic analysis 9 399
Functional group isomerism 7 278
Functions complex variable 3 338 339
real variable 11 372
Fundamental frequency 5 561*, 8 525
Fundamental mode of vibration 5 561
Fundamental particle *see* Elementary particle
Fundic gland 4 160
Fundulus 3 102, 7 345, 11 478
Fundulus majalis 3 648
Fundulus similis 8 574
Fundus 4 159
Fungi 5 561 562*, 8 548
amphotericin B 1 341
antibiotic producers 1 466-467
Ascomycetes 1 574
Basidiomycetes 2 107
Dematiaceae 4 52
Discellaceae 4 234
Erysiphales 5 66
Eumycetes 5 105
Furotfales 5 123
Moniliaceae 8 567
mushroom 8 660
Myriangiales 8 682
pathogen 9 593
Fungi—*cont*
Phycomycetes 10 198
rust (microbiology) 11 634
Septostromata 7 476
soil microbiology 12 459
soil microorganisms 12 461
Sphaeroidaceae 12 604
Sphaeropsidales 12 606
Sporobolomycetales 13 10
Stilbellaceae 13 140
Tuberculariaceae 14 128
Uredinales 14 217
wood attacking 14 537 538
yeast 14 599
Zythiaceae 14 630
Fungi Imperfecti 5 561, 562 563*; 8 678, 14 628
Cryptococcales 3 578
Melanconiales 8 212
Moniliales 8 570
Mycelia Sterilia 8 676
mycology, medical 8 673
Sphaeropsidales 12 606
spore group classification 5 563
Fungia 3 255, 474
Fungia actiniformis palaeuvia 12 77
Fungia scutaria 12 77
Fungicide *see* Fungistat and fungicide
Fungid corals 12 77
Fungida 12 78
Fungistat and fungicide 1 125, 475, 5 563 565*
agricultural fungicides 5 564
application methods 5 564
chemotherapeutants 5 564
chemotherapy in man 5 563
cherry 3 55
fumigant 5 561
plant disease control 10 315
ramie 11 335
seed treatments and soil treatments 5 564
soil sterilization 12 464
Fungivoridae 4 212
Fungizone *see* Amphotericin B
Fungus ant 6 581
Fungus gardens 7 287
Fungus gnat 4 212
Fungus root rot 1 495
Fungus weevil 3 278
Funiculina quadrangularis 9 622
Funiculus 12 144
Funkenstein, D. H 4 585
Fuoss, R. 4 486
Fur processing *see* Leather and fur processing
Fur seal 12 122
Furacin 5 565
see also Nitrofurazone
Furadantin *see* Nitrofurantoin

5 566
ldehyde 5 566
nazone 1 466
5 565 566*, 9 107
an 1 703
olidone 1 464 468
earer 14 490
a 7 459 473
iba larva 5 108
ula 3 289 290, 12 358
fural 1 231 5 565 566*,
0 113
furaldehyde 5 566
rlong 8 188
rnace· glass 6 206 207
heating *see* Central heating
open hearth 13 95
see also Electric furnace; Gas furnace, Oil furnace; Solar furnace
urnace (steam generating) 5 566 573
oil and gas 5 570, 9 303
pulverized coal 5 568
steam temperature control 13 85
stoker 5 568, 13 147
superheater 13 302
Furnace brazing 2 322
Furnace construction 5 573 577
chimney 3 61 62
kiln 7 345 347
see also Electric furnace· Furnace (steam generating), Gas furnace Oil furnace
Furnace process carbon black 2 465
Furnariidae 9 589
Furole 5 566
Furoxone *see* Furazolidone
Furrow of His 9 44
Furuncle 1 466 467, 2 2, 477, 13 38
Fury Strait 9 166
Fusain 3 228, 232 233
Fusaria 1 234, 3 265, 10 517
Fusarial head blight 14 482
Fusarium clover diseases 3 222
coconut diseases 3 254
corn diseases 3 484
in cotton spoilage 13 541
diseases of ornamental herbs 9 408
flax diseases 5 298
Irish potato diseases 10 534
millet 8 440
peanut diseases 9 603
ramie diseases 11 335
in soil 12 461
sorghum diseases 12 508
strawberry diseases 13 172
Tuberculariaceae 14 128
Fusarium bulbigenum 1 541
Fusarium conglutinans 14 128
Fusarium lini 14 128
Fusarium oxysporum 9 527 14 128
Fusarium oxysporum lini 5 298
Fusarium oxysporum f *conglutinans* 2 583
Fusarium oxysporum f. *cubense* 1 1, 2 90
Fusarium oxysporum f *niveum* 8 215
Fusarium oxysporum f. *pisi* 9 600
Fusarium oxysporum f *tracheiphilum* 3 529, 12 535
Fusarium oxysporum f *vasinfectum* 3 515
Fusarium roseum 14 481
Fusarium solani 7 529, 8 214, 12 348, 13 29
Fusarium solani f *pisi* 9 600
Fusarium vasinfectum 14 128
Fuse, electric 3 323, 4 425, 5 577 579*
Fuse, explosive 4 84, 5 579* *see also* Fuze
Fused electrolyte battery 10 589
Fused flame-spray metal coating 8 283 284
Fused junction transistor *see* Alloy junction transistor
Fused salt electrolysis 4 466 467, 498
Fused salt phase equilibria 5 579 586
Fused silica 6 206
Fuselage 5 586-591
Fusible alloy 1 259
Fusiform bacilli 14 324
Fusimotoneurons 10 528
Fusinite 3 232
Fusion (melting) 1 593, 8 215, 12 485
Fusion nuclear 5 591 595, 13 589 590
critical temperatures 5 593
cross sections 5 592
fusion power 5 591-595; 9 193 194
fusion reactor 5 591 595
hydrogen bomb 6 548
plasma physics 10 385
proton proton chain 11 47
reaction rates 5 593
thermonuclear reaction 13 589 590
Fusion bomb *see* Atomic bomb
Fusion casting 2 649
Fusion point 8 215
Fusion reactor 5 591 595*, 10 232 235
Fusobacterium 2 45
Fusobacterium fusiforme 2 71, 14 324
Fusulina 5 431
Fusulinidae 5 431, 595
Fuze base-detonating (BD) 1 540
impact 1 536, 540
point-detonating (PD) 1 540
point initiating base-detonating (PIBD) 1 540
proximity 1 536, 540
time 1 536, 540
see also Fuse
Fyn (Fünen) 5 116

G

g *see* Gravity
G actin 8 642
g factor electron spin 4 517
solution 12 486
quantum electrodynamics 11 150
spectroscopic splitting factor 6 307
g tolerance 12 540
Gabbro 6 1-2* 7 16, 10 86, 11 590
eclogite modification 4 384
Gabriel's syntheses 1 44, 506
Gacrux *see* Gamma Crucis
Gadidae 6 2
Gadiformes 3 254, 6 2* 9 442
Gadoelitus 8 680
Gadolin, J 6 2, 14 606
Gadolinite 11 342
Gadolinium 6 2
electron configuration 4 504
extractive metallurgy 8 277
ionization potential 4 504
paramagnetism 9 549
Gadolinium acetate 4 525
Gadus callarias 3 255
Gadus macrocephalus 3 254
Gadus morhua 3 254 6 2
Gaffkya 8 550
Gaffkya tetragena 6 2
Gage blocks 6 3
Gage pressure 10 581 582
Gages 6 1 5
comparator 3 328 330
gage blocks 6 3
indicating gage 6 5
plug gage 6 4
receiving gage 6 5
ring gages 6 4
screw thread gage 6 4
snap gage 6 4
taper pipe thread gage 6 4
tooling devices 13 670
Gagge, A P 12 181
Gaidukov, N 12 67
Gaithaf Alps of 5 117
Gain 6 5
Gain control automatic *see* Automatic gain control (AGC)
Gairdner, Lake 1 672
Galactan 9 608
Galactic circle 1 607 6 11 12*
Galactic clusters *see* Star clusters
Galactic coordinates 1 607* 6 11 12*
Galactic corona *see* Galactic halo
Galactic equator *see* Galactic circle
Galactic halo 3 502*, 11 245
Galactic latitude *see* Latitude, galactic
Galactic longitude *see* Longitude, galactic
Galactic nebula *see* Galaxy, external
Galactic radiation 11 209
Galactin 11 477
Galacto Waldenase 8 262
Galactokinase 6 106
Galactomannan 8 92
4 O beta D Galactopyranosyl-D glucose see Lactose 7 582
Galactose 2 455 6 5*, 106, 223
gum 6 297
monosaccharide 8 578
uridine diphosphoglucose (UDPG) 14 219
Galactose 1 phosphate uridyl transferase 6 106
Galactose phosphotransferase 8 262
D Galactose mannan 8 92
see also Galactose
alpha D Galactose 1 phosphate 6 5
Galactosemia 8 262
galactose 6 5
gene action 6 106
human genetics 6 511
mental deficiency 8 226
metabolic disorders 8 258
Galactosyl glycerol lipid 6 223
Galacturonan 9 608
Galacturonic acid 8 621
D Galacturonic acid 2 453, 6 297 9 608
Galago 10 589
Galamannoheptose 8 578
Galapagos Islands 9 263 12 530
Galapagos penguin 12 607
Galatheathuria 4 40
Galatheidea 4 51
Galaxea fascicularis 12 77
Galaxy external 6 5 9
Andromeda Nebula 1 400
cosmogony 3 505 506
cosmology 3 509 510
elliptical 6 6 9
expanding universe 6 9
spiral 6 6 9
Galaxy the 6 10 12
Galbulidae 10 215
Gale, E. F 2 61
Galena 6 12-13*, 8 277, 15 255
lead, isotopic composition 7 428 429
lead ore 7 425
Galeoidea 12 157
Galeopithecus 4 63
Galeritidae 6 463
Galeropygidae 9 214
Galilean frame of reference 5 493
clock paradox 3 206 207
space time 12 557
Galilean satellites 7 324 525
Galilean telescope 7 452, 15 448*
Galilean transformation 5 492 6 13* 11 434
Galileo (Galilei) 2 579, 7 324 8 194 9 562 11 427, 12 74 15 448 687
Galileo's law of inertia 9 91
Galium 10 489
Gall, F J 1 489
Gall (ink) 7 112
Gall midge 4 212
Gall mite 14 115
Gall wasp 6 574
Gallaun Range 9 157
Gallbladder 4 153, 5 204, 6 15 17* 7 531
absence 6 13 14
and liver 7 561
microscopic structure 6 15
microvillus 6 15
Gallbladder, comparative physiology 6 15
Gallbladder, embryology 6 13 15
Gallbladder *disorders* 6 17-18
cholecystitis 6 17
gallstones 6 17 20
Galle, J G 9 40
Gallena mellonella 7 468, 472
Galley 14 171
Gallia 6 20
Gallic acid 2 473 6 18*, 15 390 391 14 527
Galliformes 3 694 6 18*
grouse 6 285
guinea hen 6 291-292
partridge 9 588
peacock 9 602
pheasant 10 109-110
prairie chicken 10 563 564
ptarmigan 11 85
Galliformes—*cont*
quail 11 136
turkey 14 165
Gallinago gallinago 3 10
Gallinula chloropus 6 18
Gallinule 6 18 19*, 296 11 326
Gallionella 2 570, 11 65
Gallionella ferruginea 2 29, 570
Gallipoli Peninsula 5 116
Gallium 6 19 20
electron configuration 4 504
extractive metallurgy 8 277
ionization potential 4 504
occurrence and extraction 6 19 20
organometallic compounds 9 403
properties 6 20
uses 6 19
Gallocyanine 4 505
Gallon 8 188
Gallotannin 15 391
Gallstones 6 15, 17, 20*
Gallus domesticus 9 452, 11 527
Gallus gallus 3 58 6 18
Galois, E. 6 283, 11 626
Galois group group theory 6 285
Galois theory of equations 5 47
Galton, Sir Francis 5 97, 6 506
Galumnidae 12 30
Galvanic cell 4 498
Galvanic corrosion 5 489 490, 4 279
Galvanic currents 4 424
Galvanic skin reflex 11 398
Galvanizing 6 21, 8 279 280, 14 612
Galvanomagnetic effects 6 21
Galvanometer *6 21 24*
ballistic 6 23
coulomb sensitivity 6 23
damping 6 22
D Arsonval galvanometer 6 21
driving torque 6 22
indicating means 6 23
light beam galvanometer 6 21
mechanical oscillation 6 22
mirror 6 23
moving magnet fixed-coil 6 23
portable 6 23
restoring force 6 22

Galvanometer—*cont*
sensitivity 6 21
transient response 6 21
Gambir catechin tannin 13 391
Gambusia 4 386, 7 345
Gambusia affinis 6 299
Game animals 14 490
Game theory 6 24-30
see also Linear programming; Operations research
Gametangia 5 107
Gamete 13 373
Gametogenesis 4 567, 6 31-32*
Gamma (geomagnetism) 6 146
Gamma acid 9 3
Gamma cell 9 532
Gamma Crucis 3 569
Gamma detectors 6 34-35
Gamma function 6 32-33
Bessel functions 2 179
beta function 6 33
combinations and permutations 3 305
differential equation 4 127
Integration 7 171
psi function 6 32-33
Gamma globulin 1 468, 6 33-34*, 13 619
antibodies 6 33
antibody-antigen complex 6 33
deficiency 1 110
in germ free vertebrates 6 33
in german measles 6 175
globulin 6 215
immunity aspect 7 34
lactation 7 377-378
in measles 8 188
mechanism of antibody synthesis 6 34
mumps 8 632
Gamma radiation *see* Gamma rays
Gamma rays 6 34-35
absorption by snow 10 576
capture gamma rays 9 201
contrasted with x-rays 9 196
crystal counters 3 580
detection of nuclear explosions 9 183-184
energy measurement 6 35
gamma detectors 6 34 35
geophysical prospecting 10 58, 11 23-24
interaction with matter 6 34
low-level counting 7 594-595
mineral prospecting 11 23-24
nuclear radiation (biology) 9 196
Gamma rays—*cont*
pair production (electron positron) 9 495
radiation cytology 11 222
radiation damage (inanimate materials) 11 223-225
radiation shielding 11 238-240
radioactive fallout 11 266-268
radioactivity 11 286 289
sterilization 13 155
survey 10 58, 11 23 24
well logging 14 471-472
Gammaridea 1 339, 2 447, 6 36 37*
Gammarus 3 563
Gammarus chevreuxi 6 37
Gammarus fasciatus 12 307
Gamma sulfur 13 256
Gamodeme 10 507
Gamopetaly 5 527
Gamow, G. 4 552-553, 5 592, 11 282, 12 162
Gamow curve, fusion 5 592
Gamow-Teller selection rules 12 162
Gampsonychidae 1 396
Gampsonychus 13 367
Gampsonychus fimbriatus 1 396
Gang saw 13 152
Ganges-Brahmaputra River 1 580
Ganglion 6 37-38
facial 9 47
glossopharyngeal 9 47
nervous system 9 42-63
statoacoustic 9 47
trigeminal 9 47
vagus 9 47
Ganglioneuroma 1 73-74
Ganglioside 6 225 224
Gangrene 6 38
dry 4 25 24
moist 4 25 24
thermotherapy 13 596
Gangrene, gas 4 23, 6 38*
antitoxin 1 487, 2 217
Gangue 8 441, 9 376, 388
Gangylonema pulchrum 15 6
Ganister refractory 11 409
Gannet 6 38 39
Ganoderma 5 254, 265
Ganoid scale (zoology) 12 47-48
Gans, R. 12 52
Gantry crane 6 462
Gantt chart 6 39, 10 644
Gantt step bonus plan 14 379
Ganymede 7 524
Gar 6 39*, 12 175
Garamond, Claude 14 171
Garand rifle 1 537
Garda, Lake of 5 115
Garden flea hopper 6 405
Garden of the Gods, Colorado 9 156
Gardening 14 286
Gardinol 13 538
Gardner, Island of 9 481
Gargaphia solani 6 405, 409
Gargaphia tiliae 6 405
Gargoylism 8 226
Garigue 5 166-192
Garlic 6 39*; 9 326, 12 613
Garlic oil 5 71
Garner, W. W. 10 175
Garnet 6 39-40
abrasive 1 9
ferrites 5 219 220
gem 6 98
grandite series 6 40
pyralspite series 6 40
Garnierite 6 41
Garonne River 5 121
Garpike 12 48
Garrod, A. E 6 498, 507
Garrya elliptica 12 145
Garter snake 6 41*, 12 589
Gas 6 41-44
absorption by 1 14
Avogadro's law 1 697
boiling points 1 10
Boltzmann statistics 2 278-281
cohesion 5 268
compressibility 5 540
corresponding states, principle of 6 42-43
critical constant 5 550
crude oil fraction 10 66
diffusion in 4 142-146, 7 294
electrical conduction in 4 449 452
electron diffraction in 4 507-509
energy of 1 13
equations of state 6 41 42
flow measurement 5 315 321
fluid flow 5 321-326*, 338 340*
fluid statics 5 338
fugacity 5 559
heat capacity 6 363
heat conduction in 5 383 384
inert *see* Inert gases
insulating properties of 7 162-163
interplanetary 7 222
interstellar 7 221
kinetic theory 7 350 355
liquefaction of 7 535-540
luminescence in 7 611-612
moisture-content methods 8 533 535
molar volume 8 536-537
nonequilibrium theory 15 64 65
nonideal, theory of 15 65 64
perfect 5 323
Gas—*cont*
propagation of sound in 12 513 514
properties 5 340
real 2 125, 5 323, 14 128
scattering by 12 51 52
thermal conductivity 3 574 589
thermal expansion 13 538
Van der Waals equation 14 268
velocity of sound in (table 12 513
volcanic 14 353
Gas, fuel *see* Fuel gas
Gas, mine black damp 8 492
contaminants, kinds of 8 492
detecting devices 8 502
diseases and health 8 503
explosions 8 500 501
methane 8 492
Gas, natural *see* Natural gas
Gas, viscosity of *see* Viscosity of gases
Gas absorption operations 6 44-45
humidification 6 515
stripping 13 186
see also Distillation, Drying
Gas-activated reserve battery 11 486
Gas analysis 6 45 46
Gas burner 13 593
Gas cap petroleum reservoir 10 79
Gas carburizing 13 515
Gas chromatography 3 95 96 6 46 49*
biochemistry 2 199
detecting and measuring components 6 48
separation (chemical and physical) 12 186
Gas compressor 13 206
Gas condensate well 9 283
Gas constant 6 49*, 13 550
Gas counter 7 595
Gas dielectric capacitor 2 466
Gas discharge *see* Electrical conduction in gases
Gas-discharge lamp *see* Vapor lamp
Gas discharge tube *see* Gas tube
Gas drilling (method) 2 257
Gas dynamics 6 49 50
acoustic velocity 6 51
aerodynamics 1 88 89
combustion wave 6 56
conservation equations 6 49
continuity equation 6 50
control volume 6 49
Damköhler number 6 57
diabatic flow 6 55

namics—*cont*
mensionless parameters
6 53
340
fluid flow properties 5 345
fundamental relations
6 49 51
incompressible Bernoulli
equation 6 51
Isentropic flow 7 271 272
Mach wave 6 55
momentum equation *6 50*
rarefield gases 13 293 295
Rayleigh equations 6 53
Rayleigh flow 6 55
real gas effects 6 57
scope 6 49
shock wave 6 55
stagnation temperature
6 52
supersonic aerodynamics 13 293
295
thermodynamic equations
6 49
total pressure 6 53
variable area flow 6 56
wave phenomena 6 55
as electrode 4 472
as explosion 5 153
as evolution 12 186
as field and gas well 6 58
as flow *see* Flow of fluids
as flow measurement *see* Flow
measurement
as furnace 5 570 *6 58*
as kinematics 6 58
as kinetics 6 58
as laws Boyle's law 2 313
Charles' law *3 11*
Dalton's law 4 5
thermodynamic principles
13 567
as lift (petroleum *engineering*)
9 285
as liquid chromatography
8 47 48
as liquid equilibrium 3 55 56
as lubricated bearing 2 122
as Machinery *process fuel* gas
supplements 5 555
as mantle 2 615
incandescence 7 50
thorium 13 610
Welsbach mantle 12 588
as mask 5 46 6 56-60*
as mechanics 6 60
as meter 13 4
as oil coking 5 272
crude oil fractions 10 66

Gas oil—*cont*
petroleum products 10 72
fuel oil 5 557
[illegible]
ture) 7 600
Gas thermometry (flow temperature) 7 598 599
Gas tube 6 60-63
cold cathode 5 274 275*, 6 60 61
excitation 5 136-137
grid glow tube 6 61
hot-cathode 6 61 62
ignitron 7 20 22
mercury vapor rectifier
8 235 238
noise 6 62
oscillations 6 62
phanotron 6 61
Rectigon 6 61
surges 6 62
switching 13 559
thyratron 13 619 621
Tungar 6 61
volt ampere characteristics
6 60
voltage regulator 14 367
368
Gas tube boiler 5 282
Gas tube noise generator 8 382, 9 130*
*Gas turbine 6 63 68** *14 148*
aircraft 6 67 14 148
ash erosion 6 67
automotive 14 152 154
Brayton cycle 2 320 321
combined steam and gas
plants 6 68
combustion chambers 6 65
compressors 6 65
cooling 6 66
cycles 6 63 64
ducted fan 4 292
electric generation 6 68
fuels 6 66
gas pipeline transmission
6 67
governor 6 239
heat exchangers 6 66
marine 6 67
performance criteria 10 591
railroad 14 132
ram effect 6 65
steel industry *6 67*
turbine wheels 6 66
see also Turbine propulsion
Gas War (game theory) 6 29
Gas warfare *see* Chemical warfare

Gas welding 14 468
Gas well *see* Oil and gas wells
Gas x ray tube 14 587 588
Gaseous effusion method 8 557
Gaseous nebula *see* Nebula, gaseous
Gasket 6 68
Gasoscope 13 367
Gaso
Gasc
aviation gasoline 6 [illegible]
burning velocity 2 375
coking 5 272
cracking 5 532 535
crude oil fraction 10 66
ethylene dibromide 2 543
heat of combustion 8 290
isomerization 7 281 292
motor gasoline 6 69
octane number 9 275
oxidation stability 6 70
tetraethyllead 13 529
Gasoline fractions 10 55
Gaspé (peninsula) 9 145
Gaspergou 12 249
Gasteromycetes 6 469
Gasterophilus 4 218 11 511
Gasterophilus haemorrhoidalis
8 680
Gasterophilus inermis 8 680
Gasterophilus intestinalis 5 6
8 680
Gasterophilus nasalis 4 216, 8 680
Gasterophilus pecorum 8 680
Gasterosteidae 13 140
Gasterosteiformes 6 71*, 9 442
sea horse 12 92
stickleback 13 140
Gasterosteus aculeatus 12 596, 13 140
Gasterostome 4 148 150
Gasteruptiidae 6 574
Gastornithidae 4 104
Gastralia 12 48, 335
Gastric gland 4 160
Gastric juice 9 628
Gastric mill 3 565, 4 26 5 102, 200 206
Gastric mucin 4 160
Gastric pit 4 160
Gastric ulcer 14 179
Gastrin 4 167, 5 206
Gastritis 6 73 13 149
Gastrodermis 5 256
Gastrodes 10 412
Gastroenteritis 7 95
Gastroenteritis, paratyphoid see
Paratyphoid gastroenteritis
Gastrointestinal tract 6 71-72
radiation injury (biology)
11 227
Gastrointestinal tract disorders
3 288 6 72 74*
Appendicitis 6 73

Gastrointestinal tract disorders
—*cont.*
cardiospasm 6 73
colitis 6 73
gastritis 6 73
peptic ulcer 1 257, 6 72-73,
9 628
regional enteritis 6 73
[illegible]
borer 2 294
conch 3 561
ecology 6 75
economic importance 6 74-75
fossils 6 75 77
limpet 7 519
Neogastropoda 9 34 35
Opisthobranchia 6 74,
8 559, 9 345
oyster drill 9 477
Pectinibranchia 9 609
periwinkle *10 21*
Prosobranchia 6 74, 8 559,
11 18-19
Pulmonata 6 74, 8 559, 11
93
Gastropoda fossils 6 75 77
Gastroscope 9 348-349
Gastrotheca 12 10
*Gastrotricha 1 575, 6 77 78**
Chaetonotoidea 3 2 3*,
6 77
ecology 6 78
Macrodasyoidea 6 77 8 10*
reproduction and development 6 77
Gastrula 3 255 261, 6 174 175,
7 229
Gastrulation 2 257, 6 78 79*
emboly 6 79
embryology 4 568
epiboly 6 79
germ layers 6 174 175
process 6 78 79
Gates and Roller diagram
12 350
Gate circuit 6 79 80
coincidence amplifier
3 269 270
combinational circuit
13 344 345
switching gate 6 80 13 343
transmission gate 6 80
Gate valve 14 260 261
Gates, M. 8 598
Gates gyratory crusher 5 557
Gatling mechanism 1 534
Gatterman Koch synthesis
1 231
Gatterman reaction 4 106 9 10
Gauche conformation 5 397
Gaucher's disease 8 261

Gauge invariance (theoretical physics) 13 362-363
Gaulard, L 4 454
Gauss, K F 2 582, 653, 4 258, 6 146, 152, 155; 8 64, 9 225; 10 631; 12 611
Gauss 6 80*, 146
Gauss Codazzi equations 6 152
Gauss-Seidel method 9 227
Gauss' divergence theorem *see* Gauss' theorem
Gauss' error law 10 632
Gauss' forward interpolation formula 7 218
Gauss' hypergeometric equation 4 127
Gauss' mean value theorem 7 401
Gauss' theorem 2 414, 6 80 81*, 268, 7 171
Gauss' transformation formula integral transform 7 165
Gaussian curvature 6 152, 161
Gaussian distribution *see* Normal distribution
Gaussian image point 9 365 366
Gaussian noise 9 118
Gaussian optics 3 91, 9 364-366*
Gaussian system of units 4 460-461
Gava immer 6 81, 7 582
Gavial 3 551-553
Gaviahdae 3 552
Gavialis gangeticus 3 552
Gaviidae 6 81, 7 582
Gaviiformes 1 694, 6 81, 7 582
Gay-Lussac, J L 2 299, 3 11, 5 215, 13 567
Gay Lussac tower 13 261
Gay Lussac's law *see* Charles' law
Gazelle 1 568
Gazin, C L 13 641
GCA see Ground controlled system (GCA)
Gdynia, Gulf of 5 114
Gear 6 81-86
  backlash 6 82
  bevel 6 84
  crossed helical 6 83
  function 1 579
  helical 6 83
  hypoid 6 85
  noise control 9 124-125
  noncircular 6 83
  rack and pinion 6 83
  spiral bevel 6 85
  splines 13 9
  spur 6 83
  surface durability 6 89
  teeth 6 81-82
  tooth strength 6 89
  worm 6 86
  Zerol bevel 6 85
Gear cutting 6 87 88*, 8 6
  broaching 6 88
  generating 6 87
Gear cutting—*cont*
  grinding 6 88
  hobbing 6 87
  milling 6 88
  shaping 6 87
  shaving 6 88
Gear drive 6 88
Gear loading 6 88 89
Gear train *6 89 91*
  epicyclic 6 91
  friction 11 619
  noise control 9 124-125
  ordinary 6 90
  planetary 10 273 274
  reverted 6 90
  in servomechanisms 12 202
  train value 6 90
Gecarcinidae 4 34
Gecarcinus lateralis 4 33
Gecko 6 91, 13 22
Gedinnian Stage 4 87
Gedrite 1 336
Gee 9 15, 20
Gegenschein 14 619
Gehlenite 8 214
Gehman Torsion Apparatus 11 638
Geiger, H 1 268, 3 355, 11 282
Geiger Briggs rule 1 268
Geiger counter *see* Geiger Muller counter
Geiger Muller counter 6 91-93
Geiger-Nuttall rule 11 282
Geiger's rule (alpha rays) 1 268
Geigy 414 6 423
Geissler, H 12 588
Geissler tube 12 588-589
GEK *see* Geomagnetic electrokinetograph
Gekkonidae 6 91, 13 23 24
Gel 6 93
  in biological systems 2 610
  coagulation 3 228
  pectin 9 608 609
Gelastocoridae 6 401
Gelatin 5 376, 6 93 94*
  amino acid, composition 6 94
  characteristics 6 94
  coacervation 3 227
  glue 6 219
  manufacturing process 6 93
  uses 6 94
Gelatin liquefaction bacteria 2 8
Gelatin transfer process (photo copying) 10 145
Gelatinization 13 51
Gelding 6 488 492
Gelechiidae 7 464
Gelidium 6 297, 11 554
Gels 6 581
Gell Mann, M 6 587, 8 250
Gell-Mann–Nishijima scheme 13 563
Gelling agent 7 605
Gem 6 95-99
  adularescence 6 96
  agate 1 111
  amber 1 299 300*, 6 98
  amethyst 1 302*; 6 99
  asterism 6 96, 11 656
  beauty 6 95
  beryl 2 170*, 6 98
  brilliancy 6 95
  brilliant cut facets 6 102
  chatoyancy 6 96
  chrysoberyl 3 116*; 6 98
  cleavage 3 169, 6 95
  coral 3 474, 6 98
  corundum 3 496*, 6 98
  diamond 4 97-100*, 6 98
    synthetic 4 101
  dichroism 6 96
  dispersion 6 95
  durability 6 95
  emerald 4 582
    synthetic 6 101
  feldspar 5 206 214*, 6 98
  fracture 6 95
  garnet 6 39-40*, 98
  gem materials 6 98
  hardness 6 95
  hematite 6 98
  identification 6 97 98, 101*
  jade 6 98, 7 301*
  lapis lazuli 6 99, 7 422*
  malachite 6 99
  occurrence 6 96
  onyx 9 330
  opal 6 99 9 332*
  pearl 6 99, 9 606 607*
  peridot 6 99, 9 317
  play of color 6 96
  pleochroism 6 96
  precious stones 6 96
  quartz 6 99, 11 182*
  refractive indices 6 95, 97
  ruby 6 98, 11 648 649*
    synthetic 6 101
  rutile (synthetic) 6 101
  sapphire 6 98, 12 26*
    synthetic 6 100-101
  selective absorption 6 95
  semiprecious stones 6 96
  specific gravity 6 98
  spinel 6 99, 12 617 618
  spodumene 6 99, 13 9 10
  synthetic gem materials 6 97, 100 102
  topaz 6 99 13 676 677
  tourmaline 6 99 13 692 693*
  trichroism 6 96
  turquois 6 99, 14 165 166*
  zircon 6 99 14 615*
Gem manufactured 6 99 101
  diamond 4 101
  dyeing 6 100
  emerald 6 101
  flame fusion process 6 100 101
  heat treatment 6 100
Gem, manufactured—*cont*
  identification of artificial crystals 6 101
  imitation gems 6 101
  radiation 6 100
  ruby 6 101
  rutile 6 101
  sapphire 6 100 101
  synthetic gems 6 100
  treated gems 6 99 100
  verneuil process 6 100 101
Gem cutting 6 101 103
  cabochon cut 6 103
  commercial cutting 6 102
  cutting styles 6 103
  facet grinding 6 102
  hobbyist cutting 6 102
  polishing 6 102
  rough gem material 6 103
  step cut facets 6 103
Gem mounting 6 103 104
  metals used 6 103
  popular alloys 6 103
  seat 6 103 104
  setting 6 103
Gem-weight standard 2 449
Gemini 3 412 413, 6 104*
Geminids 8 308
Gemstocyte 9 68
Gemma 11 450
Gemmation 11 450
Gemmule 10 315, 11 449 1510
Gemology 6 104
Gemsbock 1 445
Gemscope 6 97
Gemuendina 13 101
Gene 4 262, 5 155, 6 104*, 115
  allele 1 256
  chromosome theory of heredity 3 114
  gene action 6 104
  Hardy Weinberg formula 6 338
  mendelism 8 225
  mutation 8 670
  pleiotropism 10 416
  radiation injury (biology) 11 225
  sex determination 12 226
Gene action 6 104-115
  in development 5 111 113
  gene dosage 6 107
  gene and environment 6 110
  gene interaction 6 108 110
  genes as units of action 6 105
  interactions between alleles 6 107 108
  lethal gene 7 478
  phenotypic effects of gene mutation 6 105
  primary gene action 6 105
  pseudoalleles 11 61 62
  sex determination 12 226
  sex influenced inheritance 12 232

Gene conversion 11 579
Gene flow (human) 6 505
Gene frequencies 10 511-512
General Catalogue of Trigonometric Stellar Parallaxes 9 545
General dementia 1 494
General paresis *see* Paresis, general
Generalized coordinates 3 415, 6 551*, 7 383 385*
Generalized forces 7 385 384
Generative nucleus 5 326 334
Generator (canonical transformation) 2 437 439
Generator, electric 6 115 114
alternating current 1 282 284
armature 1 541
copper loss 5 472
core loss 5 479-480
direct-current 4 223 225
dynamometer test 4 314
induced voltage 6 113
motor generator set 8 617
paralleled prime movers 6 242
protection 4 434
synchronizing 4 454
theory 6 115
turbogenerators 6 114
voltage regulation 14 361 362
windings 14 504 506
Generator, electrostatic *see* Electrostatic generator
Generator, thermoelectric 13 584
Generator, Van de Graaff *see* Van de Graaff generator
Genetic drift 6 505
Genetic maps 11 376 377
Genetic recombination 1 459
Genetics 4 262 6 115*
biochemical *see* Biochemical genetics
blood groups 2 266 268
breeding (animal) 2 527
breeding (plant) 2 527
cell division 2 602
chromosome 3 106
chromosome aberration 3 113
colchicine 3 275
culture tissue 5 619
cytoplasmic inheritance 3 658
eugenics 5 97
evolution organic 5 130
experiment 5 143
expressivity gene 5 155
gene 6 104
heterosis 6 450
instinctive behavior 7 148
meiosis 8 209 211
Genetics—*cont*
mendelism 8 222 224
molecular biophysics 8 544
pleiotropism 10 416
phenocopies 10 110
recombination, genetic 11 575-580
sex determination 12 227
sex-influenced inheritance 12 233
sex linked inheritance 12 233
speciation 12 567
virus in 14 331 332
Genetics, bacterial *see* Bacterial genetics
Genetics, human *see* Human genetics
Genetics, population *see* Population genetics
Genetron 6 550
Genetron HL 6 329
Geneva (Leman) Lake 5 115
Genic balance concept 12 229
Geniculate body 9 58
Geniculate ganglion 9 65
Genie missile 1 536
Geniohyidae 6 598
Genital ridge 11 462 463
Genitourinary infections 4 54
Genitourinary system 14 234
Genome 5 107
Genotype 1 256, 6 104 115
Genotypic selective values 10 509 510
Genova, Gulf of 5 114
Gentian violet *see* Rosaniline
Gentianaceae 6 115
Gentianales 6 115 10 546
ash 1 576
rauwolfia 11 347
Strophanthus 13 195
Strychnos 13 207
Gentiobiose 2 452
Genuina 6 586
Genus 2 10, 13 404
Geobotanical surveys 6 118
Geocentric latitude 6 122
Geocentric parallax 9 545
Geochelone 3 22
Geochemical cycle atmosphere 1 630
biosphere 2 243 244
lithosphere 7 551 552
Geochemical evolution earth's atmosphere 1 630-631
hydrosphere 6 567-568
lithosphere 7 550 551
origin of Earth 4 330, 340
Geochemical exploration 6 170
Geochemical processes 6 565 568
Geochemical prospecting 6 115-118
analytical techniques 6 118
biogeochemical surveys 6 117 118
dispersion aureoles 6 116
Geochemical prospecting—*cont*
dispersion fans 6 117
dispersion pattern 6 115
dispersion trains 6 117
field program 6 118
geobotanical surveys 6 118
geochemical anomalies 6 115-116
indicator plant species 6 118
leakage halos 6 116
metallogenetic provinces 6 116
migration and mobility 6 116
mineral prospecting 11 24
normal abundance (background) 6 115
primary dispersion patterns 6 116
residual dispersion halos 6 117
saline dispersion halos 6 117
secondary dispersion patterns 6 116 117
sediment surveys 6 117
soil surveys 6 117
survey techniques 6 117
trace elements in plants 6 117 118
vegetation surveys 6 117 118
vestigial dispersion halos 6 117
water surveys 6 117
Geochemical well logging 14 472
Geochemistry 4 346, 6 118 119*
of atmosphere 1 629 631
of biosphere 2 239 244
cosmic-ray-produced nuclides 11 269 271
earth, age of 4 330 331
element abundances 4 546 549
element distribution 4 549 552
geochemical prospecting 6 115-118
geologic thermometry, isotopic 6 130-135
geologic thermometry, nonisotopic 6 126-130
high-pressure phenomena 6 441-446
of hydrosphere 6 565 568
of lead isotopes 7 427 431
of lithosphere 7 546 553
meteorite 8 310 317
of ore deposits 9 383 388
paleoecology, geochemical aspects 9 516 518
radiocarbon dating 11 291 297
Geochemistry—*cont*
rock, age determination 11 591 594
of silicate systems 12 312-317
of sulfide systems 13 246 251
tektite 13 420-421
terrestrial nuclear reactions 15 521 522
see also Cosmochemistry, Paleobiochemistry
Geochronology 6 171
Geochronometry 6 119
Geococcyx 3 612
Geococcyx californianus 11 589
Geocorisae 6 408 410
Geocosmogony 6 171
Geode 6 119*; 12 134
Geodesics 6 152
geodesic motion, law of 11 436-437
relativity 11 457
Riemannian space 2 406
Geodesy 6 119 124*, 170
arc measuring method 6 120
astrogeodetic points 6 121
astronomic problem 6 120
Bessel ellipsoid 6 120
Clarke ellipsoid 6 120
coordinate systems 6 122
curvature of earth's surface 6 121-122
dynamical ellipticity 6 122-123
earth's dimensions 6 120
earth's moments of inertia 6 122
geocentric latitude 6 122
geodetic problem 6 120
geographic latitude 6 122
geographic location 6 122
Hayford ellipsoid 6 120
International ellipsoid 6 120
Krassowski ellipsoid 6 120
Laplace points 6 121
pole variation and azimuth observations 6 123
reduced latitude 6 122
reference ellipsoid 6 120
tides 6 123
triangulation 6 120 121
variation of latitude 6 123
Geodetic control surveys 13 326
angle measurement 13 327
azimuth 1 702
horizontal control 13 326
triangulation 13 326
Geodetic gravimeters 13 516
Geodia 3 88
Geodimeter 1 650
Geoelectricity *see* Terrestrial electricity
Geoflora 9 506 507
Geographic latitude 6 122

Geographic pole 9 164; 12 531
Geographic speciation 12 568
Geographical cycle 5 357
Geography, animal 2 205-206
Geography, mathematical
6 124-126
Antarctic Circle 1 437
earth time relations 6 126
ellipticity of earth's orbit 6 125
inclination of axis 6 125
lunar-terrestrial relations 6 126
parallelism of axis 6 125
plane of the ecliptic 6 125
revolution 6 124-125
rotation 6 124
seasons 6 125
sidereal month 6 126
synodic month 6 126
Geography, physical 6 126
see also Biogeography, Climatology, Continent, Earth resource patterns, Landforms, Paleogeography, Plant geography
Geohydrology 6 276
Geoid 4 324, 6 119, 13 518-519
Geologic mapping 5 175-177, 6 142-143, 11 25
Geologic thermometry, isotopic methods 6 130 135
experimental procedure 6 131
first isotope thermometer 6 131
paleotemperatures in the ocean 6 132
Pleistocene climate 6 133
principles 6 130
temperature in rock systems 6 132-134
Geologic thermometry, nonisotopic methods 6 126-130
boreholes 6 127
crystallography 6 129
decomposition temperatures of minerals 6 127-128
energy sources 4 602
eutectic crystallization 6 128
exsolution mineral pairs 6 128
fossil assemblages 6 129
fumaroles 6 127
hot springs 6 127
hydrothermal experiments 6 128
lava 6 127
liquid inclusions 6 129
melting points of minerals 6 127
metamictization 6 129
mines 6 127
properties dissipated by heating 6 129
Geologic thermometry, nonisotopic methods—*cont*
radiation colors 6 129
solid solutions pairs 6 128
sulfide phase equilibria 13 250-251
thermoluminescence 6 129
transformation temperatures of minerals 6 127
wells 6 127
Geological oceanography *see* Marine geology
Geological time scale 6 135-137*, 141-142
development of quantitative scale 6 135
new time scale 6 136
orogenic events 6 135
principles 6 135-136
Geology 4 346, 6 137-143*
dating methods 4 17-18
diastrophism 4 102-103
earthquake 4 352-354
economic 6 140
erosion 6 139-140
fossils 5 473-476*, 6 141-142
man 5 476-479
geochronometry 6 119
geologic column 6 142
historical 6 140-142
isotope dilution techniques 7 293-294
mass wasting 8 166-167
mineralogy 6 137-139, 8 463-467*
minerals 8 441 444
orogeny 9 409 413
paleobotany 9 499-507
coal 3 239-242
seeds and fruits 5 479-480
spores and pollen 9 525-527
paleoecology 9 512 516
paleogeography 9 518-520
paleogeology 9 520
paleontology 6 141, 9 520-522*
micropaleontology 8 355-357
palynology 9 525-527
petrography 10 52-54
petrology 6 137-139, 10 83 88*
structural 13 205-206
physical 6 137-140
radiocarbon dating 11 291-297
rock 11 589 591
age determination 11 591 594
igneous 7 10 18
magnetism 11 594 597
mechanics 11 597 599
metamorphic 8 296-302
sedimentary 12 129-135
scale of time 6 135-137*, 141
Geology—*cont*
sedimentation 6 140, 12 135-152*
marine 8 132 147
stratigraphy 6 141; 13 170-171*
nomenclature 13 168 170
use of aerial photographs 1 82
volcano 13 348 351
warping, earth crust 14 385-386
weathering processes 6 139-140, 7 551-552, 14 458-460
see also Earth, Engineering geology; Geomorphology, Marine geology, Petroleum geology, Structural geology
Geology, engineering *see* Engineering geology
Geomagnetic dipole 3 500 501*, 11 596-597
Geomagnetic instruments *see* Geomagnetism
Geomagnetic pole 6 144
Geomagnetic reversals paleomagnetism 11 596
Geomagnetic storm 1 608, 6 145*, 13 285-287
electrojet 4 479
recording 14 281
Geomagnetic variations, transient 6 145-144
Geomagnetism 6 144-150
aeromagnetic surveying 1 93-94
Antarctic magnetic patterns 1 442
centered dipole field 6 148
declinometer 4 36, 6 149
deep interior magnetic field 4 341
dip angle 4 338
dip circle 6 149
dip inductor 6 149
dynamo theory 4 341
earth inductor 6 149
earth inductor compass 6 150
eccentric dipole field 6 148
field intensity measurement 14 279 281
flux gate magnetometer 6 150
geomagnetic axis 6 148
geomagnetic elements 6 148
inclinometer 6 149, 7 55
induction inclinometer 6 149
intensity patterns 6 146
isoclinic lines 6 144
isodynamic lines 6 146
isogonic lines 6 144
isomagnetic lines 6 148
Geomagnetism—*cont*
isoporic lines 6 145
magnetic declination 6 144 146
magnetic equator 6 144
magnetic inclination 6 144
magnetic meridians 6 144 146
magnetic poles 6 144
magnetic storms 6 145
magnetic surveys 6 150
magnetic surveys (aero magnetic) 1 93 94
magnetometer 4 36, 6 149 8 63-66*, 14 281
main geomagnetic field 6 144
proton magnetometer 6 150
recent concepts 6 150
satellite borne instruments 6 150
secular magnetic variation 6 148-149
spherical harmonic analysis 6 148
terrestrial electricity 13 506 511
variometer 14 279 281
Geometric angle 1 404
Geometric probabilities 10 62
Geometric progressions 10 66
Geometric series 12 189
Geometric solid *see* Solid (geometric)
Geometrical albedo *see* Albedo (optics)
Geometrical chemical structures 3 35-38, 334 336
Geometrical crystallography 3 601 608
Geometrical electron optics 4 514
Geometrical isomerism 7 27 280
Geometrical optics *see* Optics geometrical
Geometridae 2 457, 7 464
Geometry 7 96, 410
see also Analytic geometry
Geometry, differential 6 152
fiber bundle 5 253 254
Geometry, euclidean 6 155*, 11 5
Geometry, noneuclidean 6 161
Geometry, projective *see* Projective geometry
Geometry, Riemannian 6 164
Geomorphic cycle 6 164 165
Geomorphology 6 126, 164 165
coastal 3 242 244
depositional landforms 6 165
erosional landforms 6 1
karst cycle concept 7 355

omorphology—*cont*
maturity stage 6 164
old stage 6 164
peneplain 6 164
process 6 164
structure 6 164
validity 6 164
youth stage 6 164
omyidae 11 615
omys burtonius 6 237
on 5 75
onemertea 6 479, 11 560
ophilomorpha 3 61
ophone 12 149
geophysical exploration 6 168
well logging 14 472
ophysical exploration 6 165-170
aeromagnetic surveying 1 93 94
Antarctica 1 442
cartographic *technique* 6 166
electrical 6 168
geochemical 6 170
gravity 6 165 166
magnetic 6 166 167
radioactivity exploration 6 170
reflection technique 6 169-170
refraction technique 6 168 169
seismic apparatus 12 148
seismic exploration 6 169 170, 12 156 157
see also Prospecting, mineral
Geophysical research 6 171 173
Antarctica stations 1 442
earth 4 324 330
earth deformations and vibrations 4 337
high pressure phenomena 6 441-446
ice island 7 4
ionosphere 7 255
Texas Towers 13 532
Geophysics 4 346, 6 170 173*
aeronomy 1 98 99
atmospheric electricity 1 635 636
atmospheric studies 6 171
atmospheric tides 13 639
earth 4 324 330
earth deformations 4 337 338
earth heat flow 4 331 334
earth interior 4 338 341
earth tides 4 346 351
earth vibrations 4 337 339
geochronology 6 119 171
geomagnetism 6 171
geodesy 6 119 124 170
geoelectricity 6 171, 13 506 511
Geophysics—*cont*
geomagnetism 6 144 150, 171
geophysical studies 6 171
geophysical techniques 6 171
geothermometry 6 126 135, 170
hydrology 6 536 557
hydrospheric studies 6 171
intra and interdisciplinary aspects 6 173
meteorology 8 525 539
mineral prospecting 11 21
oceanography 9 264-271
overlapping fields 6 171
planning observations 6 172
plutology 6 170
rocket, *meteorological* 8 521 522
rocket astronomy 11 600
satellite and rocket tools 6 172
satellites, *meteorological* use 8 522 525
seismology 6 170, 12 149 157
solar-planetary aspects 6 172
specialized planning bodies 6 172
technical literature 6 171
tectonophysics 6 170, 13 415 420
terrestrial electricity 13 506 511
terrestrial *force fields* 13 511
terrestrial gravitation 13 513 521
terrestrial magnetism *see* Geomagnetism
tides 13 632 640
volcanology 14 351-355
see also Earth (*origin of*), Geophysical research
Geophysics, astronomical *see* Astronomical geophysics
Geopotential meter 1 157
George Lake 1 109, 672
Georgia Strait 9 162
Georyssidae 5 278
Geosaurus 5 553
Geosciences 4 346, 6 137
Geostrophic current 12 102
Geostrophic *wind* 2 102 6 175*
Geosyncline 6 173-174, 9 410
Alpine (Tethys) 13 408
arkoses in 1 532
autogeosynclines 6 174
black shale deposits 2 253
Devonian 4 86
eugeosynclines 6 173
exogeosynclines 6 174
Jurassic 7 525
Geosyncline—*cont*
keratophyre rocks in 10 51-52
leptogeosynclines 6 173
orthogeosynclines 6 173
sedimentation *in* 12 142
spilite rocks in 10 51-52, 12 615
subgraywackes in 13 209
succession of rock types 12 142
Tethys 13 409
Uralian (Permian) 10 27
zeugogeosynclines 6 174
Geosynclinal cycle concept 12 142
Geotaxis 13 403
Geothermal gradient 4 332, 10 88
Geothermal metamorphism 8 304
Geothermal power development 1 672 673
Geothermal well logging 14 472
Geothermometry 6 170
Geotria australis 9 531
Geotrichum 8 567
Geotrichum candidum 8 568
Geotropism 10 364 365
Gephyrea 1 431
Gerade state 12 161
Geraniales 6 174*, 10 346
cassava 2 538
castor bean 2 545
coca 3 248
rubber tree 11 647
tung tree 14 137
Geraniol 5 71, 13 496
Geranium 3 188
trans Geranylacetone 13 20
Gerardiidae 14 618
Gerhardtite 9 102
Geriatrics 6 182
Gerlach, W 8 542
Germ 6 174
Germ layers 6 174 175
allantois 1 256
amnion 1 328
digestive system 4 150 175
ectoderm 6 174
endoderm 6 174
epiblast 6 174
fate 6 175
gastrulation 6 78-79
hypoblast 6 174
mesoblast 6 174
mesoderm 6 174
origin 6 174
specificity 6 175
German cockroach 9 416
German measles 2 550, 6 175 176*, 13 492
German roach 3 251
German *silver* 12 531
Germane 6 177
Germanic facies 14 81
Germanite 6 19
Germanium 6 176 178
alloys 6 177
analytical chemistry 6 177-178
argyrodite 1 531
compounds 6 177, 12 519
electron configuration 4 504
ionization potential 4 504
occurrence 6 176
organometallic compounds 9 402-405
photoconductivity 10 141-142
properties 6 176-177
uses 6 177
Germanium diode 6 178, 12 174
see also Diode, semiconductor
Germanium transistor *see* Transistor
Germann, A F D 1 40
Germfree vertebrate 6 178-182
apparatus 6 178
bacteria 2 8
characteristics of 6 179
experimental biology and medicine 6 181
gamma globulin 6 33
obtaining specimens 6 179
testing for contamination 6 179
uses of germfree apparatus 6 181
Germano-type *folding* 7 326
Germer, L 5 555
Germer, L. H 11 154
Germicidal lamp 14 186
Germicide 1 482
Germinal vesicle 7 226
Germination (plant) 10 335 356
Germinids 8 507
Gerontology 6 182
aging populations 6 182
geriatrics 6 182
senescence 6 182
Gerould, J 7 473
Gerrhosauridae 13 24
Gerridae 6 401, 14 404
Gerris 6 406, 14 404
Gersdorffite 9 94
Geryon 4 41
Gesner, K. 1 422
Gestalt psychologists 10 6
Gestation period 6 182-183*, 13 24, 26
Getter incandescent lamp 7 52
vacuum tubes 14 244 245
Geuther, A 5 87
Gevacolor 10 168
Gevaert Gevacopy 10 161
Geyser 6 183*, 14 351
Geyserite 12 517
see also Siliceous sinter
GFR *see* Glomerular *filtration* rate

Ghatti 6 297
Ghats 1 580
Ghee 2 379
Ghiorso, *A* 2 168, 416, 5 624; 8 222, 14 66
Ghost crab 4 34
Ghost image, optical 6 183 181
Ghost image, television 13 458
Ghost moth 7 461
Ghrelae 11 615
Giacobinids 8 307-308
Giacobini Zinner comet 8 307
Giant arborvitae 1 500
Giant bamboo 2 89
Giant Caster 5 546
Giant cell tumor 12 369
Giant cells 11 219
Giant clam 3 152
Giant ear shell 1 2 3
Giant hornet 6 582
Giant Japanese crab 4 24
Giant molecule 3 24, 26
see also Polymer
Giant salamander 3 578
Giant silkworm 7 464
Giant Springs in Montana 13 18
Giant squid 2 614, 13 30
Giant star 6 184*, 13 39 44
Giant sunfish 13 291
Giant toad 12 10
Giant water bug 6 401
Giardia 5 560 8 169
Giardia intestinalis 10 474
Giauque, W F 7 599
Gibberella 3 265
Gibberella fujikuroi 6 184, 10 342, 11 565
Gibberella zeae 2 99, 3 484
Gibberellin 6 184 185
agricultural science (plant) 1 125
endocrine mechanisms 4 591
plant growth 10 330
plant hormones 10 340-343
Gibbous moon 10 100
Gibbs, J D 4 454
Gibbs, J Willard 2 410 4 297, 5 579 9 436, 10 633 12 312, 13 60
Gibbs, W 5 55, 365, 586
Gibbs cell 3 70
Gibbs Duhem equation 1 60, 5 495 12 488
Gibbs equation 1 81
Gibbs free energy 5 494, 9 334
Gibbs function 6 185
Gibbs Helmholtz equation 5 51, 13 576*
electromotive force (cells) 4 500
thermochemistry 13 559
Gibbs phase rule 5 579 580, 10 633, 13 569 14 111
Gibbs Povnting equation equilibrium, chemical 5 52
Gibbsite 2 113, 3 166
alumina 1 297
in laterite 7 407
Gibraltar Peninsula 5 116
Gibson, A 13 333
Gibson, J J 10 6
Gid tapeworm 3 264, 642
Gide, André J 552
Gier and Dunkle instrument 11 215
Giesel, F O 11 325
Gigantism 6 597, 10 252, 13 493
Gigantocypris 4 39
Gigantopithecus 10 590
Giganturid 3 223
Giganturoidea 4 40
Gigartina stellata 6 297
Gignoux, Maurice 10 419
Gila monster 6 185* 7 564, 13 24
Gilbert 6 185
Gilbert, G K 4 102, 7 375, 13 173
Gilbert, W 4 453, 462, 8 48
Gilbert-type delta 4 48
Gilbreth, Frank B 6 495
Gilbreth, Lillian M 6 495
Gilbreth basic elements 8 345
Gilchrist J C 8 608
Gill 4 26, 8 188, 11 507
Amphibia 11 517
branchial 11 514
cyclostome 11 515
development 11 513 518
dipnoan 11 516
ectoderm and endoderm 11 518
elasmobranch 11 514
Holocephali 11 515
primitive chordates 11 513
teleostome 11 516
visceral arches 11 513
Gill (anatomy) 6 186
see also Respiratory system
Gill arch theory 8 646
Gill gland 5 105
Gill slit 4 152
Gilsonite 1 590 591 6 186-187* 9 305
composition 6 186
distillation 6 186
japanning 7 302
properties 6 186
refining 6 186
seconds 6 186
selects 6 186
uses 6 186
Gilt bug 6 460, 13 340
Gin (cotton) 5 218
Gin (distilled spirits) 4 253, 255
Ginger 6 187*, 12 76, 613
Gingerin 6 187
Gingko biloba 13 121
Ginglymoti *see* Semionoti formes
Ginkgo 6 187-188, 9 501, 506
living fossils 7 564
Ginkgo biloba 6 187, 12 229 13 121
Ginkgoales 3 401, 6 187-188 *300*, *10 321*, *346*, *13 121*
paleobotany 9 503
Ginseng 6 188, 14 189
Giovanelli, R 13 281
Giraffa camelopardalis 6 188
Giraffe 1 567, 6 182, 188
Giraffidae 1 569, 6 188
Girder, plate 6 188 190
cover plates 6 189
stiffeners 6 189
webs and flanges 6 189
Girdler process 5 555
Girella nigricans 14 78
Girty, G H 10 23
Girtyspira 9 609
Girvanella 6 190*, 9 504
Gislén, T 4 373
Gismondine 14 611
Gitterregelung 12 63
Giurgului (Gyergyo) Mountains 5 118
Given, Ivan A 8 452
Givetian Stage 4 87
Gizeh limestone 8 355
Gizzard 4 152 13 149
digestive system 4 158
feeding mechanisms and digestion 5 200 206
Gizzard shad 12 238
Gizzard stone *see* Gastrolith
Glacial acetic acid 1 30
Glacial drift 6 194
drumlin 4 276
Dwyka tillite 10 26
esker 5 70
kame 7 529
moraine 8 597
till 13 611
varved clay 14 282
Glacial Epoch 6 190 195
Antarctic ice sheet 6 192
causes of climatic fluctuation 6 195
changes of drainage 6 193
chronology 6 194
comparable events in Europe 6 191
distribution of glaciers 6 191 192
ecologic changes 6 194
effect on earth's crust 6 192
evolution of organisms 6 194
extinction of organisms 6 194
fluctuation of climate 6 191
glacial drift 6 194
glacial map 6 191
glacial time units 6 194
Greenland ice sheet 6 192
interglacial time units 6 191
Laurentide ice sheet 6 192
polygonal relief forms 10 472
Glacial Epoch—*cont*
postglacial vegetative and climatic 10 525
precipitation 6 195
Scandinavian ice sheet 6 192
sea level changes 6 192 [illegible]
stratigraphy 6 194
temperature 6 193
Glacial plucking 5 277
Glacial varves 14 282
Glaciated terrane 6 195 198
cirque 3 144
depositional features 6 [illegible]
distinguishing characteristics 6 195 196
drainage features 6 196
erosion features 6 196
Finger Lakes 5 273
fiord 5 277
marks of glaciation 6 [illegible]
Matterhorn 8 184 185
moraine 8 597
plains 10 261 263
principal glaciated areas 6 196 198
Asia 6 198
Europe 6 198
North America 6 196
observational difficulties 6 196
topographic features 6
valley features 6 196
see also Hill and mountain terrain
Glaciation 6 200
Permian 10 26
Glacier 6 198 203
ablation 6 201
accumulation 6 201
alpine type glaciers 6
Bergschrund 6 201
Block-Schollen movement 6 202
cirque glaciers 6 200
crevasse 6 201
crvoconite holes 6 201
deglaciation 6 200
erosion 6 202
flow deformation 6 202
geophysical types 6 200
Greenland 1 524
ice field (Firntrometer) internal movement 6 202
Juneau ice field 6 201
materials of 6 200
morphological categories 6 200
moulin 6 201
mountain type glacier 6 200
movement 6 201 202
névé line 6 201
New Zealand 1 673
plastic creep 6 202
plateau type glaciers

Glacier—cont
plucking 6 202
polar glaciers 6 200
recent and current fluctuation 6 203
regime 6 201
sastrugi 6 201
streaming 6 202
subpolar type 6 200
subtemperate type 6 201
temperate type 6 200
transportation of sediment 6 202 12 136
valley glaciers 6 200
velocity profiles 6 202
see also Terrestrial frozen water
Glacier National Park 9 157
Glacier snow line 12 392
Glaciomarine sediment 12 136, 138
Gladiolus 9 407
Gladiolus thrips 13 628
Gladiolus yellows 9 408
Gladstone Bate law earth (heat flow) 4 333
Glance brown coal 7 513
Glance pitch 1 590 591
Gland 6 203 205
acinous 5 43, 6 203 204
acinus 6 204
alveolus 6 204
anal 12 61
antennal 4 28
[illegible] 160
castoreum 12 61
cellular 6 203
ceruminous 13 334
compound 6 204
compound tubular 6 204
courtship 12 61
cowper's gland 3 529 530
crop 4 156
cutaneous 5 43
cyanogenous 6 203
cyanogenous gland 6 204
development 6 205 204
duodenal 4 150
errinae 13 334
endocrine 4 150 589 589* 6 203
esophageal 4 157
exocrine 4 150 5 43 6 203
femoral 12 61
fundic 4 160
gastric 4 160
granular gland 6 204
hedonic 12 61
holocrine 5 43 6 203
intestinal 4 150
lacrimal gland 7 376
maxillary 4 29
Meibomian 12 [illegible]
Gland—cont
merocrine 5 41 43, 6 203, 13 334
mixed 5 43, 6 203
mucous gland 6 204
multicellular 5 43, 6 203
musk 12 61
noncellular 6 203
parotid 4 164
preen 12 61
preputial 12 61
pyloric 4 160
secretions 6 204
serous gland 6 204
simple 5 43
simple branched tubular 6 203
simple coiled 5 43
simple tubular 6 204
skin glands 6 204
sublingual 4 164
submaxillary 4 164
sweat 13 334
tarsal 12 123
tubular 5 43, 6 203 204
tubular acinous 5 43
Tyson's 12 61
unicellular 5 43, 6 203
uropygial 12 61 14 235
vulval 12 61
wax 13 334
Gland of Bartholin 11 470
Glanders 2 350 352 6 205 206, 13 179
[illegible]
11 474
Glandular tick fever 14 135
Glans 11 472
Glans penis 11 475
Glarnan Alps 5 117
Glass and glass products 6 206 209
basaltic 2 105
electric insulation 7 158
heat treatment 6 207
natural 14 347 348
properties 6 209
radiation damage 11 223
safety glass 12 2 5
stained glass 13 33
structure of 6 206
thermal conductivity of 5 390 391
velocity of sound in 12 516
volcanic 14 347 348
Glass colored 9 350 353
Glass *optical see* Optical glass
Glass and glass products 6 206 209
Glass blowing 2 270 6 207 208
Glass electrode 6 209 210* 531
Glass fibers 1 400 6 208 374
Glass filtering crucible 6 262
[illegible]am 6 374
Glass furnace regenerator 6 375
Glass metal 8 285
Glass plates, photographic 10 156
Glass point 10 476
Glass products 6 206 208
glass sands 12 22
glazing 6 212
kilns 7 345 347
melting 6 206 207
Glass sands 12 22
Glass sponge 13 10
Glasser's disease 8 679
Glauber salt 12 412, 13 254
Glaucoma 6 210 211
eye disorders 5 171-172
keratitis 7 336
Glaucomys 13 31
Glauconite 6 211 212
in green sands 12 22
mineralogic term 6 211
morphologic term 6 211
origin 6 212
rock age determination 11 593
structure 6 211
Glaucophane 1 336, 6 212*
Glaze 10 512
Glazed frost 5 540, 10 573
Glazing 6 212
clay products, architectural 5 167 168
frit 5 537
[illegible]nd fur processing
[illegible]1546
[illegible]10 377
Gleason, L. S. 3 80
Gleason, M. N. 10 497
Gleditsia triacanthos 7 573
Gleicheniа 13 116
Glendenin, L. E. 11 5
Glens Falls diamond 12 321
Glia 9 68
Glia cell 9 43
crystal structure 5 596
Glide path indicator 6 212 213
Glide slope 7 148 9 20
Glide trajectory 6 592
Glider 6 213
Gliding flight 6 213
Gliding ratio sailplane 12 5
Glint noise radar 8 516
Glioblastoma 9 320
Glioma 9 320
Gliosis 9 68 69
Gliotoxin 1 468 7 63
Globar 12 583
Globar lamp 12 588
Globe terrestrial 6 213 215
Dymaxion 6 215
famous gl[illegible]
[illegible]cosahedr[illegible]
sizes and [illegible]
uses 6 213
Globe valve 14 260 261
Globigerina 5 7, 5 431, 435, 8 136 12 28
Globigerina bulloides 11 52
Globigerina finaferta 5 434
Globigerina ooze 8 135 136
carbonate sediments 12 139
coccoliths in 3 249
La Luna limestone 9 515
Tertiary marls 5 431
Globigerinoides 8 136
Globin 6 410
Globorotalia 5 435, 8 136
Globorotalia menardii 5 434
Globoside 6 223
Globotruncana 5 431, 435
Globotruncana arca 5 434
Globular clusters *see* Star clusters
Globule, interstellar 7 220
Globulin 2 263, 6 215*, 12 565
blood chemistry 3 197
protein 11 59
serum 12 198
beta Globulin 1 257
gamma Globulin 2 265
Globus pallidus 12 597
Glochidium 5 106 8 670
Gloeocystis 1 235
Gloeodes 7 476
Gloeodes pomigena 7 476
Gloeosporidiella 8 212
Gloeosporidiella ribis 8 212
Gloeosporium 8 212
Gloeosporium concentricum 8 212
Gloeosporium fructigenum 8 212
Gloeosporium nervisequum 8 212
Gloeotaenium 1 235
Gloeotrichia 3 636
Glomerella 8 212
Glomerella cingulata 2 385, 8 212 10 509
Glomerella gossypii 3 513 514
Glomerella lindemuthianum 8 212
Glomerular filtration rate 14 230 231
Glomerulonephritis 6 589, 7 343, 9 40
Glomerulosclerosis 7 342 344
Glomerulus 5 140, 7 340 342
Glomus aorticum 1 488
Glomus caroticum 1 488, 2 531
Glomus jugulare 1 488
Glory boling 8 481
Glossina 12 377, 14 124
Glossinidae 4 212
Glossiphonia complanata 11 556
Glossiphonidae 11 556
[illegible]
embryology 9 47
Glossopteris 5 480 9 505

Glossopteris flora 10 26
Glossy prints 10 163
Glost firing 10 512
Glottal consonant 10 121
Glottidia 1 663, 2 315
Glottis 12 594
Glover tower 13 261
Glow curve 13 585-586
Glow discharge 4 452, 6 215-217*
  contrasted to arc discharge 1 500-501
  gas tube 6 60
  neon glow lamp 9 36-37
  regions of discharge 6 215-216
  shock-wave display 12 299
  striations 13 185
Glow lamp 6 60 61
  see also Neon glow lamp
Glow tube voltage regulator 14 362
Glowworm 2 131, 5 282
Glucagon 4 153, 6 479, 9 629
  endocrine mechanisms 4 591
  liver 7 561
  pancreas 9 531, 555
Glucal 11 107
Glucinum *see* Beryllium
Glucocerebroside 6 223
Glucocorticoids *see* Adrenal gland, Hormone, adrenal cortex
Glucofuranoside 6 219
Glucoheptose 8 578, 579
Glucokinase 2 15
Glucomannan 8 92
Gluconalactone 4 207
Gluconeogenesis 4 595, 6 483
Gluconic acid 1 32, 6 217*, 8 580
D Gluconic acid *see* Gluconic acid
alpha D Glucopyranose 14 218
alpha-D-Glucopyranose-1-phosphate 6 218
D Glucopyranose *see* Glucose
Glucopyranoside 6 219
alpha-D Glucopyranosyl beta-D fructofuranoside *see* Sucrose
4 *O* beta D Glucopyranosyl D-glucose *see* Cellobiose
Glucosamine 6 223, 8 583, 12 565
6 Glucosamine 7 330
Glucose 6 217-218
  in acetobacter suboxydans fermentation 1 32
  aldose sugar 2 455
  amylase 1 366
  in bacterial alcoholic fermentation 2 38
  bacterial coenzyme 2 12
  bacterial enzyme 2 15
Glucose—*cont*
  in blood chemistry 3 197-198
  in 2,3 Butanediol fermentation 2 377
  carbohydrate metabolism 2 458, 461
  diphosphopyridine nucleotide 4 207
  glucoside 6 219
  glycolysis 10 370
  maltase 8 81
  metabolism 6 218
  monosaccharide 8 578
  plant translocation 10 380
  polymer 4 92
  reactions 6 217
  starch 13 51
  sucrose hydrolysis 5 541
  synthesis 8 264
  transferases 5 24
Glucose-1 phosphate 2 17, 5 24, 6 218*
n Glucose-1-phosphate 10 351
Glucose 6 phosphate 2 15, 460, 5 24, 6 218-219*, 10 370, 14 110
D Glucose *see* Glucose
D(+)-Glucose *see* Glucose
alpha-D Glucose 1 phosphate 6 5, 222, 8 582
beta D Glucose 2 625
Glucose carboxylic acid 8 580
Glucose cyanohydrin 8 580
Glucose diethyl mercaptal 8 581
Glucose-1,6 diphosphate 2 13 14
Glucose oxidase 5 27-28
alpha D Glucose pentaacetate 8 581
beta-D-Glucose pentaacetate 8 581
Glucose phenylhydrazone 8 579
Glucoside 6 219
Glucosuria 3 192 202
Glucovanillin 6 224
Glucuronic acid 2 453, 6 223, 522, 10 490, 12 565
  gum 6 297
  jaundice 7 302-303
D glucuronic acid *see* Glucuronic acid
Glue 6 219*, 14 544 545
Glueck E T 1 461
Glueck, S 1 461
Glugea anomala 8 403
Glugea cysts 8 403
Glugea hertwigi 8 403
Glume 5 331
Glutamic acid 1 195, 212, 529, 6 219 220*, 457, 7 164, 12 564 14 17
  amino acids 1 308 319
  biosynthesis 6 220
  chelate 3 19
  in histone 9 217
  krebs cycle 7 370
Glutamic acid—*cont*
  monosodium glutamate 8 583
  nitrogen excretion 9 111
  plant metabolism 10 357
  in protamines 9 217
  semialdehyde 11 5
  tyrothricin 14 177
L Glutamic acid 9 92
Glutamic dehydrogenase 9 112
Glutamine 6 220
  amino acids 1 308 319
  biosynthesis 6 220
  plant metabolism 10 357
Glutaramide 1 503
Glutarate 5 74
Glutaric acid 2 475, 7 638
Glutelin 6 220
  protein 11 39
Glutethimide 14 16
Glycera 10 461
Glyceraldehyde 13 126, 10 191
Glyceraldehyde phosphate 2 16 459
Glyceraldehyde 3 phosphate 2 17, 38, 214, 5 23, 8 582, 10 350
Glyceric acid 10 191
Glyceridae 10 461
Glyceride 6 220
Glycerin 6 220
Glycerin sweet water 6 221
Glycerol 2 42 3 75, 5 188, 6 220-221, 11 16
  industrial production by yeast 14 601
  petrochemical 10 43, 46
  polyester resins 10 466
  polyhydroxy alcohol 10 475
Glycerophosphatides 10 132
D Glycerose 2 453 455, 8 578
  see also Glyceraldehyde
L-Glycerose 2 453
Glyceryl 1 oleo 2 palmito 3 stearate 5 188
Glyceryl trinitrate 5 75
Glycinamide ribotide 2 60
Glycinde 1 430
Glycine 6 221-222
  amino acids 1 308 319
  bacterial fermentation of
  ch
  3
  as a component of insulin 7 164
  in creatine 3 540
  in histone 9 217
  plant metabolism 10 357
  in protamines 9 217
Glycine max 12 533
Glycine sulfate 5 225
Glycocholic acid 2 185, 7 531
Glycogen 6 222 223
  amylase effect on 1 365 4 161
Glycogen—*cont*
  in carbohydrate metabolism 2 458
  cell inclusions, noncytoplasmic 2 604
  in cell metabolism 2 604
  cell protoplast 2 614
  Cyanophyta 5 646 657
  digestive system 4 150-153
  diseases due to hormones 4 253
  from glucose 6 217, 219
  in liver 7 561
  molecular structure 6 222
  properties 6 222
  synthesis 6 222 8 262
Glycogenesis 6 222 8 226
Glycogenolysis 4 595, 5 41
Glycol 6 225
  antifreeze solutions 1 472
  ethylene glycol 5 95
  polyethylene glycol 10 470
  polyhydroxy alcohol 10 475
  printing ink vehicles 7 113
Glycol ethers 10 45
Glycolipid 6 225*, 7 529
Glycolipoproteins metabolic disorders 8 261
Glycollic acid 1 475, 7 530
Glycolysis 2 58, 459 460 10 370
  carbohydrate metabolism 2 459 460
  plant respiration 10 370
Glycoprotein Cyanophyta 5 636 657
Glycosidase 5 22
Glycoside 6 223 224
  glucoside 6 219
  oligosaccharide 9 315
Glycosuria 7 163, 9 554
Glycylalanine 9 629
Glycyphagus domesticus 12 29
Glycyrrhetic acid 14 132
Glycyrrhiza glabra 7 495
Glyodin *see* 2 heptadecyl 2 imidazoline acetate
Glyoxal 1 230
Glyoxaline 1 702, 7 51
Glyoxylic acid 2 36 6 221
  cycle 2 52 53
Glyphocyphidae 13 485
  [illegible]
Glyptosphaerites 4 210
GM counter *see* Geiger Müller counter
Gmelinite 14 611
GMR nickel base alloy 9 96
Gnat 4 213 5 362
Gnat bug (Hemiptera) 6 401
Gnathia 7 285
Gnathia antarctica 6 225
Gnathia calva 6 225
Gnathiides 6 225
Gnathobdellae 1 531
Gnathochilarium 1 565 4 [illegible]

Gnathodontidae 3 406
Gnathonemus compressirostris 4 429
Gnathophausia 4 40 8 683
Gnathosoma 1 24, 559 7 298
Gnathostoma hispidum 13 6
Gnathostoma spinigerum 13 5
Gnathostomata 1 420 6 226*, 14 508
Pisces 6 226
Tetrapoda 6 226
Gnathostomata (Echinodermata fossils) 4 371
Gneiss 6 226
compressive strength 4 613
orthogneiss 6 226
paragneiss 6 226
primary gneiss 6 226
metales 3 401 6 226*, 300 10 321 346 13 121
inetum 6 226, 8 240, 13 121
Gnomonia 8 212
Gnomonia veneta 8 212
Gnomonic azimuthal projection 8 9
Gnor
Gnor
607
Gnotidae see Psittidae
Gnu 1 443 6 226 227*
Goal striving 10 30 37
Goat 1 567 6 227 229* 12 249
milk goats 6 227
range goats 6 227
Goat mountain 1 568
Goat moth 7 464
Goat production 6 227 229
Goatkin 7 446
Goatsucker 2 448
Gobi Desert 1 586 587
Gobiatheridae 4 196
Gobiatherium 4 196
Gobiesocidae 6 229
Gobiesociformes 6 229* 9 442
Gobiesox marmoratus 6 229
Gobiologus 7 383
Goblet cell 4 150
Godavari River 1 580
Godel K 8 177
Godfrey Thomas 12 234
Godschmidt equation *esterification* 3 76
Goethe 1 332
Goethite 6 229
in jasper 7 302
in laterite 7 407
with limonite 7 519
Goiter 6 229 230* 13 625 626
see also Exophthalmic goiter
Golay cell 7 105
Golay pneumatic radiometer 11 318
Gold E 3 171
Gold T 3 510
Gold 6 230 233
Gold—*cont*
analytical methods 6 231
assay for 1 593
compounds 6 231 232
crystal structure 3 599
cyanidation 6 232 233
electron configuration 4 504
extractive metallurgy 8 277
foil 6 232
ionization potential 4 504
jewelry 6 231 232
karat system of fineness 6 103
metallurgy 6 232 233
native state 9 4
590
uses 6 230
velocity of sound in 12 516
Gold leaf 6 230, 23
Gold leaf electroscope 4 535
Gold sol 6 230
Goldacre, R 9 455
Goldbeater's skin hygrometer 8 318
Golden Ball 14 164
Golden beryl 2 170
Golden brown algae 3 117, 119
Golden crown worm 10 461
Golden eagle 4 317
Golden larch 7 404
Golden plover 3 10 7 345
Golden ratio 6 134
Golden shiner *see* Shiner, golden
Goldfinch 2 435, 5 273
Goldfish 6 233
Goldovsky E M 3 129
Goldschmidt H 2 171
Goldschmidt R 8 675 12 230
Goldschmidt V M 5 579, 8 298
Goldschmidt process 3 104
Goldstein K 10 33, 12 177
Goldstein L. 6 304
Golgi C 6 234
Golgi complex 2 587
Golgi component 3 657 6 233 235* 604
Golgi Mazzoni's corpuscle 3 633
Golgi tendon 11 402
Golgi tendon organ 7 350
Gomberg M 6 435
Gomberg Bachmann reaction 4 107
Gomphidae 9 275
Gomphosis 13 674
Gomphotherium 10 636
p gon polytopes 10 492
Gonactinia 1 52 54
Gonad 6 235
agenesis 11 465
development 11 462-463
dysgenesis 11 465
endocrine gland 4 588
hermaphroditism 11 465
hormone, adenohypophyseal 6 480
organogenesis 11 464
ovary 9 451-455
radiation injury (biology) 11 227
sex reversal 11 465
testis 13 524 527
Turner's syndrome 11 465
481, 8
Gonadotropin 6 479, 11 475, 13 526
Gonangium 9 242
Gondwanaland 13 407
Antarctica as part of 1 440
Gonia 6 31
Goniadidae 10 461
Goniastrea 12 76
Goniatites 4 87
Permian 10 27
Goniaulax 11 151
Goniocidaris parasol 4 377
Goniometer 3 602 14 578
Gonionemus 3 255 7 305, 14 10
Goniopholis 3 553
Goniozus 6 581
Gonium 1 235 2 601
Gonococcal vulvovaginitis 6 236, 14 256
Gonococci 2 3 7 33
Gonodactylus 13 150
Gonopod 3 472 473, 4 26, 209
Gonorrhea 1 466 467 554, 4 54, 6 235 236* 13 245
diagnosis 6 236
epidemiology 6 236
incubation period 6 236
therapy 6 236
venereal disease 14 296
Gonotheca 9 242
Gonozooid 2 356
Gonyaulax 2 222, 8 169
Gonyaulax catanella 11 54
Gonyaulax polyedra 1 699
Gonyostomum semen 3 77, 5 99 8 170
Gooch crucible 6 262
Goodeidae 10 253
Goodenough G A 7 198
Goodrich, E. 5 138
Goodyear, C. 11 636
Goose 1 436 6 236-237
Goose semipalmated 1 436
Goose barnacle 2 101, 3 563
Gooseberry 3 548 549 6 237
Gooseberry worm 10 461
Gopher 6 237
Gopher snake 2 370
Gopher turtle 14 166
Gophering 8 481
Gopherus 14 166
Gopherus agassizi 14 166
Gopherus berlandieri 14 166
Gopherus polyphemus 14 166
Goppert-Mayer, M 7 248
Gorczynski, W 3 424
Gordiidae 6 237
Gordioidea 6 237 238
Gordionus violaceus 6 237
Gordius 6 238, 318
Gordon, J P 1 650, 7 502
Gordon, M 12 229
Holaxonia 6 238
Scleraxonia 6 238
sea fan 12 92
Gorgonia 3 255
Gorgonia flabellum 12 92
Gorgonin 12 92
Gorgonocephalidae 5 124
Gorgonocephalus 9 344
Gorgonocephalus chilensis 9 343
Gorgonzola cheese 3 15
Gorilla 6 238 239
Gorilla gorilla 6 239
Gorter, C. J 13 299
Gortner, R A 13 174
Gossan 9 381
goethite 6 229
mineral prospecting 11 20
Gossypium 3 511, 5 246
Gossypium arboreum 3 513
Gossypium barbadense 3 513
Gossypium herbaceum 3 513
Gossypium hirsutum 3 512
Gossypose *see* Raffinose
Gotland 5 116
Gotts R A 2 172
Gottschalk, C 9 439
Goudsmit, S A 1 655, 4 516
Goudy, Frederic W 14 171
Goura 5 302
Gout 1 554 4 236 6 239*, 7 315, 8 258, 13 677
Gouy, G 4 480
Gouy balance method 13 532
Gouy double layer 8 347
Gouy layer 4 479
Governor 6 239 243
aircraft propeller 6 239
ballhead 6 239 240
dashpot 6 240
diesel 6 239
flywheel 6 241
hydraulic *amplification* 6 240
marine engine 8 111 112

Governor—*cont*
paralleled prime movers 6 242
response 6 210
servomechanisms 12 202
speed control 6 239 243
steam turbine 13 88
Gowers, W. R 6 512
GPI *see* Ground position indicator
GR S synthetic rubber 11 639, 14 207
Graafian follicle 6 235
oogenesis 9 831
ovum 9 458
reproductive system 11 474
Grab bucket 6 243
Graben 6 243-244
rift valley 11 570
Gracilaria 7 467
Gracilaria lichenoides 1 110
Gracilariid 7 464
Gracilariidae 7 464
Grackle 6 244*, 254
Graded bedding 10 566, 12 134
Gradient, hydraulic *see* Hydraulic gradient
Gradient of a scalar 2 413, 6 244*
Gradient wind 6 244*, 14 491
Grading airfield 1 216, 3 239
Graebe, C 1 457
Graebe Ullmann reaction 2 449
Graeffe's method 5 47
Graf sea gravimeter 13 514
Graf Zeppelin 1 217-218
Graft polymer 10 479
Grafting embryology, experimental 4 570
reproduction, plant 11 452
Grafting of plants 6 245
budding 2 361
plant growth 10 333
Graham Cole test 6 15 17
Graham Palmer Peninsula 1 440
Grahamella 11 567
Grahamite 1 590 591
Grahan Alps 5 117
Grain (weight) 8 188, 14 461
Grain alcohol *see* Ethyl alcohol
Grain boundaries (metallurgy) 6 245
Grain crops 6 245-246
barley 2 98-101
buckwheat 2 360
in the United States 6 246
Grain drier 1 115
Grain mite 12 29
Grain refining 6 378
Grain sorghum cultivation 12 507
description 12 506
harvesting 12 507
hybrids 12 507
origin 12 506
planting 12 507
Grain sorghum—*cont*
sorghum 12 506
varieties 12 507
Grain structure (crystallography) 3 580, 6 215, 8 293
Grain weevil 2 151
Grainer salt 12 17
Graininess: photographic materials 10 157
Grains, interstellar 7 221-222
Gram 6 246*, 8 188
Gram's stain 6 246 247
bacteria 2 6
mechanism 6 246
in taxonomy of bacteria 2 10
technique 6 246
variations 6 246
Gram equivalent weight 3 361, 6 247*
Gram molecular weight 6 247
Avogadro number 1 697
concentration scales 3 361
molar volume 8 536 537
molecular weight 8 556
Gram negative bacteria 6 246
Gram negative diplococci 6 247
Gram positive bacteria 6 246
Gramicidin 1 464
Gramicidin S 14 177
as a peptide 9 629
Graminales 6 247*, 10 346
bamboo 2 89
citronella 3 147
Cyperaceae 6 247
Gramineae 6 247
Gramine 7 63
Gramineae 6 247, 10 488
Gran Paradiso 5 119
Gran Sabana 12 526
Granby type mine car 8 487
Grand Bahama Island 14 473
Grand canonical ensemble 13 62
Grand Canyon 9 161
Grand Canyon Series 10 567
Grand Casse 5 119
Grand Coulee Dam 14 399
Grand fir 5 278
Grand Hogback 9 156
Grand mal 5 40
Grand potential 13 62
Grandite series 6 40
Grandity's corpuscle 12 180
Granit R 8 205
Granite 6 247 249* 7 16 10 86 11 590 591
alkali granites 6 248
calc alkali granites 6 248
commercial term 6 248
compressive strength 4 613
dimension stone 13 151
geologic time scale 6 135
granodiorite 6 248
heat production in 4 332
Granite—*cont*
isotopic composition 7 430 431
mineralogy 6 248
neutron flux in 13 522
occurrence 6 248
origin 6 249
ornamental stone 13 152
petrographic province 10 51
phenocryst in 10 111
recomposed granite 1 533
silicate magma origin 12 316
sound velocity in 12 516
structure 6 248
texture 6 248
Granite moss 8 633
Granite porphyry 10 521
Granitization 6 249 250
aureole, contact 1 669
Granoblastic rock fabric 8 296 297
Granodiorite 6 250*, 7 16, 10 86
petrographic province 10 51
Granophyre 10 86
Granophyric texture 7 12 13
Grant Range formations 10 26
Grantia 13 360
Grantia compressa 9 562
Grantitidae 13 360
Grantsville formation 14 84
Granular gland 6 204
Granulation (sun) 13 268
Granulite 6 250
Granuloblast 6 396 398
Granulocyte radiation injury (biology) 11 227
Granulocytic leukemia clinical pathlogy 3 192-202
Granuloma 2 171
Granuloma inguinale 4 54, 6 250-251, 13 179
diagnosis 6 250
isolation 6 250
taxonomy 2 152
transmission 6 250
Granulomatosis infantiseptica 7 543
Granulomatous encephalitis 9 70
Granulosa cell tumor 11 480
Grape culture 6 251 252
control of diseases 6 252
cultivation 6 251
diseases 6 251
kinds 6 251
production 6 251
uses 6 251
value 6 251
Grape fern 9 342
Grape leaf folder 7 472
Grape sugar *see* Glucose
Grape phylloxera 6 475
Grapefruit 6 252 253
Graph theory 6 253 256 8 172
Graphechon storage tube 13 161
Graphic arts *see* Printing
Graphic methods 6 2-6
curve fitting 3 629 631
extrapolation 5 138 139
interpolation 7 216 218
Graphic recording instruments *see* Recording instruments, graphic
Graphic scale (map) 8 98
Graphical analysis 4 69 71
Graphical coordinate systems *see* Coordinate systems, graphical
Graphical interpolation 7 216
Graphics, engineering *see* Engineering graphics
Graphiolaceae 14 236
Graphite 6 256 258
black lead 6 256
carbon 2 462
lubricant 7 604
in meteorites 8 515
occurrence 6 256
plumbago 6 256
properties 6 256
as reactor moderator 11 355 356
refractory 11 410
structure of 12 475
synthetic graphite 6 257 258
uses 6 257
Graphite bronze bearings 1 258
Graphitization 3 490, 6 379
Graphitizing furnace 6 257
Graphium 7 470
Graphium ulmi 13 140
Graphognathus leucoloma 14 460
Grappa 4 255
Grapsidae 4 31
Graptemys 14 166
Graptemys geographica 5 25 5 31, 14 67
Graptolite shales 2 253 12 529
Graptolithina 6 258
Graptoloidea 6 258
Graptozoa 6 258
Grashof number 3 442
Grass 12 506
Grass, Bermuda *see* Bermuda grass
Grass crops 6 259 261
Bermuda grass 2 168 169
bluegrass 2 272
bluestem grass 2 272
disease control measures 6 261
diseases of 6 260
distribution 6 259
fescue 5 241
growth characteristics 6 259
kinds of pathogens 6 260

rass crops—cont
structure 6 259
timothy 13 647
grass root beetle 5 276
grass spider 1 498
grassette 7 469
grasshopper 6 261
grasshopper sparrow 12 562
Grassland 10 363 14 290 291
climax community 5 182 186
low latitude distribution 14 289 290
mid latitude distribution 14 290 291
steppe 13 125
grassland climax formations 290
Grassmann H G 2 410
grating diffraction *see* Diffraction grating
grating spectrograph 4 140
grating spectrometer 4 140
grating spectroscope 4 140
grave disease 6 229 13 627
Gravitational binding energy *see* Binding energy gravitational
Gravel 6 261 262* 11 590
Gravier 10 603 610
Gravigrada 4 411
Gravimeter 6 166
Askania balance 13 515 516
Frost 13 516
gravaletic 13 516
Graf sea 13 515
Gulf underwater 13 515 516
Haalck gas pressure 13 514
Hartley 13 515 516
Hoyt Gulf 13 515
LaCoste Romberg 13 516
LaCoste sea 13 514
Magnolia 13 514
Norgaard 13 515 516
North American 13 516
sea 13 514
spring balance 13 515 516
stable 13 515
underwater 13 514
unstable 13 514
Gravimetric analysis 6 262 263* 10 573
Graving dock 4 241 242* 12 290
Gravitation 6 263 266
antigravity 1 474
celestial mechanics 2 579 581
Einstein shift 4 417
Einstein's law 11 436 437
external ballistics 2 79 82
free fall 5 196
gravitational and inertial mass 6 265
gravitational constant 6 264
Gravitation—cont
gravitational potential energy 4 600 601, 6 264 265*
graviton 6 266
gravity 6 264 266
mass 8 162
Newton's law 6 263 265
orbital motion 9 371 372
possible nature of 6 265
potentials (mathematics) 10 537 538
proof of inverse square law 2 186
quantum field theory 11 151
relativity 11 435 438
terrestrial 13 513 521
velocity of propagation 6 265 266
see also Gravity
Gravitational contraction cosmogony 5 504
Gravitational field 6 266
Gravitational field binary stars 2 189
graviton 6 266
quantum field theory 11 151
Gravitational mass 6 265* 11 435
Gravitational potential 10 540
Gravitational potential energy 6 264 265
Gravitational radiation 6 266
Gravitational red shift *see* Einstein shift
Gravitational sliding (geology) 9 413
Gravitational systems of units 14 204
Gravitational waves 6 266 11 437*
Graviton 4 543 6 266*
Gravity 6 261 266
acceleration of 1 27 13 513
artificial 1 474 12 543
formulas 13 516 517
studies of earth 13 513
see also Gravitation
Gravity balance 2 74
Gravity chute 5 448
Gravity concentration ore dressing 9 389
Gravity conveyor 5 447 448
Gravity dam 4 4
Gravity drainage recovery petroleum engineering 10 59 79
Gravity fault 5 192
Gravity measurement 13 513 516
Gravity pendulum *see* Pendulum
Gravity measurement 13 513 515
subsurface structure 13 221
Gravity measurement—cont
tectonophysics 13 414
see also Gravimeter
Gravity seiches 13 635
Gravity separation 12 186
Gravity settling 5 155
Gravity surveys geophysical exploration 6 165 166
mineral prospecting 11 23
petroleum prospecting 11 27
Gravity tide observations 4 348 350
Gravity tolerance 1 606
Gravity variometer 13 515
Grayure processes 10 603 604
Gray 6 260
Gray, G 6 420
Gray J 4 3 333 334 8 197
Gray birch 2 247
Gray blow fly 8 680
Gray body 6 266*, 6 273
Gray-breasted parakeet 11 69
Gray Brown Podzolic soils 12 436
Gray fox 5 490
Gray iron 2 540
Gray mold 9 408 13 172
Gray parrot 9 567
Gray squirrel 13 31
Gray tin 12 167
see also Tin
Gray wolf 14 522
Grayback Mountain 1 523
Graylag goose 1 436
Grayling 5 223
Graywacke 6 266 267
flysch 12 142
graded bedding 6 267 10 566
mineral composition 6 266
origin 6 267
penecontemporaneous deformation 6 267
structure 6 267
Grease lithium stearate 7 543 605 606
Great Ameater 1 442
Great auk 1 667 3 10
Great Australian Bight 1 670 9 271
Great Barrier Reef 8 90
Great Basin 8 618 9 160
Great Bear 14 235
Great Bear Lake 9 144 152
Great blue heron 6 426
Great Britain 5 116
Great circle polar triangle 10 445
sphere 12 607
Great circle terrestrial 6 267 268
Great Dividing Range 1 670
Great golden digger wasp 6 582
Great gray owl 9 460
Great horned owl 9 460
Great Ice Age *see* Glacial Epoch
Great Karroo 1 108
Great Lake, Tasmania 1 672
Great Lakes evolution of 6 193
Great Lakes Region 9 154
Great Lakes St Lawrence Seaway 9 154
Great Plains Province 9 155
Great Salt Lake 7 387, 9 160
Great Slave Lake 8 162
Great Smoky Mountains 9 147
Great soil groups *see* Soil (great soil groups)
Great Valley (Newer Appalachians) 9 145
Great Valley of California 9 162
Great white shark 12 243
Great white sturgeon 13 207
Greater Antilles West Indies 14 474 475
Greater omentum 4 154
Greatest common divisor 5 46
Grebe 6 268* 10 429
Greefiellidae 4 79
Green H S 7 541, 13 65
Green abalone 1 2 3
Green's formula 7 171
Green gland 3 565, 5 105
Green molding sand 2 542
Green Mountains 9 145
Green pearl 1 3
Green pigments 10 224
Green River formation 8 447, 9 477
Green River oil shale 9 507
Green sands 6 212, 12 22
Green snake 6 268
Green stink bug 6 405
Green sulfur bacteria 2 8
Green tea 13 405
Green's theorem 6 80 268
Green turtle 3 22 14 166
Greenbottle fly 8 680
Greenhead 4 200
Greenhouse effect terrestrial 6 269
Greenhouse thrips 13 628
Greenhouse whitefly 6 474
Greenkorn R A 6 43
Greenland 1 523 524 7 4
Greenland Sea 5 114 9 271
Greenlet 14 328
Greenockite 2 386 6 269
Greenschist 11 591
Greenstein, J L 6 11 7 221
Greenstone *see* Epidiorite
Greenwich Civil Time 13 642-643
Greenwich hour angle 2 584
Greenwich mean time 13 642 643
Greenwich meridian 5 457, 6 122
Gregarina 11 56
Gregarina rigida 5 100
Gregarine 13 11

Governor—*cont*
paralleled prime movers 6 242
response 6 240
servomechanisms 12 202
speed control 6 239-243
steam turbine 13 88
Gowers, W R 6 512
GPI *see* Ground-position indicator
GR-S synthetic rubber 11 639, 14 207
Graafian follicle 6 235
oogenesis 9 331
ovum 9 458
reproductive system 11 474
Grab bucket 6 243
Graben 6 243-244
rift valley 11 570
Gracilaria 7 467
Gracilaria lichenoides 1 110
Gracilariid 7 464
Gracilariidae 7 464
Grackle 6 244*, 254
Graded bedding 10 566, 12 134
Gradient, hydraulic *see* Hydraulic gradient
Gradient of a scalar 2 413, 6 244*
Gradient wind 6 244*, 14 494
Grading airfield 1 216, 3 239
Graebe, C 1 457
Graebe-Ullmann reaction 2 449
Graeffe's method 5 47
Graf sea gravimeter 13 514
Graf Zeppelin 1 217-218
Graft polymer 10 479
Grafting embryology, experimental 4 570
reproduction, plant 11 452
Grafting of plants 6 245
budding 2 361
plant growth 10 333
Graham-Cole test 6 13 17
Graham-Palmer Peninsula 1 440
Grahamella 11 567
Grahamite 1 590 591
Graian Alps 5 117
Grain (weight) 8 188, 14 461
Grain alcohol *see* Ethyl alcohol
Grain boundaries (metallurgy) 6 245
Grain crops 6 245 246
barley 2 98 101
buckwheat 2 360
in the United States 6 246
Grain drier 3 115
Grain mite 12 29
Grain refining 6 578
Grain sorghum cultivation 12 507
description 12 506
harvesting 12 507
hybrids 12 507
origin 12 506
planting 12 507
Grain sorghum—*cont*
sorghum 12 506
varieties 12 507
Grain structure (crystallography) 3 580, 6 245, 8 293
Grain weevil 2 131
Grainer salt 12 17
Graininess photographic materials 10 157
Grains, interstellar 7 221-222
Gram 6 246*, 8 188
Gram's stain 6 246-247
bacteria 2 6
mechanism 6 246
in taxonomy of bacteria 2 10
technique 6 246
variations 6 246
Gram-equivalent weight 3 361, 6 247*
Gram molecular weight 6 247
Avogadro number 1 697
concentration scales 3 361
molar volume 8 536 537
molecular weight 8 556
Gram negative bacteria 6 246
Gram negative diplococci 6 247
Gram positive bacteria 6 246
Gramicidin 1 461
Gramicidin S 14 177
as a peptide 9 629
Graminales 6 247*, 10 546
bamboo 2 89
citronella 3 147
Cyperaceae 6 247
Gramineae 6 247
Gramine 7 63
Gramineae 6 247, 10 488
Gran Paradiso 5 119
Gran Sabana 12 526
Granby type mine car 8 487
Grand Bahama Island 14 473
Grand canonical ensemble 13 62
Grand Canyon 9 161
Grand Canyon Series 10 567
Grand Casse 5 119
Grand Coulee Dam 14 399
Grand fir 5 278
Grand Hogback 9 156
Grand mal 5 49
Grand potential 13 62
Grandite series 6 40
Grandry's corpuscle 12 180
Granit, R 8 205
Granite 6 247 249* 7 16 10 86, 11 590 591
alkali granites 6 248
calc alkali granites 6 248
commercial term 6 248
compressive strength 4 613
dimension stone 13 151
geologic time scale 6 135
granodiorite 6 248
heat production in 4 532
Granite—*cont*
isotopic composition 7 430 431
mineralogy 6 248
neutron flux in 13 522
occurrence 6 248
origin 6 249
ornamental stone 13 152
petrographic province 10 51
phenocryst in 10 111
recomposed granite 1 535
silicate magma origin 12 316
sound velocity in 12 516
structure 6 248
texture 6 248
Granite moss 8 633
Granite porphyry 10 521
Granitization 6 249-250
aureole, contact 1 669
Granoblastic rock fabric 8 296-297
Granodiorite 6 250*; 7 16, 10 86
petrographic province 10 51
Granophyre 10 86
Granophyric texture 7 12 13
Grant Range formations 10 26
Grantia 13 360
Grantia compressa 9 562
Grantiidae 13 360
Grantsville formation 14 84
Granular gland 6 204
Granulation (sun) 13 268
Granulite 6 250
Granuloblast 6 396-398
Granulocyte radiation injury (biology) 11 227
Granulocytic leukemia clinical pathlogy 3 192 202
Granuloma 2 171
Granuloma inguinale 4 54, 6 250 251, 13 179
diagnosis 6 250
isolation 6 250
taxonomy 2 352
transmission 6 250
Granulomatosis infantiseptica 7 543
Granulomatous encephalitis 9 70
Granulosa cell tumor 11 480
Grape culture 6 251 252
control of diseases 6 252
cultivation 6 251
diseases 6 251
kinds 6 251
production 6 251
uses 6 251
value 6 251
Grape fern 9 342
Grape leaf folder 7 472
Grape sugar *see* Glucose
Grape phylloxera 6 475
Grapefruit 6 252 253
Graph theory 6 253 256 8 [illegible]
Graphechon storage tube 13 161
Graphic arts *see* Printing
Graphic methods 6 2-6
curve fitting 3 [illegible]
extrapolation 5 [illegible]
interpolation 7 216 219
Graphic recording instruments *see* Recording instruments, graphic
Graphic scale (map) 8 88
Graphical analysis 4 [illegible]
Graphical coordinate systems *see* Coordinate systems, graphical
Graphical interpolation 7 216
Graphics, engineering *see* Engineering graphics
Graphitealcare 14 256
Graphite 6 256 258
black lead 6 256
carbon 2 462
lubricant 7 604
in meteorites 8 513
occurrence 6 256
plumbago 6 256
properties 6 256
as reactor moderator 11 355 356
refractory 11 410
structure of 12 475
synthetic graphite 6 257 258
uses 6 257
Graphite bronze bearings 1 [illegible]
Graphitization 3 490, 6 [illegible]
Graphitizing furnace 6 257
Graphium 7 470
Graphium ulmi 13 140
Graphognathus leucoloma 14 460
Grappa 4 255
Grapsidae 4 [illegible]
Grapsimys 14 166
Grapsimys geographicus 3 [illegible] 5 31, 14 67
Graptolite shales 2 [illegible] 12 [illegible]
Graptolithina 6 258
Graptoloidea 6 258
Graptozoa 6 258
Grashof number 3 [illegible]
Grass 12 506
Grass, Bermuda *see* Bermuda grass
Grass crops 6 259 261
Bermuda grass 2 [illegible]
bluegrass 2 272
bluestem grass 2 [illegible]
disease control measures 6 261
diseases of 6 260
distribution 6 259
fescue 5 241
growth characteristics 6 259
kinds of pathogens 6 260

Grass crops—cont
structure 6 259
timothy 15 647
Grass root beetle 3 276
Grass spider 4 498
Grasserie 7 469
Grasshopper 6 261
Grasshopper sparrow 12 562
Grassland 10 563 14 290 291
climax community 3 192 196
low latitude distribution 14 289 290
mid latitude distribution 14 290 291
steppe 15 125
Grassland climax formations 3 190
Grassmann H G 2 410
Grating diffraction *see* Diffraction grating
Grating spectrograph 4 140
Grating spectrometer 4 140
Grating spectroscope 4 140
Grave's disease 6 229 13 627
Gravitational binding energy *see* Binding energy gravitational
Gravel 6 261 262* 11 500
Graver 10 605 610
Gravigrada 4 413
Gravimeter 6 268
astatic balance 13 515 516
cost 13 516
eodetic 13 516
for sea 13 515
gulf underwater 13 515 516
gasfield gas pressure 13 514
Harkey 13 515 516
Iowa Gulf 13 515
LaCoste Romberg 13 516
LaCoste sea 13 515
Magnolia 13 514
Nordgaard 13 515 516
North American 13 516
sea 13 514
spring balance 13 515 516
stable 13 515
underwater 13 514
unstable 13 514
Gravitative analysis 6 262
Gravity 10 573
Gravity dock 4 281 282* 290
Gravitation 6 263 266
astrogravity 3 474
celestial mechanics 2 579 593
Einstein shift 4 417
Einstein's law 11 436 437
exterior ballistics 2 79 82
free fall 5 496
gravitational and inertial mass 6 263
gravitational constant 6 264
Gravitation—cont
gravitational potential energy 4 600 601, 6 264 265*
graviton 6 266
gravity 6 264 266
mass 8 162
Newton's law 6 265 265
orbital motion 9 571 572
possible nature of 6 265
potentials (mathematics) 10 537 538
proof of inverse square law 2 186
quantum field theory 11 151
relativity 11 435 438
terrestrial 15 515 521
velocity of propagation 6 265 266
see also Gravity
Gravitational contraction *see* nergons 3 504
Gravitational field 6 266
Gravitational field binary stars 2 189
graviton 6 266
quantum field theory 11 151
Gravitational mass 6 265* 11 435
Gravitational potential 10 540
Gravitational potential energy 6 264 265
Gravitational radiation 6 266
Gravitational red shift *see* Einstein shift
Gravitational sliding (geology) 9 415
Gravitational systems of units 14 204
Gravitational waves 6 266 11 437*
Graviton 4 545 6 266*
Gravity 6 264 266
acceleration of 1 27 15 513
artificial 1 474 12 545
formulas 15 516 517
studies of earth 15 513
see also Gravitation
Gravity balance 2 74
Gravity chute 5 448
Gravity concentration ore dressing 9 489
Gravity conveyor 5 447-448
Gravity dam 4 4
Gravity drainage recovery petroleum engineering 10 59 79
Gravity fault 5 192
Gravity measurement 15 513 516
Gravity pendulum *see* Pendulum
Gravity measurement 15 513 515
subocean structure 15 221
Gravity measurement—cont
tectonophysics 15 414
see also Gravimeter
Gravity seiches 15 635
Gravity separation 12 166
Gravity settling 5 155
Gravity surveys geophysical exploration 6 165 166
mineral prospecting 11 25
petroleum prospecting 11 27
Gravity tide observations 4 518 550
Gravity tolerance 1 680
Gravity variometer 15 515
Gravure processes 10 603 604
Gray 6 266
Gray G 6 420
Gray J 5 553 554 8 197
Gray birch 2 247
Gray blow fly 8 680
Gray body 6 266*, 6 275
Gray breasted parakeet 11 60
Gray Brown Podzolic soils 12 436
Gray fox 5 490
Gray iron 2 440
Gray mold 9 408 15 172
Gray parrot 9 567
Gray squirrel 13 51
Gray tin 12 187
see also Tin
Gray wolf 14 522
Grayback Mountain 1 523
Graylag goose 1 436
Grayling 5 223
Graywacke 6 266 267
flysch 12 142
graded bedding 6 267, 10 566
mineral composition 6 266
origin 6 267
penecontemporaneous deformation 6 267
structure 6 267
Grease lithium stearate 7 543 605 606
Great anteater 1 442
Great auk 1 667 3 10
Great Australian Bight 1 670 9 271
Great Barrier Reef 8 90
Great Basin 8 618 9 160
Great Bear 14 255
Great Bear Lake 9 144 152
Great blue heron 6 426
Great Britain 3 116
Great circle polar triangle 10 445
sphere 12 607
Great circle terrestrial 6 267 268
Great Dividing Range 1 670
Great golden digger wasp 6 582
Great gray owl 9 460
Great horned owl 9 460
Great Ice Age *see* Glacial Epoch
Great Kattegat 1 108
Great Lake, Tasmania 1 672
Great Lakes evolution of 6 193
Great Lakes Region 9 154
Great Lakes St Lawrence Sea ways 9 154
Great Plains Province 9 155
Great Salt Lake 7 397, 9 160
Great Slave Lake 9 152
Great Smoky Mountains 9 147
Great soil groups *see* Soil (great soil groups)
Great Valley (Newer Appalachians) 9 145
Great Valley of California 9 162
Great white shark 12 243
Great white sturgeon 15 207
Greater Antilles West Indies 14 474 475
Greater omentum 4 154
Greatest common divisor 5 46
Grebe 6 268* 10 429
Grebellidae 4 70
Green 11 5 7 541, 15 65
Green abalone 1 2 3
Green's formula 7 171
Green gland 5 565, 5 105
Green molding sand 2 542
Green Mountains 9 145
Green pearl 1 5
Green pigments 10 221
Green River formation 8 447, 9 477
Green River oil shale 9 507
Green sands 6 212 12 22
Green snake 6 268
Green stink bug 6 405
Green sulfur bacteria 2 8
Green tea 15 405
Green's theorem 6 80 268
Green turtle 5 22 14 166
Greenbottle fly 8 680
Greenhead 4 290
Greenhouse effect, terrestrial 6 269
Greenhouse thrips 15 628
Greenhouse whitefly 6 474
Greenkorn R A 6 43
Greenland 1 523 521, 7 4
Greenland Sea 5 114 9 271
Greenlet 14 329
Greenockite 2 596 6 269
Greenschist 11 50)
Greenstein J L 6 11 7 221
Greenstone *see* Epidiorite
Greenwich Civil Time 15 642 643
Greenwich hour angle 2 584
Greenwich mean time 15 642 643
Greenwich *meridian* 5 457, 6 122
Gregarina 11 56
Gregarina rigida 5 100
Gregarine 15 11

Governor—*cont*
paralleled prime movers 6 242
response 6 240
servomechanisms 12 202
speed control 6 239 243
steam turbine 13 88
Gowers, W R 6 512
GPI *see* Ground-position indicator
GR-S synthetic rubber 11 639, 14 207
Graafian follicle 6 235
oogenesis 9 331
ovum 9 458
reproductive system 11 474
Grab bucket 6 243
Graben 6 243-244
rift valley 11 570
Gracilaria 7 467
Gracilaria lichenoides 1 110
Gracilariid 7 464
Gracilariidae 7 464
Grackle 6 244*, 254
Graded bedding 10 566, 12 134
Gradient, hydraulic *see* Hydraulic gradient
Gradient of a scalar 2 413, 6 244*
Gradient wind 6 244*, 14 494
Grading airfield 1 216, 3 239
Graebe, C 1 457
Graebe-Ullmann reaction 2 449
Graeffe's method 5 47
Graf sea gravimeter 13 514
Graf Zeppelin 1 217 218
Graft polymer 10 479
Grafting embryology, experimental 4 570
reproduction, plant 11 452
Grafting of plants 6 245
budding 2 361
plant growth 10 333
Graham Cole test 6 13-17
Graham-Palmer Peninsula 1 440
Grahamella 11 567
Grahamite 1 590-591
Graian Alps 5 117
Grain (weight) 8 188, 14 461
Grain alcohol *see* Ethyl alcohol
Grain boundaries (metallurgy) 6 245
Grain crops 6 245-246
barley 2 98-101
buckwheat 2 360
in the United States 6 246
Grain drier 1 115
Grain mite 12 29
Grain refining 6 378
Grain sorghum cultivation 12 507
description 12 506
harvesting 12 507
hybrids 12 507
origin 12 506
planting 12 507
Grain sorghum—*cont*
sorghum 12 506
varieties 12 507
Grain structure (crystallography) 3 580, 6 245, 8 293
Grain weevil 2 131
Grainer salt 12 17
Graininess photographic materials 10 157
Grains, interstellar 7 221-222
Gram 6 246*, 8 188
Gram's stain 6 246-247
bacteria 2 6
mechanism 6 246
in taxonomy of bacteria 2 10
technique 6 246
variations 6 246
Gram equivalent weight 3 361, 6 247*
Gram molecular weight 6 247
Avogadro number 1 697
concentration scales 3 361
molar volume 8 536-537
molecular weight 8 556
Gram negative bacteria 6 246
Gram negative diplococci 6 247
Gram-positive bacteria 6 246
Gramicidin 1 464
Gramicidin S 14 177
as a peptide 9 629
Graminales 6 247*, 10 346
bamboo 2 89
citronella 3 147
Cyperaceae 6 247
Gramineae 6 247
Gramine 7 63
Gramineae 6 217, 10 488
Gran Paradiso 5 119
Gran Sabana 12 526
Granby-type mine car 8 487
Grand Bahama Island 14 473
Grand-canonical ensemble 13 62
Grand Canyon 9 161
Grand Canyon Series 10 567
Grand Casse 5 119
Grand Coulee Dam 14 399
Grand fir 5 278
Grand Hogback 9 156
Grand mal 5 40
Grand potential 13 62
Grandite series 6 40
Grandry's corpuscle 12 180
Granit, R 8 205
Granite 6 247-249* 7 16 10 86, 11 590 591
alkali granites 6 248
calc-alkali granites 6 248
commercial term 6 248
compressive strength 4 613
dimension stone 13 151
geologic time scale 6 135
granodiorite 6 248
heat production in 4 332
Granite—*cont*
isotopic composition 7 430-431
mineralogy 6 248
neutron flux in 13 522
occurrence 6 248
origin 6 249
ornamental stone 13 152
petrographic province 10 51
phenocryst in 10 111
recomposed granite 1 533
silicate magma origin 12 516
sound velocity in 12 516
structure 6 248
texture 6 248
Granite moss 8 633
Granite porphyry 10 521
Granitization 6 249-250
aureole, contact 1 669
Granoblastic rock fabric 8 296-297
Granodiorite 6 250*, 7 16, 10 86
petrographic province 10 51
Granophyre 10 86
Granophyric texture 7 12-13
Grant Range formations 10 26
Grantia 13 360
Grantia compressa 9 562
Grantitidae 13 360
Grantsville formation 14 84
Granular gland 6 204
Granulation (sun) 13 268
Granulite 6 250
Granuloblast 6 396 398
Granulocyte radiation injury (biology) 11 227
Granulocytic leukemia clinical pathology 3 192 202
Granuloma 2 171
Granuloma inguinale 4 54, 6 250 251, 13 179
diagnosis 6 250
isolation 6 250
taxonomy 2 352
transmission 6 250
Granulomatosis infantiseptica 7 543
Granulomatous encephalitis 9 70
Granulosa cell tumor 11 480
Grape culture 6 251-252
control of diseases 6 252
cultivation 6 251
diseases 6 251
kinds 6 251
production 6 251
uses 6 251
value 6 251
Grape fern 9 542
Grape leaf folder 7 472
Grape sugar *see* Glucose
Grape phylloxera 6 475
Grapefruit 6 252 253
Graph theory 6 253 2-6 8 12
Graphechon storage tube 13 161
Graphic arts *see* Printing
Graphic methods 6 2-6
curve fitting 3 629 631
extrapolation 3 158 159
interpolation 7 2-6 2-9
Graphic recording instruments *see* Recording instruments graphic
Graphic scale (map) 8 68
Graphical analysis 4 69 74
Graphical coordinate systems *see* Coordinate systems, graphical
Graphical interpolation 7 2-6
Graphics, engineering *see* Engineering graphics
Graphiolaceae 14 256
Graphite 6 256 258
black lead 6 256
carbon 2 462
lubricant 7 604
in meteorites 8 513
occurrence 6 256
plumbago 6 256
properties 6 256
as reactor moderator 11 355 356
refractory 11 410
structure of 12 475
synthetic graphite 6 257-258
uses 6 257
Graphite bronze bearings 1 258
Graphitization 3 490, 6 378
Graphitizing furnace 6 257
Graphium 7 470
Graphium ulmi 13 140
Graphognathus leuoloma 14 460
Grappa 4 255
Grapsidae 4 34
Graptemys 14 166
Graptemys geographica 3 23, 5 31, 14 67
Graptolite shales 2 253, 12 524
Graptolithina 6 258
Graptoloidea 6 258
Graptozoa 6 258
Grashof number 3 442
Grass 12 506
Grass, Bermuda *see* Bermuda grass
Grass crops 6 259 261
Bermuda grass 2 168 169
bluegrass 2 272
bluestem grass 2 272
disease control measures 6 261
diseases of 6 260
distribution 6 259
fescue 5 241
growth characteristics 6 259
kinds of pathogens 6 260

Grass crops—cont
structure 6 229
timothy 13 647
Grass root beetle 5 276
Grass spider 3 498
Grasserie 7 469
Grasshopper 6 261
Grasshopper sparrow 12 562
Grassland 10 563 14 290 291
climax community 5 182 186
low latitude distribution 14 289 290
mid latitude distribution 14 290 291
steppe *15* 125
Grassland climax formations 5 190
Grassmann H G 2 410
Grating diffraction *see* Diffraction grating
Grating spectrograph 4 140
Grating spectrometer 4 140
Grating spectroscope 4 140
Grave's disease 6 229 13 627
Gravitational binding energy *see* Binding energy gravitational
Gravel 6 261 262* 11 500
Graver 10 603 610
Gravigrada 4 411
Gravimeter 6 186
astatic balance 13 515 516
Frost 13 516
geodetic 13 516
Graf sea 13 515
Gulf underwater 13 515 516
Haalck gas pressure 13 514
Hartley 13 515 516
Hove Gulf 13 515
LaCoste Romberg 13 516
LaCoste sea 13 515
Magnolia 13 514
Norgaard 13 515 516
North American 13 516
sea 13 514
spring balance 13 515 516
stable 13 515
underwater 13 514
unstable 13 514
Gravimetric analysis 6 262 264* 10 573
Graving dock 4 281 282* 12 290
Gravitation 6 263 266
antigravity 1 474
celestial mechanics 2 579 583
Einstein shift 4 417
Einstein's law *11* 456 457
exterior ballistics 2 79 82
free fall 5 496
gravitational and inertial mass 6 265
gravitational constant 6 264
Gravitation—cont
gravitational potential energy 4 600-601, 6 264 265*
graviton 6 266
gravity 6 264 266
mass 8 162
Newton's law 6 263 265
orbital motion 9 371 372
possible nature of 6 265
potentials (mathematics) 10 537 538
proof of inverse square law 2 186
quantum field theory 11 151
relativity 11 455 458
terrestrial 13 513 521
velocity of propagation 6 261 266
see also Gravity
Gravitational contraction *see* Isogeom 5 504
Gravitational field 6 266
Gravitational field binary stars 2 189
graviton 6 266
quantum field theory 11 151
Gravitational mass 6 265* 11 455
Gravitational potential 10 540
Gravitational potential energy 6 264 265
Gravitational radiation 6 266
Gravitational red shift *see* Einstein shift
Gravitational sliding (geology) 9 445
Gravitational systems of units 14 201
Gravitational waves 6 266 11 457*
Graviton 4 545 6 266*
Gravity 6 261 266
acceleration of 1 27 13 515 516
artificial 1 474 12 543
formulas 13 516 517
studies of earth 13 513
see also Gravitation
Gravity balance 2 74
Gravity chute 3 448
Gravity concentration ore dressing 9 339
Gravity conveyor 3 447 448
Gravity dam 4 4
Gravity drainage recovery petroleum engineering 10 59 79
Gravity fault 5 192
Gravity measurement 13 513 516
Gravity pendulum *see* Pendulum
Gravity measurement 13 513 515
subocranic structure 13 221
Gravity measurement—cont
tectonophysics 13 414
see also Gravimeter
Gravity seiches 13 635
Gravity separation *12* 136
Gravity settling 3 155
Gravity surveys geophysical exploration 6 165 166
mineral prospecting 11 25
petroleum prospecting 11 27
Gravity tide observations 4 548 550
Gravity tolerance 1 690
Gravity variometer 13 515
Gravure processes 10 603 604
Gray 6 266
Gray G 6 420
Gray J A 3 535 554 8 197
Gray birch 2 247
Gray blowfly 8 680
Gray buds 6 266* 6 273
Gray breasted parakeet 11 69
Gray Brown Podzolic soils 12 436
Gray fox 5 490
Gray iron 2 540
Gray mold 9 404 13 172
Gray parrot 9 567
Gray squirrel 13 31
Gray tin 12 167
see also Tin
Gray wolf 14 522
Grayback Mountain 1 523
Grayleg goose 1 436
Grayling 5 225
Graywacke 6 266 267
flysch 12 142
graded bedding 6 267 10 566
mineral composition 6 266
origin 6 267
penecontemporaneous deformation 6 267
structure 6 267
Grease lithium *stearate* 7 513 605 606
Great anteater 1 442
Great auk 1 667 5 10
Great Australian Bight 1 670 9 271
Great Barrier Reef 8 90
Great Basin 8 614 9 160
Great Bear 14 225
Great Bear Lake 9 141 152
Great blue heron 6 426
Great Britain 5 116
Great circle polar triangle *10* 445
sphere 12 607
Great circle terrestrial 6 267 268
Great Dividing Range 1 670
Great golden digger wasp 6 582
Great gray owl 9 460
Great horned owl 9 460
Great Ice Age *see* Glacial Epoch
Great Karroo 1 104
Great Lake, Tasmania 1 672
Great Lakes evolution of 6 193
Great Lakes Region 9 154
Great Lakes St Lawrence Seaway 9 154
Great Plains Province 9 155
Great Salt Lake 7 587, 9 160
Great Slave Lake 9 152
Great Smoky Mountains 9 147
Great soil groups *see* Soil (great soil groups)
Great Valley (Newer Appalachians) 9 145
Great Valley of California 9 162
Great white shark 12 243
Great white sturgeon 13 297
Greater Antilles West Indies *14* 474 475
Greatest omentum 4 154
Greatest common divisor 5 46
Grebe 6 268* 10 429
Greefiellidae 4 79
Green H S 7 541 13 65
Green abalone 1 2 5
Green's formula 7 171
Green gland 3 563 5 105
Green molding sand 2 542
Green Mountains 9 135
Green pearl 3 3
Green pigments 10 224
Green River formation 8 447, 9 477
Green River oil shale 9 507
Green sands 6 212 12 22
Green snake 6 268
Green stink bug 6 405
Green sulfur bacteria 2 8
Green tea 13 405
Green's theorem 6 80 268
Green turtle 5 22 14 166
Greenbottle fly 8 680
Greenhead 4 280
Greenhouse effect terrestrial 6 269
Greenhouse thrips 13 629
Greenhouse whitefly 6 474
Greenhorn R A 6 43
Greenland 1 523 524 7 4
Greenland Sea 5 111 9 271
Greenlet 14 528
Greenockite 2 586 6 269
Greenschist 11 591
Greenstein J L 6 11 7 221
Greenstone *see* Epidiorite
Greenwich Civil Time 13 642 643
Greenwich hour angle 2 584
Greenwich mean time 13 642 643
Greenwich meridian 3 457 6 122
Gregarina 11 56
Gregarina rigida 5 100
Gregarine 13 11

Gregarinidia 6 269*, 11 52, 13 11
Eugregarinida 5 100, 6 269, 11 52
Schizogregarinida 6 269, 11 52, 12 65
Telosporidea 13 485
Gregor, W 13 654
Gregorian calendar 2 415 416, 4 329
Gregorian telescope 13 451
Gregory, J T, 7 8
Gregory-Newton interpolation formula 5 158
Greig, J W 13 249
Gresen 6 269
Grenade hand 1 539-540
launcher 1 538 540
rifle 1 539 540
Grenadier 6 2
Grevillea robusta 11 31
Gribble 5 291; 7 283, 12 533
Grid, polar navigational 10 442
Grid bias 2 183
Grid camera 10 160
Grid current 4 256
triode 14 108-109
Grid detector 1 358
Grid-dip meter 14 440
Grid dip oscillator 14 440
Grid glow tube 6 61
Grid leak bias 2 184
Grid-leak detector 1 358
Grid modulators 1 355 357
Grid rectification meter 14 254
Grid variation 10 442
Griess, P 4 105
Griffith, F 7 390
Griffith theory 8 274
Griffithsia 11 555
Griggs, D 9 412, 11 598, 13 417
Grignard reaction 6 269 271
condensation reaction 3 376
ketone 7 359
nitrile 9 106
Grignard reagent 9 402
aldehyde 1 231
alkane 1 249
barium compounds 2 95
beryllium compounds 2 172
calcium compounds 2 399
reaction with silicon compounds 12 321-324
strontium alkyls 13 195
Grijala River 9 163
Grimaldi, F M 9 362
Grindelia 5 190
Grinding 6 271-272*; 8 6 7, 12 551
emery 4 582
gear cutting 6 88
grinding fluids 6 272
grinding materials 6 271
grinding wheels 6 272
honing 6 477
Grinding—*cont*
lapping 7 404
polishing 10 457
Grinding machines 6 272 273
Grinding mill 6 273 274
buhrstone mill 2 362
hammer mill 6 274
pebble mill 9 607
ring-roller mill 6 274
roll mill 11 616
tumbling mill 6 274, 14 135
Grinding sand 12 22
Grinding wheel 1 9 10
diamond 4 101, 6 100
Griphodon 11 128
Grisein 1 476
Griseofulvin 1 475, 5 563, 6 274 275
antimicrobial activity 6 274
dose 6 275
Penicillium 6 274
pharmacology 6 275
production 6 274
solubility 6 274
structure 6 274
Griseolutein 1 476
Griseomycin 1 476
Grit, diamond 6 100
Grit chamber 12 221
Grivation 10 442
Grizzly bear 2 118
Grmec Planina 5 118
Groat, J 4 453
Grocer's itch 12 29
Grodstein, G W 11 239
Grog refractory 11 410-411
Groin (engineering) 6 275, 11 540
Gromia 12 28
Groove casts 13 209
Gros Morn 1 523
Grosbeak 6 275*, 12 562
Grosse, A V 11 30
Grosvglockner 5 119
Grossmann's reagent 9 95
Grossularite 4 383, 6 40
Grossvenediger 5 119
Groth, P 3 608
Grotrian diagram 4 601
Ground motion components 12 147 154
particle displacement 12 148
perennially frozen 10 21
polygonal 10 471 472
strains in 12 148
Ground controlled approach system (GCA) 6 278
see also Precision approach radar (PAR)
Ground beetle 3 276
Ground bug 6 401
Ground echoes, radar 11 210
Ground effect vehicle *see* Air cushion vehicle
Ground hemlock 14 605
Ground hog 14 541
Ground inversion 13 488
Ground magnetic survey 11 21 22
Ground moraine 8 597
Ground-position indicator (GPI) 6 281
Ground radioactivity surveys mineral prospecting 11 23 24
Ground roller 3 473
Ground sloth 4 411
Ground speed (aircraft) 1 220
Ground squirrel 13 31
Ground squirrel flea 12 545
Ground state 6 275 276
Ground substance (cytoplasm) 3 657
Ground support equipment 7 419, 8 515
Ground tissue (Parenchyma) 9 562
Ground water 6 276-278
anastatic water 6 276
aquifer 1 496 6 276
argic water 6 276
artesian systems 1 553, 6 277 278
in caves 2 571
chemical quality 6 278
connate water 6 277
effective porosity 6 277
electroosmotic dewatering 4 526
forces controlling movement 6 277
infiltration 6 277
juvenile water 6 277
karst topography 7 333
kremastic water 6 276
meteoric water 6 277
movement 10 21
openings in rocks 6 276
permeability 6 276 277
pleretic water 6 276
porosity 6 276
primary water 6 277
relation to springs 13 18
replenishment of 6 277
rhizic water 6 276
source of 6 277
specific retention 6 277
specific yield 6 277
subterranean water 6 276
in thermal springs 13 551
transmissibility 6 277
vadose water 6 276
water supply engineering 14 404
water table 6 277 278
wells 6 276
zone of saturation 6 276
Ground Water Laterite soils 12 439
Ground Water Podzols 12 439
Ground wires (lightning protection) 4 443
Grounded base amplifier *see* Common base amplifier
Grounded base connection *see* Common base connection transistor
Grounded collector amplifier *see* Common collector amplifier
Grounded collector connection *see* Common collector connection, transistor
Ground emitter amplifier 1 330
Grounded emitter connection *see* Common emitter connection, transistor
Grounded grid amplifier 14 cascode amplifier 2 337
Grounded plate amplifier *see* Cathode follower
Grounding, electrical 6 278 279
coefficient of ground re 4 442
electric power systems 4 442
three phase circuits 4 442
Grounding, electronic equipment 6 279 281
bonding 6 280
capacitance to ground 6 279
floating equipment 6 279
ground lead impedance 6 280
noise pick up 6 279
Groundwood process 11 529
Groundwood pulp 9 559
Group, periodic table 10 13
Group dynamics (psychology) 6 255
Group theory 6 282 285*, 8 5 502 14 439
Grouse 6 18 285
Grout 6 285
Grouting, tunnels 14 142
Grove, D C 6 274
Groves G 4 551
Growing season 6 285 286
Grown junction transistor 2 5
Growth, embryology 4 577 57
Growth, bacterial *see* Bacterial growth
Growth, human 1 460
Growth hormone 4 592 6 10 250 251 13 622
Growth hormone
hypophysis 6 490, 506
Growth periodicity (plants) 10 537
Growth regulation, animal 2 607
Growth regulator, plant 1 12
Growth ring, tree 14 524
Growth stimulator (food) 5
Grubenmann, U 8 299

Gruenberg E. 12 177
Gruidae 3 535, 6 286
Gruiformes 1 694 6 286
coot 3 462
gallinule 6 18 19
rail 11 527
Grumusols 12 437
Grüneisen, E. 13 550
Grunerite 1 569 3 623
Grus 3 412 414*
Grus americanus 3 536 12 572
Grus canadensis 3 535
Gryllidae 3 547, 9 418
Gryllobiatta 9 416
Gryllobiatta campodeiformis 9 416
Gryllobiattidae 9 416
Gryllotalpa hexadactyla 9 416, 417
Gryllotalpidae 9 418
Gryllus assimilis 3 547
Gryphaea 7 527
Gryphus 2 315
Guadalquivir River 5 121
Guadalupian Series 10 24
Guadiana River 5 121
Guaiacum coulteri 7 514
Guaiacum guatemalense 7 514
Guaiacum officinale 7 514
Guaiacum sanctum 7 514
Guan 6 18
Guanidine 1 529, 11 113
Guanidine aluminum sulfate hexahydrate 3 225
Guanine in combination in pyrimidine 11 115
in deoxyribonucleic acid 4 66
excretion 5 137 145
in *Lactobacillus arabinosus* media 2 195
in plant metabolism 10 359
Guanophore 3 99
integument 7 174
neural crest 9 78
Guanosine diphosphate 2 51, 9 214
Guanosine triphosphate 2 51
Guanylic acid *nucleic acid* 9 208
Guar gum 6 297
Guaran 8 92
Guard 5 38
Guard cell 5 38, 13 114
leaf anatomy 7 436 441
Guard hairs 7 447
Guard ring capacitor 2 440 441
Guardian of the Pole 14 235
Guarnieri bodies 12 585
Guatemala 9 164
Guava 6 286
Guavule 6 286
Gudden, B 4 485
Gudden Pohl effect 4 485
Gudernatsch J 13 622
Guerin process 12 250
Guernsey 2 565
Guernsey Reservoir 14 599
Guiana Highlands 12 526 527
Guianian Shield 10 567
Guidance, aircraft landing *see* Precision approach radar
Guidance systems 6 286 287
autopilot 1 689
beam rider system 6 287
command guidance 6 286
homing system 6 287
inertial guidance 6 287, 7 91 92*
missile 6 287, 8 512, 515 517*
self contained 6 287
Guide fossils 3 406, 8 357, 9 448
Guided missile 6 287 291*, 8 510 511
acoustic homing system 6 291
acoustic torpedo 1 48
air-to-air 1 536
air to surface 1 537
army armament 1 540
autopilot 1 689
beam rider system 6 290
check-out equipment 6 291
command guidance system 6 289
Corporal 1 540
Guided missile—cont
Terrier 1 545, 12 263 266
test firings 6 291
wire command 6 290
see also Missile guidance systems
Guided missile ships 12 265 266
Guignardia bidwellii 8 251
Guilford J P 10 55
Guillemot 3 10
Guillotine *shipbuilding* 12 290
Guinand, P L. 9 332
Guinea Current 1 626
Guinea hen 6 291 292
Guinea pig 6 292
cavy 6 292
gestation period 6 182
Guinea worm 4 270
taxonomy 3 642 643
Guinea worm infection 6 292
Guinealoni 8 18
Guiraca caerulea 6 275
Guitar 8 665 667
Guitar fish 11 331, 348
Gula 3 275 288
Guldberg, C. M 5 51
Gulf Coast geosyncline 6 174
Gulf Coastal Plain 9 151
Gulf Intracoastal Canal 7 116
Gulf of Aden 1 107
Gulf of Alaska 9 271
Gulf of Guinea 1 109 9 271
Gulf of Maine 9 251
Gulf of Mexico 6 292 293* 9 271
coastal zone sediments 8 134 135
currents 6 294
deposits 6 292 293
Florida Straits 6 294
hydrocarbons *in sediments* 10 56
monsoon influence 8 585
neritic sediments 8 135
salinity 6 294
submarine structures 6 292 293
water temperature 6 294
Gulf of St Lawrence 9 271
Gulf of Sidra 8 207
Gulf of Trieste 8 207
Gulf Stream 1 626 6 294 296*
cold wall in 9 245
countercurrent 6 296
cross section 9 246
description 6 295
iceberg 7 7
ocean meteorological relations 9 264
off Newfoundland 1 524
slope of sea surface 9 245
surface current speeds 9 247
Gulf Stream—cont
theory 6 295
thermocline 6 295
water temperature 6 295
Gulf underwater gravimeter 13 515
Gulf weed (*Sargassum*) 12 51
Gulfs of Europe 5 114 115
Gull 6 296*, 13 495
Gulland, J M 8 598
Gullstrand errors 1 4
Gully erosion 12 430 444
Gulo luscus 14 523
D(—) Gulose 2 455
Gulper 12 2
Gum 6 296 299
arabic 6 5, 297
cell walls in plants 2 617
gasoline 6 70
guaiac 7 514
mannan 8 92
mucilage 8 621 622
pectin 9 608 609
source 6 297 298
structure 6 297 298
use 6 298
visceraity 6 296 297
Gum inhibitor (gasoline) 6 70
Gümbelina planata 5 434
Gummosis 5 548, 13 245
Gun aircraft 1 534 536
artillery 1 538 539
interior ballistics 2 82 84
machine guns 1 534 539
naval 1 542 545
self propelled 1 539
submachine guns 1 537
tank 1 540
towed 1 539
Gun batteries 5 280 281
Gun perforating (oil and gas wells) 9 296 297
Gun sights 6 298 299*, 1 537, 5 591
Guncotton 2 626, 5 75
Gunda 9 434
Gunflint chert 9 522
Gunite 5 565 6 299
Gunning (coal mining) 5 258
Gunn, D 13 405
Gunn R 10 573
Gunpowder 5 150, 9 102
Guntherschulze A 13 20
Günz (glacial) 6 195
Günz/Mindel (interglacial) 6 195
Guppy 3 649 6 299*
Gurkenthal, Alps of 3 117
Gurney, R. 7 476
Gurney, R W 10 162, 11 282
Gurney Mott theory 10 162, 168 169
Gusano del monte 8 680
Gustation 3 48 50, 4 160
Gutenberg B 4 339
Gutenberg J 3 344 10 597, 609, 14 169

Gregarinida 6 269*, 11 52, 13 11
Eugregarinida 5 100, 6 269, 11 52
Schizogregarinida 6 269, 11 52, 12 65
Telosporidea 13 485
Gregor, W 13 654
Gregorian calendar 2 415-416, 4 329
Gregorian telescope 13 451
Gregory, J T 7 8
Gregory-Newton interpolation formula 5 158
Greig, J W 13 249
Greisen 6 269
Grenade hand 1 539-540
launcher 1 538 540
rifle 1 539 540
Grenadier 6 2
Greville a robusta 11 31
Gribble 5 291, 7 283, 12 533
Grid, polar navigational 10 442
Grid bias 2 183
Grid camera 10 160
Grid current 4 256
triode 14 108-109
Grid detector 1 358
Grid dip meter 14 440
Grid dip oscillator 14 440
Grid glow tube 6 61
Grid leak bias 2 184
Grid-leak detector 1 358
Grid modulators 1 355 357
Grid rectification meter 14 254
Grid variation 10 442
Griess, P 4 105
Griffith, F 7 390
Griffith theory 8 274
Griffsthsia 11 555
Griggs, D 9 412, 11 598, 13 417
Grignard reaction 6 269 271
condensation reaction 3 376
ketone 7 339
nitrile 9 106
Grignard reagent 9 402
aldehyde 1 231
alkane 1 249
barium compounds 2 95
beryllium compounds 2 172
calcium compounds 2 399
reaction with silicon compounds 12 321-324
strontium alkyls 13 195
Grijala River 9 163
Grimaldi, F M 9 362
Grindelia 3 190
Grinding 6 271 272*, 8 6-7, 12 351
emery 4 582
gear cutting 6 88
grinding fluids 6 272
grinding materials 6 271
grinding wheels 6 272
honing 6 477
Grinding—*cont*
lapping 7 404
polishing 10 457
Grinding machines 6 272-273
Grinding mill 6 273 274
buhrstone mill 2 362
hammer mill 6 274
pebble mill 9 607
ring-roller mill 6 274
roll mill 11 616
tumbling mill 6 274, 14 135
Grinding sand 12 22
Grinding wheel 1 9-10
diamond 4 101, 6 100
Griphodon 11 128
Grisein 1 476
Griseofulvin 1 475, 5 563, 6 274 275
antimicrobial activity 6 274
dose 6 275
Penicillium 6 274
pharmacology 6 275
production 6 274
solubility 6 274
structure 6 274
Griseolutein 1 476
Griseomycin 1 476
Grist, diamond 6 100
Grit chamber 12 221
Grivation 10 442
Grizzly bear 2 118
Grmec Plamna 5 118
Groat, J 4 453
Grocer's itch 12 29
Grodstein G W 11 239
Grog refractory 11 410-411
Groin (engineering) 6 275 11 540
Gromia 12 28
Groove casts 13 209
Gros Morn 1 523
Grosbeak 6 275* 12 562
Grosse, A V 11 30
Grossglockner 5 119
Grossmann's reagent 9 95
Grossularite 4 383, 6 40
Grossvenediger 5 119
Groth P 5 608
Grotrian diagram 4 601
Ground motion components 12 147, 154
particle displacement 12 148
perennially frozen 10 21
polygonal 10 471 472
strains in 12 148
Ground controlled approach system (GCA) 6 278
see also Precision approach radar (PAR)
Ground beetle 3 276
Ground bug 6 401
Ground echoes, radar 11 210
Ground effect vehicle *see* Air cushion vehicle
Ground hemlock 14 605
Ground hog 14 541
Ground inversion 13 488
Ground magnetic survey 11 21 22
Ground moraine 8 597
Ground-position indicator (GPI) 6 281
Ground radioactivity surveys mineral prospecting 11 23 24
Ground roller 3 473
Ground sloth 4 411
Ground speed (aircraft) 1 220
Ground squirrel 13 31
Ground squirrel flea 12 345
Ground state 6 275 276
Ground substance (cytoplasm) 3 657
Ground support equipment 7 419, 8 515
Ground tissue (Parenchyma) 9 562
Ground water 6 276 278
anastatic water 6 276
aquifer 1 496 6 276
argic water 6 276
artesian systems 1 553, 6 277 278
in caves 2 571
chemical quality 6 278
connate water 6 277
effective porosity 6 277
electroosmotic dewatering 4 526
forces controlling movement 6 277
infiltration 6 277
juvenile water 6 277
karst topography 7 333
kremastic water 6 276
meteoric water 6 277
movement 10 21
openings in rocks 6 276
permeability 6 276 277
pleuitic water 6 276
porosity 6 276
primary water 6 277
relation to springs 13 18
replenishment of 6 277
rhizic water 6 276
source of 6 277
specific retention 6 277
specific yield 6 277
subterranean water 6 276
in thermal springs 13 551
transmissibility 6 277
vadose water 6 276
water supply engineering 14 404
water table 6 277 278
wells 6 276
zone of saturation 6 276
Ground Water Laterite soils 12 438
Ground Water Podzols 12 439
Ground wires (lightning protection) 4 445
Grounded base amplifier *see* Common base amplifier
Grounded base connection *see* Common base connection, transistor
Grounded collector amplifier *see* Common collector amplifier
Grounded collector connection *see* Common collector connection, transistor
Grounded grid amplifier 14 55
cascode amplifier 2 317
Grounded plate amplifier *see* Cathode follower
Grounding, electrical 6 278 279
coefficient of grounding 4 442
electric power systems 4 442
three phase circuits 4 442
Grounding, electronic equipment 6 279 281
bonding 6 280
capacitance to ground 6 279
floating equipment 6 279
ground lead impedance 6 280
noise pick up 6 279
Groundwood process 11 629
Groundwood pulp 9 539
Group, periodic table 10 13
Group dynamics (psychology) 6 255
Group theory 6 282 285*, 8 122
Group velocity 6 285*, 7 501 502 14 439
Grouse 6 18, 285
Grout 6 285
Grouting, tunnels 14 142
Grove D C 6 274
Groves G 4 551
Growing season 6 285 286
Grown junction transistor 7 519
Growth, embryology 4 527 528
Growth, bacterial *see* Bacterial growth
Growth, human 1 460
Growth hormone 4 592, 6 449 10 250 251 13 622
Growth hormone hypophysis 6 449 596
Growth periodicity (plant) 10 537
Growth regulation, animal 2 607
Growth regulator, plant 1 125
Growth ring, tree 14 624
Growth stimulator (fowl) 5 577
Grubenmann, U 8 279

H

see Planck s constant
Acid 4 106
theorem 2 279
variometer 14 280
Iaalck gas pressure
gravimeter 13 515
Haar A 2 408
de Haas-van Alphen effect
4 97
Haber process 1 326 327,
9 109
Habit strength 7 442
Habitat, fresh water 5 521
Habrobracon 5 5
Habrobracon juglandis
12 231
Habrocidaris 1 499
Habronema megastoma 13 6
Habronema microstoma 13 6
Habronema muscae 13 6
Habrotrocha minuta 2 114
Hack sawing 12 41
Hackberry 6 313
Hackmatack 7 404
Hackney horse production
6 488 492
Hadal zone 4 39
Hadamard Jacques 9 226
Hadar 2 628
Haddock 5 416 6 2, 8 113
Hadley John 12 234
Hadromerina 3 158
Hadn J 11 213
HAE process 4 535
Haeckel Ernst 1 423 4 569
10 378
Haemadipsa 1 551
Haemadipsa chiliani 6 457
Haemagogus 4 218
Haemaphysalis 13 631
Haemaphysalis leachi 13 630
Haemaphysalis leporis
palustris 13 14
Haematoloechus 14 78
Haematosiphon 6 408
Haematosiphon inodora 6 405
Haementeria 11 556
Haementeria officinalis 11 556
Haemobartonella 11 567
Haemocera danae 3 567
Haemogamasus ambulans
8 253
Haemonchus 13 193
Haemonchus contortus 12 247
Haemophilus 2 352 6 412
Haemophilus aegyptius 10 238
Haemophilus ducreyi
2 352 12 372, 413
Haemophilus duplex 8 597
Haemophilus influenzae
2 352, 461, 6 412, 10 428
Haemophilus parainfluenzae
2 352
Halacaridae 1 24 25
Halbert Typro 3 349
Halcampella 1 52 54
Halchekia 2 418
Hale, G E. 13 110
Hale spectroheliroscope 12 581
see
volcano 14 354
igital
4 182
rmulas plane
etry 14 95 96
Hall bog soils 12 438
Half life 6 318 319
commercial radioisotopes
11 315
radioactivity 11 275
Half line 6 153
Half period *see* Half-life
Half reaction oxidation
reduction reactions 9 465
Half value time *see* Half life
Half wave antenna *see*
Antenna (aerial)
Half wave potential 10 455
Half wave rectifier 11 585 584
Halfbeak 2 161
Halftone 10 610 12, 618
Haliaeetus leucocephalus
4 317
Halianassa 12 347
Halibut 5 315 416
Halibut nuclear reactor
11 563
Halichondria panicea 6 518
Halichondrida 2 647, 4 56
6 319* 10 513
Haliclona 4 57 13 10
Haliclona oculata 6 533
Haliclystus 3 255, 13 76
Haliclystus auricula 13 75
Halicryptus spinosus 10 587
Halictid bee 6 574
Halictidae 6 574
Halictus 6 582
Halicystis 2 235
Halicystis osterhoutii 10 278
Halicystis ovalis 10 278
Halide 6 319
acid *see* Acid halide
bromide 2 343
calcium 2 399
carbon 2 464
chloride 3 67
fluoride 5 350
hydrogen 6 546
Halide—cont
organic 6 325 330
plutonium 10 424
silicon 12 320
see also Alkali halide
Halimeda 6 319*, 7 516
Haliotidae 1 2 3, 591
Haliotis 6 75 11 19
Haliotis cracherodii 1 2 3
Haliotis fulgens 1 2 3
Haliotis gigantea 1 2 3
Haliotis rufescens 1 2 3
Haliotis tuberculata 1 2 3
Haliplidae 3 276
Haliserca 4 54, 57, 10 516
Haliserca dujardini 4 58
Halite *see* Rock salt
Halitherium 12 347
Hall, Asaph 6 265
Hall, C. M 1 292
Hall, J S 7 222
Hall, R. G 2 189
Hall coefficient 6 320 321
Hall effect 6 319 321*, 8 60
ferromagnetic metals
6 321
galvanomagnetic effects
6 21
gyrators 6 304
ionic crystals 6 321
semiconductors 6 321
12 167 168
thermal side effects
6 320
Hall field 6 320 321
Hall process 5 555
Hall voltage 6 320 321
Halley E 4 535 6 322, 14 501
Halley's comet 6 322
Halloysite 6 322 353
cation exchange
capacity 6 322
differential thermal
curves 6 323
forms of 3 165
hydration state 3 165
structure and morpholog
6 322
Hallucination 6 325
Halo 6 323*, 8 521
alpha Halo ester
Reformatsky reaction
11 402
Halo phenomena sundog
13 291
Halobacterium 11 64
Halobacterium halobium
2 340

Gutenberg low-velocity zone 12 154
Guthion 7 141
Guthrie, E R 7 442
Gutin 5 118
Gutta 3 59
Guttation 12 127
Guttulinaceae 1 50
Guyot *see* Seamount and guyot
Gyalu Mountains 5 118
Gymnarchus niloticus 4 428
Gymnoascaceae 5 123
Gymnoblastea 6 554
Gymnocerata *see* Geocorisae
Gymnocladus dioica 7 336
Gymnocodiaceae 1 237
Gymnoconia interstitiales 11 344-345
Gymnodinia 4 197
Gymnodinium breve 1 699, 4 197, 8 170
Gymnodium 11 59
Gymnogyps californianus 14 377
Gymnolaemata 6 299-300
  Cryptostomata 3 579
  Ctenostomata 3 611
  epistome 6 300
Gymnophiona 6 300
  Amphibia 1 333
Gymnopleura 4 33
Gymnopleuran crab 4 33
Gymnospermae 6 300 10 346
  Bennettitales 2 163, 6 300
  classification 6 300
  Coniferales 3 401, 6 300
  Coniferophytae 3 401, 10 346
  Cordaitales 6 300 3 476
Gymnospermae—*cont*
  Cycadales 3 638 6 300
  Cycadofilicales 3 639 6 300
  Cycadophytae 3 639, 10 346
  fossil plants 9 503
  Ginkgoales 6 187-188, 300
  Gnetales 6 226 6 300
  reproduction 6 300
Gymnospermous wood 14 524
Gymnosporangium juniperi-virginianae 5 546
Gymnostomatida 6 300*, 467, 11 53
  ich 6 300
  trichite 6 300
Gymnotidae 3 648, 4 428
Gymnotus carapo 4 428
Gynandromorph 12 230
Gynoecium 5 326 334
Gynogenesis 5 231, 6 301
Gynomerogony 8 244
Gynura 5 39
Gypsite 6 301
Gypsophila paniculata L. 11 546
Gypsum 6 301
  alabaster 6 301
  anhydrite with 1 407
  calcined 6 301
  calcium mineral 2 398
  evaporite (saline) 5 127
  gypsite 6 301
  occurrence 6 301
  plaster of paris 6 301, 10 397
  in redbeds 11 387-389
  rock gypsum 6 301
  satin spar 6 301
  selenite 6 301
Gypsum—*cont*
  sulfate of calcium 2 399 13 254
  terra alba 6 301
  uses 6 301
Gypsum plank 6 301
Gypsy moth *see Lymantria dispar*
Gyrator 6 301-305
  circulator 6 303
  duplexer 6 303
  Hall effect 6 304
  microwave optics 8 418
  Rayleigh's one-way optical system 6 305
  theorem of reciprocity 6 301, 11 373 375
Gyrators screen 12 81
Gyratrix hermaphroditus 11 542
Gyrinidae 3 276
Gyrinocheilidae 3 648
Gyrinophilus porphyriticus 12 7
Gyrinus 3 286
Gyro *see* Gyroscope
Gyro velocity meter 6 311
Gyrocompass 4 21, 6 305 306*, 310
  basic operation 6 305
  dead reckoning 4 21
  limitations in polar regions 10 443
  Schuler tuning 6 306, 12 69 70
Gyrocotylidea 2 650, 6 306*, 10 414
Gyrodactyloidea 8 573
Gyrodactylus 14 78
Gyrodactylus fundulı 8 57
Gyrodus 7 327
Gyrogonite 3 11
Gyromagnetic effect 6 30
Gyromagnetic ratio 6 30
  8 43
Gyropendulum 12 70
Gyropidae 8 78
Gyroscope 6 307 312
  accuracy 6 311
  angular momentum 6 30
  apparent precession 6 31
  automatic horizon 1 67
  computing optical sight 5 281
  directional *gyro* 6 30
  floated 6 309
  free 6 309
  gyro stabilized platform 6 311, 12 70
  gyro velocity meter 6 31
  gyrocompass 6 305 *See*
  gyroscopic instruments 6 309
  integrating gyros 6 310
  nutation 6 309
  precession 6 308 10 57
  random drift rates 6 31
  rate gyros 6 310
  rate of precession 6 30
  rigidity 6 308
  in servomechanisms 12 5
  single axis gyroscopes 6 3
  turn and bank indicator 14 163 164
  vertical gyro 6 309
Gyrus 9 57
Gzovski, M V 15 417

armonic (periodic phenomena)—*cont*
mode of vibration 8 525
nonsinusoidal waveforms 14 436 437
synchronous generators 1 283
Harmonic analysis 6 339 340, 12 340 341
Harmonic analyzer 6 339 340
Harmonic constituents (tides) 15 633 635, 639
earth tides 4 548
Harmonic motion 6 341 343
atomic vibrations 6 342 343
differentiation 4 151
harmonic oscillator 6 343
Lissajous figures 7 541 543
pendulum 9 616-618
rotational harmonic motion 6 342
sine wave 12 340 341
wave motion 14 425 429
weight on elastic spring 6 341-342
armonic oscillator, electric 9 419 425
Barkhausen criterion 9 420
basic principles 9 419 420
bridge 9 423
butterfly 9 422
Colpitts 9 422
crystal 9 423
dynatron 9 425
electron-coupled 9 422
feedback factor 9 420
frequency 9 420
Hartley 9 422
heterodyne 9 425
Meacham crystal bridge 9 425
microwave 8 424 426
negative resistance 9 425
phase shift 9 420 421
Pierce crystal 9 424
piezoelectric crystal 9 423
resonant circuit 9 421 422
tank circuit 15 390
tuned plate tuned grid 9 421 422
vhf 9 422
Wien bridge 9 423
Harmonic oscillator mechanical 6 343
quantum field theory 11 151
quantum theory nonrelativistic 11 170
torsional 9 618
Harmonic partial 9 571
Harmonic progression 10 646
Harmonic series of sounds 6 339
Harmonics musical acoustics 6 339
Harmothoë 9 65
Harmotome 14 611
Harms, H 10 377
Harnack, A 8 178
Harned, H S 14 22
Harned R 3 643
Harness 13 535
Harp 8 665-667
Harpacticoida 2 319, 3 462 562, 6 343 344*
Harpacticus 3 463
Harpacticus chelifer 6 344
Harpidae 9 34
Harries, C. 9 479
Harrington, C R 13 626
Harris, A F 10 603
Harris, C 10 603
Harris, C. M 4 324, 9 129 11 538
Harris, D 3 643
Harris, F S 4 133
Harris R A 13 635
Harris S A 14 342
Harris process metallurgy 7 433
Harris's sparrow 12 562
Harrison G R. 10 161
Harrison, R G 4 567, 578
Harrowing 1 127 128
Hartigia trimaculata 6 580
Hartley R V L 3 319, 7 99
Hartley bands ozone 8 252
Hartley gravimeter 13 515
Hartley oscillator 9 422
Hartley spherical model micelle 8 347
Hartman, F A 6 482
Hartman, P 5 209
Hartmann M 8 599
Hartmann formula chromatic aberration 3 89
Hartmann's lines 8 272
Hartree D R 3 359, 4 97
Hartree-Fock equations 2 92 93
Harvest fly 6 471
Harvesting 1 129 130
ensilage crops 1 129
fiber crops 1 130
grain crops 1 129
grasses 1 130
hay 1 130
legumes 1 130
root crops 1 130
silage 1 130
soilage 1 130
Harvesting ant 6 581
Harvestmen 1 496
Harvey, B G 8 222, 14 67
Harvey, E N 6 371, 10 211
Harvey H W 12 110
Harvey W 3 137
Harz Mountains 5 118, 8 617
Hasche process 5 553
Hase, B F 9 24
Hassall's body 15 618
Hassall's corpuscles 7 632
Hasing, O 10 613
Hassing engraver 10 613
Hastelloy 1 259, 7 265 266, 9 96
Hastigerinella naterai 5 434
Hastingsite 1 337
Hatch nautical 12 258 259
Hatchettite 6 344
Hatching gland 6 203 205
Hateg Mountains 5 118
Haughtonite 2 246
Hauling equipment 3 417
Hausdorff separation axiom 13 682
Hausdorff space 13 682
Hausmannite 6 344
manganese occurrence 8 88
Haustoriidae 6 37
Haustra 4 162
Hauterivian substage 3 543
Hauty, G 12 541
Haüy, R J 2 171, 3 592
Hauynite 5 214
Havelock's law 7 337
Haverhill fever (man) 2 70
Haversian canal 12 365
Haversian system 2 284, 12 365
de Havilland, G 4 274
Hawaiian Islands 9 481-482
volcanic eruptions 14 354
Hawaiian Ridge 9 261
Hawk 6 345
Hawk moth 7 464
Hawkes H E. 11 599
Hawksbill turtle 3 22
Haworth, W N 2 456
Hawser towing 7 115
Hawthorn 4 62
Hay baler 1 115
Hay fever 1 257 6 345*, 588
Hay itch mite 14 115
Hayashi, T 6 184
Havford J H 6 120
Havford ellipsoid 6 120
Haynes alloy 7 266
Hazard, C. 13 303
Haze dust storm 4 296
sky color 8 321
Hazel 5 178
Hazel sandstone 11 388
Hazelhoff E 1 123
Hazelnut *see* Filbert
HC smoke 12 82
HCA herbicide 6 421
HCl-Giemsa stain 13 33
Hcp *see* Hexagonal close packed structure
Head H 1 490, 4 584 9 564
Head 1 396 6 345*
Head (pressure) 6 526
Head, Insecta 7 134
Head botfly 8 680
Head losses pipe flow 10 240
Head louse *see* Louse
Head shaft 12 240
Headache 6 345 346
Header type boiler 8 103, 14 412
Headland 12 303
Headwater streams 11 581
Health physics 4 37 38, 6 346*
Heard, H C. 11 598
Hearing 1 665 6 346 356*
binaural hearing 6 350, 13 128, 361
binaural sound systems 2 191
Fletcher Munson contours 5 299 300
impairment of 4 21 22
limits of 6 349
loss *see* Deafness
loudness 7 586
perceptual activities 6 346 347
pitch 10 244
psychoacoustics 11 72
response of auditory system 6 351-356
sensory learning 12 182
sound detection 6 349 350
sound discrimination 6 350
sound properties 6 348 349
Hearing aid 6 356 357
binaural 6 356 357
electrical 6 356 357
eyeglass 6 356 357
monaural 6 356 357
Heart 3 137 138 6 357*
adrenergic heart beat 3 139
atrioventricular node 3 138
atrium 3 137
AV node 3 138
cholinergic heart beat 3 139
comparative anatomy 2 497
contraction cycle 3 138
diastole 3 138
electrocardiogram 3 138
electrophysiology (heart) 2 506, 4 528 529
embolism 4 565
endocarditis 4 588
P wave 3 138
pacemaker *see* Heart (ganglionic pacemaker
partition of embryonic heart 2 485 491
pericardial cavity 3 137-138
phonocardiography 10 1
physiology 2 505-508

Halobates 6 400, 406, 14 404
Halobates micans 6 406
Halocarbonyl group: acid halide 1 44
Halocline 6 323
Artic Ocean 1 526-527
Bering Sea 2 167
estuarine circulation 5 81
North Sea 9 165
Halocyptena microsoma 10 637
Haloform reaction 6 325-324*; 7 339
Halogen elements 6 324
astatine 1 595
bromine 2 343-346
chlorine 3 67-76
fluorine 5 351-355
halide 6 319
iodine 7 236-240
Halogen minerals 3 68, 6 324-325*
organic quantitative analysis 9 398
Halogenated alkenes 1 63
Halogenated hydrocarbon 6 325 330
alkyl halides 6 325-326
bromine 2 346
carbon 2 464
carbon tetrachloride 2 467
chlorine 3 73-76
chloroform 3 77
fire extinguishers 5 279-280
fluorides by diazotization 4 106
fluorine 5 353-355
Freon 5 501
halogenated aromatic hydrocarbons 6 327-328
iodine 7 240
iodoform 7 240
polyfluoroolefin resins 10 470-471
unsaturated halides 6 325-327
Halogenation 6 325-330
alkane 1 250
haloform reaction 6 323-324
bromine 2 346
iodine 7 240
Halogenoid 3 634
Halogeton 13 240
Halo-obligatory bacteria 2 340
Halophilic algae 2 340
Halophyte 8 90
Halophilus acutifrons 4 40
Halosauridae 4 41
Halosere 8 90
Halosulfonic acid 13 263
Halorydna 10 465
Halo-tolerant bacteria 2 340
Halovelia 6 406
Haltere 4 211, 214, 5 361-362, 7 127; 12 180
Halteria 9 317
Halticus bracteatus 6 405
Halysites 12 329, 13 381
Hamel 1 532
Hamilton, E L 8 137
Hamilton, W R 2 410, 3 592, 11 184, 578
Hamilton's equations of motion 2 457-459, 6 330-331*
Hamilton Jacobi theory 2 438-439, 6 331-332*
Hamilton's partial differential operator 11 187
Hamilton's principle 2 437, 6 331*
Hamiltonian 6 330
Boltzmann transport equation 2 281
canonical transformations 2 437-439
harmonic oscillator 6 343
least action, principle of 7 444
parity 9 565
quantum chemistry 11 145
quantum theory, nonrelativistic 11 163, 172-177
Haminoea 13 406
Hamitermes silvestri 12 237
Hammada 4 76
Hammar, J A 13 618
Hammer crusher 3 558
Hammer forging 5 470
Hammermill 1 154
Hammett, L P 1 42
Hamming, R W 7 100
Hammond organ 8 667
Hampshire swine 13 339
Hams (amateur radio operators) 1 298
Hamster 6 332-333
Hand, C 4 589
Hand 6 333* 8 188
Hand composition (printing) 3 544
Hand forming ceramic technology 2 648
Hand grenades 1 539 540
Handedness of space parity 9 567
Handin, J 11 598
Handsaw woodworking 15 542
Handset: telephone 13 429
Hand-set type 3 544 546
Handsome fungus beetle 5 278
Hangar 1 162
airship 1 219
Hanging-drop preparations 8 597
Hanging valley 6 198
in fiords 5 277
Hanging wall fault structures 5 192
Hankel formula 7 165
Hankel functions 2 179
Hannay, J. B. 6 100
Hansa yellow 10 224
Hansen, A. 4 159
Hansen, A J 8 76
Hansen, H J 6 225
Hansen, V. 9 266
Hansen's bacillus *see Mycobacterium leprae*
Hansenia spora 5 579, 12 2
Hansenula 12 2, 14 600, 601
Hansom, W T Jr 10 164
Hanson, J 8 642
Hanikenia 5 435
Hanikenia primitiva 5 454
Hanikeninidae 5 435
Hantzsch synthesis 11 112
Hapale 8 572
Haplodoci *see* Batrachoidiformes
Haploemsoleyi 4 565
Haplogastra 3 276
Haplolambda 9 537
Haplomacrobiotus 5 125
Haplomi *see* Clupeiformes
Haplophragmoides elegans 5 432
Haplosclerida 2 647, 4 56, 6 333-334*, 10 513
Haplosporida 1 47, 6 334*, 11 53, 13 12
Haplostele 13 105
Haplostiche constricta 5 430
Haplothrips 13 629
Hapten 1 472
Haptoglobin 2 265
Haptoglobulin 6 107
Haptonasty 10 366
Haptophrya 11 57
Haptotropism 10 366
Harary, F 6 255
Harbor 6 334-337
artificial 6 335
breakwater 2 325
of Europe 5 114-115
jetty 7 311
landlocked 6 334-336
natural 6 334 336
navigation 9 21
port construction 6 336
port efficiency 6 337
protected 6 334-336
types of 6 334 336
Harbor seal 12 122
Hard paste porcelain *see* Porcelain
Hard pine 10 236
Hard porcelain *see* Porcelain
Hard red spring wheat 14 480
Hard red winter wheat 14 48
Hard shelled clam 5 352
Hard tick 7 299, 13 628
Hard water 14 402
river water 11 382
water softening 14 472
Hard x rays 11 302
Hardboard 14 530
Hardenability steel 13 92, 312 314
Hardening induction heating 7 73
nonferrous metals and alloys 6 379
steel 6 381
Harder, D S 1 676
Harderian gland 7 376
Hardin, J W 13 417
Harding, C. 1 596
Hardness scales 6 337 338
Brinell 6 337
file test 6 337
Herbert pendulum 6 338
metals 6 337 338, 8 274 275
microhardness 6 338
mineralogy 8 465
Monotron 6 338
paving 6 338
Rockwell 6 337
scratch 6 337
Shore Scleroscope 6 338
Vickers 6 337
wood 6 338
Hardness testing abrasives 1 10
metals 8 274 275
Hardtop automobile 1 681
Hardwood 14 524 525, 595
Hardwood forest 2 205
Hardy, A S 11 187
Hardy, G H 6 338, 9 225
Hardy, Thomas 1 552
Hardy Creek limestone 3 56
Hardy Weinberg formula 6 338 339*, 505
Hare 7 382
Harelip 6 339*; 9 168, 10 1
Harenactis 1 52 54
Hargita 5 118
Hargitay, B 9 438, 14 250
Hargreaves, J 12 618
Harker, D 5 507
Harkins' rule (nuclear abundances) 4 547
Harkness, Rebecca 1 552
Harlequin bug 6 405
Harlequin duck 4 291
Harmer, S 5 8
Harmolita grandis 6 581
Harmolita tritici 6 581
Harmonic (periodic phenomena) 6 339
contrasted to partial 9 571
distortion 4 256
measurement 6 340

Harmonic (periodic phenomena)—*cont*
mode of vibration 8 525
nonsinusoidal waveforms 14 456 457
synchronous generators 1 283
Harmonic analysis 6 339 340, 12 340 341
Harmonic analyzer 6 339 340
Harmonic constituents (tides) 13 633 635 639
earth tides 4 348
Harmonic motion 6 341-343
atomic vibrations 6 342 343
differentiation 4 131
harmonic oscillator 6 343
Lissajous figures 7 541-543
pendulum 9 616-618
rotational harmonic motion 6 342
sine wave 12 340 341
wave motion 14 425 429
weight on elastic spring 6 341 342
Harmonic oscillator, sonic 9 419 425
Barkhausen criterion 9 420
basic principles 9 419 420
bridge 9 423
butterfly 9 422
Colpitts 9 422
crystal 9 423
dynatron 9 425
electron-coupled 9 422
feedback factor 9 420
frequency 9 420
Hartley 9 422
heterodyne 9 425
Meacham crystal bridge 9 425
microwave 8 424-426
negative resistance 9 425
phase shift 9 420 421
Pierce crystal 9 424
piezoelectric crystal 9 423
resonant-circuit 9 421 422
tank circuit 13 590
tuned plate, tuned grid 9 421 422
vhf 9 422
Wien bridge 9 423
Harmonic oscillator mechanical 6 343
quantum field theory 11 151
quantum theory, nonrelativistic 11 170
torsional 9 618
Harmonic partial 9 571
Harmonic progression 10 646
Harmonic series of sounds 6 339
Harmonics musical acoustics 6 339
Harmothoë 9 65
Harmotome 14 611
Harms, H 10 377
Harnack, A 8 178
Harned, H S 14 22
Harned, R. 5 645
Harness 13 535
Harp 8 665 667
Harpacticoida 2 319, 3 462 562, 6 343 344*
Harpacticus 3 463
Harpacticus chelifer 6 344
Harpidae 9 34
Harvey, C. 9 479
Harrington, C. R 13 626
Harris, A F 10 605
Harris, C. 10 605
Harris, C. M 4 324 9 129, 11 538
Harris, D 3 645
Harris, F S 4 133
Harris, R A 13 635
Harris, S A 14 342
Harris process metallurgy 7 455
Harris's sparrow 12 562
Harrison, G R 10 161
Harrison, R G 4 567 578
Harrowing 1 127 128
Hartigia trimaculata 6 580
Hartley R V L 3 519 7 99
Hartley bands ozone 8 252
Hartley gravimeter 13 515
Hartley oscillator 9 422
Hartley spherical model micelle 6 347
Hartman F A 6 482
Hartman, P 5 209
Hartmann M 8 599
Hartmann formula chromatic aberration 3 80
Hartmann's lines 8 272
Hartree D R 3 559 4 97
Hartree Fock equations 2 92 93
Harvest fly 6 471
Harvesting 1 129-130
ensilage crops 1 129
fiber crops 1 130
grain crops 1 129
grasses 1 130
hay 1 130
legumes 1 130
root crops 1 130
silage 1 130
soilage 1 130
Harvesting ant 6 581
Harvestmen 1 496
Harvey, B G 8 222, 14 67
Harvey E. N 8 371, 10 211
Harvey, H W 12 110
Harvey, W 3 137
Harz Mountains 5 118, 8 617
Hasche process 5 553
Hase, B F 9 24
Hassall's body 13 618
Hassall's corpuscles 7 632
Hassing, O 10 613
Hassing engraver 10 613
Hastelloy 1 259, 7 265 266, 9 96
Hastigerinella waterst 5 434
Hastingsite 1 337
Hatch nautical 12 238 239
Hatchettite 6 344
Hatching gland 8 205 209
Hateg Mountains 5 118
Haughtonite 2 246
Hauling equipment 3 417
Hausdorff separation axiom 13 682
Hausdorff space 13 682
Hausmannite 6 344
manganese occurrence 8 88
Haustoriidae 6 37
Haustra 4 162
Hauterivian substage 3 543
Hauty C 12 541
Haüy, R J 2 171, 3 592
Hauynite 5 214
Havelock's law 7 337
Haverhill fever (man) 2 70
Haversian canal 12 365
Haversian system 2 284, 12 365
de Havilland G 4 274
Hawaiian Islands 9 481 482
volcanic eruptions 14 354
Hawaiian Ridge 9 261
Hawk 6 345
Hawk moth 7 464
Hawkes H E 11 599
Hawksbill turtle 3 22
Haworth W N 2 456
Hawser towing 7 115
Hawthorn 4 62
Hay baler 1 115
Hay fever 1 257, 6 345*, 588
Hay itch mite 14 115
Hayashi T 6 184
Hayford, J H 6 120
Hayford *ellipsoid* 6 120
Haynes alloy 7 266
Hazard C 13 305
Haze *dust storm* 4 296
sky color 8 321
Hazel 5 178
Hazel *sandstone* 11 588
Hazelhoff E 1 125
Hazelnut *see* Filbert
HC *smoke* 12 82
HCA herbicide 6 421
HCl-Giemsa *stain* 13 35
Hcp see Hexagonal close-packed structure
Head H 1 490, 4 584, 9 564
Head 1 396 6 345*
Head (pressure) 6 526
Head Insecta 7 154
Head botfly 8 680
Head losses pipe flow 10 240
Head louse *see* Louse
Head shaft 12 240
Headache 6 345 346
Header type boiler 8 103 14 412
Headland 12 303
Headwater streams 11 581
Health physics 4 37 38, 6 346*
Heard, H C. 11 598
Hearing 1 665, 6 346 356*
binaural hearing 6 350, 13 128, 361
binaural sound systems 2 191
Fletcher Munson contours 5 299 300
impairment of 4 21 22
limits of 6 349
loss *see* Deafness
loudness 7 586
perceptual activities 6 346 347
pitch 10 244
psychoacoustics 11 72
response of auditory system 6 351 356
sensory learning 12 182
sound detection 6 349 350
sound discrimination 6 350
sound properties 6 348 349
Hearing aid 6 356 357
binaural 6 356 357
electrical 6 356 357
eyeglass 6 356 357
monaural 6 356 357
Heart 3 137-139 6 357*
adrenergic heart beat 3 139
atrioventricular node 3 138
atrium 3 137
AV node 3 138
cholinergic heart beat 3 139
comparative anatomy 2 497
contraction cycle 3 138
diastole 3 138
electrocardiogram 3 138
electrophysiology (heart) 2 506 4 528 529
embolism 4 565
endocarditis 4 588
P wave 3 138
pacemaker *see* Heart (ganglionic pacemaker)
partition of embryonic heart 2 485 491
pericardial cavity 3 137-138
phonocardiography 10 121
physiology 2 505-508

Halobates 6 400, 406, 14 404
Halobates micans 6 406
Halocarbonyl group· acid halide 1 44
Halocline 6 323
Artic Ocean 1 526-527
Bering Sea 2 167
estuarine circulation 5 81
North Sea 9 165
Halocyptena microstoma 10 637
Haloform reaction 6 323-324*; 7 339
Halogen elements 6 324
astatine 1 595
bromine 2 343-346
chlorine 3 67-76
fluorine 5 351-355
halide 6 319
iodine 7 256-260
Halogen minerals 3 68, 6 324-325*
organic quantitative analysis 9 398
Halogenated alkenes 1 63
Halogenated hydrocarbon 6 325 330
alkyl halides 6 325-326
bromine 2 346
carbon 2 464
carbon tetrachloride 2 467
chlorine 3 75-76
chloroform 3 77
fire extinguishers 5 279-280
fluorides by diazotization 4 106
fluorine 5 353-355
Freon 5 501
halogenated aromatic hydrocarbons 6 327-328
iodine 7 260
iodoform 7 260
polyfluoroolefin resins 10 470-471
unsaturated halides 6 325-327
Halogenation 6 325-330
alkane 1 250
haloform reaction 6 323-324
bromine 2 346
iodine 7 260
Halogenoid 3 634
Halogeton 13 240
Halo-obligatory bacteria 2 340
Halophilic algae 2 340
Halophyte 8 90
Halopitlus acutifrons 4 40
Haloxanidae 4 41
Haloxene 8 90
Haloxulfonic acid 13 263
Haloxylon 10 465
Halo tolerant bacteria 2 340
Halovelia 5 406
Haltere 4 211, 214, 5 361-362, 7 127; 12 180
Halteria 9 317
Halticus bracteatus 6 405
Halyxites 12 329, 13 581
Hamel 1 552
Hamilton, E. L. 8 157
Hamilton, W. R. 2 410, 3 592, 11 184, 578
Hamilton's equations of motion 2 437-439, 6 330-331*
Hamilton-Jacobi theory 2 438-439, 6 331-332*
Hamilton's partial differential operator 11 187
Hamilton's principle 2 437, 6 331*
Hamiltonian 6 330
Boltzmann transport equation 2 281
canonical transformations 2 437-439
harmonic oscillator 6 343
least action, principle of 7 444
parity 9 565
quantum chemistry 11 145
quantum theory, non relativistic 11 165, 172-177
Haminoea 13 406
Hamitermes silvestri 12 237
Hammada 4 76
Hammar, J. A. 13 618
Hammer crusher 3 558
Hammer forging 6 470
Hammermill 1 134
Hammett, L. P. 1 42
Hamming, R. W. 7 100
Hammond organ 8 667
Hampshire swine 13 339
Hams (amateur radio operators) 1 298
Hamster 6 352-353
Hand, C. 4 589
Hand 6 333* 8 188
Hand composition (printing) 3 344
Hand forming, ceramic technology 2 648
Hand grenades 1 539-540
Handedness of space parity 9 567
Handin, J. 11 598
Handsaw, woodworking 13 542
Handset, telephone 13 429
Hand-set type 5 344-346
Handsome fungus beetle 3 278
Hangar 1 162
airship 1 219
Hanging-drop preparations 8 597
Hanging valley 6 198
in fiords 5 277
Hanging wall· fault structures 5 192
Hankel formula 7 165
Hankel functions 2 179
Hannay, J. B. 6 100
Hansa yellow 10 224
Hansen, A. 4 159
Hansen, A. J. 8 76
Hansen, H. J. 6 225
Hansen, V. 9 266
Hansen's bacillus *see Mycobacterium leprae*
Hansenia spora 8 579, 12 2
Hansenula 12 2, 14 600, 601
Hansom, W. T. Jr 10 164
Hanson, J. 8 642
Hantkenina 5 455
Hantkenina primitiva 5 454
Hantkeninidae 5 455
Hantzsch synthesis 11 112
Hapale 8 572
Haplodoci *see* Batrachoidiformes
Haploemsoliens 4 565
Haplogastra 3 276
Haplolambda 9 537
Haplomacrobiotus 5 125
Haplomi *see* Clupeiformes
Haplophragmoides elegans 5 432
Haplosclerina 2 647, 4 56, 6 333-334*, 10 513
Haplosporidia 1 47, 6 334*, 11 53, 13 12
Haplostele 13 105
Haplostiche constricta 5 430
Haplothrips 13 629
Hapten 1 472
Haptoglobin 2 265
Haptoglobulin 6 107
Haptonasty 10 366
Haptophrya 11 57
Haptotropism 10 366
Harary, F. 6 255
Harbor 6 334-337
artificial 6 335
breakwater 2 325
of Europe 5 114 115
jetty 7 311
landlocked 6 334-336
natural 6 334 336
navigation 9 21
port construction 6 336
port efficiency 6 337
protected 6 334 336
types of 6 334 336
Harbor seal 12 122
Hard paste porcelain *see* Porcelain
Hard pine 10 236
Hard porcelain *see* Porcelain
Hard red spring wheat 14 480
Hard red winter wheat 14 480
Hard shelled clam 3 332
Hard tick 7 299; 13 628
Hard water 14 402
river water 11 552
water softening 14 402
Hard x rays 11 302
Hardboard 14 550
Hardenability, steel 13 92, 312 314
Hardening, induction heating 7 73
nonferrous metals and alloys 6 379
steel 6 381
Harder, D. S. 1 676
Hardenian gland 7 376
Hardin, J. W. 13 417
Harding, C. J. 596
Hardness scales 6 337 339
Brinell 6 337
file test 6 337
Herbert pendulum 6 338
metals 6 337 339
8 274 275
microhardness 6 338
mineralogy 8 465
Monotron 6 338
paving 8 358
Rockwell 6 337
scratch 6 337
Shore Scleroscope 6 338
Vickers 6 337
wood 6 338
Hardness testing abrasive 1 10
metals 8 274 275
Hardtop automobile 1 681
Hardwood 14 524 525, 595
Hardwood forest 2 205
Hardy, A. S. 11 187
Hardy, G. H. 6 338 9 225
Hardy, Thomas 1 552
Hardy Greek limestone 3 46
Hardy-Weinberg formula 6 338-339*, 503
Hare 7 382
Harelip 6 339*, 9 168, 10 120
Harenactis 1 52 54
Hargitta 5 118
Hargittay, B. 9 438, 14 240
Hargreaves, J. 12 618
Harker, D. 5 597
Harkins' rule (nuclear abundances) 4 547
Harkness, Rebecca 1 552
Harlequin bug 6 405
Harlequin duck 4 291
Harmer, S. S. 8
Harmolita grandis 6 581
Harmolita tritici 6 581
Harmonic (periodic phenomena) 6 339
contrasted to partial 9 571
distortion 4 256
measurement 6 340

ravy water 6 382 383
deuterium 4 85
isotope separation 7 295
preparation 6 382 383
properties 6 382
uses 6 382
lebb, D O 8 607
lebephrenia 12 66
lebridae 6 401
lechtia 3 190
lecla strait 9 166
lectocotylus 2 645
lectorite 3 164
ledberg H 9 515
leddle frame 13 535
ledera 9 504
ledenbergite 11 129
Hedera 7 437
Hedge Hog (rocket) 1 484
Hedge maple 8 99
Hedgehog 7 142
Hedgerow prominences *see* Solar prominences
Hedonic gland 12 61
Hedriocystis 12 27
Heel (nautical) 12 271
Heezen, B C 12 414
Heidelberg man 5 477 6 385*
Heightfinder rangefinder 11 340
Heil gun 14 69
Heilbrunn L V 11 49
Heisenberg Werner 1 660 3 353 5 230 7 503 8 176, 194 9 365 11 145, 148, 154 14 189 424
Heisenberg exchange energy 5 230 231
Heisenberg theory of *ferromagnetism* 5 230 251
Heising R A 11 98
Heiskanen W A 13 419 516 520
Heitler W 11 147
Heitler London theory 11 147
Hekla 5 120
Hektor (asteroid) 14 114
Helcionellacea 6 75
Helderbergian stage 4 87
Heleidae 4 212
Heleonomus 8 78
Helianthoa 10 245
Helianthus 14 283
Helianthus annuus 13 118 123 291
Helianthus tuberosus 1 566
Helias lens system 7 453
Heliasteridae 4 372
Helical antenna *see* Antenna (aerial)
Helical gear 6 83
Helical spring 13 16
Helicinidae 1 592 11 19
Helicity neutrino 9 85
Helicobasidium purpureum 8 677
Helicoid cyme 7 98
Helicolepidinidae 5 435
Heliconius 7 471
Helicopter 6 383 389
antisubmarine warfare 1 486
autogiro flight 6 386
blade stall 6 386
collective pitch 6 387
cyclic pitch 6 387
engines 6 385 386
flight characteristics 6 386
flight controls 6 387
lift 6 384
military uses 6 389
power plants 6 385 386
propulsion 6 384
public carriers 6 389
rotary wing 6 383 389
rotor 6 384
tip powered 6 386
vertical take-off and landing (VTOL) 14 508
Helicosporae 5 563
Helicosporida 11 52
Helicosporidia 3 226, 6 389 390
Helicosporidium parasiticum 6 389
Heligmosomidae 13 193
Helindone yellow CA 4 304
Heliochronometer 13 291
Heliodinidae 7 464
Heliomastigida 3 57 11 52 12 27
Heliogeonomy *see* Astronomical geophysics
Heliogeophysics *see* Astronomical geophysics
Heliopora 3 255
Heliopora caerulea 5 264
Heliornithidae 6 286
Heliothis armigera 7 470 472
Heliothrips haemorrhoidalis 13 628
Heliotrope 7 302
Heliozoa 1 422, 12 27
Heliozoida 1 57, 6 390 11 52 12 27
Heliports 1 162
Helisoma 11 93
Helium 6 390 392* 9 197
analytical determination 6 392
discovery 6 391
entropy temperature plot 7 596
inversion temperature 7 558
ionization potential 4 504
line spectrum 7 521
liquefaction plants 3 571
liquid and solid 6 392 393
Helium—cont
in meteorites 11 271
natural gas by product 9 6
occurrence and origin 6 390 391
production and distribution 6 391 392
properties 6 391
spectrum and term diagram 1 660
use in airships 1 217
uses 6 390 392
velocity of sound in 12 515
in welding 14 467
Helium 1 6 392
Helium II 6 392 393
Helium 3 3 572 6 393
Helium 4 3 572
Helium, liquid 6 392 393*, 7 541, 13 301 302
Bose Einstein statistics 2 305
low temperature physics 7 596 597
second-order transition 12 127
superfluidity 13 301 302
Helix 3 64, 5 205, 6 393* 11 93
Helix (spiral) 13 1
Helix aspersa 6 438
Helix desertorum 6 439
Helix pomatia 6 438 12 348
Hell R 10 613
Hell-diver 6 268
Hell Volhard Zelinski reaction 1 43 45
Helland Hansen B 9 245
Hellbender 3 578 6 393 394*
Heller, C 11 477
Helligrammite 6 394
Helmand Lake 1 580
Helmand River 1 580
Helmholtz, H L F Von 2 232 8 661 11 575
Helmholtz coils 6 394
magnetometers 8 64
solenoids 12 472
Helmholtz double layer 8 547
Helmholtz free energy 5 494 14 555
Helmholtz resonator 11 505
Helminth 9 593
Helminthosporium 7 328, 8 440 12 508
see also Plant disease
Helminthosporium disease 10 301
Helminthosporium gramineum 2 99
Helminthosporium leaf spot disease 11 564
Helminthosporium sativum 2 99 4 53, 14 493
Helminthosporium stenospilum 8 440
Helminthosporium teres 2 99
Helminthosporium turcicum 3 485
Helminthostachys 9 342
Heloblales 6 394, 10 340
Heloderma horridum 6 185 7 474, 13 24
Heloderma suspectum 6 185, 7 474, 13 24
Helodermatidae 13 24
Helodidae 3 278
Helohyus plicodon 1 569
Helomyzidae 4 212
Helopus 4 200
Heloridae 6 574
Helotidae 3 278
Helotrephidae 6 401
Helveticosaurus 12 41
Helvite 2 174, 12 476
Helvolic acid 1 476
Hemadsorption viruses 6 394
Hemagglutinin 1 112
Hemangioendothelioma 9 525
Hemangioma 2 249, 7 563
Hematite 6 394 395
gem 8 99
iron ore 7 258 259
iron ore varieties 6 395
in jasper 7 502
kidney ore 6 395
in laterite 7 407
occurrence 6 395
properties 6 395
redbed 11 397
in taconite 13 386
Hematochrome granule 8 169
Hematocrit 6 412 413
determination 5 195
Hematoidin 6 412 413
Hematologic disorders 6 395 396
Hematology 3 194 197
Hematoma 6 412 413
Hematopoiesis 2 264 6 396 398
bone marrow 12 365
radiation injury (biology) 11 226 227
spleen 13 8
Hematopoietic cell 12 332
Hematoporphyrin 10 520 521
Hematoside 6 225
Hematuria 7 542 544, 9 40
cytochrome 5 652
hemoglobin 6 410
respiratory pigments 11 510
Hemerythrin 11 510, 513, 12 346
Hemiacetal 13 402

Heart—*cont.*
QRS wave 3 138
regional differentiation of embryonic 2 487
SA node 3 138
sinoatrial node 3 138
systole 3 138
T wave 3 138
ventricle 3 137
Heart (ganglionic pacemaker) 3 139, 6 357-358*
Heart, congenital defects 2 508-516
cardiac valve anomalies 2 515
interventricular septal defects 2 511
pulmonary stenosis 2 513
septal defects, heart 2 510
situs inversus, heart 2 515
valvular stenosis 2 514
Heart disorders 5 441, 6 358-362*
beriberi 2 166
disease 4 192
Heart worm 5 258-260
Heartbeat, control 2 507
Heartbeat, origin 2 507
Heartleaf willow 14 493
Heartrot tree 14 75
Heartwater disease 6 362
Heat 6 362
British thermal unit 2 340
calorie 2 419
conduction *see* Conduction (heat)
convection *see* Convection (heat)
estrus 5 79
as form of energy 3 407*, 4 559
Joule's law 7 316
mechanical equivalent of 3 407
radiation *see* Heat radiation
thermal expansion 13 549 551
thermodynamics 13 564 566
transfer *see* Heat transfer
Heat, atomic 12 574
Heat, molecular *see* Molecular heat
Heat, specific *see* Specific heat
Heat balance 6 362 363
man 2 201
power plant 10 556
Heat balance, terrestrial atmospheric 6 363
Heat capacity 6 363-365
constant temperature 6 364
gases 6 363
and heat convection 3 441
liquids 6 364
solids 6 364, 12 574
thermodynamics 13 573
Heat conduction *see* Conduction (heat)
Heat content *see* Enthalpy
Heat exchanger 6 53, 365-367*, 375
double-pipe 6 375
enthalpy balances 5 4
evaporator 5 127
gas turbine 6 66
marine 8 121-122
steam heating 13 82
tube and-shell 6 375
Heat flow insulation, heat 7 160
see also Conduction (heat)
Heat generation (earth) 4 331-334
Heat insulation *see Insulation, heat*
Heat insulator 6 374
Heat lamp 7 104
Heat loss (skin) 12 180
Heat of combustion 8 290
Heat of condensation (neutrons) 5 287-288
Heat of formation 13 560
Heat of vaporization 3 377
Heat pump 6 367-369
as a cooling machine 6 368
ideal cycle 6 368
seasonal loads 6 368
as a warming machine 6 368
vapor cycle 14 272
Heat radiation 6 369 373
atomic theory 6 369-370
black body 2 251
black body radiation 6 371 373
cavity radiation 6 371
emissivity 4 582 585
energy distribution curves 6 370 371
gray body 6 266
heat transfer 6 374 375
incandescence 7 49 50
infrared radiation 7 104 106
Kirchhoff's law 6 371
light 7 503
from nuclear explosion 9 182
Planck's radiation law 6 372 375
from planets 10 270 271
Heat radiation—*cont*
Rayleigh Jeans law 6 372
Stefan-Boltzmann law 6 373
temperature determination of heat radiators 6 373
Wien's displacement law 6 373
Wien's radiation law 6 373
Heat resistant paints 9 493
Heat-set ink 7 115
Heat sink cooling tower 3 452
spacecraft structure 12 553
Heat storage devices chemical salt 12 470
water *12 470*
"Heat switch" 5 574, 13 298
Heat transfer 6 374-375
air-cooled engines 4 605
air cooling 1 146-147
conduction 3 383-391*, 6 374, 13 566
convection 3 439 444*, 6 374-375, *13* 566
cooling towers 5 452
design considerations 6 374 375
in the earth 4 333 334
fluid flow 5 339 340
gas dynamics 6 53
heat exchangers 6 365 367, 375
liquid cooled engines 4 605
panel heating and cooling 9 536
radiation 6 369 375
relation to temperature 13 486
resistance heating 11 488
spacecraft 12 547
in stars 13 107 108
surface condenser 13 512
thermodynamic processes 13 571
vapor condenser 3 377 382
Heat treatment (glass products) 6 207
Heat treatment (metals and alloys) 6 378 382
induction heating 7 72 74
surface hardening of steel 13 512
tempering 15 491
HEAT (High explosive antitank) projectile 1 540
Heath, T. J. 6 154
Heath 3 65
Heating, aerodynamic 3 442 443
Heating, arc *see* Arc heating
Heating, central *see* Central heating
Heating, comfort 6 375 377
cost of operation 6 377
design 6 376
degree day 4 44
forced air 14 503
fuel consumption 4 44
heat pump 6 367 369
heating load 6 375
hot water 6 495 496
infiltration loss 6 376
insulation and vapor barrier 6 376
radiant heating 11 213
solar heating 12 470 471
steam heating 13 82 83
thermostat 13 505
total heat loss 6 376
warm air 14 502 503
Heating, dielectric 4 115 116*, 6 377
Heating, electric 6 377 378
dielectric 4 115 116*, 6 377
economics 6 377
electric-arc 6 377
electrothermics 4 467
furnaces 4 427
general design features 6 378
induction 6 377, 7 72 74*
Joule's law 7 316
resistance 6 377, 11 487 490*
thermal problems 6 377
Heating, solar *see* Solar heating
Heating, steam *see* Steam heating
Heating thermoelectric 15 585
Heave fault structures 5 192
Heavier than air craft 1 695
airplane 1 208 214
glider 6 213
Heaving (frost) 5 540
Heaving (ships) 12 275
Heaviside O 2 410 9 540
Heavy cruiser 12 263
Heavy distillates (petroleum) 10 72
Heavy liquid separation (petrography) 10 52
Heavy minerals 8 444
garnet 6 40
liquid separation 10 52
in mineral prospecting 11 20 21
in sedimentary rocks 12 152
thorianite 15 609
Heavy spar *see* Barite

Heterakis spumosa 9 476
Heterangium 11 87
Heterauxesis 1 419
Heteraxine xanthophilis 8 573
Heteroauxin 7 62, 63
Heterobasidiomycetidae 2 107, 6 427*, 12 587
Uredinales 14 217
Ustilaginales 14 235 236
Heterocapsina 6 427
Heterocera 7 463
Heterocercidae 3 278
Heterochelidae 1 572
Heterochlamydous flower 5 329
Heterochlorida 6 427*, 11 52
Heterochromatin 3 108
Heterocoelous vertebra 12 354
Heterocotyle actobatis 8 575
Heterocotylea *see* Monogenea
Heterotrinoidae 4 369
Heterocyclic compounds 6 427-429* 9 394
acridine 1 50
azole 702 703
carbazole 2 449
diazine 4 104 105
ethylene oxide 5 94
furan 5 565 566
imidazole 7 31 33
indole 7 62 65
isoquinoline 7 298 299
morpholine 8 598
nomenclature 9 397 398
oxazole 9 461
pyran 11 107
pyrazole 11 109
pyridine 11 110
pyrimidine 11 113
pyrrole 11 130
quinoline 11 190 194
thiazole 13 599 601
thiophene 13 605 606
Heterocyemid 4 111
Heterocyst 12 67
Heterodera 14 169
Heterodera glycines 12 535
Heterodera marioni 9 600
Heterodonta 9 614
Heterodontoidea 12 157
Heterodontus 12 157
Heterodontus (Cestracion) 12 157
Heterodyne principle 6 429
amplitude modulation detector 1 561
jamming 4 522
noise analyzer 9 132
oscillator 2 126 9 425
superheterodyne radio receiver 11 257 258
Heterogamy 5 80 83
reproduction, plant 11 453
Heterogeneous catalysis 2 547 549
Heterogeneous equilibrium 5 52 53
Heterogeneratae 10 90
Heterogenite cobalt mineral 3 246
Heterohelicidae 5 455
Heterohyus 7 145
Heteroimmunization 2 266
Heterokaryosis 5 108
Heterolytic reaction 9 400
Heteromera *see* Tenebrionidae
Heteromi *see* Notacanthiformes
Heteromyota 4 377
Heteronchocotyle leucas 8 575
Heteronema 5 98
Heteronemertini 1 433 6 429*
Heteroneura 7 464, 466 472
Heteropatella entorhiza 4 254
Heteropatella vollellinensis 4 254
Heterophil agglutination tests 3 201
Heterophile antibody 7 95
Heterophile antigen 6 429
Heterophrys 12 27
Heterophyes heterophyes 6 429
Heterophyiasis 6 429 430
Heteropia 13 560
Heteropidae 13 560
Heteroplastic transplantation 4 572
Heteroploidy 5 115
Heteroptera *see* Hemiptera
Heterosis 6 108 430*
breeding (animal) 2 327
breeding (plant) 2 327 3 483
Heterosomata *see* Pleuronectiformes
Heterosomatidae 7 145
Heterospore 12 159
Heterosteles *see* Carpoidea
Heterostemony 5 329
Heterostraci 1 490 6 430 431*
[illegible]
[illegible] 3 80 83 11 453
Heterotrichida 6 431 432*, 11 53 13 5
Heterotrophic nutrition
bacteria 2 64 8 129 35 3
Euglena 5 99
origin of life 7 499
see also Nutrition
Heteroxenia 1 226
HETP distillation 4 251
Hettazan 5 258
Hettangian stage 7 325
Heulandite 6 432*, 14 611
Heuristics 10 635 636
Heusler alloy 8 56
Hevea 6 286 10 552
Hevea brasiliensis 6 174, 11 638-639, 646
Hevesy, G von 11 310, 14 8
Hexa p biphenylyl) ethane 6 435
Hexabromodisilane 12 321
Hexacapsula 8 689
1,2 3 4 10,10 Hexachloro 6 7 epoxy 1,4,4a,5 6 7 8,8a octahydro-1,4 *endo,endo* 5, 8 dimethanonaphthalene 7 141
1,2 3 4 10,10 Hexachloro 6 7-epoxy 1,4,4a,5 6 7 8 8a-octahydro 1,4 *endo,exo* 5,8 dimethanonaphthalene 7 141
1 2 3 4 10 10 Hexachloro 1,4, 4a,5 8 8a hexahydro-1 4 *endo exo* 5,8-dimethanonaphthalene 7 140
6 7 8a 10 10 Hexachloro 1,5,5a, 6 9 9a hexahydro 6 9 methano-2 4,3 benzodioxathiepin 3-oxide 7 141
Hexachloroacetone 6 421
Hexachlorodiaurate 6 231
Hexachlorodisilane 12 321
Hexachlorodisiloxane 12 321
Hexachloroethane 5 75
Hexachloroosmic acid 9 455
Hexachlorophene 1 493
Hexacontane 1 249
Hexacorallia *see* Zoantharia
Hexacosane 1 249
Hexactinella 6 434
Hexactinellida 1 338, 6 432 434* 10 515 519 13 10
Amphidiscophora 1 339
Hexasterophora 6 435
Hexactinosa 6 434, 10 515
Hexacyanoferrate 5 224
Hexadecane 1 249
Hexadella 4 58
Hexadentate chelating agent 3 18
1 3 Hexadien 5 yne 1 243, 6 533
Hexaethylcyclotrisiloxane 12 323
Hexafluorodisiloxane 12 321
Hexafluorophosphate anion 10 135
Hexafluoropropylene 10 471
Hexagenia 5 33
Hexagon 6 434 435*, 10 471, 11 524
Hexagonal close packed structure 2 338 339 3 598 599*
Hexagonal crystal system 3 604 605
Hexagonal lattice 3 594-595
Hexahalicene 9 548
Hexahedrite (meteorite) 8 515
Hexahedron 10 471
Hexahydropyrazine 4 105
Hexahydropyridine 11 110, 115

Hemibasidiomycetes *see* Heterobasidiomycetidae
Hemibranch 11 515
Hemibranchii 6 71
Hemicellulose 2 616-617, 619, 6 398-399*
  humus 6 517
Hemicentrotus 7 228
Hemichordata 1 414, 420, 6 399*
  Enteropneusta 5 3, 6 399
  Graptolithina 6 258, 399
  Pterobranchia 6 399, 11 87
  see also Acarina
Hemicidaridae 6 399
Hemicidaroida 4 360, 371, 6 399*
Hemiclepsis 11 556
Hemicyclaspis 9 446
Hemidiscella 6 399
Hemidiscosa 1 338, 6 399*, 10 515
Hemileia vastatrix 3 265
Hemimetabola 6 399*, 7 134
  Anisoptera 7 134
  Anoplura 1 433-434
  Dermaptera 4 67
  Embioptera 4 564 565
  Ephemeroptera 5 32-33
  Hemiptera 6 400 410
  Homoptera 6 469-476
  Isoptera 7 284 288
  Mallophaga 8 77 78
  Odonata 9 274 275
  Orthoptera 9 416-418
  Plecoptera 10 415-416
  Psocoptera 11 70 71
  Thysanoptera 13 628 629
  Zoraptera 7 134, 14 629 630
  Zygoptera 7 134
  see also Exopterygota
Hemimorphite 6 399 400
  see also Calamine
Hemimysis 7 476
Hemin 3 264, 6 412
  structure 3 18
Hemioniscus 5 35
Hemipene 3 472 473
Hemipeplidae 3 278
Hemiprocnidae 1 491
Hemiptera 6 400-410*, 7 134
  bedbug 2 127
  bug 2 362
  chinch bug 3 62
  Homoptera 6 469 476
  Insecta fossils 7 139
  kissing bug 7 364
  squash bug 13 29
  tarnished plant bug 13 398
Hemispera 13 602
Hemisphere 12 609
Hemispherical pyrheliometer 11 214
Hemisquilla 13 150
Hemisymmetric lens system 7 451
Hemiterpene *see* Terpene
Hemithyris 2 315
Hemithyris psittacea 13 485
Hemizonida 1 598, 4 360, 6 410*
Hemlock 6 410
Hemochorial placenta 10 254
Hemochromatosis 3 192-202, 7 563
Hemocoele 3 141
Hemocyanin 2 645, 3 565, 5 105, 11 510, 512
  Xiphosura 14 566
Hemocyte 3 275 288
Hemocytoblast 2 264, 6 397, 7 632
Hemoendothelial placenta 10 254
Hemoglobin 1 473, 2 263, 612, 6 210, 410-411*, 8 257, 10 208, 11 40, 510, 12 565
  bacterial metabolism 2 59
  gene action 6 106
  human genetics 6 508
  iron metabolism 7 267
  oximetry 9 469
  porphyrin 10 520-521
  probable structure 6 411
  properties 6 411
  thermotherapy 13 594
Hemolymph 3 137-141, 275-288
Hemolysin 2 270
  lysin 7 637
  staphylococcus 13 37
Hemolysis blood plate 2 270
  jaundice 7 302 303
  vitamin E deficiency 14 344
Hemolytic anemia 7 302 303
Hemophilia 2 266, 6 411* 499
  hematologic disorders 6 395 396
  human genetics 6 510
Hemophilic bacteria 6 412
  Moraxella lacunata 8 597
  pink eye 10 238
  whooping cough 14 489
Hemophiloid disease 3 195
Hemophilus ducreyi 14 296
Hemophilus influenzae 2 13, 5 67 8 224, 10 427, 15 179, 528
  see also Haemophilus influenzae
Hemophilus pertussis 5 67
Hemorrhage 3 143, 6 412 413*
  aneurysm 6 412
  anovla 6 412
  apoplexy 6 412
  arteriosclerosis 6 412
  infarct 6 412
  leukemia 6 412
  pernicious anemia 6 412
  septicemia 6 412
  thrombocytopenia 6 412
Hemorrhagic diathesis 3 195-196
  coagulation time 3 196
  clot retraction time 3 196
  fibrinogen level 3 195
  platelet count 3 196
  prothrombin time 3 196
Hemorrhagic disorders 6 396
Hemorrhagic septicemia 2 351, 6 413
Hemorrhoids 6 413-414
Hemosiderin 3 192 202, 6 412 413
Hemosiderosis 13 9
Hemotherapy 14 29
Hemozoin 6 313
Hemp 2 439, 5 250, 6 414*, 12 79, 14 235
Hen clam 3 152
Hench, P S 6 483
Hencke, K F 1 596
Hendecane (undecane) 1 249
Henderson, L J 10 210
Hendersonia 12 604
Heneicosane 1 249
Heneicosanoic acid 2 474
Henequen 12 79
Henna 8 685
Hennessey shale II 388
Henning, H 12 385
Henodus 12 41
Henri-Martin, Mlle G 5 370
Henry, Joseph 4 453
Henry 6 414
  absolute 4 458
Henry's law 12 488
Hentriacontane 1 249
Henvey L G 7 221
Heparin 2 266, 8 259 15 615
Hepatic circulation, physiology of 2 505
Hepatic duct 4 153
Hepatic portal vein 2 500 4 153
Hepatic steatosis 9 533
Hepatic tanager 15 388
Hepaticae 2 353 6 415 417* 10 346
Hepatitis 1 425, 3 192 202 6 417-418*, 15 4
Hepatocystis 6 315
Hepatolenticular degeneration 7 563, 9 71
Hepatoma 7 563
Hepatopancreas 5 206
Hepatotoxin 7 563
Hepatozoon muris 1 64 3 249
Heptahidrate 7 464
Heptalus 7 466
Heptasgastridae 8 78
Heptachlor 7 140
1 4,5,6,7,8,8 Heptachloro 3a, 4,7,7a tetrahydro 4,7 methanoindene 7 140
Heptacosane 1 249
Heptacosanoic acid 2 474
Heptadecane 1 249
2 heptadecyl 2 imidazol ne acetate 5 564
Heptagon 10 471
Heptamide 1 303
Heptane 1 249 9 5
  natural gas 9 5
n Heptane 10 65
Heptanoic acid 2 474
Heptatonic scale 12 47
Heptode 6 418
Heptose 8 578
n Heptylpenicillin 9 619
Herb 9 407 408
Herbal 10 378
Herbarium 4 62 6 418 419*
Herbert pendulum hardness scale 6 338
Herberta 6 415
Herbicide 6 420 424
  agricultural science (plant) 1 324
  defoliant 4 45
  fumigant 5 561
  plant hormones 10 342
  soil sterilization 12 65
Herbisan 5 6 423
Herbst corpuscle 12 180
Hercothrips fasciatus 13 626
Hercules (constellation) 3 412 413
Hercynian massifs 13 498
Hercynian orogeny 13 410
Herd immunity 7 95
Heredity allele 1 256
  behavior *see* Behavior and heredity
  chromosome 3 106 113
  chromosome theory of 3 114 115
  deoxyribonucleic acid in 4 66, 9 215
  gene 6 104
  gene action 6 104 115
  human *see* human genetics
  study of 6 115
  see also Behavior Breeding (animal) Breeding (plant)
Hericia hericia 6 399 390
Hering, C 10 235
Hering theory 5 300
Hermann, J M 1 375
Hermann Mauguin notation crystallography 5 597, 603 605
Hermaphroditism 6 424 425* 11 465
Hermes 1 597
Hermetia illucens 8 680
Hermit crab 3 531, 563 4 21
Hermit thrush 13 615
Hermite, C 4 317, 9 227
Hermite polynomial 6 345
Hermitian operator 11 165
Hermodice 10 462

6 425
estine, disorders of
I 223
9 4
, W T 2 151
3 120, 6 425 426*
study 2 151 152
ilt, Paul L T 1 292,
09
angina 3 530
es 1 466 467
es simplex 6 426*, 7 55,
383
es zoster 8 383 404,
501
pestes javanicus 8 567
pestidae 8 567
petic gingivostomatitis
426
rpetomonas 14 125
rreshoff furnace 9 98
rring 3 223, 5 416 6 426*
marine fisheries 8 113
rring bodies pituitary
10 249
lerring gull 6 296
lerrington L P 12 181
Herrmann, G 13 553
Herschel Clemens 14 298
Herschel Sir William 7 105,
11 317
Herschelian telescope 13 451
Hersey J B 12 60
Hertwig O 13 373
Hertz Heinrich 1 448 633,
4 462 495 496 519
8 412 416 14 442
Hertz diagram (meteorology)
1 633
Hertzian oscillator 4 495
Hertzian wave 4 496
Hertzsprung E 11 387
Hertzsprung Russell diagram
13 39 43* 209 302
cosmogony 3 503
stellar evolution 13 106
Hesionidae 10 461
Hesperidin 5 296
Hesperidium 5 542
Hesperiidae 2 381 7 464
Hesperiphona vespertina 6 275
Hesperonoe 10 465
Hesperornis 1 694 6 426 427*
Hesperornis gracilis 6 426
Hesperornis regalis 6 426
Hesperornithidae 6 426 9 276
Hesperornithiformes 6 426
Hess H H 8 532 9 412
Hess V 3 498
Hess law 13 560
Hesse R 14 625
Hessian *see* Burlap 2 372 373
Hessian fly 4 219 5 6 362
Hessite 13 482
Heterakidae 1 571 9 475
Heterakis 9 475
Heterakis gallinarum 9 476
Heterakis spumosa 9 476
Heterangium 11 87
Heterauxesis 1 419
Heteraxine xanthophila 8 573
Heteroauxin 7 62, 63
Heterobasidiomycetidae 2 107,
6 427*, 12 387
Uredinales 14 217
Ustilaginales 14 235-236
Heterocapsina 6 427
Heterocera 7 463
Heterocrinidae 4 [illegible]
Heterocyclic compounds
6 427-429* 9 394
acridine 1 50
azole 702 703
carbazole 2 449
diazine 4 104 105
ethylene oxide 5 94
furan 5 565 566
imidazole 7 31 33
indole 7 62 65
isoquinoline 7 288 289
morpholine 8 598
nomenclature 9 397 398
oxazole 9 461
pyran 11 107
pyrazole 11 109
pyridine 11 110
pyrimidine 11 113
pyrrole 11 130
quinoline 11 190 194
thiazole 13 599 601
thiophene 13 605 606
Heterocyemid 4 111
Heterocyst 12 67
Heterodera 14 169
Heterodera glycines 12 535
Heterodera marioni 9 600
Heterodera rostochiensis 14 169
Heterodon 6 460
Heterodont dentition 13 673
see also Dentition
Heterodonta 9 614
Heterodontoidea 12 157
Heterodontus 12 157
Heterodontus (Cestracion)
12 157
Heterodyne principle 6 429
amplitude modulation
detector 1 361
jamming 4 522
noise analyzer 9 132
oscillator 2 126 9 425
superheterodyne radio
receiver 11 257 258
Heterogamy 3 80 83
reproduction plant 11 453
Heterogeneous catalysis
2 547 549
Heterogeneous equilibrium
5 52 53
Heterogeneratae 10 90
Heterogenite cobalt mineral
3 246
Heterohelicidae 5 435
Heterohyus 7 143
Heteroimmunization 2 266
Heterokaryosis 5 108
Heterolytic reaction 9 400
4 234
Heteropatella valtellinensis
4 234
Heterophil agglutination tests
3 201
Heterophile antibody 7 95
Heterophile antigen 6 429
Heterophrys 12 27
Heterophyes heterophyes 6 429
Heterophyiasis 6 429 430
Heteropia 13 560
Heteropiidae 13 560
Heteroplastic transplantation
4 572
Heteroploidy 3 113
Heteroptera *see* Hemiptera
Heterosis 6 108, 430*
breeding (animal) 2 327
breeding (plant) 2 327,
3 483
Heterosomata *see*
Pleuronectiformes
Heterosoricinae 7 143
Heterospore 12 159
Heterostelea *see* Carpoidea
Heterostemony 5 329
Heterostraci 1 420, 6 430 431*
see also Pteraspidomorphi
Heterotanais oerstedi 13 388
Heterotardigrada 6 431
Heterothallism 3 80 83, 11 453
Heterotrichida 6 431 432*
11 53 13 5
Heterotrophic nutrition
bacteria 2 64, 8 129, 13 1
Euglena 5 99
origin of life 7 498
see also Nutrition
Heteroxenia 1 226
HETP distillation 4 251
Hetrazan 5 258
Hettangian stage 7 325
Heulandite 6 432*, 14 611
Heuristics 10 635 636
Heusler alloy 8 36
Hevea 6 286 10 332
Hevea brasiliensis 6 174,
11 639 639, 646
Hevesy, G. von 11 310, 14 8
Hexa *p* biphenylyl) ethane
6 435
Hexabromodisilane 12 321
Hexacapsula 8 689
1,2 5 4,10 10 Hexachloro 6,
7 epoxy 1,4,4a,5 6 7,8 8a
octahydro 1 4 *endo,endo* 5,
8 dimethanonaphthalene
7 141
[illegible] 4,10 10 Hexachloro 6 7-
[illegible] o 5 8
[illegible] ne
[illegible] o 1,4,
[illegible] ,4 *endo*
[illegible] phtha
[illegible] ne 7 [illegible]
6 7,8a,10,10 Hexachloro 1,5 5a
6,9 9a hexahydro 6 9 meth
ano 2 4,3 benzodioxathiepin
3-oxide 7 141
Hexachloroacetone 6 421
Hexachlorodiaurate 6 231
Hexachlorodisilane 12 321
Hexachlorodisiloxane 12 321
Hexachloroethane 3 75
Hexachloroosmic acid 9 435
Hexachlorophene 1 483
Hexacontane 1 249
Hexacorallia *see* Zoantharia
Hexacosane 1 249
Hexactinella 6 434
Hexactinellida 1 538, 6 432-
434*, 10 515, 519, 13 10
Amphidiscophora 1 538
Hexasterophora 6 435
Hexactinosa 6 434 10 515
Hexacyanoferrate 5 224
Hexadecane 1 249
Hexadella 4 58
Hexadentate chelating agen
3 18
1,3 Hexadien 5 yne 1 245,
6 535
Hexaethylcyclotrisiloxane
12 323
Hexafluorodisiloxane 12 32
Hexafluorophosphate anio
10 135
Hexafluoropropylene 10 4
Hexagenia 5 53
Hexagon 6 434 435*, 10 4
11 324
Hexagonal close packed s
ture 2 338 339, 3 598 5
Hexagonal crystal system
3 604 605
Hexagonal lattice 3 594
Hexahalicene 9 348
Hexahedrite (meteorite)
Hexahedron 10 471
Hexahydropyrazine 4 1
Hexahydropyridine 11 1

Hexamethylcyclotrisiloxane 12 323
Hexamethyldisiloxane 12 323
Hexamethylene diisocyanate 10 493
Hexamethylenediamine 1 70, 6 552, 10 46, 460
Hexamethylenetetramine 5 472, 6 435*, 10 113
Hexamitus 8 169
Hexamminneplatinum(IV) chloride 3 334
Hexanchus (Notidanus) 12 157
Hexane 1 249
natural gas 9 5
solvent 12 496
n Hexane 10 65
1,2,6-Hexanetriol 10 473
Hexaphenylcyclotrisiloxane 12 323
Hexaphenylethane 6 435
Hexapoda 1 565, 6 435*, 7 153
Apterygota 1 495
Protrua 11 61
Pterygota 11 88
see also Insecta
Hexarthra 11 634
Hexasterophora 6 435-436*, 10 513
Hexactinosa 6 434
Lychniscosa 7 623
Lyssacinosa 7 638
Reticulosa 11 536
Hexathionate 13 262
1,3,5-Hexatriene 1 245
1 Hexene 14 207 209
Hexode 6 436
Hexogen 6 435
Hexokinase 10 370
Hexone 10 423
Hexoxarone 8 579
Hexose 5 90
Hexose diphosphate pathway *see* Glycolysis
Hexose monophosphate pathway 2 460
Hexosotriazole 8 579
n Hexyl radical 1 252
Hexylresorcinol 1 571
Hevl, P R 6 264, 13 515
Hevting, A 7 582
HGF see Hyperglycemic-glycogenolytic factor
Hi fi *see* High fidelity
Hi pot insulation testing 7 162
Hiatus hernia 13 149
Hibbardia 9 510
Hibbardia lacrimosa 9 511
Hibernacula 2 356, 5 611, 6 439 440
Hibernation 6 436 441, 597
adipose tissue 1 70
cell (pressure temperature effects) 2 597
cold blooded vertebrates and invertebrates 6 436 440
Hibernation—*cont*
hypothermia 6 597
physiology of 6 440
respiration 11 509
warm blooded vertebrates 6 440-441
Hibiscus esculentus 9 311
Hickory 2 360, 6 441*, 7 316-317
Hidaglo I 596 597
Hiddenite 13 10
Hide (tanning) 7 445
Hidv, P 3 643
Hieracium umbellatum 12 571
Hierarchy social 12 404-405
Hierarchy structure (cosmogony) 5 504 505
Higginsia 8 213
High barometric *see* Atmospheric high
High-altitude flight 13 293
High-alumina cement 2 627
High Atlas 1 107
High Calcareous Alps 13 408
High energy fuel 3 29
High explosive antitank (HEAT) projectile 1 540
High fidelity 5 254 6 441*
amplifier 1 345
equalization 5 45
preamplifier 10 565
High-fidelity sound systems *see* Sound reproduction systems, electrical
High-frequency direction finders 4 232
High frequency impedance measurements *see* Impedance measurements high frequency
High frequency radio waves broadcast use 1 363-364
overcrowding of hf band 1 364
overseas telephone service 13 438 439
radio spectrum allocations 11 260
radiotelephony 1 364
High frequency titration conductimetric 13 660
High g maneuvering 1 534
High lead tin bronze 5 471
High pass filter acoustic 5 263
electronic 5 267
High plains grasshopper 9 416
High polymer *see* Polymer
High pressure area anticyclone 14 494
High pressure phenomena 6 441-446
apparatus used in research 6 442 443
application to geophysical problems 6 446
applications in petrology 6 445
High-pressure phenomena—*cont*
areas of research 6 442
coes-type high-temperature — high-pressure apparatus 6 444
cold seal test tube pressure vessel 6 443
high-pressure pistons 6 444
melting under volatile pressure 6 444 445
synthesis of minerals and new materials 6 443-444
umiaxial high-pressure apparatus 6 444
High-pressure physics 6 446-447
High pressure processes 6 447-450
autoclave 1 674
hydrogenation 6 552-553
High-pressure region (weather) 14 446
High pressure system (meteorology) 1 157
High-pressure well control 9 294-295
High Q cavity 2 576
High quartz 6 127
High Si Iron 7 264
High speed flight 1 102-104
High speed photography *see* Photographs
High Tauern 13 408
High temperature coke 3 270
High temperature materials ablation 12 553
alloys 1 259
cermet 1 259
chromium 5 103
iron alloys 7 265 266
refractories 409 411
spacecraft structure 12 553, 556
High temperature metallography 8 295
High temperature processes pyrometallurgy non ferrous 11 119
High test hypochlorite 3 72
High vacuum pumps 14 241 243
High velocity air sterilization 5 392
High voltage cables 14 54
High voltage power supply 10 561
High voltage surge protection 7 510 512
High voltage test equipment 7 47 48
High voltage x ray tube 14 588 589
Higher carbon steel 15 90
Highland Rim Tennessee Kentucky 9 153
Highway engineering 6 450-452*, 14 13 15 64
access control 14 14 15
bridge 2 335
compaction 6 452
construction 6 451
drainage structures 6 451
maintenance and operation 6 452
pavement 9 596 598
route surveys 13 325
selection of route 6 451
soil foundations *see* Soil mechanics
soil studies 6 450
staking out 6 451
surfacing 6 451
tunnels 14 141 146
Highway paints 9 603
Hilaria jamesi 3 190
Hilbert, David 9 225 14 [illegible]
Hilbert formula 7 165
Hilbert space 2 410, 9 341 414, 14 22 23
Hilda asteroids 1 596
Hildebrand, J 12 446
Hilgard, E R 4 584
Hill, J 9 78
Hill and-dale recording 4 258
Hill and mountain terrain 6 452 455
Appalachian Highlands 9 144 150
development of 6 452
distribution pattern 6 452 453
effects of geologic structure 6 455
glaciated rough terrain 6 454
stream eroded pattern 6 453
Hill reaction 10 [illegible] 191
Hiltner, A W 7 222
Hilton, W 5 8
Hilum 12 144
Himalaya 1 577, 3 110
[illegible] 5 329
Hinnöv 5 116
Hinny (mule) 8 625
Hinokitiol 14 117
Hinsberg reaction 8 [illegible] 13 251
Hinshaw II C. 13 [illegible]
Hip 6 455
Hiperco 55 7 264
Hipernik 8 35
Hipersil 7 264
Hippa 4 31
Hip sarchus 5 31 10 [illegible]

ria trojana 1 599
ies punio 4 215
a 4 32
ocidae 4 211 212
ampus (brain) 9 59
amus hudsonicus 12 92
rates 1 422 9 542
iorpha 10 18 19
otamus 1 567; 6 455*
opotamus amphibius

hoa 2 354
nt acid 9 462
9 13
felder, J O 7 357
felder rule 7 358
maria granulosa 1 531
nea 1 429 6 456 457*
anelida fossils 1 431
rhynchobdellae 1 531-532
ech 7 448
hynchobdellae 11 556
a 6 457
lo medicinalis 1 531,
48
ndinidae 9 589, 13 332
ndo rustica 13 332
Wilhelm 4 569
iger W 2 654
aniola 14 475
ano Suiza mechanism
534
amine 1 434, 566 6 457
anaphylaxis 1 395
endocrine mechanisms
4 391
hypersensitivity 6 589
teridae 3 276
teroidea 3 276
tidine 6 457 458
amino acids 1 508 519
bacterial oxidation 2 35
bioassay of 2 195
in histone 9 217
imidazole compound 7 32
nitrogen compound
bacterial fermentation
2 45
plant metabolism 10 357
in protamines 9 217
Protozoa 11 51 60
stiocyte 3 402 403
istioeuthidae 4 40
istotoxic anoxia 1 435
istochemistry 3 650
histogenesis 6 458* 13 651
histogenesis skeletal 12 352
histogram 2 225 13 69
histology 6 458
blood 2 262 264
bone 2 292 294
connective tissue 3 402 403
epithelium 5 41 43
muscular tissue 8 635 636
nervous tissue 9 51 54
tissue 13 651
Histomonas meleagridis 9 476
Histone 3 110, 9 217,
11 39
Histoplasma capsulatum
1 341, 6 457; 8 583, 678
9 236
Histoplasmosis 1 342 466-467,
6 458-459*, 8 678, 10 428
Historadiography 2 199,
6 459*, 8 366 367
Historical geology 6 140 142
Histriobdellidae 10 461
Histrionicus histrionicus 4 291
Hittorf dark space 6 215 216
Hittorf method 14 19 20
Hives 1 257 6 588
Hlavaty, V 14 201
HMS Challenger 12 116
Hoar frost 4 90 5 540
Hoarding behavior 6 459
motivation to hoard 6 459
neural mechanisms 6 459
physiological mechanisms
6 459
Hoary bat 2 109
Hoary willow 14 495
Hoatzin 6 18
Höber R 10 211
Hobbing gear cutting 6 87
Hobble bush 2 560
Hochfeiler 5 119
Hochgolling 5 119
Hochkönig 5 119
Hochschwab group 5 117
Hodgkin's disease 6 459 460
clinical pathology
3 192 202
metabolic disorders 8 256
Hodograph 13 508 509
Hodotermitidae 7 284
Hoff J H van t 13 125
Hoffman B 11 437
Hofmann W 11 81
Hofmann A W 1 506
Hofmann degradation
anthranilic acid 1 456
Hofmann's hypohalite reaction
1 506 507
Hofmann method ammonia
1 506
Hofmann reaction amide, acid
1 503
Hofmann rearrangement
13 127
Hofmann rule 13 132
Hog 5 183 6 460
Hog Island freighter 12 286
Hog nosed snake 6 460
Hogan C L 6 503
Hogback 5 69
Hogben L 11 478
Hoisting machines 3 418
6 460 463*
block and tackle 6 460
boring and drilling 2 295
crane hoist 3 418 536
6 462
derrick 3 418 4 69 6 462
Hoisting machines—cont
electric 6 461
overhead traveling and
gantry cranes 6 462
pneumatic 6 461
winches and hoists 6 461
Hoja blanca rice 11 564
Holacaine 9 4
Holarctic region 14 620
Holasteridae 6 463
Holasteroida 4 360, 371, 6 463*
Holaxonia 6 233
Holcocera pulverea 7 467
Holcorpa maculosa 7 139
Hold (nautical) 12 258
Holding magnet 4 489
Hole, drilling of 2 295
Hole conduction 6 464
Hole induction *see*
Holes in solids
Holectypidae 6 463
Holectypoida 4 360, 371
6 463*
Holes in solids 6 463 464
electrical conductivity of
metals 4 455
excitons 5 135 136
luminescence 7 616
photoconductivity 10 141
semiconductors 12 166
Hollander beater paper
manufacture 9 540
Hollinella 9 510
Hollinella dentata 9 511
Holloidae 9 510
Hollow cathode discharge tube
12 589
Hollow-charge effect *see*
Shaped charge
Hollow stalk tobacco disease
13 663
Hollow wave guides 14 57 58
Holly 6 464 465* 12 26 13 124
Holmes A 6 135
Holmium 6 465
electron configuration
4 504
extractive metallurgy
8 277
Holobasidiomycetes *see*
Homobasidiomycetidae
Holobranch 11 515
Holocellulose 6 598
Holocene 11 575 13 169
Holocentrus ascensionis 2 170
Holocephali 3 86, 5 205
6 465*, 12 360
Holocoenosis 5 12
Holocrine gland 5 43
Holoenzyme 2 15 19 5 20
Holomastigotoides 6 587
Holometabola 6 465*, 7 134
Coleoptera 5 275 288
Diptera 4 211 219
Endopterygota 4 599
Hymenoptera 6 573 583
Lepidoptera 7 459 473
Holometabola—cont
Mecoptera 8 206
Neuroptera 9 80
Siphonaptera 12 343 345
Holomictic 5 525
Holomorphic functions
(mathematics) 5 540 540
Holonephros 7 341, 14 220
Holonomic system 5 415
Holophyra 3 122, 6 300
Holophytic nutrition 5 99
Holostei 1 57 58, 9 445
Holosymmetric lens system
7 451, 454*
Holothuria 1 592, 6 465 466
Holothuriidae 1 592
Holothuroidea 4 360, 372
6 465 467*
Apoda (echinodermata)
1 491
Aspidochirota 1 592
Dendrochirota 4 58
Elasipoda 4 418
Molpadonia 8 561
sea cucumber 12 91
Holothyridae 9 528
Holotricha 1 601 3 120,
6 467*, 11 55
Apostomatida 1 492
Astomatida 1 601
Chonotrichida 3 86
Gymnostomatida 6 500
Hymenostomatida 6 583
Peritrichida 10 20 21
Suctoria 13 236 237
Thigmotrichida 13 602 603
Trichostomatida 14 87
Holotype 14 372
Holozoic nutrition 5 99 11 37
Holstein Friesian cattle 2 565
Holt S J 12 121
Holtzinger, K J 6 507
Homalopteridae 3 648
Homalorhagae 7 562
Homalozoa 4 365
Homaridae 7 570
Homarus 4 25
Homarus americanus 7 570
Home entertainment systems
television 2 208
Homeomorphic graph 6 253
Homeomorphic space 13 681
Homeomorphism 13 681 683
Homeostasis 4 235, 6 467-468*
ecology, human 4 401
hypothermia 6 597
mechanisms in ecology
4 591
motivation 8 603
neurophysiology 9 80
stress (psychological)
13 180
Homeotherm 13 590
Homing guidance system
6 287, 296 8 516
Homing torpedo *see*
Acoustic torpedo

Hexamethylcyclotrisiloxane 12 323
Hexamethyldisiloxane 12 323
Hexamethylene diisocyanate 10 493
Hexamethylenediamine 1 70, 6 552, 10 46, 460
Hexamethylenetetramine 5 472, 6 435*, 10 113
Hexamitus 8 169
Hexammineplatinum(IV) chloride 3 334
Hexanchus (Notidanus) 12 157
Hexane 1 249
  natural gas 9 5
  solvent 12 496
n Hexane 10 65
1,2,6-Hexanetriol 10 473
Hexaphenylcyclotrisiloxane 12 323
Hexaphenylethane 6 435
Hexapoda 1 565, 6 435*, 7 133
  Apterygota 1 495
  Protrua 11 61
  Pterygota 11 88
  see also Insecta
Hexarthra 11 634
Hexasterophora 6 435-436*, 10 513
  Hexactinosa 6 434
  Lychniscosa 7 623
  Lyssacinosa 7 638
  Reticulosa 11 536
Hexathionate 13 262
1,3,5-Hexatriene 1 245
1 Hexene 14 207-209
Hexode 6 436
Hexogen 6 435
Hexokinase 10 370
Hexone 10 423
Hexosazone 8 579
Hexose 5 90
Hexose diphosphate pathway *see* Glycolysis
Hexose monophosphate pathway 2 460
Hexosotriazole 8 579
n Hexyl radical 1 252
Hexylresorcinol 1 571
Heyl, P R 6 264 13 513
Heyting A 7 582
HGF *see* Hyperglycemic glycogenolytic factor
Hi fi *see* High fidelity
Hi pot imulation testing 7 162
Hiatus hernia 13 149
Hibbardia 9 510
Hibbardia lacrimosa 9 511
Hibernacula 2 356, 3 611, 6 439 440
Hibernation 6 436 441, 597
  adipose tissue 1 70
  cell (pressure temperature effects) 2 597
  cold blooded vertebrates and invertebrates 6 436 440
Hibernation—*cont.*
  hypothermia 6 597
  physiology of 6 440
  respiration *11* 509
  warm blooded vertebrates 6 440-441
Hibiscus esculentus 9 311
Hickory 2 360, 6 441*; 7 516-517
Hidaglo 1 596 597
Hiddenite 13 10
Hide (tanning) 7 445
Hidy, P 3 643
Hieracium umbellatum 12 571
Hierarchy, social 12 404-405
Hierarchy structure (cosmogony) 5 504-505
Higginsia 8 213
High, barometric *see* Atmospheric high
High-altitude flight 13 293
High-alumina cement 2 627
High Atlas 1 107
High Calcareous Alps 13 408
High energy fuel 5 29
High explosive antitank (HEAT) projectile 1 540
High fidelity 5 254, 6 441*
  amplifier 1 345
  equalization 5 45
  preamplifier 10 565
High-fidelity sound systems *see* Sound reproduction systems, electrical
High-frequency direction finders 4 232
High-frequency impedance measurements *see* Impedance measurements, high frequency
High frequency radio waves
  broadcast use 1 363-364
  overcrowding of hf band 1 364
  overseas telephone service 13 438 439
  radio spectrum allocations *11* 260
  radiotelephony 1 364
High frequency titration conductimetric 13 660
High g maneuvering 1 534
High lead tin bronze 3 471
High pass filter acoustic 5 265
  electronic 5 267
High plains grasshopper 9 416
High polymer *see* Polymer
High pressure area anticyclone 14 494
High pressure phenomena 6 441 446
  apparatus used in research 6 442 443
  application to geophysical problems 6 446
  applications in petrology 6 445
High-pressure phenomena—*cont*
  areas of research 6 442
  coes-type high temperature — high pressure apparatus 6 444
  cold seal test tube pressure vessel 6 443
  high-pressure pistons 6 444
  melting under volatile pressure 6 444-445
  synthesis of minerals and new materials 6 443-444
  uniaxial high-pressure apparatus 6 444
High pressure physics 6 446-447
High-pressure processes 6 447-450
  autoclave 1 674
  hydrogenation 6 552-553
High-pressure region (weather) 14 446
High pressure system (meteorology) 1 157
High-pressure well control 9 294-295
High Q cavity 2 576
High quartz 6 127
High Si Iron 7 264
High speed flight 1 102 104
High speed photography *see* Photography
High Tauern 13 408
High-temperature coke 5 270
High-temperature materials
  ablation 12 553
  alloys 1 259
  cermet 1 259
  chromium 3 103
  iron alloys 7 265 266
  refractories 409 411
  spacecraft structure 12 553 556
High temperature metal lography 8 295
High temperature processes
  pyrometallurgy, non ferrous 11 119
High test hypochlorite 3 72
High vacuum pumps 14 241 243
High vacuum thermal evaporation (microcircuits) 8 349
High vacuum x ray tube 14 588
High velocity air sterilization 5 392
High voltage cables 14 54
High voltage power supply 10 561
High voltage surge protection 7 510 512
High voltage test equipment 7 47 48
High voltage x ray tube 14 588 589
Higher carbon steel 15 90
Highland Rim Tennessee Kentucky 9 153
Highway engineering 6 450 452*, 14 15 15 66
  access control 14 14 15
  bridge 2 335
  compaction 6 4-5
  construction 6 451
  drainage structures 6 451
  maintenance and operation 6 452
  pavement 9 506-509
  route surveys 13 329
  selection of route 6 450
  soil foundations *see* Soil mechanics
  soil studies 6 450
  staking out 6 451
  surfacing 6 451
  tunnels 14 141 144
Highway patrol 9 495
Hilaria jamesi 3 190
Hilbert, David 9 225 14 570
Hilbert formula 7 165
Hilbert space *2 410 9 311* 414, 14 22 23
Hilda asteroids 1 506
Hildebrand, J 12 488
Hilgard, E R 4 584
Hill, J 9 78
Hill and dale recording 4 238
Hill and mountain terrain 6 452 455
  Appalachian Highlands 9 144 150
  development of 6 452
  distribution pattern 6 452-455
  effects of geologic structure 6 455
  glaciated rough terrain 6 454
  stream eroded patterns 6 453
Hill reaction 10 188, 191
Hiltner, A W 7 222
Hilton W 5 8
Hilum 12 144
Himalaya 1 577, 3 110
Himantandraceae 5 529
Hindbrain 2 316
Hindenburg 1 7 129 3 219
Hindu Kush 1 577
Hinnöy 5 116
Hinny (mule) 8 625
Hinokitiol 14 117
Hinsberg reaction 1 505 14 570 15 251
Hinshaw H C 13 179
Hip 6 455
Hipparco 35 7 264
Hipparrik 8 35
Hipparsil 7 264
Hippia 4 31
Hipparchus 5 34 10 573

asteria trojana 1 599
elates pusio 4 215
idea 4 32
obosidae 4 211 212
ocampus (bram) 9 59
ocamus hudsonius 12 92
ocrates 1 422, 9 542
omorpha 10 18, 19
opotamus 1 567, 6 455*
opotamus amphibius
153
pthoa 2 354
uric acid 9 462
s 9 15
chfelder, J O 7 357
chfelder rule 7 358
idinaria granulosa 1 531
idinea 1 429 6 456-457*
Annelida fossils 1 431
Arhynchobdellae 1 531-532
leech 7 448
Rhynchobdellae 11 556
ida 6 457
ida medicinalis 1 531,
448
mdinidae 9 589 13 332
mdo rustica 13 332
Wilhelm 4 569
nger W 2 654
oamola 14 475
rano Suiza mechanism
334
amine 1 474 566 6 457
anaphylaxis 1 595
endocrine mechanisms
4 591
hypersensitivity 6 589
teridae 3 276
teroidea 3 276
tidine 6 457-458
amino acids 1 508 519
bacterial oxidation 2 35
bioassay of 2 195
in histone 9 217
imidazole compound 7 32
nitrogen compound
bacterial fermentation
2 45
plant metabolism 10 357
in protamines 9 217
Protozoa 11 51-60
itiocyte 3 402 403
itioteuthidae 4 40
itotoxic anoxia 1 435
stochemistry 3 650
stogenesis 6 458* 13 651
stogenesis skeletal 12 352
stogram 2 225 13 69
stology 3 458
blood 2 263 264
bone 2 292 284
connective tissue 3 402 403
epithelium 5 41 43
muscular tissue 8 635 636
nervous tissue 9 51 54
tissue 13 651
stomonas meleagridis 9 476
Histone 3 110 9 217,
11 39
Histoplasma capsulatum
1 341, 6 457, 8 585, 678,
9 236
Histoplasmosis 1 342, 466 467,
6 458 459*, 8 678, 10 428
Historadiography 2 199*
6 459*, 8 366 367
Historical geology 6 140 142
Histriobdellidae 10 461
Histrionicus histrionicus 4 291
Hittorf dark space 6 215 216
Hittorf method 14 19 20
Hives 1 257 6 589
Hlavaty, V 14 201
HMS Challenger 12 116
Hoar frost 4 90, 5 540
Hoarding behavior 6 459
motivation to hoard 6 459
neural mechanisms 6 459
physiological mechanisms
6 459
Hoary bat 2 109
Hoary willow 14 495
Hoatzin 6 18
Hober, R 10 211
Hobbing gear cutting 6 87
Hobble bush 2 560
Hochfetiler 5 119
Hochgolling 5 119
Hochkönig 5 119
Hochschwab group 5 117
Hodgkin's disease 6 459 460
clinical pathology
3 192 202
metabolic disorders 8 256
Hodograph 13 508 509
Hodotermitidae 7 284
Hoff, J H van t 13 125
Hoffman, B 11 437
Hoffmann, W A 11 81
Hofmann, A W 1 306
Hofmann degradation
anthranilic acid 1 456
Hofmann's hypobalite reaction
1 306 307
Hofmann method ammonia
1 306
Hofmann reaction amide acid
1 303
Hofmann rearrangement
13 127
Hofmann rule 13 132
Hog 3 183 6 460
Hog Island freighter 12 286
Hog nosed snake 6 460
Hogan, C L 6 303
Hogback 5 69
Hogben, L 11 478
Hoisting machines 3 418
6 460 463*
block and tackle 6 460
boring and drilling 2 295
crane hoist 3 418, 536
6 462
derrick 3 418 4 69 6 462
Hoisting machines—cont
electric 6 461
overhead traveling and
gantry cranes 6 462
pneumatic 6 461
winches and hoists 6 461
Hoja blanca rice 11 564
Holacaine 9 4
Holarctic region 14 620
Holasteridae 6 463
Holasteroida 4 360 371, 6 463*
Holaxonia 6 238
Holcocera pulverea 7 467
Holcorpa maculosa 7 139
Hold (nautical) 12 258
Holding magnet 4 489
Hole, drilling of 2 295
Hole conduction 6 464
Hole induction see
Holes in solids
Holectypidae 6 463
Holectypoida 4 360, 371,
6 463*
Holes in solids 6 463 464
electrical conductivity of
metals 4 453
excitons 5 135 136
luminescence 7 616
photoconductivity 10 141
semiconductors 12 166
Hollander beater paper
manufacture 9 540
Hollinella 9 510
Hollinella dentata 9 511
Hollinidae 9 510
Hollow cathode discharge tube
12 589
Hollow charge effect see
Shaped charge
Hollow stalk tobacco disease
13 665
Hollow wave guides 14 57 58
Holly 6 464 465* 12 26 13 124
Holmes, A 6 135
Holmium 6 465
electron configuration
4 504
extractive metallurgy
8 277
Holobasidiomycetes see
Homobasidiomycetidae
Holobranch 11 515
Holocellulose 6 598
Holocene 11 373 13 169
Holocentrus ascensionis 2 170
Holocephali 3 86 5 205,
6 465*, 12 360
Holocoenosis 5 12
Holocrine gland 5 43
Holoenzyme 2 13, 19 5 20
Holomastigotoides 6 587
Holometabola 6 465*, 7 134
Coleoptera 3 275 288
Diptera 4 211 219
Endopterygota 4 599
Hymenoptera 6 573 583
Lepidoptera 7 459 473
Holometabola—cont
Mecoptera 8 206
Neuroptera 9 80
Siphonaptera 12 343 345
Holomictic 5 523
Holomorphic functions
(mathematics) 3 339 340
Holonephros 7 341, 14 229
Holonomic system 3 415
Holophyra 3 122 6 300
Holophytic nutrition 5 90
Holostei 1 57 58 9 445
Holosymmetric lens system
7 451, 454*
Holothuria 1 592 6 465 466
Holothuriidae 1 592
Holothuroidea 4 360, 372,
6 465-467*
Apoda (echinodermata)
1 491
Aspidochirota 1 592
Dendrochirota 4 59
Elasipoda 4 418
Molpadonia 8 561
sea cucumber 12 91
Holothyridae 9 328
Holotricha 1 601, 3 120,
6 467* 11 53
Apostomatida 1 492
Astomatida 1 601
Chonotrichida 3 86
Gymnostomatida 6 300
Hymenostomatida 6 583
Peritrichida 10 20 21
Suctorida 13 236 237
Thigmotrichida 13 602 603
Trichostomatida 14 87
Holotype 14 172
Holozoic nutrition 5 99 11 57
Holstein Friesian cattle 2 565
Holt, S J 12 121
Holzinger, K J 6 507
Homalopteridae 3 648
Homalorhagae 7 362
Homaloxoa 4 365
Homaridae 7 570
Homarus 4 25
Homarus americanus 7 570
Home entertainment systems,
television 3 208
Homeomorphic graph 6 253
Homeomorphic space 13 681
Homeomorphism 13 681 683
Homeostasis 4 235 6 467-468*
ecology human 4 401
hypothermia 6 597
mechanisms in ecology
4 591
motivation 8 603
neurophysiology 9 80
stress (psychological)
13 180
Homeotherm 13 590
Homing guidance system
6 297, 290 8 516
Homing torpedo see
Acoustic torpedo

Hominidae 10 590
Homininae 5 477
Hominoidea 10 589-590
Homo heidelbergensis 6 383
Homo neanderthalensis 9 22
Homo neanderthalensis soloensis see Solo man
Homo rhodesiensis 11 550
Homo sapiens 3 554, 3 570, 478, 6 504, 9 21, 11 527
in the biosphere 2 240
Homo sapiens dawsoni 10 232
Homo soloensis see Solo man
Homobasidiomycetidae 2 107; 6 469*
Homocrinoidae 4 369
Homocysteine I 318, 3 649, 8 341
Homoeosaurus II 484
Homogeneous catalysis 2 547
Homogeneous equilibria chemical 5 52
Homogeneous functions 9 570
Homogeneous precipitation 10 573
Homogeneous reactor II 354
Homogenization, milk 8 429-430
Homogenizer 12 351
Homogentisase 8 258
Homogentisate oxidase 6 106
Homogentisic acid 2 35, 6 106, 507, 8 258
Homographic substitution 4 563
Homographic transformation II 186
Homolochlamydeous flower 5 329
Homologous series chemistry 3 39 41, 6 533
Homolytic fission I 252
Homolytic reactions 9 399-400
Homomorphism II 579
Homoneura 7 463-466
Homonym 14 626
Homoplastic transplantation 4 572
Homopolymer 10 478
Homoptera 6 469 476*, 7 154, 15 7
aphid 1 490
leaf hopper 7 441
mealybug 8 187
spittle insect 15 7
treehopper 14 76
Homosclerophorida 4 57, 6 476*, 10 515
Homosexine 8 341
Homothallism 5 80 83, 11 453
Homotopy group 6 293, 13 682
Homotype 14 172
Homunculus 10 590
Honda, K 5 231
Honduras 9 163-164
Honest John rocket 1 540
Honey 2 129 129, 13 236 239
Honey ant 6 582
Honey locust 7 573
Honeybee 2 127, 6 574, 582
Honeybee colony 2 128
Honeycomb *see* Reticulum
Honeycomb coral 13 381
Honeycomb sandwich panel 1 69
Honeycomb theory: gel structure 6 93
Honeydew (insect) 6 474; 8 187
Honeydew melon 6 476-477*; 8 668
Honing 6 477, 8 6
Honkasalo, T. 13 514
Hoof integument 7 175
Hooke, Robert 2 587, 3 526, 5 487
Hooke's joint 14 204-205
Hooke's law of elasticity 4 419-422*, 6 477, 13 184
Hookean deformation 10 476
Hooker, C 11 477
Hooker, D 2 140
Hooker diaphragm cell 3 69
Hooker process 5 161
Hooktip 7 464
Hookworm 6 477-478*, 13 192
Hookworm disease 6 478
Hoopoe 3 473
Hoover Dam 14 392, 399
Hop 6 478 479
Hopcalite 6 59
Hope, T 13 194
Hophornbeam 5 178, 6 479*, 7 268
Hopkins, F G 1 418
Hopkins Cole test 14 125
Hoplocampa cookei 6 580
Hoplocarida 3 563, 6 479*
Hoplonemertini 6 479
Hoplophoridae 4 40
Hopperburn peanut 9 603
Hops 14 235
Hordeolum *see* Sty
Hordeum bulbosum 2 98
Hordeum deficiens 2 98
Hordeum distichon 2 98
Hordeum jubatum 2 98
Hordeum murinum 2 98
Hordeum nodosum 2 98
Hordeum secalinum 2 98
Hordeum vulgare 2 98
Horgan, S H 10 605, 612
Horizon 6 479
Horizon (soil) 12 415
Horizon coordinate system 1 607
Horizontal buoyancy 2 372
Horizontal flow precipitator 1 153
Horizontal intensity variometer 14 280
Horizontal measurements surveying 13 323 324
Horizontal parallax 9 545
Horizontal retort process 14 614
Horizontal stabilizer, aircraft 13 31
Horizontal tail assembly aircraft 13 386
Horlick Mountains 1 440
Hormiphora 8 646
Hormiscium pinophilum 4 52
Hormodendron cladosporioides 4 52
Hormodendrum compactum 3 106
Hormodendrum pedrosoi 3 106
Hormone 2 35, 199 4 93, 589, 6 479 480*
adenohypophyseal 6 480
adrenal medullary 6 484
aldosterone 1 252
amino acids 1 308
androgen 1 399
body rhythm 2 274
cell protoplast 2 615
endocrine mechanisms 4 589
endocrinology 4 598
epinephrine 5 41
estrogen 5 77
hermaphroditism 6 425
insulin 7 163
menopause 8 224
menstruation 8 225
neurohypophyseal 6 485
obesity 9 242
pituitary gland disorders 10 252
progesterone 10 644
protein 11 53-59
see also Endocrine gland, other entries under Hormone
Hormone, adenohypophyseal 6 480-482
gonad 6 235
gonadotropic hormones 6 480
metabolic hormones 6 481
Hormone adrenal cortex 6 482 484
Addison's disease 1 62
adrenal cortical androgens 1 74
bioassay 6 485
estrogens 1 74
glucocorticoids 1 74
mineralocorticoids 1 74
relative biological potency 6 484
structural formulae 6 483
Hormone adrenal medullary 6 484
Hormone follicle stimulating 13 526
Hormone inhibitory 6 403
Hormone luteinizing 13 526
Hormone, neurohypophyseal 6 485
hypophysis 6 596
Hormone, steroid androgen 1 398
Horn, W. 4 350
Horn, acoustic 7 592
Horn, electromagnetic *see* Antenna (aerial)
Horn, French 8 666
Horn: integument 7 175
Horn's beetle 3 278
Horn coral 12 92
Horn reflector *see* Antenna (aerial)
Horn silver 12 329
Hornbeam 5 178, 6 485 6*, 7 268
Hornbill 3 473
Hornblende 1 336, 4 395 6 486*
Hornblendite 7 16
Horned dace 4 1
Horned dinosaur 11 484
Horned grebe 6 268
Horned lark 7 405
Horned lizard 13 23
Horned pout 2 552
Horned puffin 11 91
Horned toad 6 486
Horner's method 5 47
Hornet 6 486*, 574
Horney, E. H. 74
Horney, K 5 535, 11 80
Hornfels 6 486 487*, 8 298 299, 11 591
aureole, contact 1 668
composition of 6 488 4
equilibrium assemblages 6 487
formation of 6 486
Goldschmidt classes 6 487
mineral assemblages 6 487
Hornstone 3 56
Horntail 6 574
Hornwort 1 455, 2 553
Horny coral *see* Coral hor
Horny teeth 13 673
Horologium 3 415 416
Horology 6 487 488
Horowitz, N. H. 7 499
Horse 6 488
Horse bot 4 212
Horse botfly 5 6
Horse chestnut 13 113
Horse fly 4 212
Horse guard 6 582
Horse latitudes 11 495
Horse leech 7 414
Horse production 6 488 4
disease and parasite control 6 491 492
gestation period 6 182, 488*, 10 18 2
horse breeding pra

me production—cont
fices 6 488 489
sales 6 492
of horses bred
89 490
elk 14 488
s 14 310
tenn 2 559 12 26
5 362
r worm 1 574
d Nebula 9 23
e 7 446
ser 6 492
ser rating (D C
4 226
lish 6 492 493
se crab 3 557, 5 531,
565
se crab beetle 3 278
se kidney 7 342
se magnet 8 25
15 62 12 607
l tree 2 545
493
arctic 1 440
ltural crops 6 493
crop culture 9 231
etable growing
4 296
H L 8 195
) equation for mine
ation 8 499
nal rule of 4 131
99
munology 7 35
valence 13 329
ompound
movement 7 611
arasite relationship

ories heat radiation
500 573
thode tube *see*
rmionic tube
ell (radiochemical
ration) 11 297 299
opping *metal*
279
ion anemometer 14 502
aboratories
adiochemical 11 297 299
netal type 10 601
metallic coatings
79 280
pressing ceramics
3 619
metals 12 542
rolling 11 617
spots coronal 13 282 283
springs *see* Thermal
ring
Springs National Park
153
water heating system
493 494
central heating 2 630

Hot water heating system—*cont*
convectors 6 493
expansion tank 6 494
forced circulation 6 494
gravity circulation 6 494
one pipe system 6 495
radiators 6 493 11 241
two pipe system 6 494
Hot wire ammeter 1 322
Hot wire anemometer
1 221 403 14 502 503
Hot wire microphone
8 563
Hot working processes
metals 8 286 287
Hotel china 10 516
Houdriflow process 5 535
Houdry E J 5 535
Houpert O A 6 42
Houghton H G 6 363,
7 144
Houot G 2 110
Hour 13 642
Hour angle 1 607
celestial navigation
2 581
Hour circles 1 607 2 583
Hourglass structure igneous
rocks 7 13 14
House centipede 2 629
House finch 5 273
House fly 4 212, 5 362
House mouse mite 8 253
House wren 14 559
Houssay A B 7 163
Houtermans F G 4 533
Howard L 3 210
Howardite 8 315
Howe truss 14 121
Howell B F Jr 7 289
Howick Island 8 90
Howitzer 1 539 539* 12 265
Howling (acoustic feedback)
see Feedback
Hover B H 14 928
Hoxie F 3 510 4 553
5 504 505
Hoyt Gulf gravimeter
13 515
Hp *see* Horsepower
H R diagram *see*
Hertzsprung Russell
diagram
Hrones J A 8 195
Hsi (Si) 1 577
Hsi River 1 580
Hsing-an Mountain 1 586
H T H 3 72
H T U 4 251
Huai River 1 580
Huai yang hills 1 577
Huanuco 1 266
Hubbard J C 12 117
Hubble E 3 510 6 9
7 505 506, 11 387
Hubble expansion
parameter 6 8
Hubble's constant 11 387
cosmogony 3 503 504
cosmology 3 509 510
expanding universe 6 9
Hubble time 6 9
Hubble's Variable Nebula
9 24
Hubnerite 14 159
Hucket, E. 1 548, 4 496 5 51
12 494
Hucker's crystal violet 13 33
Hudson C 2 457
Hudson Bay 9 271 142
Hudson River 11 586 14 590
Hudson Valley 9 145 147 148
Hudsonian curlew 3 625
Hudsonian zone 8 215
Huebner W C 10 615
Huebnerite 5 215 6 491*
Huff C 8 515
Huffman D A 7 100
Huggins M L 4 520
Hughmilleria 5 124
Hugoniot curves 5 149
Hugoton field, Kansas 9 5
Hull A W 4 519
Hull C L 7 442 8 601
10 52
Hull G F 11 238
Hull corrosion 4 279
Hull design 12 269 270
by towing tank 14 2 4
Hull fouling 4 279
Hull preservation and
maintenance 4 282
Hulst H C van der 14 619
Human biogeography 2 206
Human biology 1 696
Human engineering
6 494 497
aircraft instrument panel
1 180 181
comparative capabilities
of men and machines
6 497
coordination of man
and machine
10 640 641
fatigue and emotion
6 496
fields covered 6 495
historical development
6 494
instrumentation 7 154
relation to *systems*
engineering 6 496
13 578
visual displays 6 496
see also Anthropometry
Emotion Hearing
Kinesthetic sensation
Learning theories
Psychophysical
methods Reflex
conditioned, Reflex
unconditioned
Sensation, Touch
Vision
Human factors engineering
see Human engineering
Human fat 5 189
Human flea 5 299 12 343
Human genetics 6 497 513
advantages 6 497
agamma globulinemia
3 110
anthropology, physical
1 459
balanced genetic
polymorphism 6 501
biochemical genetics
6 507 509
chromosome
aberrations 6 513
chromosome linkage
6 498
chromosome number
6 498
cretinism 3 547
determination of
inheritance pattern
6 499 502
difficulties 6 497
disease 4 236
gene flow 6 505
genetic drift 6 505
Hardy Weinberg
formula 6 358
hemophilia 6 411
Huntington's chorea
6 520
inheritance of
pathologic traits
6 509 513
muscular dystrophy
8 643
mutation 8 673
phenylpyruvic
oligophrenia 10 114
population analysis
6 503 505
population twin rate
6 506
quantitative
inheritance 6 505 506
racial differences 6 504
sex linked inheritance
12 233
synthesis of nonenzymatic
proteins 6 508 509
twin studies 6 506-507
Human head louse 7 593
Human menstrual cycle
12 387
Human performance
environmental conditions
5 15
Human society 4 401 402
Human variation
anthropometry 1 461-462
anthroposcopy 1 462

Hominidae 10 590
Homininae 5 477
Hominoidea 10 589-590
Homo heidelbergensis 6 383
Homo neanderthalensis 9 22
Homo neanderthalensis soloensis see Solo man
Homo rhodesiensis 11 550
Homo sapiens 3 554, 5 370, 478; 6 504, 9 21; 11 527
  in the biosphere 2 240
Homo sapiens dawsoni 10 232
Homo soloensis see Solo man
Homobasidiomycetidae 2 107, 6 469*
Homocrinoidae 4 369
Homocysteine 1 318, 3 649, 8 341
Homoeosaurus 11 484
Homogeneous catalysis 2 547
Homogeneous equilibria chemical 5 52
Homogeneous functions 9 570
Homogeneous precipitation 10 573
Homogeneous reactor 11 354
Homogenization milk 8 429-430
Homogenizer 12 351
Homogentisase 8 258
Homogentisate oxidase 6 106
Homogentisic acid 2 35, 6 106, 507, 8 258
Homographic substitution 4 563
Homographic transformation 11 186
Homoiochlamydous flower 5 329
Homologous series chemistry 3 39-41, 6 533
Homolytic fission 1 252
Homolytic reactions 9 399 400
Homomorphism 11 579
Homoneura 7 463 466
Homonym 14 626
Homoplastic transplantation 4 572
Homopolymer 10 478
Homoptera 6 469-476*, 7 154, 13 7
  aphid 1 490
  leaf hopper 7 441
  mealybug 8 187
  spittle insect 13 7
  treehopper 14 76
Homosclerophorida 4 57, 6 476*; 10 513
Homosexine 8 341
Homothallism 3 80 83, 11 455
Homotopy group 6 245, 13 682
Homotype 14 172
Homunculus 10 590
Honda, K 5 231
Honduras 9 163-164
Honest John rocket 1 540
Honey 2 129 129, 13 236 239
Honey ant 6 582
Honey locust 7 573
Honeybee 2 127, 6 574, 582
Honeybee colony 2 128
Honeycomb *see* Reticulum
Honeycomb coral 13 581
Honeycomb sandwich panel 1 69
Honeycomb theory. gel structure 6 93
Honeydew (insect) 6 474, 8 187
Honeydew melon 6 476-477*, 8 668
Honing 6 477, 8 6
Honkasalo, T 13 514
Hoof integument 7 175
Hooke, Robert 2 587, 3 526, 5 487
Hooke's joint 14 204-205
Hooke's law of elasticity 4 419 422*, 6 477, 13 184
Hookean deformation 10 476
Hooker, C 11 477
Hooker, D 2 140
Hooker diaphragm cell 3 69
Hooker process 5 161
Hooktip 7 464
Hookworm 6 477-478*, 13 192
Hookworm disease 6 478
Hoopoe 3 473
Hoover Dam 14 392, 399
Hop 6 478 479
Hopcalite 6 59
Hope, T 13 194
Hophornbeam 5 178, 6 479*, 7 268
Hopkins, F G 1 418
Hopkins Cole test 14 125
Hoplocampa cookei 6 580
Hoplocarida 5 563 6 479*
Hoplonemertini 6 479
Hoplophoridae 4 40
Hopperburn peanut 9 603
Hops 14 235
Hordeolum *see* Sty
Hordeum bulbarum 2 98
Hordeum deficiens 2 98
Hordeum distichon 2 98
Hordeum jubatum 2 98
Hordeum murinum 2 98
Hordeum nodosum 2 98
Hordeum secalinum 2 98
Hordeum vulgare 2 98
Horgan, S H 10 605, 612
Horizon 6 479
Horizon (soil) 12 415
Horizon coordinate system 1 607
Horizontal buoyancy 2 372
Horizontal flow precipitator 1 153
Horizontal intensity variometer 14 280
Horizontal measurements surveying 13 323 324
Horizontal parallax 9 545
Horizontal retort process 14 614
Horizontal stabilizer, aircraft 13 31
Horizontal tail assembly aircraft 13 386
Horlick Mountains 1 440
Hormiphora 3 646
Hormiscium pinophilum 4 52
Hormodendron cladosporioides 4 52
Hormodendrum compactum 3 106
Hormodendrum pedrosoi 3 106
Hormone 2 35, 199 4 93, 589, 6 479-480*
  adenohypophyseal 6 480
  adrenal medullary 6 484
  aldosterone 1 232
  amino acids 1 308
  androgen 1 399
  body rhythm 2 274
  cell protoplast 2 613
  endocrine mechanisms 4 589
  endocrinology 4 598
  epinephrine 5 41
  estrogen 5 77
  hermaphroditism 6 425
  insulin 7 165
  menopause 8 224
  menstruation 8 225
  neurohypophyseal 6 485
  obesity 9 242
  pituitary gland disorders 10 252
  progesterone 10 644
  protein 11 33 39
  see also Endocrine gland, other entries under Hormone
Hormone, adenohypophyseal 6 480 482
  gonad 6 255
  gonadotropic hormones 6 480
  metabolic hormones 6 481
Hormone adrenal cortex 6 482 484
  Addison's disease 1 62
  adrenal cortical androgens 1 74
  bioassay 6 493
  estrogens 1 74
  glucocorticoids 1 74
  mineralocorticoids 1 74
  relative biological potency 6 484
  structural formulae 6 485
Hormone adrenal medullary 6 484
Hormone follicle stimulating 13 526
Hormone, Inhibitory 6 403
Hormone luteinizing 13 526
Hormone, neurohypophyseal 6 485
  hypophysis 6 596
Hormone, steroid androgen 1 398
Horn, W. 4 350
Horn, acoustic 7 592
Horn, electromagnetic *see* Antenna (aerial)
Horn, French 8 666
Horn' integument 7 175
Horn's beetle 3 278
Horn coral 12 92
Horn reflector *see* Antenna (aerial)
Horn silver 12 329
Hornbeam 5 178, 6 485 486* 7 268
Hornbill 3 473
Hornblende 1 336, 4 385 6 486*
Hornblendite 7 16
Horned dace 4 1
Horned dinosaur 11 481
Horned grebe 6 268
Horned lark 7 405
Horned lizard 13 23
Horned pout 2 552
Horned puffin 11 91
Horned toad 6 486
Horner's method 5 47
Hornet 6 486*, 574
Horney, E 11 74
Horney, K 5 535, 11 80
Hornfels 6 486 487*, 8 298 299, 11 591
  aureole, contact 1 668
  composition of 6 486 487
  equilibrium assemblages 6 487
  formation of 6 486
  Goldschmidt classes 6 487
  mineral assemblages 6 487
Hornstone 3 56
Hornfail 6 574
Hornwort 1 453, 2 353
Horny coral *see* Coral horny
Horny teeth 13 673
Horologium 3 415 414
Horology 6 487 488
Horowitz, N H 7 498
Horse 6 488
Horse bot 4 212
Horse botfly 5 6
Horse chestnut 13 115
Horse fly 4 212
Horse guard 6 582
Horse latitudes 14 495
Horse leech 7 448
Horse production 6 488 492
  disease and parasite control 6 491 492
  gestation period 6 182, 488*, 10 18 27
  horse breeding prac

Hydraulic turbine—*cont*
draft tube 6 529
efficiency 6 529
Francis 6 527
governor 6 259
impulse 6 527
Kaplan 6 527
Pelton 6 527, 9 618*
reaction 6 527
specific speed 6 529
Hydraulic valve lifter 6 529
Hydraulicking placer mining 6 478
Hydraulics 6 529 530
applications 6 529
density 6 530
elasticity 6 530
fluid coupling 5 334 336
hydrodynamics 6 536 541
hydrostatics 6 568 570
mass 6 530
open channels 3 8 9
physical laws 6 530
properties 6 530
surface tension 6 530
viscosity 6 530
Hydrazide 9 110
Hydrazine 6 530*, 546
heat of combustion 8 290
liquid propellant 11 6
Hydrazine hydrobromide 6 530
Hydrazinium salts 9 110
Hydrazoic acid 1 702
Hydrazone 6 530
Hydric environment 5 14
Hydrida 6 534
Hydridae 6 523
hydride 6 531 535
boron 6 546
fluorine 6 549
lithium 7 545
silicon 12 319 320
hydride metal 2 290 292, 6 531 535*
Hydrimet process 2 398
Hydrindene 3 255
Hydroacoustic signals *see* Underwater sound
Hydroammonolysis 1 304, 6 532
Hydrobiotite 2 246, 10 637
Hydrocarbon 6 535 536* 546
aircraft fuels 1 177-179
alicyclic *see* Alicyclic hydrocarbon
aliphatic *see* Aliphatic hydrocarbon
aromatic hydrocarbon 1 546 649, 6 534
bacterial aerobic oxidations 2 29
biphenyl 2 247
cracking 3 532 535
decay 10 56

Hydrocarbon—*cont*
detection devices 1 486
gases 10 72
halogenated *see* Halogenated hydrocarbon
hydroformylation 6 542 543
lubricant 7 601
from marine organisms 10 56
in natural gas 9 5
from organic matter 10 56
petroleum 10 54 57
polynuclear *see* Polynuclear hydrocarbon
radiation damage to oils 11 223
solid propellant 11 8
sources 6 535 536
unsaturated *see* Unsaturated hydrocarbon
see also Reforming (petroleum refining)
Hydrocarbon resin 6 536
see also Polymer
Hydrocarbon waxes 14 443
Hydrocele 11 482
Hydrocenidae 11 19
Hydrocephalus 9 69
Hydrocharis 10 532
Hydrocharitaceae 6 394
Hydrochloric acid aqua regia 1 495
chloride 3 66
digestive system 4 160
Hydrochoerus capybara 2 448
Hydrochory population dispersal 10 498
Hydrocoralliina 8 439
Hydrocorisae 6 405 406
Hydrocortisone 4 591, 13 138
Hydrocracking 11 403
Hydrocyanic acid 3 634
Hydrocyclone 2 634
Hydrodamalis 12 347
Hydrodesulfurization 10 48
Hydrodictyon 2 601
Hydroduct propulsion 1 486
Hydrodynamics 5 321 326 6 536 542*
Bernoulli equation 6 539
cavitation 6 539
doublet flow 4 269
flow field 6 536
fluid flow principles 5 338 340
hydrokinematics 6 537 538
hydrokinetics 6 538 540
inviscid fluid 6 537
irrotational flow 6 540
magnetohydrodynamics 8 56 57

Hydrodynamics—*cont*
Navier Stokes equation 6 539
in petroleum engineering 10 57
relativistic hydrodynamics 11 452 455
sink flow 6 538
source flow 6 538
stream functions 6 537
towing tanks and models 14 1 4
viscous flow 6 541
vorticity vector 6 538
water hammer 14 396 399
Hydroelectric generator 6 541
Hydroelectric plant 4 432
Hydroelectric power 4 4, 14 399-400
economic factors 14 400
generator 6 541
hydraulic turbine 6 527-529
plant capacity 14 400
plant site 14 400
see also Electric power generation Power plant, Water power
Hydrofluoric acid 5 330
Hydrofoil craft 6 541 542
antisubmarine warfare 1 486
Hydroformylation 2 547 6 542 543*
catalyst 6 543
hydrogenation 6 552 553
metal carbonyl 8 279 286
Hydrogen 6 543 549
in airships 1 217
analytical methods 6 547 548
chemical properties 6 545 546
cryogenic properties 5 572
escape velocity 5 68
heat of combustion 8 290
hydride 6 531 535
hydroformylation 6 542 543
inversion temperature 7 538
ionization potential 4 504
line spectrum 7 521
liquefaction plants 5 571
liquid propellant 11 6
natural occurrence 6 544
organic quantitative analysis 9 398
physical properties 6 544 545
preparation 6 547
principal compounds 6 546
production 4 469
quantized atom 1 653

Hydrogen—*cont*
radio waves (21-cm) from 11 246
spectrum and term diagram 1 657 658
uses 6 544
velocity of sound in 12 515, 14 431
water 14 387
alpha Hydrogen 3 374
Hydrogen bomb 1 648, 6 548* radioactive fallout 11 266 268
Hydrogen bond 3 24 25, 6 548 549*, 8 537 538, 14 387 388
Hydrogen bromide 2 545, 6 546
Hydrogen burning 4 553
Hydrogen chloride 3 73, 6 546 8 553
Hydrogen cyanide 3 634
fumigant 5 561
petrochemical 10 44
polyacrylonitrile resin 10 459
Hydrogen disulfide 13 256
Hydrogen electrode 6 549
electrode potential 4 472
hydrogen ion 6 551
Hydrogen embrittlement 6 544
Hydrogen fluoride 1 253, 6 546, 549 550*
Hydrogen fluorine (liquid propellant) 11 6
Hydrogen halides 6 546
Hydrogen iodide 6 546, 7 238
Hydrogen ion 6 550 552
acid base indicator 7 59 61
buffer solution 2 362
glass electrode 6 209 210
hydrogen electrode 6 549 550
hydrolysis 6 552
pH 6 551, 10 89
thermodynamic data 6 551
Hydrogen molecule quantum chemistry 11 146 147
rotation 8 551
vibration 8 549
Hydrogen-oxygen bipropellant 11 6
Hydrogen-oxygen fuel cell 5 551-552
Hydrogen peroxide 6 546, 8 674, 10 28
liquid propellant 11 6
petrochemical 10 43
sterilization 13 136
Hydrogen plasma 5 593
Hydrogen polysulfide 13 256
Hydrogen sulfide 6 546, 13 256, 604
in Black Sea 2 251
mine gas 8 492
Hydrogenase 11 511
Hydrogenate 2 398

Human variation—*cont*
craniometry 1 461
genetics 1 459 460
growth 1 460
osteology 1 459
somatotyping 1 460 461
statistical analysis 1 461
Humason, M. L. 7 506
Humboldt, Alexander von 7 290
Humboldt Current 9 249, 483, 12 530
Humboldt Glacier 7 7
Hume-Rothery, W 1 260-261, 3 599
Hume-Rothery compounds *see* Electron compounds
Hume Rothery rule 1 262*, 3 461
Humectant 5 377, 6 221
Humerus 1 533, 12 306
Humic deposits 12 140
Humid mesothermal regions 4 342
Humid microthermal regions 4 342
Humid transition zone 8 245
Humidification 6 513 515
cooling towers 6 514
dehumidification 6 514 515
humidity control 6 516
psychrometric chart 6 513 514
Humidistat 6 515
Humidity 6 515 516*, 11 82 84
absolute 6 515, 11 83
air conditioning 1 143
dew point 6 515
measurement 8 533
mixing ratio 6 515
psychrometer 6 515
relative 6 515 11 83
temperature humidity index 13 491
vapor pressure 6 515
Wet bulb temperature 6 515
Humidity control 6 516
air conditioning 1 144
comfort control 3 316 317
dehumidification 6 516
humidification 6 516
humidistat 6 515
Humidity measurement 8 533 535, 11 82 84
hygrometer 6 572 573
psychrometer 11 82
Humite 6 516
Hummingbird 1 491, 6 516*
Hummingbird moth 7 461
Hummocky terrane 8 597
Hump backed fly 4 212
Humpback salmon 12 14
Humphreys, L. G. 3 549
Humulus lupulus 6 478, 12 229, 14 233
Humus 6 516-518
humification 6 517
manure 8 94
organic decomposition 6 517-518
peat 6 517
soil texture 6 517
Hund, F. 12 161
Hundredweight 8 188
Hungarian vetch 14 310
Hunger 6 518 519
body rhythm 2 273
Cannon theory 6 518
neural centers 6 519
physiological mechanism 6 518
specific hunger behavior 6 519
Hunter, M. A. 13 654
Hunter killer submarine 1 486
Hunter-Penrose Autoscan 10 607
Hunting 6 520
control systems 3 435
synchronous motor 13 372
Hunting circuit *see* Lockout circuit
Huntington's chorea 6 520*, 9 69
Huntite 6 520
Huon River 1 671 672
Hurewicz, W. 13 683
Hurler-Pfaundler's disease 8 262
Hurley, D. 9 344
Huronian System 9 522
Hurricane 6 520 521*, 8 332 333
Atlantic Ocean 1 624
atmospheric low 1 642
cloud systems 6 521
forecasting 9 8
formation 6 520 521
movement 6 520 521
radar detection 8 320
structure 6 521
warnings 14 433
Hurricane induced surge 13 165
Hurter and Driffield characteristic curve 10 161 164
Hutchinson, G. F. 2 239 241, 5 523
Hutchinson's teeth 15 676
Hutchinsonella 1 561
Hutchinsonella macracantha 2 643
Hutchison, B. F. 10 611
Hutner, S. I. 6 69, 15 157
Hutton, James 8 302
Huxley, H. 8 642 643
Huxley, J. 1 423
Huygens, C. 2 579, 6 521*, 9 362, 12 40
Huygens construction' crystal optics 3 588-589
Huygens eyepiece *see* Eyepiece
Huygens-Fresnel principle 6 521
Huygens Fresnel theory of diffraction 4 139
Huygens' principle 6 521 522
Schelkunoff formulation 1 449 450
wave motion 14 425 429
Huygens secondary waves 4 132-138
Hyades 6 522
Hyaemidae 2 523
Hyalascolecosporae 4 234, 8 213 12 604
Fungi Imperfecti 5 563
Zythiaceae 14 630
Hyalella 5 563
Hyalella azteca 9 496
Hyalellidae 6 36
Hyaline cartilage 2 533 534
Hyalinella punctata 10 201
Hyalite 9 332
Hyalodictvae 5 563
Hyalodidymae 4 231, 12 604
Fungi Imperfecti 5 563
Leptostromitaceae 7 476
Melanconiales 8 213
Hyalodiscus stelliger 8 128
Hyalohelicosporae 5 563
Hyalod artery (eye) 5 162 171
Hyalomere 2 261
Hyalonema 1 358 6 433
Hyalophane 5 207
Hyalophragmiae 5 563 14 128
Hyalopilitic texture in andesite 1 398
Hyaloplasm 2 610 614 3 657
Hyalospongia 10 519
Hyalosporae 4 231 7 476 12 604 14 128
Fungi Imperfecti 5 563
Melanconiales 8 212
Stilbellaceae 13 140
Tuberculariaceae 14 128
Zythiaceae 14 630
Hyalostauropsae 5 563
Hyaluronic acid 2 20 6 552* 10 490 15 37
Hyaluronidase 2 20 6 522 523* 15 37
virulence 14 330
Hyattechinus 4 559
Hybocrinida 4 560
Hybodont 12 157
Hybodontoidea 4 419 6 523*, 12 157
Hybodus 7 327
Hybodus hauffianus 6 523
Hybothynchus notatus 8 85
Hybrid 8 223, 625
Hybrid vigor *see* Heterosis
Hybridization chemical bond 11 148
introgressive 12 570
polyploidy 10 489
speciation 12 569
Hybridized bonding orbitals 3 38
Hycar OR 11 640
Hycosa gulosa 1 496
Hydantoin 7 32
Hydatid 4 359, 13 393 394
cyst 13 393
tapeworm 3 642
taxonomy 3 641 642
Hydatid mole 11 481
Hydatidiform mole 3 192 [illegible] 9 320
Hydatidosis *see* Echinococcus
Hydnocarpic acid 5 190
Hydra 5 151, 255 5 203 529 6 523 524*, 554 8 407 11 449
Hydra (constellation) 3 412 413
Hydra cluster 6 9
Hydra littoralis 6 525
Hydrachnellae 14 115
Hydrate 4 77, 6 524*, 14 5
Hydrated lime 7 514 515
Hydration 1 225, 6 524*, 12 494
Hydraulic actuator 6 521 525
basic hydraulic control 6 524
characteristics 6 525
fluid amplifier 6 525
pump 6 525
servomotor 12 205
Hydraulic analog table 6 525 526
Hydraulic braking system 1 681
Hydraulic cement *see* Cement
Hydraulic clutch 5 225
Hydraulic gradient 6 526
Hydraulic jack 6 527
Hydraulic jump 3 9 6 526 527*
Hydraulic lime 7 515
Hydraulic mining 3 247
Hydraulic motor *see* Hydraulic actuator
Hydraulic press 6 527
Hydraulic scales 14 462 463
Hydraulic separation 3 155
Hydraulic servomechanism *see* Servomechanism
Hydraulic torque converter 15 686
Hydraulic transmission 7 572
Hydraulic turbine 6 527 529
cavitation 2 574 575

4 Hydroxyquinoline 2 carboxylic acid 11 192
5 Hydroxystilbamidine 2 257
5 Hydroxytryptamine 7 65, 14 126
see also Serotonin
5 hydroxytryptophan 14 126
Hydrozoa 3 255, 261, 571 572*
Hydra 6 525 524
Hydroida 6 554 555
Milleporina 8 439
Obelia 9 241 242
Portuguese man-of war 10 525 524
Siphonophora 12 345 346
Stromatoporoidea 13 191 192
Stylasterina 13 208
Trachylina 14 9 10
Hydrurus 3 117
Hydrus 3 412, 414*
Hyemoschus 5 568
Hyena 6 572, 9 505
Hyenales 6 572*, 10 346
Heterodyne detector 1 361
Hygobiidae 3 276
Hygrine 1 248 11 130
Hygrometer 6 572 573, 8 534
dew point elements 6 573
electrical hygrometer 6 573
gravimetric hygrometery 8 534
hair hygrometer 6 573
see also Psychrometer
Hygromycin 1 475
Hygroscopicity wood physics 14 534 535
Hyla cinerea 10 639
Hyla crucifer 5 537
Hyla versicolor 5 538, 10 639
Hylaeosaurus 4 201
Hylaphora prometheа 7 469
Hylidae 4 208, 5 538
Hylorichla fuscescens 13 615
Hylorichla guttata 13 615
Hylorichla mustelina 13 615
Hylurgopinus rufipes 3 287 14 76
Hyman, L. H. 2 603 4 362 571 9 50 10 414
Hymen vaginae 11 474
Hymeniacidon heliophila 10 515
Hymenolepiasis 13 593
Hymenolepis diminuta 2 658
Hymenolepis nana 5 642, 13 593
Hymenomycetes 6 469
Hymenophyllum 5 33
Hymenoptera 6 573 589* 7 134 12 405
ant 1 436 437
bee 2 127 129
Hymenoptera—cont
hornet 6 486
ichneumon 7 8
wasp 14 386 387
Hymenostomatida 6 467, 583*, 11 53
Hynobiidae 3 578
Hynobius 3 578
Hyocephalidae 6 401
Hyoid arch 12 356
Hyolithes 3 400
Hyolithes baconi 3 400
Hyolithes carinatus 3 400
Hyolithes neapolis 3 400
Hyopsodontidae 3 394
Hyopsodus 3 394
Hyoscine 9 547, 10 440
Hyoscyamine 10 440
Hyoscyamus 10 176, 359
Hyoscyamus niger 10 440
Hyostyly 12 356, 360
Hypabyssal rock 7 10 16, 10 521
Hypalon rubber 11 642
Hypanthium 5 326 334
Hypaxial musculature, anatomy 8 646, 652
Hyperadrenocorticism 9 242
Hyperaldosteronism see Adrenal disorders
Hyperalgesia 9 492
Hyperbola 1 390 3 399, 6 583 584*
Hyperbolic function 2 551 6 584 585*
Hyperbolic geometry see Geometry noneuclidean
Hyperbolic motion 2 580
Hyperbolic navigation system 6 584 585
Decca 4 34 35* 9 15
Decca 4 58 59
Gee 9 15
loran 7 585 585* 9 15
Omega 9 15, 318*
Raydist 9 15
Hyperbolic orbit 8 312 9 572
Hyperbolic paraboloid 9 542 11 135
Hyperbolic spiral 13 1
Hyperbolic sweep generator 12 45
Hyperbolic velocity 9 572
Hyperboloid 6 585 586
quadric surfaces 11 135
surfaces and solids of revolution 13 310 311
Hyperchromatic lens 7 452
Hypercorryphodon 9 537
Hypercube 10 492
Hyperelliptic integral 4 561
Hyperemia 8 143 7 49
Hyperesthesia 10 100
Hypereutectoid steels 6 381
Hyperfine interaction 4 515 516 9 190-193
Hyperfine structure 6 586
atomic clock 1 649 650
electron paramagnetic resonance spectroscopy 4 515 516
interferometry 7 193
molecular structure and spectra 8 349 350
nuclear moments 9 190 193
Hypergeometric functions 6 32
Hypergeometric series 4 127
Hyperglobulinemia 8 256
Hyperglycemia 6 518, 7 165 9 553
Hyperglycemic glycogenolytic factor 9 553
Hypergon lens system 7 452 453
Hyperia 6 586
Hyperia galba 6 586
Hypericum 12 79
Hyperiidea 1 339 341 2 447, 6 36 586*
Hyperinfection 13 194
Hyperinsulinism 9 551
Hyperion 12 40
Hyperiopsis 4 39
Hyperlipemia 8 260
Hypermastigida 6 586 587*, 11 52
Hypermetamorphism 3 275 298, 6 575 583
Hypernephroma 7 342 344
Hyperoche 6 586
Hyperoche mediterranea 6 586
Hyperon 4 542 544, 6 587 588*
cascade particle 2 537
decay modes 6 587 588
interaction with matter 6 588
isotopic spin 6 587 588 7 296 297
lifetime 6 587 588
mass 6 587 588
parity 8 249
spin 6 587 588
as strange particle 13 168
strangeness number 6 587 588
types 6 587 588
V particle 14 376
Hyperopia 5 172
Hyperparathyroidism 9 561 12 369
Hyperpathia 9 564
Hyperphagia 6 519
Hyperplane 1 392 6 155 10 492
Hyperplasia 6 588* 593 9 520
Hyperpnea 1 488
Hyperpotassemia 2 265
Hyperproteinemia 8 256
Hypersensitivity 1 474 554, 556 3 401 6 588 590*
allergy atopic 1 257
analgesics 1 366
anaphylaxis 1 395
Hypersensitivity—cont
antibody 1 468
asthma 1 601
biologicals 2 218
chemotherapy 3 53
coccidioidomycosis 3 249
delayed 6 589
guinea worm infection 6 292
hay fever 6 345
histidine 6 457
immediate 6 589 590
Streptococcus 13 178
tuberculous 14 150
Hypersolid cells 10 492
Hypersomnia 12 375 376
Hypersonic flight 6 590 592*, 14 514
aerothermodynamics 1 102 104
ballistic trajectory 6 591
conditions at high speed 6 590
flow over a blunt nosed body 6 591
glide trajectory 6 592
heat loads 6 591
reentry 6 591
skin friction 12 372
skip trajectory 6 592
vehicular trajectories 6 591
Hypersonic wind tunnel 14 500 501
Hypersplenism 13 9
Hypersthene 11 129
Hypersurface 12 357
Hypertely (macroevolution) 8 15
Hypertensin 9 629
Hypertension 6 592
renal origin 14 232 233
Hyperthermy 13 596
Hyperthyroidism 13 599, 627, 14 342
Hypertrajulidae 1 568 569
Hypertrophy 6 588 593*
Hyperuricemia 8 258
Hyphantria cunea 7 472
Hyphochytriales 10 200
Hyphochytrium 10 200
Hyphomicrobiaceae 2 22 6 593
Hyphomicrobiales 2 22 6 593* 11 64
bacteria taxonomy of 2 11
Hyphomicrobiaceae 6 593
Pasteuriaceae 6 593
Schizomycetes 12 65 66
Hyphomicrobium vulgare 6 593
Hypidiomorphic granular texture, igneous rocks 7 11
Hypisodus 1 568

Hydrogenation 6 552-553
catalysts 2 548, 6 553
catalytic 6 552
equipment 6 553
fat and oil, nonedible 5 190
food 5 398-399
hydrogenolysis 6 552
petroleum processing 10 69
see also Dehydrogenation
Hydrogenolysis 6 522, 11 403
Hydrogenomonas 2 28, 54, 8 129, 340, 11 65
Hydrogeology 6 276
Hydrographic surveys 13 329
Hydrography 6 553 554
Hydrohalic acids 6 319
Hydroida 3 255, 6 554-555
Anthomedusae 3 255
Chondrophora 3 255
Leptomedusae 3 255
Limnomedusae 3 255
Hydrokinematics 6 537-538*, 555
see also Hydrodynamics
Hydrokinetics 6 538-540*, 555 556
see also Hydrodynamics
Hydrolaccolith 6 556
Hydrolagus affinis 6 465
Hydrolase 5 22
Hydrolith 2 398
Hydrologic cycle 6 556 557*, 13 316-317, 14 392-393
climatology 5 178
conservation of resources 3 408 411
water conservation 14 392-393
Hydrology 6 171, 556 557
evapotranspiration 5 129-130
forest 5 450
glacier 6 198 203
ground water 6 276 278
hydrography 6 553
lake 7 386-389
saline water reclamation 12 13
snow surveying 12 393
spring (water) 13 18
stream gaging 13 173
surface water 13 316-321
terrestrial frozen water 13 511
tree ring 14 77
water power 14 399 400
see also Hydrometeorology; Hydrosphere, geochemistry of; Precipitation (meteorology)
Hydrolysis 6 557 559*, 14 389
ester 5 73 75
salt (chemical) 12 16 17
Hydrolysis—*cont*
silicate rock weathering 14 459
soap and detergent 12 394
Hydrolytic agent (food) 5 377
Hydrolytic processes 6 558-559
Hydromagnetic wave 10 392-393
Hydromagnetics 8 54-55
Hydromantes italicus 12 7
Hydromechanics 6 559
Hydrometallurgy 6 559 560
Hydrometeorology 6 560-562
analysis of precipitation data 6 561
atmospheric water cycle 6 560
evaporation 6 561 562
precipitation 6 560-561
transpiration 6 561-562
watershed area 6 561
see also Evapotranspiration, Precipitation (meteorology)
Hydrometeors 5 367
Hydrometer 4 62, 6 562 563*
Archimedes' principle 1 517
chain-balanced float type 6 563
inductance bridge 6 562
photoelectric 6 562
thermohydrometer 6 562
Hydrometridae 6 401
Hydron Blue R 2 450
Hydronephrosis 7 342
Hydronium ion 6 550 557
Hydropericardium 6 562
Hydroperoxidase 5 21
Hydroperoxidase 10 29
Hydrophidae 15 26 27
Hydrophitoidea 3 276
Hydrophilus 3 286
Hydrophobia *see* Rabies
Hydrophone 6 563 14 18*
electrokinetic transducer 4 481
sofion 12 483
Hydrophotometer 12 118
Hydroplant *see* Power plant
Hydroponics 6 563 565
economic possibilities 6 564
mineral solution culture 6 563
nutrient solution 6 561
Hydroquinone 6 565* 10 112 11 194
Hydrosalpinx 11 480
Hydroscere 13 232
Hydrosite 14 400
Hydrosol 9 585
Hydrosphere 6 565, 14 399
Hydrosphere, geochemistry of 6 565 568
closed basins 6 569
Hydrosphere, geochemistry of—*cont.*
fresh waters and rain 6 568
oceanic waters 6 565 568
origin and evolution 6 567-568
photosynthesis 6 566 567
residence times 6 565-566
salt content 6 567
see also Hydrology, Sea water
Hydrostatic paradox 10 29
Hydrostatic pressing 2 649
Hydrostatic sterilization (food) 5 392
Hydrostatics 6 568-570
aerostatics 1 102
applications 6 569
Archimedes' principle 1 517
buoyancy 2 370, 6 569
hydrostatic forces 6 569
Pascal's law 9 588
pressure measuring instruments 6 569
pressure transmission 6 570
pressure volume 6 569
stability 6 569
see also Fluid statics
Hydrosulfites 13 260
Hydrothermal ore deposits 9 578 579 585 588
Hydrothorax 4 409
Hydrotropism 10 366
Hydrouretер 7 342
Hydrous chromic oxide 3 106
Hydroxide 6 570
Hydroxide ion 2 106
2 Hydroxindole *see* Oxindole
5 Hydroxmethylcytosine 11 115
alpha Hydroxy acid 7 380
bacterial oxidations 2 53
beta hydroxy acyl CoA 2 31
11(beta) hydroxy delta4 androstene 3 17 dione 1 399
5 hydroxy 2 hydroxymethyl *gamma* pyrone 7 369
Hydroxy nitrile 1 229
Hydroxy L proline 2 35
6 Hydroxy 2 pyridone 11 111
Hydroxy (trarsl)methane dye 4 301
Hydroxy xanthene dye 4 302
Hydroxyacetylene 2 36
beta Hydroxyacyl CoA dehydrogenase 7 532
Hydroxyacyloxy compound 5 43
5 hydroxyanthranilic acid 14 126
Hydroxyanthraquinone glycoside 6 224
Hydroxyapatite 1 489 12 365 368
Hydroxybenzene *see* Phenol
m Hydroxybenzoic acid 2 473
p-Hydroxybenzoic acid 2 473
p Hydroxybenzal alcohol 2 35
p Hydroxybenzalpenicillin 9 619
beta hydroxybutyric acid 2 12, 7 534
ketosis 7 540
Hydroxycitronellal 13 497
17 Hydroxydeoxycorticosterone 1 74-78, 6 443 444
beta Hydroxyethal hydrazine 6 530
Hydroxyethylation of alcohol 10 487
Hydroxyethylcellulose 2 625
alpha hydroxyglutaric acid 7 644
3-Hydroxyindole *see* Indoxyl
5-hydroxyindoleacetic acid 12 196, 14 126
beta hydroxyisobutyryl CoA 14 260
Hydroxyisoquinoline 7 249
3 hydroxykynurenin maternal influence 8 171
Hydroxyl organic quantitative analysis 9 399
Hydroxyl compound 6 570
Hydroxyl derivatives nomenclature 9 396
Hydroxyl ion 2 106, 6 550
Hydroxylamine 8 580
Hydroxylammonium salts 9 110
Hydroxylapatite 9 561
Hydroxylation reaction 6 570 571
5 hydroxylysine 7 638
alpha Hydroxymethyl a (N-acetylaminomethylene) succinic acid 2 37
N(10) hydroxymethyl THFA 1 318
3 Hydroxymethylindole 7 65
Hydroxymethylterrahydrofolic acid 6 221
6 Hydroxynicotinic acid 2 37
p Hydroxyphenylpyruvic acid 2 55 4 236
6(beta) Hydroxyprogesterone 10 645
11 alpha hydroxyprogesterone 13 138
17(alpha) Hydroxyprogesterone 15 526
Hydroxyproline 10 357 11 5 130
2 Hydroxypyridine 11 111
3 Hydroxypyridine 11 111
delta 4 Hydroxypyrrolone 2 carboxylic acid 2 35
4 Hydroxyquinaldinic acid 11 195
Hydroxyquinoline 11 192
8 Hydroxyquinoline 11 195

4 Hydroxyquinoline 2 carboxylic acid 11 192
5 hydroxystilbamidine 2 257
5 Hydroxytryptamine 7 65 14 126
see also Serotonin
5 hydroxytryptophan 14 126
Hydroma 3 255, 261, 571 572*
Hydra 6 525 524
Hydroida 6 554 555
Milleporina 8 439
Obelia 9 241 242
Portuguese man-of-war 18 522 524
Siphonophora 12 345 346
Stromatoporoidea 13 191 192
Stylasterina 13 208
Trachylina 14 9 10
ydrurus 3 117
ydrus 3 412 414*
yemoschus 1 568
yenia 6 572, 9 505
yenidae 6 572* 10 346
yeterodyne detector 1 361
ygobidae 3 276
ygrine 1 248, 11 130
ygrometer 6 572 573, 8 534
dew point elements 6 573
electrical hygrometer 6 573
gravimetric hygrometery 8 534
hair hygrometer 6 573
see also Psychrometer
Hygromycin 1 475
Hygroscopicity wood physics 14 534 535
Hyla rinerea 10 639
Hyla crucifer 5 537
Hyla versicolor 5 538, 10 639
Hylaeosaurus 4 201
Hylaphora promethea 7 469
Hylidae 4 209 5 538
Hylocichla fuscescens 13 615
Hylocichla guttata 13 615
Hylocichla mustelina 13 615
Hylurgopinus rufipes 3 287 14 76
Hyman, L. H. 2 601, 4 362 371 9 30 10 614
Hymen vaginae 11 474
Hymenaeodon heliophila 10 515
Hymenolepiasis 13 595
Hymenolepis diminuta 2 659
Hymenolepis nana 3 642 13 595
Hymenomycetes 6 469
Hymenophyllum 5 57
Hymenoptera 6 573 583*, 7 131 12 405
ant 1 436 437
bee 2 127 129
Hymenoptera—*cont*
hornet 6 486
ichneumon 7 8
wasp 14 386 387
Hymenostomatida 6 467, 583*, 11 55
Hynobiidae 3 578
Hynobius 3 578
Hyocephalidae 6 401
Hyoid arch 12 356
Hyolithes 3 400
Hyolithes baconi 3 400
Hyolithes carinatus 3 400
Hyolithes neapolis 3 400
Hyopsodontidae 3 394
Hyopsodus 3 394
Hyoscine 9 547, 10 440
Hyoscyamine 10 440
Hyoscyamus 10 176, 359
Hyoscyamus niger 10 440
Hyostylv 12 356 360
Hypabyssal rock 7 10, 16, 10 521
Hypalon rubber 11 642
Hypanthium 5 326 334
Hypaxial musculature, anatomy 8 646 652
Hyperadrenocorticism 9 242
Hyperaldosteronism *see* Adrenal disorders
Hyperalgesia 9 492
Hyperbola 1 390 3 399 6 583 584*
Hyperbolic function 2 551 6 584 585*
Hyperbolic geometry *see* Geometry, noneuclidean
Hyperbolic motion 2 580
Hyperbolic navigation system 6 584 585
Decca 4 34 35* 9 15
Dectra 4 38 39
Gee 9 15
loran 7 585 585* 9 15
Omega 9 15 318*
Raydist 9 15
Hyperbolic orbit 3 312 9 372
Hyperbolic paraboloid 9 542 11 135
Hyperbolic spiral 13 1
Hyperbolic sweep generator 12 45
Hyperbolic velocity 9 372
Hyperboloid 6 585 586
quadric surfaces 11 135
surfaces and solids of revolution 13 310 311
Hyperchromatic lens 7 452
Hypercoryphodon 9 537
Hypercube 10 492
Hyperelliptic integral 4 561
Hyperemia 3 143 7 49
Hyperesthesia 10 100
Hypereutectoid steels 6 581
Hyperfine interaction 4 515 516, 9 190 193
Hyperfine structure 6 586
atomic clock 1 649 650
electron paramagnetic resonance spectroscopy 4 515 516
interferometry 7 193
molecular structure and spectra 8 549 550
nuclear moments 9 190 193
Hypergeometric functions 6 52
Hypergeometric series 4 127
Hyperglobulinemia 8 256
Hyperglycemia 6 518, 7 163 9 533
Hyperglycemic glycogenolytic factor 9 533
Hypergon lens system 7 452 453
Hyperia 6 586
Hyperia galba 6 586
Hypericum 12 79
Hyperiidea 1 339 341, 2 447, 6 36, 586*
Hyperinfection 13 194
Hyperinsulinism 9 534
Hyperion 12 40
Hyperiopsis 4 39
Hyperlipemia 8 260
Hypermastigida 6 586 587* 11 52
Hypermetamorphism 3 275 288; 6 573 585
Hypernephroma 7 342 344
Hyperoche 6 586
Hyperoche mediterranea 6 586
Hyperon 4 542 544, 6 587 588*
cascade particle 2 537
decay modes 6 587 589
interaction with matter 6 588
isotopic spin 6 587 588 7 296 297
lifetime 6 587 589
mass 6 587 588
parity 8 249
spin 6 587 588
as strange particle 13 168
strangeness number 6 587 588
types 6 587 588
V particle 14 376
Hyperopia 5 172
Hyperparathyroidism 9 561, 12 369
Hyperpathia 9 564
Hyperphagia 6 519
Hyperplane 1 392 6 155, 10 492
Hyperplasia 6 588* 593 9 320
Hyperpnea 1 488
Hyperpotassemia 2 265
Hyperproteinemia 8 256
Hypersensitivity 1 474 554 556 3 401 6 588 590*
allergy atopic 1 257
analgesics 1 356
anaphylaxis 1 595
Hypersensitivity—*cont*
antibody 1 468
asthma 1 601
biologicals 2 218
chemotherapy 3 55
coccidioidomycosis 3 249
delayed 6 589
guinea worm infection 6 292
hay fever 6 545
histidine 6 457
Immediate 6 589 590
Streptococcus 13 178
tuberculosis 14 130
Hypersolid cells 10 492
Hypersomnia 12 375 376
Hypersonic flight 6 590 592*, 14 514
aerothermodynamics 1 102 104
ballistic trajectory 6 591
conditions at high speed 6 590
flow over a blunt nosed body 6 591
glide trajectory 6 592
heat loads 6 591
reentry 6 591
skin friction 12 372
skip trajectory 6 592
vehicular trajectories 6 591
Hypersonic wind tunnel 14 500 501
Hypersplenism 13 9
Hypersthene 11 129
Hypersurface 12 357
Hypertely (macroevolution) 8 13
Hypertensin 9 629
Hypertension 6 592
renal origin 14 232 233
Hyperthermy 13 596
Hyperthyroidism 13 599 627 14 342
Hypertrajulidae 1 568-569
Hypertrophy 6 588, 593*
Hyperuricemia 8 258
Hyphantria cunea 7 472
Hyphochytriales 10 200
Hyphochytrium 10 200
Hyphomicrobiaceae 2 22, 6 593
Hyphomicrobiales 2 22 6 593* 11 64
bacteria, taxonomy of 2 11
Hyphomicrobiaceae 6 593
Pasteuriaceae 6 593
Schizomycetes 12 65 66
Hyphomicrobium vulgare 6 593
Hypidiomorphic granular texture igneous rocks 7 11
Hypisodus 1 568

Hydrogenation 6 552 553
catalysts 2 548, 6 553
catalytic 6 552
equipment 6 553
fat and oil, nonedible 5 190
food 5 398-399
hydrogenolysis 6 552
petroleum processing 10 69
see also Dehydrogenation
Hydrogenolysis 6 522, 11 403
Hydrogenomonas 2 28, 54, 8 129, 340, 11 65
Hydrogeology 6 276
Hydrographic surveys 13 329
Hydrography 6 553-554
Hydrohalic acids 6 319
Hydroida 3 255, *6 554-555*
Anthomedusae 3 255
Chondrophora 3 255
Leptomedusae 3 255
Limnomedusae 3 255
Hydrokinematics 6 537-538*, 555
see also Hydrodynamics
Hydrokinetics 6 538-540*, 555-556
see also Hydrodynamics
Hydrolaccolith 6 556
Hydrolagus affinis 6 465
Hydrolase 5 22
Hydrolith 2 398
Hydrologic cycle 6 556 557*, 13 316-317, 14 392 393
climatology 3 178
conservation of resources 3 408-411
water conservation 14 392-393
Hydrology 6 171, 556 557
evapotranspiration 5 129-130
forest 5 450
glacier 6 198-203
ground water 6 276 278
hydrography 6 553
lake 7 386 389
saline water reclamation 12 13
snow surveying 12 393
spring (water) 13 18
stream gaging 13 173
surface water 13 316-321
terrestrial (frozen water 13 511
tree-ring 14 77
water power 14 399 400
see also Hydrometeorology, Hydrosphere, geochemistry of, Precipitation (meteorology)
Hydrolysis *6 557-559*, 14 389
ester 5 73-75
salt (chemical) 12 16-17
Hydrolysis—*cont*
silicate rock weathering 14 459
soap and detergent 12 394
Hydrolytic agent (food) 5 377
Hydrolytic processes 6 558 559
Hydromagnetic wave 10 392-393
Hydromagnetics 8 54 55
Hydromantes italicus 12 7
Hydromechanics 6 559
Hydrometallurgy 6 559-560
Hydrometeorology 6 560 562
analysis of precipitation data 6 561
atmospheric water cycle 6 560
evaporation 6 561 562
precipitation 6 560-561
transpiration 6 561 562
watershed area 6 561
see also Evapotranspiration, Precipitation (meteorology)
Hydrometeors 5 367
Hydrometer 4 62, 6 562 563*
Archimedes' principle 1 517
chain-balanced float-type 6 563
inductance-bridge 6 562
photoelectric 6 562
thermohydrometer 6 562
Hydrometridae 6 401
Hydron Blue R 2 450
Hydronephrosis 7 342
Hydronium ion 6 550, 557
Hydropericarditis 6 362
Hydropericardium 4 409
Hydroperoxidase 5 24
Hydroperoxidate 10 29
Hydrophidae 13 26, 27
Hydrophiloidea 3 276
Hydrophilus 3 286
Hydrophobia *see* Rabies
Hydrophone 6 563 14 18*
electrokinetic transducer 4 481
solion 12 483
Hydrophotometer 12 118
Hydroplant *see* Power plant
Hydroponics 6 563-565
economic possibilities 6 564
mineral solution culture 6 563
nutrient solution 6 564
Hydroquinone 6 565* 10 112 11 194
Hydrosalpinx 11 480
Hydrosere 13 232
Hydrosite 14 400
Hydrosol 9 585
Hydrosphere 6 565 14 399
Hydrosphere, geochemistry of 6 565-568
closed basins 6 568
Hydrosphere, geochemistry of—*cont*
fresh waters and rain 6 568
oceanic waters 6 565-568
origin and evolution 6 567-568
photosynthesis 6 566 567
residence times 6 565 566
salt content 6 567
see also Hydrology, Sea water
Hydrostatic paradox 10 29
Hydrostatic pressing 2 649
Hydrostatic sterilization (food) 5 392
Hydrostatics 6 568 570
aerostatics 1 102
applications 6 569
Archimedes' principle 1 517
buoyancy 2 370, 6 569
hydrostatic forces 6 569
Pascal's law 9 588
pressure-measuring instruments 6 569
pressure transmission 6 570
pressure volume 6 569
stability 6 569
see also Fluid statics
Hydrosulfites 13 260
Hydrothermal ore deposits 9 378-379, 383-388
Hydrothorax 4 409
Hydrotropism 10 366
Hydroureter 7 342
Hydrous chromic oxide 3 106
Hydroxide 6 570
Hydroxide ion 2 106
2 Hydroxindole *see* Oxindole
5 Hydroxmethylcytosine 11 115
alpha-Hydroxy acid 7 380
bacterial oxidations 2 33
beta hydroxy acyl CoA 2 31
11(beta) hydroxy-delta4-androstene 3 17 dione 1 399
5 hydroxy-2-hydroxymethyl gamma-pyrone 7 369
Hydroxy nitrile 1 229
Hydroxy L-proline 2 35
6-Hydroxy-2-pyridone 11 111
Hydroxy triarylmethane dye 4 301
Hydroxy xanthene dye 4 302
Hydroxyacetylene 2 36
beta Hydroxyacyl CoA dehydrogenase 7 552
Hydroxyacyloxy compound 5 43
3 hydroxyanthranilic acid 14 126
Hydroxyanthraquinone glycoside 6 224
Hydroxyapatite 1 489, 12 365 368
Hydroxybenzene *see* Phenol
m Hydroxybenzoic acid 2 453
p-Hydroxybenzoic acid 2 453
p-Hydroxybenzyl alcohol 2 53
p-Hydroxybenzylpenicillin 9 619
beta hydroxybutiric acid 2 12, 7 534
ketosis 7 540
Hydroxycitronellal 13 497
17-Hydroxydeoxycorticosterone 1 74 78, 6 483 484
beta Hydroxyethyl hydrazine 6 530
Hydroxyethylation of alcohol 10 487
Hydroxyethylcellulose 2 626
alpha hydroxyglutarate 7 698
3-Hydroxyindole *see* Indoxyl
5 hydroxyindoleacetic acid 12 196, 14 126
beta hydroxyisobutiryl CoA 14 260
Hydroxyisoquinoline 7 289
3-hydroxykynurenin maternal influence 8 171
Hydroxyl organic quantitative analysis 9 399
Hydroxyl compound 6 570
Hydroxyl derivatives nomenclature 9 396
Hydroxyl ion 2 106 6 550
Hydroxylamine 8 580
Hydroxylammonium salts 9 110
Hydroxylapatite 9 561
Hydroxylation reaction 6 570 571
5 hydroxylysine 7 638
alpha Hydroxymethyl a (N acetylaminomethylene) succinic acid 2 57
N(10) hydroxymethyl THFA 1 318
3-Hydroxymethylindole 7 63
Hydroxymethylitetrahydrofolic acid 6 221
6 Hydroxynicotinic acid 2 57
p Hydroxyphenylpyruvic acid 2 55, 4 236
6(beta) Hydroxyprogesterone 10 645
11 alpha hydroxyprogesterone 13 138
17(alpha) Hydroxyprogesterone 13 526
Hydroxyproline 10 557, 11 5 150
2 Hydroxypyridine 11 111
3 Hydroxypyridine 11 111
delta 4 Hydroxypyrroline 2 carboxylic acid 2 55
4 Hydroxyquinaldinic acid 11 193
Hydroxyquinoline 11 192
8 Hydroxyquinoline 11 195

ydroxyquinoline 2
arboxylic acid 11 192
idroxystilbamidine 2 257
idroxytryptamine 7 65
4 126
see also Serotonin
idroxytryptophan 14 126
drozoa 3 255, 261, 571 572*
Hydra 6 523 524
Hydroida 6 554 555
Millepora 8 459
Obelia 9 241 242
Portuguese man-of war
10 523 524
Siphonophora 12 345 346
Stromatoporoidea
13 191 192
Stylasterina 13 208
Trachylina 14 9 10
ydrurus 3 117
ydrus 3 412 414*
ylemoschus 1 568
yena 6 572 9 505
yenas 6 572*, 10 346
yeterodyne detector 1 361
ygrobiidae 3 276
ygrine 1 248 11 130
ygrometer 6 572 573, 8 534
dew point elements 6 573
electrical hygrometer
6 573
gravimetric hygrometery
8 534
hair hygrometer 6 573
see also Psychrometer
Hygromeia 1 475
Hygroscopicity wood physics
14 534 535
Hyla cinerea 10 639
Hyla crucifer 5 537
Hyla versicolor 5 538, 10 639
Hylaeosaurus 4 201
Hylaphora prometheа 7 469
Hylidae 4 208 5 539
Hylocichla fuscescens 13 615
Hylocichla guttata 13 615
Hylocichla mustelina 13 615
Hylurgopinus rufipes 5 287
14 76
Hyman L H 2 601 4 362
371 9 30 10 414
Hymen vaginae 11 474
Hymenaeridon heliophila
10 515
Hymenolepiasis 13 593
Hymenolepis diminuta 2 658
Hymenolepis nana 5 642,
13 593
Hymenomycetes 6 469
Hymenophyllum 5 37
Hymenoptera 6 573 585*
7 134, 12 405
ant 1 436 457
bee 2 127 129
Hymenoptera—cont
hornet 6 486
ichneumon 7 8
wasp 14 386-387
Hymenostomatida 6 467, 585*,
11 53
Hynobiidae 3 578
Hynobius 3 578
Hyocephalidae 6 401
Hyoid arch 12 356
Hyolithes 3 400
Hyolithes baconi 3 400
Hyolithes carinatus 3 400
Hyolithes neapolis 3 400
Hyopsodontidae 3 394
Hyopsodus 3 394
Hyoscine 9 547, 10 440
Hyoscyamine 10 440
Hyoscyamus 10 176 359
Hyoscyamus niger 10 440
Hyostylv 12 356, 360
Hypabyssal rock 7 10, 16
10 521
Hypalon rubber 11 642
Hypanthium 5 326-334
Hypaxial musculature
anatomy 8 646, 652
Hyperadrenocorticism 9 242
Hyperaldosteronism see
Adrenal disorders
Hyperalgesia 9 492
Hyperbola 1 390, 3 399
6 583 584*
Hyperbolic function 2 551,
6 584 585*
Hyperbolic geometry see
Geometry noneuclidean
Hyperbolic motion 2 580
Hyperbolic navigation
system 6 584 585
Decca 4 34 35*, 9 15
Dectra 4 38 39
Gee 9 15
loran 7 583 585*, 9 15
Omega 9 15 318*
Raydist 9 15
Hyperbolic orbit 3 312, 9 372
Hyperbolic paraboloid 9 542,
11 135
Hyperbolic spiral 13 1
Hyperbolic sweep generator
12 45
Hyperbolic velocity 9 372
Hyperboloid 6 585 586
quadric surfaces 11 135
surfaces and solids of
revolution 13 310 311
Hyperchromatic lens 7 452
Hypercoryphodon 9 537
Hypercube 10 492
Hyperelliptic integral 4 561
Hyperemia 3 143 7 49
Hyperesthesia 10 100
Hypereutectoid steels 6 381
Hyperfine interaction 4 515
516, 9 190 193
Hyperfine structure 6 586
atomic clock 1 649 650
electron paramagnetic
resonance spectroscopy
4 515 516
interferometry 7 193
molecular structure and
spectra 8 549 550
nuclear moments 9 190 193
Hypergeometric functions 6 32
Hypergeometric series 4 127
Hyperglobulinemia 8 256
Hyperglycemia 6 518, 7 165,
9 535
Hyperglycemic glycogenolytic
factor 9 533
Hypergon lens system
7 452 453
Hyperia 6 586
Hyperia galba 6 586
Hypericum 12 79
Hyperiidea 1 339 341, 2 447,
6 36, 586*
Hyperinfection 13 194
Hyperinsulinism 9 534
Hyperion 12 40
Hyperiopsis 4 39
Hyperlipemia 8 260
Hypermastigida 6 586 587*
11 52
Hypermetamorphism
3 275-288, 6 573-583
Hypernephroma 7 542 544
Hyperothe 6 586
Hyperoche mediterranea 6 586
Hyperon 4 542 544, 6 587 588*
cascade particle 2 537
decay modes 6 587 588
interaction with matter
6 588
isotopic spin 6 587 588,
7 296 297
lifetime 6 587 588
mass 6 587 588
parity 8 249
spin 6 587 588
as strange particle 13 168
strangeness number
6 587 588
types 6 587 588
V particle 14 576
Hyperopia 5 172
Hyperparathyroidism 9 561,
12 369
Hyperpathia 9 564
Hyperphagia 6 519
Hyperplane 1 392 6 155
10 492
Hyperplasia 6 588* 593 9 320
Hyperpnea 1 488
Hyperpotassemia 2 265
Hyperproteinemia 8 256
Hypersensitivity 1 474 554,
556, 3 401 6 588 590*
allergy atopic 1 257
analgesics 1 566
anaphylaxis 1 595
Hypersensitivity—cont
antibody 1 468
asthma 1 601
biologicals 2 218
chemotherapy 3 53
coccidioidomycosis 3 249
delayed 6 589
guinea worm infection
6 292
hay fever 6 345
histidine 6 457
immediate 6 589 590
Streptococcus 13 178
tuberculosis 14 130
Hypervolid cells 10 492
Hypersomnia 12 375 376
Hypersonic flight 6 590 592*,
14 514
aerothermodynamics
1 102 104
ballistic trajectory 6 591
conditions at high speed
6 590
flow over a blunt nosed
body 6 591
glide trajectory 6 592
heat loads 6 591
reentry 6 591
skin friction 12 372
skip trajectory 6 592
vehicular trajectories
6 591
Hypersonic wind tunnel
14 500 501
Hypersplenism 13 9
Hypersthene 11 129
Hypersurface 12 557
Hypertely (macroevolution)
8 13
Hypertensin 9 629
Hypertension 6 592
renal origin 14 232 233
Hyperthermy 13 596
Hyperthyroidism 13 599, 627
14 342
Hypertrajulidae 1 568 569
Hypertrophy 6 588 593*
Hyperuricemia 8 258
Hyphantria cunea 7 472
Hyphochytriales 10 200
Hyphochytrium 10 200
Hyphomicrobiaceae 2 22,
6 593
Hyphomicrobiales 2 22 6 593*
11 64
bacteria taxonomy of 2 11
Hyphomicrobiaceae 6 593
Pasteuriaceae 6 593
Schizomycetes 12 65 66
Hyphomicrobium vulgare 6 593
Hypidiormorphic granular
texture igneous rocks
7 11
Hypisodus 1 568

Hydrogenation 6 552-553
catalysts 2 548, 6 553
catalytic 6 552
equipment 6 553
fat and oil, nonedible 5 190
food 5 398 399
hydrogenolysis 6 552
petroleum processing 10 69
see also Dehydrogenation
Hydrogenolysis 6 522, 11 403
Hydrogenomonas 2 28, 54, 8 129, 340, 11 65
Hydrogeology 6 276
Hydrographic surveys 13 329
Hydrography 6 553-554
Hydrohalic acids 6 319
Hydroida 3 255, 6 554 555
Anthomedusae 3 255
Chondrophora 3 255
Leptomedusae 3 255
Limnomedusae 3 255
Hydrokinematics 6 537-538*, 555
see also Hydrodynamics
Hydrokinetics 6 538 540*, 555-556
see also Hydrodynamics
Hydrolaccolith 6 556
Hydrolagus affinus 6 465
Hydrolase 5 22
Hydrobth 2 398
Hydrologic cycle 6 556 557*, 13 316-317, 14 392 393
climatology 3 178
conservation of resources 3 408-411
water conservation 14 392-393
Hydrology 6 171, 556-557
evapotranspiration 5 129-130
forest 5 450
glacier 6 198 205
ground water 6 276 278
hydrography 6 553
lake 7 386-389
saline water reclamation 12 13
snow surveying 12 393
spring (water) 13 18
stream gaging 13 175
surface water 13 316-321
terrestrial frozen water 13 511
tree ring 14 77
water power 14 399 400
see also Hydrometeorology, Hydrosphere, geochemistry of, Precipitation (meteorology)
Hydrolysis 6 557-559*, 14 389
ester 5 73-75
salt (chemical) 12 16-17
Hydrolysis—*cont*
silicate rock weathering 14 459
soap and detergent 12 394
Hydrolytic agent (food) 5 377
Hydrolytic processes 6 558 559
Hydromagnetic wave 10 392-393
Hydromagnetics 8 54 55
Hydromantes stalicus 12 7
Hydromechanics 6 559
Hydrometallurgy 6 559-560
Hydrometeorology 6 560 562
analysis of precipitation data 6 561
atmospheric water cycle 6 560
evaporation 6 561-562
precipitation 6 560 561
transpiration 6 561 562
watershed area 6 561
see also Evapotranspiration, Precipitation (meteorology)
Hydrometeors 5 367
Hydrometer 4 62, 6 562 563*
Archimedes' principle 1 517
chain balanced float type 6 563
inductance bridge 6 562
photoelectric 6 562
thermohydrometer 6 562
Hydrometridae 6 401
Hydron Blue R 2 450
Hydronephrosis 7 342
Hydronium ion 6 550, 557
Hydropericarditis 6 362
Hydropericardium 4 409
Hydroperoxidase 5 21
Hydroperoxidase 10 29
Hydrophidae 13 26, 27
Hydrophiloidea 3 276
Hydrophilus 3 286
Hydrophobia *see* Rabies
Hydrophone 6 563, 14 18*
electrokinetic transducer 4 481
solion 12 483
Hydrophotometer 12 118
Hydroplant *see* Power plant
Hydroponics 6 563 565
economic possibilities 6 564
mineral solution culture 6 563
nutrient solution 6 564
Hydroquinone 6 565* 10 112, 11 194
Hydrosalpinx 11 480
Hydrosere 13 232
Hydrosite 14 400
Hydrosol 9 585
Hydrosphere 6 565 14 399
Hydrosphere, geochemistry of 6 565-568
closed basins 6 568
Hydrosphere, geochemistry of—*cont*
fresh waters and rain 6 568
oceanic waters 6 565-568
origin and evolution 6 567-568
photosynthesis 6 566-567
residence times 6 565-566
salt content 6 567
see also Hydrology, Sea water
Hydrostatic paradox 10 29
Hydrostatic pressing 2 649
Hydrostatic sterilization (food) 5 392
Hydrostatics 6 568 570
aerostatics 1 102
applications 6 569
Archimedes' principle 1 517
buoyancy 2 570, 6 569
hydrostatic forces 6 569
Pascal's law 9 588
pressure-measuring instruments 6 569
pressure transmission 6 570
pressure volume 6 569
stability 6 569
see also Fluid statics
Hydrosulfites 13 260
Hydrothermal ore deposits 9 378-379, 383-388
Hydrothorax 4 409
Hydrotropism 10 366
Hydroureter 7 342
Hydrous chromic oxide 3 106
Hydroxide 6 570
Hydroxide ion 2 106
2 Hydroxindole *see* Oxindole
5 Hydroxmethylcytosine 11 115
alpha-Hydroxy acid 7 380
bacterial oxidations 2 33
beta hydroxy acyl-CoA 2 31
11(beta) hydroxy-delta4-androstene 3 17-dione 1 399
5 hydroxy 2 hydroxymethyl gamma-pyrone 7 369
Hydroxy nitrile 1 229
Hydroxy L proline 2 35
6-Hydroxy-2-pyridone 11 111
Hydroxy triarylmethane dye 4 301
Hydroxy xanthene dye 4 302
Hydroxyacetylene 2 36
beta Hydroxyacyl CoA dehydrogenase 7 532
Hydroxyacyloxy compound 5 43
3 hydroxyanthranilic acid 14 126
Hydroxyanthraquinone glycoside 6 224
Hydroxyapatite 1 489, 12 365, 368
Hydroxybenzene *see* Phenol
m Hydroxybenzoic acid 2 473
p-Hydroxybenzoic acid 2 473
p-Hydroxybenzyl alcohol 2 33
p Hydroxybenzylpenicillin 9 619
beta hydroxybutyric acid 2 12, 7 534
ketosis 7 540
Hydroxycitronellal 13 497
17 Hydroxydeoxycorticosterone 1 74 78, 6 483 484
beta Hydroxyethyl hydrazine 6 550
Hydroxyethylation of alcohol 10 487
Hydroxyethylcellulose 2 62b
alpha hydroxyglutarate 7 618
3 Hydroxyindole *see* Indoxyl
5 hydroxyindoleacetic acid 12 196, 14 126
beta-hydroxyisobutyryl CoA 14 260
Hydroxyisoquinoline 7 289
3-hydroxykynurenin maternal influence 8 171
Hydroxyl organic quantitative analysis 9 399
Hydroxyl compound 6 570
Hydroxyl derivatives nomenclature 9 596
Hydroxyl ion 2 106, 6 550
Hydroxylamine 8 580
Hydroxylammonium salts 9 110
Hydroxylapatite 9 561
Hydroxylation reaction 6 570-571
5 hydroxylysine 7 638
alpha Hydroxymethyl a-(N-acetylaminomethylene) succinic acid 2 37
N(10) hydroxymethyl THFA 1 318
3 Hydroxymethylindole 7 63
Hydroxymethyltetrahydrofolic acid 6 221
6 Hydroxynicotinic acid 2 37
p Hydroxyphenylpyruvic acid 2 35, 4 256
6(beta)-Hydroxyprogesterone 10 645
11-alpha hydroxyprogesterone 15 158
17(alpha) Hydroxyprogesterone 15 526
Hydroxyproline 10 357, 11 5 130
2-Hydroxypyridine 11 111
3 Hydroxypyridine 11 111
delta 4 Hydroxypyrroline 2 carboxylic acid 2 35
4-Hydroxyquinaldinic acid 11 193
Hydroxyquinoline 11 192
8-Hydroxyquinoline 11 193

[illegible] clinical pathology 3 202
I spin *see* Isotopic spin
Ianira 7 284
Iapetus 12 40
Iapyx diversiungus 4 210
Iatron storage tube 13 161
Ibalidae 6 574
Iberian Peninsula 5 116
Iberian Sea 8 207
Iber 7 1
Ibis 3 120, 7 1*
Ibididae 7 456
Icarus 1 596 597
ICBM *see* Intercontinental ballistic missile
Ice 14 387
  classification of forms 13 512
  glacial *see* Glacier
  massive ice constants 13 512 513
  in permafrost 10 21
  in the sea *see* Iceberg; Sea ice
  sediment transport by 12 136
  stable phases of 13 512
  terrestrial *see* Terrestrial frozen water
Ice Age *see* Glacial Epoch
Ice cap 6 195, 7 3
  Antarctica 1 440
  Arctic Ocean 1 525
  distribution 6 196 199
  Greenland 1 524
  ice field (Eisstromnetz) 7 5
Ice clouds 3 210
Ice cream 7 1 5
  ice milk 7 2
  manufacture 7 1
  microbiology 7 2 3
Ice crystals 10 574 575
  cloud physics 3 215 217
  halo 6 325
  snow 12 591
Ice drift *see* Sea ice
Ice erosion *see* Glaciated terranes
Ice field (Eisstromnetz) 7 5
Ice island 7 6
Ice lense 5 340
  soil mechanics 12 455
Ice manufacture 7 4 6* 11 415
  see also Dry ice
Ice milk 7 2
Ice needles 10 574 575
Ice nuclei (cloud physics) 3 215 217
Ice pellets 10 574 575
Ice point 7 6*, 13 486 487
Ice sheet 6 192, 7 3*
Ice shelf 1 439
Ice storm 5 540
Iceberg 7 6 8
  Antarctic icebergs 1 438, 7 7
  Antarctica 1 441
  Arctic icebergs 7 6
  Atlantic Ocean 1 624
  characteristics 7 6
  Greenland 1 524
  polar navigation 10 444
  types 7 6
Icebreaker 12 262, 267
Iceland 1 522 523 622 5 109 117
Iceland spar 2 397
  calcium mineral 2 398
  crystal optics 3 589 591
Icelandic Low 1 522
Icelandic moss 8 621
Icerya 3 107
Icerya purchas 6 475
Ich 6 300
Ichneumon 7 8
Ichneumon fly 6 574
Ichneumonidae 6 574 7 8
Ichthophthirius 6 583
Ichthydium 3 2 6 77
Ichthyobdellidae 11 556
Ichthyophis 12 361
Ichthyophthirius 6 300
Ichthyopterygia 7 8*, 11 484
Ichthydorus 1 694, 7 8*, 12 362
Ichthyornithes 7 8
Ichthyornithidae 7 8
Ichthyornithiformes *see* Ichthyornithes
Ichthyosaur *see* Ichthyosauria
Ichthyosauria 7 9* 11 484 12 364
Ichthyosaurus 5 474, 7 327, 11 484
Ichthyosporidium gigenteum 6 334
Ichthyostega 1 335 7 9
Ichthyostegalia 1 334 7 9*, 575
Ichtyotomidae 10 461
Ichthyoxenus jellinghausii 5 291
Icilius Quintus 13 580
Icing (aircraft) 1 97
Iconaster perierctus 14 260
Iconoscope 13 464
Icosahedron 10 471, 492
ICSH *see* Interstitial cell stimulating hormone (ICSH)
Ictalurus furcatus 2 552
Ictalurus lacustris 2 552
Ictalurus (*Ameiurus*) *nebulosus* 10 125
Icteria virens 3 11
Icteridae 2 234, 3 528 7 404 9 407
Icterus bullocki 9 407
Icterus galbula 9 407
Icterus index 3 199
Icterus spurius 9 407
Ichthyopterygium 12 357
Ictidosaur *see* Ictidosauria
Ictidosauria 7 9*, 11 484
Ictops 7 143
Icy Bay Alaska 6 199
Id Freudianism 5 534
IDso 7 961
Ideal (ring theory) 11 579
Ideal chemical solution 12 487
Ideal flow 5 521
Ideco full view mast 9 301
Identity algebra 1 239 240
  logic 7 578
Identity element (group theory) 6 282
Identity matrix 8 183
Ideokinetic apraxia 1 494
Ideomotor apraxia *see* ideokinetic apraxia
Idioblast 7 436 441 8 296, 12 78
Idiomorphic granular rock texture 7 11
Idiopathic epilepsy *see* Epilepsy
Idiopathic familial jaundice 7 302 303
Idiopathic hypercholesteremia 8 260
Idioseptus pygmaeus 2 644
Idiosoma 1 24
Idler gear 6 89
Idocrase 7 10
Idontostomatida 13 5
D(-) Idose 2 455
Idotea 14 264
Idotea metallica 14 264
Idotea neglecta 14 264
Idoteidae 14 264
Idothea 7 283
Ietidosauria 7 9
I F *see* Intermediate frequency series of entries
IFR *see* Instrument flight rules (IFR)
Igneous lead 7 430
Igneous rocks 6 138 7 10 18*, 11 590
  amygdaloidal structure 7 15
  aureoles 1 668
  banding in 7 15
  chemical composition 7 16 17, 548
  clans or associations 10 85
  classification 7 15
  common types 10 86
  compressional velocity 12 151
  compressive strength 4 615
  crystallinity 7 10
  density of 7 18
  elements, distribution in 4 550 551
  ellipsoidal structure 7 14
  enclosures 7 14
  flow structure 7 15
  fluidal structure 7 15
  fluxion structure 7 15
  grain size 7 10
  grain shape 7 10 11
  granophyric texture 7 12-13
  heat production in 4 532
  hourglass structure 7 13 14
  hypabyssal types 7 16
  implication textures 7 12
  inclusions 7 14
  intergrowths 7 12
  lead, isotopic composition 7 428
  metals in 9 376
  miarolitic openings 7 13
  micrographic texture 7 12-13
  micropegmatitic texture 7 12 13
  mineral composition 7 17 18
  molten rock material 8 15-18
  myrmekitic texture 7 12-13

Hypnosis 6 594-595
aid in examination 6 594
in conjunction with analysis 6 594
diagnostic tool 6 594
as a motivational tool 6 594
as a substitute for pharmacological agents 6 595
in symptom control 6 594
as an uncovering device 6 594
Hypnotic 6 595
Hypobasidium 6 427
Hypoblast 6 78-79
Hypobranchial musculature, anatomy 8 653
Hypochilidae 1 559
Hypochilomorphae 1 498
Hypochlorination water purification 14 401
Hypochlorite 3 72, 6 595*
as antimicrobial agent 1 475
bleaching 2 258
production 4 466
Hypochlorous acid 3 72, 6 595
Hypochondria 12 500
Hypocopridae 3 278
Hypocotyl 12 145
Hypocreales 14 128, 630
Hypoderma bovis 4 218, 8 680
Hypoderma crossi 8 680
Hypoderma lineata 4 218, 8 680
Hypodermatidae 4 212
Hypodermis 3 495, 6 595-596*
Hypoeutectoid steels 6 581
Hypogamma-globulinemia 8 257
Hypoglossal nerve 3 538
embryology 9 47
Hypoglycemia 8 265
Hypogyny 5 326-334
Hypohalite haloform reaction 6 323
Hypoid gear 6 85
Hypoiodous acid 7 238
Hypolimnion 3 527, 5 522
Hyponomees 14 128
Hyponitrite 9 110
Hypoparathyroidism 9 561
Hypophosphatemic rickets 6 511
Hypophysectomy 10 249
Hypophysis 6 596-597
effector systems 4 414
nervous system 9 42-63
see also Endocrine gland, Pituitary gland
Hypopituitarism 10 252
Hypoplasia 6 597
Hypopotassemia 2 265
Hypoproteinemia 2 265, 8 257
Hypoprothrombinemia 6 595-596
Hyposaurus 3 553
Hyposchromic shift spectrophotometric analysis 12 583
Hypostoma 3 564
Hypostomides *see* Pegasiformes
Hyposulfurous acid 13 259
Hypotaurine: cysteine 3 649
Hypotenuse 11 132
Hypothalamus 6 519, 9 80, 10 252, 13 182, 592
thermotherapy 13 594
thirst 13 608
Hypothallus Myxomycetes 8 688
Hypothermia 6 597
phenacetin 10 110
Hypothesis 6 598
experiment 5 143
testing, statistics 13 72
Hypothyroidism 3 546, 13 627
Hypotrichida 6 598*, 11 53, 13 5
Hypovemia 2 551
Hypoxia 3 145, 12 543
Hypsilophodon 4 200, 11 484
Hypsographic curve 13 216
Hypsometer 5 457-461
Hyracoidea 6 598*, 8 82
Hyracoidea fossils 6 598 599
Gemolyidae 6 598
Myohyracidae 6 598
Procaviidae 6 598
Hyrtarch succession 13 232
Hyrtax 6 598
Hyrtrichus 4 202
Hysteresis, dielectric 4 115 116
Hysteresis, ferroelectric 5 225-226
Hysteresis, instrument 10 296
Hysteresis, magnetic 6 599*, 8 50 51
Hysteresis, mechanical 1 401, 4 12
Hysteresis, piezoelectric 5 226
Hysteresis, thermal 6 599 600
Hysteresis clutch 3 226
Hysteresis damping *see* Damping
Hysteresis loop 6 599
ferroelectrics 5 225
hysteresis loss 3 479
Hysteresis loss 3 479
magnetic circuits 8 50
reduction 3 479
Steinmetz coefficient 3 479
Hysteresis motor 1 284, 6 600
Hysteria 6 600
Hysterogenic relics 8 297
Hystricomorpha 11 614
Hystricopsilla gigas 5 299
Hystricurus 2 426

Impedance, acoustic—*cont*
impedance analogies 7 36
sound 12 510
sound absorption 1 18 19
Impedance, electrical 1 270 7 36*
ac circuits 1 271 272
admittance 1 71
analogy to acoustic impedance 7 36
antennas 1 450 451
capacitive reactance 11 349
electrical measurements 7 38 47
inductive reactance 11 349
in parallel 1 272
in series 1 272
transformer 14 26 27
Impedance, mechanical 5 437 7 37*
Impedance bridge 7 66 67
Impedance coupled amplifier 1 343 14 357
Impedance matching 7 37 38
acoustic filter 5 265 266
antennas 1 451
cathode follower 2 553 7 37
maximum power transfer theorem 7 37
microwave transmission lines 8 424
networks 7 37
transformer 7 37
Impedance measurement 7 68
capacitance measurement 2 441-445
inductance measurement 7 68 69
measurement of parameters 4 457 458
resistance measurement 11 490 495
Impedance measurements, high frequency 7 38 47
Boonton RX meter 7 42
General Radio admittance meter 7 42
General Radio rf bridges 7 41
Hewlett Packard vhf bridge 7 43
microwave reflectometer 7 43
null methods 7 40
parallel resonance methods 7 39
Q meter 11 133 134
Q of a tuned circuit or cavity 7 40
resonant rise method 7 39
R_0 Q_0 of a resonant cavity 7 40
Impedance measurements, high frequency—*cont.*
radio frequency bridges 7 40
series resonance methods 7 38 39
slotted line 7 44
slotted section 7 44
standing wave detector 7 43 46
transfer function and immittance bridge 7 42
Wayne Kerr rf bridge 7 41
Impeller axial flow or propeller 2 632
centrifugal 2 632
mixed flow 2 632
mixing 8 522
torque converter 13 686
Impennes 12 607
Imperfect flower 5 326
Imperfections in crystals *see* Crystal defects
Imperial bushel 8 188
Imperial gallon 8 188
Imperial Valley 9 160
Impersonal micrometer 1 610
Impetigo 2 2, 7 47*
Implicit functions 9 569 570
Imported currant worm 6 580
Imported fire ant 6 581
Impregnated bit 2 296
Improper integrals 7 168 169
Impsonite 7 47
Impulse (mechanics) 7 47
Impulse, specific *see* Specific impulse
Impulse generator 7 47 48* 9 573
Impulse turbine 7 48 14 148
Pelton wheel 9 615
Impulsive force *see* Impact (impulsive force)
Impulsive loading 7 35
Impurity (crystals) 5 581 582* 586
Impurity atom acceptor 1 28
crystal defects 5 582
donor 4 263
Impurity semiconductor *see* Semiconductor
Impurity sensitized (luminescence) 7 615
IMViC test 7 48 49*, 12 254
Aerobacter 1 84
citrate 7 48
indole 7 48
methyl red 7 48
Salmonella 12 14
Voges Proskauer 7 48
In-situ combustion 10 80
Inadunata 3 547 4 360, 368 369* 7 49
Inari Lake 5 115
Inarticulata 2 314 7 49*
Atremata 1 663* 7 49
Neotremata 7 49 9 58*
Incandescence 7 49 50
Incandescent lamp 7 50 54
base types 7 50
bulb shapes 7 50
characteristics 7 52 53
filament structures 7 50
incandescence 7 50
miniature 7 54
Incendiary 7 54
ammunition 1 539
bomb 1 535-536
metallic incendiaries 7 54
petroleum incendiaries 7 54
pyrotechnics 11 128
Incense cedar 2 578
Incenter (triangle) 1 405
Incentive motivation 8 604
Incentive wage plan 14 380
Inch 8 188
Incineration 1 154 155
Incisional hernia 6 425
Incisor 4 65
Inclination (earth's axis) 6 125
Inclination (orbital motion) 9 572
Inclined plane 7 55
lever 7 494
principal forces 7 55
rigid body dynamics 11 576 577
wedge 14 460
Inclined skip hoist 8 475
Inclined tube manometer 8 93
Inclinometer 6 149 7 55*
dip circle 7 55
dip needle 7 55
Inclusion (chemical precipitation) 10 572
Inclusion blennorrhea 5 171, 7 55*
Inclusion bodies (virus) 7 55*, 11 197, 12 14
Inclusion compounds *see* Clathrate compounds
Incoherent scattering 12 57
Introlov 7 263 266
Incomplete block design 5 145
Incomplete flower 5 326
Incomplete metamorphosis 5 133
Incompressible flow 7 55 56
Bernoulli's theorem 2 169
Inconel 3 258, 7 263
heat resisting alloys 7 265 266
nickel alloys 9 96
Inconel diaphragm 11 2
Increment borer Swedish 5 461
Incunabula 10 597
Incurvariidae 7 464
Incus ear 4 319
Rotifera 11 634
skeletal system 12 357
Indallov 7 263
Indamine and indophenol dye 4 305
Indefinite integral 7 167
Indefinite metric *see* Metric
Indene 3 235, 6 535 536 7 56*
Indentation hardness scales 6 537 538
tests 8 274
Independence (conditional probability) 10 626 627
Independent assortment (genetics) law of 8 223
recombination 11 373
Independent sideband radio receiver 11 259
transmitter 11 265
Independent trials 10 627 628
Indeterminate cleavage 3 168
Indeterminate errors analytical chemistry 1 394
Index of continentality 3 424
Index ellipsoid 3 587 591
Index fossil 2 159 5 475, 7 56
Index Kewensis 10 577
Index of refraction *see* Refractive index
Indian buffalo 2 250
Indian corn 12 236
Indian meal moth 7 472
Indian Ocean 7 56-59
Bass Strait 7 59
coastal chart 13 636
islands of 1 580
monsoon 8 584 585
ocean floor 7 56
pelagic sediments 8 135
salinity 7 56 57
subsurface circulation 7 58
surface currents 7 56 58
temperature 7 56 57
tributary seas 9 271
Indian plateau 1 580
Indian python 13 25
Indian rat flea 12 345
Indian red 10 224
Indian tick typhus *see* Fièvre boutonneuse
Indican 6 224, 7 63
Indicated air speed 1 220
Indicating fuse 5 578
Indicating gage 6 5
Indicator, acid base 7 59 61
dye 4 307
hydrogen ion 6 551
titration 13 657
Indicator lamp 6 60 61
Indicator media 3 615
Indicator organisms in ocean 12 121
Chaetognatha 3 1 2
Indicator plants 6 118
Indicator tube, electron ray 14 253 254
Indicatoridae 10 213
Indicatrix, optical *see* Index ellipsoid
Indicolite 13 693
Indigo 4 306, 7 63

Igneous rocks—*cont*
ophitic texture 7 12
orbicular structures 7 14
perthitic texture 7 12-13
petrology 10 83 84
phenocrysts in 10 111
pillow structure 7 14, 10 567
plutonic types 7 15-16
poikilitic texture 7 11-12
porphyritic texture 7 11-12
preferred orientation in 10 49
reaction rims 7 14
regional character *see* Petrographic province
schlieren structure 7 15
spherulite structures 7 14 15
vesicular structure 7 *12-13*
volcanic types 7 16
zoned crystals 7 13
Ignimbrite 14 349
Ignition gravimetric analysis 6 262 263
ignition coil 7 19, 71-72
Ignition system 7 18-20
automotive 1 687
battery system 7 18
diesel 7 19-20
distributor 4 259 7 19
firing sequence 7 18
ignition coil 7 19, 71-72
magneto system 7 19, 8 51-52*
spark plug 12 561-562
Ignitron 7 20 22
Ignorable coordinate *see* Cyclic coordinate
Iguana 12 361
Iguanidae 3 7, 6 486, 13 24
Iguanodon 4 198 200, 11 522
Iguite 10 86
Ilesius 6 73, 7 22*
Ileum 1 492, 4 161, 7 223
Ilex 3 188
Ilex aquifolium 6 464
Ilex opaca 6 464
Ilha Nova Volcano 14 351
Ili River 1 580
Iliac artery 1 487
Ilium 6 455, 9 616 12 358
Illaenus lacertus 14 105
Illex 4 34
Illg, P 9 169
Illinoian (glacial) 6 195
Illinois Waterway 7 116
Illite 3 165, 7 22-23*
cation exchange 7 22
dehydration 7 22
mica type clay mineral 3 165
Illium G corrosion resisting alloy 7 266
electrical-resistance alloy 7 265
Illuminance 7 23
Illumination 7 23 29
arc lamp 1 503 504
automobile headlamps 7 29
colored light 7 29
elliptic reflectors 7 27
exterior-lighting design 7 29
floodlight 11 4
fluorescent lamp 5 347-349
incandescent lamps 7 50 54
interior-lighting design 7 27
interreflection method 7 28
lens control 7 27
light control methods 7 27
light panel 7 507-508
light sources 7 24
location and spacing of luminaires 7 28
lumen method of design 7 28
luminaire 7 610
luminosity curve of human eye 7 23
luminous architectural elements 7 28
in mines 8 491
natural lighting 7 28
outdoor lighting 11 4
parabolic reflectors 7 27
photometers 10 170 173
photometric definition 7 23
photometric units *see* Photometric units
photometry 10 173-175
polarization of light 7 27
projector (light) 11 5 4
Purkinje effect 7 23
recommended standards 7 29
reflection and transmission 7 24 27
room coefficients 7 28
searchlights 11 4
spotlighting 7 28, 11 4
standard black-body *radiator* 7 23
supplementary lighting 7 28
survey 10 175
vapor lamps 14 274
Illumination engineering 7 23 29
Illuminometer 10 170 171
Ilmen Lake 5 115
Ilmenite 7 29*; 8 278
in black sands 12 22
titanium ore 15 652
Iloteyin *see* Erythromycin
ILS *see* Instrument landing system (ILS)
Ilyanthus 1 52-54
Image, acoustical 7 29
Image, electric 4 540-541
Image error coefficients (optics) 9 367
Image, latent *see* Latent image
Image, optical 7 29 31
aberrations 1 3 7, 7 30, 9 363 368
cameras 2 428 431
chromatic aberration 3 89 91
eyepieces 5 173
geometrical optics 9 363-369
ghost images 6 183 184
mirror optics 8 506 510
optical fibers 9 348 349
real 7 29 30
resolution 7 30
telescope images 13 448 452
virtual 7 29 30
Image converter tube: infrared 7 104
radiography of metals 11 305
television camera tube 13 461 467
Image dissector 13 466
Image focal point 9 365
Image iconoscope 13 464 465
Image orthicon 7 31*, 13 459, 462-464
Image parameter filter 5 270
Image potential 12 68-69
Image sector 3 397
Imagen 5 145
Imaginal bud 4 215
Imaginary number I 239
Imago 5 52
Imbibition 10 288
Imbreeding plants 2 327-330
population genetics 10 508
Imhoff, Karl 7 31
Imhoff tank 7 31*, 12 219
Imidazole 1 702, 7 31-33*, 11 115
Imidazoleacetic acid 6 457
Imidazolidine 7 32
Imidazoline 7 32
Imide 9 110
Iminazole 7 31
Imine 6 271
Imino glutaric acid 9 92
Imitation gem 6 99, 101
Immediate hypersensitivity 6 589-590
Immiscibility 5 56
Immiscible solvents 5 146
Immis, A D 7 469
Immune adherence 10 91
Immune lysins 7 688
Immune precipitation protein isolation 11 37
Immune serums 2 217
Immunity 1 468, 7 33 33*
acquired 7 34
active 2 217, 7 34
bacteriology, medical 2 68
biological 2 217
and chemotherapy 7 35
chickenpox and shingles 5 59
immunization 7 34
and irradiation 7 34
mechanisms 7 33
natural 7 33
passive 2 217, 7 34
phagocytosis 10 91
vaccination 14 239
Immunization infectious disease control 7 94
multiple 2 219
see also Immunity
Immunoelectrophoresis 11 38
Immunology 1 696, 7 35*
ablastin 1 7
agglutinin 1 112
antibody 1 468 469
antigen 1 472
antitoxin 1 487
blood groups 2 266 269
botulism 2 307
complement (serum) 5 333
fluorescent-antibody technique 8 383
heterophile antigen 6 429
hypersensitivity 6 590
immunity 7 33
neutralizing antibody 9 82
opsonin 9 346
precipitin 10 576
properdin 11 15
toxin antitoxin reaction 14 7
toxin, bacterial 14 6
virulence 14 329 330
Impact (impulsive force) 5 291, 7 35*
Impact extrusion 5 161
Impact forging 5 471
Impact fuze 1 556 560
Impact loads 7 568, 12 291
Impact strength 8 274, 13 184
Impact tube *see* Pitot tube
Impedance, acoustic 7 35 36
acoustic compliance 7 36
acoustic filter 5 265 266
acoustic mass 7 36
acoustic reactance 7 36

Impedance acoustic—*cont*
impedance analogies 7 36
sound 12 510
sound absorption 1 18 19
Impedance electrical 1 270 7 36*
ac circuits 1 271 272
admittance 1 71
analogy to acoustic impedance 7 36
antennas 1 450 451
capacitive reactance 11 349
electrical measurements 7 38 47
inductive reactance 11 349
in parallel 1 272
in series 1 272
transformer 14 26 27
Impedance mechanical 5 437, 7 37*
Impedance bridge 7 66 67
Impedance-coupled *amplifier* 1 343 14 557
Impedance matching 7 37 38
acoustic filter 5 265 266
antennas 1 451
cathode follower 2 553 7 37
maximum power transfer theorem 7 37
microwave transmission lines 8 424
networks 7 37
transformer 7 37
Impedance measurement 7 68
capacitance measurement 2 441 445
inductance measurement 7 68 69
measurement of parameters 4 457 458
resistance measurement 11 490 495
Impedance measurements high frequency 7 38 47
Boonton RX meter 7 42
General Radio admittance meter 7 42
General Radio rf bridges 7 41
Hewlett Packard vhf bridge 7 43
microwave reflectometer 7 45
null methods 7 40
Parallel resonance methods 7 53
Q meter 11 133 134
Q of a tuned circuit or cavity 7 40
resonant rise method 7 39
R_0 Q_0 of a resonant cavity 7 40
Impedance measurements, high frequency—*cont*
radio frequency bridges 7 40
series-resonance methods 7 38-39
slotted line 7 44
slotted section 7 44
standing wave detector 7 43 46
transfer function and immittance bridge 7 42
Wayne Kerr rf bridge 7 41
Impeller axial flow or propeller 2 632
centrifugal 2 632
mixed flow 2 632
mixing 8 522
torque converter 13 686
Impennes 12 607
Imperfect flower 5 326
Imperfections in crystals *see* Crystal defects
Imperial bushel 8 188
Imperial gallon 8 188
Imperial Valley 9 160
Impersonal micrometer 1 610
Impetigo 2 2, 7 47*
Implicit functions 9 569 570
Imported currant worm 6 580
Imported fire ant 6 581
Impregnated bit 2 296
Improper integrals 7 168 169
Impsonite 7 47
Impulse (mechanics) 7 47
Impulse specific *see* Specific impulse
Impulse generator 7 47 48* 9 573
Impulse turbine 7 48 14 148
Pelton wheel 9 615
Impulsive force *see* Impact (impulsive force)
Impulsive loading 7 35
Impurity (crystals) 5 581 582*, 586
Impurity atom acceptor 1 28
crystal defects 5 582
donor 4 263
Impurity semiconductor *see* Semiconductor
Impurity sensitizer (luminescence) 7 615
IMViC test 7 48 49*, 12 254
Aerobacter 1 84
citrate 7 48
indole 7 48
methyl red 7 48
Salmonella 12 14
Voges Proskauer 7 48
In situ combustion 10 80
Inadunata 5 547, 4 360 368 369* 7 49
Inari Lake 5 115
Inarticulata 2 314 7 49*
Atremata 1 663* 7 49
Neotremata 7 49 9 38*
Incandescence 7 49 50
Incandescent lamp 7 50 54
base types 7 50
bulb shapes 7 50
characteristics 7 52 53
filament structures 7 50
incandescence 7 50
miniature 7 54
Incendiary 7 54
ammunition 1 539
bomb 1 535 536
metallic incendiaries 7 54
petroleum incendiaries 7 54
pyrotechnics 11 128
Incense cedar 2 578
Incenter (triangle) 1 405
Incentive motivation 8 604
Incentive wage plan 14 580
Inch 8 188
Incineration 1 154 155
Incisional hernia 6 425
Incisor 4 65
Inclination (earth's axis) 6 125
Inclination (orbital motion) 9 572
Inclined plane 7 55
lever 7 494
principal forces 7 55
rigid body dynamics 11 576 577
wedge 14 460
Inclined skip hoist 8 475
Inclined tube manometer 8 93
Inclinometer 6 149 7 55*
dip circle 7 55
dip needle 7 55
Inclusion (chemical precipitation) 10 572
Inclusion blennorrhea 5 171, 7 55*
Inclusion bodies (virus) 7 55* 11 197, 12 14
Inclusion compounds *see* Clathrate *compounds*
Incoherent scattering 12 57
Incolax 7 263 266
Incomplete block *design* 5 145
Incomplete *flower* 5 326
Incomplete metamorphosis 5 143
Incompressible *flow* 7 55 56
Bernoulli's theorem 2 169
Inconel 1 258 7 263
heat resisting alloys 7 265 266
nickel alloys 9 96
Inconel diaphragm 11 2
Increment borer Swedish 5 461
Incunabula 10 597
Incurvariidae 7 464
Incus ear 4 319
Rotifera 11 634
skeletal system 12 357
Indalloy 7 263
Indamine and indophenol dye 4 303
Indanthrone 4 305
Indefinite integral 7 167
Indefinite metric *see* Metric
Indene 5 235; 6 535, 536, 7 56*
Indentation hardness, scales 6 337 339
tests 8 274
Independence (conditional probability) 10 626 627
Independent assortment (genetics) law of 8 225
recombination 11 375
Independent *sideband radio* receiver 11 259
transmitter 11 265
Independent trials 10 627 628
Indeterminate cleavage 3 168
Indeterminate errors, analytical chemistry 1 394
Index of continentality 5 424
Index ellipsoid 5 587 591
Index fossil 2 159 5 475, 7 56
Index Kewensis 10 377
Index of *refraction see* Refractive index
Indian buffalo 2 250
Indian corn 12 236
Indian meal moth 7 472
Indian Ocean 7 56 59
Bass Strait 7 59
cotidal chart 15 636
islands of 1 580
monsoon 8 584-585
ocean floor 7 56
pelagic sediments 8 135
salinity 7 56 57
subsurface circulation 7 58
surface currents 7 56 58
temperature 7 56 57
tributary seas 9 271
Indian plateau 1 580
Indian python 13 25
Indian rat flea 12 545
Indian red 10 224
Indian tick typhus *see* Fièvre boutonneuse
Indican 6 224, 7 63
Indicated air speed 1 220
Indicating fuse 5 578
Indicating gage 6 5
Indicator acid base 7 59 61
dye 4 307
hydrogen ion 6 551
titration 13 657
Indicator lamp 6 60 61
Indicator media 5 615
Indicator organisms in ocean 12 121
Chaetognatha 3 1-2
Indicator plants 6 118
Indicator tube, electron ray 14 253-254
Indicatoridae 10 213
Indicatrix, optical *see* Index ellipsoid
Indicolite 13 693
Indigo 4 306 7 62

Indigofera 4 298, 7 63
Indigofera hirsuta 3 527
Indigoid dye 4 305
Indigotin 7 63
Indirect arc furnace 4 427
Indirect lithography 10 600 601
Indium 7 61 62
  compounds 7 61-62
  electron configuration 4 504
  extractive metallurgy 8 277
  ionization potential 4 504
  metal 7 61-62
  organometallic compounds 9 403
Indole 6 106, 7 62-65*
Indole 3-acetic acid 1 693
Indole-3 butyric acid 1 693
Indole-3 carboxaldehyde 7 63
Indole-3-carboxylic acid 7 63
Indole test (microbiology) 7 48
Indoleacetic acid plant growth hormone 10 340-342*, 362
  stem cuttings 13 124
  tryptophan 14 124
Indoleacetonitrile 10 340
Indolebutyric acid 10 342, 13 124
Indoleglycerol 1 315
Indolenine 7 62
Indolepyruvic acid 10 340
Indoline 7 63
Indonesian Islands 4 355
Indoxyl 2 35, 7 64
  glucoside derivative 7 63
  in indican 6 224
  reactions 7 64
  structural formula 7 62
Indraft wind tunnel 14 500
Induced dipole 4 211
Induced emf eddy current 4 409
  electromagnetic induction 7 69 70
  Faraday's law 5 183
  inductance 7 65 66
  Lenz's law 7 454
Induced fission *see* Fission, nuclear
Induced mutations 8 673
Induced radioactivity 11 277
Inductance 3 269, 7 65 66*
  combined self and mutual 1 271
  electrical measurements 7 68 69
  electrical units 4 461
  henry 6 414
  inductometer 7 79 80
  inductor 7 80 81
  magnetic field 8 32
  mutual 7 66
  permeability 10 22
  self 7 65 66
  standards of 4 459
Inductance bridge 7 66 68
  Anderson 7 67
  Carey-Foster 7 67
  general impedance bridge 7 66
  general inductance bridge 7 66
  inductometer 7 79-80
  Wagner ground precaution 7 68
Inductance coil *see* Coil
Inductance measurement 7 68-69
  distributed inductance 4 457, 7 69
  effective inductance 7 68
  hysteresis 7 68
  inductance bridge 7 66 68
  inductance standards 7 68, 79-80*
  inductometer 7 79 80
  mutual inductance 7 68
  saturation 7 68
  self-inductance 7 68
Inductance standard *see* Inductometer
Induction, electromagnetic 7 69-71
  coupling coefficient 7 70 71
  Faraday's law 5 183
  inductance 7 65 66
  metal inspection 8 288
  motional electromotive force 7 69 70
  mutual induction 7 70
  self induction 7 70
Induction, electrostatic 4 539* 7 71
Induction, embryonic *see* Embryonic induction
Induction, magnetic 7 71
  Biot-Savart law 2 246 247
  field 8 30
  gauss 6 80
  magnet 8 25
  magnetic field 8 30
  permeability 10 22
  search coil 12 123
  units 4 461*, 7 71
Induction coil 7 71-72
Induction-cylinder relay 11 441
Induction-disk relay 11 441
Induction furnace *see* Induction heating
Induction generator 1 284
Induction heating 6 377
  7 72-74*
  brazing 2 322
  steel manufacture 13 101
  surface hardening 13 314
Induction inclinometer 6 149
Induction motor 1 284, 286, 7 74 79*
  constant horsepower drive 1 286
  constant torque drive 1 286
Induction motor—*cont*
  polyphase 7 74-77
  single phase 7 77-79
  slip 12 380-381
  slip rings 12 381
  speed control 1 286 287
  synchronous speed 13 373
Induction voltage regulator 14 565 566
Induction watt-hour meter 14 413-414
Induction welding 14 468
Induction well logging 14 471-472
Inductive coordination 3 523, 14 54
Inductive-coupled circuits 3 521
Inductive-input filter 10 561
Inductive reactance 1 270 272, 11 349
Inductometer 7 79 80
  Ayrton and Perry inductometer 7 80
  Brooks variable 7 80
  Campbell standard mutual inductance 7 79
Inductor 7 80-81
  adjustable 7 81
  air-core coils 7 80
  choke (filter) 3 84
  fixed 7 81
  iron-core coils 7 80
  powdered cores 7 81
  power supply filter 10 561
  saturable reactor 12 37
  standard inductors 4 459
  toroidal coil 7 81
  use of ferrites 5 221
  variable 7 81
  see also Coil, Reactor, electric
Inductor alternator 1 283 284
Inductormeter 4 459
Indus 3 412, 414
Indus low pressure center 1 582
Indus River 1 580
Indusium 5 263
Industrial alcohol *see* Ethyl alcohol
Industrial chemistry *see* Chemical engineering
Industrial control 7 81 82
  budget control 7 81
  cost control 7 81
  Gantt chart 6 39
  inventory management 7 224
  job costs 7 81
  order costs 7 81
  process costs 7 81
  production planning 10 644
  standard costs 7 81
Industrial diamonds 4 101, 6 100
Industrial elevators 4 558
Industrial engineering 7 82 83
  functions 7 82
  human engineering 6 495
  industrial control 7 81 82
  methods engineering 8 341 342
  methods study 8 342 345
  motion study 14 555 556
  operations research 9 536 538
  operator training 9 341
  plant facilities 10 622 625
  quality control 11 338-342
  time study 7 82, 14 554 555
  work measurement 7 82, 14 555 557
Industrial melanism 7 473
Industrial meteorology 7 83 84
Industrial microbiology 7 84 86
  Acetobacter suboxydans fermentation 1 51 54
  acetone butanol fermentation 1 54 55
  acetone ethanol fermentation 1 55 56
  bacteria 2 5
  bioassay 7 85
  2,3-butanediol 2 377
  butter 2 380
  cheese 3 11
  chlortetracycline 3 83
  citric acid 3 146
  cyclosterine 3 643
  enzyme (industrial production) 5 26 29
  epoxysuccinic acid 5 44
  erythromycin 5 67
  ethyl alcohol 5 90
  fermentation 5 215
  food technology 7 85
  fumaric acid 5 560
  gallic acid 6 18
  gluconic acid 6 217
  industrial fermentation criteria 7 84
  itaconic acid 7 297
  itatartaric acid 7 297
  kojic acid 7 369
  lactic acid 7 378 380
  other uses 7 85
  petroleum 10 64
  products 7 85
  riboflavin 11 561
  textile 13 541
  types of fermentation 7 85
  utilization of wastes and surpluses 7 85
  yeast industrial 14 602, 604
Industrial plant 10 622 625
Industrial processes stimulation 12 340
  technology 13 406
Industrial sands 12 22
Industrial tractor 14 12
Industrial trucks 7 86 90

ifacts (archeology) 1 514
lastic collision 3 291
lastic scattering 9 91,
2 54 56*
rt filler rubber 11 636
rt gas shielded arc welding
390, 14 467
rt gas type ions 3 94
rt gases 7 90
argon 1 530 531
helium 6 390 392
krypton 7 371-373
neon 9 56
radon 11 323 326
xenon 14 561
ertia 7 90
and gravitation 6 265
kinetics 7 359
mass 8 162
moment of 8 565 566
product of 10 639 640
nertia of energy 7 90
light 7 506
rest mass 11 535
nertial frame of reference
5 492
nertial guidance system
5 287 288 7 91 92*, 9 20
accelerometers 6 288 7 91
aided inertial systems 7 92
dead reckoning 9 16
gyro stabilized platform
6 311 312
gyroscopes 7 91
integrators 7 91
missile guidance systems
8 517
navigation errors 7 92
reference system 6 288
Schuler tuning 7 91, 12 70
use in oceanographic
surveys 9 267
Inertial mass 6 265, 11 435
Inertial space 1 537
Inerrinite 3 252
Infant diarrhea 7 95
Infantile eczema 1 257, 4 408,
8 589
Infarct 8 432
Infarction 7 93 94
circulation disorders
5 142, 143
death 4 93
embolism 4 565
thrombosis 13 615
Infection 7 94* 12 188
acute childhood 4 54
genitourinary 4 54
tick borne 1 425
types 7 94 95
wounds 2 2
Infection lysis 7 94
Infection hypersensitivity 6 589
Infection immunity 7 94
Infectious arthritis *see*
Arthritis, Joint (anatomical)
disorders
Infectious canine hepatitis
8 353
Infectious disease control 7 94
Infectious disease transmission
7 94 95
Infectious hepatitis *see*
Hepatitis
Infectious myocarditis 6 560
Infectious mononucleosis
8 429; 7 95 96
Infectious papillomatosis
(rabbit) *see* Papillomatosis
infectious (rabbit)
Infective dose 50 7 96
Infeld L 11 437
Inferior artery 1 483
Inferior conjunction (planet)
10 267
Inferior turbinate 12 373
Inferior vena cava 14 291
Infestation 7 94
Infiltration galleries 14 405
Infinite baffle 12 512
Infinite collection 7 96
Infinite dimensional case
9 340 341
Infinite impedance detector
1 560
Infinite spaces 10 626
Infinite universe 3 503
Infinitesimal calculus 7 166
Infinitesimal canonical
transformations 2 438
Infinity 7 96 97
Inflammation 7 97-99
Buerger's disease 2 561
cellulitis 7 98
Inflorescence 5 328 7 98*,
12 236
Influence lines 13 198
Influenza 1 424, 466 467,
8 412, 7 98 99*
culture, embryonated egg
5 615
epidemic 5 34
fluorescent antibody
method 8 585
virus 14 550-551
Information processing *see*
Data processing systems
Information theory 5 519,
7 99 102*
bandwidth signal to
noise ratio relation
7 101
bit 2 250
capacity 7 101
discrete and continuous
cases 7 99
encoding and decoding
7 99
entropy 5 11, 7 101
information *content of a*
message 7 100
instrumentation 7 134
noiseless and noisy cases
7 99
Information theory (biological
applications) 7 102-103
noise and redundancy
theorem 7 103
representation theorem
7 102 103
Information transfer
(molecular biophysics) 8 544
Information transmission *see*
Communications, electrical
Infracambrian 2 425
Infrared absorption 1 11-17
atmospheric 6 269
specific heat of solids
12 575
by superconductors 13 299
Infrared absorption spectrum
7 107-110
Infrared detector 7 103 104
bolometer 7 103
Golay cell 7 105
photo 7 103,
10 140, 151, 192
semiconductors 12 168
spectral sensitivity 7 106
thermal 7 105
see also Radiometry
Infrared gratings 4 140
Infrared homing system 6 290
Infrared image converter tube
7 104
Infrared lamp 7 104
Infrared photography 10 159
Infrared radiation 7 104-110
absorption *see* Infrared
absorption
contrasted to microwaves
8 416
detectors 7 105 105 106,
11 317 318
discovery of 7 105
heat radiation 6 369 373
infrared lamp 7 104
infrared spectroscopy
7 107 110
infrared spectrum 7 105
photoelectric infrared
7 105
propagation of 7 106
radiometry 11 317 318
in sea water 12 105
solar heating 12 470
sources of 7 105
terrestrial 11 214
Infrared radiation (biology)
7 104, 107*, 13 595
Infrared searchlight 7 104
Infrared spectrophotometry
12 583
Infrared spectroscopy 7 107-
110*, 12 587
instrumentation and
techniques 7 107 108
qualitative chemical
analysis 7 110
quantitative chemical
analysis 7 110
Infrared spectroscopy—*cont*
and Raman spectroscopy
11 532 533
solid state studies
7 110
Infrared telescope 7 104
Infrasonic frequency 12 506
Infrasonic wave 12 509
Infrasonics 12 506
Infusoriform larva 4 110
Infusorigen 4 110
Ingepon A 15 538
Ingerson E 6 127, 129
Inglusies 4 150 175
Ingolfiellidea 1 339 341
Ingrain dyes 4 508
Ingression 6 79
Inguinal hernia 6 425
Inheritance *see* Genetics
Inheritance of pathologic traits
6 509 515
abiotrophy 6 512
anticipation 6 512
chromosomal aberrations
6 513
definitions 6 509
genes and environmental
interaction 6 511
patterns of inheritance
6 509 511
sporadic cases 6 512
syndromes 6 512
variation in genetic disease
6 511 512
Inhibitor (chemical)
7 110 112
allylic termination
7 111
antifreeze mixture
1 471 472
antioxidant 1 479-480
autoinhibition 7 111
chain reaction chemical
3 6
corrosion 7 112
corrosion prevention 5 491
plastics compounding
10 477
vinyl polymerization
7 110-111
Inhibitory hormone 6 405
Inhoffen H H 6 235, 14 541
Inomi *see* Myctophiformes
Injected carriers 13 322
Injection molding 10 405
Ink 7 112-114
colorants 7 113
intaglio inks 7 114
lithographic inks 7 113-114
marking inks 7 112
printing ink vehicles 7 113
printing inks 7 112-113
silk screen system 7 114
tannin 13 590-591
writing inks 7 112
Inkometer 7 114

Inland waterways transportation 7 114-117
canals 2 434, 11 586
commodities moved 7 114-115
machinery and equipment 7 116
navigation projects 7 115-116
river barges 7 114-116
river engineering 11 583 586
river locks and dams 11 585
tonnage moved 7 117
types of carriers 7 116-117
Inman, D L 12 301
Inn River 5 121
Innuitian fold axis 1 523
Inoceramus 7 327, 9 614
Inoculation 7 117-118
Inorganic chemistry 7 118-121
applied inorganic chemistry 7 121
chemical symbols and formulas 3 44
organometallic compounds 7 119
solid state chemistry 7 119, 12 474-479
synthetic inorganic chemistry 7 118-120
theoretical inorganic chemistry 7 120-121
Inorganic compounds *see* specific articles on each chemical element
Inositicates 12 311
Inosine diphosphate 2 51
Inosine triphosphate 2 51
Inositol 4 236, 6 223,
7 121-122*, 14 340
bioassay 2 194
food 5 371
industrial production 7 121
polyhydroxy alcohol 10 473
Inositol hexaphosphate 10 473
Inoué, S 8 520
Inpectioscope 14 183
Inquiline 4 217
Inscribed circle 1 405
Insect anatomy 7 134 137
Insect control, biological 7 122
Insect eating bat 3 63
Insect pathology 7 122
Insect physiology 7 122-133
development and growth 7 122-123
muscular movement and flight 7 129 131
nervous system 7 131-135
receptors and reception 7 125-128
sound and light production 7 128-129
Insect physiology—*cont.*
system physiology 7 123 125
Insect resistance insecticide 7 141
Insect wax 14 443
Insecta 7 135-137
anatomy 7 134-137
Apterygota 1 495
Diplura 4 210
Diptera 4 211-219
Embioptera 4 564-565
Ephemeroptera 5 32 33
fossils *see* Insecta fossils
Hemiptera 6 400-410
hibernation 6 438
Hymenoptera 6 573-583
Insecta fossils 7 137-140
Isoptera 7 284-288
Mallophaga 8 77-78
Mecoptera 8 206
metamorphosis 7 136
Neuroptera 9 80
Odonata 9 274-275
Plecoptera 10 415-416
Pterygota 11 88
Thysanopteras 13 628 629
Thysanura 13 629
Trichoptera 14 86 87
wood-attacking 14 538
Zoraptera 14 629 630
Insecta fossils 7 137 140
Permian 10 27
Insecticide 1 123, 7 140-142
cockroach 3 251-252
fumigant 5 561
insect control, biological 7 122
insect resistance 7 141
plant disease control 10 315
pyrethrum 11 110
synergist 7 142
Insectivora 7 142 143*, 8 82
fossils 7 143-144
mole 8 537
shrew 12 307
Insectivora fossils 7 143-144
Insectivorous plants 7 144
pitcher plant 7 144
sundew 7 144, 13 291
Venus' flytrap 7 144
Inselberg 4 76 77
Insemination artificial 2 327
copulatory organ 8 472-473
fertilization 5 234-236
Insequent stream 5 357
Insolation 7 144 145
solar energy 12 468
Insomnia 6 345, 12 375
Inspection and testing 7 145, 11 138
automation 1 679
comparator 5 328-330
gages 6 3-5
optical flat 9 349-350
Inspection and testing—*cont*
qualification test 11 136
see also Quality control
Instability, electrical 7 145-146
Instant centers 14 294 295
Instantaneous axis 11 576
Instantaneous center 2 641
rigid-body dynamics 11 576
Instantaneous particle velocity 12 510
Instantaneous sound pressure 12 510
Instar 4 215
Instinctive behavior 7 146 147
criteria 7 146
focal points in research and theory 7 146
hoarding behavior 6 459
hypothermia 6 597
migratory behavior 8 427
the problem 7 146
reproductive behavior 11 454
Instron tester 11 638
Instrument flight rules (IFR) 1 163-164
Instrument landing system (ILS) 7 147-149
aircraft glide-slope receiver 7 148
aircraft localizer receiver 7 147
autopilot connection 1 690
cross-pointer instrument 7 147
glide-path indicator 6 212-213
glide slope 7 148
localizer field pattern 7 147
marker beacons 7 148
Instrument low approach system (ILAS) *see* Instrument landing system (ILS)
Instrument panel, aircraft *see* Aircraft instrument panel
Instrument transformer 7 149 151
accuracies 7 151
actual 7 151
equivalent circuits 7 150
ideal 7 150
principles of operation 7 150
Instrumental analysis 7 151-152
Instrumentation 7 152 155
accuracy and precision 7 153
calibration 2 416
damping 4 11 13, 10 206
drift error 10 206
environmental conditions 10 206
hysteresis error 10 206
instrument lag 10 206
resonance errors 10 206
scope 7 153
transducer 14 18
Instrumentation—*cont*
vernier scale 14 306
weight measurement 14 461-464
see also Physical measurement
Insulating board 14 530
Insulation, electric 7 155-160
abrasion resistance 7 157
asbestos 7 158
Buna S 7 157
butyl 7 157
chemical requirements 7 156
cost 7 157
dielectric constant 7 156
dielectric strength 7 155
effect of impurities 3 582
electrical requirements 7 155
epoxy resins 7 158
flammable 7 157
flexible 7 156 158
glass 7 158
heat-insensitive insulations 7 158
insulation resistance 7 157
insulation tests 7 159
Kel-F 7 157
magnesium oxide 7 158
mechanical requirements 7 156
mica 7 158
Mylar 7 157
neoprene 7 157
nitrogen gas 7 158
nylon 7 157
paper 7 158
plastic 7 157
polyethylene 7 156
polystyrene 7 156
polyvinyl chloride 7 157
porcelain 7 158
power factor 7 155
resistance to deformation 7 157
resistance to sunlight 7 157
resistivity 7 155
rigid 7 158-160
rubber compounds 7 157
silicone resins 12 325
silicone rubber 7 157
stiffness 7 157
synthetic rubber 7 157
Teflon 7 157
temperature limit 8 27
temperature requirements 7 156
temperature requirements rigid insulation 7 159
tensile strength 7 157
thermoplastic insulation 7 156
thermosetting materials 7 157
uses of rigid insulation 7 158

sulation electric—*cont*
varnished cambric 7 158
voltage requirements, rigid insulation 7 159
water impermeability 7 157
see also Insulator, electric
nsulation, heat 6 374 375*; 7 160
heat flow 7 160
thermal conductivity 7 160
nsulation sound 1 519 9 129 130
Insulation resistance 7 157
Insulation resistance testing 7 161 162
guard circuit 7 161
guarded deflection method 7 161
guarded Wheatstone bridge 7 162
hi pot testing 7 162
impulse generator 7 47 48
megger 8 208 209
unguarded Wheatstone bridge 7 162
Insulator, electric 7 162 163*, 12 480
Brillouin zone theory 2 338 339
dielectrics 4 114 116
excitons 5 135 136
gaseous 7 162 163
heat radiation 6 371
liquid 7 162 163
optical properties of 3 582
resistance of 3 582
resistance testing 7 161 162
secondary emission 12 124 126
solids 7 162 163
thermal conductivity 3 390
transmission line 14 52
see also Dielectrics, Insulation, electric
Insulator thermal 6 374
Insulin 4 153, 235 6 479 7 163 164* 11 40
amino acids 1 308
endocrine mechanisms 4 391
lipid metabolism 7 534
pancreas 9 537
Insulin shock 7 164
Intaglio (gemology) 8 99, 7 164*
Intaglio inks 7 114
Intaglio plates 10 617
Intaglio printing 10 603
engraving 10 603
gravure processes 10 603-604
printing press 10 622
Intake manifold engine 7 204
Intalox saddles 6 45
Integers 9 224
Integral 12 189
Integral, line *see* Line integral
Integral calculus *see* Calculus, differential and integral
Integral form 8 186 187
Integral of Lebesgue 7 172 173
Integral test 12 190
Integral transform 7 164 166
inversion theory 7 165
Laplace 7 402-404
transformation formulas 7 165
Integraph 7 172
Integrating circuit 1 376
Integrating gyros 6 310
Integrating sphere 10 171-172
Integration 7 164 174
analog computer solution 1 374-376
antiderivatives 7 167
calculus of vectors 2 414
complex numbers and complex variables 5 540
functions defined by integrals 7 171
improper integrals 7 168 169
integral of Lebesgue 7 172 173
line integral 7 169 171 520
mechanical 7 171 172
multiple integrals 7 167
Riemann integral 7 166 167
surface integral 7 169 171
volume integrals 7 169 171
see also Calculus differential and integral
Integrative control hearing 6 356 357
Integrator analog 1 375
Integrodifferential equation 2 282
Integument 7 174 175*, 12 144
biochemistry 2 199
corium 7 174
cutaneous wounds 7 176
deep wounds 7 176
dermal derivatives 7 175
dermis 7 174
development of 7 175
epidermal derivatives 7 175
epidermis 7 174
feather 7 175
gland 7 175
hair 7 175 176
hypodermis 7 174
leather and fur processing 7 445
melanoblast 7 174
melanocyte 7 175
pigment cells 7 174
regeneration 7 176
scale 7 175
stratum corneum 7 174
stratum germinativum 7 174
ultrastructure of skin 7 176
Integumentary musculature, anatomy 8 657
Integumentary patterns 7 177-178
epidermal ridges 5 57
pattern variability 7 177 178
ridge patterns 7 177
volar pads 7 177
Intelligence 7 178 179
bases of 7 178
components of 7 178
quotient 7 178
tests 7 178
Intensification photography 10 163
Intensity, sound *see* Sound intensity
beta Interaction 4 505
Interatomic force *see* Force
Intercarrier sound system (ICS) 13 471
Intercept line 1 388
Interchange fuel gas 5 553
Interchangeable manufacturing 10 643
Intercommunicating system 7 179 180
Intercontinental ballistic missile 2 76
see also Ballistic missile, Missile
Intercoolers 14 152
Intercrystalline boundaries *see* Grain boundaries (metallurgy)
Interdiffusion chemical *see* Chemical interdiffusion
Interdiffusion of two fluids 4 146
Interelectrode capacitance (vacuum tubes) 14 249
Interesterification reactions *see* Transesterification
Interface of phases 7 180 181
contact angle 7 181
emulsion 4 586 587
foam 5 565 566
surface active agent 13 321
surface energy 7 180 181
surface phenomenon 13 315
surface tension 13 316
Interfacial forces *see* Surface tension
Interfacial phenomena *see* Adsorption Surface phenomenon
Interfacial polarization 10 447
Interfascicular cambium 13 118
Interference, electrical 7 181 12 253 254
Interference filter (optical) 7 181 183
color filters 5 266
frustrated reflection 7 182-183
Interference filter (optical)—*cont*
lens coatings 6 183
multilayer types 7 182
reflection 11 593
Interference fringes 5 537, 7 184 189*; 10 150
Interference microscope *see* Microscope, interference
Interference of waves 7 183 189
amplitude splitting 7 186 188
Billet split lens 7 186
channeled spectrum 7 187
constructive 7 184 187
crystal optics 5 589 591
destructive 7 183 187
diffraction grating 4 139-141
Fresnel biprism 7 185 186
Fresnel coefficient 7 187 188
Fresnel double mirror 7 185
Haidinger fringes 7 188
interference filters 7 181-183
interference fringes 5 537, 7 184 189*, 10 150
interference microscope 8 585
interference photographs 5 440 441
interferometry 7 190-194
light 7 499
Lloyd's mirror 7 186 187
multiple beam interference 7 188 189
nonreflecting film 7 188
quantum mechanics 11 154
splitting of light sources 7 184 188
testing of optical surfaces 7 187
thin films 7 187
two beam interference 7 183 184
wave motion 14 425-429
Young's two slit experiment 7 184 185
Interferometer acoustic 7 189 190* 14 182
Interferometer, optical 7 190 194
Fabry Perot 7 192 193
Mach-Zehnder 7 193-194
Michelson 7 191 193
Michelson stellar 4 136, 7 190 191
Rayleigh 7 190
refractometric analysis 11 409
resolving power 11 500
use in spectroscopy 12 590 591

Interferometer, optical—*cont.*
wavelength measurement 14 439
Interferometry 7 190-194
beam-splitters 8 509
etalons 7 191-192
interference spectroscope 7 192
Michelson Morley experiment 7 504 505
reflective coatings 7 193
Intergalactic space 3 505
Intergranular corrosion 3 490
Interionic attraction 4 486
Interior ballistics *see* Ballistics, interior
Interior drainage basins 2 107
Interior finishes wood 14 532 534
Interlaced scanning, television 13 475
Intermediary metabolism 2 26-27; 4 207
Intermediate distillates 10 72
Intermediate frequency 1 345, 11 257-258
i-f amplifiers 1 345, 7 191, 14 358
i f transformer 14 28
Intermediate frequency amplifier 7 194
radar 11 200
radio 11 257 258
television 13 470
Intermediate metals, law of 13 580
Intermediate temperatures, law of 13 579-580
Intermedin 3 98 103
Intermetallic compounds 7 194-195
beryllium alloys 2 176
cermet 2 655-656
solid-state chemistry 12 477-478
see also Alloy
Intermittent cavitation 2 574
Intermittent stream 11 581
Intermodulation 4 257
sound reproduction systems, electrical 12 519
Intermolecular forces 7 195-196
adhesion 1 66
adhesives 1 66
cohesion 1 66, 5 268 269*
diffusion 4 142 148
gases 6 43 44
long range forces (Van der Waals forces) 7 195-196
polymers 10 475 476
potential curve 7 196
short range forces 7 195
solutions 12 485-487
statistical mechanics 13 64
surface tension 13 315-316
viscosity 14 352 354
Intermontane Plateau systems 8 618
Internal combustion engine 4 604, 7 196 209*
aircraft 1 167
automotive engine 1 683
automotive vehicle 1 688
carburetor 2 477-480
combustion chamber 3 307-308
combustion knock 3 308-310
compression ratio 3 349
contrast between diesel and Otto engines 7 200
diesel cycle 4 118 119
distributor 4 258
engine cooling 4 604
engine roughness 3 308
fuel consumption and supercharging 7 206 209
fuel injection 5 556
fuel system 5 558
governor 6 239
hydraulic valve lifter 6 529
ignition system 7 18 19
knock 3 308
magneto ignition 8 52
manifold 8 92
marine engine 8 109
Otto cycle 9 450 451
performance criteria 10 591
prime mover 10 590 592
slider crank mechanism 12 379
spark plug 12 561 562
supercharger 13 295
trends in 7 200
types 7 196-197
typical American automobile engine 7 206
valve 14 261
valve train 14 262 264
vapor lock 14 274
vibration 8 192
Internal conversion
radioactivity 11 287 288
Internal electrolysis 4 475
Internal energy 4 599, 7 209*, 13 573
definition 13 559
molecular system 13 565
Internal flow aerothermodynamics 1 102-103
Internal pair production 9 495
Internal sea wave 14 417 418
effect on thermocline 13 562
tidal periodicities 13 637
Internal seiche 12 147
Internal standard spectrochemical analysis 12 580
Internally heated pressure vessel 13 218
International ampere
see Ampere
International Annealed Copper Standard electrical conductivity 3 467
International candle 2 436
International Date Line 7 209 210
International electrical standards 4 458
International Ellipsoid 6 120, 13 516
International Geophysical Year 1 608
International gravity formula 13 516
International Ice Patrol 1 627
International Map of the World 8 97
International ohm 9 276
International rule, forestry 5 460
International system of units 4 458
International Temperature Scale 13 487
Interoceptors 12 179
sensation 12 177
Interphase (cell) 3 108, 8 211, 521
Interplanetary propulsion 7 210 216
chemical rocket 7 210
electrical propulsion 7 211
electromagnetic propulsion 4 490 492, 7 211
engine development 7 215
engine types 7 210
environment 7 214
ion propulsion 7 211, 243 247*
magnetoplasma rocket 7 211, 8 54 65
mission needs 7 213
nuclear propulsion 7 210 9 201
performance evaluation 7 212
photon propulsion 7 212
solar heating 7 211
space flight 12 543
spacecraft structure 12 556
trajectory requirements 7 212
see also Propulsion
Space flight
Interplanetary space 7 222
Interpolation 7 216 219
curve fitting 3 629 631
difference equations 7 218 219
finite differences 7 217 218
geometrical optics 9 368 369
graphical interpolation 7 216
inverse interpolation 7 217
numerical analysis 9 228 229
Interpolation—cont
partial difference equations 7 219
round-off errors 7 217
tabular interpolation 7 216 217
see also Extrapolation
Interpoles 3 527, 4 224
Interquartile range 13 67
Interrenal body *see* Adrenal gland
Intersection highway 14 14
set theory 12 206
Intersegmental reflex 11 402
Interstage spacecraft 12 549
Interstage coupling amplifier 1 343
Interstellar absorption 7 219 222
Interstellar cloud *see* Nebula (astronomy)
Interstellar hydrogen radiation 4 493
Interstellar matter 7 219 222
bright gaseous nebulae 7 219
Coal Sack 3 242
dark nebulae 7 221 222
formation of stars 7 222
galaxies 6 9
gas 7 221
particles 7 221 222
origin of 7 222
polarization of starlight 7 222
reflection nebulae 7 219-220
Interstellar noise 9 117
Interstellar reddening 7 219 222
Interstellar space 3 502, 7 222*
see also Interstellar matter
Interstellar travel clock paradox 3 207
Interstitial alloy *see* Alloy structures
Interstitial atom 3 582 583
Interstitial cell 13 525
Interstitial cell stimulating hormone (ICSH) 6 480, 11 477
endocrine mechanisms 4 591
hypophysis 6 506
reproductive system 11 477
Interstitial compounds 2 201 12 478 479
Interstitial hepatitis 6 418
Interstitial impurities 3 582
Interstitial ions 9 138
Interstitial mechanism (diffusion) 4 146 147
Intertropical convergence (ITC) 13 164
monsoon influence 8 585
wind 14 495

Intertype 3 345 14 169
composition (type) 3 345
Teletypesetter 15 455
Interval (music) 12 47
Interval rule 9 191
Interventricular septal defects 2 511
Intestinal absorption 4 173
Intestinal anthrax 1 457
Intestinal gland 4 150
Intestinal motility 4 172
Intestinal secretion 4 171
Intestine 3 204 6 72, 7 223*
embryology 4 160
rectum 11 386
Intestine, disorders of 7 223
Intine wall 5 330 332
Intoxication test (alcohol) 3 440
Intracartilaginous *see* Ossification
Intraformational breccias 2 326
Intramembranous ossification *see* Ossification
Intraocular pressure 6 210
Intraxilary fiber 12 79
Intrazonal soils 12 443 434
ecological succession 15 234
Intrinsic conductivity 12 167 168
Intrinsic semiconductor *see* Semiconductor
Intrinsic soils isoelectric point 7 213
Introgressive hybridization 12 570
Intromittent organ *see* Copulatory organ
Introrse 3 329
Intrusive rock 7 10 *14* 348
batholith 2 109
laccolith 7 375 376
petrology *10* 84
pluton 10 420 422
structures 14 353
Intumescent coatings 5 295
Intussusception 6 72 74
Inulase 7 224
Inulin 5 541, 7 223 224* 10 490
cell protoplast 2 614
Invagination 6 79
Invar 1 259, 7 267
Invariable plane 2 582 585
Invariance principles (physics) *see* Symmetry laws (physics)
Invariant *space* time interval 12 557
Invariant system 5 55
Invention 9 591 592
conception 9 591
patent 9 590 593
reduction to practice 9 591
Inventory *management* 3 224
design standards 4 78
Interventricular septum 2 488
Inverse 6 282
Inverse beta decay 9 83
Inverse interpolation 7 217
Inverse photoelectric effect 10 151 152
Inverse square law 7 224 225
noise levels 9 121
photometry 10 173
Inverse trigonometric functions differentiation 4 129
plane trigonometry 14 96
Inverse voltage 11 386
Inverse Zeeman effect 14 609
Inversion chromosome 8 671
Inversion (meteorology) 13 489
Inversion laser (semiconductors) *12* 172
Inversion symmetry 13 563
Inversion temperature 7 538
Inversion theory 7 165
Invert soaps 12 394
Invert sugar 13 236 237
Invertase 5 27 28 203
digestive system 4 172
yeast industrial 14 604
Invertebrata 7 225
carbonate rock forming 7 516
Mesozoa 8 253 254
Metazoa 8 305 306
Parazoa 9 562
Protozoa 11 51 60
regeneration 11 418 421
Invertebrate embryology 7 225 235
molluscan development 7 231 233
sea urchin development 7 233
tunicate development 7 234 235
Inverted microscope 8 392
Inverted siphon sewage collection 12 215
Inverter 7 235
converter synchronous 3 444
electromechanical vibrator 7 235
electronic 7 235
induction coil 7 71 72
phase *see* Phase inverter
rotating machine 7 235
thyratron 7 235
Investment casting 2 545
Inviscid flow 5 523
Involucre 7 98
Involuntary muscle *see* Smooth muscle
Involute 7 255 256
gear teeth 6 82 83
Involute vernation 2 561
Involution 6 79
Involutional melancholia 7 256
Io 7 324
Iodamoeba butschlii 1 300 331
Iodate 7 236*, 238
Iodic acid 7 236, 239
Iodide 7 236*, 238
organic 6 325 330
Iodide chromium 3 105
Iodide process 11 125
zirconium 14 616
Iodination 6 327 328
Iodine 1 475, 2 266 6 324 7 236 240*
antiseptic 1 482
biological importance of iodine 7 240
compounds 7 236 240
electron configuration 4 504
entropy of solution 12 490
goiter 6 229
iodate 7 236
iodide 7 236
ionization potential 4 504
lowest rotational levels 8 531
occurrence 7 237
organic compounds 6 325 330
periodate 10 13
properties 7 237 239
recovery and production 7 237
solubility of 12 489
uses 7 236
vibrational levels 8 530
Iodine 131 14 8
Iodine coulometer 3 516
Iodine monochloride 7 239
Iodine value fat and oil edible 5 186
fat and oil nonedible 5 189
wax 14 444
7 Iodo 8 hydroxy *quinoline* 5 sulfonic acid 11 193
Iodobenzene 7 240
meta Iodobenzoic acid 2 475
ortho Iodobenzoic acid 2 475
para Iodobenzoic acid 2 475
Iododichloride 7 240
Iodoform 7 240
haloform reaction 6 323
Iodopsin photoreception 10 182
Iodopyrrole 11 131
Iodosilane 12 320
Iodoso compound 7 240
Iodoxy compound 7 240
Ion 7 240
chemical binding 3 24 26
transition elements 14 42
Ion association extraction systems 5 157
Ion beam etching 8 349
Ion diffusion in gas 4 451
Ion-dipole interaction 12 487
Ion emission 5 235
Ion exchange 7 241 243
clay minerals 3 166
hydrometallurgy 6 559 560
ion exclusion 7 243
ion permeable membrane 7 255
molecular sieve 8 546 647
resin 7 241 243
saline water *reclamation* 12 13
in sea water 12 108
separation (chemical and *physical*) 12 185
in soils 12 423 426
water softening 14 403
zeolite 7 241
Ion exchange chromatography 3 93, 95 7 241
berkelium isolation 2 168
Ion exchange membrane *see* Ion permeable membrane
Ion exclusion 7 243
Ion formation chemical structures 3 35 35
Ion ion interaction 12 486 487
Ion permeable membrane 7 255 257*, 10 588
Donnan equilibrium 4 265
primary battery 10 589
saline water reclamation 12 12 13
Ion product constant of water 6 550
Ion propulsion 7 243 247
Brayton cycle 7 243 244
energy converter 7 243
energy source 7 245
nuclear reactor 7 243
propellant 7 245
Rankine cycle 7 243 244
solar radiation energy collector 7 243
surface ionization system 7 245
thrust 7 243
von Ardenne plasmatron ion source 7 246
Ione 7 285
Ionian Sea 8 207
Ionic binding 3 24 26*; 14 258
Ionic catalysis 10 482
Ionic conductivity 4 486 7 250 251* 14 333
see also Electrolytic conductance
Ionic crystals 7 247 251
Born Haber cycle 7 248-249
Born Mayer equation 7 249 250
chemical binding 3 24 25
chemical structures 3 35
cohesion 3 269
cohesive energy 7 248 250
color centers 3 294 297

Interferometer, optical—*cont*
wavelength measurement 14 439
Interferometry 7 190-194
beam-splitters 8 509
etalons 7 191 192
interference spectroscope 7 192
Michelson Morley experiment 7 504-505
reflective coatings 7 193
Intergalactic space 3 505
Intergranular corrosion 5 490
Interionic attraction 4 486
Interior ballistics *see* Ballistics, interior
Interior drainage basins 2 107
Interior finishes wood 14 532-534
Interlaced scanning, television 13 475
Intermediary metabolism 2 26-27, 4 207
Intermediate distillates 10 72
Intermediate frequency 1 345, 11 257-258
i-f amplifiers 1 345, 7 191 14 358
i-f transformer 14 28
Intermediate frequency amplifier 7 194
radar 11 200
radio 11 257-258
television 13 470
Intermediate metals, law of 13 580
Intermediate temperatures, law of 13 579 580
Intermedin 3 98 103
Intermetallic compounds 7 194-195
beryllium alloys 2 176
cermet 2 655 656
solid-state chemistry 12 477 478
see also Alloy
Intermittent cavitation 2 574
Intermittent stream 11 581
Intermodulation 4 257
sound reproduction systems, electrical 12 519
Intermolecular forces 7 195 196
adhesion 1 66
adhesives 1 66
cohesion 1 66, 3 268-269*
diffusion 4 142 149
gases 6 43 44
long range forces (Van der Waals forces) 7 *195-196*
polymers 10 475 476
potential curve 7 196
short-range forces 7 195
solutions 12 485 487
statistical mechanics 13 64
surface tension 13 515 516
viscosity 14 532 534
Intermontane Plateau systems 8 618
Internal combustion engine 4 601, 7 196 209*
aircraft 1 167
automotive engine 1 683
automotive vehicle 1 688
carburetor 2 477-480
combustion chamber 3 307-308
combustion knock 3 308 310
compression ratio 3 349
contrast between diesel and Otto engines 7 200
diesel cycle 4 118-119
distributor 4 258
engine cooling 4 604
engine roughness 3 308
fuel consumption and supercharging 7 206 209
fuel injection 5 556
fuel system 5 558
governor 6 239
hydraulic valve lifter 6 529
ignition system 7 18-19
knock 3 308
magneto ignition 8 52
manifold 8 92
marine engine 8 109
Otto cycle 9 450 451
performance criteria 10 591
prime mover 10 590 592
slider crank mechanism 12 379
spark plug 12 561-562
supercharger 13 295
trends in 7 200
types 7 196 197
typical American automobile engine 7 206
valve 14 261
valve train 14 262-264
vapor lock 14 274
vibration 8 192
Internal conversion
radioactivity 11 287 288
Internal electrolysis 4 475
Internal energy 4 599, 7 209*, 13 573
definition 13 559
molecular system 13 565
Internal flow aerothermodynamics 1 102 103
Internal pair production 9 495
Internal sea wave 14 417-418
effect on thermocline 15 562
tidal periodicities 15 637
Internal seiche 12 147
Internal standard spectrochemical analysis 12 580
Internally heated pressure vessel 13 218
International ampere
see Ampere
International Annealed Copper Standard electrical conductivity 5 467
International candle 2 436
International Date Line 7 209 210
International electrical standards 4 458
International Ellipsoid 6 120, 15 516
International Geophysical Year 1 608
International gravity formula 13 516
International Ice Patrol 1 627
International Map of the World 8 97
International ohm 9 276
International rule, forestry 5 460
International system of units 4 458
International Temperature Scale 13 487
Interoceptors 12 179
sensation 12 177
Interphase (cell) 3 108, 8 211 521
Interplanetary propulsion 7 210-216
chemical rocket 7 210
electrical propulsion 7 211
electromagnetic propulsion 4 490 492 7 211
engine development 7 215
engine types 7 210
environment 7 214
ion propulsion 7 211 213 217*
magnetoplasma rocket 7 211, 8 54-63
mission needs 7 213
nuclear propulsion 7 210, 9 201
performance evaluation 7 212
photon propulsion 7 212
solar heating 7 211
space flight 12 543
spacecraft structure 12 556
trajectory requirements 7 212
see also Propulsion
Space flight
Interplanetary space 7 222
Interpolation 7 216 219
curve fitting 3 629 631
difference equations 7 218 219
finite differences 7 217 218
geometrical optics 9 368 369
graphical interpolation 7 216
inverse interpolation 7 217
numerical analysis 9 223 229
Interpolation—*cont*
partial difference equations 7 219
round off errors 7 217
tabular interpolation 7 216 217
see also Extrapolation
Interpoles 3 327, 4 224
Interquartile range 13 67
Interrenal body *see* Adrenal gland
Intersection highway 14 14
set theory 12 206
Intersegmental reflex 11 402
Interstage spacecraft 12 549
Interstage coupling amplifier 1 343
Interstellar absorption 7 219-222
Interstellar cloud *see* Nebula (astronomy)
Interstellar hydrogen radiation 4 493
Interstellar matter 7 219 222
bright gaseous nebulae 7 219
Coal Sack 5 242
dark nebulae 7 221 222
formation of stars 7 222
galaxies 6 9
gas 7 221
particles 7 221 222
origin of 7 222
polarization of starlight 7 222
reflection nebulae 7 219 220
Interstellar noise 9 117
Interstellar reddening 7 219 222
Interstellar space 5 502, 7 222*
see also Interstellar matter
Interstellar travel clock paradox 3 207
Interstitial alloy *see* Alloy structures
Interstitial atom 3 582 585
Interstitial cell 13 525
Interstitial cell stimulating hormone (ICSH) 6 480 11 477
endocrine mechanisms 4 591
hypophysis 6 596
reproductive system 11 477
Interstitial compounds 2 294 12 478 479
Interstitial hepatitis 6 418
Interstitial impurities 3 582
Interstitial ions 9 238
Interstitial mechanism (diffusion) 4 146 147
Intertropical convergence (ITC) 15 164
monsoon influence 8 545
wind 14 495

Isentropic surfaces (meteorology) 1 632 7 272 273*
Isentropic thermodynamic process 3 573 7 272
Isethionic acid 12 594
Isia isabella 7 470
Isinglass 13 208
Island arcs 9 263, 13 412 413*
Asiatic complex 13 411
deep sea trenches 13 222 223
East Indies complex 13 410
orogeny 9 431
Island faunas and floras 7 273 274
Islands ancient 12 123
off Africa 1 108
Aleutian 1 525
Arctic and subarctic 1 521 525
off Asia 1 580 581
Atlantic 1 622 623
atoll 3 646 647
Canadian Archipelago 1 523
coral 5 475 12 76
East Indies 4 355 358
of Europe 5 116 117
faunas and floras 7 273 274
fiord islands 5 277
Mediterranean 8 207
oceanic 9 261 265
Pacific 9 481 485
reef islands 5 475
off South America 12 530
West Indies 14 473 476
see also Island arcs
Isle of Pines 9 482
Islet O 14 341
Islets of Langerhans 4 150 155 7 163, 9 531
Isoagglutinin 1 468
Isoantigen 1 472 7 274*
antibody 1 468
Isoascorbic acid 5 376
Isobar (adsorption) 1 80
Isobar (atomic physics) 7 274
Isobar (meteorology) 7 274
Isobaric process 7 274 275
Isobaric surfaces (meteorology) 7 274
solenoid 12 473
Isobutane 1 245 2 376
Isobutene 14 207 209
Isobutyl alcohol 2 378
Isobutyl radical 1 252
Isobutylene 1 245
butyl rubber 11 640
Isobutyrylcoenzyme A 14 260
Isochemical metamorphism 8 302
Isochromatic fringes 10 149
Isochron 7 428 429
Isocitric acid 2 31, 33
Krebs cycle 7 570
Isochinic fringes 10 150
Isoclinic lines 6 144
Isocyanate 7 275
Isocyanic acid 3 634
Isocyanide 1 306, 3 634
Isodiazotate 4 106
Isodimorphism 10 572
Isodynamic lines 6 146
Isoecho contour circuit 1 166
Isoelectric point 7 275 276
coagulation 3 228
electrophoresis 4 527
salting out effect 12 19
Isoelectronic sequence 7 276
Isoetaceae 7 276
Isoetales 7 276*, 625 10 546
Isoetes 7 626
Isoetes nuttallii 7 627
Isogamy 5 82 11 453
Isogeneratae 10 90
Isogonic lines 6 144
Isograd 10 87
Isohexyl radical 1 252
Isoimmunization 2 266
Isoindole 7 62
1,3 Isoindoledione 10 198
Isolan 7 142
Isolated polyene 10 460
Isolating mechanisms (speciation) 12 569
Isolation shock *see* Shock isolation
Isolator *microwave* 3 221
Isolator shock *see* Shock isolation
Isolecithal ovum 9 459
Isoleucine 1 589, 2 195 7 164 276 277* 9 217
amino acids 1 308 319
plant metabolism 10 557
Protozoa 11 51 60
L-Isoleucine 11 41
Isolith map 5 176
Isomagnetic chart 6 148
Isomagnetic lines 6 148
Isomaltose 4 92
Isomer nuclear 7 280 281
Isomerase bacterial enzyme 2 16
enzyme 5 20 24
Isomeric transition 11 288 289
Isomerism, molecular 7 277 280
chain 7 277
cis trans 7 279
complex compounds 5 536
functional group 7 278
geometrical 7 278 280
optical 9 346 348
position 7 277
ring 7 279 280
syn anti 7 279
see also Stereochemistry Tautomerism
Isomerism nuclear 7 280*, 11 289
Isomerization 7 281 282
alkane 1 251
Isomerization—*cont*
cracking 3 352 355
petroleum processing 10 69
see also Reforming (petroleum refining)
Isometopidae 6 401
Isometra vinpara 3 550
Isometric drawing 10 214 216
Isometric process 7 282
Isomorphic graph 6 253
Isomorphic ring 11 579
Isomorphism (crystallography) 7 282*, 8 466 467
Isoniazid 1 475, 11 113, 15 180
see also Isonicotinic acid hydrazide
Isonicotinic acid 11 113
Isonicotinic acid hydrazide 6 530 7 282 283* 314
antibiotic 1 464 468
para-aminosalicylic acid 1 320
Isonitrile 3 634
Isooctane 1 249
Isopach maps 5 175
Isopachic fringes 10 150
Isoparaffin 1 253
Isopentapolyphosphoryl *chloride* 10 137
Isopentaquine 11 193
Iso pentenyl pyrophosphate 2 54
Isopentyl radical 1 252
Isoperm 7 264
Isophthalate 5 74
Isophthalic acid 10 197
Isopleth 10 49
map 2 535
Isopoda 1 563, 5 563 7 283 284*, 12 601
Anthuridea 1 462
Asellota 1 575 576
Epicaridea 5 33 34
Gnathidea 6 225
Phreatoicoidea 10 197
Oniscoidea 9 527 528
sow bug 12 552 553
Valvifera 14 264 265
Isopolymolybdate 8 561 565
Isoponic lines 6 148
Isoprene 6 533 7 284
butyl rubber 11 640
essential oils 5 71 72
polyolefin resins 10 487
synthesis 4 117
see also Terpene
Isopropanol *see* Isopropyl alcohol
Isopropenyl methyl cyclohexene 7 284
Isopropyl alcohol 1 34 483 11 6
petrochemical 10 45 46
solvent 12 496
Isopropyl carbamate 2 116
Isopropyl ether 5 86
1-Isopropyl 3 methyl 5-pyrazolyl dimethylcarbamate 7 142
Isopropyl methylphosphono fluoridate 9 405
Isopropyl N (3 chlorophenyl) carbamate 1 125, 6 421, 12 465
Isopropyl *N* phenylcarbamate 6 421
Isopropyl radical 1 252
4 Isopropyltropolone 14 117
Isoptera 7 134, 284 288*, 12 405
Termite 13 494
Isopycnic 7 288
Isopyridoxal 2 37
Isoquinoline 6 429, 7 288 289*
Isoquinoline 1 carboxylic acid 7 289
Isoquinoline-5 sulfonic acid 7 289
Isorotation 8 60
Isosaccharinic acid 2 625
Isosceles linkage 5 486
Isosceles trapezoid 11 135
Isosceles triangle 14 81
Isosebacic acid 4 118, 12 410
Isoseismal lines 12 130
Isospondyli, Shad 12 238
see also Clupeiformes
Isospora belli 4 417
Isospora hominis 4 417
Isostasy 7 289 290*, 13 519 521
Isostatic pressing 2 649
Isosteric surfaces (meteorology) 7 288
solenoid 12 473
Isotach 7 290
Isotactic polymer 10 475, 479
polymerization catalysis 15 653
Isotactic polystyrene 10 491
Isotelus gigas 14 105
Isotherm 7 290
adsorption-desorption 1 80
gas 6 42
heat convection 3 441
Isothermal chart 7 290
Isothermal crystallization 11 570
Isothermal layer (sea water) 13 562
Isothermal process 7 290 291
Isothiazole 1 702
Isothiocyanate 13 603
isocyanate 7 275
Isotone 7 291
Isotope 7 291 293
abundances 4 547 7 291 293*
in atmosphere 1 630
cosmic ray-produced 1 630, 635, 11 269-271*
determination of atomic weight 7 293
fertile 9 184 187

Ionic crystals—*cont*
coordination number 3 461 462
crystal structure 7 247-248
diamagnetism 4 97
dielectric properties 7 251
Hall effect 6 321
ionic conductivity 7 250-251
ionic radii 7 251
Madelung constant 8 14
nonstoichiometric compounds 9 138
solid state chemistry 12 474
vacancies and interstitials 3 583
Ionic equilibrium *see* Equilibrium, ionic
Ionic hydrides 6 531
Ionic mobility 4 451
Ionic radii ratios chemical structures 3 36-38
Ionic strength (solutions) 12 494
Ionium 11 278
Ionization 7 252
acid 1 39
acid and base 1 40
Aurora 1 669
cell-surface *see* Cell-surface ionization
corona discharge 3 487
electrical conduction in gases 4 450 452
in gas 4 450 452
Ionization chamber 7 252 253
circuits 7 252
current measurement 7 252 253
electroscope 4 535 536*, 7 252
fission chambers 7 253
Geiger-Muller counter 6 92
proportional counters 7 253
Ionization constants 4 486 487
Ionization energy 4 519
Ionization gage 7 253 254
cold cathode (Philips) 7 254
hot-filament 7 253
Ionization potential 7 254
chemical structures 3 33 34
complete table 4 504 505
measurement of 7 254
periodic table 10 15
plasma physics 10 386-387
Ionized gas 4 450 452
see also Plasma physics
Ionizing radiation biochimatologs 2 200
dose in biology 11 218
effects in biology 11 218
film badge 5 264 265
monitoring of 8 571 572
roentgen unit 11 615 616
Ionography 3 97
Ionone 13 496, 498
Ionosphere 1 628-629, 7 254-255*
character 1 99
concept development 7 254
dynamo action in 6 143-144
electric currents in 6 143 144
gaseous character 7 255
lunar tidal air motions 6 144
radar 11 201
radio wave propagation 11 319-321
refinements of investigation 7 255
reflection of radio waves 1 363
telephone service, overseas 13 438
Iontophoresis 4 541-542
Iospilidae 10 461
Iota-Aquarids 8 308
IPC 6 421
Ipecac 7 257
Rubiales 11 647
Ipecacuanha plant 1 475
Iphitime 10 465
Ipidae *see* Scolytidae
Ipomoea batatas 10 534
Iproniazid 7 282
IQ 7 178
IR drop 7 257*, 9 276
see also Voltage drop
I-R loss *see* Copper loss
Iranian plateau 1 580
Iraq bituminous shales 8 251
Iresine 4 109
Ireland 5 117
Iridaceae 7 514 10 345 12 4
Iridic reflex 11 393
Iridiocyte 7 174 175
Iridium 7 257 258
electron configuration 4 504
extractive metallurgy 8 277
ionization potential 4 504
metallurgical extraction 10 411 412
see also Platinum
Iridocyclitis 5 171
Iridocyst 2 645
Iridocyte neural crest 9 78
Iridomyrmex humilis 1 437
Iridophore 3 99
Iridosmine 10 411
Irion, A. L. 7 443
Iris (botany) 5 37 7 436 9 407
Iris (eye) 5 161 12 566
anatomy and histology 5 168
glaucoma 6 210 211
Iris agate 1 111
Irish moss 11 554
mucilage 8 621
Irish Sea 5 114
Irminger Current 9 249
Irminger Sea 9 251
Iron 7 258-268
alloys *see* Iron alloys
blast-furnace process 7 259 262
coordination compounds 7 258-259
corrosion 3 493
crystal structure 3 599, 6 380
direct extraction processes 7 262
electron configuration 4 504
extractive metallurgy 8 277
ferric compound 5 217-218
ferricyanide 5 218
ferrocyanide 5 224
ferromagnetism 5 230 233
ferrous compound 5 234
heat radiation from 6 374
hematite 6 394 395
ionization potential 4 504
line spectrum 7 521
native state 9 4
organometallic compound 9 404
permalloy 10 22
pig iron 7 262
properties of 7 258
speed of sound in 14 431
steel *see* Steel
taconite 13 386
velocity of sound in 12 516
alpha Iron 7 258
beta Iron 7 258
delta Iron 7 258
gamma Iron 7 258
Iron (extraction from ore) 7 259 263
Iron alloys 5 104 7 265-268*
cast iron 2 539 541
corrosion-resisting 7 265 266
electrical resistance 7 264 265
heat resisting 7 264 265
magnetic 7 263 264
manganese 8 87 88
thermal expansion alloys 7 266 267
Iron bacteria 2 8
Iron carbide Fe_3C 13 90
Iron carbon phase diagram 6 380
Iron carbonyl 1 474
Iron filing map 8 26
Iron foundry batch melter 1 502
continuous melter 1 502
direct arc furnaces 1 502
duplexer 1 502
Iron metabolism 7 267 268
erythrocytes 7 267
porphyrin 10 521
Iron meteorite 8 315
Iron ore deposits 9 370
laterite 7 407
limonite 7 519
magnetite 8 48
Iron porphyrin 2 13 14
Iron pyrites 11 115 13 235
Iron rich shales 12 241
Iron silicon alloys 5 233, 7 268*
Iron standards wavelength 14 441
Irona 5 291
Ironing sheet metal 12 251
Ironwood 2 545 6 479, 7 268 269*
Irradiance (sea water) 12 109
Irradiance collector 12 118
Irradiation neutron 9 85
food 5 396 397
Irradiation, isotopic 7 269
Irrational numbers 1 239
real variable 11 371
Irregular cleavage 7 250
Irregular flower 5 327
Irregularia 4 370, 7 269*
Irreversible process 13 572
cryogenics 5 573
entropy 5 9 12
thermodynamics of 13 576 577
Irrigation of crops 7 269 271
canals 2 433 434
dams 4 5 11
irrigation in arid and humid areas 7 271
methods of irrigation 7 270
water supply engineering 14 404 407
Irriwaddy River 1 580
Irrotational flow 6 340
Kelvin's circulation theorem 7 335
Kelvin's minimum energy theorem 7 335 336
Irrotational motion, Laplace's *see* Laplace's irrotational motion
Isanciistrinae 14 78
Isanomal lines 7 271
Isanomal temperature 7 271
Isaria (*Paecilomyces*) *farinosa* 13 141
Isariopsis griseola 13 141
Isatin 7 62 64, 377, 11 192 13 401
Isatin chloride 7 377
Isatin alpha chlorine 7 65
ISB *see* Independent sideband radio
Ischemia 3 142 6 413
hemorrhage 6 412 413
Ischemic necrosis 4 23
Ischiopodite 5 564
Ischium 5 564 12 358
Ischnomesus 4 41
Isentropic flow (fluids) 5 537 7 271 272*

J

J acid 9 5
J display radar presentations 11 207
Jacanas 5 10
Jacanidae 5 10
Jack, screw *see* Screw jack
Jack in the pulpit 1 497
Jack pine 5 451, 13 235
Jack plane 14 545
Jack shaft 12 240
Jackass 4 265
Jackhammer 3 417
Jacks (mule) 8 625
Jackson, J H 1 490
Jackson, R 2 424 4 359, 13 141
Jacksonian seizure 5 40
Jacobi polynomials 9 415
Jacobi symbol 9 225
Jacobian elliptic functions 4 562 565
Jacobian matrices 8 181
Jacobian partial differentiation 9 370
Jacobs, J A 4 341
Jacobs, W C 12 103
Jacobshavn Glacier 7 7
Jacobson C 9 77
Jacobson, D W 12 117
Jacobsonidae 5 278
Jacobson's organ 9 61 12 180 13 22
Jaculella acuta 5 430
Jade 7 301
gem 6 98
Jadeite 7 301*, 11 129
gem 6 98
Jaera 7 284
Jaera marina 1 576
Jägersten G 11 213
Jaguar 7 301 302
Jalpug Lake 5 115
Jam nut 9 251
Jamaica 14 475
James R A 1 301 3 624 14 66
James William 4 593 10 55
James River 9 146
Jamin refractometer 11 407
Jamming 7 302
see also Electronic countermeasures
Janet 3 476
Jannuzzi Lake 5 115
Jansky K G 11 243 261
Japan Sea 9 271
Japan wax 14 419
Japanese B encephalitis 1 499
Japanese beetle 2 110 3 297
Japanese chestnut 3 58
Japanese crab 1 555
Japanese dogwood 4 260
Japanese flowering cherry 3 56
Japanese yew 14 605
Japanning 7 302
Jar fly 6 471
Jararaca 5 215
Jarosch H 4 549
Jasp-agate 7 302
Jasper 7 302
quartz 11 182
Jasper National Park 9 157
Jaspilite 7 302
Jaundice 6 18, 7 302 303*, 14 464
clinical pathology 3 192-202
hemolytic 3 199 7 303
hepatic 3 199
metabolic pathway 7 302 303
obstructive 3 199, 7 303
parenchymal jaundice 7 303
pigmentation 10 226
symptomatology 7 303
Java 4 557
Java finch 5 275
Java *man* 3 477 7 303 304*
Java Sea 9 271 12 531
Javanthropus soloensis see Solo man
Javelina 9 608
Javor Planina 5 118
Jay 7 304
Jean Sir James 3 505, 507
Jefferson, T 12 447
Jeffersonite 11 129
Jeffery E C 11 85
Jeffreys, Sir Harold 4 335, 339 340 350, 6 125 13 419 640
Jejunum 4 161, 7 223
Jel Tepe 5 119
Jellied *gasoline* 7 54
Jellied gasoline bomb 1 536
Jelly gel 6 95
pectin 9 608
Jelly *fungi* 6 427
Jellyfish 7 304 305
Jenner C 7 34
Jenner K 12 384
Jennet 4 263
mule production 8 625
Jensen E 13 249
Jenson Nicolas 14 171
Jentzsch R 7 412
Jersey cattle 2 565
Jerusalem artichoke 1 566
Jesus Cristo lizard 13 23
Jet (comets) 3 314
Jet (gemology) 7 305
Jet drilling 2 298
Jet etching 13 522
Jet flow 7 305-306
noise 1 185 184
Jet fuel 1 178 179, 7 306
Jet mixing 14 161
Jet noise 1 185 184
Jet nozzles 7 306
Jet piercing 9 471-472
Jet propulsion 7 306-310
fuels 1 178 179, 7 306 11 6 10
jet nozzles 7 306
jet velocity 7 311
liquid propellant rocket engine 7 308 309
noise 1 92 93 183 184*
propellants 11 6 10
ramjet 7 308 11 335 336*
solid propellant rocket engine 7 309
subsonic flight 7 307
thrust 11 17
turbofan 14 154 155
turbojet 7 307, 14 149 155-157*
see also Propulsion, Turbine propulsion
Jet stream (aircraft) noise 1 183 184
Jet stream (meteorology) 1 96, 7 310 311
atmospheric low 1 643
characteristics 7 310
frontal zone 5 538
isotach 7 290
upper air circulation 14 495
variations 7 310
Jet Tapper 12 242
Jet type perforator 9 297
Jet velocity 7 311
Jetting (pile driving) 10 227
Jetty 7 311
Jewelry amber 1 299 300
cameo 2 428
carat 2 448 449
diamond 4 97 101
gem 6 95 99
gemology 6 104
gold 6 231-232
imitation gems 6 101
Jewelry—cont
intaglio 7 164
jet 7 305
karat 6 103
metals used for 6 103 104
palladium 9 523
platinum 10 411
ring settings 6 103 104
silver 12 329
stone settings 6 103 104
synthetic gems 6 100-101
treated gems 6 99 100
see also entries for specific gems
Jig 13 670
Jig, fixture, and die design 7 311-314
chip control 7 312
clamping 7 312
construction 7 313
locating methods 7 311
materials for stampings 7 313
safety 7 312
self-centering devices 7 312
stamping dies 7 312
stamping tolerances 7 313
tool guides 7 312
Jigger 12 345
Jiggering 2 648
Jigging 9 389 390
Jipijapa 13 365
Jirovec O 10 428
jj coupling atomic structure and spectra 1 657
nuclear structure 9 205
selection rules 12 160
Joachimstal pitchblende 6 135
Job's Coffin *see* Delphinus
Jobst, G 4 519
Johannsenite 11 129
Johansson, K 10 431
Johansson, O V 3 424
John Dory 14 610
Johne's disease 7 314
Johnin 7 314
Johnny darter 4 13
Johnson, H L 8 73, 13 41
Johnson H M 9 24
Johnson, M W 12 60
Johnson Morgan U,B,V three-color system 8 75
Johnson noise 11 318
Joining 13 199

Isotope—*cont*
fissionable 9 184-187
isotope shift 7 296
lead isotopes 7 427
nuclear stability 7 291
radioactive *see* Radioisotope
separation of 7 294-296
terrestrial nuclear reactions 13 522
use of separated isotopes 7 293
Isotope dilution techniques 7 293-294
applications in analytical chemistry 7 293
applications in geology 7 293 294
element abundance studies 4 546, 551
Isotope fractionation in nature in atmosphere 1 635
in biosphere 2 242
carbon-14 11 294
fractionation factor 6 130-132
Isotope separation (radioactive isotopes) *see* Radioisotope production
Isotope separation (stable isotopes) 7 294-296
electrolysis 7 295
electromagnetic 7 295
Isotope shift 7 296
nuclear moments 9 193
Isotope thermometers 6 130-135
Isotopic carrier 9 179
Isotopic exchange reactions 11 300 301
Isotopic inversion 13 362-364
Isotopic irradiation *see* Irradiation, isotopic
Isotopic mass 13 299
Isotopic spin 7 296-297*, 13 362 363
elementary particle 4 543-544
hyperon 6 587-588
nucleon 9 215
selection rules 12 162
Isotopic tracer studies *see* Tracer, radioactive
Isotropic radiator 1 450
Isotropy (physics) 7 297
Isovaleric acid 2 474
Isovel *see* Isotach
Isoxanthopterin 6 106
Isoxazole 1 702; 6 428
Istiophoridae 10 10
Istria Peninsula 5 116
Isuridae 12 157
Itaconic acid 7 297
Italian cypress 3 647
Itatartaric acid 7 297
ITC *see* Intertropical convergence
Itch 7 297-298
Itch mite 8 518, 12 29
Iteration method, mathematics 10 39-40
Iterative method analog solution of simultaneous linear equations 1 384
Iternonilla 13 10
Itonididae 4 212
Ivanov, A V 1 622, 13 545
Ivanov-Smolensky, A G 11 399
Ives, F E 10 605, 612
Ives, H 3 207, 4 265
Ives, J M, 10 615
Ives-Stilwell experiment 4 265
clock paradox 3 207
Ivory-billed woodpecker 14 541
Ivory-nut mannan 8 92
Ivy, A 6 16
Ixobrychus exilis 6 426
Ixodes 13 629
Ixodes holocyclus 13 631
Ixodes persulcatus 7 299
Ixodes pilosus 13 631
Ixodid tick 13 13
Ixodidae 7 298 299 13 629
Ixodides 7 298-299
Argasidae 7 298
Ixoditdae 7 298 299
Nuttalliellidae 7 298
tick paralysis 13 630
Ixoreus naevius 13 615
Izod test 8 272 273

K

K band 11 201
K band (color centers) 3 296
K-capture 4 503*, 11 286
K corona 4 331, 13 270 272*
K meson 8 249 14 376
see also Meson
Kagu 6 286
Kahn test 13 575
Kahoolawe, island of 9 481
Kaima plateau 1 577
Kainite 5 238
Kainozoic 2 627
Kairolin 11 191
Kakatoidae 8 249
Kakutani S 7 412
Kala azar 4 218, 7 449, 14 125
metabolic disorders in 8 256
taxonomy 11 60
Kalahari Desert 1 106
Kalanchoe blossfeldiana 1 126
Kalckar, H M 6 5
Kale 7 329
Kalicephalus 13 193
Kalimantan 4 356
Kaliophilite 7 329
Kalix film 10 147
Kalle, K 2 216
Kallima 7 471, 11 51
Kalmia 3 189
Kalmia angustifolia 10 440
Kalotermes 7 285, 12 407
Kalotermitidae 7 284
Kalsilite 7 329
Kaluza, T 14 200
Kama River 5 121
Kamacite 8 319
Kamanchile 12 144
Kamchatka 1 522 580
Kame 7 329
Kamm O 8 485, 10 251
Kamperman G W 9 133
Kamptozoa see Entoprocta
Kanam man 5 477
Kanamycin 1 476 7 329 330*
antibiotic 1 464-468
Kanawha River 9 149
Kandalaksa 5 114
Kangaroo 7 330
gestation period 6 182
Kanin (*Canin*) Peninsula 5 116
Kanjera man 5 479
Kansan (Glacial) 6 195
Kanthal A 7 265
Kantorowitch, L V 7 412
Kantrex see Kanamycin
Kaolin 2 648, 3 160-161
laterite 7 407
Kaolinite 7 330
alteration to cristobalite 3 161
alteration to mullite 3 161
atmospheric ice nuclei 3 216
ceramic technology 2 647
formation 7 331
kaolinitic clays 3 160-161
morphology 7 331
properties 7 331
species 3 165
structure 7 330
Kaolinitic clays 3 160 161
Kaolinization 7 407
Kaon (*K* meson) *see* Meson
Kapela Planina 5 118
Kaplan hydraulic turbine 10 591
Kaplansky, I 7 411
Kapok 7 332, 12 79
Kapok tree 7 332
Kappa particles 3 658-660
Kara Sea 5 114, 9 271
Karaginski Island 1 581
Karakorum Pass 1 577
Karat 6 103
see also Carat
Karathane 8 215
Karawanks 5 117
Karaya 6 297
Kardiner, A 10 32
Karlsbad twin law 5 207
Kármán, Theodor von 6 52, 590, 7 332, 413 12 575, 14 160 309, 376
Karman vortex street 7 332*, 14 376
Karman vortices 2 538
Karnian stage 14 82
Karroo deposits 1 106
Karroo System 10 25
Karp A 14 70
Karpinsky O 10 23
Karrer P 14 344
Karst topography 7 332 334
cave 2 572
cycle concept 7 333
Florida 9 151
karst coasts 3 245
lapiés 7 333
related features 7 333
sinkhole types 7 333
soil 7 335
Karst topography—*cont*
solution marked plains 10 258 259
Virginia 9 148
Yucatan 9 151 152
Karumiidae 3 277
Karwendel Gebirge 5 117
Karyolymph 2 607
Karyotype 3 113
Kasai River 1 109
Kata thermometer air velocity measurement 1 221
sensible temperature measurement 12 181
Katabatic wind 8 332
Antarctica 1 440
Arctic region 1 524
Katchalsky, A 4 487
Kater, H 13 515
Kater's pendulum 9 618
Kathlamidae 1 571 9 475
Katla 5 120
Kattegat 5 114
Katydid 7 334* 9 418
Katz, B 8 197
Kauai, island of 9 481
Kauffmann-White scheme 12 15
Kaula, island of 9 481
Kauri pine 3 187
Kawaguchi spaces 6 164
Kaya S 5 231
Kazakh upland 1 585
Kazanian stage 10 23
Kazbek 5 119
Ked 4 211
Keel (ships) 12 286 287
Keel (sternum) 12 365
Keenan P C 13 41
Keep, W J 2 540
Keeper, magnet 8 25
Keeping quality (food) 8 433
Keesom, W H 7 195
Keewatin section 9 143
Kefir 8 455
Kerl, F 2 132
Keilor man 5 478
Keintzler, C F 12 102
Kekule, F A 1 547, 9 393, 11 502
Kekule benzene structure 11 503
Kel F *see* Polyfluoroolefin resin
Kell R D 11 98
Kell blood group factors 2 269
Kelland P 11 187
Keller D 12 542
Keller-Dorian color film process 10 167
Kellner eyepiece 5 175
Kelly, G 10 56
Kelly, William 13 94
Keloid 9 320
Kelp 10 89
Kelthane 8 518
Kelvin, William Thompson, first baron (Lord) 1 567, 575, 584, 13 581-584
Kelvin body 13 417-418
Kelvin bridge 7 334 335
Kelvin's circulation theorem 7 335
Kelvin equation 7 181
kelvin guard ring capacitor 2 445
Kelvin's minimum energy theorem 7 335 336
Kelvin relations (thermodynamics) 13 583
Kelvin temperature scale 13 486 487
Kemijoki, Kemi 5 121
kenai Peninsula 9 159
Kenai Range 9 159
Kendall, E C 6 482 13 626
Kennedy, Alexander B W 14 295
Kennedy, J W 10 422, 14 66
Kennedy key 8 5
Kennedy's theorem 14 294 295
Kennedy-Thorndike experiment 11 434
Kenozooecum 2 356
Kentei Range 1 577
Kentrogen larva 11 547
Kentucky bass 2 108
Kentucky bluegrass 2 272
Kentucky Bluegrass region 9 153
Kentucky coffeetree 7 336
Kenya highlands 1 107
Kenya tick typhus 13 630
Kepler, Johannes 1 596, 2 579 580, 4 335, 6 263, 9 371, 11 427
Kepler's laws celestial mechanics 2 579 582
gravitation 6 263
planets 10 266
Kepler's nova 13 305
Keplerian motion 2 581
Keplerian orbit 3 311
Keplerian telescope *see* Terrestrial *telescope*
Keratella 11 634

Joint (anatomical) 7 314-315
  histogenesis 12 352
Joint (anatomical) disorders 7 315-316
Joint (mechanical) 7 316
  adhesive 1 68, 7 316
  bolted *see* Bolted joint
  brazing 7 316
  friction-held 7 316
  interlocking 7 316
  nailed 9 1
  pressure-tight gasket 6 68
  riveted 7 316, 11 587-588*
  screw fastener 7 316, 12 84
  soldering 7 316
  staking 7 316
  stapling 7 316
  structural connections 13 203
Joint (rock) 2 571
  fabric studies 13 205
Joint, welded *see* Welded joint
Jointer plane 14 543
Jointfir 5 32
Joist 11 620
  bending moment 2 162
Jokulhlaup 14 550
Joliot, F 7 506
Joliot, I C. 3 47
Joliot, J F 3 47
Jolly balance 2 74
Joly, C J 11 187
Jominy test (hardness) 13 92
Jonah crab 4 34
Jones, D F 6 430
Jones, F D 8 195
Jones, G 4 485
Jones, H 1 263
Jones, Sir Harold Spencer 4 335 336
Jones, L A 10 161
Jones, R C 10 453
Jones calculus 10 453-454
Joppeicidae 6 401
Jordan, P 7 503
Jordan curve 3 340
Jordan region 3 396
Jordan River 1 580
Jordan's theorem 3 340
Joree 14 1
Josephs, R C. 4 485
Jost, A 11 467
Joubert, J 1 476
Joukovsky, N. 14 396
Joukowski, N 13 224
Joukowsky transformation 1 204
Joule, J P 3 407, 7 316
Joule 4 425, 7 316*
  relation to calorie 7 316
  relation to electron volt 4 519
  work 14 552
Joule equivalent 3 407
Joule's law 1 101, 7 316*
Joule-Thomson effect 7 195, 538-540
Journal bearing 2 122
Joy, A H 8 506
Joyce, James 1 552
Juan de Fuca Strait 9 162
Judson, W L 14 615
Jug wasp 6 582
Jugatae 7 463
Juglandaceae 7 316
Juglandales 7 316 317*, 10 346
  hickory 6 441
Juglans 3 188, 7 317
Juglans cinerea 14 383
Juglans nigra 14 383
Juglans regia 4 615, 8 243, 14 384
Juglone 11 195
Jugular veins 2 499
Jugum 7 459 475
Julian Alps 5 117
Julian calendar 2 415
Julus 8 441
Jumping ground bug 6 401
Jumping plant lice 6 473
Jumping Pound pools 9 5
Jumping spider 1 498
Jumping tree bug 6 401
Juncaceae 7 514, 10 345
Junco 7 317
Junction diode 7 317-319
  alloy junctions 7 317
  characteristics 7 319
  Esaki tunnel diode 5 67
  fabrication methods 7 317
  fused aluminum wire silicon 7 317
  germanium 6 178; 7 317
  gold bonded germanium 7 317
  junction rectification 7 318
  photodiode 10 148-149
  silicon 7 317, 12 324
  see also Diode, semiconductor
Junction rectifier *see* Semiconductor rectifier
Junction transistor 7 319-321
  alloy-junction 7 319
  conductivity and impurity profiles 7 320
  diffused base 7 320
  germanium 7 319
  grown-junction 7 319
  high-temperature 7 319
  high-voltage 7 319
  n-p-i-n 7 321
  p-n-i-p 7 321
  power rating 7 319
  power transistor 7 321
  rate grown 7 320
  remelt junction 7 320
  silicon 7 319
  tetrode 7 321
  see also Transistor
Juncus 4 293, 8 127
June bug 2 131
Jung C G 5 535, 10 34, 11 74, 80
Jungfern Passage 2 521
Jung frau 5 119
Junger cell 13 158
Juniata shale 11 388
Juniper 4 293, 9 408
Juniperus 3 188
Juniperus scopulorum 14 288
Juniperus virginiana 2 574, 14 527
Juno 1 596 597
Jupiter 7 321 325
  albedo 1 223
  atmosphere 7 325
  eclipses of Galilean satellites 4 382 383
  escape velocity 3 68
  internal structure 7 325 326
  oblateness 6 254
  occultation by 9 244
  orbital elements 7 321
  perturbations 2 582
  phases 7 322
  radio emission from 11 245
  Red Spot 7 322 325
  rotation period 7 322 325
  satellites 4 382 383, 7 324 325*, 14 41
  telescopic appearance 7 322 325
  Trojan planets 14 114
Jura Mountains 13 408
  fold and fold systems 5 368
Jurassic 6 136, 142, 7 325 327*
  animal life 7 327, 9 521
  economic products 7 327
  paleogeography 7 325
  plant life 7 327, 9 505
  subdivision 7 325
  tectonic history 7 326
Jursa, A 15 272
Just tuning 8 662 664
Justifying typewriter 3 348
  composition (type) 3 348
Justowriter system 3 348
Jute 2 459, 7 327-328*, 12 79
  burlap 2 572
  diseases of 7 328
  fiber, natural 5 250
Jutland Peninsula 5 116
Juvenile hormone 6 405
  insect physiology 7 125
Juvenile water 6 277, 11 270
  in thermal springs 15 341

nosternon odoratus 3 22
nosternon subrubrum 3 23
pping, F S. 12 323
rchhoff, G. R. 1 270, 6 255, 321 322*, 11 647, 12 515, 586 587
rchhoff's equation of heat capacity 5 52, 13 561
rchhoff's laws of electric circuits 4 222, 7 363 364*
rchhoff's law of radiation 6 371*, 12 593
rchhoff's theory of diffraction 4 139
rchneriella 1 235
rkaldy, G 6 400
rkbridae 9 510
rkendall effect 4 149
rkocystis 8 680
rkpatrick, P 3 358, 14 581
rkwood J G 7 541, 12 486
rkwood's gaps 1 596
rsch 4 255
rthar Range 1 577
ssing bug 7 564
ssiakowsky G B 1 547, 2 419
stna River 1 580
stner, A 8 340
te 7 364 365*, 11 135
bow 7 364
box 7 364
lift to-drag ratio 7 364
stability 7 364
ttel, C. 5 253
ttiwake 6 296
vu Lake 1 107
wi 1 495 4 198, 7 365*
jeldahl, J 2 199
jeldahl method 9 399
jeruff Rosenbusch rule 8 298
ladolithus 13 629
lamath Mountains 9 162
laproth M H 2 654, 14 209
lebsiella 5 1 2 98
Klebsiella pneumoniae 1 466-467 3 67, 7 365*, 619, 10 427, 429 13 179 528
fluorescent antibody method 8 383
leeman R 1 268
lein F 8 180
lein G 5 10 36
lein O 14 200
lein Gordon equation 11 180
lein Nishina global cross section 3 357
lein Nishina scattering formula 3 356-357
leitman N 12 377
lic K. 10 617
line test 13 575
lingenberg L. J 10 75
lystrons 13 403
lippe 5 194
lystrograph 10 619
Klosterella 9 579
Klosterellidae 9 510
Kluyver, A J 2 67
Kluyvera 11 64
Klystron 7 365 368
amplifier 7 367
bunching action 7 365-366
circuit 7 366
oscillator 7 367
radar transmitter 11 211
reflex klystron oscillator 7 367
transfer admittance 7 366
Knapp, R. T 14 409
Knemidokoptes mutans 12 30
Knife balance 14 461-462
Knife harrow 1 527
Knife switch 13 542
Knipping, P 3 592, 14 567
Knisely, M 7 559
Knobbed pear conch 14 487
Knobbed whelk 14 487
Knock 7 198
combustion *see* Combustion knock
Knock-on protons and neutrons 3 499
Knoevenagel reaction 5 374
aldehyde 1 229
ethyl acetoacetate 5 88
Knoop hardness test 8 275
Knoop indentation test 1 10
Knorr, L. 5 87
Knorr quinoline synthesis 11 192
Knorr synthesis 5 89, 11 131
Knot (speed) 9 12, 12 256
Knowlton hophornbeam 7 268
Knudsen, M 12 102
Knudsen V O 9 129
Knudsen gage 14 240
Knudsen number 7 368, 13 295
Knurled nut 9 231
Koala 7 368 369
Koch Robert 1 475, 482 2 68
Koch Rudolf 14 171
Koch Weeks bacillus 10 258
Kochab 14 235
Kochia 3 191
KOCN 6 421
Koczy F *12 110*
Kodachrome film 10 167
Kodachrome process *10 158*
Kodacolor 10 167 168
Kodak Dye Transfer 10 168
Kodel 5 244
dyeing 4 310
Kodiak Island 1 525 9 158 159
Koehler O 13 403
Koeleria 3 190
Koenig G H R von 7 304
Koeppen W 3 182
Koeppen climatic classification 3 182
Koffka K 10 33
Kohlenkalk (Carboniferous) 2 469
Köhler, Wolfgang 7 443, 10 33
Köhler's illumination 8 394
Kohlrabi 7 569
Kohlrausch, F 4 484
Kojic acid 7 369*, 11 108
Kola (Cola) Peninsula 5 116
Kolanin 3 273
Kolbe electrolysis 2 476
Kolbe hydrocarbon synthesis 7 369
alkane 1 249
Kolguev 5 117
Kolkwitz, R 5 534
Koller, C. 3 249
Kolm 9 308
Kolmer test 13 575
Kolmogoroff, A N 14 162
Kolmogoroff spectrum 8 63
Komodo dragon 13 22
Kompassia 1 587
Kompfner R 4 519
Konigsberg bridge problem 6 253
Kominekites volutus zone 14 82
Konjak mannan 8 92
Konorsky, J 11 399
Kookoligit Mountains 1 525
Koonunga 8 76, 13 367
Koonunga cursor 1 396
Koonungidae 1 396
Kopal Z 2 189
Kopet Dagh 1 577
Koplik's spots 8 188
Koppen W 1 93
Korat plateau 1 580
Kornberg, A 2 62 9 213
Korner's method 7 277
Koroseal 3 75
Kort nozzle 7 116, 11 12
Kossinna E 4 325
Kotoite 10 425
Kottler, F 14 201
Kovar 1 259
thermal-expansion alloy 7 267
Kotzebue Sound 9 158
Kraepelin E 12 66
Kraft process cellulose 2 625
wood pulp 9 539
Krafft temperature 12 394
Kraft 13 27
Krakatoa volcano 14 555
Krämer drive (induction motor) 1 287
Kramer's rule 9 227
Kramerite 12 464
Kramers, H A 3 471
Kramers Kronig relationship 4 107
Krassowski ellipsoid 6 120
Krausosis 11 481
Kraus C. A 6 177
Krause's end bulb 3 633 *12 180 13 490*
Krebs H A 2 31 5 142 7 370
Krebs cycle 1 530 7 369 371* 10 132, 350
bacterial metabolism 2 31
lipid metabolism 7 533
Krebs cycle—cont
plant respiration 10 370 371
respiration 11 506
Kremastic water 6 276
Kretschmer, E. 10 31, 12 66
Krilium 1 52
Krill 5 108
Krim (Crimea) Peninsula 5 116
Krimpen, Jan van 14 171
Krishnan, K S 11 532
Krogh, A 13 505
Kroll, W A 13 654
Kroll Betterton process 7 455
Kroll process 11 124
titanium 11 119 13 654
zirconium 11 119, 14 616
Kronecker, L. 5 46
Kronecker delta 2 404
Kronecker symbol 11 166
Kronig Penney model 7 371
Kropp E. 3 643
Krōyera 2 418
Krüger 60 2 186
Krugiodendron ferreum 7 268
Krumbein, W C. 12 241
Krupp mill 3 559
Krupp wheel excavator 9 305
Krynine, P D 12 24 13 209
Krypton 7 371-373
analytical methods 7 372-373
discovery 7 372
electron configuration 4 504
ionization potential 4 504
occurrence 7 372
production 1 637, 7 372
properties 7 372
uses 7 371 372
Kryter, K D 9 127
Kuban River 5 121
Kudoa 8 689
Kudzu 7 373
Kuei chou plateau 1 527
Kuenen P H 9 412
Kuen lun Mountains 1 577
Kuffler, A W 8 205
Kuffler S W 8 197
Kuhn A 13 403
Kuhn H W 6 26
Kühn, O 12 604
Kuhn, W 9 438 14 230
Kuhn-Moos Catharina 14 615
Kuiper, G 1 597 3 507, 10 420
Kuiper G K 12 471
Kullenberg, B 8 146
Kullerud, G 9 379
Kulp J L 6 136
Kummer E. E. 9 225
Kumquat 7 373
Kunelsen, M 9 266
Kungangie formations 10 26
Kungurian stage 10 23
Kunzite 13 10
gem 6 99
Kupferschiefer 9 308

Keratin 3 655
protein, fibrous 11 40
wool 5 251
Keratitis 7 336*, 337
Keratoconjunctivitis (epidemic) 3 337*, 7 337
adenovirus 1 65
keratitis 7 336
Keratosis 6 258
Keratophyre 10 51-52, 86
Kerch Peninsula 5 116
Kerf 14 542
Kermack, K A. 4 259
Kern, D Q 6 367
Kernel blight 2 99
Kernite 2 292, 301
Kerogen 7 337*, 8 447; 9 304
Kerosine 7 337*, 10 54-55
aircraft fuel 1 179
crude oil fraction 10 66
distillate fuel 4 246
jet fuel 7 306
petroleum products 10 72
Kerr, J 7 337
Kerr, W J 13 361
Kerr cell *Kerr effect* 7 337-338
photography 10 160
time-interval measurement 13 646
Kerr constant 7 337-338
Kerr effect 7 337-338
electrooptical shutter 7 338
magnetooptics 8 68
Kersantite 7 389
Kerst, D W 14 589
Keta salmon 12 14
Ketal 9 414
Ketchup 5 407-408
Ketene 7 338
acetone 1 34
Keto acids 2 33
alpha Keto-delta aminovaleric acid 11 5
2-Keto 3 deoxy-8-phosphooctonic acid 2 17
Keto enol tautomerism 15 402
Keto form 5 87
Keto grouping 13 402
2-Keto-4 hydroxy-5-aminovaleric acid 2 35
Ketoacidosis 7 334
beta Ketoacyl-CoA 2 31
alpha-Ketoadipic acid 7 638
beta-Ketoadipic acid 2 33, 14 126
alpha Ketobutyric acid 13 615
beta-Ketoester 5 375
alpha-Ketoglutarate 7 638
alpha Ketoglutaric acid 1 550, 2 31; 10 372, 13 598, 14 17
Krebs cycle 7 370
metabolic disorders 8 261
nitrogen excretion 9 111
Ketohexose 2 454
Ketoisoleucine 6 106
Ketolase 2 16
beta-Ketomonocarboxylic acids 2 33
Ketone 7 339 340
acetone 1 34
acetophenone 1 36
bacterial aerobic oxidation 2 30
benzophenone 2 165
Grignard reaction 6 270
ketene 7 338
methyl 6 323
methyl ethyl ketone 8 345
nomenclature 9 396
oxime 9 468
quinone 11 195
Reformatsky reaction 11 402
Ketonemia 9 534
2-Ketopyrrolidine 11 131
Ketose 2 451
Ketosis 7 340*, 534, 8 265
17-Ketosteroid 13 526
clinical pathology 3 192-202
beta-Ketothiolase 7 532
Ketovaline 6 106
Ketovime 9 468
Kettering, C F 4 274, 7 198
Kettle (geology) 7 329
Kettle Interlobate Moraine 6 197
Kettledrum 8 665-666
Keuper 14 81
Keweenaw Peninsula 9 142
Keweenawan sandstones 10 567
Key, machine *see* Machine key
Key punch 4 14
Keyboard balance 2 72
Keyboard instruments 8 666-667
Keyed clamp 3 153
Keyhole limpet 1 591
Keyhole saw 14 542
Keyline layout 10 601
Keyways 8 5
Khamsin 12 548
Kharasch, M S 1 63
Kicking Horse Pass 9 157
Kid 6 227-229
Kidd blood group factors 2 269
Kidder, G 1 698
Kidney 7 340-342*, 9 40, 14 221-231
amniotes 14 228-229
anamniotes 14 226-228
comparative anatomy 14 226-229
embryology 7 341-342*, 14 221-225
endocrine gland 4 588
Kidney bean 12 145
Kidney disorders 7 342-344
cysts 7 344
nephritis 9 40
tumors 7 344
Kidney infection 13 36-38
Kidney ore 6 395
Kidney region 1 70
Kidney worm 4 202
Kidskin 7 446
Kiel, Gulf of 5 114
Kier bleaching 2 258
dyeing 4 310
Kilauea volcano 9 482, 14 349-353
Kilbourne, F. 6 315
Kiliani, H 8 579
Killdeer 7 345
Killed steel 13 97-99
Killer whale 4 262
Killifish 7 345
Killing frost 5 540
Kiln 7 345-347
Kiln furniture 7 246
Kilocalorie *see* Calorie
Kilogram 7 347
Kiloton yield (atomic bomb) 1 648
Kilowatt *see* Watt
Kilowatt hour 4 425
Kimball, O 9 534
Kimball-Epply instrument 11 214
Kimberlite 4 98; 6 96, 10 12
in eclogite 4 383
Kimmeridgian stage 7 525
Kinase 5 24
bacterial enzyme 2 15
nucleic acid 9 213
Kinchinjunga 1 577
Kinderhookian stage 2 471
Kinematic lead 1 537
Kinematic viscosity 14 333
Kinematics 7 347
gas 6 58
machines 8 195
Kinepanorama 3 129
Kinescope 7 347-349*, 14 243
color 7 349
color television 3 298
recording (television) 13 458
television receiver 15 472
Kinesthesis 7 349
Kinesthetic sensation 7 349-350
discriminations 7 350
mechanoreceptors 8 197
perception 10 4
receptors 7 350
stereognosis 13 127
tickle 13 631
Kinetic energy 4 599 600
harmonic motion 6 341
Lagrange's equations 7 384-386
nuclear reactions 9 199
Kinetic metamorphism 8 296
Kinetic momentum 7 386
Kinetic reaction (mechanics) 4 3
Kinetic temperature nuclear fusion 5 595
Kinetic theory of matter 7 350-355
Kinetic theory of matter—*cont*
electrical conductance of metals 7 353 354
equipartition theorem 7 353
gas constant 6 49
gases 6 41-44
ideal gas pressure 7 352
mean free path 7 354 355
quantum problems 7 351-352
quantum theory, nonrelativistic 11 167
specific heat 7 353
as stored energy 13 565
viscosity 7 354 355
Kinetics (chemical) 7 355 359*, 10 203
activation energy 7 356 357
antioxidants 1 479 480
catalysis 2 519
chain reaction, chemical 5 6
combustion 5 306 307
free radicals 5 496 498
half life 6 318 319
isotopic exchange reaction 11 300
organic reaction mechanism 9 399
Kinetics (classical mechanics) 7 359 360
gas 6 58
Newton's laws of motion 7 359 360, 9 91*
one dimensional particle motion 7 360
three dimensional particle motion 7 360
two dimensional particle motion 7 360
Kinetin 10 330
endocrine mechanisms 4 592
Kinetoplast 11 58
King, Ralph 10 26
King, W 9 22
King cobra 3 248, 13 25
King crab 1 557, 5 530, 531, 4 31, 14 565
King Island 8 90
King rail 11 326
King salmon 12 14
King snake 7 360 361
Kingbird 5 562, 7 361
Kingdom Animalia 1 420, 13 404
Kingfisher 5 473, 7 361
Kinglet 7 361
Kingpin 1 685
Kingsbury, J 7 355
Kingslake, R 9 332
Kinin plant hormones 10 34 343
Kinorhyncha 1 413, 573, 7 361
Kinosternon 14 167

L

L band radar 11 201
L head automotive engine 1 687
La Chapelle, T J 14 66
Laberbia 13 191
Labial gland 9 369
Labial pit 12 180 13 25
Labiatae 5 24 329
Labidognathus 10 465
Labidosaurus 11 484
Labiodental consonant 10 121
Labium majus pudendi 11 474
Labium minus pudendi 11 474
Labrador 9 141 145
Labrador Current 1 626, 9 249
icebergs 7 7
off Newfoundland 1 524
Labrador Sea 9 251
Labradorite 5 213 214 7 375*
in theralite 13 549
Laburnum 10 332
Labyrinthic placode 9 47
Labyrinthodontia 1 334, 415, 7 375*, 12 365
Ichthyostegalia 7 9
Rhachitomi 11 545
Stereospondyli 13 128
Labyrinthula 7 375
Labyrinthula macrocystis 11 44
Labyrinthula sopfi 11 44
Labyrinthulales 7 375
Labyrinthulidae 11 44
Labyrinthus hepatis 7 559
Lac insect 6 476
Lac resin 12 253
Lacifer lacca 6 476
Lacolith 7 375 376* 10 64, 421
Lace bug 6 401
Lacerta 3 412, 414*
Lacerta agilis 7 632 10 127
Lacerta vivipara 10 127
Lacertidae 13 21
Lacertilia (Sauria) 11 494
Lepidosauria 7 474
Lachesilla 11 71
Lachesis muta 2 576
Lachlan River 1 671
Lacombe 11 5 125
Laconia Gulf of 5 114
LaCoste sea gravimeter 13 514
LaCoste Romberg gravimeter 13 516
La Cour D 8 63
Lacquer F 6 295
Lacquer 7 376* 9 493
japanning 7 302
surface coating 13 311
Lacquer tree 14 282
see also Varnish tree
Lacrimal bone 12 373
Lacrimal gland 7 376
eye 5 162 171
Lacrimator 3 45
chemical warfare 3 45
alpha chloroacetophenone 1 56
Lacrosse missile 1 540
Lactam and lactim 7 376 377
lactam definition 13 401
tautomerism 13 401
Lactaroviolin 1 476
Lactase 2 461, 5 203 7 377*
Lactate 2 213, 7 377*
Lactation 7 377 378* 9 455 13 599
breast 2 325
control of secretion 7 378
milk production 7 377 378
Lacteal 4 161 5 205
Lactic acid 7 378 380
antimetabolic agent 1 475
byproduct of 2, 3 butane diol production 2 377
in carbohydrate metabolism 2 460
chemical production 7 379 380
fermentation 2 41 42 3 11 7 378 380
in food preparation 4 415 5 376
food preservation 5 426
grades 7 380
in reactions with diphosphopyridine nucleotide (DPN) 4 207 492
Lactic acid N phenylcarbamate 10 380
Lactide and lactone 7 380
Lactim 7 376 377
definition 13 401
tautomerism with lactam 13 401
Lactobacillaceae 5 96 7 380-382* 10 423
bacteria, taxonomy of 2 11
Lactobacilleae 7 382
milk 8 431
Streptococceae 7 381 382
Streptococcus 13 177
Lactobacilleae *Catenabacterium* 7 382
n 7 382
7 382
Lactobacilleae—*cont*
Lactobacillaceae 7 381
Lactobacillus 7 382
Lactobacillus 2 41, 8 81, 431, 14 508
Lactobacillus acidophilus 8 434
lactose 7 382
Lactobacillus arabinosus 2 245 9 92
bioassay 2 194
Lactobacillus brevis 5 423 7 381
lactic acid 7 378
Lactobacillus bulgaricus 8 435 437
lactic acid 7 378
Lactobacillus casei 5 369, 8 431
bioassay 2 194
kefir 8 435
riboflavin 11 561
Lactobacillus citrovorum 2 380
Lactobacillus delbrueckii 2 195
lactic acid 7 378
Lactobacillus fermenti 2 194
Lactobacillus lactis 2 194
Lactobacillus leichmannii 2 194
Lactobacillus plantarum 5 423
lactic acid 7 378
Lacto-enoic tautomerism 13 402
Lactogen 11 477
Lactogenic hormone 6 480
hypophysis 6 596
mammary gland 8 85
pituitary gland 10 250
see also Prolactin
Lactogogin 4 592
Lactone 7 380
tautomerism 13 402
Lactone dye 4 504
Lactose 2 452 458 7 382*
fermentation 9 544
sugar 13 239
swine production 13 341
Lactuca sativa 7 478
Lacuna 12 352 365
Lacustrine plains 10 262 263
Lacydonidae 10 461
Ladinian stage 14 82
Ladoga Lake 5 118
Ladore Canyon 9 157
Ladybird beetle 2 130 3 278
Ladybug 2 130
Laemobothridae 8 78
Laennec's cirrhosis 7 562
Lag (instrument) 7 155 10 206
Laganum 3 226
Lagena 12 28
Lagena (phonoreception) 10 124
Lagenidea 5 435
Lagenidiales 10 200
Lagenidium 10 200
Lager beer 8 80
Lagging (tunnels) 14 142
Lagodon rhomboides 8 575
Lagomorpha 7 382*, 8 82
cony 3 452
rabbit 11 197
Lagomorpha fossils 7 382 383
Lagoon estuary 5 79
sediments 5 83 8 132-135*
Lagoon (embayment) 9 150
Lagoon Nebula 9 25 27
Lagopus 6 18 11 84
Lagopus lagopus 11 85
Lagopus leucurus 11 85
Lagrange, J L 8 178, 194, 345 9 225, 12 611, 14 114
Lagrange multiplier 2 410
Lagrange's equations 7 383 386
canonical transformations 2 437
conjugate momentum 7 385
conservative systems 7 385-386
derivation 7 383 384
derived from Hamilton's principle 6 331
equivalence to Hamilton's equations 6 330
generalized coordinates 7 385 385
generalized forces 7 383 384
kinetic momentum 7 386
Lagrangian function 7 386
nonconservative systems 7 385
relativistic systems 7 386
Lagrange's interpolation formula 7 217, 8 181, 9 229
Lagrange's method (partial differentiation) 9 570
Lagrangian density 7 386
Lagrangian function 7 386
canonical transformations 2 437
Hamilton Jacobi theory 6 322
Lagrange's equations 7 385 386
Lagrangian points 14 114
Lagrudae 5 276

Kupffer cell 7 559
Kuratowski's theorem 6 254
Kure Island 9 481
Kurie plot 11 286
Kurile Islands 1 523
Kurish Haff 5 114
Kurland Peninsula 5 116
Kuroda, P K 13 522
Kurosawa, E 6 184
Kuroshio 9 247
Kuroshio Current 9 264, 483
Kurthia 2 330
Kurthia zopfii 2 330, 8 686
Kurtosis 12 131
Kurtz, W 10 605
Kusch, P 1 649
Kuskokwim River 9 158
Kustner, F 6 123
Kutnahorite 2 467, 7 375-374*
Kutorgina 7 49
Kutorgina cingulata 9 497
Kutorginacea 9 497; 11 61
Kutta, W. M. 13 224
Kutta condition 1 204 205
subsonic flight 13 224
Kutta-Joukowski equation of lift 13 224
Kuttung lavas 11 597
Kuttung red varvoid sediments 11 597
Kützing, F. T 5 215
Kuwahara, S 12 102
Kwajalein atoll 1 646
Kwanto Plain 1 586
Kwashiorkor disease 8 79
Kyanite 7 374 11 409
Kymography 11 303
Kynurenic acid 11 192, 193
Kynurenin 8 171
Kynurenine 2 35, 14 126
Kynurine 11 192
Kyoga, Lake 1 109

L

L band radar 11 201
L head automotive engine 1 687
La Chapelle, T J 14 66
Laberhia 13 191
Labial gland 9 369
Labial pit 12 180 13 25
Labiatae 5 24 329
Labidognathus 10 465
Labidosaurus 11 484
Labiodental consonant 10 121
Labium majus pudendi 11 474
Labium minus pudendi 11 474
Labrador 9 141 143
Labrador Current 1 626, 9 249
icebergs 7 7
off Newfoundland 1 524
Labrador Sea 9 251
Labradorite 5 213 214 7 375*
in theralite 13 549
Laburnum 10 332
Labyrinthic placode 9 47
Labyrinthodontia 1 534 415 7 375* 12 363
Ichthyostegalia 7 9
Rhachitomi 11 343
Stereospondyli 13 128
Labyrinthula 7 375
Labyrinthula macrocystis 11 44
Labyrinthula zopfi 11 44
Labyrinthulales 7 375
Labyrinthulidae 11 44
Labyrinthus hepatis 7 559
Lac insect 6 476
Lac resin 12 253
Laccifer lacca 6 476
Laccolith 7 375 376* 10 84, 421
Lace bug 6 401
Lacerta 3 412 414*
Lacerta agilis 7 632 10 127
Lacerta vivipara 10 127
Lacertidae 13 24
Lacertilia (Sauria) 11 484
Lepidosauria 7 474
Lachesilla 11 71
Lachnus murus 2 376
Lachlan River 1 671
Lacombe H 5 123
Laconia Gulf of 5 114
LaCoste sea gravimeter 13 514
LaCoste Romberg gravimeter 13 516
La Cour D 8 65
Lacquer E. 6 235
Lacquer 7 376* 9 403
japanning 7 302
surface coating 13 311 312
Lacquer tree 14 282
see also Varnish tree
Lacrimal bone 12 373
Lacrimal gland 7 376
eye 5 162 171
Lacrimator 3 45
chemical warfare 3 45
alpha-chloroacetophenone 1 56
Lacrosse missile 1 540
Lactam and lactim 7 376 377
lactam definition 13 401
tautomerism 13 401
Lactaroviolin 1 476
Lactase 2 461, 5 203 7 377*
Lactate 2 215 7 377*
Lactation 7 377 378* 9 455, 13 599
breast 2 325
control of secretion 7 378
milk production 7 377 378
Lacteal 4 161, 5 205
Lactic acid 7 378 380
antimicrobial agent 1 475
byproduct of 2 3 butane diol production 2 377
in carbohydrate metabolism 2 460
chemical production 7 379 380
fermentation 2 41 42 3 11 7 378 380
in food preparation 4 415 5 376
food preservation 5 426
grades 7 380
in reactions with diphosphopyridine nucleotide (DPN) 4 207 092
Lactic acid N phenylcarbamate 10 380
Lactide and lactone 7 380
Lactim 7 376 377
definition 13 401
tautomerism with lactam 13 401
Lactobacillaceae 5 96 7 380 382* 10 425
bacteria taxonomy of 2 11
Lactobacilleae 7 382
milk 8 431
Streptococceae 7 381 382
Streptococcus 13 177
Lactobacilleae *Catenabacterium* 7 382
Cillobacterium 7 382
Eubacterium 7 382
Lactobacilleae—cont
Lactobacillaceae 7 381
Lactobacillus 7 382
Lactobacillus 2 41, 8 81, 431, 14 508
Lactobacillus acidophilus 8 434
lactase 7 382
Lactobacillus arabinosus 2 245 9 92
bioassay 2 194
Lactobacillus brevis 5 423 7 381
lactic acid 7 378
Lactobacillus bulgaricus 8 435 437
lactic acid 7 378
Lactobacillus casei 5 360 8 431
bioassay 2 194
kefir 8 435
riboflavin 11 561
Lactobacillus citrovorum 2 380
Lactobacillus delbrueckii 2 195
lactic acid 7 378
Lactobacillus fermenti 2 194
Lactobacillus lactis 2 194
Lactobacillus leichmannii 2 194
Lactobacillus plantarum 5 423
lactic acid 7 378
Lacto-enoic tautomerism 13 402
Lactogen 11 477
Lactogenic hormone 6 480
hypophysis 6 596
mammary gland 8 85
pituitary gland 10 250
see also Prolactin
Lactogogin 4 592
Lactone 7 380
tautomerism 13 402
Lactone dye 4 304
Lactose 2 452 458 7 382*
fermentation 9 544
sugar 13 239
swine production 13 341
Lactuca sativa 7 478
Lacuna 12 352, 365
Lacustrine plains 10 262 263
Lacydonidae 10 461
Ladinian stage 14 82
Ladoga, Lake 5 115
Ladore Canyon 9 157
Ladybird beetle 2 130, 3 278
Ladybug 2 130
Laemobothridae 8 78
Laennec's cirrhosis 7 562
Lag (instrument) 7 153 10 206
Laganum 3 226
Lagena 12 28
Lagena (phonoreception) 10 121
Lagenides 5 435
Lagenidiales 10 200
Lagenidium 10 200
Lager beer 8 80
Lagging (tunnels) 14 142
Lagodon rhamboides 8 373
Lagomorpha 7 382*, 8 82
cony 3 452
rabbit 11 197
Lagomorpha fossils 7 382 383
Lagoon estuary 5 79
sediments 5 83, 8 132 133*
Lagoon (embayment) 9 150
Lagoon Nebula 9 25 27
Lagopus 6 18, 11 84
Lagopus lagopus 11 85
Lagopus leucurus 11 85
Lagrange J L, 8 174 194 345 9 225 12 611, 14 114
Lagrange multiplier 2 410
Lagrange's equations 7 383 386
canonical transformations 2 437
conjugate momentum 7 385
conservative systems 7 385 386
derivation 7 383 384
derived from Hamilton's principle 6 331
equivalence to Hamilton's equations 6 330
generalized coordinates 7 383 384
generalized forces 7 383 384
kinetic momentum 7 386
Lagrangian function 7 386
nonconservative systems 7 385
relativistic systems 7 386
Lagrange's interpolation formula 7 217, 8 181, 9 229
Lagrange's method (partial differentiation) 9 570
Lagrangian density 7 386
Lagrangian function 7 386
canonical transformations 2 437
Hamilton Jacobi theory 6 322
Lagrange's equations 7 385 386
Lagrangian points 14 114
Lagrudae 3 276

Kupffer cell 7 559
Kuratowski's theorem 6 254
Kure Island 9 481
Kurie plot 11 286
Kurile Islands 1 523
Kurish Haff 5 114
Kurland Peninsula 5 116
Kuroda, P K 13 522
Kurosawa, E 6 184
Kuroshio 9 247
Kuroshio Current 9 264, 483
Kurthia 2 330
Kurthia zopfii 2 330, 8 686
Kurtosis 12 131
Kurtz, W. 10 605
Kusch, P 1 649
Kuskokwim River 9 158
Küstner, F 6 123
Kutnahorite 2 467, 7 373-374*
Kutorgina 7 49
Kutorgina cingulata 9 497
Kutorginacea 9 497, 11 61
Kutta, W M. 13 224
Kutta condition 1 204 205
subsonic flight 13 224
Kutta-Joukowski equation of lift 13 224
Kuttung lavas 11 597
Kuttung red varvoid sediments 11 597
Kütting, F. T. 5 215
Kuwahara, S 12 102
Kwajalein atoll 1 646
Kwanto Plain 1 586
Kwashiorkor disease 8 79 82*
Kyanite 7 374, 11 409
Kymography 11 303
Kynurenic acid 11 192, 195
Kynurenin 8 171
Kynurenine 2 35, 14 126
Kynurine 11 192
Kyoga, Lake 1 109

Langmuir Child law—cont
relativistic form 11 430
variation of tube characteristics 14 248
Langmuir isotherm 8 547
adsorption 1 89
Langouste 4 30
Language 3 499
Languridae 3 278
Laniatores 10 92
Lanidae 12 507
Lanioles 8 561
Lanius excubitor 12 507
Lanius ludovicianus 12 507
Lanolin 7 309*, 14 444, 546
Lanosterol 2 54
Lans Mountains of 5 117
Lanston monotype 5 345
Lantana lace bug 6 405
Lantern optical 7 399
Lantern fish 8 679
Lantern slides 7 399, 11 1 5
Lanthanide contraction 7 399 400
Lanthanide elements *see* Rare earth elements
Lanthanum 7 400
electron configuration 4 504
extractive metallurgy 8 277
ionization potential 4 504
in monazite 8 566
Lanthella flabelliformis 4 58
Lanthonotidae 13 24
Lantsch h. 8 340
Lanugo 6 317 318
Lap (gem cutting) 6 102
Lap weld 14 464
Lap winding 14 505
Lapidary *see* Gem cutting 6 101
Lapides 7 555
Lapilli 14 349
Lapilli tuff 14 153
Lapis lazuli 6 99* 7 422
Laplace P S 2 582 5 508 4 335 7 402 8 194 345 14 430
Laplace expansion 4 84 12 610
Laplace points 6 121
Laplace [illegible]
[illegible]
analog solution 1 383
electrolytic tank 4 487 489
electron motion in vacuum 4 511
in polar coordinates 12 193
spherical harmonics 12 609
Laplace's irrotational motion 7 401 402
Laplace's law *see* Ampere's law
Laplace's transformation formula 7 165
Laplacian 7 403
La Plata River 12 529
Laporte rule (parity) 9 565
Laporte selection rule 12 160
Lappet 12 165
Lappet moth 7 464
Lapping 7 404
machining operations 8 6
polishing 10 457
Lapse rate, atmospheric 1 632
atmospheric stability 1 149, 633
in thunderstorms 13 616
troposphere 14 118
Lapteu Sea 9 271
Lapus Mountains 5 118
Lapworth C 9 575 12 327
Laqueus 2 515
Larch 7 404
Larch arabo galactan 6 5
Larch arabinogalactan 6 297
Lard 7 529 14 19
Larder beetle 2 131, 5 247
Large intestine 4 155 162
see also Digestive system
Large mouthed black bass 2 107
Large numbers laws of 10 630
Large oak apple gall 6 581
Large winged beetle 5 277
Larger yellow ant 6 582
Largus 6 407
Laridae 5 10, 6 296 13 494
Larix 5 188
Larix decidua 7 404
Larix laricina 7 404
Larix occidentalis 7 404
Lark 7 404 405
Lark bunting 2 371
Larmor, J 7 405
Larmor precession 7 405* 10 568
Larmite 7 405
Larrea 5 190
Larsen H 2 56
Larsenite 9 317
Lartet L 5 554
La Rue G R 4 149 14 77
Larus argentatus 6 296
Larus atricilla 6 296
Larus delawarensis 6 296
Larus pipixcan 6 296
Larvacea 7 405 406* 11 450
[illegible]
4 212
3 27 12 594
13 615
Larynx disorders 7 406
Laschmidt's number 7 586
Lashley hazl 5 7 443
Lasiocampidae 7 464
Lasioderma serricorne 5 287
Lasiurus cinereus 2 109
Lasius interjectus 6 582
Lasperesia maleata 7 472
Lasperesia saltitans 7 467
Latent bud 2 361
Latent heat 11 84 13 566
Latent image 7 407*, 10 162 169 169
Lateral aberration 5 91
Lateral bone 12 375
Lateral chord (Nematoda) 9 32
Lateral disk recording 4 237 238
Lateral fold theory (muscular system) 8 646
Lateral line 12 505
Lateral line organ 12 180
embryology 9 40
nervous system 9 42 63
Lateral moraine 8 597
Lateral plate (embryology) 6 174 175
Laterite 5 184, 7 407*
nickel ores 9 97
redbed 11 587
Lateritic soils 7 407
Lateritization 7 407
Latex 6 246 12 129
rubber 11 635
rubber tree 11 646
Latex paints 9 495
Lathe 7 407 409
automatic screw machine 7 409
engine lathe 7 407
machining operations 8 7
turret lathe 7 407 408
Lathrididae 5 278
Lathyrus 4 295
Lathyrus hirsutus 5 527
Latilaminae 13 191
Latimeria 3 415 9 446 12 561
living fossil 7 564
Latimeria chalumnae 5 255
Latin square design 5 144
Latitude 7 16 409* 10 86 14 10 547
Latitude astronomical 7 409
Latitude *celestial* 1 607
Latitude galactic 1 607
Latitude terrestrial 5 456 457
Latitude circle (spherical coordinates) 5 455
Latitude effect (cosmic rays) 5 501
Latosolic soils (distribution) 12 442
Latosols 12 438
Latreille, P 6 400, 435 8 682
Latrine fly 8 680
Latrodectus 1 498
Latrodectus mactans 1 496
Lattice (mathematics) 7 409 412
see also Boolean algebra
Lattice crystal 5 592
base centered monoclinic 5 594 595
base centered orthorhombic 5 594 595
body centered cubic 5 594 595, 598 599*
body centered orthorhombic 5 594 595
body centered tetragonal 5 594 595
Bravais lattices 5 594 597
Lattice, crystal—cont
cubic 5 594 595
face centered cubic 5 594 599
face centered orthorhombic 5 594 595
hexagonal 5 594 595
lattice vibrations 7 412 415
monoclinic 5 594 595
orthorhombic 5 594 595
tetragonal 5 594 595
triclinic 5 594 595
trigonal 5 594 595
x ray powder methods 14 583
Lattice constant 7 412
Lattice defects *see* Crystal defects
Lattice inclusion compounds 5 157
Lattice ordered groups 7 411 412
Lattice vibrations 7 412 415
ionic crystals 7 250
relation to superconductivity 13 301
relaxation time of electrons 11 430
and resistance 5 581 582
and resistivity 11 496 497
thermal conductivity 5 549 591
Latus rectum 9 542
Laubenfels M W de 10 519
Laudanum 1 566
Laue, Max von 14 567 568, 584
Laue camera 14 573
Laue equations 14 571 572
Laue method 14 573 575
Laughing gas 9 114
Laughing gull 6 296
Laughton A S 8 157
Laumontite 14 611
Launcher rocket *see* Rocket launcher
Launching (ships) 12 289 290
Launching pad complex 7 415 421* 12 544
blockhouse 7 417 419
combined erector and tower 7 420
electric power 7 420
fueling facilities 7 419
general support 7 420
geodetic survey of site 7 417
ground support equipment 7 419
launch stand 7 415
operational systems 7 421
oxidizers 7 419
pad for solid propellant rockets 7 421
pressurized gas supply 7 420
service tower 7 415
static test 7 415

Laguncularia 8 91
Lahars 14 350
Lake 4 306, 7 386-388*
amictic 5 523
Asphalt Lake, Trinidad 1 590
Australia 1 672
basin characteristics 7 387
classification of lakes 5 529
conservation aspects 7 388
consumer level 5 531
dimictic 5 523
economic aspects 7 388
Europe 5 115 116
Finger Lakes 5 273
holomictic 5 523
major lakes (table) 7 386
measurement 5 531
meromictic 5 523
monomictic lake 5 523
New Zealand 1 672
oligomictic 5 523
photosynthetic capacity 5 531
pigment 10 224
Pitch Lake, Bermudez 1 590
polymictic 5 523
regional factors 7 387
Tasmania 1 672
tides in 13 636
water character 7 387
see also lakes listed under proper names
Lake Agassiz 10 263
Lake classifications 5 523, 529
Lake copper 5 467
Lake Illamna 9 158
Lake Lanao 9 485
Lake Maracaibo 9 288
Lake Mead 4 48, 9 160 14 392, 399
Lake Nicaragua 9 164
Lake Okeechobee 9 151
Lake Poso 4 357
Lalande cell 14 477-478
Lama peruana 7 564
La Manche (English Channel) 5 109
Lamarck J B 2 259, 5 132 8 682
Lamarckism 5 132
Lamb, Willis Jr 1 658, 3 273
Lamb shift 1 657 658*, 5 273, 11 150
Lambda hyperon *see* Hyperon
Lambda point 6 392 395* 12 126, 13 301
Lambert 7 388
Lambert Bouguer law *see* Lambert's law of absorption
Lambert conformal conic projection 8 97
navigator's chart 9 16
polar navigation 10 442
Lambert's cosine law albedo 1 223
photometry 10 173
Lambert's law of absorption 1 12, 12 581
Lamblia intestinalis 10 474
Lambskin 7 446
Lamellar (streamline) flow 13 175
Lamellibranchiata 8 14
Lamellicorn beetle 8 276
Lamellicornia 8 276
Lamellisabella 10 431
Lamellisabellidae 13 545
Lamina propria 4 150 175
Laminae hepatis 7 559
Laminar flow 2 308, 5 324, 336, 7 388
aerothermodynamics 1 102 104
fluid-flow properties 5 341
heat convection 3 440-442
pipe flow 10 239
subsonic flight 13 227
see also Streamline flow
Laminaran gum 6 297
Laminaria 6 297, 8 108, 10 89
Laminariales 10 90
Laminated chain 5 5
Laminating (plastics fabrication) 10 405 406
Laminations in beach face 12 304
in shales 12 241
Laminations (electric machinery) 5 479, 4 409
Lamna ditropis 13 21
Lamnia nasus 12 243
Lamp (electric) 7 388
arc 1 503 504
combustion 10 155
electroluminescent 4 482
fluorescent 5 347 349
gaseous discharge 14 274
incandescent 7 50 54
infrared 7 101
invention 4 454
photoflash 10 155
ultraviolet 14 186
vapor 14 274
Lamp miner's safety 12 5
Lamp stroboscopic 13 187
Lamp black 10 224
Lamp shell 2 314
Lampbrush chromosomes 5 111 114
Lampert M A 6 304
Lampetra 5 616
Lamprey 1 414, 7 388 389* Petromyzontiformes 10 88
Lampridiformes 7 389*, 9 412
Lamprocystis 11 552
Lamprophis doliata 7 360
Lamprophis getulus 7 360
Lamprophyre 7 389 390
Lampshell 1 414
Lampsilis 5 100
Lampsilis siliquoides 8 669
Lampyridae 3 277, 5 282
Lampyris 3 282
Lampyroidea 3 277
Lampyridae 3 277
Lanai, island of 9 481
La Naulette jaw 9 22
La Plata River 12 529
Lancaster Sound 9 166
Lancefield, Rebecca C 7 390
Lancefield differentiation scheme 7 390 391
Lancelet 7 391
Lanceola 6 586
Lanceolidae 4 39
Lanchester, W F 15 224
Lanchester-Prandtl wing theory airfoil 1 198
Land breeze 8 332, 14 495
Land bridge (historical geology) 4 86, 9 520, 13 223
fauna and flora migration 7 273
Land capability classes 12 448
Land carrying capacity 5 185
Land crab 5 530, 4 33
Land exploitation 7 391
Land mines *see* Mine, land
Land navigation 9 10
Land transportation *see* Transportation
Land use capability ratings 12 428, 447 449
Land use map 2 536
Land use planning 7 391-393
land capability classes 12 448
land use map 2 536
see also Conservation of resources
Landau, L 4 97 6 393
Landau theory of diamagnetism 4 97
Landé *g* factor 4 517 518* 6 307
Landform differences *see* Terrain areas world wide
Landforms 5 65 66
bolson topography 9 160
coastal 5 242 244
depositional 6 165
desert erosion origin 4 74 77
effect on air movement 1 643
effect on air pollution 1 645
erosional 6 165
fluvial erosion origin 5 358 361
geomorphology 6 164 165
glaciated 6 195 198
hill and mountain 6 452 455
karst regions 7 533
Landforms—cont
mountain 8 617
plains 10 256-265
plateau 10 410
shaping by mass movement 7 297
volcanic 14 350
see also Basin, Escarpment, Fault and fault structures, Fold and fold systems
Landing altimeter *see* Terrain clearance indicator
Landing craft *see* Landing ships and craft
Landing flaps (aircraft) 14 31*
Landing gear 7 393 395
bicycle 7 394
main gears 7 393
nose gear 7 393
oleo pneumatic strut 7 394
outriggers 7 394
shock strut 7 394
skids 7 394
tail wheel 7 394
tricycle 7 393
Landing Ship dock 7 395 396
tank 7 395 396
Landing ships and craft 7 395 396
Landis, F 9 457
Landmarks (piloting) 10 250
Landsberg, G 11 352
Landsberg, H E 5 182
Landscape architecture 7 396 397
Landslide 7 397 398
earthquake 4 352
soil mechanics 12 458
in submarine canyons 13 215
underwater 13 222
Landslip 7 397
Landsteiner, K 2 266, 5 201
Lane, H C 5 80
Lane, J A 11 272
Lang, K 9 169
Langbeinite 5 238
Langbein, W B 12 305
Lange, G C 4 585
Langeberg 1 108
Langevin, P 4 96 97, 9 345
Langevin Debye law magnetic susceptibility 4 112 13 351
Langevin equation 2 350
Langevin function 7 398*, 9 346
Langevin theory of diamagnetism 4 96 97
Langevin theory of paramagnetism 9 345
Langley, S P 1 90 2 278 15 266
Langlois, Jean Charles 6 234
Langmuir, I 10 345 397
Langmuir Child law 4 204 7 398 399*
diode, vacuum 4 204

Lecithinase 2 19 20
Lecky P 10 33
Leclanche cell *see* Dry cell
Lecthylus gregarius 1 451
Lectotype 14 172
Lederberg J 2 67 5 617, 12 292
Leduc A 13 568
Ledum 3 180
Lee, T D 9 83 566 12 558
Leech 1 428, 7 448*
Leek 9 326
Leg 7 448 449
Legal chemistry *see* Forensic chemistry
Legendre, A M 3 130, 7 444, 12 611
Legendre equation 4 127
195, 610
endre polynomial 2 180
127
endre symbol 9 224
endre's duplication formula
32
endre's normal form (ellip
c integral) 4 561
ge's Peak 1 671
ghorn (chicken) 3 58
gionary ant 6 581
gume 5 541, 7 449*
alfalfa 1 232
pea 9 599
peanut 9 602
in soil management
12 428
soybean 12 535
vetch 14 310
gume forages 7 449
clover 3 218
cover crops 3 526 528
cowpea 3 529
kudzu 7 373
lespedeza 7 477
lupine 7 622
eguminocytheres 10 429
eguminosae 3 187 190 5 529
derris 4 69
legume 7 449
licorice 7 495
rosales 11 628
Lehmann E 6 250
Lehmann I 4 339
Lehmer D H 8 626
Lehr oven 6 297
Leibnitz G W 8 176
Leibnitzian symbol 7 167
Leidyosuchus 3 554
Leifson Einar 1 39 11 64
Leighton R B 7 414
Leiobunum 10 92
Leiodidae 5 276
Leiomyoma 9 319 320 14 236
Leiomyosarcoma 9 320
Leiotomus xanthurus 8 573
Leishmania 1 700 14 125
Leishmania braziliensis 14 125
Leishmania donovani 7 449, 14 125
Leishmania tropica 7 449, 14 125
Leishmaniasis 7 449*, 10 428, 11 60
Leitneria floridana 7 449
Leitneriaceae 7 449
Leitneriales 7 449*, 10 546
Leitz micromanipulator 8 552
Lejay P 13 515
Lelapiidae 2 306 13 560
Lemaitre A G E 3 505
Lemche, H 8 576
Lemma 5 534
Lemming 7 449 450
Lemnaceae 1 497
Lemniscate (of Bernoulli) 7 450
Lemnus 7 450
Lemon 7 450
Lemon grass oil 5 71
Lemon oil 5 71
Lemuria (Jurassic) 7 525
Lemuridae 10 590
Lena River 1 577
Lendenfeldt Mountain 1 671
Length 7 450
angstrom 1 406
foot 5 429
measurement of by interferometry 7 191 192
measures 8 188
meter 8 339
micron 8 355
standard 10 205
Length tension diagram 8 638 639
Lengthening reflex 11 401
Lenin 11 362 365
Lenin Peak 1 577
Lenitic ecosystem 5 522 552
Lennard Jones potential 6 41, 7 196
Lennard Jones theory 1 82
Lennoaceae 5 65
Lens anatomy 5 168
antenna *see* Antenna (aeral)
electron *see* Electron lens
electrostatic *see* Electrostatic lens
embryology 5 163
eye 5 168
magnetic *see* Magnetic lens
optical *see* Lens optical
Lens optical 7 451 454
aberrations 1 3 7
achromat 7 451
afocal 5 566
anamorphic 3 127 128
anastigmatic 7 455
apochromatic 7 452
apodization 4 137
biconcave 7 451
biconex 7 451
Biotar 7 455
cameras 2 424 431
Lens, optical—*cont*
Celor 7 455
cemented 7 452
Chevalier 7 454
chromatic aberration 3 89 91
coatings 6 185
collecting 7 451
compound lenses 7 451 452
concentric 7 451
contrasted to electron lens 4 510
Cooke triplet 7 455
cylindrical 12 608
Dagor 7 455
diopter 4 205
diverging 7 451
enlarger lenses 7 454
eyepiece 5 175
f number 7 451 455
germanium 6 177
gun sights 6 298 299
Heliar 7 455
hemisymmetric 7 451
holosymmetric lens system 7 451, 454
hyperchromatic 7 452
Hypergon wide angle 7 452 455
lens coatings 6 185
lens systems 7 452 454
light projectors 11 4
magnifiers 7 454
meniscus 7 451 455
modern lenses 7 455
motion picture cameras 3 124 129
motion picture projectors 3 124 127
negative meniscus 7 451
optical center 7 451
optical tracking instruments 9 360 362
Periskop 7 452 455
Petzval objective 7 455 454
photographic objectives 7 452 454
planoconcave 7 451
planoconvex 7 451
positive meniscus 7 451
power 4 205
rangefinders 11 338 340
refraction of light 11 406 407
single lenses 7 451
Sonnar 7 455
Steinheil triple aplanat 7 454
superchromatic 7 452
symmetrical 7 451
telephoto *see* Telephoto lens
telescope systems 7 452
Tessar 7 455
thick lenses 7 451
thin lenses 7 451-452
Topogon 7 455
Lens, optical—*cont*
toroidal 12 609
Verant 7 454
zoom *see* Zoom lens
Lens coatings 6 185
Lentic environment 5 525 527
Lenticel 10 11, 13 112
Lentinel 14 529
Lenz's law 7 454
eddy current 4 409
electromagnetic induction 7 70
Leo 5 412 414, 7 455*
Leo Minor 5 412 414*
Leo Minorids 8 508
Leonardian Series 10 21
Leonids (meteor showers) 7 455 8 507 508
Leopard 7 455
Leopard frog 4 208 5 534
Leotichidae 6 401
Lepadomorpha 7 455 456*, 13 608
Lepas 1 562 2 101
Lepas anatifera 5 145 13 608
Lepas fascicularis 7 455 13 609
Leperditacea 9 510
Lephoriyx californica 11 135
Lepidanthenia 10 465
Lepidocaris rhyniensis 2 643 7 535
Lepidocarpon 7 457 458
Lepidocarpon ioense 7 458
Lepidocentrotida 7 456
Lepidocyclina 5 434 435
Lepidocyclinidae 5 435
Lepidodendrales 7 456 459* 625 10 546
Lepidodendron 7 456 457 9 504
Lepidodendron aruleatum 7 458
Lepidodendron laviculare 7 457
Lepidodermella 5 3 6 77
Lepidoglossate radula 8 561
Lepidolite 7 459* 8 277 278, 346
cesium ore 2 656
lithium mineral 7 544
rubidium ore 11 617
Lepidomelane 2 246
Lepidophloios 7 457
Lepidoptera 7 134, 138 459-473*
army worm 1 545 546
behavior 7 473
butterfly 2 380 381
cankerworm 2 436 437
caterpillar 2 551 552
classification 7 465 472
cutworm 3 633 634
developmental stages 7 461-463
distribution 7 472 473
ecology 7 472 473
evolution 7 473
genetics 7 473

Launching pad complex—*cont*
timing and communication 7 420
weighing system 7 415
Lauraceae 2 433, 3 129
Lauramide 1 303
Laurasia 13 407
Laurel oak 9 237
Laurelia 3 187
Laurentian Upland 9 141
Laurer's canal (Trematoda) 14 78
Lauric acid 2 474, 5 184, 10 356, 470
Lauristen, C C 3 357
Laurus 3 187
Lauryl chloride 1 45
Lautarite 12 408
Lautsch skull 5 554
Lauxanidae 4 212
Lava 7 421-422*, 14 348-350
amygdules in 1 365
basaltic 2 105
block 14 349
flows 14 349
geologic thermometry 6 127
ground water in rocks 6 276
perlite 10 21
petrographic province 10 49 52
petrology 10 83 84
pillow structure 10 567, 14 349
types 14 349
volcanic glass 14 347 348
see also Magma
de Laval, G 8 120
Lavalier microphone 8 559
Laveran, Charles Louis 8 77
Laves, F 5 209
Lavoisier, A L 1 39, 2 199, 3 46, 13 254
Law of additive pressures 4 5
Law of faunal succession 13 168 170
Law of superposition 13 168, 170
Lawn textile 13 537
Lawrencite 8 312 313
Lawson cypress 2 578, 3 647
Lawsonia inermis 8 683
Lawsonite 6 212, 7 301
Layout drawing 7 422
design 4 611
master 4 611
plant 4 611, 10 322
Laysan, island of 9 491
Laysan bunting 2 371
Laterite 5 214, 7 422*
L D process steel manufacture 15 101
LC filters 5 268
LCM *see* Landing ships and craft
LCPL *see* Landing ships and craft
LCU *see* Landing ships and craft
LD_{50} *see* Lethal dose 50
Le Bel, J A 1 242, 13 125
Leaching 7 422-424
batch leaching 7 422-423
continuous countercurrent leaching 7 423 424
desilication, laterite 7 407
hydrometallurgy 6 559-560
of saline soils 12 429 430
Lead 7 424-427
bournonite ore 2 313
crystal structure 3 599
electron configuration 4 504
extraction and refining 11 120
extractive metallurgy 8 277
galena ore 6 12
gamma ray absorption 6 34
ionization potential 4 504
isotopic composition of ores 7 430
metallurgy 7 431 434
natural occurrence 7 424 426
organometallic compounds 9 403
poisoning 7 424
principal compounds 7 426
pyromorphite ore 11 128
thermal conductivity of 13 300
uses 7 425 426
velocity of sound in 12 516 14 431
Lead-acid storage battery 7 425, 15 155 157
active materials 15 153
capacity 15 154
cell construction 15 155
charging 15 154 156
containers 15 156
corrosion 15 156
densification of negative material 15 157
discharge 15 154
disintegration of plate 15 156
double sulfate theory 15 154
electrolyte 15 153
equations 15 154
Exide Ironclad plate 15 156
freezing of electrolyte 15 156
Gould spun plates 15 156
local action 15 157
Manchester plate 15 155
overcharging 15 157
pasted plates 15 155
principles of operation 15 154
rated-discharge characteristics 15 155
reactants 15 154
Lead-acid storage battery—*cont*
self-discharge 15 157
separator shorts 15 157
shedding of active materials 15 156
undercharging 15 157
volt time characteristics 15 154
Lead alloys 7 426 427
Lead arsenate 7 140
Lead azide 4 84, 5 151
Lead blast furnace 11 122
Lead chamber process (sulfuric acid) 15 260, 263
Lead chromate 3 105
Lead fluoride (band spectrum) 2 90
Lead isotopes, geochemistry of 7 427 431
anomalous leads 7 429-430
in granite 7 430
in magmatic differentiation 7 431
meteorite lead age 4 511
ore lead age 4 331
variation with time 7 427
Lead metallurgy 7 431 434
Lead plating (electroplating) 4 531
Lead selenide photoconductive cell 7 106* 10 140
Lead styphnate 10 592
Lead sulfide photoconductive cell 7 106*, 10 140
Lead telluride photoconductive cell 7 106* 10 140
Lead tetraacetate 1 30
Lead tin alloy 12 471
Leadbetter E R 8 340
Leaded tin bronze 3 471
Leadwood 7 268
Leaf (botany) 7 434 441* 10 368
Leaf anatomy 7 436 441
Leaf base 7 434 435
Leaf beetle 3 278
Leaf blight 5 516 518 13 172
Leaf chafer 3 287
Leaf curl disease 9 601
Leaf hopper 7 441
Leaf margin 7 434
Leaf miner 5 362
Leaf miner fly 4 212
Leaf roller 7 472
Leaf rust *see* Plant disease
Leaf scar 13 112
Leaf scorch 13 172
Leaf shape 7 435
Leaf spot 13 172
alfalfa 1 234
sugar beet 13 241
Leaf spring 15 16
automotive 1 645 686
Leaf tendril 13 124
Leaf tip 7 434
Leaf type 7 435
Leaf venation 7 435
Leafcutting bee 2 127 6 571 582
Leaflet propeller 1 540
League 8 188
Leakage inductance 3 322
Leakey, L. S 5 478
Lean gas 9 5
Leap year 2 415 416
Learning 2 149 152
behavior and heredity 2 149 152
problem solving (psychology) 10 633
psychology of 14 501 505
Learning, sensory *see* Sensory learning
Learning, verbal *see* Verbal learning
Learning theories 7 441 443
cognitive concept 7 443
electroencephalographic 4 479
memory 8 216 222
personality theory 10 52
reflex, conditioned 11 337
sensory learning 12 193
stimulus response concept 7 441 442
verbal learning 14 501 505
Least action, principle of 7 443 444
Least bittern 6 426
Least squares, method of 7 444 445
curve fitting 3 610
statistics 13 71
Leather 1 257
Leather and fur preserving 7 445 448
dye 4 506
dyeing 4 511, 7 447
tannin 13 390 391
Leatherback turtle 3 22
Leavening agent (food) 5 377
Leavitt, Henrietta 14 278
Lebachia 9 504
Lebeau P 2 171
Lebesgue, H L 7 167 172
Lebesgue integral 7 172 175 11 372
Lebistes reticulatus 6 290 12 299
LeBlanc process 3 75
LeBlon, J C 10 605
Lecanicephaloidea 2 650 7 448*, 10 414
Lechatelierite 15 420
Lecher wires 14 439
Lechevalier, H A 9 35
Lechthal, Alps of 5 117
Lecithin classification as phosphatide 7 529
food antioxidant 5 376
in plant metabolism 10 374
from soy 12 537
structure 10 532

Lewisite 5 41 9 401
Leyden, L. van 10 617
Lexell's Comet 9 312, 315
Lexington Plain 9 155
Leyte Island of 9 482
LH *see* Luteinizing hormone
Leptopodidae 6 401
Leptopsylla minor 6 405
Lesna 1 587, 3 187, 13 124
Lezard Plain 9 158
Lias (Jurassic) 7 325
Liatris punctata 11 621
Libby, W. F. 11 291, 293
Libellula 4 271
Libellulidae 9 275
Liberty freighter 12 286
Libido 5 334
Liboredrus decurrens 2 578
Libra 3 142 145, 7 494*
Libriform wood fibers 14 524
Libyan Basin 1 108
Libyan Desert 4 527
Libythea 7 471
Libythaena 7 471, 473
Libytheidae 7 464
Lice sucking 1 433
Liceales 8 687
Lichen planus 12 369
Lichenase 5 203
Lichens 5 561, 7 494 495*
Licorice 7 495
Lidz, T. 12 66
Lie 5 6 282
Lie detector 7 495
Lie groups fiber bundle 5 253 254 6 282
Lieberkühn crypts of 4 150
Liebermann, C. 1 457
Liebig, J. von 1 59 2 199 239, 6 45 9 393
Liesegang, R. E. 7 496
Liesegang bands 7 495
Liesegang rings 7 495 496
Liestle 12 351
Life evolution of *see* Evolution organic Life origin of
Life geologic record of *see* Fossil, Geology Paleobotany Paleontology
Life origin of 7 496 499
Life form 2 225
Life raft 3 182
Life zone 2 204
community classification 5 325 327
zoogeography 14 625
Lifson, S. 4 487
Lift (aerodynamic) 1 84 87
aircraft performance 1 186
airfoil 1 201
airplane 1 211
airship 1 217 218
autogiro 1 674
helicopter 6 384
kite 7 561
lift drag ratio 1 201
propulsion 11 17
Lift (aerodynamic)—*cont*
subsonic flight 13 224, 229
supersonic flight 13 303
Lift (elevating machine) 4 557
Lift slab construction method precast concrete 10 568
Lifting magnet 4 490
Lifting oil 9 284 286
Ligament 7 499
Ligand chelate stability 3 19 21
definition 3 17
ore deposits, geochemistry of 9 387
Light 7 499 507
aberration of 1 7* 7 504
absorption *see* Absorption (electromagnetic radiation)
black body radiation *see* Heat radiation
Cerenkov radiation 2 653
chemical effects 7 499 500
coherent light 7 184 185
Compton effect *see* Compton effect
corpuscular nature of 7 503
detection of nuclear explosions 9 185 181
diffraction see Diffraction
dispersion 3 15 17* 7 502 503
Doppler effect 4 264 265
electromagnetic spectrum 4 493* 7 500
electromagnetic wave propagation 7 502
finite velocity 7 499
Fizeau's experiment 7 504
geometrical optics 9 363 369
gravitational and nebular red shifts 7 504 505
Huygens principle 6 521 522
interference *see* Interference of waves
matter and radiation 7 506
Michelson Morley experiment 7 504 505
nature of 7 500
opacity 9 332
optics 9 362 363
photoelectric effect *see* Photoemission
physical optics 9 369
polarized *see* Polarized light
principal facts regarding visible light 7 499 500
propagation in crystals *see* Crystal optics
quantum theories 7 503 504
reflection *see* Reflection (electromagnetic radiation)
Light—*cont*
reflection coefficients 11 396 397
refraction *see* Refraction of waves
refractive index 7 502 503
relativistic effects 7 504 506
results of general relativity 7 506
scattering *see* Scattering (electromagnetic radiation)
in the sea 12 105
transmission coefficients 11 396 397
unified field theories 7 506 507
velocity (precise value) 1 632
velocity determination 7 501 502
velocity in moving media 7 504
vision 14 334
wave character of 7 500 503
wave motion 14 425 429
see also Electromagnetic radiation
Light amplifier 4 492 7 507*
electroluminescent 4 492 493 7 507
modified image orthicon 7 507
Light beacon 11 4
piloting 10 230
Light beam galvanometer 6 21
Light cone space time 12 559
Light cruiser 12 263
Light curves (astronomy) of asteroids 1 597
of binary stars 2 184 189
of novae 9 172
of supernovae 13 303
Light dimmer saturable reactor 12 97
Light distillates petroleum 10 72
Light filter see Birefringent filter Filter color Interference filter, optical
Light lists (mariners) 7 508
Light measurement *see* Photometry
Light panel 7 507 508
Light projector *see* Projector (light)
Light solvent coal chemicals 5 235
Light sources *see* Illumination
Light year 7 513*, 9 567
Lighter than air craft 1 101-102
airship 1 217 220
balloon 2 84
blimp 2 259 261
dirigible 4 234
Lighthouse 7 504
beacon 11 4
piloting 10 230
Lighthouse tube 7 504 509
Lighting *see* Illumination
Lightning 7 509 510
aeronautical meteorology 1 97
cloud physics 3 216
shock wave 12 294 298
strikes 1 97
see also Lightning and surge protection
Lightning and surge protection 7 510 512
buildings 7 510
grounded metal cage 7 510
immediate reclosure 7 512
lightning rod or mast 7 510 513
lightning arrester 7 511 513
overhead ground wires 7 511
rod gaps 7 512
substations 4 442 443
transmission lines 7 510 14 54
Lightning arrester 7 511 513
application characteristics 7 513
distribution 7 513
expulsion 7 512
impulse generator tester 7 47
intermediate 7 513
substation 4 443 7 513
valve 7 512
Lightning bug 2 131
Lightning fighter 1 534
Lightning mast *see* Lightning rod
Lightning rod 7 510, 513
cone of protection principle 7 510
substation 4 443
Lightship 10 230
Lightweight (ships) 12 268
Lightweight aggregate 3 163
Ligia 3 565
Lignin 2 617
cell walls in plants 2 617
humus 6 518
ion exchange 7 242
wood chemicals 14 527
Lignite 3 228 230 7 505, 513*; 8 452
Lignoceric acid 2 474
Lignumvitae 6 174 7 514
Ligulate flower 5 327
Ligule 7 434, 12 153
Ligulifloreae 2 432
Ligurian Apennines 5 118
Ligurian Sea 5 114 8 207

Lepidoptera—*cont*
morphology 7 459 461
moth 8 600
physiology 7 473
Lepidorbitoididae 5 435
Lepidosaphes 6 476
Lepidosauria 7 473-474*, 11 484
Lepidosiren 6 437, 7 622
Lepidosiren paradoxa 4 211
Lepidosirenidae 4 211
Lepidosteus 11 514, 13 537
Lepidostrobus 7 457-458
Lepidotus 7 327
Lepidozia 6 415
Lepidurus 3 563
Lepidurus arcticus 9 171
Lepinotus 11 71
Lepisma saccharina 12 333, 13 629
Lepisosteidae 12 175
Lepisosteus osseus 6 39
Lepisosteus productus 12 175
Lepisosteus spatula 6 39
Lepocinclis 5 98
Lepomis gibbosus 13 291
Lepontine Alps 5 117
Leporidae 7 382-383
Leporinae 7 383
Lepospondyli 1 334, 7 474*
aistopoda 1 221
Nectridia 9 28
Lepromin skin test 7 475
Leprosy 5 35, 7 475*, 13 253
Leptestheria 3 562
Leptictidae 7 143-144
Leptinidae 3 276
Leptinotarsa decemlineata 2 130, 3 287
Leptocoris 6 409
Leptocoris trivittatus 6 405
Leptodactylidae 5 538, 10 638
Leptodira 14 395
Leptodiridae 3 276
Leptodora kindti 3 151
Leptognathia filiformis 13 388
Leptolepis 7 327
Leptomedusae 6 554
Leptomitales 10 200
Leptomitus 10 200
Leptomonas 14 125
Leptomyxa 11 44
Lepton 7 475
conservation 13 363 364
elementary particle 4 543 544
neutrino 9 83
Leptonema 8 209
Leptorhynchoides thecatus 9 495
Leptosomatidae 3 475
Leptosphaeria coniothyrium 11 345
Leptosphaeria herpotrichoides 14 483
Leptospira 7 475*, 14 464
Leptospira australis 14 464
Leptospira automnalis 14 464
Leptospira batavia 14 464
Leptospira canicola 14 464
Leptospira grippotyphosa 14 464
Leptospira habdomadis 14 464
Leptospira icterohemorrhagiae 1 466 467, 8 383, 13 4, 14 464
Leptospira mitis 14 464
Leptospira pomona 14 464
Leptospirosis 14 464
antibiotics 1 466-467, 468, 13 4
in swine 13 340
see also Leptospira, Spirochete
Leptostraca 1 560, 7 476*
Nebaliacea 9 22 23
Phyllocarida 3 562, 10 202*
Leptostroma 7 476
Leptostroma pinastri 7 476
Leptostromataceae 5 563, 7 476*, 12 606
Leptosynapta 6 431
Leptosynapta minuta 6 467
Leptothrips mali 13 628
Leptothrix 3 64
Leptothrix discophora 3 65
Leptothrix ochracea 2 28, 3 65
Leptothyrium 7 476
Leptotyphlopidae 13 27
Leptosypha 6 409
Leptychaster 1 600
Lepus 3 412-413
Lepyronia quadrangularis 13 8
Lernaea 2 418
Lernaea cyprinacea 2 417
Lernaeidae 2 418
Lernaeocera branchialis 3 567
Lernaeopodidae 7 476
Lernaeopodoida 3 562 7 476 477*
Lernanthropus 2 418
Lernanthropus chrysophrys 2 417
Lesbos (Mytilene) 5 117
Lesne P 10 129
Lespedeza 7 477
Lesser Antilles 14 475 476
Lesser housefly 8 680
Lesser migratory locusts 6 261
Lesser omentum 4 154
Lestidae 9 275
Leston D 6 400
LET *see* Linear energy transfer (biology)
Lethal dose 50 7 477 478*
10 437
Lethal gene 7 478
Lethal meander mutation (lime) 6 111
Lethal mutation 6 105
Lethargic encephalitis *see* Sleeping sickness, African
Lethocerus 6 404, 406
Lethocerus americanus 14 391
Letterpress printing 10 598 600, 615 619
Letting-off process (textiles) 13 535
Lettuce 7 478 479
diseases of 7 478
harvesting 7 478
propagation 7 478
Leucaltidae 7 479
Leucaltis 7 479
Leucaltis clathria 2 396
Leucandra aspera 2 395
Leucania unipunctata 7 470, 472
Leucascidae 7 479
Leucascus 7 479
Leucetta 2 395, 7 479
Leucettida 2 396, 7 479*, 10 513
Leucettusa tubulosa 2 396
Leucilla 13 360
Leucine 2 195, 7 164, 479*, 10 483
amino acids 1 308 319
in histone 9 217
plant metabolism 10 357
in protamines 9 217
Protozoa 11 51-60
tyrothricin 14 177
valine 14 259
L-Leucine 11 41
Leucite 5 214, 7 479 480*
Leucite basalt 7 16, 480, 10 51, 86
Leucite basanite 7 16, 480, 10 51
Leucite phonolite 7 16, 10 86
Leucite rock 7 480
Leucite tephrite 7 16, 480
Leucitite 7 16 480
Leuco vat esters 13 543
Leucocytozoon 6 515-515
Leucocytozoon simondi 6 515
Leucocytozoon smithi 6 515
Leucolepsunea 6 415
Leuconoid sponge 2 394
Leuconostoc 2 41-42, 7 381 8 431 14 508
Leuconostoc citrovorum 2 195, 8 431
Leuconostoc dextranicus 2 49
Leuconostoc mesenteroides 2 195 4 92 5 423, 7 381
Leucophore 3 99
Leucophoxa thula 6 426
Leucosolenidae 4 34
Leucosia Chrysophyta 3 117
Mastigophora 8 169
Protozoa 11 56
Leucosolenia 2 393 7 480 10 516
Leucosolenia botryoides 2 395
Leucosolenia complicata 2 395
Leucosolenilda 2 396, 7 480*, 10 513
Leucospidae 6 574
Leurothea 7 570
Leucothoidae 6 37
Leurothrix 2 132
Leucotrichaceae 2 132
Leukemia 3 197, 6 395 [illegible] 7 480 485*, 8 618, 9 [illegible]
acute 7 481
chronic 7 481
circulation disorders 3 [illegible] 144
granulocytic 7 481
lymphocytic 7 481
monocytic 7 481
myelogenous 7 481
radiation injury (biology) 11 230
Leukemoid reaction (clinical pathology) 3 192 202
Leukocidin 7 485*, 13 37
Leukocyte 2 263 7 485 [illegible] 12 5
Leukocytic abnormalities 6 [illegible]
Leukocytosis 3 196 197, 7 48
Leukoderma 10 223
Leukopenia 3 196, 7 485 [illegible] course and manifestations 7 486
etiology and pathogenesis 7 485 486
Leukoplakia 11 481
Leukorrhea 11 481
Leutscher, J A 1 252
Levan 7 486 487
Level (surveying) 7 487
differential leveling 13
dumpy 7 487
self leveling 7 487
wye 7 487
Level dyeing dyes 4 310
Level measurement 7 487 4
liquid *see* Liquid level measurement
solids *see* Solids level measurement
Leveling effect of solvents 12 497
Levenstein process 5 44
Lever 7 494, 527
Leverrier, U J 6 265, 9 40 10 420
Levi Civita, T 2 405, 11 49
Levine, C A 13 522
Levine, P 3 201
Levo form (definition) 13
Levulenic acid 1 475
Levulose *see* Fructose
Levulose fruit sugar *see* Fructose
Levy, L F 10 605 612
Levy, M 10 605 612
Lewin, Kurt 7 485
Lewis, F T 7 555
Lewis, G N 1 41, 59, 5 45 9 550 12 486, 497 14 25
Lewis, Sir Thomas 6 590
Lewis, W L 5 44
Lewis acid 5 582
Lewis blood factors 2 269
Lewis theory acid and base 1 41 42 12 17
Lewisian Series 10 567

Lewisite 3 44 9 401
Leyden I van 10 617
Lexell's Comet 3 312 315
Lexington Plain 9 153
Leyte, island of 9 432
LH *see* Luteinizing hormone
Leptopodidae 6 401
Leptopsylla minor 6 405
Liana 1 587, 3 187, 13 124
Liard Plain 9 158
Lias (Jurassic) 7 325
Liatris punctata 11 621
Libby W F 11 291 293
Libellula 4 271
Libellulidae 9 275
Liberty freighter 12 286
Libido 3 534
Libocedrus decurrens 2 578
Libra 3 142 143 7 494*
Libriform wood fibers 14 524
Libyan Basin 1 109
Libyan Desert 4 327
Libythea 7 471
Libytheana 7 471, 473
Libytheidae 7 464
Lice sucking 1 433
Liceales 8 687
Lichen planus 12 369
Lichenase 5 205
Lichens 5 561 7 494–495*
Liconce 7 495
Lidz T 12 66
Lie S 6 282
Lie detector 7 495
Lie groups fiber bundle 5 253 254 6 282
Lieberkühn crypts of 4 150
Liebermann C 1 457
Liebig J von 1 39 2 199 239 6 45 9 393
Liesegang R E 7 496
Liesegang bands 7 495
Liesegang rings 7 495 496
Lievrite 12 351
Life evolution of *see* Evolution, organic Life origin of
Life geologic record of *see* Fossil, Geology Paleobotany Paleontology
Life, origin of 7 496 499
Life form 2 225
Life raft 3 182
Life zone 2 204
community classification 3 325 327
zoogeography 14 625
Lilson S 4 487
Lift (aerodynamic) 1 84 87
aircraft performance 1 186
airfoil 1 201
airplane 1 211
airship 1 217 218
autogiro 1 674
helicopter 6 534
kite 7 364
lift-drag ratio 1 201
propulsion 13 17
Lift (aerodynamic)—*cont*
subsonic flight 13 224, 228
supersonic flight 13 308
Lift (elevating machine) 4 557
Lift slab construction method precast concrete 10 369
Lifting magnet 4 489
Lifting oil 9 284 286
Ligament 7 499
Ligand chelate stability 3 19 21
definition 3 17
ore deposits geochemistry of 9 587
Light 7 499 507
aberration of 1 7*, 7 504
absorption *see* Absorption (electromagnetic radiation)
black body radiation *see* Heat radiation
Cerenkov radiation 2 655
chemical effects 7 499 500
coherent light 7 181 185
Compton effect *see* Compton effect
corpuscular nature of 7 503
detection of nuclear explosions 9 183 184
diffraction *see* Diffraction
dispersion 1 15 17* 7 502 503
Doppler effect 4 264 265
electromagnetic spectrum *4 493** *7 500*
electromagnetic wave propagation 7 502
finite velocity 7 499
Fizeau's experiment 7 504
geometrical optics 9 363 369
gravitational and nebular red shifts 7 504 505
Huygens principle 6 521 522
interference *see* Interference of waves
matter and radiation 7 506
Michelson Morley experiment 7 504 505
nature of 7 500
opacity 9 332
optics 9 362 363
photoelectric effect *see* Photoemission
physical optics 9 369
polarized *see* Polarized light
principal facts regarding visible light 7 499 500
propagation in crystals *see* Crystal optics
quantum theories 7 503 504
reflection *see* Reflection (electromagnetic radiation)
Light—*cont*
reflection coefficients 11 396 397
refraction *see* Refraction of waves
refractive index 7 502 503
relativistic effects 7 504 506
results of general relativity 7 506
scattering *see* Scattering (electromagnetic radiation)
in the sea 12 105
transmission coefficients 11 396 397
unified field theories 7 506 507
velocity (precise value) 1 652
velocity determination 7 501 502
velocity in moving media 7 504
vision 14 534
wave character of 7 500 503
wave motion 14 425 429
see also Electromagnetic radiation
Light amplifier 4 482, 7 507*
electroluminescent 4 482 483 7 507
modified image orthicon 7 507
Light beacon 11 4
piloting 10 230
Light beam galvanometer 6 21
Light cone space time 12 558
Light cruiser 12 265
Light curves (astronomy) of asteroids 1 597
of binary stars 2 188 189
of novae 9 172
of supernovae 13 303
Light dimmer saturable reactor 12 37
Light distillates petroleum 10 72
Light filter *see* Birefringent filter *Filter color* Interference filter optical
Light lists (mariners) 7 508
Light measurement *see* Photometry
Light panel 7 507 508
Light projector *see* Projector (light)
Light solvent coal *chemicals* 3 235
Light sources *see* Illumination
Light year 7 513*, 9 567
Lighter than air craft 1 101 102
airship 1 217 220
balloon 2 84
blimp 2 259 261
dirigible 4 234
Lighthouse 7 509
beacon 11 4
piloting 10 230
Lighthouse tube 7 508 509
Lighting *see* Illumination
Lightning 7 509 510
aeronautical meteorology 1 97
cloud physics 3 216
shock wave 12 294 296
strikes 1 97
see also Lightning and surge protection
Lightning and surge protection 7 510 512
buildings 7 510
grounded metal cage 7 510
immediate reclosure 7 512
lightning rod or mast 7 510 513
lightning *arrester* 7 511 513
overhead ground wires 7 511
rod gaps 7 512
substations 4 442 443
transmission lines 7 510, *14 59*
Lightning arrester 7 511 513
application characteristics 7 513
distribution 7 513
expulsion 7 512
impulse generator tester 7 47
intermediate 7 513
substation 4 443 7 513
valve 7 512
Lightning bug 2 131
Lightning fighter 1 534
Lightning mast *see* Lightning rod
Lightning rod 7 510 513
cone-of protection principle 7 510
substation 4 443
Lightship 10 230
Lightweight (ships) 12 268
Ligia 3 563
Lignin 2 617
cell walls in plants 2 617
humus 6 518
ion exchange 7 242
wood chemicals 14 527
Lignite 3 228 230 7 505, 513*, 8 452
Lignoceric acid 2 474
Lignumvitae 6 174, 7 514
Ligulate flower 5 327
Ligule 7 434 12 157
Liguliflorae 2 432
Ligurian Apennines 5 118
Ligurian Sea 5 114, 8 207

Likelihood criterion statistics 13 72
Lilac 9 408, 13 113
Liliaceae 3 273, 7 514, 10 345
Liliales 1 588, 6 39, 7 514*, 10 346
  colchicine 3 275
  saffron 12 4
Lilienthal, O 9 409
Lilium 3 107, 5 38
Lilliputia 5 123
Lilliputia pallida 1 340
Lily 3 107
Lily thrips 13 628
Liman 2 253
Limax 11 93
Limax flavus 12 383
Limax maximus 12 383
Limb-kinetic apraxia 1 494
Limbo (mortor) 12 265
Limburger cheese 3 15
Limburgite 7 514
Lime (botanical) 7 514
Lime (industrial) 1 9, 2 398 399, 7 514-515*
  in glass manufacture 6 206
  mortar 8 599
  plaster 10 307
  as a raw material 13 153
  water softening 14 402
Lime-soda process water softening 14 402 403
Lime soda sintering process 1 291
Lime tree 2 108
Limenitis 7 471
Limenitus archippus 7 471
Limestone 7 515 516*, 8 277, 11 590 591
  allochthonous 7 516
  atoll 1 647
  autochthonous 7 516
  biohermal 7 516
  biostromal 7 516
  calcarenite 2 395
  calcium mineral 2 308
  carbon 2 462
  carbonate 2 467
  chalk variety 3 7
  chemical composition 7 515
  chert in 3 56
  classification 7 516
  compressive strength 4 613
  crushed stone 13 152
  dimension stone 13 151
  dolomite rock 4 261
  ground water 6 276
  iron ore reduction 7 262
  karst topography 7 332
  lime (industrial) 7 514 515
  lime manufacture 13 153
  mineralogy 7 515
  ornamental stone 13 152
  pebble conglomerates 5 309
  pelagic 7 516
  pneumatolytic minerals in 10 425
Limestone—*cont*
  portland cement 13 153
  sand 12 21
  steel manufacture 13 93-102
  stylolites in 13 208
  subaerial solution 7 332
  textures 7 515
  underground solution 7 332
  weathering of 14 460
Limit acceleration 12 292
Limit of identification 11 137
Limiter circuit 7 516 518
  clamping element 7 516-517
  coincidence amplifier 3 269 270
  multielement tube 7 517
  semiconductor diode 7 517
  transistor 7 517
  vacuum diode 7 516 517
  see also Clipping circuit
Limiting dilution (qualitative analysis) 11 136
Limiting parallels occultation 9 244
Limiting proportions (qualitative analysis) 11 137
Limits, method of 11 77
Limits of complex sequences 3 338
Limits of functions 7 96
Limits of hearing 6 349
Limnadia 3 362
Limnadia lenticularis 3 362
Limnaea 8 171
Limnaea peregra 9 331
Limnanthaceae 12 26
Limnatis nilotica 6 457
Limnephilus 14 87
Limnetic zone 3 327, 7 519
Limnetis 3 362
Limnichidae 3 278
Limnology 7 518 519
  fresh water ecosystem 5 521 534
Limnomedusae 14 9 10
Limnophthecus 10 590
Limnoria 1 341 5 291 7 283
Limnoria lignorum 12 533
Limonene 6 534 13 497
d Limonene 3 147
Limonite 7 519
  goethite 6 229
  iron ore 7 258
Limonum sacra 10 129
Limothrips cerealium 13 628
Limpet 1 591 7 519 520*
Limpkin 6 286
Limpopo River 1 109
Limulacea 14 563 565
Limulida 14 563
Limulina 8 241
Limulodidae 3 226
Limulus 1 557, 2 554 6 357, 7 564 8 14 10 180 11 512
Limulus polyphemus 3 531, 14 563-565
Lin, C S 4 145
Linalool 5 71, 13 496, 498
Linamerase 6 106
Linamerin 6 106
Linckia 1 598, 11 448
Lind, F F 3 80
Lind, J 2 495
Linde, Carl von 1 638, 7 539
Linde liquefaction process 1 638, 7 539*
Lindemann, F 3 130, 9 227
Lindemann, R. 2 216
Lindemann efficiency, ecology 4 393
Lindeman electrometer 14 371
Lindemann glass 2 174
Lindera benzoin 8 243
Lindgren, W 9 378, 381
Lindgren volume law of 8 305
Lindia 8 575, 11 635
Lindsley, D B 4 584, 8 605
Line 7 520
  analytic geometry 1 388
  centroid 2 641
  euclidean geometry 6 153
Line casting machine 3 345
Line conic 3 400
Line engraving 10 610
Line hydrophone 14 18
Line integral 2 414, 7 169 171, 513*
Line microphone 8 563
Line of apsides 1 495, 9 371
Line of nodes 9 372
Line reversal 12 591
Line segment 1 387
Line shafting 12 210
Line *spectrum* 7 520 521
  atomic structure and spectra 1 658
  electrooptics 4 525
  fine structure 5 275
  hyperfine structure 6 586
  identification of lines 12 591
  interpretation 12 587
  Paschen Back effect 9 588
Linear acceleration *see* Acceleration
Linear accelerator 7 521, 9 573 581 581*
Linear conductor antennas *see* Antenna (aerial)
Linear dichroism 4 108, 14 88
Linear differential equation *see* Differential equation
Linear differential transformer 12 201
Linear displacement 4 214
Linear energy transfer (biology) 7 522* 9 197
Linear equations *see* Linear systems of equations
Linear expansion coefficient of 13 550
Linear line array 12 311 312
Linear measurement caliper 2 418
  gages 6 3
  micrometer 8 554
  see also Distance measurement
Linear momentum *see* Momentum
Linear operator 9 359
Linear phenomenological equation 9 333
Linear polymer 10 474
Linear programming 7 522 523
  applications 7 523
  general theory 7 522
  methods of calculation 7 523
  see also Game theory; Queueing theory
Linear regression 2 292
Linear sweep generator 12 45
Linear systems of equations 7 523 525
  matrix theory 8 182 191
  numerical analysis 9 227
Linear velocity 14 292
Linearity 7 525 526
Linearizing machine 13 453
Lineidae 6 429
Linen 5 249 7 526*, 12 79
  processing the fiber 7 526
  properties of flax fiber 7 526
Linene textile 13 537
Linnaea Pringsheim 2 536
Lines drawing 12 269
Lines of force 7 526
  electric 7 526
  magnetic 7 526
Lines of Zahn *see* Thrombus
Linetus 11 559
Linetus ruber 6 429
Linetus vegetus 11 559
Lingual gland 9 369
Lingual nerve 13 399
Linguatula serrata 10 520
Linguatulidae 10 520
  see also Pentastomida
Lingula 1 665, 2 511 8 14 11 513 12 241
Lingulacea 1 665
Lingulella 1 665
Link 7 526
  measure 8 188
  mechanical *see* Linkage, mechanical
Link Belt mechanical analyzer 12 226
Link fuse 5 578
Linkage genetic 7 526 527* 11 476
Linkage, mechanical 7 527 528
  arbitrary function generators 1 579
  bar 7 527

Linkage—cont
cam mechanism 2 420-424
crank 3 539
four bar 5 483-487*, 7 527
lever 7 527
pantograph 7 528
Scotch yoke 7 527
in servomechanisms 12 202
slider crank mechanism 7 527, 12 379 380*
straight line mechanism 13 165
toggle 13 664
universal joint 14 204 206
Linkage differential 1 369
Linkage groups (genetics) 5 115
Linkage multiplier 1 370 371
Linnaean system 14 626
Linnaeite 3 246
Linnaeus C 1 422, 10 378
Linnaeus 12 571, 14 172, 626
Linné, Karl von 12 527
Linnemann, M 12 608
Linz and Donawitz (L D) process 13 101
Linocedrus 3 188
Linolium 3 347 348
Linoleic acid 10 356, 466 5 185
Linoleum 4 290, 7 529*
Linotype 3 344 345 13 453 14 169
Linseed 8 621
Linseed oil 7 529
analysis of 5 189
glycerides in 4 290
in paint 9 493
(paint) effect of drier 4 273
Linseed varnish 7 113
Linstead, R. P 13 402
Linter method 4 92
Linton R 10 32
Linuche 3 255
Linum 12 78
Linum usitatissimum 5 297, 6 298, 7 528 12 79
Lion 6 182, 7 528*
Lion the *see* Leo
Lions Gulf of 5 114
Liopelma 1 338
Liopteridae 6 574
Liothrips ilex 13 628
Liothrips oleae 13 628
Liothrips vaneeckei 13 628
Liouville J 6 330, 9 227
Liouville's theorem 6 330, 13 60
Lip 7 528 529
Liparidae 4 41 8 600
Lipase 2 19, 4 167, 5 203-204, 7 531
blood chemistry 3 197
Lipema 7 531
Liphistiidae 1 559
Liphistiomorphae 1 498
Lipid 2 55 237, 609, 662 7 529 530*, 12 565
adipose tissue 1 70
Lipid—cont
bacterial biosyntheses 2 52-60
bacterial cell chemistry 2 12
biochemistry 2 199
cell protoplast 2 615
classification 7 529
extraction 7 530
fat and oil edible 5 185
function 8 259 260
glycolipid 6 225
hyperlipemia 8 260
identification 7 530
metabolism 7 530
mitochondria 8 520
nutrition 9 235
obesity 8 260
occurrence 7 530
phosphatide 10 132
plasmal 10 397
separation 7 530
sphingolipid 12 611
structure 8 259
triglyceride 14 91
tumors 8 260
Lipid metabolism 7 530 535
adipose tissue 7 531
biochemistry 2 199
cachexia 7 534
change in length of fatty acid chains 7 533
degradation of fatty acids 7 534
essential fatty acids 7 535
fat absorption 7 531
fat digestion 7 531
lipids in the blood 7 531
lipogenesis 7 533
obesity 7 534
oxidation of higher fatty acids 7 531
plant metabolism 10 355 356
role of the phosphatides 7 534
steatorrhea 7 531
transport of fatty acids 7 533
turnover of body lipids 7 531
unsaturated fatty acids formation 7 533
Lipid tumors 8 260
Lipocaic factor 9 534
Lipochrome 3 99, 5 197
see also Carotenoid
Lipogenesis *see* Lipid metabolism
Lipoic acid bioassay 2 194
Lipolytic enzyme 4 170
Lipoma 9 920
Lipomyces 12 2, 14 601
Lipomycetoideae 12 2
Lipophore integument 7 174
neural crest 9 78
Lipoprotein 2 265, 612, 7 550
Lipoproteinase 8 259
Liposarcoma 9 920
Liposcelis 11 71
Lipostraca 3 562, 7 535*
Lipotropic agent 7 534
Lipotyphla 7 149
Lipschutz bodies 8 561
Liquefaction necrosis death 4 22 24
Liquefaction of gases 7 535 540
atmospheric gases production of 1 637 640
cohesion 3 268
critical constant 3 550
Joule Thomson expansion 7 538 540
refrigeration 7 536
storage of liquefied gases 7 540
Liquefied gases cryogenics 3 572 575
petroleum products 10 72
transportation and storage of 3 571 7 540
Liquefied methane 9 6
Liquefied petroleum gas (LPG) 7 540* 9 283, 11 6
Liqueur 4 256
Liquid 7 540 541
absorption by 1 14
boiling point 2 276
cavitation in 2 572 576
cohesion 3 268
critical constant 3 550
diffusion in 4 142 146
distillation 4 247
electron diffraction in 4 307 309
evaporation 5 125 126
flow measurement 5 315 321
flow of fluids 5 321 326
fluid flow principles 5 338 340
fluid statics 5 338
heat capacity of 6 364
heat conduction in 3 383 384
hole theory of 14 534
melting point 8 215
nonequilibrium *theory* 13 64 65
propagation of sound in 12 514-515
properties 5 340
thermal conductivity 3 384 389
thermal expansion 13 550
viscosity of *see* Viscosity of *liquids*
wave motion in *see* Wave motion in liquids
Liquid asphalt 1 591
Liquid column pressure gage 10 581
Liquid cooling system 4 604
Liquid dielectric capacitor 2 447
Liquid drop model of nucleus 5 247 249
Liquid extraction *see* Solvent extraction
Liquid gas phase equilibrium 5 55 56
Liquid gold 6 240
Liquid helium *see* Helium, liquid
Liquid hydrogen 3 569 571, 7 599
Liquid hydrogen bubble chamber 2 339
Liquid junction potential salt *bridge* 12 18
Liquid level *measurement* 7 497-499
buoyant displacer elements 7 499
capacitance measuring devices 7 499
electrode or probe systems 7 499
float mechanisms 7 498
gage glasses 7 497 498
nuclear level gages 7 499
pressure gages 7 499
sonic level detector 7 499
stick, hook, and tape gages 7 497
Liquid liquid extraction 5 156
Liquid liquid miscibility 12 490
Liquid liquid phase equilibrium 5 56 57
Liquid measure 8 188
Liquid metals *electromagnetic* pumps 4 492 493
as reactor coolants 11 350 351
Liquid oxygen 3 570
Liquid phase nitration 9 104
Liquid piston 3 552
Liquid propellant 11 6 8
acetylene 11 6
bipropellants 11 6
combustion 11 7
combustor design 11 7
ethylene oxide 11 6
exhaust velocity 11 7
heat capacity 11 7
hybrid propellants 11 6
hydrazine 11 6
hydrogen 11 6
hydrogen fluorine 11 6
hydrogen-oxygen 11 6
hydrogen peroxide 11 6
metal base *fuel* 8 291
monopropellants 11 6
nitrogen *tetroxide* 11 6
nitrogen tetroxide hydrazine 11 6
performance 11 7
physical properties 11 6
red fuming nitric acid *unsym*-dimethyl hydrazine 11 6

Liquid propellant—*cont*
red nitric acid 11 6
rocket engine 11 601, 606
specific impulse 11 7
thrust 11 7
Liquid-propellant rocket engine 7 308 309, 11 603 606
controls and operation 11 605
engine components 11 603
feed system 11 604
propellants 11 6 8, 606
Liquid salt carburizing 15 315
Liquid scintillation detector *see* Scintillation detector, liquid
Liquid solid phase equilibrium 5 57-58
Liquidambar 3 187 188
Liquidambar styraciflua 13 336
Liquidus curve 1 261
Liquor, distilled *see* Distilled spirits
Liriodendron 3 188, 10 118, 13 116
Liriodendron tulipifera 14 135
Liriope 3 255
Liriopeidae 4 212
Liriopsis 5 33
Lironeca ejmmetrias 5 291
Lisbon earthquake 4 354
Lissajous figures 7 541 543
frequency measurements 5 508 7 542
methods of constructing 7 541 542
phase measurements 7 542-543*, 9 432, 10 107
Lissocarcinus 6 466
List (nautical) 12 271
Lister A 10 275
Lister, Lord 1 475 482
Listeria 3 497
Listeria monocytogenes 3 497, 7 513
Listeriosis 7 513
Listomatic camera 10 144 145
Litchi chinensis 7 623
Lithic sandstone 15 209
Lithic tuff 14 134
Lithification diagenesis 4 93
Lithinus 3 284
Lithionite 7 459
Lithistid Demospongia 10 519
Lithistid sponges 4 57
Lithistida 4 57, 10 519
Lithium 7 543 546
heat of combustion 8 290
ionization potential 4 504
lepidolite 7 459
metallurgical extraction 7 544, 8 277
occurrence 7 544
ore of 15 10
organometallic compounds 9 402
Paschen Back effect 9 588
Lithium—*cont*
principal compounds 7 545-546
production 4 467
properties 7 544 546
resistivity 11 497
thermonuclear reactions 7 546
Lithium aluminum hydride 7 546
Lithium-base lubricating grease 7 546
Lithium hydride 7 545-546
Lithium metal 7 545
Lithium mica 7 459
Lithium perchlorate 7 544
Lithium stearate 7 543
Litho stone absorption 10 615
Lithobiomorpha 3 60
Lithobius 13 12
Lithocholic acid 2 185
Lithocircus magnificus 11 52
Lithocolletis 7 467
Lithocyst 5 37
Lithodes maia 4 31
Lithodidae 4 31
Lithofacies 5 175, 6 141
map of 12 328
Lithographic inks 7 113 114
Lithographic limestone 2 395
Lithographic press 10 621
Lithography 10 600 615
Lithol 10 224
Lithophile elements 4 546
Lithophyllum 3 476
Lithophysae 11 460
Lithopone 2 96, 10 225
Lithosere 15 232
Lithosmylus columbianus 7 158
Lithosols 12 438
Lithosphere 7 546
Lithosphere, geochemistry of 7 546 553
chemical composition of core 7 547 548
chemical composition of mantle 7 547
geochemical cycle 7 551 552
important crystalline phases 7 549
oxide structures 7 549
processes 7 552
crystallization 7 552
diagenesis 7 552
melting of rock 7 552
metamorphism 7 552
sedimentation 7 552
weathering 7 551 552
silicate structures 7 549
Lithothamnium 3 476 7 516
Lithotypes, coal 3 232 240
Litomastix 11 449
Litomosoides carinii 8 253 9 53
Litopterna 7 553*, 8 82
Little, A D 3 24 7 538
Little America I 440
Little Bear 14 235
Little Carpathians 5 118
Little Dipper 14 235
Little's disease 9 69
Little-drop technique 3 617
Little Ice Age 6 203
Little John rocket 1 540
Little Karroo plateau 1 108
Littleleaf disease, shortleaf pine 14 74
Littlewood, J E 9 225
Littoral community 8 108
Littoral drift 3 242, 12 304
Littoral sediments 8 152
Littoral system 8 107
Littoral transport 3 242, 12 304
Littoral zone 3 327, 7 519
Littorina 6 439, 7 291
Littorina littorea 9 609, 10 21
Littorina Sea 2 87
Littorinidae 9 609, 10 21
Littrow mounting 4 141
Littrow prism 12 590
Littrow quartz spectrograph 12 590
Litholides 5 432 435
Lituus 13 1
Liu Hui 14 611
Live oak 9 237
Live roller conveyors 3 450
Lively ant guest beetle 3 277
Liver 2 185, 4 150, 5 204, 7 555 561*
anatomy 7 556 558
bilirubin 2 186
biochemistry 2 199
cirrhosis 8 236
embolism 4 565
embryology 7 554 556
endocrine gland 4 588
histology 7 558 561
lipid metabolism 7 534
metabolism 12 566
mitochondria 8 519
physiology 7 561
structural development 7 555 556
urea (biochemistry) 14 215
Liver disorders 7 561 564
bacterial infections 7 563
chemical agents 7 563
cirrhosis 3 144 7 562
hepatitis 6 417
malnutrition 7 562
obstruction 7 563
other diseases 7 563
parasites 7 564
tumors 7 563 564
viral infections 7 562
Liver fluke 7 563 12 589
Liver function test 3 199
Liver mortis 4 22
Liverpool Bay 5 114
Liverwort 2 353 6 415
Livestock feed 6 259
judging 1 121
see also Agricultural science (animal)
Living fossils 7 564* 8 53
Livor mortis 4 22
Lizard 7 564*, 13 21
Lizard beetle 3 278
Lizard fish 8 679
Ljubimova, M N 8 642
Ljungstrom preheater 6 573
Llama 1 296 7 564*
see also Camel
Llandeilian Series 9 373
Llandoverian Series 12 327
Llanos 12 526
Llanvirnian Series 9 373
Lloyd, H 5 592
Lloyd mirror effect (under water sound) 14 197 198
Lloyd's mirror interference 7 186 187
Lloyd's Register of Shipping 4 280
Loa loa 5 257, 259
Loach 3 618
Load (stream transport) 12 296 337, 15 173
Load center substation *see* Electric power substation
Load graphs 4 432 433
Load line 7 564 565
Load metamorphism 8 534
Load tests soil mechanics 12 456 457
Loading, electrical 7 565
Loading, gear *see* Gear loading
Loading, impulsive 7 35
Loading, transverse 7 565 566
beam 7 565 568
bending 7 565 566
bending moment 7 565
bending moment diagram 7 566
deflection 7 567
elastic stresses 7 566
girder, plate 8 149
inelastic stresses 7 566
section modulus 7 566
shear 7 565 566
shear center 7 568
shear diagram 7 566
shear flow 7 567
statically indeterminate beam 7 567
unsymmetrical bending 7 567
Loading coils 7 565
Loads dynamic 7 568 569
deformations 7 568
elastic behavior 7 568
impact loads 7 568
inelastic behavior 7 568
load factor 7 568
resistance to 15 194
stresses 7 568
toughness 7 568
Loads, repeated 7 569
cycle of stress 7 569
fatigue strength 7 569
stress raisers 7 569

obachevski \ 1 6 154 155
obar pneumonia 10 425
obata 3 608, 7 569 570*
obe (directivity) 4 233
obelin fish 12 29
obeliaceae 2 432
obipes lobatus 10 92
obophilia 12 77
obophytum 1 226
obopodia 11 51 60
obry de Bruyn Ekenstein transformation 8 580
obster 1 560, 4 24, 7 570*
Norway 4 31
Spanish 4 30
spiny 4 30
ocal channel radio broadcasting 1 163 11 249
Local hour angle 2 594
Local oscillator automatic frequency control (AFC) 1 675
radar 11 200
radio receiver 11 258
Localizer instrument landing system 7 147, 9 20
Locating tooling 13 670 671
location fit 1 258 7 570
Location survey 13 327
Loci analytic geometery 1 588
Lock canal 2 434
inland waterways 7 116
river 11 585
Lock washer 14 586
Lockjaw see Tetanus
Lockout circuit 13 347 348
Lockver] \ 6 591 12 587
Loco weed 10 459
Locomotive 7 570 573* 11 522
accelerating resistance 7 573
boiler 5 282
capacity 7 573
cold weather resistance 7 573
curve resistance 7 573
diesel 7 571
diesel electric 7 572
drawbar pull 7 573
electric 7 571
grade resistance 7 573
steam 7 571
tractive effort 7 573
train resistance 7 573
turbine 7 572
Locomotive crane 3 536
Locust (forestry) 7 573 574
Locust, black 12 29
Locust bean gum 6 297 8 92
mucilage 8 621
Locust borer 3 287
Locustidae 6 261 9 416 417
Lode (mining) 8 441
claims 8 472
Lodestone 8 48
Lodicule 5 334
Loeb J 13 403
Loeb L B) 501, 12 560 561
Loeffler's medium 4 208
Loess 7 574
Asia 1 583
authigenic changes in 7 574
China 1 577
plains 10 263
Löffler, H 5 523
Löffler's methylene blue stain 13 33
Lofoten Islands 9 251
Lofuna 5 431
Logan, W E 10 63
Loganiaceae 6 115, 13 207
Logarithm 7 571 576
differentiation 4 129 130
evaluation 12 190, 195
Logarithmic decrement 1 401 4 11 13*
Logarithmic spiral 13 1
Logarithmic transformation 2 231
Loggerhead shrike 12 307
Loggerhead turtle 3 22 14 166
Logging (forestry) 7 576 578
Logic 7 578 582* 8 176 177
Boolean algebra 2 288 290
circuit see Combinational circuits
contradiction 3 578
deductive theory 7 581 582
lattices 7 411
non Aristotelian 7 582
postulate 10 326
propositional calculus 7 579 580
switching theory 13 357
syllogism 7 578 579
tautology 7 581
truth function 7 580
Logone River 1 109
Loire River 5 121
Loki rocket 8 322
Loligo 2 644 4 34 13 551
Loligo opalescens 13 30
Loligo pealei 13 30
Lolland (Laaland) 5 117
Lombard R H 13 248
Lombardian Alps 5 117
Lombardy poplar 10 498, 12 586
Lomentum 5 541
Lomond Loch 5 115
Lomonosov Ridge 1 525
Lomonossow Land (Aleksandra) 5 117
Lonchaeidae 4 212
Lonchocarpus utilis 7 142
London F S 268 7 196 11 147, 12 485 13 300
London H 13 300
London Clay formation 5 479 480
London forces solutions 12 485 486
London plane tree 13 360
London theory (cohesion) 5 268
London theory (superconductivity) 13 300 301
Long Beach 11 565, 12 264*
Long billed curlew 3 625
Long Island Sound 9 150
Long jointed bark beetle 3 276
Long legged fly 4 212
Long lipped beetle 3 277
Long needle conifer forest 8 245
Long nosed gar 6 59
Long path staff 4 232
Long period tide 13 653 654
Long range order 1 264
Long range weather forecasts 14 447 449
Long shunt connection 4 225
Long span construction buildings 2 361
Long tailed swallow 13 532
Long tailed thalessa 7 8
Long toed water beetle 3 278
Long tom (placer mining) 8 477
Long ton 8 189
Long tube vertical evaporator 5 127
Longhorn beetle 3 278
Longidorinae 4 268
Longitude astronomical 7 582
Longitude celestial 1 607 9 572
Longitude galactic 1 607
Longitude terrestrial 3 457
Longitude of ascending node 9 572
Longitude of perihelion 9 572
Longitudinal aberration 3 91
Longitudinal mass 11 432
Longitudinal stability 12 269 272
Longleaf pine 10 236
Lonposomidae 10 461
Longshore bars 12 302
Longshore currents 12 300 301
Longshore troughs 12 302
Longsworth L G 4 486 14 22
Longuet Higgins M S 9 257
Longwall mining 3 237
Lonicera 11 647
Lookout Mountain 9 150
Loom 13 535
Looming mirage 8 506
refraction 11 407
Loomis A L 8 371
Loomis theorem of 2 249
Loon 7 582 583
Loop antenna 1 445
180° ambiguity 9 13
directional properties 9 13
navigation uses 9 13
Loop prominences 13 284
Looper 7 464
Loose smut barley 2 99
wheat 14 482
see also Plant diseases
Lop Nor salt lakes 1 580
Lopadorhynchidae 10 461
Lophiiformes 2 111, 7 585*, 9 412
pediculati 4 40, 7 585 9 412
Lophius piscatorius 11 456
Lophobranchii 6 71
Lophodermium pinastri 7 476
Lophodolus acanthognathus 4 40
Lophogaster 4 40
Lophogaster typicus 8 684
Lophogastrida 10 1
Lophogorgia ceratophyta 6 258
Lophohelia 4 41
Lophomonas 6 587
Lophomonas blattarum 6 587
Lophophore 2 555, 7 595* 10 129 11 87
Lophopodella 13 75
Lophopodella carteri 2 354, 10 201
Lophopodidae 10 201
Lophopus crystallinus 10 201
Lopolith 10 421
Loran 7 585 585*, 9 15 20
Cytac 7 585
Hiloran 7 585
master station 7 584
navigational fix 7 584
service coverage 7 585
slave station 7 584
ss loran 7 585
standard loran 7 585
Loranthaceae 8 517 12 25
Loranthus 8 517
Loreal gut 13 25
Lorentz H A 4 462 5 290 490 7 585 9 365, 14 200
Lorentz field 4 132 11 429*
Lorentz force electron motion Hall effect 6 520
relativistic electrodynamics 11 429
in vacuum 4 511
Lorentz frame of reference 5 493
Lorentz group 6 285
Lorentz invariance 8 187, 13 362
Lorentz Lorentz formula 12 485
Lorentz transformations 7 585 586
improper 7 586 12 557 559
invariance 13 362
proper 7 586
relativistic mechanics 11 431 433
relativity 11 433
space time 12 557 559
Lorenzini, ampullae of 12 180
Loricata see Polyplacophora
Loris 10 589
Los Angeles ZR 3 1 218
Loschmidt's number 7 586
Losing coalition game theory 6 29 30
Loss, dielectric 4 114 115

Liquid propellant—*cont*
red nitric acid 11 6
rocket engine 11 601, 606
specific impulse 11 7
thrust 11 7
Liquid propellant rocket engine 7 308-309, 11 603 606
controls and operation 11 605
engine components 11 603
feed system 11 604
propellants 11 6 8, 606
Liquid salt carburizing 13 515
Liquid scintillation detector *see* Scintillation detector, liquid
Liquid solid phase equilibrium 5 57-58
Liquidambar 3 187-188
Liquidambar styraciflua 13 536
Liquidus curve 1 261
Liquor, distilled *see* Distilled spirits
Liriodendron 3 188, 10 118, 13 116
Liriodendron tulipifera 14 135
Liriope 5 255
Liriopeidae 4 212
Liriopsis 5 53
Litoneca epimerias 5 291
Lisbon earthquake 4 354
Lissajous figures 7 541-543
frequency measurements 5 508, 7 542
methods of constructing 7 541-542
phase measurements 7 542-543*, 9 432 10 107
Lissocarcinus 6 466
List (nautical) 12 271
Lister, A 10 275
Lister Lord 1 475, 482
Listeria 5 497
Listeria monocytogenes 3 497, 7 543
Listeriosis 7 543
Listomatic camera 10 144-145
Litchi chinensis 7 623
Lithic sandstone 13 209
Lithic tuff 14 134
Lithification diagenesis 4 93
Lithinus 3 284
Lithionite 7 459
Lithistid Demospongia 10 519
Lithistid sponges 4 57
Lithistida 4 57, 10 519
Lithium 7 545-546
heat of combustion 8 290
ionization potential 4 504
lepidolite 7 459
metallurgical extraction 7 544 8 277
occurrence 7 544
ore of 13 10
organometallic compounds 9 402
Paschen-Back effect 9 588
Lithium—*cont*
principal compounds 7 545 546
production 4 467
properties 7 544-546
resistivity 11 497
thermonuclear reactions 7 546
Lithium aluminum hydride 7 546
Lithium base lubricating grease 7 546
Lithium hydride 7 545-546
Lithium metal 7 545
Lithium mica 7 459
Lithium perchlorate 7 544
Lithium stearate 7 543
Litho stone absorption 10 615
Lithobiomorpha 3 60
Lithobius 13 12
Lithocholic acid 2 185
Lithocrinus magnificus 11 52
Lithocolletis 7 467
Lithocyst 5 37
Lithodes maia 4 51
Lithodidae 4 51
Lithofacies 5 175 6 141
map of 12 328
Lithographic inks 7 115 114
Lithographic limestone 2 395
Lithographic press 10 621
Lithography 10 600 615
Lithol 10 224
Lithophile elements 4 546
Lithophyllum 3 476
Lithophysae 11 560
Lithopone 2 96 10 223
Lithosere 15 232
Lithosmylus columbianus 7 158
Lithosols 12 438
Lithosphere 7 546
Lithosphere, geochemistry of 7 546-553
chemical composition of core 7 547-548
chemical composition of mantle 7 547
geochemical cycle 7 551-552
important crystalline phases 7 549
oxide structures 7 549
processes 7 552
crystallization 7 552
diagenesis 7 552
melting of rock 7 552
metamorphism 7 552
sedimentation 7 552
weathering 7 551 552
silicate structures 7 549
Lithothamnium 3 476 7 516
Lithotripes coal 3 232 240
Litomastix 11 449
Litomosoides carinii 8 253, 9 33
Litopterna 7 553* 8 82
Little, A D 3 28, 7 538
Little America 1 440
Little Bear 14 235
Little Carpathians 5 118
Little Dipper 14 235
Little's disease 9 69
Little drop technique 3 617
Little Ice Age 6 203
Little John rocket 1 510
Little Karroo plateau 1 108
Littleleaf disease, shortleaf pine 14 74
Littlewood, J E 9 225
Littoral community 8 108
Littoral drift 3 242, 12 304
Littoral sediments 8 152
Littoral system 8 107
Littoral transport 3 242, 12 304
Littoral zone 3 327, 7 519
Littorina 6 439 7 231
Littorina littorea 9 609 10 21
Littorina Sea 2 87
Littorinidae 9 609, 10 21
Littrow mounting 4 141
Littrow prism 12 590
Littrow quartz spectrograph 12 590
Lituolidea 5 432-435
Lituus 15 1
Liu Hui 14 611
Live oak 9 237
Live roller conveyors 3 450
Lively ant-guest beetle 3 277
Liver 2 185, 4 150 5 204 7 553 561*
anatomy 7 556-558
bilirubin 2 186
biochemistry 2 199
cirrhosis 8 236
embolism 4 565
embryology 7 554-556
endocrine gland 4 588
histology 7 558-561
lipid metabolism 7 534
metabolism 12 566
mitochondria 8 519
physiology 7 561
structural development 7 555 556
urea (biochemistry) 14 215
Liver disorders 7 561-564
bacterial infections 7 563
chemical agents 7 563
cirrhosis 3 144, 7 562
hepatitis 6 417
malnutrition 7 562
obstruction 7 563
other diseases 7 563
parasites 7 563
tumors 7 563-564
viral infections 7 562
Liver fluke 7 563 12 389
Liver function test 3 199
Liver mortis 4 22
Liverpool Bay 5 114
Liverwort 2 353 6 415
Livestock feed 6 259
judging 1 121
see also Agricultural science (animal)
Living fossils 7 564*, 8 56
Livor mortis 4 22
Lizard 7 564*, 13 21
Lizard beetle 3 278
Lizard fish 8 679
Ljubimova, M. N. 8 642
Ljungstrom preheater 8 35
Llama 1 266 7 564*
see also Camel
Llandeilan Series 9 573
Llandoverian Series 12 527
Llanos 12 526
Llanvirnian Series 9 573
Lloyd, H 3 592
Lloyd mirror effect (underwater sound) 14 197 198
Lloyd's mirror interference 7 186 187
Lloyd's Register of Shipping 4 280
Loa loa 5 257, 259
Loach 5 618
Load (stream transport) 12 156-157, 13 173
Load center substation *see* Electric power substation
Load graphs 4 452 453
Load line 7 564 565
Load metamorphism 8 534
Load tests soil mechanics 12 456-457
Loading electrical 7 565
Loading, gear *see* Gear loading
Loading impulsive 7 55
Loading transverse 7 565 566
beam 7 565 568
bending 7 565 566
bending moment 7 183
bending moment diagram 7 566
deflection 7 567
elastic stresses 7 566
girder, plate 6 189
inelastic stresses 7 568
section modulus 7 566
shear 7 565 566
shear center 7 565
shear diagram 7 566
shear flow 7 567
statically indeterminate beam 7 567
unsymmetrical bending 7 567
Loading coils 7 565
Loads dynamic 7 568 569
deformations 7 568
elastic behavior 7 568
impact loads 7 568
inelastic behavior 7 568
load factor 7 568
resistance to 13 184
stresses 7 568
toughness 7 568
Loads, repeated 7 569
cycle of stress 7 569
fatigue strength 7 569
stress raisers 7 569

minescence—cont
luminescence involving electron motion 7 616-617
luminous paint 7 618
phosphorescence *see* Phosphorescence
photochemistry 10 137-138
photoluminescence 10 168
quantum mechanical corrections 7 614
sensitized 7 615-616
Stokes shift 5 494
thermoluminescence 13 585 586
Luminol 11 114
Luminophor *see* Phosphor
Luminosity (stars) 13 42
Luminosity factor 7 617
Luminous efficiency 7 617
Luminous energy 7 617
lumen hour 7 610
Luminous flux 7 617, 10 173 174
illuminance 7 25
lumen 7 610
Luminous intensity 7 618, 10 173 174
candle 2 436
candlepower 2 436
luminance 7 610
Lum...
...
Lummer Brodhun photometer head 10 170
Lumped parameter circuits 14 30 35
Lumped parameters (electrical) 4 457
Lumpy jaw *see* Actinomycosis
Lunar appulse 4 382
Lunar eclipses see Eclipse astronomical
Lunar ephemeris 5 32
Lunar probe 12 546
Lunar tide 13 632
Lunda cirrhata 11 91
Lundegardh vaporizer 5 294
Lune 12 608
Luneberg lens radar ECM 4 521
Lung 7 618* 10 408 11 228, 507
anatomy 11 522 525
diffusing capacity 11 509
embolism 4 565
embryology 11 519 522
histology 11 525
see also R...
Lung di...
bro...
circ...
7...
Lung disorders—cont
inflammatory diseases 7 618 621
scarring and destruction 7 619 621
tumors 7 621
Lung irritant chemical warfare 3 45
Lung volume 13 5
Lungfish 7 621 622*, 12 29, 13 557
Lunik 10 271
Lunisolal interval 13 635
Lupine 3 526 7 622*
Lupinus 3 100
Lupus 3 412-413
Lupus erythematosus 6 589 7 315 622 623* 8 658
Lure Mountains of 5 117
Lurex 5 245
Lustrous schists 10 202
Lutecium *see* Lutetium
Lutein 2 530 3 92
see also Carotenoid
Luteinizing hormone 13 526
endocrine mechanisms 4 391
oogenesis 9 331
ovary 9 454
pituitary gland 10 250
reproductive system 11 477
Luteola 5 296
Lutetium 7 623
electron configuration 4 504
extractive metallurgy 8 277
ionization potential 4 504
Lutheran blood group system 2 269
Lutidine 3 236 11 110
Lutite 3 529 11 590 12 190 135
Lutra canadensis 9 449
Lutrinae 2 523
Lux 7 623
Luxullianite 10 425
Luzern, Lake of 5 115
Luzon island of 9 482
LVT *see* Landing ships and craft
Lycaea 6 586
Lycaenidae 2 381 7 464
Lychee 7 623* 12 26
Lychnoscosa 7 623*, 10 513
Lycidae 3 277
Lycium halimifolium 10 440
Lycopene 2 54 529 13 498
Lycopersicon hirsutum 13 665
Lycopersicon peruvianum 13 665
Lycopersicon pimpinellifolium 13 665
Lycopersicon pusum 13 665
Lycopersicum 7 436
Lycopodiales 7 623 625*, 10 346
Lycopodineae 7 625 626*, 10 346
Isoetales 7 276*, 625 10 346
Lepidodendrales 7 456 459*, 625 10 346
Lycopodiales 7 623 625* 10 346
Pleuromeiales 7 625 10 346 417*
Selaginellales 7 625 10 346 12 157 160*
Lycopodium 7 623 8 210
Lycopodium alpinum 2 244
Lycopodium clavatum 7 625
Lycopsida 7 626 627*, 10 321, 346 13 116
fossils 9 502
Lycopodineae 7 625 626*, 10 346
structure 7 626
Lycopus 8 155
Lycoridae 4 212
Lycosa 1 498
Lycosidae 1 498
Lyctocteuthidae 4 40
Lyctidae 3 277
Lyctororis 4 608
Lydersen A. I 6 43
Lyell Charles (Sir) 5 51 8 502 505 9 512 508, 10 416 418 11 373 12 505 13 523
Lygaeid bug 6 401
Lygaeidae 3 62 6 401
Lygidea mendax 6 405
Lyginopteridaceae 11 87
Lyginopteris 11 87
Lygus bug 6 405
Lygus hesperus 6 405
Lygus lineolaris 6 405 409 13 598
Lyman, J. 12 102
Lyman *ghosts* 4 240
Lyman limit 1 620
Lyman *series* 1 657
Lymantria 11 450
Lymantria dispar 12 229
Lymantriidae 7 464
Lymexylonidae 3 277
Lymexylonoidea 3 277
Lymnaea 11 93
Lymph circulation 3 137 141
formation 7 633
heart 7 630
node *see* Lymph node
vessels 7 633
see also Lymphatic system
Lymph node 7 627*, 633
Lymphadenitis 2 546
Lymphadenopathy 4 62
Lymphatic system 7 627 636
circulatory system 3 144
comparative anatomy 7 630 632
embryology 7 627 629
histology 7 632 633
Hodgkin's disease 6 459
lymph node 7 627
physiology 7 633 636
spleen 7 629 630 13 8
tonsil 7 632 13 668 669
Lymphatic vessel 3 137
Lymphocyte 2 263 6 396, 13 8
lymphatic system 7 627
radiation injury (biology) 11 227
Lymphocytic choriomeningitis 7 636* 9 70 10 428
Lymphocytic leukemia 3 192 202 6 398
Lymphocytopoietic organ *see* Lymphatic system
Lymphocytosis 3 192 202
Lymphogranuloma inguinale *see* Lymphogranuloma venereum
Lymphogranuloma psittacosis group 7 636*, 10 429
Lymphogranuloma venereum 4 54 7 636* 8 256 10 428, *12 372 13 529*
Lymphoma leukemia 7 481, 9 320
Lymphoma leukemia tumors 9 321
Lymphosarcoma 1 603, 9 320 10 100
Lyngbya 3 636
Lynx 3 412 414 7 636 637*
Lynx canadensis 7 636
Lynx rufus 2 272
Lyomeri *see* Saccopharyngiformes
Lyons formation 10 26
Lyophilic colloid 3 292
Lyophilic gels 6 93
Lyophilic group 13 321 322
Lyophilization 1 421, 3 617 7 637*
Lyophobic colloid 3 292
Lyophobic gels 6 93
Lyophobic group 13 321 322
Lyot, B. 3 488, 13 289
Lypoderma lineata 4 216
Lypoprotein 3 533
Lyra 3 412-413, 7 637*
Lyre, the *see* Lyra
Lyrids 8 308
Lyrocteis 10 412
Lysaretidae 10 461
Lysergic acid 10 434
Lysergic acid diethylamide *see* LSD 25
Lysianassidae 6 46

Lost wax process 2 543
Lotic ecosystem 5 532 534*; 3 326
Loudness 7 586 587
  decibel 7 587
  Fletcher-Munson contours 5 299 300
  phon 7 587, 10 120
  sone 7 587, 12 504 505
Loudspeaker 7 587-593
  baffle 7 589
  coaxial 7 592
  crossover network 3 555
  diaphragm 7 589
  direct radiator 7 590-591
  directional characteristics 7 588
  distortion 7 588
  dynamic 7 589
  efficiency 7 589
  electrical speaker impedance 7 588
  electrostatic 7 589, 591
  enclosures 7 591
  force factor 7 589
  horn 7 590, 592
  moving coil 7 589, 591
  physical performance characteristics 7 588
  power rating 7 589
  pressure-response—frequency characteristic 7 588
  public address system 11 88 90
  radiation controlling elements 7 589, 591
  radiation impedance 7 590
  requirements for speech and music 7 587
  ribbon conductor 7 589
  speaker placement 1 520, 7 592
  speaker systems 7 592
  transients 7 588
  tweeter 7 591
  types 7 589
  woofer 7 591
Louping-ill 1 499, 7 593*
Louse 7 593
  body 1 434
  crab 1 434
  head 1 434
Louse fly 4 212, 5 362
Love emotion 4 583
Love numbers earth tides 4 548
Love waves 12 151
Lovebird 7 594
Loveland, R P 10 162
Lovén, S L 4 570
Lovén system (echinoid rays) 4 570
Lovering, T S 8 532
Low, A 4 274
Low, barometric *see* Atmospheric low
Low-approach systems, aircraft *see* Aircraft low approach systems
Low-carbon iron 7 259
Low-expansion alloys 1 259
Low frequency loran 7 585
Low-frequency radio waves broadcast use 1 363
  navigation use 1 363
  spectrum allocations 11 260
Low-level counting 7 594 596*, 11 292-293
Low-pass filter, acoustic 5 265
Low-pass filter, electric 5 266
Low-pressure systems (meteorology) 1 157 14 416
  cyclone 14 494
Low quartz 6 127
Low Si Iron magnetic alloy 7 264
Low speed wind tunnel 14 499
Low-temperature coke 3 220
Low temperature distillation 6 46
Low-temperature physics 7 596-598
  absolute zero 1 10 11
  cryogenic engineering 3 569-572
  cryogenics 3 572 575
  liquefaction of gases 7 535 540
  liquid helium 6 392 393
  low temperature phenomena 7 597 598
  low temperature thermometers 7 598 601
  production of low temperatures 7 596 597
  superconductivity 13 295 301
  superfluidity 13 301 302
Low temperature thermometry 7 598 601
Lowell, P 8 154, 10 420
Lowenstein, W R 8 197
Lower limb, man 1 397
Lower Productus limestone 10 2b
Lower Sonoran zone 8 245
Lowry, T M 3 40
Loxia curvirostra 3 554
Loxia leucoptera 3 555
Loxocalyx 3 7
Loxodes 11 57
Loxodonta africanus 4 537
Loxodrome 6 267 8 97, 13 1
Loxomesplon 5 7
Loxonematacea 6 76
Loxorhynchus 11 31
Loxosoma 5 7
Loxosomatoides 5 7
Loxosomella 5 7
Loxothylacus texanus 11 547
Loyalty Islands 9 482
Lozara Mts 5 118
LP gas fuel gas 5 553
LPD *see* Landing ships and craft
LPG *see* Liquefied petroleum gas
LPH *see* Landing ships and craft
LS coupling *see* Russell-Saunders coupling
LSD see Landing ships and craft
LSD 25 11 81
LSM *see* Landing ships and craft
LSMR *see* Landing ships and craft
LST *see* Landing ships and craft
LTH *see* Luteotropic hormone
Lualaba River 1 109
Lube oil 10 66
Lubricant 7 601 606
  antioxidant 7 603
  antiwear additive 7 603
  bearing 2 120
  boundary lubricants 7 604
  cutting fluids 8 3
  dispersant 7 603 604
  emulsion 4 586-587
  engine lubrication 7 606 607
  extreme pressure additives 7 603
  friction reducing additive 7 603
  grease 7 605 606
  multigrade oils 7 602 601
  oils 7 602 10 66 67, 72
  petroleum lubricants 7 602, 10 72
  pour point depressants 7 603
  silicone resins 12 425
  solid lubricants 7 604 605
  surface-active agents 13 321
  synthetic oils 7 604
  viscosity index improvers 7 603
Lubrication (leather and fur processing) 7 447
Lubrication engine 7 606 607
  force feed 7 607
  lubricants 7 601 606
  lubrication system 7 606
  splash lubrication 7 607
  viscosity 7 606
  wear 7 607
Lucanian Apennines 5 118
Lucanidae 3 276
Lucanthone hydrochloride 12 64
Luce meteorite 8 310
Lucernaria 3 255, 13 76
Lucifer 5 97 5 103, 12 308
Luciferase 2 23, 221 7 129
Luciferin 2 25, 221, 7 129
Lucilia caesar 8 680
Lucite optical materials 9 350
Luckiesh Moss visibility meter 10 173
Lucretius 1 552
Lüders, G 13 363
Ludlovian Series 12 227
Ludlow Typograph 3 343 14 169
Ludwig, K 14 229
Ludwigite 10 425
Lueder's lines 8 272
Lug worm 10 461
Lugano, Lake of 5 115
Lumbia 1 600
Lumbia messelensis 9 599
Lumbricidae 9 599
LULU (depth charge) 4 48
Lumbar vertebra 12 383
Lumber 4 61
  structural materials 13 205
  walnut 14 383
Lumber manufacture 7 607 609
  grading 7 609
  laminated wood 7 609
  logging 3 585
  seasoning 7 608 609
  plywood 10 425
  sawmill operation 7 607 608
Lumbosacral plexus 1 429
Lumbricus 1 431
Lumbricus terrestris 5 554 9 314
Lumbritmeridae 10 461
Lumen 7 610
Lumen hour 7 610
Luminaire 7 28, 610
Luminance 7 610
  foot lambert 5 429
  lambert 7 588
  photometry 10 174
Luminescence 1 15 7 610 617*
  activators 7 611
  arc lamp 1 505
  in atomic gases 7 611 615
  bacterial 2 25
  bioluminescence *see* Bioluminescence
  cathode-ray tube phosphors 2 558 559
  cathodoluminescence 2 560 561
  chemiluminescence 3 46
  color centers 3 296
  concentration quenching 7 616
  configuration coordinate curve model 7 612 615
  electroluminescence 4 492 493
  excitons 5 135 136
  fluorescence *see* Fluorescence
  Franck Condon principle 5 495 494
  impurity atoms 3 582

M

M60 machine gun 1 538
M252 nickel alloy 9 96
M1 rifle 1 537
M14 rifle 1 537 538
M15 rifle 1 537 538
M-centers 3 295
M-derived filter 5 270
M discontinuity *see* Mohoro vičić discontinuity
M G M 63 3 128
M region (sun) 13 287
M type carcinotron 8 72
MAA 6 421
Macaca cynomolgus 8 572
Macadam 9 597
McAdams W H 3 381
McAdie A G 1 93
Macaque 8 572
MacArthur J S 6 252
Macassar Strait 4 356
McAtee W L 11 33
McAulay J 11 187
Macaw 9 567 11 69
Macbeth illuminometer 10 171
Macbride, T H 10 275
McBurney's point 1 396
Macchiavello stain 13 33
McClelland D C 8 608 10 36
McClure, Alan 3 314
McClure Strait 9 166
MacConkey broth 14 389
McCormick, J R D 4 53
McCormick J S 13 505
McCoy H N 5 123
McCutcheon F G 6 19
MacDonald C 4 350
McDonald C J F 4 335
MacDonald functions 2 180
Macdonnel range 1 671
MacDowell A N 9 310
McDowell S 11 347
Mace 12 613
Maceral (coal) 3 252
McGill selection program 2 152
McGinnies E 8 608
Mach Ernst 6 265 9 12
Mach number 3 349 6 51 8 1*
at subsonic speeds 1 220
at supersonic speeds 1 220
wave motion in fluids 14 431
Mach wave 6 55
Mach Zehnder interferometer 7 193 194 12 298
Machilis maritima 13 629
Machinability (metals) 8 1 3
Machine 8 3, 194
Machine—*cont*
efficiency 4 414
kinematics 8 195
simple 12 339 340
see also Machinery
Machine bolt 2 277
Machine cast type *see* Type (printing)
Machine composition (type) 3 344 346
Machine design 8 4
acceleration analysis 1 26 27
velocity analysis 14 293 296
Machine elements 8 4
bearings 2 118 8 4
bolts 2 276 277*, 8 4
brake 2 317 318* 8 4
clutch 3 223 226* 8 4
gear 6 81 86*, 8 4
key 8 4 5*
pulley 8 4 11 91 93*
rivets 8 4 11 586 587*
screw fastener 12 85
shaft 8 4 12 239 240*
simple machine 12 339 340
splines 13 9
spring (mechanical) 13 15
tie rod 13 640
tolerance 13 664
wheel 8 4 14 487*
Machine forging *see* Upset forging
Machine gun 1 537 538
aircraft 1 534 537
M60 1 538
sights 6 298
Skysweeper 1 540
Machine key 8 5
Machine printing 13 542
Machine screw 12 86
Machine time 4 124
Machine tools 8 2 3
Machinery 8 5 6
see also entries by names of specific machinery such as Air compressor or of classes of machinery such as Mining machinery
Machining operations 8 6 9
boring 2 294 8 6
broaching 2 341 8 6
buffing 8 6
choice of machine method 8 6
cooling 8 9
Machining operations—*cont*
cutting fluid 8 9
cutting tools 8 6
drilling 4 274, 8 6
facing 8 6
gear cutting 6 87 88* 8 6
grinding 6 271 273*, 8 6
honing 6 477 8 6
jig, fixture and die design 7 311 314
lapping 7 401 8 6
lathe 7 407 409
machinability (metals) 8 1 3
machines for cylindrical surfaces 8 6
machines for flat surfaces 8 7
machines for parting or trimming 8 7
milling 8 6 441
motion between tool and work 8 6
multipoint tool 8 8
nibbling 8 6, 9 93*
peening 9 610
planing 8 6 10 266
polishing 8 6 10 457*
powder metal forming 8 296
reamer 11 372 373
sawing 8 6 12 42
shaping 8 6
single point tool 8 7
speed and feed 8 8
tapping 8 6
threading 8 6 13 612
turning 8 6
Machmeter 1 220
MacInnes D A 4 486 14 20
Mckechnie James 7 200
Mckechnie R K 14 269
Mackenzie K R 1 595
Mackenzie Bay 9 158
Mackenzie Lowland 9 158
Mackenzie Mountains 9 158 159
Mackenzie Plains 9 152
Mackenzie River 9 152 158
Mackerel 5 416 419 8 9*
marine fisheries 8 115
Mackerel shark *see* shark
McKillop A A 8 429
McKinstry H E 10 567
McKinsey J C C 7 411
McLaughlin, D B 9 172
Maclaurin series 12 102
Macleod D B 9 543
Macleod J R 7 165, 9 531
McLeod gage 8 9 10*, 14 240
Macles 4 98
McLetchie N 9 533
Maclura 14 235
Maclura pomifera 9 419
McMillan, B 7 100
McMillan F M 6 304, 9 41, 10 422 14 65 66
MacMillan, J 6 185
MacNeille H M 7 411
Macon ZRS 5 1 218
Macracanthorhynchus hirudinaceus 1 19 516
Macrauchenidae 7 555
Macrobalance 2 72
Macrobdella decora 1 551
Macrobiotophthora vimarienus 13 598
Macrobiotus 13 596
Macrobiotus dispar 13 598
Macrobrachium faustinum 4 29
Macrocentrus 6 579 580
Macrocheira 4 31
Macroclemys temminckii 14 167
Macrocnemus 11 50
Macroconsumer 4 390
Macrocorixa 11 511
Macrocystic rust (microbiology) 11 634
Macrocylindrus 4 41
Macrocystis pyrifera 6 297
Macrocytic anemia 3 195
hematocrit determination 3 195
Macrodactylus subspinosus 3 287
Macrodasyoidea 8 10
Macrodasys 8 10
Macroevolution 8 10 14
adaptation 8 11
adaptive radiation 8 11
correlation 8 12
extinction 8 13
hypertely 8 13
irreversibility 8 13
mutation (ontogeny) 8 675 676
preadaptation 8 12
rates of evolution 8 14
relicts 8 14
specialization and survival 8 12
types of change 8 10 11
Macrolide antibiotic *see* Carbomycin

Lysin 3 201, 7 637-638*
Lysine 2 16, 195, 7 638*
amino acids 1 308 319
in histone 9 217
plant metabolism 10 357
in protamines 9 217
in Protozoa 11 51-60
L-Lysine 11 41
Lysiosquilla 13 150
Lysis 2 70, 607
Lysogenic bacteria *see* Bacteria, lysogenic
Lysophosphatidyl choline 10 152
Lysophosphatidyl ethanolamine 10 152
Lysosomes 3 651
Lysozyme 2 12, 4 165
leukocidin 7 485
lysin 7 637
Lyssacinosa 7 638*, 10 513
Lytechinus 4 365
Lytic reaction 7 634 636
antigen antibody rea 1 473
complement fixation 3 333
D(-) Lyxose 2 455

Magnetic inclination—*cont*
earth inductor 4 338
measurement 7 55
Magnetic induction *see* Induction magnetic
Magnetic induction accelerator *see* Betatron
Magnetic ink 7 313
Magnetic intensity *see* Magnetic field
Magnetic lens 8 33 34*, 9 583
Magnetic materials 8 34 36
Alnico 1 266
atomic structure 8 36
iron alloys 7 263 264
iron silicon alloy 7 268
magnetic alloys 1 259 260
magnetic ceramics 2 650
magnetic separation methods 8 46 47
Mu metal 8 652
nonmetallic ferrites 8 34 35
Permalloy 10 22
78 Permalloy 8 35
Magnetic meridian 4 36, *6 144* 146
Magnetic microphone 8 360
Magnetic mine 12 266
Magnetic mirror 10 488
Magnetic moment 8 36
ferrimagnetism 5 218 219
magnetic units 4 461
magnetism 8 47-48
magneton 8 66 67
Magnetic *moment atomic* ferromagnetism 5 229 232
gyromagnetic ratio 6 307
Magnetic moment electron 4 516 518 8 35*
Magnetic moment *nuclear see* Nuclear moments
Magnetic north 4 36
Magnetic ordering 1 469 470, 9 90 91
Magnetic particle testing 8 287 288
Magnetic permeability *see* Permeability *magnetic*
Magnetic pickup 4 240 241
Magnetic pole strength 4 460 461
Magnetic poles (earth) 6 144
Magnetic pyrite 11 130
Magnetic quantum number 11 152
Magnetic recording 8 36 41
aircraft testing 1 195
binaural system 8 40
cinematography 3 124 129
computer recording 8 41
data recording 4 15 8 41
distortion 8 41
drop-outs *8 41*
flutter and wow 5 356 357
magnetic heads 8 38 39
noise 8 41
optical recording 9 357 358
Magnetic recording—*cont*
prerecorded tapes 8 41
print through 8 41
recording characteristics 8 39 40
reproducing characteristics 8 39 40
reproducing system 8 39
stereophonic system 8 40
telephone tape recording 8 41
television tape recording 8 41 13 458
Magnetic refrigerator 3 574
Magnetic relaxation 8 41 43
electron paramagnetic resonance spectroscopy 4 515
ferromagnetic 8 43
magnetism 8 42
nuclear 8 42
paramagnetic 8 42 43
spin spin energy 8 42
Magnetic reproducing system *8 39 40*
Magnetic resonance 8 43 46
antiferromagnetic 8 46
applications 8 45
color centers 5 296
electron paramagnetic resonance spectroscopy 4 514 516
ferrimagnetic 8 46
ferromagnetic 8 45 46
gyromagnetic ratio 8 43
magnetochemistry 8 52 54
molecular beams 8 541
nuclear 8 44 45
paramagnetic 8 45
quantum theory 8 44
Magnetic rotation *see* Faraday *effect*
Magnetic *scattering (neutron diffraction)* 9 89 91
Magnetic separation methods 8 46 47
ore dressing 9 589
separation *(mechanical)* 12 187
Magnetic sound track 3 *124* 125
Magnetic storm *see* Geomagnetic storm
Magnetic surveys geomagnetism 6 150
geophysical exploration 6 166 167
mineral prospecting 11 21 *22*
petroleum prospecting 11 26 27
Magnetic susceptibility *see* Susceptibility magnetic
Magnetic tape 8 37 41 13 159
Magnetic tape recording *see* Magnetic recording
Magnetic thermometer 7 601
Magnetic units 4 460 461
ampere turn 1 333
gauss 6 80
gilbert 6 185
maxwell 8 185
oersted 9 276
weber 14 460
Magnetic variation *see* Magnetic declination
Magnetic vector potential 4 510 513
Magnetism 8 47 48
antiferromagnetism 1 469 471
Curie temperature 3 623 624
demagnetization 4 52
diamagnetism 4 96 97
and electricity 4 462
electrodynamics 4 477
electromagnetism 4 496
electron spin 4 516 518
ferrimagnetism 5 218 219
ferromagnetism 5 229 234
geomagnetism 6 144 150
history 8 48
iron alloys 7 263 264
low temperature physics 7 597 598
magnet 8 24 26
magnetic field 8 30 33
magnetic flux 8 33
magnetic induction 7 71
magnetic materials 8 34 36
magnetic relaxation 8 41 43
magnetic resonance 8 43 46
magnetic units 4 460 461
magnetization 8 48 51
magnetochemistry 8 52 54
magnetostatics 8 68 69
metal inspection magnetic 8 287 288
neutron diffraction 9 89 91
nuclear 8 43
paramagnetism 9 547 550
permeability 10 22 23
potentials 10 538
quantum nature of 4 97
susceptibility 13 330 332
thermomagnetic effects 13 586
Magnetite 6 167 8 48*
iron ore 7 258 259
in meteorites 8 513
separation 8 47
in taconite 13 386
Magnetization 8 48 51
Barkhausen effect 2 98* 8 51
Curie temperature 3 623
curves 6 599 *8 49-50*
demagnetizing fields 8 51
domain growth 8 50
of earth *see* Geomagnetism
ferromagnetism 5 229 234
gyromagnetic effect 6 306 307
Magnetization—*cont*
hysteresis 6 599*, 8 50 51
magnetic field 8 31
magnetic susceptibility 13 330 332
magnetic units 4 461
magnetochemistry 8 52
paramagnetism 9 547 549
of rocks *see* Rock magnetism
saturation 8 49
of ships 4 43 44
single crystals 8 50
see also Magnet, Magnetic flux, Magnetic resonance
Magneto 8 51 52
Magneto aerodynamics 8 53
Magnetocaloric *effect* 8 52
Magnetochemistry 8 52 54
Magnetoelastic coupling constants 8 69
Magnetogas dynamics 8 54 55
see also Magnetohydrodynamics
Magnetograph 14 279
Magnetograph, solar 13 268
Magnetohydrodynamic shock tube 4 491
Magnetohydrodynamics 8 54 63
external gas flow 1 105
flow instability 8 62 63
Hall effect 8 60
hydrodynamic *equations* 8 57
ionized gases 8 56
liquid metals 8 56
Maxwell's equations 8 56 57
Ohm's law 8 57 59
pinch effect 8 59 60 10 232 235
plasma 8 55 63 10 385 397
shock waves 8 62
space technology 12 544
steady flow 8 60 61
stellarator 8 59 60 10 397
sunspots 8 56
thermonuclear *reactor* 8 55
transient flow 8 62
transport equation description 8 63
turbulence 8 63
wave motion in fluids 14 430
Magnetomechanical *ratio 6 307*
Magnetometer 6 149, 8 64 66
absolute type 8 64 65
aeromagnetic surveying, 1 93 94
classical 8 64
declinometer 4 36
MAD 1 484 485
magnetic declination measurement 4 36
magnetometric zero balance 8 65 66

Macrometer 2 604
Macrometeorology 8 353
Macromolecule *see* Polymer
Macromonas 11 65, 13 604
Macronucleus 11 51 60
Macronutrient 6 563 565
Macrophage 2 264, 6 396
  connective tissue 3 102-403
Macrophoma corchori 7 328
Macrophomina 12 604
Macrophomina phaseoli 3 529, 7 328, 12 535
Macropodidae 7 330
Macroscelididae 7 142 143
Macrosclerotd 12 145
Macrostomidae 11 541
Macrostylocrinus 4 366
Macrostylus 1 576
Macrostylus hadalis 4 41
Macrotermes 7 284
Macrouridae 4 41
Macrozamia 3 638 13 120
Macrura 4 24 34
Macula 4 322 5 170
  ear 4 320
  eye 5 162-171
Macula neglecta 10 125
MAD (Magnetic air borne detector) 1 484 485
Madagascar 1 108
Madda ens Mountains 5 118
Madder 1 456, 6 224
Madeira River 12 529
Madelung, F 7 248, 8 15, 12 575
Madelung constant 8 14-15
  ionic crystals 7 250
Madelung's deformity 12 368
Madison Range 9 157
Madre de Dios River 12 529
Madreporaria *see* Scleractinia
Madreporite *13* 52
Madro-Tertiary Geoflora 9 506
Madsen, F 3 548
Madtom 2 552
Maelstrom 9 251
Maestrichtian stage 3 543
Mafic minerals in gabbro 6 1
  igneous rocks 7 17-18
  lava 14 349
  principal rock forming 8 17
Magadi, Lake 1 107
Magadina 2 315
Magazine, film 3 123
Magdalena River 12 527, 530
Magellanic Clouds 6 8, 8 15
Magelonidae 10 461
Magenta 10 606
Maggiore, Lake 5 115
Maggot 4 211, 5 361
Magic numbers, nuclear 9 204-206
Magic tee junction 14 423-424
Magnetcada septendecim 6 471
Magma 8 15-18
  composition of 14 353
Magma—*cont*
  crystallization 7 552, 8 16
  magmatic assimilation 8 16
  magmatic differentiation 8 18
  mingling of magmas 8 18
  origin of 8 17-18
  petrographic province 10 49 52
  petrology 10 83 84
  physical properties 14 353
  primary magmas 8 17-18
  reaction principle 8 17
  secondary magmas 8 18
  silica poor 8 16
  silica-rich 8 16
  temperatures of 8 15
  viscosity 8 15-16
  volcanic 14 349, 353
  xenolithic constituents 8 18
  see also Lava, Volcanology
Magmatic assimilation 8 18
Magmatic differentiation 8 18
  crystal assimilation in 10 51
  crystal fractionation in 10 50 51
  isotopic lead studies 7 431
  petrographic province 10 49 52
  petrology 10 84
Magmatic evolution 10 86
Magmatic gases 10 425
Magmatic stoping 10 84
Magnamycin *see* Carbomycin
Magne gage 4 533
Magnesia *see* Magnesium oxide
Magnesia alba 8 19
Magnesian limestone 7 515
Magnesite 8 18
  carbonate minerals 2 467
  magnesium occurrence 8 19
Magnesite refractories 11 409-410
Magnesium 8 18-24
  anodizing 4 535
  content in present day organisms 9 517
  crystal structure 3 599
  electron configuration 4 504
  extraction and refining *11 120*
  extractive metallurgy 8 277
  Grignard reaction 6 269
  heat of combustion 8 290
  incendiars 7 54
  ionization potential 4 504
  natural occurrence 8 19
  organometallic compound 9 402-403
  principal compounds 8 21
  production 4 466 8 19-20
  properties 8 20
  resistivity 11 497
  uses 8 20 21
  workability 8 20
Magnesium alloys 8 20 24
  alloy preparation 8 23 24
  commercial alloys 8 22 23
  fabricability 8 24
  structural materials 13 205
  uses 8 24
Magnesium germanate phosphor 6 177
Magnesium iron mica 2 246
Magnesium nickel phase diagram 7 191
Magnesium oxide 8 21
  as electric insulation 7 158
  from magnesite 8 18
  secondary emission 12 124
  as thermal insulator 6 374
Magnet 8 24-26, 47-48
  atomic theory 8 25
  keeper 8 25
  magnetic dipole moment 8 25
  magnetic field 8 30-33
  north south orientation 8 25
  in particle accelerators 9 576 585
  pole strength 8 26
  see also Electromagnet, Magnetization
Magnet wire 3 392, 8 26-27*
Magnetic air borne detector *1 484-485*
Magnetic alloy *see* Magnetic materials
Magnetic amplifier 8 27-29
  core material 8 27
  nonlinearity 8 28
  in servomechanisms 12 203
  speed of response 8 28
Magnetic braking 2 318
Magnetic ceramics 2 650
Magnetic circuits *5 151 8* 29-30*
  air gap fringing 8 30
  circuit calculations 8 29
  eddy currents 4 409, 8 30
  hysteresis 6 559 8 30
  reluctance 11 445 446
Magnetic clutch 3 225
Magnetic cobber 8 46
Magnetic compass *see* Compass, magnetic
Magnetic cores 13 159
  materials 8 28
Magnetic coupling 3 521 525
Magnetic damping *see* Damping
Magnetic declination 4 36
  6 144 146
  dectinometer 4 36
Magnetic declination survey 11 22
Magnetic deflection 2 557
  12 45-47
Magnetic dip *see* Magnetic inclination
Magnetic dipole 4 211, 9 548*
Magnetic dipole antenna *see* Antenna (aerial)
Magnetic dipole coupling 8 47
Magnetic dipole moment, electron spin 4 517 518
  magnet 8 25
  nuclear *see* Nuclear moments
Magnetic disks 13 159
Magnetic drum 13 159
Magnetic ferrite *see* Ferrite
Magnetic field 8 30 33*, 48
  13 297
  ampere turn 8 31
  near antenna 1 444-445, 449 453*
  in cavity resonator 2 570
  of earth *see* Geomagnetism
  eddy current 4 409
  electromagnetic induction 7 69 70
  as electron lens 4 510
  electron motion in vacuum 4 510 514
  energy of 7 65-66*, 8 32
  field strength (interior) 6 146-148 8 30
  Hall effect 6 319 321
  induction 8 30
  Larmor precession 7 405
  lines of force 7 526*, 8 32
  magnetic induction 7 71
  magnetic units 4 461
  oersted 9 276
  particle accelerators 9 572 585
  poles 8 31
  production of high fields at low temperatures 5 571 572
  shielding 12 253 254
  of *ships* 4 43-44
  solenoid 8 31 32, 13 472
  of sun 13 263
  near superconductors 13 296 299
  see also Magnet, Magnetization
Magnetic field (earth) *see* Geomagnetism
Magnetic fluid and powder *clutch* 3 225
Magnetic flux 8 33
  eddy current 4 409
  electromagnetic induction 7 69 71
  Faraday's law 5 185
  fluxmeter measurement 5 361
  magnetic induction 7 71
  magnetic units 4 461
Magnetic head (magnetic recording) 8 38 40
Magnetic hysteresis *see* Hysteresis, magnetic
Magnetic inclination 6 144
  dip circle 4 36

ales 8 82*, 10 346
cacao 2 584 585
cola 3 273
jute 7 327 328
kapok tree 7 332
yate 6 325
nekte 7 563
nba 13 27
nel River 5 121
mmal nest beetle 3 276
mmalia 1 415, 420, 8 82-83*, 13 550
Allotheria 1 258
Amniota 1 328 329
behavior development 2 139
behavioral capacity 12 400
capybara 2 448
Cetacea 2 660
Chiroptera 3 63
Dermoptera 4 68
Eutheria 5 125
fossils 8 83 84
geographic distribution 8 85
Insectivora 7 142 143
Insectivora fossils 7 143 144
Monotremata 8 584
Monotremata fossils 8 584
morphology 8 82 85
phylogeny 8 82
porpoise 10 522
Prototheria 8 82 11 51*
Sirenia 12 346 347
Sirenia fossils 12 347
Theria 8 82 13 549*
Mammalia *fossils* 8 83 84
Mammalian respiration 11 530-531
Mammary gland 2 325 8 84 85
embryology 8 84
lactation 7 377-378
maturation 8 85
Mammillaria parkinsonii 8 241
Mammillaria perbella 8 241
Mammoth Cave Kentucky 6 301
Mammotropic hormone 6 490
Mammotropin 11 477
mmut 10 636
mmuthus primigenius 10 636
more River 12 529
in chromosome number 3 207
classification of 1 458 459
developmental stages in behavior 2 140 142
fossil *see* Fossil man 5 476 479
gestation period 6 182
individual variation 1 458 459
prehistory of *see* Archeology

Man—*cont.*
physical Environmental protection Life, origin of
Man eater shark 12 243
Man made fiber *see* Fiber, man made
Man-of war bird 5 536
Management gaming 12 340
Manatee 8 85 86* 12 346, 361
Manawatu plain 1 673
Manawatu River 1 671
Manayunkia leidyi 10 465
Manca 13 389
Manchuriae 14 175
Manchurian plain 1 586
Mandarin 8 86
Mandarin oil 5 71
Mandarin orange 5 546
Mandelamine 1 466
Mandelic acid 2 55
Mandelonitrile 1 621
Mandelstam, L. 11 532
Mandible (lower jaw) bone 12 373
Mandibular arch 12 356
Mandibulata 1 555 560 8 86*
Chilopoda 3 56 61
Crustacea 5 562 569
Diplopoda 4 209
Insecta 7 135 137
Myriapoda 8 692 693
Pauropoda 9 595 596
Symphyla 13 565
Maneb 1 475 5 564
Manebach law 5 207
Maneuverability, aircraft 1 192
Manganate 8 89
Manganese 8 86 89
alloys 8 87 88
electron configuration 4 504
extractive metallurgy 8 277
ionization potential 4 504
manganite 8 89
production 8 87
properties 8 87
rhodochrosite 11 553
Manganese *bronze* 3 469
Manganese compound 8 88 89
Manganese ethylene bisdithiocarbamate 1 475 5 564
Manganese fluoride 5 469
Manganese nodules in Cretaceous deposits 9 514
in Pacific Ocean 8 130
in radiolarian earth 11 315
pyrolusite 11 117
Manganese oxide 1 470 471 8 88 89*, 9 90
Manganese sediments 12 140
Manganese vanadium steel 13 206
Manganin 4 459
Manger 2 456
Mangifera indica 8 90 12 26
Mangin mirror 6 290
Mango 8 90*, 12 26
Mangrove cuckoo 5 612
Mangrove swamp 8 90 91
Africa 1 106
Manic depressive psychosis 8 91
involutional melancholia 7 256
Manifold 8 91 92
fiber bundle 5 253
Manifold (topology) 13 682 685
Manifold engine 8 91 92
Manihot 2 538
Manihot esculenta 2 538
Manila hemp 5 250
see also Abaca
Manila rope 11 627
Manioc 2 538
Manipulated quantity (control systems) 3 429
Manis 10 119
Mannan 8 92
hemicellulose 6 399
Manned space flight *see* Space flight
Mannheim process 12 412 13 261
Mannich reaction 5 575 5 473
D Mannitol 1 52 8 582
Mannocarolose 8 92
Mannoheptulose 8 578
D Mannonic acid 8 580
D Mannose 6 225 8 580 10 580
hemicellulose 6 399
mannan 8 92
Monosaccharide 8 578
D (+) Mannose 2 455
D Mannuronic acid 2 453
gum 6 297
Manometer 8 92 93* 10 581
glass tube 8 92
inclined tube 8 93
mercury 8 92
U tube 8 93
well type 8 93
Manometric method 6 46
Mansonella ozzardi 5 257 259
Mansonellasis 5 258 260
Mansonia 4 218
Manticoceras intermescens 4 87
Mantidae 8 93 9 416
Mantis 8 93 94
Mantis religiosa 8 93
Mantis shrimp 6 479 13 150
Mantissa 7 575 576
Mantle of earth *see* Earth (mantle of)
Mantle rock *see* Regolith
Manual shift transmission 14 43 45
Manubrium 12 555
Rotifera 11 634
Manufactured gem *see* Gem, manufactured
Manufacturing assembly methods 1 594
automation 1 676 679
gage blocks 6 5
industrial engineering 7 82 83
machining operations 8 6 9
mass production 8 164 164
metal forming 8 286 287
pilot production 10 229 230
production engineering 10 640 642
prototype (equipment) 11 51
quality control 11 138 142
standardization 4 58
tolerance 13 664
tooling 13 670
Manure 1 125 8 94*
fertilizing 5 236, 241
Manus 12 364
Manutius Aldus 14 171
Many plume moth 7 464
Manyplies *see* Omasum
Map 2 534
air pressure 7 274
air temperature 7 290
bathymetric 9 519
contour representation 3 425
economic 2 536
facies (geology) 5 175 177
forest mapping 5 455 457
forest stands 5 455
geologic 6 142 143
gravity 6 166
isolith 5 176
isomagnetic 6 149
isopath 5 175
isothermal chart 7 290
land capability 12 428, 447 449
land use 2 535 536
lithofacies 5 176 12 328
magnetic 1 93
paleogeographic 9 519
paleogeologic 9 520
paleolithologic 9 519
palinspastic 9 519
petroleum prospecting 11 25
relief 2 534
topographic 2 534 535, 13 677 679*
topology 13 679 680
weather 14 454
see also Cartography, Globe, terrestrial Topographic surveying and mapping

Magnetometer—*cont*
observatory-type 8 64
quartz horizontal 8 65
relative 8 65 66
rubidium vapor 8 65
saturable core 8 65-66
Schmidt vertical field balance 8 65
sine galvanometer 8 64
standard intensity instrument 8 64
use in prospecting 11 22
Magnetometric zero balance (BMZ) 8 65 66
Magnetomotive force 8 66
ampere turn 1 333
gilbert 6 185
magnetic units 4 461
reluctance 11 445-446
Magneton 8 66 67
Bohr 8 66 67
nuclear 9 191
Weiss 8 67
Magnetooptical shutter 10 160
Magnetooptics 8 67-68
Cotton-Mouton effect 8 68
Faraday effect 5 181-183*, 8 67
Kerr effect 8 68
Majorana effect 8 68
Paschen Back effect 9 588
Voigt effect 8 67-68
Zeeman effect 8 67, 14 607-610
Magnetoplumbite ferrite 2 650 5 219 220*
Magnetopulsed systems (electromagnetic propulsion) 4 490
Magnetoresistance 6 21, 8 68*
Magnetostatic shielding 12 253-254
Magnetostatics 8 68 69
Coulomb's law of *see* Coulomb's law
see also Magnet
Magnetostriction 8 69
ferrites 5 221
ferromagnetism 5 231-235
magnetoelastic coupling constants 8 69
transducer 14 182
Magnetron 8 69-72
amplifiers 8 71-72
crown of thorns 8 71
cw operation 8 71
electron paths 8 70
hole and-slot circuit 8 70
interdigital circuit 8 70
mechanical tuning 8 70-71
modes 8 70
oscillator 8 69-71
pi mode 8 70
pulsed 8 71
radar transmitter 11 211
rising sun circuit 8 70
Magnetron—*cont*
transit time 8 70
voltage tuning 8 72
Magnetron beam switching tube 13 360
Magnification 8 72
geometrical optics 9 365 367
gun sights 6 298
telescopes 13 449
Magnifier (optical) 7 454
Magnifying power 8 72
Magnitude, stellar 8 72 74*, 13 38 48
color 8 72-73
color index 8 73
of galaxies 6 8
methods of measurement 8 73
parallax 9 546
photovisual 1 615
Magnolia 3 188, 8 74*
Magnolia acuminata 8 74
Magnolia grandiflora 8 74
Magnolia gravimeter 13 516
Magnolia kobus 8 74
Magnolia macrophylla 8 74
Magnolia soulangeana 8 74
Magnolia stellata 8 74
Magnolia tripetala 8 74
Magnolia virginiana 8 74
Magnolia ɔulan 8 74
Magnoliophyllum 9 502
Magnus, law of 13 578
Magnusia 5 123
Magnusson, L B 14 66
Magoptical CinemaScope prints 3 127-128
Magpie 8 74
Magura Mountains 5 118
Mahogany 3 187, 6 174, 8 74 75*
Mahogany beetle 2 151
Mahogany Ledge 9 304, 308
Maiden-hair tree 6 187
Maier, N 5 549
Main sequence star *see* Dwarf star
Maintainability of equipment 8 75
adjustments 8 75
component design 13 379
expendable components 8 75
on site repair 8 75
reliability of equipment 11 443-445
repair 8 75
standardized building blocks 8 75
systems engineering 13 379
Maize *see* Corn
Maja 9 434
Majidae 4 34
Majolica ware 10 546
Major diatonic scale 12 47
Major term 7 579
Majorana effect 8 68
Majorca (Mallorca) 5 117
Majority carrier 12 166, 14 36
Majors (qualitative analysis) 11 136
Makassar Strait 9 271
Makran Range 1 577
Maksutov optics 1 615
Maksutov telescope 13 452
Makushin Volcano 1 523
Mal de caderas 14 124
Malachiidae 3 277
Malachite 8 75
copper ore 3 464
gem material 6 99
Malachite green acid base indicator 7 60
dye 4 301
Malaclemys centrata 11 527
Malaclemys terrapin 3 23, 13 502
Malacobdella 2 114
Malacobdella grossa 11 560
Malacochersus 3 23
Malacocotylea *see* Digenea
Malacon 6 317
Malacosoma 7 472
Malacosoma americana 7 469
Malacostraca 1 562, 3 562, 8 75 77
Amphipoda 1 339 341
classification 8 76
Cumacea 3 622
Eucarida 5 96 97
Eumalacostraca 5 102 103
evolution 8 76
Leptostraca 5 562, 7 476* 8 76
Pancarida 9 527 529
Peracarida 10 1 2
Malad Springs (Idaho) 13 18
Maladie du sommeil see Sleeping sickness African
Malania anjouanae 3 255
Malapterurus 4 428
Malapterurus electricus 4 428
Malaren, Lake 5 115
Malaria 4 218 5 6, 8 77* 10 428 13 8
Cinchona 3 122
entomology economic 5 5-7
mosquito 8 599
Protozoa 11 60
thermotherapy 13 596
Malaspina Glacier 6 200
Malathion 3 251 252 7 141
Malay Tapir 13 394
Malcodermata 3 277
Maldanidae 10 462
Malebranche, N 10 33
Maleic acid (cis) 2 475
Maleic anhydride 10 467
Maleic hydrazide 6 530, 8 674
herbicide 6 422
Maleylacetoacetic acid 6 106
4 Maleylacetoacetic acid 2 35
Malic acid 2 32
krebs cycle 7 370
L-Malic acid 5 23
Malignant anaplasmosis 11
Malignant pustule 1 457
Mall, F P 7 556
Malla tree 12 25
Mallagine lavas 11 597
Mallard 1 436, 4 290
Malleability 10 401 402
Malleable iron 7 259
cast 2 540 541
Mallein 6 206
Malleolus 1 428
Malleomyces 8 585
Malleomyces mallei see Actinobacillus mallei
Malleomyces pseudomallei 8 214
Malleus 12 357
ear 4 319
Rotifera 11 634
Mallomonas 3 117
Mallophaga 7 134, 395 8 77 78*
Malm (Jurassic) 7 325
Malnutrition 8 78 80
cell requirements 8 78
essential metabolite deficiencies 8 79
generalized 8 79
Kwashiorkor disease 8 79
Malonate 5 74
Malonic acid 2 36 475 5 29
Malonic ester *see* Ethyl malonate
Malpighi, M 5 139
Malpighian body 5 140
Malpighian cell 12 145
Malpighian corpuscles 13 8
Malt beverage 8 80 81
Malt diastase 5 26
Malt vinegar 14 324
Malta fever *see* Brucellosis
Maltase 1 366, 2 461, 5 203 8 81*
digestive system 4 172
oral gland 9 370
Malter, L 12 126
Malthus T R 5 133
Malting of barley 2 100 101
Maltol 11 108
Maltose 1 366, 2 452, 461 4 164 8 81 82*
cellobiose 2 620
Malus, E 10 448
Malus baccata 3 552
apple 1 493
Malus domestica 1 493 494 3 552, 5 545
Malus' law 10 448 449
Malus malus see Malus domestica
Malus pomila see Malus domestica
Malus sylvestris see Malus domestica

Marine navigation—*cont*
dead reckoning 4 18 21*, 8 129
harbor control 9 21
instruments 9 17 18
Nautical Almanac 9 6
naval meteorology 9 7 8
navigator's chart 9 17
pilot ng *10* 230 232
in polar regions 10 443
position fixing *9* 21
rine phosphate 11 23 24
rine propeller *see* Propeller, marine
rine railway 4 280
rine refrigeration 8 130
rine regression 2 469
arine resources 4 344 345 8 130 132*
extractive 8 130 131
living 8 131
nonextractive 8 131 132
non renewable 8 130
renewable 8 130
larine salvage *see* Ship salvage
larine sediments 8 132 147
abyssal red clay 8 135 137
age determination by Foraminifera 5 435
Atlantic Ocean 1 623 624
authigenic mineral formation 12 108 109
authigenic processes in 1 671 12 108 109
bay deposits 8 132 133
biogenic carbon 8 139
bulk density measurements 8 137 138
calcareous oozes 8 135 136
chlorite 5 77
climatic record in 8 141 145
compressional wave velocity measurements 8 137-138
coring devices 8 145-146
deltaic deposits 4 50 51
diatom ooze 8 135 136
dredge sampler 8 144 145
elements abundances in 4 550 551
environmental temperatures 9 509, 516 518*
environments of deposition 8 132 137
estuarine deposits 5 83-84
free fall *corer* 8 145
globigerina ooze 8 135 136
great snowfall 8 138
on guyots 12 123
illite in 7 25
incompressibility measurements 8 137 138
lontum method for rate of deposition 8 139
isotopic thermometers 8 142
Marine sediments—*cont*
7 428
littoral deposits 8 132
neritic deposits 8 133 135
neritic sediments calcareous 8 135
noncalcareous 8 133-135
organic oozes 8 135 136
pelagic deposits 8 135 137
physical properties 8 137 138
piston corer 8 146
pteropod ooze 8 135 136
radiolarian ooze 8 135 136
rates of sedimentation 8 139 141
sampling and coring devices 8 145 147
seismic refraction measurements 8 138
shear wave velocity measurements 8 137 138
siliceous oozes 8 135-136
in submarine canyons 13 215
terrigenous deposits 8 133, 136
transport of sediments 8 138 139
see also Lithosphere, geochemistry of Sedimentation (geology)
Marine sextant 2 585 12 234
Marine sterol 13 139
Marine transgression 2 469
Maring Marvin sunshine recorder 13 292
Marinsky J A 11 5
Mariotte Edme 2 513
Mariotte's law 2 513
Maritime Alps 5 117
Maritime Commission 12 283
Maritime safety buoy 2 371 372
light lists 7 508
lighthouse 7 508
routing ships 9 8
Marjoram 12 613
Markab 9 610
Marker beacons 7 148
Marking inks 7 112
Marking smokes 12 82
Markov chain probability 10 628
stochastic process 13 142
Markov process 13 142
Markowitz W 4 350
Markownikoff V V 1 62
Marlite 8 147
Marlstone 8 147
Marmara Sea 5 114
Marmer, H A 12 95
5 117
Marmota monax 14 541
Marquesas Islands 9 263
Mars 8 147 155
albedo 1 223, 8 147
atmosphere 8 149
chemical composition 8 149 149
clouds 8 149
mass 8 148
surface pressure 8 148
vertical structure 8 149
bright regions 8 151
canals 8 154 155
dark regions 8 151
Deimos 8 152
escape velocity 5 68
internal constitution 8 152
mass 8 147
oblateness 6 264
phases 8 147, 10 100
Phobos 8 152
polar caps 8 150
rotation period 8 147-148
satellites 8 152 154
surface features 8 150
surface temperature 8 150
telescopic appearance 8 148
water on 8 150
Marsh O 7 9
Marsh S B 8 641
Marsh 8 108 13 333
flood plains 10 260
glaciated regions 13 333
marine 8 127 128
Marsh beetle 3 278
Marsh birds 14 490
Marsh gas 8 339
Marsh test 1 550
antimony 1 478
arsenic 1 551
Marsh treader 6 401
Marshall, E 14 230
Marshall N B 12 60
Marshall's acid 13 262
Marsilia 13 116
Marsipobranchii *see* Cyclostomata (Chordata)
Marson M 5 534
Marssonia 8 215
Marssonia rosae 8 215
Marssonina agaves 12 348
Marssonina panattoniana 7 478
Marston, A T 13 333
Marsupial frog 12 10
Marsupialia 8 82, 8 155*
Jurassic 7 327
kangaroo 7 330
Peracarida 10 1
Marten 12 1
Martens' hardness test 8 275
Martensite 6 581; 13 90
Martes americana 12 1
Martes pennanti 5 284
Martin G. W 8 688, 10 275
Martin 8 156
Martingale 13 111
Martinottiella communis 5 432
Marussi, A 4 316
Marx, F 7 48
Marx impulse generator circuit 7 48
Masbate, island of 9 482
Maser 3 571 8 156 160*
ammonia 1 650
circuits 8 158
discrete energy levels 8 156
frequency or time standard 8 157
gas 8 157
high sensitivity 8 156
infrared 8 160
low noise 8 156
low temperature operation 8 158
noise temperature 8 159
optical 8 160
pumping frequency 8 158
Raman type 8 158
resonant cavity 8 159
thermodynamic equilibrium 8 156
three level solid state 8 158
time interval measurement 13 646
two level solid state 8 157
Mask crab 3 331 4 33 34
Masked duck 4 291
Maskelenite 8 513
Maskelyne N 6 264
Masking (sound) 8 160 161
complex sounds 8 160
hearing 6 350
noise control 9 125
pure tones 8 160
by random noise 8 160 161
subjective tones 8 160
Maslow, A H 10 33
Mason, B J 5 217, 12 391
Mason, H L 1 232
Masonry 8 161
cement 2 627
mortar 8 599
Mass 8 161-163
atomic mass unit 1 652
conservation of 3 407
energy 8 163
and force 5 435 436
and gravitation 6 263-265*, 8 162
gravitational 6 265, 11 435
hydraulics 6 530
inertia 8 162
longitudinal 11 432
measurement 2 73-74
moment of inertia 8 565
rest mass 11 533

Map design 8 91 95
Map plotting 13 677
Map projections 8 95 97
  Aitoff Hammer oval world projection 8 97
  Albers equivalent conic 8 97
  azimuthal projections 8 96
  azimuthalthy 8 96
  conformality 8 96
  conic projections 8 95
  cylindrical projections 8 95
  deformation patterns 8 95
  directional relations 8 96
  equal area 8 96
  equivalence 8 96
  in geodesy 6 122
  gnomonic azimuthal projection 8 97
  great circle routes 6 267-268
  Lambert conformal conic 8 97
  Mercator 8 97
  navigator's chart 9 16
  polyconic 8 97
  properties of 8 96
  significant lines 8 96
  stereographic azimuthal conformal 8 97
  transverse Mercator 8 97
Map reproduction 8 97 98
  inked-plate printing processes 8 98
  non ink reproduction processes 8 98
Map scale 8 98-99*, 13 677
Map symbols 2 534 13 677
Map turtle 3 25, 5 31, 14 166-167
Maple 8 99-100, 13 113
Maple sugar 13 239, 245
Maracaibo, Lake 12 527
Maranon River 12 529
Maranta arundinaceae 1 549
Marantaceae 1 549 5 186-192, 12 76
Marasmius perniciosus 2 385
Marattia alata 8 100
Marattiales 8 100*, 10 346
Marble 8 100 101*, 11 591
  calcite type 8 100
  calcium mineral 2 398
  carbon 2 462
  compressive strength 4 613
  dolomite type 8 100
  ornamental stone 13 152
  syntectonic recrystalization 11 593
  velocity of sound in 12 516
Marble bone *see* Osteopetrosis
Marcasite 8 101
March fly 4 212
Marchantia 2 354
Marchantia polymorpha 6 415
Marche, Apennines of 5 118
Marchison, R. I 10 25
Marcq St-Hilaire method 2 585
Marcus, E 4 362, 13 125
Margaric acid 2 474
Margarine 8 101 102
Margarite 3 77
Margarodes 6 475
Margenau, H 5 101, 7 196
Marggraf, A S 2 95
Marginal distributions 10 629
Marginal seas 9 219 250
Marginulina glabra 5 453
Mariana Trench 2 110, 4 365, 13 223
Marie, P 6 597
Marie Byrd Land 1 440
Marie Victorin, Frère 10 377
Marignac, J C G 6 2, 14 606
Marijuana 8 102*, 14 235
Marimba 8 666
Marine biocycle 3 326
Marine boiler 8 102-104*, 116
  see also Steam boiler
Marine borers 14 538
Marine bug 6 401
Marine charts 2 535
Marine delta 4 48
Marine ecosystem 4 405, 8 104 108*
Marine engine 8 109 112*, 116
  backing power of ships 12 282 283
  diesel direct drive 8 110
  diesel electric drive 8 111
  governors 8 111 112
  internal combustion engines 8 109
  oil consumption 8 111
  reciprocating steam engines 8 109
  reduction gears 8 111
  steam engines 8 109
  steam turbines 8 109
  turboelectric drive 8 111
Marine engineering 8 112
  marine boilers 8 102-104
  marine engines 8 109 112
  marine machinery 8 116 127
  marine propellers 11 12 15
  ship propulsion *12 276* 284
  ship propulsion reactors 11 361 363
Marine environment 8 104 107
  classification of 4 39
Marine fisheries 8 112 116
  Atlantic Ocean 1 626 627
  Baltic Sea 2 89
  Bass Strait 7 59
  conservation problems 8 115
  distribution of fishing grounds 8 113
  improving the harvest 8 114-115
  life cycle 8 114
  North Sea 9 165
  potential harvest of sea fisheries 8 114
Marine fisheries--*cont*
  production 8 112-113
  productivity estimates 12 120 121
  role of plants 8 114
Marine fouling 9 271
  barnacle 2 101
  Cirripedia 3 145
  drydocking 4 279 282
  shipworm 12 291
  wood preservation 14 538
Marine geology atoll 1 646 647
  coastal landforms 3 242-244
  continental shelf and slope 3 422 423
  delta 4 48-51
  estuaries, geomorphological classification 5 79 80
  marine sediments 8 132 147
  oceanic islands 9 261-263
  seamount and guyot 12 122 123
  shore processes 12 299-306
  submarine canyon 13 215 216
  submarine topography 13 216 223
  turbidity current 14 146-147
  see also Oceanography, Paleoecology Paleoecology (geochemical aspects)
Marine influence on weather and climate 3 174 176 8 116*
Marine life 8 101 108
  Antarctic Ocean 1 439-440
  on beaches 12 305 306
  deep-sea fauna 4 39
  light compensation depth 12 106
    compensation intensity 12 106
    intensity requirements 12 119
    photic zone limits 12 106
    seasonal variation 12 119
    visibility and predators 12 105
  populations composition of 12 121
    fluctuations in 12 121
    size measurement 12 121
  productivity carbon dioxide assimilation 12 119
    geographic variations 12 120
    oxygen production 12 119
    pH change 12 119
    photosynthesis 12 119
    respiration 12 119
    seasonal variations 12 120
    upwelling 12 120
Marine life--*cont*
  sound noise makers 12 107
    noise producers 12 109
    scatterers 12 60 14 198 199
  source of petroleum 10 *see also* Marine ecosystem
  Marine fisheries Marine microbiology, Marine resources
Marine limestone 7 516
Marine machinery 8 116-127
  air-conditioning equipment 8 123 124
  air revitalization equipment 8 124
  anchor 8 125
  auxiliary 8 121
  blowers 8 122
  centrifugal pumps 8 122
  compressors 8 122
  condensers 8 121
  corrosion 8 127
  diesel propulsion 8 118 119
  distilling plants 8 123
  ejectors 8 122
  electric plants 8 126
  engines *see* Marine engine
  fans 8 122
  fuel considerations 8 117
  heat exchangers 8 121 122
  heating 8 125
  maintenance 8 118
  noise 8 117 118
  nuclear propulsion 8 120
  piping 8 126
  propulsion 8 116 121
  pumps 8 122
  reciprocating steam pumps 8 122
  refrigeration 8 125
  rotary pumps 8 122
  shafting 8 120
  steam propulsion 8 119 120
  steam turbines 8 120
  steering 8 124 125
  surface condensers 8 121 122
  ventilation 8 123
  vibration 8 *117* 118
  weights 8 117
Marine marsh 8 127 128
Marine microbiology 8 128 129
Marine microbiology chemoautotrophs 8 129
  heterotroph* 8 129
  interrelationships of microorganisms 8 129
  phagotrophs 8 129
  phototrophic microorganisms 8 128
  role of microorganisms 8 129
Marine navigation 8 129 130*, 9 10
  anti collision 9 21
  celestial 2 583 587, 8 129

Maxwell's electromagnetic theory—*cont*
see also Maxwell's equations
Maxwell's equations 8 185 187
conducting media 8 186
displacement current 4 244 245
equation of continuity 5 45 46
index of refraction 8 186
integral form 8 186 187
Lorentz invariance 8 187
magnetohydrodynamics 8 56 57
microwaves 8 412 413
ratio of units 8 186
rectangular coordinates 8 186
relativistic electrodynamics 11 428 431
wave equation 14 419
wave guide 14 421
wave motion 14 425 429
Maxwell field *see* Electromagnetic field
Maxwellian gas 10 586
Mayall N U 6 7 12 13 303
Mayaro virus 1 499
Mayer, H 10 133
Mayer J E 7 541 13 84
Mayer, M 4 532
Mayer M M 7 639
Mayfly 8 187
Mayo, F R 1 63
Mayon volcano 14 352
Mayonnaise 5 187, 390
Mayorella bigemina 1 330
Mayr, E 12 571
Mazocarpon 7 457 458
Mazzard 5 56
Mcbitite basalt 10 86
MCPA 6 422
4 (MCPB) 6 422
MCPP 6 422
Meacham L. A 10 221
Meacham crystal bridge oscillator 9 425
Meadow grasshopper 6 261, 9 418
Meadowlark 7 404
Mealybug 6 475 8 187*
Mean law of the 4 131
definition 13 57
calculus differential and integral 2 402
differentiation 4 131
Mean anomaly 2 591
Mean deviation 13 63
Mean free path 7 354 355* 8 187*
for cosmic rays 3 498 499
gas 14 332
ionosphere 7 255
kinetic theory 7 354 355
molecules 13 293
semiconductors 12 171
Mean free path—*cont*
sound 11 539
Mean sea level 12 94
Mean solar time 13 642
earth rotation 4 355
Mean squares 1 387
Mean value theorem 2 402
Meander belts 5 311
Meandra lamellina 12 77
Meandrina 3 474
Meanies 2 568 8 187*
Meantone tuning 8 662 664
Measles 1 425 466 467, 4 102 8 188* 10 428 12 570
fluorescent antibody study 8 585
Measure 8 188 189
Measured mile course 12 285
Measurement 12 74
see also Instrumentation Physical measurement
Measuring worm 7 464
Meat products 5 373 414 416
canned meats 5 415
cured and pickled meats 5 414
cured and smoked meats 5 414 415
fats 5 415
food microbiology 5 424
frozen meats 5 415
tenderized fresh meats 5 415
Méchain Pierre 8 254
Mechanical (lavout) 10 601
Mechanical advantage 8 189
block and tackle 2 262 6 460
lever 7 494
Mechanical birefringence 10 149
Mechanical bonding 1 66
Mechanical classification *see* Classification *mechanical*
Mechanical clock *see* Clock
Mechanical differentials 1 369
Mechanical disturbance 12 509
Mechanical drawing *see* Engineering drawing
Mechanical engineering 8 189
air conditioning 1 145 145
automotive *see* Automotive vehicle
control systems 3 429 438
heating system *see* Heating
machine design 8 4
machinery 8 5 6
manufacturing processes *see* Manufacturing
prime movers 10 590 592
refrigeration 11 411-415
ventilating system 14 296 298
Mechanical equivalent of heat 3 407
Mechanical equivalent of light 7 617
Mechanical filter 5 271
Mechanical hysteresis *see* Hysteresis, mechanical
Mechanical impedance *see* Impedance, mechanical
Mechanical integration 7 171 172
Mechanical metamorphism 8 *304*
Mechanical pulping 9 539
Mechanical reactance 7 37
Mechanical rectifier 8 189 190*, 11 585
output voltage 8 190
rotating element 8 190
three phase 8 189
see also Vibrator
Mechanical resistance *see* Resistance mechanical
Mechanical resonator 4 12
Mechanical rotation 13 646
Mechanical schematic drawing 12 62
Mechanical twins metallography 8 295
Mechanical vibration 8 190 195*, 14 311
beam vibrations 8 192 193
bending vibrations 8 192
critical damping 8 191
damping 8 191
engine 8 192
fatigue 8 191
flutter 8 193
increased wear 8 191
lateral vibration 8 192
longitudinal vibration 8 192
membrane vibration 8 193
microphonics 8 565
musical instruments 8 193
natural frequency 8 191
principal causes 8 191
resonance 8 191
self excited vibrations 8 193
time interval measurement 13 646
torsional vibration 8 191 192
Mechanical weathering (geology) 12 133
Mechanics 8 193 194* 10 207, 13 548
angular momentum 1 405
celestial 2 579 583
classical 8 194
continuum 5 255 256*, 13 548
dynamics 4 313 314* 8 193 194
fluid 5 336 338
matrix 8 181 182
quantum 11 153 162
relativistic 11 431 433
Mechanics—*cont*
soil 12 449 458
statistical 13 58 66
Mechanics, classical 8 194
ballistics 2 78 84
causality 2 571
celestial 2 579 583
center of gravity 2 628
centroids 2 641
collision 5 290 291
constraints 3 413
dynamics 4 313 314
force 5 435 437
gravitation 6 263 266
kinematics 7 547
Lagrange's equations 7 583 586
linear momentum 8 566
minimal principles 8 471
motion 8 600
Newton's laws of motion 9 91
precession 10 568 670
rigid body dynamics 11 570 577
statics 8 193 194, 13 54 56
strength of materials 13 177
work 14 551 553
Mechanisms 8 194 196
analysis 8 195
escapement 5 69-69
four bar linkage 5 483 487
gear 6 81 86
graphical kinematic synthesis 8 195
kinematics of machines 8 195
mathematical synthesis 8 195
slider crank *see* Slider crank mechanism
sliding pair 12 380
straight line *see* Straight line mechanism
Mechanization 1 676 679
Mechanocaloric effect 6 393
Mechanoelectric conversion (biology) bioelectric generator 8 198
mechanoreceptors 8 193 198
nerve impulse discharge sites 8 198
transducer sequence 8 197
Mechanooptical vibrometer 14 315 316
Mechanoreceptors 8 196 206
bioelectric generator 8 198
code of sensory messages 8 203
efferent control of 8 205 206
equilibrium, biological 5 47-49
in generator potential 8 204

Mass—*cont*
transfer 3 445 444
transverse 11 432
units gram 6 216
kilogram 7 347
slug 12 383
Mass acoustic 7 96
Mass, center of *see* Center of *mass*
Mass defect 8 163
see also Binding energy, nuclear
Mass distribution (earth's crust) 13 518
Mass measures 8 188
Mass number 4 547, 8 165*
Mass production 8 163 161*, 10 613
effects 8 164
machines 8 164
standardization of parts 8 164
see also Manufacturing
Mass spectrograph 8 164-166*, 558
Mass spectrometer 8 164 166
atomic weight 1 663
Calutron 7 296
canal rays 2 435
Mass spectroscope 8 164-166
Mass *spectrum 8 166 12 592*
Mass transfer operation 8 167-168
adsorption 1 78 82
coefficients 4 144
countercurrent operation 3 518-519, 5 156 158 12 500
diffusion 4 142 146
gas absorption 6 44 45
heat convection 3 443-444
leaching 7 422 424
separation (chemical and physical) 12 186
solvent extraction 12 500
sublimation 13 210
Mass wasting 8 166 167
creep 8 166 167
debris avalanche 8 167
earthflow 8 167
landslide 7 397-398 8 167
mudflow 8 167
permafrost 10 22
rapid flowage 8 167
rock creep 8 167
slow flowage 8 166
soil creep 8 166
solifluction 12 482
Massalsky, T. B 1 263
Massasauga 11 347
Massif 8 167
Massif Central 5 118
Massif du Pelvoux 5 117
Mast cell 3 395
connective tissue 3 402 403
hypersensitivity 6 590
Mastacembelidformes 8 168*, 9 442
Mastacembelus circumcinctus 8 168
Mastax 2 114, 12 157
Rotifera 11 633
Master-slave manipulator 11 446
Mastigophius 2 255
Mastigophius flagellum 2 255
Mastigamoeba reptans 8 168, 11 547
Mastigella 11 548
Mastigophora 8 168 170*, 11 52
ecology 8 170
Euglena 5 98
morphology 8 168
nutrition 8 169
Phytomastigophorea 10 212*, 11 52
respiration 8 170
Zoomastigophorea 11 52, 14 627-628*
Mastigoproctus giganteus 1 496, 14 235
Mastitis (cows) 1 468, 7 390, 8 170*, 14 628
Mastodontoidea 10 636
Mastodynia *see* Fibrosis
Mastotermes 7 284
Mastotermitidae 7 284
Mat 10 598
Matanuska Valley 9 159
Mataura River 1 671
Match 8 170
Matched filter 5 270
Matching pennies 6 25
Maté 2 388
Material balance equation 10 73
Materialization of energy 9 495
Materials handling 8 170 171
automation 1 676 679
in plant transportation 10 323
plant layout 10 322
standardization 4 79
Materials handling machines 8 171
bulk-handling 2 365 370
conveying 3 447 450
conveyor 3 450 452
elevating 4 557 559
industrial trucks 7 86 90
mining machinery 8 489
monorail 8 572-578
Maternal influence 8 171 172
Mathematical biology *see* Biophysics, mathematical
Mathematical biophysics *see* Biophysics, mathematical
Mathematical geography *see* Geography, mathematical
Mathematical logic 7 578
notation 8 172
Mathematical model Monte Carlo method 8 586 587
Mathematical notation, contemporary 8 172 174
Mathematical physics 8 174 175
Mathematics 8 175-180
algebra 1 238 241
analytic geometry I 387-392
Boolean algebra 2 288
calculus, differential and integral 2 403-403
complex numbers and complex variables 3 336 343
conformal mapping 3 393 397
coordinate systems, graphical 3 454 456
determinants 4 82
differential equations 4 125
equations, theory of 5 46 47
Fourier series and integrals 5 487-490
game theory 6 24 30
geometry, differential 6 150-152
geometry, euclidean 6 152 155
graph theory 6 253-256
group theory 6 282 285
infinity 7 96
least squares, method of 7 444 445
linear programming 7 522 523
linear systems of equations 7 523 525
logic 7 578 582
mathematical notation, contemporary 8 172 174
mathematical physics 8 174-175
Monte Carlo method 8 586-587
number systems 9 220 223
number theory 9 224-227
operator theory 9 338 341
perturbations 10 59 41
potentials 10 537
probability 10 624 630
series 12 180 196
topology 13 692
Matheson cell 3 71
Mating 11 476
assortive 6 504
random *see* Panmixis
Mating system inbreeding 10 508
panmixis 6 503, 10 508
Matra Mountains 5 118
Matrix (connective tissue) 3 401
Matrix (mathematics) determinants 4 81 84
linear systems of equations 7 524
see also Matrix calculus
Matrix theory
Matrix calculus 8 180 181
Matrix compound (luminescence) 7 611
Matrix games (game theory) 6 27-28
Matrix mechanics 8 181 182*, 14 22
Matrix theory 8 182 184
matrix calculus 8 180 181
transformation theory
quantum 14 22
Matromicin *see* Oleandomycin
Matte 3 465
smelting 11 119
Matter (physics) 8 184
antimatter 1 475
conservation of 3 407
and gravitation 6 263 264
inertia 7 90
Matter fields 11 148
Matter waves 5 355 356 11 154*
Matterhorn 8 184 185
Matthes, F E 5 277, 6 198
Matthew, W D 14 624
Matthiessen's rule 8 185
crystal defects 3 581
resistivity 11 497
Maturing agent (food) 5 577
Mauch Chunk formation 11 388
Maui, island of 9 481
Maumee Plain, Lake 9 153
Mauna Kea 9 481
Mauna Loa 9 482, 14 553
Mauna Loa volcano 14 553
Maury, M F 1 622, 9 296
Mauser mechanism 1 534
Mauve 4 298
MAVAR *see* Parametric amplifier
Max min rule 6 28
Maxilla 12 373
Maxillary gland 3 565, 4 25 5 105
Maxima functions 2 407 410
Maximum likelihood, biometrics 2 231
human genetics 6 505
statistics 13 71
Maximum power transfer theorem 9 76 15 397
Maxwell, E 13 299
Maxwell, James Clerk 3 399 4 244 245 462, 477, 496 7 500 8 48, 412 9 363, 10 152 175 11 429, 12 39 14 200
Maxwell 8 185
relation to gauss 6 80
Maxwell bods 15 418
Maxwell Boltzmann distribution *see* Boltzmann distribution
Maxwell distribution *see* Boltzmann distribution
Maxwell's electromagnetic theory 4 462, 9 365

Melilotus indica 3 221
Melilotus officinalis 3 221
Melinae 2 523
Melioidosis 8 214
Meliolaceae 5 66
Melissic acid 2 474
Melitaea 7 471
Melitodes 6 238
Melitose *see* Raffinose
Melittia satyriniformis 7 466
Melittidae 6 574
Mellin formula 7 165
Mellisuga helenae 1 491
Mellitic acid 2 463
Mellitophile 3 275 283
Mellisorinae 2 523
Melodae 3 277
Melodogyne 1 235, 3 529 10 302 12 535 14 169
Melodogyne arenaria 9 603
Melodogyne hapla 9 603
Melodogyne incognita 7 328
Melodogyne incognita acrita 3 514
Melon *see* specific entries as Muskmelon, Watermelon
Melon growing 8 214 215
characteristics 8 214
diseases of 8 214
muskmelon 8 668
Persian melon 10 30
watermelon 14 411
Melonechinus 9 496
Melophagus ovinus 12 247, 13 629
Melopsittacus 9 45
Melopsittacus undulatus 7 594
Melospiza melodia 12 562
Melt spinning 5 242
Melting point 8 215 216
Melton A W 7 443
Melusinidae 4 212
Melville R. 2 424 4 359 570 575, 5 97 7 269 456 11 425 13 141
Melville Island 1 523
Melvridae 3 277
Membracidae 6 470 471 14 76
Membrane osmosis 9 441
vibration 14 313 314
Membrane bone 7 174 175
Membrane bone formation *see* Bone
Membrane filter water analysis 14 390
Membranipora 2 554 3 16
Memory 3 490 8 216 222*
amnesia 1 328
asterengnosis 1 595
brain structure complexity 8 221
delay period 8 220
factors affecting 8 219 220
localization of 8 221
long term 8 221
measures of 8 218
Memory—*cont*
methods of studying 8 216 219
nature of material 8 219
nervous system 8 220
problem solving (psychology) 10 653
short term 8 220
Memory devices *see* Storage devices
Memotron storage tube 13 162
Memramcook Estuary 14 309
Menadione 11 195, 14 344 345
see also Vitamin K
Menarche 8 225
Menard, H W 12 505
Mendel, Gregor 8 222
Mendel L B 1 417
Mendeleev, D I 6 176, 8 222, 10 15, 12 49
Mendelevium 8 222* 14 67
Mendelian behavior 1 459
Mendelian heredity 10 507
Mendelian population 10 507 512
Mendelian segregation 3 658
Mendelism 8 222 224
chromosome theory of heredity 5 114
gene 6 104
heterosis 6 430
independent assortment law of 8 223
segregation law of 8 223
sex linked inheritance 12 233
Mendocino Escarpment 13 219
Mendocino Fracture Zone 13 219
Menger's theorem 6 255
Menhaden 8 223 224
marine fisheries 8 115
Menindee Lake 1 672
Meninges 2 516 630 8 224* 9 60 68
Meningitis 1 466 467 8 224*, 9 69 70, 13 245
hemophilus bacteria 6 412
spinal cord disorders 12 617
Meningocele 9 69
Meningococcus 2 3, 8 224
Meningoencephalitis 2 546
listeriosis 7 543
nervous system disorders 9 70
Meningomyelocele 9 69
Menippe 4 34
Menippe mercenaria 4 33
Meniscotheriidae 3 394 6 598
Meniscotherium 3 394
Meniscus 13 316
Meniscus lens 7 451-453
Menopause 8 224 225
Menopon gallinae 7 593
Menoponidae 8 78
Menorrhagia 11 481
Menotyphla 7 145
Mensa 3 413 414
Menschutkin, N 5 72 76
Menstrual cycle 9 454
Menstruation 8 225*, 11 476
menopause 8 224
Mental abnormality *see* Abnormal behavior
Mental deficiency 8 225 226
abnormal behavior 1 8
classification 8 225
cretinism 3 546
degrees of intelligence 8 226
diagnosis 8 225
mongolian idiocy 8 566
phenylpyruvic oligophrenia 10 115
Mental illness 8 226 227
types 8 226
see also specific entries as Hysteria Manic depressive psychosis Obsessive compulsive reaction, Paranoid state, Phobic reaction Schizophrenia, Somatization
Mental telepathy 5 159
Mentha arvensis 8 227
Mentha piperita 9 628
Mentha spicata 12 563
p Menthadiene 13 496
p Menthadiene 1(7)2 *see* beta Phellandrene
Menthane 13 496
p Menthene 1 8 ol *see* alpha Terpineol
Menthol 8 227* 10 112
peppermint 9 628
Menzelia 5 59
Menzel D H 3 507
Menzies, R J 8 142
Mepacrine 1 51
Meperidine 9 4
Mephitinae 2 523
Mephitis 11 33
Mephitis mephitis 12 574
Meprobamate 14 16
Meramecian stage 2 471
Merbromin NF *see* Mercurochrome
Mercalli intensity scale 12 150
Mercapsol process 10 70
Mercaptal 1 229
Mercaptan 8 227 228
conversion 10 70
nomenclature 9 597
organosulfur compound 9 405
removal 10 70
thio compounds 13 603
Mercaptide 8 227
2 Mercaptobenzothiazole 8 227, 13 601
beta Mercaptoethylamine 9 538
2 Mercaptoimidazole 7 32
6 Mercaptopurine 8 227
Mercator projection 8 96 97
chart 6 268
navigator's chart 9 16
Mercenaria mercenaria 5 152, 5 100
Mercer J 13 539
Mercerization 13 538 539
Merchant ship *see* Ship merchant
Mercresin 1 483
Mercurials 1 475
Mercuric chloride 1 482
Mercuric compound *see* Mercury compounds
Mercuric oxycyanide 1 482
Mercurochrome 8 231, 11 109
Mercurous compound *see* Mercury compounds
Mercury (element) 8 229 232
amalgam 1 208
calomel 2 418
electrical resistance 13 296
electron configuration 4 504
extractive metallurgy 8 278
ionization potential 4 504
isotope shift 7 296
line spectrum 7 521
metallurgical extraction 8 229
natural occurrence 8 228 229
organometallic compound 9 402
principal compounds 8 230 232
properties 8 229 230
spectrum and term diagram 1 660 661
speed of sound in 14 451
uses 8 228
Mercury (planet) 8 232 233
albedo 1 223
appearance 8 232
atmosphere 8 232 233
escape velocity 5 68
general relativity 11 438
motion of perihelion 6 265
phase (astronomy) 10 100
rotation 8 232
transits 8 233
Mercury, *transits of* 14 41
Mercury arc tube *see* Mercury vapor rectifier
Mercury battery 8 233 234*, 10 587 588
active materials 8 233
capacity 8 234
cell potential 8 233
cell reaction 8 233
electrochemical system 8 233
electrolyte 8 233
theoretical output 8 234
typical characteristics 8 234
Mercury bichloride 1 482

Mechanoreceptors—*cont*
in impulse discharge 8 204
local excitation and generator elements 8 198 201
modulation at accessory structure 8 205
modulation at receptor level 8 205
mechanoelectric conversion 8 197
nerve impulse discharge sites 8 198
production of nerve impulses 8 202 204
receptor adaptation 8 204-205
receptor-effector mechanisms 8 196
receptor inactivation 8 202
receptor membrane properties 8 199-202
receptor potentiation 8 202
refractoriness 8 201
transducer sequence 8 197
triggering mechanism 8 202 203
Mechta 10 271
Mecistocirrus 13 193
Meckel's cartilage 12 356
Meckel's diverticulum digestive system 4 150-175
gastrointestinal tract disorders 6 72 74, 7 233
pancreas 9 532
Mecklenburg, Gulf of 5 114
Meconic acid 11 108
Meconium 4 154, 7 125
Mecoptera 7 134 139, 8 206*
Insect fossils 7 139
Media components of culture *see* Culture media components of
Medial moraine 8 597
Median 13 67
biometrics 2 225
Median effective dose *see* Effective dose 50
Median infective dose *see* Infective dose 50
Median lethal dose *see* Lethal dose 50
Medicago 13 122
Medicago falcata 1 233
Medicago obiculatris 3 527
Medicago sativa 1 233
Medical bacteriology *see* Bacteriology, medical
Medical science clinical pathology 3 192 202
dentistry 4 63
gerontology 6 182
surgery 13 322 323
teratogenesis 13 491-494
toxicology 14 5-6
Medical therapy prosthesis 11 28 30
psychotherapy 11 80
Medical therapy—*cont*
radioactive isotopes 11 289
radiology 11 315-317
surgery 13 322 323
thermotherapy 13 593-596
Medicinal products biological 2 217-219
pharmaceutical chemistry 10 92
pharmaceutical testing 10 93-94
Medicine 8 206 207
clinical pathology 3 192-202
forensic 5 440 441
gerontology 6 182
microbiology 8 348
nursing 9 229
pharmacy 10 97-98
public health 11 90-91
surgery 13 322
teratogenesis 13 491 494
Medinan series 12 327
Mediterranean anemia 13 9
Mediterranean flour moth 7 472
Mediterranean forest 3 189
Mediterranean scrub forest 5 468
Mediterranean Sea 5 114, 8 207-208*, 9 219, 271
Mediterranean vegetation zones 14 290
Medium frequency band 11 260
Medium frequency radio waves 1 363
Medium steel 13 90
Medulla wool fiber 14 547
Medulla adrenal *see* Adrenal gland
Medulla oblongata 2 316 631, 9 58
Medullosa 11 85
Medullosaceae 11 85
Medusa 3 256
Meekocaras gracilitatis zone 14 82
Meekospira 9 609
Meerittherium 10 636
Meerschaum 12 187
Mees, C E K 10 161
Megaceryle alcyon 7 361
Megachile 6 582
Megachilidae 6 574
Megachiropiera 3 63
Megacolon gastrointestinal tract disorders 6 72 74
Megaeryst 10 111
Megacyclolene robiniae 3 287
Megadolodus 3 394
Megadrepanoides 2 643
Megakaryocyte 6 397
Megaladapis 10 590
Megalobatrachus 3 578
Megalocephalus 9 69
Megalocnus 4 411
Megalohyrax palaeotheroides 6 598
Megalopa 3 566
Megalopa larva 4 26
Megalops atlantica 3 223
Megalopygidae 7 464
Megalosaurus 4 199
Megamerinidae 4 212
Meganthropus 5 478
Meganyctiphanes norvegica 3 567
Megaphone 8 208
directivity 4 233
Megapodiidae 6 18
Megarhyssa lunator 7 8
Megarhyssa macrurus 6 581
Megasclere 4 56
Megasporangium 12 159
Megaspore 12 159
Megasporophyll 5 532
Megastigmus 6 581
Megaton yield atomic bomb 1 648
Megawatt *see* Watt
Mége-Mouriés 8 101
Megger 8 208 209
Meggers, W F 14 441
Megophrys nasuta 1 433
Meibomian cyst 12 124
Meibomian gland 12 123
Meijer formula 7 165
Meinesz, F A Vening 10 446, 13 418, 419 514
Meiomite 12 50
Meiosis 8 209 211 10 199
cell division 2 602
chromosome aberration 3 113
chromosome theory of heredity 3 114
oogenesis 9 330 331
radiation cytology 11 222
significance to genetics 8 211
spermatogenesis 12 602 603
stages 8 209 211
Meisenheimer, J 9 468
Meissner W 8 211 13 296
Meissner corpuscle 3 633, 8 196 12 180
nervous system 9 42 63
Meissner effect 8 211* 13 296 297
gyromagnetic ratio 6 307
Meissner's plexus 4 156
digestive system 4 150-175
Meitner, L 3 48, 11 30
Meker burner 6 263
Mekong River 1 580
Melamine 14 216
Melamine formaldehyde resins 14 215-217
Melamine resin lamination 10 406
molding 10 405
Melamphaidae 4 40
Melampsora lini 5 298, 10 307
Melampsoraceae Uredinales 14 217
Melanoliaceae 5 563
Melanconiaceae Melanconiales 8 212
Melanconiales 5 563 8 212 217*
Colleototrichum 8 212
Cryptosporiopsis 8 213
Gloeosporidiella 8 212
Gloeosporium 8 212
Marssonia 8 213
Myxosporium 8 212
Sphaceloma 8 213
Melanconis 8 213
Melanconium 8 213
Melanconium fuligineum 6 252, 8 213
Melandrium album 12 229, 231
Melandryidae 3 277
Melanerpes erythrocephalus 14 541
Melanesians 1 458
Melania 9 545
Melanin 3 99, 5 169, 12 567
clinical pathology 3 192 202
granule 2 604
integument 7 174
pigmentation 10 225
tyrosine 14 176
Melanoblast 5 197, 9 79
Melanocarcinoma 9 320
Melanocyte 5 169
feather (bird) 5 197
Melanocyte stimulating hormone 9 629
connective tissue 3 402
pigmentation 10 225
pituitary gland 10 251
Melanoid 4 362
Melanoma 5 171, 9 320
mole (skin) 8 537
Melanophore 3 99, 7 175
neural crest 9 78
Melanoplus 5 100
Melanoplus femurrubrum 9 416
Melanoplus mexicanus 6 261, 9 416
Melanoprotein 7 174
Melanosuchus 3 552
Melanotus 3 287
Melanterite 8 215
Melarsen BAL 12 578
Melasidae 3 277
Melavinia 7 476
Melastrongylus 13 193
Melegrinidae 6 18, 14 163
Meleagris gallopavo 14 164
Melenzos 2 452
Melibiose 2 452, 11 326
Melilite 8 213 214
Melilite basalt 10 51
Melilotus 3 221
Melilotus alba 3 221

letabolism protein see Prote
in metabolism
Metabolism in ruminants
8 264 266
cellular metabolism of ace
tate 8 264
digestive system 4 168
fat synthesis 8 265
glucose synthesis 8 264
ketosis 8 265
Metabolite 3 85, 13 494
bacterial metabolism 2 27
Metaboric acid 2 292
Metacarpal 6 535
Metacenter 12 271
Metacentric height 12 271 272
Metacentric radius 12 271
Metacercaria 4 149
Metachromatic granules 3 496,
4 209
Metachrosis 13 23
Metacinnabar 3 129
mercury ore 8 228
Metacresol purple 7 60
Metacrinus cyaneus 1 567
Metagalaxy 8 266
Metagenesis 8 266*, 12 90, 165
Crustacea 3 562 569
Obelia 9 241
Phaeophyta 10 89
plants 8 266
reproduction, animal
11 448
Metagonimus yokagawai 3 207
Metahalloysite 3 165
Metal 8 266 267
alloys 8 267
anelasticity 1 400 401
Brillouin *zone theory*
2 338 339
brittle temperature 8 268
269
casting 2 541 544
chemical binding 3 26
chemical reactivity 8 266
267
contact potential differ
ence 3 421
corrosion 3 488
creep in 3 541
crystal structure 3 597 599
deformation 8 267 269
eddy current 4 409
electrical conductivity
4 452-453* 8 267
elongation 8 272
fatigue 8 275 276
fracture 8 267 269
free-electron theory 5 499
501
Hall effect 6 319 321
hardness testing 8 274 275
heat treatment 6 379 382
impact strength 8 274
mechanical properties of
8 267 276
natural occurrence 8 267
notch bar testing 8 272
274
occurrence 8 276 278
organic quantitative anal
ysis 9 598
Pauli paramagnetism
9 550
periodic table 10 14
in petroleum 10 55
physical properties 8 266
properties 13 182
reflectivity 11 394 595
resistance of 3 581 582
resistivity 11 496 497
Rockwell hardness 8 275
secondary emission 12 124
126
strain hardening 8 269 270
stress strain curve 8 269-
270
structure 8 294 13 205
superconductivity 13 295
301
tensile strength 8 271
tension 8 268
tension test 8 270 272
thermal conductivity of
3 389 390
thermionic emission
13 553 554
thermoelectricity 13 579
595
torsion 8 268
viscosity 8 269 270
work function 12 170
14 553
yield point 8 271 272
yield strength 8 271
see also entries on specific
metals such as iron
gold etc
Metal, mechanical properties
of 8 267 276
Metal and mineral processing
8 276 278
Metal base fuel 8 290 292
aluminum 8 290
beryllium 8 290
boron 8 290
chemical 5 30
compounds 8 291
deposits 8 291
dissociation 8 291
limitations in use 8 291
liquid propellant 8 291
lithium 8 290
loss due to condensed
phase 8 292
magnesium 8 290
nozzle condensation and
recombination 8 292
solid propellant 8 291
sodium 8 290
vaporization 8 291
see also Semiconductor rec
tifier
Metal carbonyl 2 463 8 279
Metal coatings 8 279 286
aluminizing 8 280
calorizing 8 280
ceramic 8 284 285
chemical 8 283 284
cladding 3 149
corrosion prevention
3 491
crystalline materials
8 285
electroplating of metals
4 529
flame spray process 8 283
fused flame spray 8 285
284
galvanizing 8 279 280
glassy materials 8 285
hot dipping 8 279
hot metallic 8 279 280
metal spraying 8 280 281
metal vapor plating 8 281
plasma spray 8 282 283
sherardizing 8 280
spray 8 280 281
tinplate 13 648
vapor 8 280
Metal deactivators 6 70
Metal fins 4 79
Metal forming 8 286 287
aluminum 1 294 295
casting 2 544
coining 3 270
cost 8 287
drawing of metal 4 271
272
explosive forming 5 153
154
extrusion 5 160 162
finish 8 287
forging 5 470 472
influence on service be
havior 8 286
jig, fixture and die de
sign 7 311 314
machinability 8 1 3
material 8 286
metallurgical structure
8 286
powder metallurgy 16 550
process selection 8 286
production factors 8 287
quantity 8 287
rolling 11 616 619
shape 8 286
sheet *see* Sheet *metal form*
ing
size 8 286
spinning *see* Spinning of
metal
tolerances 8 287
Metal halides 7 247
Metal hydride *see* Hydride
metal
Metal inert gas welding 14 467
Metal inspection, magnetic
8 297 288
Metal inspection radiographic
11 304 306
Metal inspection ultrasonic
8 288 290
Metal mark 7 464
Metal metal ion electrodes
4 471
Metal powders 10 551
Metal refining 8 276 278
Metal semiconductor rectifier
12 171
Metal spraying 8 280 281
Metal vapor plating 8 281
Metal working *see* Metal form
ing
Metalation 9 402
Metalegoceras jacksoni 10 25,
26
Metalimnion 3 325 327
fresh water ecosystem
5 521 534
Metallic binding 3 26
Metallic disk rectifier 8 292
see also Semiconductor rec
tifier
Metallic intensifiers 7 43
Metallic ink 7 113
Metallic Mountains 5 118
Metallic pigment 10 224
Metallic sap beetle 3 278
Metallic soaps 12 393
Metallic *state* 12 476 477
Metallic wood boring beetle
3 277
Metallized dyes 4 307
Metallizing 8 281 14 612
Metalloacid elements 8 292
Metalloenzymes 5 20
Metallogenetic epochs 11 20
Metallogenetic provinces 6 116
Metallography 8 292 295
applications 8 295
metallographic microscopy
8 294 295
microstructures 8 295
preparation of specimens
8 293
quantitative 8 295
Metalloid 8 266 295*, 12 518
Metalloorganic compounds
7 119 9 401-404
Metallurgical extraction 8 276
278
aluminum 1 290 294
chromium 3 104
cobalt 3 246 247
copper 3 464-466
gold 6 232 233
iron 7 259 263
lead 7 431-433
lithium 7 544
mercury 8 229
molybdenum 8 562 563
nickel 9 97 100
Metallurgical microscope 8 393
Metallurgy 8 295-296
cladding 3 149
electrometallurgy 4 496
498

Mercury cell (chlorine manufacture) 3 71
Mercury column delay line 13 159
Mercury compounds 8 230-232
Mercury fulminate 4 81, 5 151
Mercury pool gas tube 7 20 22
Mercury-type watt hour meter 14 413
Mercury vapor lamp 8 234
  235*, 14 186
  applications 8 235
  arc tube 8 234
  ballast 8 234
  color rendition 8 235
  construction 8 234
  operation 8 234
  phosphor-coated 8 235
  starting 8 234
  sunlamp 8 235, 13 292
  ultraviolet radiation 8 235, 14 186
  visible radiation 8 235
Mercury vapor rectifier 8 235-238
  excitron 5 136-137
  hot cathode 8 236
  ignitron 7 20 22
  phanotron 8 236
  pool cathode 8 236
  thyratron 8 236
Mercury vapor tube *see* Mercury vapor rectifier
Merganser 1 436
Mergenthaler, O 3 344 14 170
Mergenthaler Linotype's Prototype 3 348
Merginae 4 291
Mergus serrator 4 291
Meridian 8 238
Meridian, International 7 209
Meridian angle 2 584
Meridian circle 1 610
  spherical coordinates 3 455
Meridional astigmatism 1 6
Meridional coefficients 9 368
Meridional errors 9 368
Meridosternata 4 41
Merino *see* Sheep
Merismopedia 3 636
Meristem 5 37
Meristem, apical 8 238 241*, 12 145 13 114
  branch roots 8 239
  cell walls in plants 2 615
  floral 8 241
  intercalary 8 241
  leaf primordia 8 240
  primary thickening 8 240
  root 8 239
  shoot 8 240
  stem branch primordia 8 241
Meristem, lateral 8 241-243
  cork cambium 8 243
  fusiform initials 8 243
  other cambia 8 243
Meristem, lateral—*cont*
  ray initials 8 243
  vascular cambium 8 242
Merkel, F 3 454
Merkel's corpuscle 12 180
Merkel disks 3 633
Mermithidae 8 243
Mermithoidea 8 243
Meroblastic cleavage 5 105
Merocrine gland 5 41 43, 13 331
Merogony 4 573, 5 234, 8 243-244*, 12 65
  andromerogony 8 244
  diploid 8 244
  embryology 4 567
  embryology, experimental 4 573
  gynomerogony 8 244
  parthenomerogony 8 244
Meromictic lake 5 523
Meropidae 3 473
Meropodite 3 564
Merostomata 3 22, 8 244 245*
  Eurypterida 5 124
  Xiphosura 14 563
Merozone 2 246
Merozoite 6 316
Merriam, C H 8 245, 14 625
Merriam's life zones 8 245-247
Merrillite 8 313
Merritt hypsometer 5 458
Mersenne prime 9 224
Mertiolate *see* Thimerosal
Merus 3 564
Merwin, H E 13 249
Merwinite 8 247
Mervchippus sejunctus 10 19
Mesa 4 77
Mesaconic acid (trans) 2 475
Mesaverde formation 1 590
Mescaline 10 434
  psychotomimetic drug 11 81
Mesembryanthemum crystallinum 5 39
Mesencephalon 2 316 9 46, 547
Mesenchyme cell 2 591
Mesenchyme differentiation 12 351 367
Mesenteric artery 1 487
Mesenteron 3 275 288
Mesentery, dorsal 4 153
Mesentoblast cell 2 605
Mesh connection 1 277
Mesic environment 5 14
Mesodotea entomon 14 264
Mesityl oxide 1 34
Mesmi, F 6 334
Mesoblast 6 78 79
Mesocarp, fruit 5 544 545
Mesocypris terrestris 9 447
Mesoderm 6 78 79
  derivatives 6 174 175
  formation 7 230
Mesogastropoda *see* Pectinibranchia
Mesoglea 3 256, 259
Mesolite 14 611
Mesomerism *see* Resonance (molecular structure)
Mesometeorology 8 353
Mesomorphy anthropology, physical 1 461
Mesomyzostomatide 10 461
Meson 4 543-544, 8 247-251*
  cosmic rays 5 498 500
  decay processes 8 247 248
  intrinsic spin 8 249
  isotopic spin 7 296 297
  lifetimes 8 247 248
  nuclear capture 8 250 251
  nuclear interactions 8 249 250
  nuclear structure 9 208
  parity 8 249
  production processes 8 248 249
  quantum field theory 11 152
  relativistic quantum theory 11 180
  scattering 12 60
  stars 8 250-251
  as strange particle 13 168
  strangeness quantum numbers 8 249
  x ray emission from muons 9 202
Mesonephric duct 14 234
Mesonephron 14 223
Mesonephros 7 342 14 223, 228
Mesopause 1 628 8 324
Mesopelagic fauna 4 40
Mesophilic bacteria 2 7
Mesophyll 7 440
  leaf anatomy 7 437
Mesopithecus 10 590
Mesopotamian plain 1 580
Mesorchium 11 470
Mesosauria 8 251-252
Mesosaurus 8 251 252
Mesosoma 12 80
Mesosphere 1 628 8 252*
Mesosternum 12 355
Mesostigmata 8 252 253
  development 8 252
  interspecific relations 8 253
Mesostoma ehrenbergii 11 542
Mesostoma ehrenbergii wardii 14 145
Mesotardigrada 5 125
Mesotartaric acid 13 398 399
Mesothelioma 7 621
Mesothelium 5 42
Mesothorium 11 277 279
Mesovelia mulsanti 6 406-408
Mesoveliidae 6 401
Mesoxylon 3 477
Mesozoa 1 415, 420, 8 253-254*
  Dicyemida 4 109 111*, 8 255
  Moruloidea 8 599
  Orthonectida 8 253, 9 415
Mesozoic 8 254
  animal life 9 521
  floras 9 505 506
Mespilus 10 332
Mesquite 3 190
Mesquite gum 6 5
Message register telephone service 13 433
Messier, Charles 8 254, 9 21
Messier number 8 254
Messina, Gulf of 5 116
Meta antimonate 1 477
Meta arsenate 1 550
Meta arsenite 1 551
Meta bentonite 2 163
Metaarteriole 1 553
Metabolic disorders 8 254-26
  amino aciduria 8 258
  carbohydrate deficiency 8 261
  carbohydrate metabolism 8 261 263
  diseases 8 258
  function of lipids 8 25 260
  general effects of injury cell proteins 8 255 2
  lipid metabolism 8 259
  lipid storage disease 8 2
  lipids and degenerate c 8 260
  liver and kidneys 8 25
  nucleic acid metabolism 8 258
  protein metabolism 8 2 258
  sources of lipid accumu tion 8 260
  structure of lipids 8 2
  virus infection 8 259
Metabolic hormone 6 481
Metabolic pathways bacte 2 25 63
Metabolic studies 5 202
Metabolism 8 261 264
  acetyl phosphate 1 36
  adenosinetriphosphate (ATP) 1 64
  bacterial *see* Bacteria metabolism
  biochemistry 2 199
  biological oxidation 2
  Krebs cycle 7 369
  phosphate metabolism 10 131-132
  purine 13 677
  triphosphopyridine nu otide (TPN) 14 110
Metabolism, bacterial *see* B terial metabolism
Metabolism, cell *see* Cell tabolism
Metabolism, intermediary Intermediary metabolism
Metabolism, plant *see* Pl metabolism

Meteorological
instrumentation—*cont*
synoptic observations 8 317
transponder ranging device 8 319
upper air instruments 8 318
wind measurement 14 495-496
see also Atmospheric evaporation, Humidity, Radiation terrestrial
eteorological optics 8 320 321
Brocken specter 2 342
green flash 8 320
halo 6 323 8 321
interation with particulate matter 8 320 321
large particle optics 8 321
light scattering by air molecules 8 320
Mie scattering of light 8 321
mirage 8 320, 506*
parhelia 8 321
propagation of infrared radiation 7 106
radio-wave propagation 11 519 522
rainbow 8 321, 11 331
refraction 11 407
scintillation 8 320
sundog 13 291
use in measurement of physical quantities 8 321
variations of refractive index 8 320
visibility and related features 8 321
Meteorological rockets 8 321 322
Meteorological use of satellites 8 322 323
Meteorology 4 346 6 171 8 323 339*
aerology 1 93
aeronautical 1 95 97
agricultural 1 118 119
dynamical *see* Meteorology (dynamical)
Industrial 7 83 84
naval 9 7 8
physical *see* Meteorology (physical)
polar 10 440-442
synoptic *see* Meteorology (synoptic)
tropical 14 116 117
weather 14 446
see also Air mass Atmospheric pollution Climatology Front Hydrometeorology Meteorological instrumentation Micrometeorology Ocean meteorological relations
Meteorology—*cont*
Weather (forecasting and prediction), Weather modification
Meteorology (dynamical) 8 336 339
baroclinic field 2 101 102
barotropic field 2 102 103
geostrophic wind 6 173
gradient wind 6 244
hydrodynamic equations 8 336 337
isentropic surfaces 7 272-273
isobar 7 274
isopycnic 7 288
motions without friction and heat sources 8 337
solenoid 12 473
stability and wave motions 8 338
theory of large scale motions 8 338 339
thermodynamic equations 8 337
wind stress 14 496 497
see also Atmospheric adiabatic change Micrometeorology
Meteorology (physical) 8 323 327
air masses 1 148 151* 8 326 327
atmospheric disturbances 3 610 8 326
clouds 5 209 212* 8 326
components of dry air 1 627 634, 8 323
electrical properties of atmosphere 1 635 636* 8 327
fronts 5 538 540* 8 326 327
general atmospheric circulation 8 326
optical phenomena *see* Meteorological optics
precipitation 8 326 10 573 575*
pressure and wind 8 324-326
radiation 3 172 174* 7 144 145 8 324
temperature inversion 13 488
thermal structure of atmosphere 1 627 629* 8 324
water vapor in atmosphere 6 515 516* 8 326
see also Air pressure Atmospheric evaporation Atmospheric high, Atmospheric low Atmospheric pollution, Climatology, Cloud physics, Hydrometeorology, Meteorologic instrumentation Meteorology (synoptic), Radiation terrestrial, Storm, Wind
Meteorology (synoptic) 8 327 336
air masses and front jet systems 8 327 329
air waves upper synoptic 1 164
circumpolar aerology after 1940 8 334 336
fronts and frontogenesis 8 329 331
general atmospheric circulation 8 327
large scale tropical weather systems 8 332 334
life cycle of extratropical cyclones 8 332
waves and vortices 5 548 549 8 331 332
weather map analysis 14 454 456
see also Meteorology (physical)
Meteorus 6 580
Meter (unit) 8 339
angstrom 1 406
measurement of by interferometry 7 191 192
relation to foot 5 429
Metes and bounds surveys 13 329
Metestrus estrus 5 79
reproductive system 11 476
Methacrylate optical materials 9 550
Methacrylyl CoA 14 260
Methadone 9 4
Methallyl chloride 3 75
Methane 1 245 249 8 339 340*
cryogenic properties 3 572
detection in mines 8 502
mine gas 8 492
natural gas 9 5
velocity of sound in 12 515
Methanide 2 451
Methanobacillus 2 37
Methanobacterium 2 37 13 2
Methanococcus 2 37
Micrococcaceae 8 350
Methanoic acid 2 473
Methanol 6 544 8 339 340*
hydrogenation 6 552
petrochemical 10 44
Methanol production high pressure processes 6 449
Methanomonadaceae 8 340 341*, 11 66
bacteria taxonomy of 2 11
Carboxydomonas 8 340
Methanomonadaceae—*cont*
Hydrogenomonas 8 340
Methanomonas 8 340
Pseudomonadales 11 65
Methanomonas 10 64
Methanomonas methanica (Söhngen) Orla Jensen 8 340
Methanosarcina 2 37
Methanoic acid 9 115
Methemoglobin respiratory pigments 11 512
Methenamine mandelate antibiotic 1 464 468
Methine and polymethine dye 4 903
Methionine 1 589, 2 195 3 540, 6 221 8 341*
amino acids 1 308 319
cysteine 5 649
in histone 9 217
plant metabolism 10 357
in protamines 9 217
Protozoa 11 51 60
L Methionine 11 41
Method of exhaustion integration 7 166
Method of joints 14 121
Method of least squares biometrics 2 228
Method of moments estimation 13 71
truss 14 121
Method of shears 14 121
Methods engineering 8 341 342
motion study 8 342
wage incentives 14 379 380
work measurement 14 553 557
work standardization 14 557 558
Methods instruction production 10 642
Methods study 8 342 343
flow process chart 8 344
material handling 8 345
methods design 8 345
micromotion study 8 345
motion study 8 344
operation anlysis 8 344
operation process chart 8 343
process chart analysis 8 343
work standardization 14 557 558
Methods Time work measurement 14 555
Methoxy polyethylene glycols 10 487
6 Methoxy 8 aminoquinoline 11 193
2 Methoxycarbonyl 1-methyl vinyl dimethyl phosphate insecticide 7 141
Methoxychlor 7 140

Metallurgy–*cont*
electroplating of *metals* 4 529 535
flotation 5 312-315
heat-treatment (metals and alloys) 6 378 382
hydrometallurgy 6 559-560
machinability (metals) 8 1-3
metal, mechanical properties of 8 267-276
metal inspection, ultrasonic 8 237-288
metallography 8 292 295
ore dressing 9 388 391
plastic deformation of metal 10 198
powder *see* Powder metallurgy
pyrometallurgy 11 118 119
pyrometallurgy, nonferrous 11 119-125
radiography of metals 11 304-306
rare-earth elements 11 342
use of microradiography 8 366
see also entries under specific names of metals as Beryllium, Iron, etc
Metamere 3 563
Metamerism 1 413, 555, 8 296*
Crustacea 3 562 569
Metamerism, embryonic 8 296
Metamers 3 302
Metamict minerals 11 269
allanite 1 256
thorite 13 610
zircon 14 615
Metamictization 6 129
Metamorphic rocks 6 359, 8 296-302*; 11 590 591
alteration of stratified rocks 8 298 299
armored relics 8 297
cataclastic group 8 296
contact metamorphic 8 298-299
crystalloblastic structure 8 296
diablastic structure 8 296
experimental work 8 301
facies principle 10 87
fissility 8 298
granoblastic fabrics 8 296 297
hysterogenic relics 8 297
lithosphere, geochemistry of 7 548
metasomatism 8 299
mineral facies 8 299
petrology 10 86 88
pneumatolysis 8 299
poikilitic structure 8 296
preferred orientation 8 296 297
proterogenic relics 8 297
Metamorphic rocks–*cont*
reaction rims 8 297
recrystallized group 8 296
regional metamorphic 8 299 301
relic structures 8 297
schistosity 8 298
stable *relic* 8 297
structural relations 8 296
temperature *and mineral* facies 8 301-302
unstable *relic* 8 297
water content *and mineral* facies 8 302
Metamorphism 7 552, 8 302-304*
allochemical 8 302
of coal 3 229
index mineral *hastingsite* 1 337
in infrastructure 8 304
isochemical 8 302
isometamorphic intensity 10 88
lithosphere *geochemistry* of 7 552
metamorphism versus metasomatism 8 302-303
metasomatic 8 302
in *superstructure* 8 304
theory of 8 303-304
types of 8 304 10 87
see also Metasomatism, Pneumatolysis
Metamorphosis, *amphibian* 4 595 596
Metanauplius larva 4 26
Metanephric tubule 14 228
Metanephros 7 342, 14 224, 228
Metaperiodic acid 7 239, 10 13
Metaphase (cell) 3 108
meiosis 8 211
mitosis 8 521
Metaphen 1 483
Metaplasia 2 518, 8 304*
ultimobranchial bodies 14 179
Metasequoia 9 501, 506
living fossils 7 564
Metasoma 12 80
Metasomatism 8 299 302 305
alteration of minerals 8 443-444
metamorphic rocks 8 299
ore and mineral deposits 9 377
Metasome 3 462
Metastable state 8 305
isomerism 7 280-281
luminescence 7 612
Metastasis 9 319
Metastoma 3 561
Metastrongylidae 13 193
Metastrongylus 1 572
Metatarsus 5 428
autoradiogram 14 8
Metatheria 1 415, 8 82, 305*; 13 519
Marsupialia 8 82, 155*, 305
Marsupialia fossils 8 155-156
Metatitanates 14 651
Metatungstates 14 140
Metatungstic acid 14 140
Metatype 14 172
Metazoa 1 420, 8 305-306*
Metazoea larva 4 26, 5 105
Metencephalon 9 46-47
Meteor 8 306 310
artificial 8 310
comets 8 307
Encke's comet 5 587
Halley's comet 6 322
luminosity 8 309 310
magnitudes 8 309
masses 8 309
nature of 8 310
numbers 8 309
observations 8 307-309
orbital motion 9 372
photographic observations 8 308-309
radar observations 8 309
radiants 8 307
showers 3 587 6 322 8 307
spectra 8 310
spectroscopic observations 8 309
trains 8 309 310
trajectories 8 307
visual observations 8 307-308
wakes 8 309 310
Meteor burst communication radio 11 321
Meteoric water 2 571 6 277
in thermal springs 13 551
Meteorite 8 310 317
achondrites 8 314-315
age of 8 316
chondrites 8 314
composition 8 313 314
craters 8 316 317
distribution 8 311
element abundances in 4 546 549
fall of 8 310 311
geologically old falls 8 311
identification of 8 316
iron 8 315
lead isotopic compositions 4 551
leads 4 551
Meteorite–*cont*
metal chemical phase 4 546 549
origin of 8 313 316
shapes of 8 312
silicate chemical phase 4 546 549
and spacecraft structure 12 550
stony-iron 8 315
structures 8 314
sulfide chemical phase 4 546-549
tektite 13 421
temperatures while falling 8 312 313
troilite lead 7 428
types 8 314 315
velocity and size 8 311 31
Meteoroid 6 322
Meteorological balloons 2 84
Meteorological codes air ma*classification* 7 149
Beaufort scale 14 495
weather map 14 454
wind direction 14 496
wind rose 14 496
wind scale 14 493
WMO cloud classifica*3* 211 212
Meteorological instrumenta8 317 320
accessibility and conve
sion of data 8 318
air soundings 8 318
automatic tracking ante
na 8 319
balloons 8 318
bench mark stations *8* 318
climatological observatio8 317
direct electrical-change type radiosonde 8 319
fixed altitude radiosond8 318
mechanical change type
diosonde 8 318 319
operational observations8 317
plastic balloons 8 318
precipitation gages 10 5
problems of instrume
exposure 8 317 318
radar storm tracking 8 3
radar wind observation 8 319 320
radiosonde 8 318 319
research observations 8 3
rockets 8 321 322
rubber balloons 8 318
satellites 8 322 323
snow gage 12 591 592
sunshine duration trans
mitter 13 292 295
surface observational pra
tices 8 318

Micrapides calmani 1 306
Micrinite 3 252
Microaerophilic bacteria 2 7
Microammeter *see* Ammeter
Microanalysis 11 143
Microangiography 8 403
Microautoradiography 8 295
radioisotope (biology) 11 309
see also Autoradiography
Microbacterium 3 497
Microbacterium lacticum 8 455
Microbalance 2 72, 74
Microbar 8 347*, 12 518
Microbial fat 5 188
Microbial soil balance *see* Soil balance microbial
Microbiological methods 2 68, 8 348*
agar 1 110
bioassay 2 193 198
blood plate hemolysis 2 270
chemostat 3 51
culture 3 613
culture media components of 3 615
culture, tissue 3 617
culture technique 3 622
germfree vertebrate 6 178
Gram's stain 6 246
inoculation 7 117
lyophilization 7 637
pasteurization 9 589
Microbiology 2 66 8 348*
bacteria 2 5 9
bacterial physiology 2 65 66
brine *see* Brine microbiology of
food *see* Food microbiology
Fungi 5 561 562
germ 6 174
immunology 7 35
industrial *see* microbiology
marine 8 128
methods 8 348
milk 8 428
mycology 8 678
parasitology medical 9 555
Protozoa 11 51 60
rickettsioses 11 568 570
virus 14 330
water *see* Water microbiology
Microbrachis 8 370
Microcanonical ensemble 13 61
Microcard 10 148
Microcaecus 13 56
Microcentrum rhombifolium 9 417
Microcephalus 8 226 9 69
Microchiroptera 3 63
Microchloris 11 535
Microciona 11 419, 13 10
Microciona prolifera 10 430
Microcircuitry 8 348 350*, 469
applications 8 349
cybernetics 8 349
evaporated films 8 349
high vacuum thermal evaporation 8 349
ion beam etching 8 349
micromodule approach 8 349
molecular electronics 8 345 346
photoengraving techniques 8 349
plating 8 349
solid state microcircuits 8 349
sputtering 8 349
see also Miniaturization of equipment
Microclimate 3 184 5 13
Microcline 5 209 210 8 350
Micrococcaceae 5 96 8 350*
bacteria taxonomy of 2 11
Gaffkya 8 350
Methanococcus 8 350
Micrococcus 8 350
Peptococcus 8 350
Sarcina 8 350
Staphylococcus 8 350
Micrococcus 2 45, 5 66 8 340 9 620
Micrococcaceae 8 350
Micrococcus flavus 2 3 461
Micrococcus lactilyticus 2 42 11 15
Micrococcus pyogenes 13 57
Micrococcus pyogenes var *aureus* 2 461 13 37 529
Microcanodon 11 484
Microconstituents 8 293
Microcoquina 3 473
Microcracks 8 293
[illegible] 13 179
[illegible]
microcystis 5 636
Microcytic anemia 14 341
Microdalyellia rossi 11 542
Microdensitometer 1 615 617 618
Microdiplodia agaves 12 348
Microdissection 8 350
Microdomatacea 6 75
Microelectrophoresis 2 625, 4 527
Microenvironment 5 13
Microfibril 9 218
Microfiche 10 148
Microfilaria 5 259
Microfilming 8 350, 10 160, 161
photocopying processes 10 147 148
Microfossils 8 356
Microglia nervous system 9 42 63
Microgram analysis 11 143
Micrographic texture 7 12 13
Microgravimetric analyses 2 199
Microgroove records 4 241
Microgyria 9 69
Microhardness 6 358
Microhierax erythrogonys 5 178
Microhylidae 4 208, 209
Microinjection 8 350
Microisolation 8 350
Microlepidoptera 7 463
Microlex 10 149
Microlites 7 10 11* 8 16 14 347
Micromalthidae 5 276
Micromalthus 5 284
Micromanipulation 8 350 353
application 8 351
culture, pure 3 617
differential pistons 8 352
instrumentation 8 351
Leitz micromanipulator 8 352
procedures 8 351
Micrometer 2 604
Micrometeorological circulations 14 493
Micrometeorology 8 353 354
instrumental needs 8 353
scale of focus 8 353
significant applications 8 354
turbulence research and applications 8 354
see also Meteorology
Micrometer 8 354
in astronomical telescopes 3 610 612 615
caliper 2 418 8 354
measurement of electroplating thickness 4 533
Micron 8 355
Micronisicum 5 53
Micronucleus 11 51 60
Micronutrient 6 563 565
Microorganisms microbiology 8 348
virulence 14 329
Micropaleontology 8 355 357
animal kingdom objects 8 355
app [illegible]
coll [illegible] 8
con [illegible]
Foraminifera fossils 5 435
occurrence and abundance 8 355
Ostracoda 9 447 449
palynology 9 525 527
plant microfossils 8 355
Micropaleontology—cont
unicellular forms 8 355
see also Fossil, Paleontology
Micropegmatitic texture 7 12 13
Microperthite 10 57
Micropetalon 6 463
Microperidae 4 212
Microphagy 5 200 202
Microphone 8 357 364
antinoise 8 364
carbon microphone 8 361
ceramic microphone 8 361
contact microphone 8 361
crystal microphone 8 360 361
dynamic microphone 8 359 360
electrokinetic transducer 4 491
electrostatic (condenser) microphone 8 360
hot wire microphone 8 363
lavalier microphone 8 359
line microphone 8 363
magnetic microphone 8 360
moving coil microphone 8 359
open circuit response 8 363 364
optical recording 9 354
performance characteristics 8 363 364
pressure gradient microphone 8 362 363
pressure microphone 8 359 361
pressure transducer 10 593
reflector microphone 8 363
ribbon type pressure microphone 8 359 360
ribbon type velocity microphone 8 362
sound 12 510
transducers 8 357 359
types 8 359 363
unidirectional types 8 362 363
velocity microphone 8 362
wave microphone 8 362
Microphonic tube 8 364 365
Microphonics 8 365
Microphotography 10 161
Microphotometer 12 579
[illegible]
[illegible] 5 83
Microporosity 8 293
Micropterus 2 107
Micropterus dolomieui 2 108
Micropterus punctulatus 2 108
Micropterus salmoides 2 107
Micropterygid 7 464

2 Methoxy-6 chloro 9-(4'-diethylamino 1' methylbutyl) aminoacridine I 51
6 Methoxy 8-nitroquinoline II 193
2,2 bis(*p*-Methoxyphenyl)-1, 1,1-trichloroethane 7 140
Methyl alcohol 8 339
Methyl ammonium alum 5 225
Methyl bromide 2 343
fumigant 5 561
nematocide 9 20
rodenticide II 615
Methyl cellosolve solvent 12 496
Methyl chloride 3 73
refrigerant II 415
Methyl chloroacrylate 10 459
Methyl esters 5 74
Methyl ethyl ketone 8 345
petrochemical 10 46
Methyl glucosides 2 458
carbohydrate 2 458
beta-Methyl glutaric acid 2 54
beta-OH beta Methyl glutaric acid 2 54
Methyl iminazole 6 218
Methyl isobutyl ketone petrochemical 10 43
plutonium extraction 10 423
production I 34
Methyl isopropyl ketone 7 339
Methyl ketone haloform reaction 6 323
Methyl methacrylate 10 458
Methyl orange acid base indicator 7 60
Methyl parathion insecticide 7 141
Methyl pentose Monosaccharide 8 578
5 Methyl pyrrolidine synthesis 4 117
Methyl radical 1 252
Methyl red acid base indicator 7 60
Methyl red test IMViC test 7 48
Methyl salicylate 5 71
Methyl violet acid base indicator 7 60
alpha Methylacetoacetyl-CoA 7 277
Methylacetylene 14 207 209
Methylacrylic ester 14 18
2 Methyladenine 9 209
Methylallene functional group isomerism 7 278
Methylallylbenzylphenylammonium iodide II 183
Bis Methylamine cadmium(II) 3 17
Methylamine ligand 3 17
3 (4 Methylaminobutyryl)-pyridine 2 37
6-Methylaminopurine 9 209
beta Methylaspartate 2 45
Methylated sugars 5 581
Methylation amine 1 306
1-Methylazolidine 6 429
Methylbenzene *see* Toluene
2 Methyl 1, 3-butadiene 6 533 14 207-209
3 Methyl-1,2 butadiene 14 207-209
3 Methyl 2 butanone 7 339
2 Methyl-1 butene 14 207-209
2 Methyl 2 butene 14 207-209
3 Methyl-1-butene 14 207-209
alpha-Methylbutyryl CoA 7 277
Methylcarbinol 5 89
Methylcellulose 2 626
2 Methyl 4 chlorophenoxyacetic acid herbicide 6 422
4 (2 Methyl-4 chlorophenoxy)-butyric acid herbicide 6 422
2 Methyl 4 chlorophenoxypropionic acid herbicide 6 422
20 Methylcholanthrene 9 324
alpha-Methylcinnamic acid 7 279
4 Methylcyclohexanol ring isomerism 7 279
4 Methylcyclohexene 1 242
Methylcyclopentadienyl manganese tricarbonyl antiknock agent 1 474
Methylcyclopentane 1 242
5 Methylcyclopropene functional group isomerism 7 278
5 Methylcytosine 10 359
11 115
Methyldichlorosilane 12 319
N Methyldithiocarbamate nematocide 9 29
Methylene blue 4 208, 304
Methylene chloride 3 75
refrigerant II 415
Methylene group aldehyde 1 229
Methylene succinic acid *see* Itaconic acid
Methylenecyclobutane 6 534
Methylethyloleylammonium bromide II 184
2 Methyl 5-ethylpyridine II 110 112 113
alpha Methylglucoside 2 458
Methyl beta D glucoside 6 219
Methylglyoxaline 6 218
2 (1 Methyl-heptyl) 4 6 dinitrophenyl crotonate 5 564
Methylhexane 1 248
alpha-Methyl beta hydroxybutyryl CoA 7 277
4-Methyl 5 (beta-hydroxyethyl)-thiazole 13 509
5 Methylindole 7 62
1-Methyl 4 isopropenylcyclohexene 6 534
3-Methylisoquinoline 7 289
2 Methyl-1,4-naphthalenediol-1 monoacetate 14 345
2-Methyl 1,4-naphthoquinone 11 195, 14 345
N1-Methylnicotinamide 9 92
2 Methyl-3 nitro aniline 13 401
Methyl 5-nitro aniline 13 401
Methylol phenols phenol-formaldehyde resin 10 113
Methylparafynol 14 16
Methylphenyldichlorosilane 12 322 323
Methylphenylpyrazolone II 110
3-Methyl 1 phenyl 5 pyrazolyl dimethylcarbamate insecticide 7 142
Methylpropane 1 245
2 Methyl 1 propanol 2 378
2-Methyl-2 propanol 2 378
Methylpropene 1 245, 252
Methylpyridine II 110
4-Methylpyridine II 111
N Methyl 2 pyridone II 111
1 1 Methyl 2-(3'-pyridyl) pyrrolidine insecticide 7 142
4 Methylpyrimidine II 114
1 Methylpyrrolidine 6 429
2-Methylquinoline II 192
2-Methylquinolinium ethiodide II 191
2 Methyl 4 quinolone II 192
4 Methyl 2 quinolone II 192
Methyltestosterone jaundice 7 302 303
N Methyl 1,2 3,4 tetrahydroquinoline II 191
Methyltetra *O* methyl alpha-D glucose 8 582
Methyltrichlorosilane 12 322-323
Metlon 5 245
Metopon 9 4
Metopsauridae 13 128
Metopsittacus undulatus II 69
Metric space time 12 557
topology 13 680
unified field theory 14 200
Metric geometry 6 153
Metric system 8 345 346
Metridia 2 393
Metridiidae 1 52 54
Metridium 1 52 54, 3 255
Metrorhynchus 3 553
Metrobates 6 406
Metrology *see* Physical measurement
Metropolis, N 5 287
Metrorrhagia II 481
Meuse River 5 121
Mevalonic acid 2 54, 3 81
Mexican beaded lizard 6 185, 7 564
Mexican bean beetle 2 131, 3 287
Mexican chicken bug 6 405
Mexican Highland 9 161
Mexican jade 7 301
Mexico, Gulf of *see* Gulf of Mexico
Meyer, H von 1 511
Meyer, K H 5 87, 13 402
Meyer, P 3 501
Meyer, V 3 44, 5 72
Meyer hardness number 8 275
Meyer reaction 9 401
Meyerhofferite 2 293
Mezzotint 10 617
MH 6 422, 490
Mho 1 71, 4 484, 8 346
Miacidae 2 522
Miacoidea 2 522, 523
Miadesmia 7 457, 458
Miarolitic structure 7 15
Miastor 9 489
Mica 8 346 347*, 12 476
biotite 2 246*, 8 346
in chlorite 3 165
chlortoid 3 77
geological time scale 6 136 137
insulation, electric 7 158
muscovite 8 346 615*
occurrence 8 346
phlogopite 8 346, 10 115
in rock cleavage 5 169
scrap (flake) mica 8 347
sheet (punch) mica 8 346 347
structure 8 346
uses 8 346 347
vermiculite 3 165
see also Chlorite
Mica capacitor 2 446
Mica schist 8 347*, 11 501
porphyroblastic 10 521
Micaceous cleavage 8 346
Micaceous shale 12 241
Micanite 8 347
Micellar colloids 8 347
Micelle 8 347
soap and detergent 12 591
Michael condensations 3 575
ethyl acetoacetate 5 84
ethyl sodiomalonate 5 90
nitroparaffin 9 115
Michaelis Arbuzov reaction 9 401
Michaelsen, W 9 515
Michel Lévy, A 8 299
Michelson, A A 4 186 7 19 502
Michelson interferometer 7 191-192*, 504 505
Michelson Morley experiment 7 504 505
FitzGerald Lorentz contraction 5 290
relativity II 434
Michelson stellar interferometer 4 156 7 190 194*
Michigan Basin 4 88
Micractinium 1 255

Microwave—*cont*
wavemeters 8 414
X band 11 201
see also Microwave optics Radar
Microwave amplifier 8 424 426
Microwave filter 5 271
Microwave frequency bands 11 201
Microwave frequency measurements 5 509 511
by heterodyning 5 510
by wavelength measurement 5 510
Microwave impedance measurements *see* Impedance measurements high frequency
Microwave optics 8 416 418
diffraction 8 417
diffraction of microwaves 4 159
Faraday effect for microwaves 8 418
polarization 8 417 418
polarization of waves 10 448
rectilinear propagation 8 416
reflection 8 416 417
refraction 8 416 417
Microwave power measurement 4 439
thermistor 13 556
Microwave radio relay 13 469
Microwave radiometry 8 456
Microwave reflectometer *see* Reflectometer microwave
Microwave spectroscopy 8 419 422*, 12 587
apparatus 8 419
applications 8 420 422
measurement of nuclear moments 9 103
resolution 8 419 420
Microwave striplines 8 422
Microwave transmission lines 8 414 415 422 424
attenuation 8 423
characteristic impedance 8 423
coaxial transmission lines 8 422
dielectric rods 8 422 423
discontinuity 8 423
graphical solutions 8 424
hollow pipe wave guides 8 422
impedance matching 8 424
Lines as circuit elements 8 424
matching networks 8 424
microwave optics 8 416
microwave striplines 8 422 423
microwave structures 8 422
modes of transmission 8 423
Microwave transmission lines—*cont*
phase velocity 8 423
quarter wave section 8 424
radar 11 211
reflection coefficient 8 423
Smith chart 8 424
standing waves 8 423
taper 8 424
traveling waves 8 423
wave guide 14 421 424
Microwave tube 8 424 426
backward wave tube 2 3
bandwidth 8 425
double stream amplification 8 426
efficiency 8 425
frequency stability 8 425
gain 8 425
interaction between electron streams and plasmas 8 426
Klystron 7 365 368
limitations of conventional tubes 8 426
magnetron 8 69 72
noise figure 8 425
noise temperature 8 425
particle accelerators 9 584
radar transmitter 11 211
resistance wall and reactance wall amplifiers 8 426
ripple stream and rippled wall *amplifiers* 8 426
traveling wave tube 14 68 71
tuning 8 425
types 8 426
velocity jump amplification 8 426
see also Maser Parametric amplifier
Micrura 11 559
Micruroides euryxanthus 3 476
Micrurus fulvius 5 475
Mictic egg 11 634
Micturition *see* Urination
Mid Atlantic Ridge 1 622 9 261 13 220 221
Mid ocean fracture system 13 414
Mid Pacific Mountains 9 261
Midbrain 2 516 631
Middle distillate (petroleum) 10 54 55
Middle latitude forests 5 468
Middle of the square method 9 221
Middle soap 12 394
Middle term 7 579
Midge 4 211 212 8 426 427*
Midgley T 2 343
Midgut 4 150 175
Midnight 13 643
Midnight sun 8 492
Mie, G 8 521, 12 53
Mie scattering 8 521, 12 53
Miescher s tubes 12 30
MIG welding 14 467
Migmatite 8 427
Migmatization 8 304
Migraine 6 546
Migrant shrike 12 507
Migration (animal) 13 504
Migration (ions) 4 144
Migration (petroleum) 10 56 57
Migratory behavior 8 427 429
external factors 8 427
internal factors 8 427
navigational ability 8 428
Migratory grasshopper 9 416
Mild steel 13 90
welding 14 466 467
Mildew 5 561
Mildew resistance textile chemistry 13 539
of wood 14 534
Mildred Lake 9 505
Miliichidae 4 212
Miliolidae 5 433, 12 28
Miliolidea 5 432 435
Miliolina (Quinqueloculina) auberiana 5 432
Military armament *see* Armament, air, Armament army Armament naval
Military aviation 1 160 162
Military coincidence rangefinder 11 339 340
Military electronic equipment 4 520 523
Milk 2 537 4 1 8 428 439*
acidophilus milk 8 434
addition of vitamins to 8 430 431
buttermilk 8 434
clarification 8 428 429
concentrated milk products 8 436
contamination from external sources 8 431
cultured sour cream 8 434
dried milk products 8 437
fat determination 8 428
fermented milk products 8 434 435
growth of microorganisms 8 432
homogenization 8 429 430
ice cream 7 1
instant dried skim milk 8 438
kefir 8 435
kinds of microorganisms 8 431
mastitis (cows) 8 170
microbiology 8 431 435 439
pasteurizer 4 2
Milk—*cont*
quality control 8 432
raw milk 8 431
separation 8 428 429
skim milk 8 435
standards 8 430
sweetened condensed 8 436
yogurt 8 435
Milk borne infection 7 91
Milk chocolate 3 253
Milk goat 6 227
Milk of lime 7 515
Milk of sulfur 13 256
Milk products 4 1
Milk snake 7 360
Milk sugar *see* Lactose
Milking machines 4 1
Milky Way 6 10 12
Coal Sack 3 242
interstellar matter 7 219 222
Millepora 3 255 8 439
Milleporellacea 12 604
Milleporina 3 255, 8 439*
Miller, D 9 439
Miller J S 3 548
Miller, M M 6 202 13 513
Miller, N 10 32, 11 80
Miller, N E, 5 549, 7 442 8 601 608 10 32, 56
Miller S 11 399
Miller S L 7 497
Miller (moth) 7 464
Miller effect (vacuum tube) 14 250
Miller indices 3 604 608
crystal structure 3 593
x ray powder methods 14 584
Miller integrator saw tooth generator 12 44 46
time delay *circuits* 13 644
Miller s thumb 12 89
Millerite 8 439 440
nickel ore 9 94
Millet 8 440
Milliammeter see Ammeter
Millibar 1 156 8 440 441*
Millidarcy 10 74
Milligram analysis 11 145
Millikan, R A 1 650, 698, 4 501 9 9, 587, 10 152, 11 46
Millikay (*unit*) 11 567
Millimicron 8 535
Milling (cereal) 2 651 652
Milling (gear cutting) 6 88
Milling (lead) 7 431 432
Milling machine 8 441
machining operations 8 6 7
Millipede 1 560 8 441*
Millipore filter 13 136
Milliwatt *see* Watt
Millman P M 8 510
Millman S 1 649
Millon s base 8 252

Micropterygidae 7 464
Micropteryx aruncella 7 461
Micropteryx calthella 7 463
Micropump 12 483
Micropyga 4 93
Micropygidae 4 93
Micropyle 12 144
  invertebrate embryology 7 226
  Lepidoptera 7 461
Microradiography 8 365-370
  applications 8 366 367
  color film 8 367-368
  contact 8 365
  electronic 8 368
  historadiography 8 366 367
  instrumentation 8 368-370
  microscope types 8 368-370
  projection 8 365 366
  radiography of metals 11 305
  sources of error 8 368
  stereoscopy 8 367
Microrefractometry 8 399
Microsauria 1 336, 7 474, 8 370*
Microsclere 4 56
Microscope 8 370-371
  centrifuge 8 371-372
  chemical *see* Chemical microscopy
  compound 8 370
  electron *see* Microscope, electron
  field-emission 5 255 256
  field-ion 5 255-256
  fluorescence *see* Microscope, fluorescence
  interference *see* Microscope, interference
  lighting 1 503
  metallography 8 292-295
  optical *see* Microscope, optical
  particle size measurement 12 349
  phase contrast *see* Microscope, phase contrast
  polarizing *see* Microscope, polarizing
  reflecting *see* Microscope, reflecting
  simple microscope 8 370
  types of compound microscope 8 371
  ultramicroscopy 14 181
  x-ray *see* Microscope, x-ray
Microscope, centrifuge 8 371-372
Microscope, electron 8 372-382
  clay mineral investigations 3 166
  emission electron microscopes 8 375
  image characteristics 8 380
  instrumental defects 8 380
Microscope, electron—*cont*
  limitations on observations 8 379-382
  metallography 8 292 295
  microscopy 8 375-382
  Microtatobiotes 8 403
  molecular biophysics 8 543
  particulate materials 8 376
  resolution 8 372
  shadowcasting 8 376
  specimen artifacts 8 379
  specimen preparation 8 376
  substrates 8 376
  tissues and cells 8 377
  transmission electron microscope 8 373
  use in electron diffraction 4 507
  x ray *see* Microscope, x-ray
Microscope, fluorescence 8 382 384
  instrumentation 8 382
Microscope, interference 8 384 387
  biological applications 8 386
  comparison with phase contrast microscopes 8 386
  measurement of phase changes 8 386
  nonbiological applications 8 387
  practical realization 8 385
  simple theory 8 384
Microscope, optical 8 387-397
  aperture 8 389
  calibration 8 395
  catadioptric systems 8 388, 12 68
  comparison microscope 8 392
  condenser system 8 389
  dark field 8 389
  dissecting microscope 8 393
  hanging drop preparations 8 397
  illumination 8 393
  image formation 8 388
  immersion fluids 8 396
  inverted microscope 8 392
  lenses 8 388 389
  light microscope 8 391
  magnifying power 8 388
  measurement 8 395
  metallography 8 292-295
  metallurgical microscope 8 393
  micromanipulation 8 351
  microscopy 8 393-397
  mountants 8 397
  resolving power 4 135-137, 11 500*
  theory of imaging 4 136-137
  types of 8 391 393
  use of filters 8 395
Microscope, phase contrast 8 397-400
  biological applications 8 399-400
  image interpretation 8 399
  microscope, interference 8 384
  microscopy of transparent objects 8 397
  nonbiological applications 8 400
  practical realization 8 398-399
  simple theory 8 397-398
Microscope, polarizing 5 589, 5 225
  ferroelectrics 5 225
  petrography 10 53 54
Microscope, reflecting 8 400-401
  optical system 8 400
  uses 8 401
Microscope, x-ray 8 368-370, 401-403*
  applications 8 403
  chemistry of specimen 8 402
  contact microradiography 8 401
  microradiography 8 368-370
  principles of image formation 8 401
  projection x-ray microscopy 8 402
  quantitative microscopy 8 402
  reflection x-ray microscopy 8 402
  x ray image spectrography 8 402
  x-ray optics 14 581
Microscopic reversibility 13 362
Microscopium 5 415-414
Microseisms 4 352, 12 147, 156* storms 12 156
Microstilace ferruginea 11 69
Microsomes 3 651
Microspora 1 236
Microsporangium 12 159
  flower (botany) 5 326 334
Microspore 11 454, 12 159
  flower (botany) 5 326 334
Microsporida 11 52
Microsporidae 3 276
Microsporidia 3 226, 8 403*, 13 11
Microsporium canis 4 68, 6 274
Microsporocyte 3 109
Microsporon audouini 1 341
Microsporum 8 568
Microsporum audouini 4 68, 6 275
Microsporum canis 6 275
Microsporum gypseum 6 275
Microstomidae 11 541
Microstomum 11 541
Microstrip 10 148
Microstructures 8 295
Microsurgery 4 570
Microswitch *see* Switch, electric
Microtape 10 148
Microtatobiotes 8 403 404*, 14 328
  Rickettsiales 11 557
Microtechnique 8 404 412
  finishing and storing slides 8 412
  fixation and preservation 8 405
  mounting media 8 406
  preparation of mounts 8 406
  sections 8 408
  smears and squashes 8 407
  stains and staining 8 405
Microtitrations 2 199
Microtron 9 581
Microtus 8 618
Microvelia 6 406
Microvillus (biological cell) 2 588
Microvillus, gallbladder 6 15
Microvitrain 3 229
Microvivisection 8 350
Microwatt *see* Watt
Microwave 4 139, 8 412 416
  advantages of microwaves 8 415 416
  antennas 1 447 449, 8 414 415
  applications of microwaves 8 416
  attenuators 8 413
  C band 11 201
  cavity resonator 2 576 577
  communications 8 156
  diffraction 4 139
  frequency and velocity 8 412
  frequency measurements 5 509 511
  generation of microwaves 8 412
  K band 11 201
  L band 11 201
  microwave circuit elements 8 412-414
  microwave detectors 8 414
  microwave propagation in space 8 415
  microwave spectroscopy 8 419 422
  modulation processes 8 414
  P band 11 201
  phase changers 8 413 414
  power measurement 4 49
  probes 8 414
  Q band 11 201
  reception of microwaves 8 415
  S band 11 201
  transmission of microwaves 8 414 415
  wave guides 8 413

Minimum energy theorem, Kelvin's *see* Kelvin's minimum energy theorem
Minimum variance method of 13 71
Mining 8 471 472
block caving asbestos 1 570
open cut *see* Mining, open-cut or pit
oxygen 9 471
pit *see* Mining open cut or pit
placer *see* Mining, placer
strip see Mining strip
underground see Mining, underground
Mining open cut or pit 8 472 475
ammonium nitrate 8 475
blasting 8 473
churn drill 8 472
communication 8 475
conveyors 8 475
draglines 8 474
dynamite 8 473
inclined skip hoist 8 475
jet piercing 8 475
mechanical haulage 8 474
mechanical loading 8 473 474
percussion drills 8 473
power shovels 8 474
rail haulage 8 474
rock drilling for open cut mining 8 472
rotary drill 8 475
slope stability and bench patterns 8 475
truck haulage 8 475
waste disposal problems 8 475
Mining placer 8 476-478
bucket ladder dredges 8 478
dragline dredges 8 478
dredging 8 478
drift mining 8 478
hydraulicking 8 478
jigs 8 476
long tom 8 477
mechanical equipment 8 478
mercury and amalgamation 8 476
mining methods 8 476
pan and batea 8 476
prospecting 8 476
recent improvements 8 478
recovery methods 8 476
riffles 8 476
rocker 8 475
sampling 8 476
undercurrents 8 476
valuation 8 476
Mining strip 8 478 480
Mining underground 8 480 484
block caving 8 492 493
Mining, underground—*cont*
caving 8 482
concrete supports 8 484
filled stopes 8 481-482
filling mined out areas 8 484
open stopes 8 480-481
pillars 8 483
pillar supported stopes 8 481
rock bolts 8 483-484
shafts 8 482-483
sinking of shafts 8 482 483
square set stoping 8 481
steel sets 8 484
stull supported stopes 8 481
sublevel caving 8 482
support of workings 8 483 484
supported stopes 8 481 482
timber 8 483
timber supported stopes 8 481
top slicing 8 482
yieldable arches 8 484
Mining bee 6 582
Mining excavation 8 484 487
coal *planer* 8 486
explosives 8 484
explosives fragmentation 8 484 485
fragmentation 8 484 486
loading 8 486 487
mechanical *fragmentation* 8 485 486
planer 8 486
transportation 8 487
Mining machinery 8 487 489
articulated cutters 8 489
augers 8 489
auxiliary machines 8 489
borer 8 489
bucketline and bucket wheel excavators 8 489
continuous miners 8 489
conveyors 8 489
corer 8 489
dipper *shovel* 8 489
dragline cranes 8 489
drills 8 488
excavator loaders 8 489
hydraulic monitors 8 489
planer 8 489
railroad locomotives 8 489
rock saws 8 489
suction pump floating dredges 8 489
trucks 8 489
wire rope hoists 8 489
Mining operating facilities 8 489 499
compressed air power 8 490
diesel power 8 490
drainage *see* Mine drainage
electric power 8 490
estimation of ore 8 498
Mining operating facilities—*cont*
evaluation of workable deposits 8 498 499
field sampling 8 497 498
Hoskold premise for mine evaluation 8 499
hydraulic *power* 8 490 491
hydroelectric power 8 491
illumination 8 494
present worth evaluation 8 499
refuse and tailings disposal 8 495 496
sampling and calculations 8 497 498
sectionalization of mine power 8 490
sorting washing, and screening 8 496 497
steam power 8 491
storage and shipping 8 495 497
ventilation 8 491-494
Mining safety 8 499 505
cave-in excavations 8 502 503
explosions 8 500 501
fires 8 501
flooding 8 501 502
gases and ventilation 8 491 494 502
hazards and disasters 8 500
mine diseases and health 8 505
rock dusting 8 500 501
roof support 3 237 238
safety lamp 12 3
ventilation see Mine ventilation
Minitrack 1 36 8 503 504*
Mink 8 504 505
Minkowski *H* 11 434 12 556 557, 14 200
Minkowski O 7 163, 9 532
Minkowski R 9 24 13 303
Minkowski geometry 12 557 559
Minkowski universe 12 557 559
Minnesota *number 1* swine 13 339
Minnesota *number 2* swine 13 339
Minnow 3 647, 4 1, 8 505*
Minor diatonic *scale* 12 47
Minor lobe (*directivity*) 4 233
Minor planet *see* Asteroid
Minor term logic 7 579
Minority carrier 12 166
injection 14 36
Mint 12 615
Minusinsk basin 1 585
Minute 8 188 13 642
Minute beetle 3 276
Minute black scavenger fly 4 212
Minute bog beetle 3 276
Minute brown scavenger beetle 3 278
Minute false water beetle 3 278
Minute fungus beetle 3 278
Minute mud loving beetle 3 278
Minute tree fungus beetle 3 278
Miocene 6 156 142, 8 505 506*
fauna 8 506
lithology 8 505 506
Mioclaenus 3 394
Miogeosynclines 6 175
Miogypsina 5 435
Miogypsinidae 5 435
Mira 8 506
Mira type variable star 14 277
Miracidium 4 148, 12 64
paragonimiasis 9 545
Miracil D 12 64
Mirage 8 320, 506*
flying saucers 3 364
Miranda 14 214
Miranda aurantia 1 406
Mirfak 10 50
Mirialite 12 50
Miridae 6 401 13 598
Miripinnati 4 40
Mirror 8 506 510
ellipsoidal 12 608
elliptical 12 608
etalon 7 191 192
Fresnel double *mirror* 7 185
gun sights 6 298 299
Lloyd's 7 186 187
Mangin 6 299
parabaloidal 12 608
Mirror image *molecular* 4 587
Mirror nuclei 9 202 203
Mirror optics 8 506 510
beam splitters 8 509
double mirrors 8 506-507
mirror coatings 8 510
nonspherical mirrors 8 509 510
plane mirrors 8 506-509
prisms 8 507-509
reflection (electromagnetic radiation) 11 395
spherical mirrors 8 509
triple mirrors 8 507
Mirror planes crystal structure 3 595 596
crystallography 3 602 603
Miscellaneidae 5 435
Misch metal 11 344
production 4 467
Mischmetall 2 655
Miskou 1 431
Missier, E 10 515
Missile 8 510 515
aerodynamic heating 3 104
airframe 8 513
ballistic *see* Ballistic missile
classification 8 512

Millstone Grit 2 469
Milnesium 5 125
Milnesium tardigradum 13 395
Milori 10 224
Milroy's disease edema 4 411
Milton, John 1 552
Miltown 14 16
Milwaukee Depth 4 326
Mimas 12 40
Mimeographing 10 605
Mimette 11 128
Mimicry 2 381, 11 32
  Hemiptera 6 400 410
  Lepidoptera 7 473
Mimidae 2 550, 8 525, 9 589, 13 612
Mimolagus 7 382 383
Mimus polyglottos 8 525
Min max strategy 6 28
Minchinella 10 92
Mindanao, island of 9 482
Mindanao Deep 4 326
Mindel (glacial) 6 195
Mindel Riss (interglacial) 6 195
Mine (mineral) *see* Mining
Mine, land antipersonnel 1 540
  antitank 1 540
Mine, naval 1 542 543
  acoustic 1 48
  magnetic 12 266
  mine sweepers 12 266
Mine air *see* Gas, mine
Mine drainage 8 491 495
  drains 8 495
  flooding 8 501 502
  flumes 8 495
  pumping 8 495
  sources and types of waters 8 491 495
  sumps 8 495
  tunnels 8 495
Mine explosions 5 153 8 500 501*
Mine fires 8 501
Mine layers 1 543
Mine laying 1 48
Mine shafts 8 482 483
Mine surveys 13 329
  inclinometer, use of 7 55
Mine sweepers 12 266
Mine ventilation 8 491-494
  air flow fundamentals 8 491-492
  air quality requirements 8 492
  air temperature and humidity 8 493
  auxiliary ventilation 8 493
  dust and dust hazards 8 492 493, 500 503
  mine gases 8 492, 502
Mineral 8 441-444
  alteration of 8 443 444
  aqueous solution formation 8 442
  assemblages *see* Mineral assemblages
Mineral—*cont*
  classification of 8 442
  cleavage in 3 169
  contact metamorphism formation 8 443
  crystallization from magma 8 442 443
  deuteric alteration 8 444
  embedding 10 42
  emplacement 10 42
  facies (defined) 8 299
  formation of 8 442
  groups of 8 444
  igneous rock forming 7 17-18
  melting points 6 127
  metal occurrence in 8 277-278
  metamorphic assemblages 10 87
  metamorphic facies 8 301
  metamorphic series 8 296
  metasomatism 8 443 444
  in meteorites 8 313 314
  names of 8 442
  native elements 9 4
  occurrence of 8 441 442
  precipitation 10 42
  pseudomorphs 8 443
  radioactive *see* Radioactive minerals
  regional metamorphism formation 8 443
  rock forming 11 590 591
  in soils 12 423 424
  space arrangement in rocks 10 48 49, 51*
  sublimation formation 8 442
  transformation temperatures 6 127
  weathering of 8 443
  see also Ore and mineral deposits
Mineral additives animal feed 1 427
Mineral assemblages metamorphic 10 87
  metamorphic facies 8 301
  ore forming fluids 9 386 387
  pressure temperature curves 6 445 446
  sedimentary rocks 12 132
  silicate phase equilibria 12 316
  stability curves for 6 445
Mineral charcoal 3 228
Mineral deposits *see* Ore and mineral deposits
Mineral dressing 9 388 391
Mineral facies 8 299
Mineral fuel *see* Fossil fuel
Mineral fuel areas 8 444 456
  coals 8 449 456
  liquid fuels and reserve areas 8 444
Mineral fuel areas—*cont*
  liquid petroleum (crude oil) 8 441 447
  natural gas 9 5 6
  oil sands 8 448 449
  petroleum gas 8 447
  synthetic liquid fuels from coal 8 449
Mineral nutrition of plant *see* Plant, mineral nutrition of
Mineral oil 10 72
Mineral processing 8 276 278
Mineral prospecting *see* Prospecting, mineral
Mineral resource areas 8 456-460
  categories of materials 8 457-460
  geologic associations 8 457
  origin 8 456 457
  production problems 8 460
  see also Ore and mineral deposits
Mineral resources conservation 8 460 463
  classification of minerals 8 460
  demand and supply 8 463
  indispensability of minerals 8 461
  mineral conservation measures 8 462
  mineral resources problems 8 460
  minerals and world affairs 8 462
  search for minerals 8 461
Mineral seal oil 10 72
Mineral spring 8 463
Mineral stabilities 12 141
Mineral waters 8 463
Mineral waxes 10 61, 14 413
  hatchettite 10 61
  petroleum geology 10 61
Mineral wool 6 208
  anechoic chamber 1 400
  as thermal insulator 6 374
Mineralocorticoids *see* Adrenal gland Excretion Urinary system
Mineralogenetic provinces 9 381 382
Mineralogical phase rule 8 295
Mineralogy 6 137 139, 8 463 467*
  blowpipe analysis 8 467
  chemical composition and crystal structure 8 466 467
  chemical mineralogy 8 466 467
  cleavage 8 465
  color 8 465
  crystal faces 8 464
  crystal structure 3 592 600
  crystal symmetry 3 602 604 8 464
Mineralogy—*cont*
  crystal systems 3 604-605 8 464
  crystallographic 3 601 8 463 465
  electrical properties 8 466
  flotation 5 312 315
  fracture 8 465
  hardness 8 465
  isomorphism 7 282
  luster 8 465
  magnetism 8 466
  optical mineralogy 8 466
  physical mineralogy 8 465 466
  polymorphism (crystallography) 10 488
  specific gravity 8 466
  streak 8 465 466
  structure 8 466
  synthesis of minerals 8 467
  twin crystals 8 464 465
  see also Gem
Minerals essential to plants *see* Plant, minerals essential to
Minesweeper 1 48
Minette 7 589
Minette iron ore 6 229, 9 379
Miniature camera 2 428 429
Miniaturization of equipment 8 468 471
  automated assembly 8 470
  autosembly 8 470
  component assemblies 8 468
  component design 13 379
  component miniaturization 8 468, 13 379
  cost 8 468
  encapsulation 8 470
  microcircuitry 8 348 356* 469
  molecular electronics 8 470 545 546*
  power requirements 8 468
  printed circuit 8 470, 10 503 507*
  reasons for miniaturization 8 468
  reliability 8 468
  solid state circuits 8 470
  systems engineering 13 379
  Tinkertoy 8 470
  weight and volume 8 468
  see also Microcircuitry
Minicard 10 148
  system 10 162
Minima 2 407 410
Minimal principles 8 471
  Hamilton's principle 6 531
  principle of least action 7 415 441
Minimal surface 13 57
Minimax principle of game theory 13 72
Minimum chi square method of 13 71

oho (Mohorovičić discontinuity)—*cont*
submarine topography 11 221
temperature and pressure 8 532 533
Mohole 8 533
Mohorovičić, A 8 531
Mohr, O 13 416
Mohr's circle 13 184
Mohr's salt 5 234 7 258
Mohr's stress diagram 5 193
Mohr's theory 13 420
Mohs scale 8 465
gem 6 95
hardness 6 337
Moina macrocopa 3 151
Moine granulites 6 250
Moine schists 11 185
Moine Series 10 567
Moinodaphnia rectirostris 3 151
Moiré fringes 3 591
Moissan, H 2 299, 3 352, 6 100
Moissanite 8 515
Moist gangrene 4 25 24
Moisture content measurement 8 533 536
atmosphere 11 82
dew point indicator 8 534
gases 8 535 535
absorption methods 8 535
condensation methods 8 533
dew point indicator 8 534
gravimetric hygrometry 8 534
hygrometer 8 534
psychrometer 8 534
thermal conductivity 8 535
gravimetric *hygrometry* 8 534
hygrometer 6 572 573* 8 534
liquids 8 535
absorption methods 8 536
chemical methods 8 536
distillation methods 8 536
electrical capacitance methods 8 535
electrical conductivity methods 8 535
equilibrium methods 8 535
oven drying methods 8 536
psychrometer 8 534 11 82*
psychrometrics 11 82 84
solids 8 535
absorption methods 8 535
Moisture-content measurement —*cont*
solids—cont
chemical methods 8 536
distillation methods 8 536
electrical capacitance *methods* 8 535
electrical conductivity methods 8 535
equilibrium methods 8 536
oven drying methods 8 536
Moisture saturation measurement 6 572 573
Moisture set ink 7 113
Mojave Desert 9 160, 10 265
Moko 2 90
Mola mola 13 291
Molality 3 361
Molar 4 66
Molar absorbance index 1 12
Molar extinction coefficient 1 12
Molar polarization 11 405
Molar refraction 11 404
Molar susceptibility *see* Susceptibility, magnetic
Molar volume 8 536 537
Molarity concentration scales 3 361
stoichometry 13 145
Molasse 12 142
Molasses 13 238 239
Mold (biology) milk 8 432
see also Fungi
Mold (fossil) 5 474
Mold loft 12 287 288
Moldboard *plow* 1 126
Molding sand 12 22
Mole (animal) 7 142, 8 537*
gestation period 6 182
Mole (skin) 8 537
nevus 2 248 10 225
Mole (unit) *see* Gram molecular weight
Mole hydatidiform *see* Hydatidiform mole
Mole crab 4 31
Mole fraction distillation 4 247
Mole per cent concentration *scales* 3 361
Molecular adhesion *see* Adhesion molecular
Molecular association 8 537-539
carboxylic acid 2 476
dimerization 8 538
hydrogen bonding 6 548 549 8 537 538
liquid 7 541
polymerization 8 538
Molecular beam magnetic resonance spectroscopy 4 514 516
Molecular beams 8 538 542
measurement of nuclear moments 9 192
microwave spectroscopy 8 420
nonspectroscopic applications 8 542
radio frequency spectroscopy 8 540 541
spectroscopic applications 8 541 542
techniques 8 539 540
Molecular biophysics 3 232, 8 542 545*
conversion of matter 8 544
energy transport 8 543
information transfer 8 544
molecular function 8 545
molecular structure 8 543
transport of matter 8 544
Molecular collisions *see* Scattering experiments, atomic and molecular
Molecular colloid 8 547
Molecular crystals 12 480
cohesion 3 269
Molecular diamagnetism 8 53
Molecular diffusion 4 142 143
Molecular dipole 4 211
Molecular distillation *see* Distillation molecular
Molecular electronics 8 545 546
advantages 8 545
applications 8 545
cost 8 545
efficiencies 8 545
microcircuitry 8 549
miniaturization of equipment 8 470
radiation 8 545
reliability 8 545
volume 8 545
weight 8 545
Molecular evaporator 4 252
Molecular finger print 7 107 108
Molecular heat 12 574
Molecular inclusion compounds 3 157
Molecular isomerism *see* Isomerism molecular
Molecular orbital theory 3 458
Molecular paramagnetism 8 53 54
Molecular physics 8 546
intermolecular forces 7 195 196
kinetic theory 7 350 355
molecular beams 8 538 542
molecular structure and spectra 8 547 556
molecular weight 8 556 558
quantum mechanics 11 353 362
Molecular rotation infrared spectroscopy 7 107, 110
optical activity 9 346
Molecular scattering experiments *see* Scattering experiments, atomic and molecular
Molecular selection rules *see* Selection rules (physics)
Molecular sieve 3 156 8 546 547*
Molecular spectra band spectrum 2 90 91
electronic band spectra 8 554 555
infrared spectroscopy 7 107-110
molecular electronic states 8 555 556
molecular spectra 8 551 555
polyatomic electronic spectra 8 556
pure rotation spectra 8 551 552
Raman spectroscopy 11 332 333
spectrophotometric analysis 12 586
see also Molecular structure and spectra
Molecular still 4 252
Molecular structure chemical binding 3 24 26
chemical structures 3 32 42
dielectric constant 4 113
dipole moments 8 548
electron diffraction 4 506 509
magnetochemistry 8 52 5
molecular polarizability 8 548
molecular rotations 8 549 555
molecular sizes 8 548
molecular vibrations 8 548 556
parachor 9 543
physical *chemistry* 10 2
resonance (molecular structure) 11 502 504
selection rules 12 161
vibration rotation bands 8 552-554
Molecular structure and spectra 8 547 556
electron paramagnetic resonance spectroscopy 4 514 516
Franck Condon principle 5 493 494 8 555 556
microwave spectroscopy 8 421
molecular energy levels

Missile—*cont*
cryogenic engineering 3 570
flight dynamics 5 309
flight science 5 309 310
ground support 8 515
guidance *see* Missile guidance systems
heat convection near 3 443
launchers 5 280 281
launching pad complex 7 415 421
nose cone 9 167-168
nutation of 9 233
optical tracking instruments 9 358 362
payload 8 514
propulsion 8 513
propulsion requirements 8 511
reentry 8 514
reliability 8 512
rocket engine 11 601-611
rocket staging 11 611 612
static test 7 415
subsystems 8 513
telemetering 13 426
tracking 8 503 504
trajectories 2 78 82
unguided 8 510
Missile bays 1 536
Missile guidance systems 6 287-291, 8 512, 515 517*
active homing 8 516
autopilot 1 690
ballistic missiles 8 517
beam rider 8 516
collision course 8 516
command 8 515 516
inertial 8 517
long range missiles 8 516-517
missile tactics 8 516
passive homing 8 516
proportional navigation 8 516
pursuit course 8 516
radar glint noise 8 516
short range 8 515 516
see also Guided missile
Mississippi alluvial plain 9 152
Mississippi delta 8 134
Mississippi gambler 6 25
Mississippi River 9 152
delta 4 48 51
estuarine oceanography 5 80
flood plains 5 310 312
sediment discharge 6 293
Mississippian 6 136, 142, 8 517
animal life 9 521
plant life 9 504
see also Carboniferous
Missouri River 13 320 14 393
inland waterways transportation 7 116
Mist 3 366
Mists 1 266
Mistichthys 10 243
Mistletoe 8 517*, 12 25
Mistral 14 493
Mitchell, J. W. 10 169
Mitchell River 1 671
Mitchell Studio Camera 3 123-124
Mite 1 24, 406 8 517-518*, 10 383 384, 12 29, 13 15, 16
Mesostigmata 8 252
miticide 8 518
trombidiform *see* Trombidiformes
Mitella 3 563
Mitella polymerus 7 456
Mithrax acuticornis 4 83
Miticide 8 518
fumigant 5 561
Mitochondria 2 587 614, 8 518-520*, 637 11 56
biological oxidation 2 214
composition 8 519
cytology (molecular basis) 3 654
distribution 8 519
function 8 519
number 8 519
plant metabolism 10 347
submicroscopic structure 8 519
Mitosis 8 520 521
cell division 2 602
chromosome aberration 3 113
chromosomes 8 521
cytokinesis 3 652
spindle 8 520
Mitotic apparatus 2 602 603
Mitotic spindle 2 611
Mitral stenosis circulation disorders 3 141 144
respiratory system disorders 11 532
Mitrospermum 3 478
Mixed coniferous forest 8 245
Mixed grass prairie 10 562, 15 125
Mixer 4 247 8 521
heptode 6 418
hexode 6 436
optical recording 9 354
radar 11 200
radio receiver 11 258
in recording 8 37
Mixer settler extractor 12 498
Mixing 8 521 524
fluid mixing 8 522 524
rubber products 11 645
solid mixing 8 524
Mixing and stirring (oceanography) 13 562
Mixodectidae 7 145
Mixopterus 5 124
Mixopterus kiaeri 1 557
Mixture 8 524
see also Solution
Miyake, Y. 12 102
Mizar 2 190*, 14 235
Mjosa, Lake 5 115
Mks system 14 203
Mks unit magnetic field 8 31
Mnemiopsis 7 570
Mnemiopsis leidyi 7 569
Mnemomica auriceyanea 7 466
Mnesarchaea paracosma 7 461
Mnesirchaeid 7 461
Mnesarchaeidae 7 464
Mnionopsida 8 633
Mnium 8 634
Mn-Zn ferrite 8 35
MNSs blood groups system 2 268
4 Mo Permalloy 7 264
Moa 4 198
Mobile communications 1 364
Mobility (charge carriers) 12 167
Möbius band 5 253, 8 92
Mochastone 3 6
Mock sun 5 364
Mockernut hickory 6 441
Mockingbird 8 525
Mode 2 225 226
Mode (location parameter) 13 67
Mode (rock) 10 53 54
Mode of vibration 8 525
architectural acoustics 1 518
contrasted to partial 9 571
lattice vibrations 7 413
molecular structure and spectra 8 552
normal modes 6 342-345*, 8 525 13 57 58
Model mathematical 8 586-587
Model analysis (structures) Beggs method 13 109
similitude 13 109
Model basin 12 270
Model testing aircraft testing 1 189
Mach Zehnder interferometer 7 193 194
ships 12 279 280
similitude 12 339 340
by towing tank 14 2 4
wind tunnel 1 189
Model theory 8 525 526
dimensional analysis 4 195
dimensionless characteristic 8 525
dynamic similarity 4 315
fluid mechanics system 8 526
Froude number 5 541
Reynolds number 11 540
similitude relationships 8 525
Moderator (reactor) 6 382 11 555* 557 558
Modifiers (gene) 6 109
Modiolus 6 419
Modiolus phaseolinus 2 251
Modular lattice 7 410
Modulation 3 318 8 526 527*
amplitude *see* Amplitude modulation
angle *see* Angle modulation
bandwidth occupancy 8 526
carrier wave 2 532* 8 526
defined 8 526
detectors *see* Detector
frequency *see* Frequency modulation
modulated wave 8 526
modulating wave 8 526
modulators *see* Modulator
multiple modulation 8 529
phase *see* Phase modulation
pulse *see* Pulse modulation
sideband 8 527, 12 308
telemetering 13 428
Modulator 8 529 530
amplitude *see* Amplitude modulator
chopper 3 86
diode, vacuum 4 205
frequency *see* Frequency modulator
microwave 5 221
optical recording 9 354 355
phase *see* Phase modulator
phase shifter *see* Phase shifter modulator
pulse *see* Pulse modulator
radar 11 200, 211
Modulus (complex quantity) 3 358
Modulus (quaternions) 11 194
Modulus of elasticity 4 419 420
bulk modulus 4 419
shear modulus 4 419
Young's modulus 4 419 14 606
Moebius process 12 335
Moenkopi formation 14 81
Moeritherium 10 500
Moeritherium 10 636
Mohair 8 530 531
goat 6 227 229
Mohawk depression 9 149
Mohawk Valley 9 149
Mohawkian series 9 574
Moho (Mohorovicic discontinuity) 4 328* 7 547, 8 532 533* 12 155 156, 13 419
composition of mantle 8 532
gravity measurements 13 520
Gulf of Mexico 6 272
rock density 8 532

Monochlorotrifluoroethylene 10 470
Monochromatic aberration *see* Aberration, optical
Monochromator 12 583
Monochromats 5 300
Monochmax 3 183 13 234
Monoclinic crystal system 3 604 605
Monoclinic lattice crystal structure 3 594 595
Monoclinic sulfur 13 256
Monoclonius 4 201
Monocoque structure 14 509
Monocotyledoneae 1 404, 8 572*, 10 346
Angiospermae 1 404
Arales 1 497, 8 572 10 346
Farinales 5 183, 8 572 10 346
Graminales 6 247, 8 572, 10 346
Helobiales 6 594 8 572 10 346
Liliales 7 514, 8 572 10 346
Orchidales 8 572 9 573 10 346
palm 9 524
Palmales 8 572, 9 524, 10 346
Pandanales 8 572 9 556 10 346
Scitaminales 8 572 10 346 12 76
Synanthales 8 572 10 346 13 365
Monocrathea 1 518
Monocyte 2 263 6 396
Hematopoiesis 6 396 399
Monocytic leukemia 5 192 202
Monod T 9 528, 13 592
Monodella argentarii 9 528
Monodella halophila 9 528
Monodella stygicola 9 528
Monodellidae 9 528 13 592
Monodentate ligand 3 17
Monoecious flower 5 328
Monoeidae 5 278
Monogenea 4 150 8 572 574* 10 414 14 77
ecology 8 574
life history 8 573
morphology 8 572
physiology 8 574
taxonomy 8 572
Monogenoidea 14 77
Monogermane 6 177
Monoglyceride 14 19
Monogononta 8 574 575*, 11 635 12 236
Monogrammus 5 259
Monogynaspida 8 252
Monohydroxylation 8 570 571
Monokonophora 13 388
Monoletes 11 87
Monomer 10 478
Monomethylnaphthalene 3 236
Monomethylolurea 14 215
Monomictic lake 5 523
Monommidae 3 276
Monomorium minimum 1 436
Monomorium pharaonis 6 581 12 407
Mononchidae 4 616
Mononchulus ventralis 9 53
Mononchus 6 436 441
Mononodal seiche 12 146
Mononuclear cell 10 91
Mononucleosis, infectious *see* Infectious mononucleosis
Monoolefins 14 207 209
Monopack method 10 167
Monoperphthalic acid 3 44
Monopersulfate 10 28
Monophonic disk recording 4 237 243
optical recording 9 553 557
Monophonic system 8 37 40
recording 8 37 38
reproducing 8 39 40
Monophoto composition (type) 3 347
Monoplacophora 8 559 575 577*
Amphineura 1 559
anatomy 8 576
geologic history 8 575-576
Neopilina (Neopilina) galathea 8 576
Neopilina (Vema) exingi 8 576
recent discoveries 8 576
significance 8 576 577
Monopole radiation 8 627
Monopulse radar 8 577
Monoplana 12 27
Monorail 8 577 578
lift and drop sections 8 578
rails 8 577
switches 8 578
trolleys 8 578
wheels 8 578
Monorhaphis 1 338
Monosaccharide 2 451 452, 8 578 589*
acetone sugars 8 581
acetylated sugars 8 581
amino sugars 8 583
cyanohydrin synthesis 8 579
D ribose 8 582
derivatives 8 581
enolization 8 580
epimerization 8 580
fructose 5 541
galactose 6 5
glucose 6 217
hydroxylamine 8 580
methylated sugars 5 581
oligosaccharide 9 515
oxidation 8 579
phenylhydrazine 8 579
reactions 8 579
reduction 8 579
sugar alcohols 8 582
sugar mercaptals 8 581
sugar phosphates 8 582
Monosiga 8 169
Monosilane 12 319, 320
Monosodium glutamate 8 583 584
source 8 583
uses 8 584
Monosodium urate 13 677
Monostable multivibrator 8 630
transistor 8 631
vacuum tube 8 630
Monostome 4 148 150
Monosynaptic arc 11 399
Monoterpene *see* Terpene
Monotremata 8 82 584*
Monotremata fossils 8 584
Monotrichous flagellation 2 63
Monotron hardness 6 338
Monotype caster 3 346
composition 3 345
Monotypy (taxonomy) 14 175
Monroe dry gas field 9 6
Monsoon 8 584 585
Asia 1 581 582
effect on North America 8 585
general development 8 584 585
great Asiatic monsoons 8 585
Monsoon forest 1 587 3 187
Monstera 1 497 12 79
Monstrilla 9 555
Monstrilla reticulata 8 585
Monstrilloida 3 562 8 585
Mont Cervin 8 184
Mont Saint Michel 14 390
Montan (domestic) 14 445
Montan (Reibeck) 14 445
Montan wax 9 607
Montana Number 1 swine 13 559
Montanic acid 2 474
Monte Carlo method 8 586 587
Monte Silvio 8 184
Monterey cypress 5 647
Monterey formation 3 57
Monterey shale 1 590, 9 507
Monteruma quail 2 205
Month 2 415 416
Monticellidae 11 43
Monticellite 9 517
Montmaurin jaw 9 22
Montmorillonite 8 587 588
atomic substitution 8 588
in bentonite 2 163, 3 162
cation exchange reactions 8 588
identification techniques 3 167
other properties 8 588
in soil material 3 160
structure 8 587 588
use 8 587
varieties 3 165
x ray diffraction identification 8 588
Monuron 12 465
herbicide 6 423
Monzonite 7 16, 8 588 589*, 13 560
Moody diagram *pipe flow* 10 240
Moon 8 589 597
albedo 1 223
eclipses of 4 382
gibbous 10 100
gravitational force on earth 13 632 635
nadir distance 13 635
occultation by 9 244
phase (astronomy) 10 100
radio emission from 11 244
solar eclipses 4 380 382
tide generating force 13 632 635
zenith distance 13 635
Mooney Plastometer 11 637
Moonstone *10* 37
gem 6 98
Moor peat 9 607
Moore, E. H. 7 412
Moore jackknife mast 9 502
Moose 8 597
Mooser H. 14 80
Mooseri 14 175
Mor 5 464 465
Mora 3 187
Moraceae 2 324
Moraine 8 597
Morales M. F. 8 643
Morax Axenfeld bacillus 8 597
Moraxella 2 352, 6 412
Moraxella bovis 2 352
Moraxella lacunata 2 352, 8 597*
Moraxella liquefaciens 2 352
Moray eel 4 412
Morav Firth 5 114
Morbidity rate epidemiology 5 55
Mordant 8 597 599
dyeing 4 310
Mordant blue 10 4 303
Mordant dyes 4 307
Mordant red 14 4 305
Mordellidae 3 277
Mordenite 14 611
Morel 1 574
Morelli, C. 13 520
Morera's theorem 3 341-342
Morey, G. W. 9 552 13 248
Morey Schreinemaker's coincidence theorem 13 248
Morgan, G. T. 3 18

Molecular vibrations 6 342-343
infrared spectroscopy 7 107-110
Molecular weight 8 556 558
boiling and freezing point methods 8 557
electron microscopy 8 558
experimental determination 8 556-558
formula weight 8 556
gas-density method 8 556-557
gaseous effusion 8 557
gram molecular weight 6 247, 8 556
mass spectrographs 8 558
molar volume 8 556 557
nonomolecular surface films 8 558
osmotic pressure 8 557 558
polymer properties 10 475
ultracentrifugation 8 558
vapor pressure lowering 8 557
velocity of sound 8 558
viscosity measurements 8 558
x ray methods 8 558
Molecular weight measurement polymers 10 477 478
solution 12 487-488
Molecule 8 558 559
absorption by 1 14
Boltzmann statistics 2 278-281
Brownian movement 2 349 350
chemical binding 3 24 26
cohesion 3 268
crystal growth 3 585 586
diamagnetism 4 97
dipole moments 8 548
energy levels 8 549 551
giant 3 21, 26
infrared spectra of 7 107 110
molecular structure and spectra 8 547 556
nuclear moments and spins in 9 191 193
polar *see* Polar molecule
polarizability 8 548
rotation of 8 549 555
scattering by 12 51-57
see 8 548
spectra of 8 551-555
structure of 8 547-551
vibrations of 8 548-556
Molgula 1 574
Molidae 13 291
Molinose *see* Raffinose
Moll Garczynski instrument 11 214
Mollie 3 619
Mollier steam diagram 13 77
Mollusca 1 420, 3 262, 8 559 561*
Amphineura 1 339*, 8 559
Cephalopoda 2 611 645
classification 8 559
Conchonchia 3 400
development 7 231-232
Gastropoda 6 74 75*, 8 559
habits and ecology 8 560
hibernation 6 436 441
Monoplacophora 8 559, 575 577*
morphology 8 559
pearl bearing 9 607
Pelecypoda 8 559, 9 612 613*
Scaphopoda 8 559, 12 50
Molluscoidea 2 314
Molluscum contagiosum 7 55, 8 561*
Mollusk *see* Mollusca
Molodenski, M S 4 340, 349
Molokai island of 9 481
Molothrus ater 3 528 529
Molpadonia 4 41, 360
Molten rock 7 421
Molten salt 5 579 586
Molting 5 196
Molting (Ecdysis) 3 566
Molucca Islands 12 531
Molukka Sea 9 271
Molybdate 8 561 562
Molybdate orange 10 224
Molybdenite 8 278 562*, 564
Molybdenum 8 562 563
electron configuration 4 504
extraction from ores 8 562 563
extractive metallurgy 8 278
ionization potential 4 501
molybdate 8 561
molybdenite 8 562
occurrence 8 562
principal compounds 8 563 565
properties 8 562
x rays 3 555 558
Molybdenum blue 8 564
Molybdenum disulfide 7 604
Molybdenum mirrors 8 546
Molybdic acid 8 564
Molybdic oxide 8 563
Molybdicyanide 8 565
Moment (force) 13 55 56*, 686
Moment magnetic *see* Magnetic moment
Moment of inertia 8 565 566
of area 8 565
atomic nucleus 9 206
of the earth 6 122
of mass 8 565
parallel axis theorem 8 566
principal axes of inertia 8 566
Moment of inertia—*cont*
radius of gyration 11 324
rigid-body dynamics 11 574
rotational motion 11 632
Moments, nuclear *see* Nuclear moments
Momentum 8 566
angular 1 406-407
conservation of 3 407-408
impulse 7 47
kinetic theory 7 352
linear 8 566
quantum theory, nonrelativistic 11 166-167
rigid body dynamics 11 572
transfer 3 443 444
see also Angular momentum, Conservation of momentum
Momentum theorem, Euler's *see* Euler's momentum theorem
Momentum transfer heat convection 3 443 444
between sea and atmosphere 12 103
wind 14 497
Mommaert, W 8 642
Momotidae 3 473
Monadidae 11 45
Monadnock 10 264
Monalbite 1 223, 5 211
Monantha vetch 14 310
Monarch butterfly 2 381
Monas 8 168 11 45
Monascus 5 123
Monaural hearing aid 6 356 357
Monazite 8 277, 566*
cerium ore 2 634
ore reserves 9 186
radioactive minerals 11 269
rare earth mineral 11 342
thorium ore 13 610
Monazo dye 4 299
Monchiquite 7 389 390
Mond nickel carbonyl process 9 99
Mond process 14 241
Mondrian, Piet 1 552
Monel 1 258 9 96
Monestrus 5 79 11 476
Monge, Gaspard 4 69
Mongolian idiocy 6 513, 8 566 567*
Mongolian low pressure center 1 581
Mongolian plateau 1 577
Mongolism 9 69
Mongoloids 1 458
Mongolotherium 4 197
Mongoose 8 567
Monhystera 6 436 441
Monhysterida 9 30
Monhysteridae 8 567
Monhysteroidea 8 567
Monieziа 12 247
Monieziа benedeni 12 30-31 12
Monieziа expansa 3 642, 12 30 13 12
Monilia 14 602
Moniliaceae 8 568
Monilia fructicola 8 568
Monilia fructigena 8 568
Monilia laxa 8 568
Monilia roreri 2 385
Moniliaceae 5 563, 8 567 570*
aleuriospores 8 568
arthrospores 8 567
blastospores 8 568
phialospores 8 569
radula spores 8 568
Monilial vaginitis 14 256
Moniliales 5 563, 8 570 571*
Dematiaceae 4 52
Moniliaceae 8 567 570
Stilbellaceae 13 140
Tuberculariaceae 14 128
Moniliasis *see* Candidiasis
Moniliformis dubius 1 19
Moniliformis moniliformis 1 516
Monilinia 8 569
Monilinia fructicola 5 546 9 601, 10 420
Monilinia laxa 1 495, 9 601
Monimolimnion 5 523
Monitor lizard 13 24
Monitoring (ionizing radiation) 5 264 265, 8 571 572*
background count 2 3
dosimeter 4 268 269
film badge 5 264 265
ionization chamber 7 252 253
personnel monitoring 8 571
radioactivity 11 277
Monitoring system record of 8 37
Monitz, E 11 80
Monkey 4 62, 8 572*
filariasis 5 258
Monkey board 9 303
Mono oil 9 101
1,2 Monoacetone D glucofuranose 8 581
Monobasic acid 1 40
Monobathrida 4 360
1 Monobenzone 14 345
Monobiella 10 199 200
Monoblepharella 10 199 200
Monoblepharidales Phycomycetes 10 200
Monoblepharis 10 200
Monocalcium arsenate 1 491
Monocarboxylic acid 2 473 474
Monocelis 1 258
Monoceros 5 412 414*
Monochlamydous flower 5 52
Monochloracetic acid 3 76

lotor systems—*cont*
neuromuscular transmission 8 610
pyramidal tract 8 614 615
regulation of motoneuron discharge 8 612
skeletal muscle contraction 8 610 612
skeletal muscle innervation 8 610
summation of contraction 8 611
Motor torpedo boat 12 266 267
Motorboating 8 616
amplifier 1 348 8 616
Motorcycle 8 616 617
brakes 8 617
clutch 8 617
engine 8 616
suspension 8 617
transmission 8 617
Mott, N F 10 162, 169
Mottled iron 2 540
Moulin kame 7 329
Moulton F 2 81
Mound bird 6 18
Mount Apo 9 483
Mount Cook 1 673
Mount Elgon 1 107
Mount Etna 11 596
Mount Forel 1 525
Mount Kenya 1 107
Mount Kibo 1 107
Mount Kilimanjaro 1 107
Mount Kosciusko 1 670 671
Mount Lofty range 1 671
Mount Mayon 9 492
Mount Mitchell 9 147
Mount Palomar 1 614 615 13 452
Mount Pelée volcano 14 350
Mount Pulog 9 482
Mount Waialeale 9 482
Mount Wilson 1 615-618
Mount Wilson and Palomar Observatories 6 6 7
Mountain 8 617
Appalachian Highlands 9 144 150
Asia 1 577
Australia 1 671
building 2 471 472
core areas of 9 411
deformed rocks in 9 409 411
electric current flow in 13 506
Europe 5 117 118
geographic distribution 13 500 501
hill and mountain terrain 8 452 455
New Zealand 1 671
rain shadow of 11 551
roots of 13 519 520
South America 12 527 528
Mountain—*cont*
Tasmania 1 671
uplift 14 386
see also Orogeny
Mountain (lee) wind 1 96
Mountain goat 1 568, 6 227
Mountain lion 3 515
Mountain sheep 1 568
Mountain sickness 2 201
Mountain systems 8 617 618
cordilleran belt 3 478 479
fault occurrence 12 149
Intermontane Plateau 8 618
Pacific 8 617 618
Rocky Mountain 8 618
Mountain wind 8 532
Mountain zebra 14 607
Mountains of the Moon, Africa 1 107
Mounting media 8 406
Mouriria 12 78
Mourning dove 4 270
Mouse 8 618
gestation period 6 182
spontaneous mutation frequencies 8 675
viral leukemias *see* Mouse viral leukemias
Mouse deer 1 568
Mouse flea 12 345
Mouse kangaroo 7 550
Mouse Trap (rocket) 1 484
Mouse viral leukemias 8 618-619
Mousebird 3 288
Mousterian *stone culture* 9 22
Mouth 8 619
digestive system 4 164
Mouth disorders 8 619 620
Mouton 7 448
Movements cell 2 591 595
Movie camera 3 123 124
Movie projector 3 124 125
Moving boundary method 14 19 22
Moving coil microphone 8 359
Moving coil voltmeter 14 369 370
Moving constraint see Constraint
Moving iron voltmeter 14 372 375
Moving magnet voltmeter 14 370
Moving pictures 3 123 129
Moving stairway *see* Escalator
Moving target indication 8 620 621
clutter suppression factor 8 620
coho (coherent oscillator) 8 620
delay line 8 620
Doppler effect 8 620
Moving target indication—*cont*
Doppler radar 4 266
stalo (stable local oscillator) 8 620
Mowing machine 1 129
Mowrer, O H 8 604, 10 32
Moxostoma macrolepidotum 3 647
Mozambique Strait 1 108
MPN *see* Most probable number
MSG *see* Monosodium glutamate
MSH *see* Melanocyte-stimulating hormone
MTA 14 555
MTI *see* Moving target indication
MTM 14 555
Mu meson 3 207
see also Meson
Mu metal 8 632
magnetic alloy 7 264
Mu Pegasids 8 308
Mu space 2 278
Mucedinaceae *see* Moniliaceae
Mucigen granule 2 604
Mucilage 8 621 622
mannan 8 92
Mucking (tunnels) 14 142
Mucocutaneous leishmaniasis 7 449
Mucoeuglobulin 3 333
cis cis Muconic acid 14 126
Mucopolysaccharide 2 612 12 564
Mucoproteins 12 564
Mucor 9 603 10 200 12 231
Mucorales 10 200
Mucosa 4 152
Mucous gland 6 204
Mucoviscidosis 7 223
Mud drilling *see* Drilling *mud*
Mud blister worm 10 461
Mud cones 8 622
Mud crab 4 33 34
Mud dauber 14 386
Mud eel 2 568, 8 187
Mud fladens 8 622
Mud hen 3 462
Mud pickerel 10 213
Mud pits 8 622
Mud polygons 10 472
Mud puppy 8 622
Mud shrimp 4 29 30
Mud turtle 3 22 23
Mud volcano 8 622 623* 10 60
Mudcracks 12 134
Muddler 12 89
Mudflow 4 75, 8 167*, 10 60
landslide 7 397
volcanic 14 350
Mudlumps 4 50
Mudstone 1 529 12 139, 574
Mueller matrices 10 454
MUF (maximum usable frequency) *see* Radio wave propagation
Muffle kiln 7 216
Muffler 8 623 624
dissipative mufflers 8 623 624
filter, acoustic 5 264 265
noise control 9 122
parallel baffle 8 624
reactive mufflers 8 623
Mugearite 10 86
Mugga porphyry 11 597
Mugger 3 553
Mugil 6 429
Muhlenbergia 5 190
Mulberry 8 624 625
Mule 4 42 8 625
Mule cactus 2 386
Mule production 8 625
Mull 5 464 465
humus 5 182 186
Mullaly, J 10 615
Müller, E W 5 255, 256
Muller, H J 8 673
Muller Johannes 12 178
Müller cell 5 162 171
Mullerian duct 11 465
Mulliken, R 4 520
Mulliken R S 12 486
Mullite 5 161
from calcined kaolins 5 161
properties 5 161 162
uses 5 161 162
Multi path navigation systems 9 19
Multi primary feeders 14 520
Multiar *comparator* circuit 3 351
Multicellular gland 5 45
Multiceps 3 264 10 413
Multiceps multiceps 3 642
Multicilia 11 548
Multicrystal spectrograph 3 357 358
Multidimensional derivatives 2 408 409
Multigrade oils 7 602 604
Multilith machine 10 616
Multilocular adipose tissue 1 70
Multimet 7 266
Multimeter 8 625
see also Volt ohm milliammeter
Multiplanes 1 201
Multiple allelism 1 459
Multiple batch extraction fuel reprocessing 9 189
Multiple beam fringes 7 189
Multiple beam interferometer 7 192
Multiple colloid goiter 6 229

Morgan, W W 1 528*, 6 10, 8 73, 13 41
Morganite 2 167
  gem 6 98
Morganucodon 4 259, 13 362, 14 89
Moridae 6 2
Morinae 4 41
Moringa oleifera 9 539
Moringaceae 9 539
Moris barsana 6 38
Morison, Stanley 14 171
Mormon cricket 6 261, 9 416
Mormon tea 5 52
Mormyrid 3 223
Mormyridae 4 428
Mormyrus rume 4 428
Moroccan Mesta 1 107
Morone americana 2 108
Morone chrysops 2 108
Morphine 1 366, 8 598*, 9 5, 345, 10 434
  Papaverales 9 539
  poppy 10 498
Morpho 7 471
Morphogenesis, animal *see* Animal morphogenesis
Morphogenesis, plant *see* Plant morphogenesis
Morpholine 8 598
Morphotropism 8 598 599
  isomorphism 7 282
Morrison, T W 13 522
Morse, Samuel F B 4 453, 13 421
Morse telegraph code 13 421
Morse theory 2 410
Mortality rate 5 35
Mortar 8 599
  grout 6 285
  placement 6 299
  plaster 10 397
Mortar (military) 1 538
  Limbo 12 268
Mortar structure (rock) 8 296-297
  flaser rock 5 296
Mortensen, T 4 369, 375, 7 456
Morton W T G 5 86
Morula 4 55 8 254
  Microtatobiotes 8 404
Moruloidea 8 254, 599*
  Dictyemida 4 109 111
  Orthonectida 9 415
Morus alba 8 624
Morus rubra 8 624
Morus tinctoria 14 528
Mosaic iconoscope 13 461
Mosaic development (embryology) 4 580
Mosaic disease 13 243
Mosaic egg 3 168, 9 459
Mosaic sunflower 13 292
Mosaic virus *see* Abaca, Plant disease, Squash, Tobacco Virus
Mosander, C. G 5 64, 7 400, 13 491, 14 606
Mosasaur 11 484
Moschus 1 568
Mosel River 5 121
Moseley, H G J 3 47; 14 577
Moseley's law 14 577
Moselle 14 507
Moskenstraumen 9 251
Mosquito 4 212, 5 6, 8 599-600*
  disease carriers 8 599
  life history 8 599
Mosquito fish 6 299
Mosquito Ridge 9 164
Moss 2 353
Moss, club 12 157
Moss agate 1 111, 3 6
Moss animal 2 354
Mössbauer effect relativity 11 438
Mossbunker 8 223
Mossy rose gall 6 581
Most probable number (MPN) water analysis 14 390
Mosteller, F 7 443
Motacillidae 9 589
Moth 7 459, 8 600*
  characteristics 8 600
  pests 8 600
Moth fly 4 212
Mother-of-coal 3 228
Mother of pearl 1 428, 9 606
  Pelecypoda 9 613
Mother of vinegar 1 30
Motility, bacterial *see* Bacterial motility
Motion 8 600
  anharmonic 1 407
  celestial mechanics 2 579 583
  centrode 2 641
  circular motion 11 631 632
  curvilinear 8 601
  Einstein Planck law of motion 11 432
  Euler s equations 5 101-102
  exterior ballistics 2 78 82
  flight 5 303
  Hamilton's equations 6 330 331
  Hamilton Jacobi theory 6 331 332
  harmonic 6 341 343
  kinematics 7 347
  kinetics 7 359
  Lagrange s equations 7 385 386
  Newton's laws of motion 9 91
  orbital 9 371 372
  periodic *see* Periodic motion
  rectilinear *see* Motion, rectilinear
  relative motion 11 426 428
Motion—*cont*
  relativistic mechanics 11 431 433
  retrograde motion (astronomy) 11 537
  rigid body dynamics 11 570-577
  rolling motion 11 575 576
  rotational 11 631
  sliding motion 11 575-577
Motion, rectilinear 8 600 602
  acceleration 8 601 602
  average velocity 8 601 602
  curvilinear motion 8 601
  force and motion 8 602
  motion with constant velocity 8 601
  Newton's laws 8 602
Motion-picture camera 3 123-124
  film chamber 3 123
  gate 3 123
  lens 3 124-129
  pull down mechanism 3 123
  shutter 3 123
Motion-picture projector 3 124 125
Motion-picture recording *see* Optical recording
Motion pictures 3 125 129*, 10 168
  see also Cinematography
Motion study 8 342, 344
  human engineering 6 495
Motion Time Analysis 14 555
Motional electromotive force 7 69 70
Motivation 2 152-153, 8 602 608*
  activation and affectivity 8 605
  behavior and heredity 2 152 153
  chemical motivation 8 604
  cognition and motivation 8 607
  definition 8 602
  dynamics of behavior 8 602 606
  externalization of drive 8 608
  feedback 8 606 607
  incentive motivation 8 604
  intelligence 7 179
  and learning 8 608
  needs 8 603
  organic drives 8 603
  principle of homeostasis 8 603
  psychological hedonism 8 605
  regulation and direction 8 606 608
  reticulex action 8 606
  set 8 606
Motivation—*cont*
  sociocultural regulation 8 607
  the stimulus response principle 8 604
Motmot 3 473
Motoneurons 8 610
Motor, electric 8 608-609
  alternating current *see* Alternating current motor
  application 8 609
  armature 1 544
  characteristics 8 609
  copper loss 3 472
  core loss 3 479 480
  direct current *see* Direct current motor
  dynamometer test 4 314
  electrical type 8 609
  hysteresis *see* Hysteresis motor
  induction *see* Induction motor
  mechanical protection and cooling 8 609
  motor classification 8 609
  motor generator set 8 617
  mounting 8 609
  principles of motor operation 8 609
  reluctance *see* Reluctance motor
  repulsion *see* Repulsion motor
  size 8 609
  speed variability 8 609
  synchronous *see* Synchronous motor
  universal motor 14 206
  windings 14 504 506
Motor apraxia 1 494
Motor branch circuit 2 319
Motor constant (galvanometer) 5 561
Motor cortex 8 612 616
Motor generator effect, electromagnetic 4 12
Motor generator set 8 617
Motor systems 8 609 616
  afferent inputs 8 616
  biological 8 609 616
  cerebellar regulation of movement 8 616
  effects of ablations 8 613 614
  excitation contraction coupling 8 611
  extrapyramidal systems 8 615 616
  function 8 616
  gradation of muscle contraction 8 611
  motor cortex 8 612 616
  motor unit 8 610
  muscle contraction 8 611

sical instruments—*cont*
bassoon 8 665 666
bell 2 159 8 665 667
brass instruments 8 665 666
celesta 8 666 667
cello 8 666
clarinet 8 665 666
cornet 8 666
cymbal 8 665 666
drum 8 665 666
electrical and electronic instruments 8 667
electronic carillon 8 667
flute 8 665 666
French horn 8 666
frequency range 8 665 666, 12 519
guitar 8 666 667
Hammond organ 8 667
harp 8 666 667
kettledrum 8 665 666
keyboard instruments 8 666 667
marimba 8 666
oboe 8 665 666
percussion instruments 8 665 666
piano 8 665 667
piccolo 8 665 666
pipe organ 8 668 667
saxophone 8 665 666
stringed instruments 8 665 667
timpani 8 665 666
triangle 8 665 666
trombone 8 666
trumpet 8 666
tuba 8 666
tuning of 662, 664
viola 8 666
violin 8 666 667
woodwind instruments 8 665 666 14 515
xylophone 8 665-666
Musical scale *see* Scale (music)
Musical tone *see* Tone (music and acoustics)
Musidoridae 4 212
Musk deer 12 61
Musk gland 3 149 12 61
Musk ox 8 668* 9 144
Musk turtle 3 22* 14 167
Mucking 9 141
Muskellunge 10 213
Muskmelon 8 669
culture 8 668
harvesting 8 668
melon growing 8 214
Persian melon 10 30
Muskrat 8 668 669
Musophagidae 3 612
Mussel 1 427 3 152 8 669 670*
characteristics 8 669
pearl 8 669 670
pearl bearing 9 607
Mussel—*cont*
reproduction 8 670
uses 8 669
Mussett, F. 4 259
Mustang fighter 1 554
Mustard 8 670
spice and flavoring 12 613
Mustard gas 3 44 8 674, 13 605
Mustard oil 3 71
Mustela 14 445
Mustela furo 5 217
Mustela longicauda 14 445
Mustela nigripes 5 217
Mustela vison 8 504
Mustelidae 2 72, 523, 5 217, 284, 8 504, 9 449, 12 1, 373
wolverine 14 523
Mustelinae 2 523
Mustelus canis 11 477
Mutarotation 2 456
Mutase 2 17
Mutation 8 670 675
allele 1 256
bacterial 2 20
chemical mutagens 8 674
chromosome 8 671
culture, tissue 3 819
cytological 8 672
deficiencies (chromosome) 8 671
duplications (chromosome) 8 671
gene action 6 104-113
induced mutations 8 673
inversions (chromosome) 8 671
lethal 8 672
locus 8 672
nondisjunction (chromosome) 8 671
ontogeny *see* Mutation (*ontogeny*)
origin of 8 673
polyploidy 8 671
pressure 10 507 512
radiation biology 11 219
speciation 12 567
spontaneous mutation 8 674
spontaneous *mutation* frequencies 8 675
techniques for studying 8 672
translocations (chromosome) 8 671
Mutation (ontogeny) 8 675 676
bird studies 8 676
evolutionary significance 8 676
insect studies 8 676
mammalian studies 8 676
Mute swan 1 436
Mutillidae 6 574
Muton 6 104 11 379
Mutton tallow 3 189
Mutual conductance pentode 9 626
triode 14 108
vacuum tube 14 247 248
measurement 14 128
see also Transconductance
Mutual inductance 7 66
between two self inductances 1 271
bridge measurement 7 67
Carey Foster bridge 7 67
coupled circuit 3 522
measurement 7 68 69
Mutualism 4 584 585
environment 5 12 15
Muzzle brake 2 82 84
Muzzle velocity 2 82 84
Mya 5 206
Myalgia 11 545
Myasthenia gravis 8 660
Mycelia Sterilia 5 563 8 676 677*
Mycena citricolor 3 265
Mycetaeidae 3 278
Mycetobia pallipes 6 390
Mycetome insect physiology 7 124
Mycetophagidae 3 278
Mycetozoa 1 409
Myxomycetes 8 687
plant 10 275
Mycetozoida 8 677* 11 52 12 27
Acrasiales 1 49
Labyrinthulales 7 375
reproduction 8 677
Mycifradin *see* Neomycin
Mycobacteriaceae 8 677 678
Actinomycetales 1 56
taxonomy 2 11
Mycobacterium 1 45, 56 2 28 33 36 8 540, 677
Mycobacterium leprae 7 475 8 678 13 244
Mycobacterium paratuberculosis 7 314
Myrobacterium phlei 2 10, 8 678
Mycobacterium tuberculosis 1 466 467 6 223 7 169, 8 678 9 589 594 10 428, 13 244 14 129 527
nonicotinic acid hydrazide 7 282
streptomycin 13 180
Mycoderma aceti 1 30
Mycology 8 678
Mycology medical 8 678 679
blastomycosis 2 257
candidiasis 2 456
chromomycosis 3 106
coccidioidomycosis 3 249
Cryptococcales 3 578
cryptococcosis 3 579
fungistat and fungicide 5 563 564
Mycology, medical—*cont*
griseofulvin 6 274
histoplasmosis 6 459
infection 7 94
meningitis 8 224
Myriangiales 8 682
nocardiosis 9 116
pneumonia 10 428
Mycomycin 1 476
Myconostoc 13 2
Mycoplana 11 64
Mycoplasma 8 679
Mycoplasma agalactiae 8 679
Mycoplasma fermentans 8 679
Mycoplasma hominis 8 679
Mycoplasma hyorhinis 8 679
Mycoplasma laidlawii 8 679
Mycoplasma mycoides var *mycoides* 8 679
Mycoplasma salivarium 8 679
Mycoplasmataceae 8 679
Mycoplasmatales 8 679
biochemical characteristics 8 679
morphology 8 679
pleuropneumonia like organism (PPLO) 10 418
Schizomycetes 12 65 66
taxonomy 2 11
Mycorhiza rhizosphere 11 548 549
Mycoses 1 341, 10 200
Myrosphaerella blight pea 9 600
Mycosphaerella fragariae 13 172
Mycosphaerella pinodes 9 600
Mycosphaerella ribis 3 626
Mycosphaerella sentina 5 546
Myrosphaerella tassiana 4 52
Mycostatin see Nystatin
Mycosterol 13 139
Mycota 5 561
Mycotic infections *see* Mycology medical
Mycteria americana 7 1
Myctophidae 4 40
Myctophiformes 8 679*, 9 442
Myctophum punctatum 4 40
Mydaidae 4 212
Mydas fly 4 212
Mydriatic 1 664
Myelencephalon 9 47
Myelin 8 196 9 68
Myelin sheath 2 237, 9 42 63
Myelitis 12 617
Myeloblastosis 1 605
Myelogenous leukemia 6 396
clinical pathology 3 192 202
Myeloid tissue 6 396
eosinophil 6 396
erythrocyte 6 396
Myeloma 2 265, 8 257 12 369
Myelosclerosis 6 360

Multiple fission 11 418
Multiple hearth roaster 11 121
Multiple immunization 2 219
Multiple incomplete selection human genetics 6 502
Multiple integral 7 165
integration 7 167
Multiple modulation 8 529
Multiple myeloma 8 256
clinical pathology 3 198
electrophoresis 4 527
Multiple pregnancy 10 579
Multiple proportions, law of 8 626
Multiple sclerosis 8 626*, 9 71
spinal cord disorders 12 617
Multiple stars 2 190-191
Multiple tuned antenna *see* Antenna (aerial)
Multiple twinning in feldspars 5 203
Multiplexing 1 352 353, 8 626
amplitude modulation 1 352
frequency division 14 60
pulse modulation 11 97
telemetering 13 426 428
time-division 1 352, 14 60-61
see also Frequency-division multiplexing
Multiplication 8 626
algebra 1 238
analog computer solution 1 370 372
digital computer 4 184
number systems 9 220
quaternions 11 184-185
Multiplier analog comparison 1 372
electronic quarter square 1 372
linkage mechanism 1 370-371
mechanical integrator 1 370 371
mechanical quarter-square 1 371
pulse width, pulse-amplitude 1 371 372
servomultipliers 1 371
square law gears and cams 1 370 371
Multiplier phototube *see* Phototube, multiplier
Multiplier phototube photometer 12 105
Multipole radiation 8 626 627
radioactivity 11 287
selection rules 12 160-162
Multisynaptic arc 11 400
Multituberculata 8 82, 627-629*
Allotheria 1 258
Multiturn potentiometer 10 545
Multivariate normal distribution 4 258
distribution (probability) 4 258
Multivibrator 8 628 632
astable multivibrator 8 631
bistable multivibrator 8 628
chopping 3 86
comparator circuit 3 330-331
Eccles Jordan multivibrator 8 628
flip flop 8 628
gate circuit 6 80
monostable multivibrator 8 630
pulse generator 11 93 94
in scaling circuit 12 48
triggering 8 632
see also Relaxation oscillator
Mumetal 8 35
Mumps 8 632
fluorescent antibody method 8 383
Mumida evermanni 4 31
Munk, W. H. 4 335, 350, 351
Munk's stagger theorem 1 201
Munna 7 283
Munroe, C. E. 12 241
Muntoe crucible 6 262
Munroe effect shaped charge 12 241
Munson, W. A. 5 299
Muntz metal 2 320
Muon 8 247
muonium 8 632
see also Meson
Muonium 8 632
Muralium 7 559
Murchison, R. I. 4 85, 9 373, 12 327
Murchison River 1 671
Murchisonacea 6 76
Murex 2 291 8 561 11 19
Murex brandaris 4 298
Murgantia histrionica 6 405, 410
Muricacea 6 76
Muricea 3 255
Muricella 6 238
Muricidae 2 291 9 34, 477
Muridae 11 345
Murine typhus 12 344
Murlin, J. 9 554
Murphy, G. M. 4 84, 5 101, 10 33
Murray, C. A. 4 535
Murray, H. A. 8 603, 608, 10 36
Murray, J. 9 266
Murray, P. 2 655
Murray 14 176
Murray-Darling basin 1 671
Murray Fracture Zone 9 261
Murray loop test 3 156
Murray River 1 671
Murrayona 10 92
Murre 3 10, 11 91
Murrina de caderas 14 124
Murrumbidgee River 1 671
Mus musculus 8 618
Musa 7 437
Musa canton 1 2
Musa lolodensis 1 2
Musa nana 2 90
Musa pacal 1 2
Musa paradisiaca 2 90
Musa sapientum 2 89
Musa textilis 1 1, 12 79
MUSA (antenna) *see* Antenna (aerial)
Musaceae 5 186 192, 12 76
Musca 3 412, 414*
Spiruroidea 13 7
Trypanosomatidae 14 124
Musca domestica 4 216 5 562 8 680
Muscatel 14 507
Muscatine, L. 4 389
Muschelkalk 14 81
Musci 2 353, 8 632-635*, 10 346
alternation of generations 8 633
classification 8 633
structure 8 632
Muscid 4 212
Muscidae 4 212
myiasis 8 680
Muscina stabulans 8 680
Muscle 7 129 8 635 636*, 13 491, 651
activity 8 636
adenosinetriphosphate (ATP) 1 61
biochemistry 2 199, 12 563
biophysics of *see* Muscle (biophysics)
cardiac 8 635
contraction 2 607
creatine creatinine 5 540
electromyogram 4 501
embryology 8 644 649
groups 8 650 651
histogenesis 8 649
histology 8 649
involuntary 8 649
mechanics 8 649 650
morphology 8 636
skeletal 8 636
smooth 8 635
spindles 7 350
tissue 6 458
voluntary 8 649
see also Muscular system
Muscle (biophysics) 8 636 645
contraction and the active state 8 637 638
coupling biochemical and mechanical events 8 641 642
cytology (molecular basis) 8 655
Muscle (biophysics)—cont
efficiency 8 640
estimation of work 8 639 640
force velocity relation 8 641
heat production 8 640
length tension diagram 8 638 639
localization of actin and myosin 8 642 643
molecular biophysics 8 [illegible]
stimulus and response 8 637
structure proteins 8 642
theory of muscle contraction 8 645
Muscle adenylic acid *see* Adenylic acid
Muscovite 8 546, 645*
Muscovy duck 1 436
Muscular atrophies 8 [illegible]
Muscular dystrophy 8 [illegible] 659
Muscular system 8 644 657
appendicular musculature 8 655
anatomy 8 655
branchiomeric musculature 8 656
bursa 2 375
comparative anatomy 8 651 657
embryology 8 644 649
tendon 13 491
Muscular system disorders 8 657 660
classification 8 658
muscular dystrophy 8 644
Muscularis externa 4 150 151
Muscularis mucosa 4 155
Musgrave range 1 671
Mushroom 5 561, 8 660 661
Homobasidiomycetinae 6 469
Music reproduction 12 510
Musical acoustics 8 661-662
beats 8 661
consonance 8 661
equally tempered scale 8 662, 664
just tuning 8 662 664
musical instruments 8 667
octave 9 273
partial tone 9 551
pitch 10 214
Pythagorean tuning 8 661
scales 12 47
standard pitch 8 662
temperament 8 664
timbre 8 661
tuning note 8 [illegible]
vibrato 8 661 662
Musical instruments 8 667
accordion 8 666 667

N

counter circuit 12 48
type semiconductor *see* Semiconductor
Nabam 5 564
Nabidae 6 401
Nabis ferus 6 409
Nacelle (aircraft) 1 186 14 509
Nachmansohn, D 2 203
Nacre 5 100 9 606 607
Nacrite 5 165
kaolinite 7 331
Nadir (celestial navigation) 3 584
Nadsonia 12 2 14 601
Naegleria gruberi 1 329
Nafe, J P 8 532 13 490
Nagana 4 218 14 124
Nagaoka, M 1 123
Nagyagite 13 482
Naiad 5 113
Odonata 9 275
Naididae 9 515
Nailing 9 1 2
Nainsook 13 537
Naivasha, Lake 1 107
Naja haje 3 248
Nakasa, L 10 575 12 391
Naked bud 2 360
Nakhlite 8 515
Namib Desert 1 106
Namurian stage 2 469
Nan ling system 1 577
Nan Shan 1 577
NaNP4 (herbicide) 6 422
Nansen bottle 12 415
Napalm 7 54
NaPCP (herbicide) 6 422
Naphtha 9 2
distillate fuel 4 246
petroleum products 10 72
Naphthalene 1 548 6 553 9 2 3*
chlorinated *see* Chlorinated naphthalenes
coal chemical 3 215
coal tar chemical 3 216
isomerism, molecular 2 278
Naphthalene 1 sulfonic acid 9 2
Naphthaleneacetic acid 1 493 10 342 13 124
alpha Naphthaleneacetic acid 1 693
Naphthene 1 211 6 534
in crude oil 10 65
Naphthenic acid 10 47
Naphthionic acid 9 3
Naphthol chloride 1 45
alpha Naphthoic acid 2 475
beta Naphthoic acid 2 475
alpha Naphthoic amide 1 503
beta Naphthoic amide 1 503
Naphthol 9 3*, 10 112
Naphthol AS 4 300
alpha-Naphthol 1 529
Naphthol green B 4 299
Naphthol printing 13 543
1 4 Naphthoquinone 9 2 11 194
2 6 Naphthoquinone 11 194
Naphthoxyacetic acid 10 342
1 Naphthyl N methylcarbamate 7 142
N 1 Naphthyl phthalamic acid 6 422
1 (1 Naphthyl) 2 thiourea 9 3
Naphthylamine 9 3*
beta Naphthylamine 9 326
1 Naphthylamine 4 sulfonic acid 9 3
alpha Naphthylthiourea 11 615
Naphthyltrichlorosilane 12 322 323
Napier, J 7 575
Napier's analogies (spherical trigonometry) 14 101 102
Napier's rules (spherical trigonometry) 14 99 100
Naples, Gulf of 5 114
Napoleon Louis 8 101
Nappe (geology) 13 408
Nappe (geometry) cone 3 594 ellipse 4 560
Narbada River 1 580
Narcine brasiliensis 4 428
Narcotine 9 4
Narcomedusae 3 255 14 10
Narcosis 10 96
cell membranes and monolayers 2 607
Narcotic 9 3 4
Nares, G S 7 4
Narrow band amplifier 1 544
Narrow band pass color filter 5 266
Narrow waisted bark beetle 3 276
Narrowleaf vetch 14 510
Nasal bone 12 373
Nash, J 8 29
Nashville Dome 9 153
Nassariidae 14 488
Nassellina 12 27
Nassula 6 500
Nastic movements epinasty 10 366
haptonasty 10 366
nyctinasty 10 366
plant movements 10 366
Nasutitermes graveolus 12 407
Natantia 4 28 12 307
NaTCA (herbicide) 6 421
Nathorstiana 10 417
Naticidae 9 600
National Bureau of Standards 1 400 6 31 13 559 645
National Communications System (NACOMS) 13 432
National Electrical Code 4 449
National Geographic Society–Palomar Observatory Sky Survey 1 615
National mining codes 8 472
National Warning System (NAWAS) 13 431
Native elements 8 442 9 4* in meteorites 8 515
Native elm bark beetle 3 287
Native metals 9 4
NATO cartridge 1 537 538
Natrin 6 423
Natrix 14 401
Natrolite 9 4* 14 611
Natron, Lake 1 107
Natta stereospecific catalyst 11 649
Natural bridge karst topography 7 533
Natural cement 2 627
Natural coke 3 229
Natural convection (*heat transfer*) 6 374
Natural fiber *see* Fiber, natural
Natural gas 8 530 9 5 6*
butane 9 5
carbon 2 462
casinghead gas 9 5 6
composition 9 5
distribution 9 5
dry gas 9 5
dry gas fields 9 5 6
energy sources 4 *601*
ethane 5 84 9 5
fuel gas *see* Fuel gas
geological associations 9 5 6
helium source 6 390
heptane 9 5
hexane 9 5
hydrocarbons in 9 5
impurities in 9 5
Natural gas–cont
lean gas 9 5
methane 9 5
mineral fuel areas 8 447
natural sources of hydrocarbons 6 537
octane 9 5
pentane 9 5
propane 9 5
pyrolysis 11 118
related products and problems 9 6
reserves 9 5
residue gas 9 5
sour gas 9 5
sweet gas 9 5
wet gas 9 5
see also Gas field and gas well, entries under Oil and gas
Natural glass *see* Volcanic glass
Natural immunity 7 33
Natural levee 4 50 5 511, 10 259
Natural logarithms 7 575
Natural numbers 9 224
Natural philosophy 10 207
Natural radioactivity 11 276 277
Natural resources 4 541 545
conservation of 5 408 411
forest conservation 5 444 448
fuels, mineral 8 444 456
ground water 6 276 278
marine resources 8 130 132
mineral resources 8 456 460
mineral resources conservation 8 460 463
soil conservation 12 443 449
surface water 13 316 321
water conservation 14 391 395
wildlife conservation 14 490 492
world distribution 4 541 545
Natural rubber 11 638 639
Natural selection, eugenics 5 97
evolution, organic 5 132
population genetics 10 500
Naturlichen Pflanzenfamilien, Die 10 377
Naucoridae 6 401

Myeloxylon 11 86
Myers, F J 11 634
Mygalomorphae 1 498
Mygasis 5 6; 8 679 681*
cavity 8 680
cutaneous 8 680
external 8 680
intestinal 8 680
wound 8 680
Mylabridae 3 278
Mylar 5 215, 8 38
insulation, electric 7 157
meteorological balloons 8 318
Mylodontidae 4 411
Mylone fumigant 5 561
herbicide 6 423
Mylonite 8 681
along faults 5 191
flaser rock 5 295
Mymaridae 6 574
Myoblast 2 591
muscular system 8 644
Myoblastoma 8 659
Myocardial infarct 8 260
Myocarditis 7 622
Myocardium 6 357
Myocardosis 6 360
Myocoptes 8 678
Myocyte Porifera 10 514
Myodaria 4 212
Myodiocopa 3 562 8 681 682*, 9 447
fossil forms 8 682
Myofibril 8 611
mitochondria 8 519
Myoglobin hemoglobin 6 411
respiratory pigments 11 510
Myohemoglobin 10 520
Myohyracidae 6 598
Myomorpha 11 614
Myopia 5 171-172
Myopsida 4 34
Myopsitta monachus 11 69
Myosin 2 492, 610, 3 655, 8 611
muscle (biophysics) 8 612
protein, fibrous 11 40
Myositis 8 658, 11 545
Myostoma 5 7
Myotatic reflex 11 401
Myotis lucifugus 2 109
Myotome 8 644, 12 357
Myotonic dystrophy 8 659
Myrcene 13 496
Myrtangiales 8 682
Myrtangium duriaei 8 682
Myriapoda 1 563 8 682 685*
Chilopoda 3 59 61
Pauropoda 9 595
Symphyla 13 365
Myrica carolinensis 8 683
Myrica cerifera 8 683
Myricaceae 8 683
Myricales 8 683*, 10 346
Myriotrochidae 1 491
Myriotrochus 1 491
Myristate 5 74
Myristic acid 2 474 10 556
Myristica fragrans 9 234, 11 336
Myristicaceae 9 235
Myrmecocystus 6 582
Myrmecophaga jubata 1 442
Myrmecophile 3 275 288
Myrmekitic texture igneous rocks 7 12 13
Myrmeleon immaculatus 1 437
Myrmeleontidae 1 437
Myrmonyssus phalaenodectes 7 472
Myrotheccium 13 541
Myrrhis odorata 14 189
Myrsidea 8 78
Myrtaceae 1 265, 3 218, 5 96, 6 286
Myrtales 8 683*, 10 346, 497
allspice 1 265
cinnamon 3 129
clove 3 218
guava 6 286
Myrtillus 5 457
Myrtle warbler 14 384
Myrsida 8 683, 10 1
Mysidacea 1 563, 3 563, 4 39, 8 683 685*
ecology 8 684
economic importance 8 684
growth and reproduction 8 683 684
Lophogastrida 8 683
Mysida 8 683
physiology 8 683
systematics 8 684
Mysidopsis gibbosa 8 684
Mysis 3 563
Mysis larva 4 26 5 102
Mysis relicta 8 14
Mysophobia 10 119
Mystacocarida 3 562, 8 685*
Mysticeti 2 660 661
Mystriosaurus 3 553
Mystriosuchus 13 546
Mytilidae 1 427
Mytilus 4 574 5 201 6 439, 7 226
Mytilus edulis 3 152 8 669
Mytonolagus 7 383
Myxazone 13 606
Myxamebae 1 49, 8 688
Myxedema 4 235, 13 625 627
Myxicola 9 65
Myxine 11 515
Myxine glutinosa 8 685
Myxiniformes 8 685
Myxinoidea *see* Myxiniformes
Myxobacterales 8 685-687*, 12 65 66
affinities 8 687
fruiting bodies 8 686
isolation 8 686
microcysts 8 686
motility 8 686
physiology 8 686
taxonomy 2 11
Myxobolus 8 689
Myxococcaceae 8 687
Myxococcus fulvus 8 686
Myxogastrales 7 375
Myxoma 9 329
Myxomatosis, infectious (rabbits) 8 687
Myxomycetes 5 562 8 688*, 12 459
plant 10 275
plant movements 10 [illegible]
soil microorganisms 12
Myxomycetidae 8 687
Myxomycophita 1 498 10 [illegible] 13 545
Myxomycota 10 520
Myxomyxsporium corticola 8 213
Myxophyta *see* Cyanophyta
Myxopodia Protozoa 11 3
Myxosarcoma 9 329
Myxosporidia 3 226, 8 689*, 11 52 13 11
Myxosporium 8 212 213
Myxosporium laricola 8 2
Myxovirus 8 689*, 9 91
Myxoxanthin 12 67
Myxoxanthophyll 12 67
Myzostoma 3 548
Annelida fossils 1 451
Myzostomida 1 429, 10 46

Nearthrosis 12 368
Neat's foot oil 5 189
Neat soap 12 394
Nebalia 3 563 7 476 12 157
Nebalia bipes 9 23
Nebaliacea 3 562 9 22 23*
ecology 9 22 23
morphology 9 22
Nebaliella 9 22
Nebaliopsis 9 22
Nebaliopsis typica 9 23
Nebraskan (Glacial) 6 195
Nebula 9 23 27
Andromeda 1 400
California 9 24
Crab 9 24 26
dark 7 221 222*, 9 24
diffuse 9 24 27
extragalactic 6 5 9
gaseous 9 24 27
Hubble's 9 24
lagoon 9 25 27
network 9 24 26
North American 7 220
Orion 9 24 27*, 407
planetary 9 24 27
radio 9 24
reflection 7 219 220* 9 24
ring 9 24
rosette 7 221
triangulum 1 400, 9 27
trifid 9 25
variable 9 24
white 9 24
Nebula, gaseous 9 24-27
brightness 9 25
catalogs 9 24
Crab 3 531 532
densities 9 26
diffuse 9 24 27
distances 9 25
ex supernovae 9 24
in external galaxies 9 27
internal motions 9 26
interstellar matter 7 219
masses 9 26
observation 9 24 26
planetary 9 24 27
radio 9 24
relation to illuminating stars 9 27
spectra 9 25 26
temperatures 9 26
variable 9 24
Nebular hypothesis (cosmogony) 3 508
Nebular lines 9 25 26
Nebular transitions 9 25 26
Nebularine 1 476
Neburon herbicide 6 423
Necator 13 192 193
Necator americanus 6 477 478
Neck 1 39* 9 27 28*
Necking down (metal) 8 270
Necrobacterium necrophorum see *Sphaerophorus necrophorus*
Necrobiosis 4 23
death 4 22 24
Necrosis 4 23
death 4 22 24
gangrene 6 58
infarction 7 93 94
Nectar 2 129, 12 127
Nectarina 12 406
Nectarine 9 28
Nectary 5 334
Nectonema 9 28, 33
Nectonematoidea 9 28
Nectonemertes 11 560
Nectophrynoides 10 638 12 10
Nectria 3 265 14 75, 128
Nectria cinnabarina 14 128
Nectria galligena 14 128
Nectridia 1 336 7 474, 9 28*
Nectrioidaceae 14 630
Necturidae 12 7
Necturus 6 204, 8 653, 11 517, 12 7 361
vertebra 14 307
Necturus maculatus 11 520
Necturus maculosus 2 569, 8 622 13 618
Needham, J. 1 419
Needle leaved forest 3 188-189
Needle nozzle 7 305
Needle valve 14 261
Needlefish 2 161
Needling (foundations) 5 483
Needs (behavior) 8 603
Néel, L. 1 469 470 5 218 233 11 595
Néel temperature 1 469 470
Néel theory of ferrimagnetism 5 219
Negative (photographic) 10 158
Negative color film 10 168
Negative crystals 5 591
Negative feedback 5 199
amplifiers 1 347
distortion reduction 4 257
servomechanisms 12 198
Negative genetics 5 98
Negative ion accelerators 14 267 268
Negative modulation (television) 13 458
Negative resistance oscillators 9 425
Negative semiconductor see Semiconductor
Negative space charge (bioclimatology) 2 201
Negative stain 13 33
Negator spring 13 17
Negatron see Electron
Negri body 7 55 11 197
Negro River 12 529
Negroids 1 458
Negros (island) 9 492
Neill Mooser body 8 404
Neill Mooser reaction 14 175
Neisseria 2 461 9 28 620
Neisseria catarrhalis 6 247
Neisseria flavescens 6 247
Neisseria gonorrhoeae 1 466-467, 2 461, 6 235, 247, 9 28 14 296
fluorescent antibody method 8 383
Neisseria intracellularis 8 224
Neisseria meningitidis 1 466-467, 2 461, 6 247 8 224 9 28
Neisseria sicca 6 247
Neisseriaceae 5 96 9 28*
gram negative diplococci 6 247
taxonomy 2 11
Nekal 13 537
Nekton, deep sea 4 39 40
fresh-water 5 529, 533
limnology 7 519
Nelson, G. L. 8 195
Nelson, R. A., Jr. 11 15
Nelson, W. 13 477
Nelson cell 3 70
Nemagon 5 561
Nemalion 11 555
Nemates see Nematoda
Nemathelminthes see Nematoda
Nematocera 4 211 219
Nematocide 1 125 9 28 29*
fumigant 5 561
soil sterilization 12 464
Nematocyst, Astomocnidae 3 257
discharge 3 258
in other organisms 3 258
Stomocnidae 3 257
toxin 3 257
Nematoda 1 573 6 478, 9 29 34* 10 383 384
Adenophorea 9 32
ascariasis 1 571
Ascaridoidea 1 572
bionomics 9 35
Chromadoroidea 3 89
diagnosis of phylum 9 30 32
digestive tract 9 30 31
Enoploidea 4 616
filariasis 5 257
hibernation 6 436 441
hookworm 6 477 478
life cycle 9 32 33
Monhysteroidea 8 567
musculature 9 30
nematocide 9 28 29
nervous system 9 31
reproductive system 9 31 32
Rhabditoidea 11 541
Secernentea 9 32
Spiruroidea 13 5
Strongyloidea 13 192
taxonomy 9 30
Trichuroidea 14 88
Nematode galls 10 302
Nematodirus 12 247 13 195
Nematogen 4 109 110
Nematognathi see Cypriniformes
Nematoidea see Nematoda
Nematomorpha 9 33 34
Gordioidea 6 237 238; 9 33
hairworm 6 318
morphology 9 33 34
Nectonematoidea 9 28, 33
reproduction 9 34
Nematoparataenia 1 492
Nematophytales 9 34
Nematoscelis 4 40 5 108
Nematoscelis difficilis 12 121
Nematoscelis megalops 12 122
Nematospora 12 2
Nematospora coryli 14 602
Nematosporoideae Saccharomycetales 12 2
Nematothallus 9 34
Nembutal 11 114
Nemere wind 5 120
Nemertea 1 413
Nemestrinidae 4 212
Nemichthyidae 4 40
Nemobius fasciatus 9 417
Nemotins 1 476
Neoantergan 1 474
Neoanthropinae 5 478
Neoascaris vitulorum 1 572
Neobesseya 8 241
Neoblast 11 420
Neoborus amoenus 6 405
Neoceratodus 2 490 6 457
Neoceratodus forsteri 4 210, 7 622
Neocerebellum 9 59
Neocomian stage 3 545
Neodiprion lecontei 6 580
Neodymium 9 34
electron configuration 4 504
extractive metallurgy 8 278
paramagnetism 9 549
Neoechinorhynchus emydis 1 20, 5 30 31
Neogaean realm, Neotropical region 14 620
zoogeographic region 14 620
Neogastropoda 9 34 35*, 11 18
Neogene 9 507-508*, 13 169 524
Neognathae 1 694 9 35*
Neogossea 6 78
Neohexane 1 249
Neomenia 1 490
Neomycin 1 464 468, 475 7 330, 9 35 36*
activity 9 35
chemotherapeutic use 9 35
LD_{50} 9 35
pharmacology 9 35
structure 9 35
Neomysis integer 8 684
Neon 9 36
analytical methods 9 36

Naudin, C 2 439
Naumann, C F 8 304
Naumanniella 11 65, 12 309
Naumannite 12 165
Nauplia, Gulf of 5 114
Nauplius 12 308
Nauplius eye 6 343-344
Nauplius larva 3 145, 4 26, 5 102, 13 609
Nausithoe 3 255, 488, 12 90
Nautical Almanac 9 6
  celestial body identification 2 583
Nautical charts 9 17
  polar navigation 10 442
Nautical length measures 8 188
Nautical mile 8 188, 9 11, 12 256
Nautilidae 9 6
Nautiloidea 2 645 646, 4 107, 8 559, 9 6*
  fossil 2 646
Nautilus 2 644 646, 4 107, 7 91 8 120 9 6 7*, 166
Nautilus (nuclear reactor) 11 363
Nautilus (submarine) 9 166
Nautilus pompilius 9 6
Navaglobe 9 8, 20
  antenna location and field pattern 9 9
  keying cycle 9 9
  radio range 11 256
Navajo sandstone 11 388
Naval aircraft 1 541-542
Naval architecture 9 7
  ship design 12 268 276
Naval armament *see* Armament, naval
Naval auxiliaries 12 267-268
Naval brass 13 650
Naval guns 1 542-543
Naval meteorology 9 7 8
  aerology 1 93
  hurricane forecasting 9 8
  radar 9 8
  routing ships 9 8
  sonar 9 8
  transosonde 9 8
  wave forecasting 9 8
Naval mine *see* Mine, naval
Naval Research Laboratory 2 611, 13 285
Naval stores 9 8
Naval torpedo *see* Torpedo, naval
Naval warfare 1 48, 13 210 211
  antisubmarine warfare 1 484 487
Navar sonar 12 502 504
Navaho 9 8*, 20
Navaho radio range 11 256
Navicula 12 517
Navier Stokes equation 9 9
Navigas dynamics 6 50
Navigodynamics 6 539
Navigable inland waterways 7 114-117
Navigation 1 181, 9 9-17*
  air *see* Air navigation
  azimuth 1 702, 9 11
  bearing 9 11
  celestial *see* Celestial navigation
  course made good 9 11
  dead reckoning *see* Dead reckoning
  dead reckoning position 9 10
  direction 9 10
  distance 9 11
  electronic dead reckoning 9 16
  electronic uses 9 13-16
  estimated position 9 10
  fix 9 10
  great circle routes 6 267-268
  hydrography 6 553 554
  marine *see* Marine navigation
  methods of determining position 9 12
  Nautical Almanac 9 6
  nautical mile 9 11
  piloting *see* Piloting
  polar regions *see* Polar navigation
  position 9 10
  publications 9 17
  pulse modulation systems 9 14
  radar 9 14 11 199 212*
  radar beacons 9 15
  radio piloting 9 13 15
  rotating directional transmission 9 15
  sonar measurements 9 15 16
  speed 9 12
  track 9 11
  transponder 9 14 15
  upstream limit 5 179
  use of artificial earth satellites 9 16
Navigation aids buoy 2 571
  echo sounder 4 378 379
  lighthouse 7 508
  polar region limitations 10 443
  see also Navigation systems electronic
Navigation canal 2 433 434
Navigation channels 12 304 305
  through sandy beaches 12 304 305
Navigation chart *see* Navigator's chart
Navigation computer course line computer 3 526
  ground position indicator (GPI) 6 281
Navigation fix 4 19, 9 10
  piloting 10 230 232
Navigation instruments 9 17 18
  aircraft 1 181
  gyrocompass 6 305 9 17
  magnetic compass 3 531 532*, 9 17
  polar region limitations 10 443
  sextant 9 17, 12 234-235*
  see also Navigation systems, electronic
Navigation systems, electronic 9 18 21
  air operations 9 20
  aircraft low approach systems 1 182
  airport surface detection equipment 1 217
  airport zone 9 21
  approach and landing zone 9 21
  astro equipment 9 19
  celestial navigation 9 16
  classical 9 18 19
  Consol 9 15
  Consolan 9 15
  course line computer 3 526
  dead reckoning 9 16
  Decca 4 34 35, 9 15
  Decca 4 38 39
  direction finding equipment 4 231 232
  directional loop antennas 9 13
  Doppler equipment 9 19
  Doppler radar 9 16
  Elektra 9 15
  electronic classifications 9 18 20
  Gee 9 15
  ground position indicator (GPI) 6 281
  harbor control 9 21
  hyperbolic 6 584 585*, 9 18 19
  inertial guidance system 7 91 92* 9 16
  instrument landing systems (ILS) 7 149
  long distance enroute zone 9 20
  loran 7 585 595* 9 15
  marine operations 9 21
  multiple path 9 18 19
  Navaglobe 9 9
  Navarho 9 9
  Omega 9 15 318*
  operational classifications 9 20 21
  piloting 10 231
  polar coordinate 10 446
  polar region limitations 10 443
  position fixing 9 21
Navigation systems electronic *—cont*
  Precision approach radar 10 578
  pressure equipment 9 19
  pulse modulation 9 14 15
  radar 9 14 15, 11 199 212*
  radar beacon 9 15
  radial 9 18 19
  radio range 11 254 256
  Raydist 9 15
  rotating directional transmission 9 15
  self contained 9 19 20
  short-distance enroute zone 9 21
  single path 9 18 19
  Sonar 9 15 16
  Sonne 9 15
  Tacan 9 15 15 582
  transponder 9 14 15
  VOR DME 9 15
  Vortac 9 15
  see also Guidance systems
Navigational ability (animal) 8 428
Navigational star 9 610
  Centaurus 2 628
  Crux 3 569
  Leo 7 455
  Lyra 7 637
  Orion 9 407
Navigator's chart 9 16 17
  aeronautical 9 17
  azimuthal projection 9 16
  conformal 9 16
  conic projection 9 16
  cylindrical projection 9 16
  gnomonic azimuthal projection 9 16
  hydrographic surveys 13 529
  Lambert conformal conic projection 9 16
  Mercator projection 9 16
  nautical 9 17
  nonconformal 9 16
  plotting chart 9 17
  polar stereographic projection 9 16
  rhumb lines 9 16
Navar G 9 77
Neagh Lough 5 115
Neanderthal man 3 474 9 21 22*
Neanthes 10 461
Neap tide 6 126 13 634
Neapolitan Apennines 5 119
Near infrared radiation 7 105
Near infrared spectrophotometers 12 583
Near Island 1 523
Nearctic fauna 14 621
Nearctica 14 620 621
Nearshore processes *see* Shore processes
Nearsightedness *see* Myopia

Nervous system disorders—*cont*
syphilitic infections 9 71
ventricular system 9 68
viral encephalomyelitides 9 70 71
Nesberg L. S. 8 608
Nesbitt E. A. 5 234
Nesbitt, L. B. 13 299
Nesidea 10 430
nidae 10 429
notonidae 8 78
somantis 1 433
sophontidae 7 145
sosilicates 12 511
st building birds 11 458-459
fishes 11 458 459
Hymenoptera 6 573 585
mammals 11 458-459
reproductive behavior 11 458 459
estor (asteroid) 14 114
et blotch 2 99
etropsin 1 476
ets of curves 6 151
ettleton L. L. 9 310
etwork electric bridge circuit 2 337
filter, electric 5 266 271
nonreciprocal 6 304
transient *see* Transient, electric
Network, radio broadcasting *see* Radio broadcasting networks
Network analysis 9 72 76
television *see* Television networks
Network analyzer analog computer 1 367
simulator 12 340
Network nebula 9 24-26
Network synthesis 9 72-76
Network theory, electrical 9 72 76
analysis 9 72 76
equivalent circuit 5 63-64
Kirchoff's laws 7 363 364* 9 72
L loop network 9 74
loop method 9 73
maximum power transfer theorem 7 37 9 76
methods of solution 9 72
network theorems 9 75
network topology 9 72 73
node method 9 74
Norton's theorem 9 76
Ohm's law 9 72
reciprocity principle of 9 76 11 374 375
superposition theorem 9 75 13 304
synthesis 9 72 76
Thevenin's theorem 9 75, 13 396 598*
two loop network 9 74
Network theory, electrical—*cont*
Y and delta sections 9 75
Y-delta transformations 14 598-599
Network topology 9 72 73
Neu Mecklinberg 4 358
Neu Pommern 4 358
Neuchâtel, Lake of 5 115
Neufeld, F. 9 346
Neumann, J. von 6 28, 7 411, 8 586
Neumann function 2 179
Neumayr, M. 9 613
Neural arch 12 354, 363
Neural crest 1 74 78, 9 76 79*
chromaffin cells 9 78
contributions to neural system 9 77-78
crest cells 9 77
nervous system 9 43
pigment cells 9 78
Neural epithelium 9 43
Neural plate 9 43, 82
Neural tube 9 43 81
Neuraminic acid 2 12
Neurasthenia 12 500
Neurite 9 42 63
Neuritis 2 166, 9 67 72
Neuroblast 9 43
Neuroblastoma 1 73 74, 9 320
Neurocranium 12 355
Eryops 12 360
Neurodermatitis 4 68 408
Neurodontiformes 3 406
Neurofibromatosis mental deficiency 8 226
pigmentation 10 225
Neuroglia 9 51
Neurohumors 4 593 594
Neurohypophysis 9 58
Neurolemma 9 53
Neurolemma sheath 9 42 63
Neuroleptic effect 14 16
Neurolymphomatosis 1 695
Neuroma 9 320
Neuromast 9 42 63 12 180
Neuromere 9 44 82
Neuromuscular end plate 8 610
Neuron 9 97* 11 399
cybernetics 3 637
disorders 9 67 68
structure and function 9 43 54
Neurophysiology 9 80* 12 502
psychogalvanic response 11 74
Neuropile nervous system 9 44
Neuroptera 7 134 138 9 80*
ant lion 1 437
hellgrammite 6 394
Neuropteridium 9 505
Neuropteris 9 504 11 86
Neurosecretion 9 66
Neurosis 5 535, 9 80 81*, 13 180
abnormal behavior 1 8
hysteria 6 600
obesity 9 242
obsessive compulsive reaction 9 243
personality theory 10 32
phobic reaction 10 119
psychoanalysis 11 74
reflex, conditioned 11 395
skin disorders 12 370
somatization 12 500
Neurospora cytoplasmic inheritance in 5 659
effect of temperature on mutant strains 6 110
effects of radiation and radioactive isotope incorporation 9 197
hemoglobin in 11 511
lethal gene 7 478
ornithine formation mechanism 1 316
spontaneous mutation frequencies 8 675
stages as cause of brown rot 8 568
Neurospora crassa 3 85
mutant 2 194
Neurospora stiophila 8 568
Neurosporene 2 54
Neurosyphilis 9 564
Neurotoma inconspicua 6 580
Neurotoxin 14 4
botulism 2 306 307
tetanus 13 527
tick paralysis 13 630
Neurotropism 11 424
Neurulation 9 81 82
Neuston 5 529
Neutralism 4 385
Neutralization 9 82
Neutralization reaction (antibody) 1 473, 9 82*
feather (bird) 5 195 197
mesenchyme and skeleton 9 78
Neutralization reaction (chemistry) 13 656
Neutralization tests 13 527
Neutralizer (food) 5 378
Neutralizing antibody 9 82* 13 630
Neutrally buoyant float 9 251
Neutrino 4 542 544, 9 83* 11 284 285
inverse beta decay 9 83
parity 9 566
radioactivity 11 284 285
selection rules 12 162
two component theory 9 83
Neutron 9 83 91
activation 9 85
chain reaction *see* Chain reaction, nuclear
cosmic rays 3 499 501
cross section *see* Neutron cross section
delayed 9 85 86*, 290
detection of 9 84 85
detection of nuclear explosions 9 183 184
diffraction *see* Neutron diffraction
elementary particle 4 542 544
energy spectrum 11 238
fission *see* Fission, nuclear
half life 9 85
health tolerance levels 9 84
intrinsic properties 9 85
magnetic moment 9 85
mass 9 85
neutron optics 9 91
nuclear explosion 9 182
nuclear fuels 9 184 186
nuclear radiation (biology) 9 196
nuclear reactions 9 198 201
nuclear structure 9 85, 201 208
as nucleon 9 215
penetrating power 9 84
photomagnetic capture 12 58
photoneutron 9 84
polarized 9 85
radiation damage 11 223 225
radiation shielding 11 238 240
radiative capture 9 204
reactor physics 11 357 358, 364 370*
slow 5 287-290
sources of free neutrons 9 83 84
thermal *see* Thermal neutrons
Neutron, delayed 9 85 86
Neutron absorption, hydrogen bearing substances 13 522
well logging 13 522
Neutron activation 9 85
element abundance studies 4 546 551
see also Activation analysis
Neutron capture, fission 5 288
nuclear fuels 9 184 186
nuclear reactions 9 201
radiation shielding 11 239
Neutron chain reaction *see* Chain reaction, nuclear
Neutron chopper 9 87
Neutron conversion ratio, nuclear fuels 9 184 186
Neutron cross section 9 86 88
diffraction 9 89

Neon—*cont*
discovery 9 36
electron configuration 4 504
inversion temperature 7 538
ionization potential 4 504
line spectrum 7 521
occurrence 9 36
production 1 637, 9 36
properties 9 36
uses 9 36
velocity of sound in 12 515
Neon glow lamp 9 36-37
applications 9 37
ballast 9 37
characteristics 9 37
operation 9 37
stroboscope 13 187
Neopallium 9 59
Neopentane 1 249
Neopentyl radical 1 252
Neoplina 1 359, 414
Neoplina galatheae 4 41, 8 576*
living fossils 7 564
Neoplina (Neoplina) galatheae 8 576
Neoplina (Vema) ewingi 8 576
Neoplasia 2 435, 9 37 38*
prostate disorders 11 27
thyroid gland disorders 13 627
Neopopanoceras haugi zone 14 82
Neoprene 11 639
electric insulation 7 157
meteorological balloons 8 318
Neopterygii *see* Actinopterygii
Neorhabdocoela 11 541-542
Neorickettsia 11 567
Neorickettsia helminthoeca 8 404, 11 567
Neornithes 1 693-694, 9 38*
Ichthyornithes 1 694, 7 8, 9 38
Neognathae 1 694, 9 35, 38
Odontognathae 1 694, 9 38, 276
Neosamiria 10 590
Neoschwagerinidea 5 431
Neosporida 13 11
Neostoptile 5 195
Neostigmine 10 436
Neostriatum 9 59
Neotanais 4 41
Neotenin 7 123
Neoteny 9 38*, 12 6
Caudata 2 569
Cidaroida 3 120
Coleoptera 3 275 288
Cryptobranchoidea 3 578
Meantes 8 187
paedogenesis 9 489
respiratory system 11 517
Neothalamus 9 59
Neotoca bilineata 9 452
Neotoma lepida 3 473
Neotoma micropus 3 473
Neotrans 8 518
Neotremata 9 38
Neotropical biogeographic region 14 620, 622-623
Neotropical-Tertiary geoflora 9 506
Neotype 14 172
Nepa 6 406
Nepenthaceae 10 244, 12 31
Nepenthes 10 245
Neper 9 38
Nephelene- feldspathoid 5 214
in nepheline syenite 9 39
in theralite 13 549
Nepheline basalt 7 16, 10 86
Nepheline monzonite 9 39
Nepheline syenite 7 16, 9 38-39*, 10 86
composition 9 39
formation 9 39
occurrence 9 39
petrographic province 10 52
structure 9 39
texture 9 39
Nephelinite 7 16, 9 39*
Nephelometer 14 146
Nephelometric analysis 9 39-40
Nephrite 7 301
gem 6 99
Nephritis 9 40
clinical pathology 3 192-202
Nephrocoele 14 221
Nephrocyte 5 105
Nephrogenic cord 14 223
Nephron 14 221
Nephrops 4 31
Nephropsidea 4 31
Nephrosclerosis 7 343
Nephrosiemus 3 579
Nephrosis 7 343 8 261 9 40
Nephrotic edema 3 141
Nephrotome 14 221 225
urinary system 14 221
Nephthys pacifica 1 227
Nephtyidae 10 461
Nephtys 10 461
Nepidae 6 401
Nepticula 7 466
Nepticula nyssaefoliella 7 462
Nepticulidae 7 464
Neptune 9 40 41
albedo 1 223
escape velocity 5 68
optical spectrum 9 41
orbit 9 40
satellites 9 41
telescopic appearance 9 41
Neptune's goblet 13 10
Neptunetidae 14 487
Neptunium 9 41 42*, 14 65 66
Neptunium—*cont*
electron configuration 4 504
fission 5 287
radioactivity 11 278
Nereid 9 41
Nereidae 4 212, 10 461
Nereis 2 638, 7 226, 10 461
Nereis cultrifera 9 434
Nereis diversicolor 9 434
Nereis pelagica 9 434
Nereocystis 8 108
Nerillidae 1 517
Nerinacea 6 76
Neritacea 6 75
Neritic sediments 8 133 135
Neritic zone 4 39, 5 14
marine ecosystem 8 107
Nerritidae 1 591
Nerium oleander 10 440, 12 128
Nernst, A 9 435
Nernst, W. 12 575
Nernst equation (electrode potential) 4 473
Nernst galvanomagnetic effect 6 21
Nernst glower 12 585, 588
Nernst's heat theorem 12 575
Nernst method of measuring heat capacities 2 419
Nereocla 5 291
Nerol 13 496
Neroli oil 13 497
Nerran, Lake 1 672
Nerthra 6 404
Nerve 9 42
see also Nervous system
Nerve cell 9 52
Nerve cell bodies 6 37
Nerve deafness 4 22
Nerve fibers 9 52-53
Nerve gas 3 45
Nerve impulse production
code of sensory messages 8 202 204
triggering mechanism 8 202 204
Nerve net 9 64 65
Coelenterata 3 255 261
Nerve tissue 13 651
acetylcholine 1 37
biochemistry 12 563 564
histology 6 458, 9 51
see also Biopotentials and electrophysiology, Neurophysiology, Nervous system
Nervonic acid 5 190
Nervous system 1 689, 7 136 9 42 63*
automatic nervous system 1 689*, 9 47 48
biochemistry 2 199
biopotentials and electrophysiology 2 237
brain 9 57 60
Nervous system—*cont*
central pathways 9 55
comparative embryology 9 42 47
comparative morphology 9 54 57
cranial ganglia 9 63
cranial nerve 3 537 538 9 61 63
cybernetics 3 637
histogenesis 9 43 44
histology 9 51 54
lateral line organs 9
memory 8 220
morphogenesis 9 44 45
motor systems 8 609 61
nerve 9 42
nerve cell 9 52
nerve fibers 9 52 53
nervous tissue 6 458 9
neuroglia 9 51 52
neurolemma 9 53
neuron 9 79
peripheral nervous sy 9 47 48
phylogenesis 9 59
radiation injury 11 229
reflex arc 9 54 55
sense organ embryology 9 48 51
sense organs 12 170
spinal nerves 9 47
subdivisions 9 57 58
synapse 9 54
taste buds 9 49 50
Nervous system (invertebr 9 65 67
central nervous systems 9 65
excitation and transmission 9 65 66
nerve nets 9 64 65
neurosecretion 9 66
synaptic transmission
Nervous system disorders 9 67-72
atrophy 9 68 69
bacteria 9 70
demyelinating diseases 9 71 72
encephalitis 9 70 71
glia 9 68
hydrocephalus 9 69
inflammatory diseases 9 69
malformations 9 69
meninges 9 68
meningitis 9 69 70
multiple sclerosis 9 71
myelin 9 68
neuron 9 67 68
parasites 9 70
Parkinson's disease 9 3
poliomyelitis 9 71
Rickettsia 9 70
spinal cord 9 69

ous system disorders—*cont*
syphilitic infections 9 71
ventricular system 9 68
viral encephalomyelitides 9 70 71
berg, L. S. 8 608
bitt, E. A. 5 254
bitt, L. B. 13 299
adea 10 430
udeidae 10 429
nourridae 8 78
somantis 1 455
sophontidae 7 143
ssilicates 12 511
st building: birds 11 458 459
fishes 11 458 459
Hymenoptera 6 573 583
mammals 11 458 459
reproductive behavior 11 458 459
estor (asteroid) 14 114
et blotch 2 99
etropsin 1 476
ets of curves 6 151
ettleton, L. L. 9 510
etwork, electric bridge circuit 2 337
filter, electric 5 266 271
nonreciprocal 6 304
transient *see* Transient, electric
Network, radio broadcasting *see* Radio broadcasting networks
Network analysis 9 72 76
television *see* Television networks
Network analyzer, analog computer 1 567
simulator 12 340
Network nebula 9 24 26
Network synthesis 9 72 76
Network theory, electrical 9 72 76
analysis 9 72 76
equivalent circuit 5 63 64
Kirchoff's laws 7 563 564*, 9 72
L loop network 9 74
loop method 9 75
maximum power transfer theorem 7 37 9 76
methods of solution 9 72
network theorems 9 75
network topology 9 72 75
node method 9 74
Norton's theorem 9 76
Ohm's law 9 72
reciprocity principle of 9 76 11 374 373
superposition theorem 9 75 13 304
synthesis 9 72 76
Thévenin's theorem 9 75, 13 596 598*
two loop network 9 74
Network theory, electrical—*cont*
Y and delta sections 9 75
Y delta transformations 14 598 600
Network topology 9 72 75
Neu Mecklinberg 4 558
Neu Pommern 4 558
Neuchâtel, Lake of 5 115
Neufeld, F. 9 546
Neumann, J. von 6 29* 7 411, 8 586
Neumann function 2 179
Neumayr, M. 9 615
Neural arch 12 554, 563
Neural crest 1 74 78, 9 76 79*
chromaffin cells 9 78
contributions to neural system 9 77 78
crest cells 9 77
nervous system 9 43
pigment cells 9 78
Neural epithelium 9 43
Neural plate 9 43 82
Neural tube 9 43 81
Neuraminic acid 2 12
Neurasthenia 12 500
Neurite 9 42 63
Neuritis 2 166 9 67 72
Neuroblast 9 43
Neuroblastoma 6 73 74 9 520
Neurocranium 12 355
Errops 12 360
Neurodermatitis 4 68 404
Neurodontiformes 5 406
Neurofibromatosis, mental deficiency 8 226
pigmentation 10 225
Neuroglia 9 51
Neurohumors 4 593 594
Neurohypophysis 9 58
Neurolemma 9 53
Neurolemma sheath 9 42 63
Neuroleptic effect 14 16
Neurolymphomatosis 1 605
Neuroma 9 520
Neuromast 9 42 63 12 180
Neuromere 9 44 82
Neuromuscular end plate 8 610
Neuron 9 97* 11 399
cybernetics 3 637
disorders 9 67 68
structure and *function* 9 43, 54
Neurophysiology 9 80* 12 502
psychogalvanic response 11 74
Neuropile, nervous system 9 44
Neuroptera 7 134 138 9 80*
ant lion 1 457
hellgrammite 6 594
Neuropteridium 9 505
Neuropteris 9 504 11 86
Neurosecretion 9 66
Neurosis 5 335 9 80 81*, 13 180
abnormal behavior 1 8
hysteria 6 600
obesity 9 242
obsessive compulsive reaction 9 245
personality theory 10 32
phobic reaction 10 119
psychoanalysis 11 74
reflex, conditioned 11 309
skin disorders 12 370
somatization 12 500
Neurospora, cytoplasmic inheritance in 5 659
effect of temperature on mutant strains 6 110
effects of radiation and radioactive isotope incorporation 9 197
hemoglobin in 11 511
lethal gene 7 478
ornithine formation mechanism 1 316
spontaneous mutation frequencies 8 675
stages as cause of brown *rot* 8 568
Neurospora crassa 5 85
mutant 2 194
Neurospora sitophila 8 568
Neurosporene 2 54
Neurosyphilis 9 564
Neurotoma inconspicua 6 580
Neurotoxin 14 4
botulism 2 306 307
tetanus 13 527
tick paralysis 13 630
Neurotropism 11 424
Neurulation 9 81 82
Neuston 5 529
Neutralism 4 585
Neutralization 9 82
Neutralization reaction (antibody) 1 475, 9 82*
feather (bird) 5 195 197
mesenchyme and skeleton 9 78
Neutralization reaction (chemistry) 13 656
Neutralization tests 13 527
Neutralizer (food) 5 578
Neutralizing antibody 9 82* 13 630
Neutrally buoyant float 9 251
Neutrino 4 542 544, 9 83*, 11 284 285
inverse beta decay 9 83
parity 9 566
radioactivity 11 284 285
selection rules 12 162
two-component theory 9 83
Neutron 9 83 91
activation 9 85
chain reaction *see* Chain reaction, nuclear
Neutron—*cont*
cosmic rays 3 491 501
cross section *see* Neutron cross section
delayed 9 85 86*, 200
detection of 9 84 85
detection of *nuclear explosions* 9 183 184
diffraction *see* Neutron diffraction
elementary particle 4 542 544
energy spectrum 11 239
fission *see* Fission, nuclear
half life 9 85
health tolerance levels 9 84
intrinsic properties 9 85
magnetic moment 9 85
mass 9 85
neutron optics 9 91
nuclear explosion 9 182
nuclear fuels 9 184 186
nuclear *radiation* (biology) 9 196
nuclear reactions 9 198 201
nuclear structure 9 83, 201 208
as nucleon 9 215
penetrating power 9 84
photomagnetic capture 12 58
photoneutron 9 84
polarized 9 85
radiation damage 11 225 225
radiation shielding 11 238 240
radiative capture 9 201
reactor *physics* 11 357 358, 364 370*
slow 5 287 290
sources of free neutrons 9 85 91
thermal see Thermal *neutrons*
Neutron, delayed 9 85 86
Neutron absorption, hydrogen bearing substances 13 522
well logging 13 522
Neutron activation 9 85
element abundance studies 4 546 551
see also Activation analysis
Neutron capture, fission 5 288
nuclear fuels 9 184 186
nuclear reactions 9 201
radiation shielding 11 239
Neutron chain reaction *see* Chain reaction, nuclear
Neutron *chopper* 9 87
Neutron conversion ratio, nuclear fuels 9 184 186
Neutron cross section 9 86 88
diffraction 9 89
energy dependence 9 88

Neon—*cont*
discovery 9 36
electron configuration 4 504
inversion temperature 7 538
ionization potential 4 504
line spectrum 7 521
occurrence 9 36
production 1 637, 9 36
properties 9 36
uses 9 36
velocity of sound in 12 513
Neon glow lamp 9 36-37
applications 9 37
ballast 9 37
characteristics 9 37
operation 9 37
stroboscope 13 187
Neopallium 9 59
Neopentane 1 249
Neopentyl radical 1 252
Neopilina 1 359, 414
Neopilina galatheae 4 41, 8 576*
living fossils 7 564
Neopilina (Neopilina) galatheae 8 576
Neopilina (Vema) ewingi 8 576
Neoplasia 2 435, 9 37-38*
prostate disorders 11 27
thyroid gland disorders 13 627
Neopopanoceras haugi zone 14 82
Neoprene 11 639
electric insulation 7 157
meteorological balloons 8 518
Neoptera*n see* Actinopterygii
Neorhabdocoela 11 541-542
Neorickettsia 11 567
Neorickettsia helminthoeca 8 404, 11 567
Neornithes 1 693-694, 9 38*
Ichthyornithes 1 694, 7 8, 9 58
Neognathae 1 694, 9 35, 38
Odontognathae 1 694, 9 58 276
Neosaimiri 10 590
Neoschwagerinidea 5 431
Neosporidia 13 11
Neosuppitle 5 195
Neostigmine 10 436
Neostriatum 9 59
Neotanais 4 41
Neotenin 7 123
Neoteny 9 38*, 12 6
Caudata 2 569
Cidaroida 3 120
Coleoptera 5 275 288
Cryptobranchoidea 5 578
Meantes 8 187
paedogenesis 9 489
respiratory system 11 517
Neothalamus 9 59
Neotoca bilineata 9 452
Neotoma lepida 3 473
Neotoma micropus 3 473
Neotran 8 518
Neotremata 9 38
Neotropical biogeographic region 14 620, 622 623
Neotropical-Tertiary geoflora 9 506
Neotype 14 172
Nepa 6 406
Nepenthaceae 10 244, 12 31
Nepenthes 10 245
Neper 9 58
Nepheline feldspathoid 5 214
in nepheline syenite 9 39
in theralite 13 549
Nepheline basalt 7 16 10 86
Nepheline monzonite 9 39
Nepheline syenite 7 16, 9 38-39*, 10 86
composition 9 39
formation 9 39
occurrence 9 39
petrographic province 10 52
structure 9 39
texture 9 39
Nephelinite 7 16 9 39*
Nephelometer 14 146
Nephelometric analysis 9 39-40
Nephrite 7 501
gem 6 99
Nephritis 9 40
clinical pathology 3 192-202
Nephrocoele 14 221
Nephrocyte 5 105
Nephrogenic cord 14 225
Nephron 14 221
Nephropa 4 31
Nephropaidea 4 31
Nephrosclerosis 7 343
Nephrotelmis 3 579
Nephrosis 7 343, 8 261 9 40
Nephrotic edema 5 141
Nephrotome 14 221 223
urinary system 14 221
Nephthys pacifica 1 227
Nephtyidae 10 461
Nephtys 10 461
Nepadae 6 401
Nepticula 7 466
Nepticula nyssaefoliella 7 462
Nepticulidae 7 464
Neptune 9 40-41
albedo 1 223
escape velocity 5 68
optical spectrum 9 41
orbit 9 40
satellites 9 41
telescopic appearance 9 41
Neptune's goblet 13 10
Neptunea*dae* 14 487
Neptunium 9 41 42*, 14 65 66
Neptunium—*cont*
electron configuration 4 504
fission 5 287
radioactivity 11 278
Nereid 9 41
Nereidae 4 212, *10 461*
Nereis 2 638, 7 226, 10 461
Nereis cultrifera 9 434
Nereis diversicolor 9 434
Nereis pelagica 9 434
Nereocystis 8 108
Nerillidae 1 517
Nerinaeea 6 76
Neritacea 6 75
Neritic sediments 8 133-135
Neritic zone 4 39, 5 14
marine ecosystem 8 107
Neritidae 1 591
Nerium oleander 10 440, 12 128
Nernst, A 9 435
Nernst W 12 575
Nernst equation (electrode potential) 4 473
Nernst galvanomagnetic effect 6 21
Nernst glower 12 583, 588
Nernst's heat theorem 12 575
Nernst method of measuring heat capacities 2 419
Nerocila 5 291
Nerol 13 496
Neroli oil 13 497
Nerran, Lake 1 672
Nerthra 6 404
Nerve 9 42
see also Nervous system
Nerve cell 9 52
Nerve cell bodies 6 37
Nerve deafness 4 22
Nerve fibers 9 52 53
Nerve gas 3 45
Nerve-impulse production
code of sensory messages 8 202-204
triggering mechanism 8 202 204
Nerve net 9 64 65
Coelenterata 3 255 261
Nerve tissue 15 651
acetylcholine 1 57
biochemistry 12 563 564
histology 6 458 9 51
see also Biopotentials and electrophysiology Neurophysiology Nervous system
Nervonic acid 5 190
Nervous system 1 689 7 136 9 42 63*
automatic nervous system 1 689* 9 47 48
biochemistry 2 190
biopotentials and electrophysiology 2 237
brain 9 57 60
Nervous system—*cont*
central pathways 9 55
comparative embryology 9 42-47
comparative morphology 9 54 57
cranial ganglia 9 61
cranial nerve 3 337 356* 9 61-63
cybernetics 3 632
histogenesis 9 45 46
histology 9 51 54
lateral line organs 9 49
memory 8 220
morphogenesis 9 44 45
motor systems 8 609 618
nerve 9 42
nerve cell 9 52
nerve fibers 9 52 55
nervous tissue 6 458 9 51
neuroglia 9 51 52
neurolemma 9 53
neuron 9 79
peripheral nervous system 9 47-48
phylogenesis 9 59
radiation injury 11 529
reflex arc 9 54 55
sense organ embryology 9 48 53
sense organs 12 179-180
spinal nerves 9 47
subdivisions 9 57 58
synapse 9 54
taste buds 9 49 50
Nervous system (invertebrate) 9 65-67
central nervous system 9 65
excitation and transmission 9 65-66
nerve nets 9 64 65
neurosecretion 9 66
synaptic transmission 9 66
Nervous system disorders 9 67 72
atrophy 9 68 69
bacteria 9 70
demyelinating diseases 9 71 72
encephalitis 9 70 71
glia 9 68
hydrocephalus 9 69
inflammatory diseases 9 69
malformations 9 69
meninges 9 68
meningitis 9 69 70
multiple sclerosis 8 [illegible] 9 71
myelin 9 68
neuron 9 67 68
parasites 9 70
Parkinson's disease 9 36*
poliomyelitis 9 71
Rickettsia 9 70
spinal cord 9 69

...obium—cont
extractive metallurgy 8 277
ionization potential 4 504
see also Columbium
...obrara chalk 5 7, 6 74
...obrara formation 6 426 7 8
...opple (mammary gland) 8 85
...opponese beetle 3 276
...Nippostrongylus 11 511, 13 192
...Nippotaenia 9 102
...Nippotaeniidea 2 639 9 102* 10 414
...Nirvanol 7 32
...Niscuil 9 4
...Nism 5 12
...Nissl granules 4 478
...Nitella 2 235 237, 618 5 528
...Niter 9 102
...Nitidulidae 5 278
...Nitralloy 13 514
...Nitramine 5 151
Nitrate 9 102
Chilean 12 408
fertilizer 5 237
oxidation state 9 110
Nitrate minerals 9 102 103
niter 9 102
soda niter 12 407 408
Nitration 9 103 105*, 106
alkane 1 250
cyclic compounds 9 103 104
liquid phase 9 104
nitrobenzene 9 107
nitroparaffin 9 115
vapor phase 9 104 105
Nitric acid 9 105
aqua regia 1 495
chemical oxidant 9 464
dinitrogen pentoxide 9 114
source of nitrate 9 102
titrology 14 526
o Nitric acid 9 110
Nitric oxide 9 113 114
band spectrum (photograph) 2 90
velocity of sound in 12 515
Nitride 9 105 106* 110
abrasive 1 9
talcum 2 398
cermet 2 635
interstitial compounds 12 478
refractory 11 410
selenium 12 161
silicon 12 321
Nitriding surface hardening of steel 13 514
Nitrification 9 111
Nitrile 9 106
acrylonitrile 1 52
adiponitrile 1 70
Grignard reaction 6 271
Nitrile 9 106* 110
Nitrite ion 9 114
Nitro and nitroso compounds 9 106 107
Nitro compounds 9 106 107*, 399
Nitro dye 4 299
Nitro form (nitroparaffin) 9 115
N (5 Nitro 2 furfurylidene) 1 aminohydantoin *see* Nitrofurantoin
4 Nitro 3 hydroxymercuri o cresol 1 483
2 Nitro 4 methoxyaniline 11 104
3 Nitro 4 methyl aniline 13 401
Nitroalkane 1 250
Nitroamide 1 302
Nitroaniline 1 306
p Nitroaniline 4 300
Nitroaromatic inhibitor 7 111
Nitrobacter 2 29 64 8 129 9 107 111
Nitrobacter agile 9 107
Nitrobacter winogradskyi 9 107
Nitrobacteraceae 9 107* 11 66
bacteria taxonomy of 2 11
Pseudomonadales 11 65
Nitrobarite 9 102
Nitrobenzene 9 103 107*
solvent 12 496
p Nitrobenzoic acid 2 35
Nitrocalcite 9 102
Nitrocellulose 2 626
fiber 5 243
lacquer 7 376
m Nitrochlorobenzene 14 526
o Nitrochlorobenzene 14 526
p Nitrochlorobenzene 14 526
Nitrocystis 9 107
Nitroethane 9 104 115
Nitrofuran 9 107 108
Nitrofurantoin 1 466 6 511 9 108
antibiotic 1 464 468
Nitrofurazone 1 466 5 565 9 109
antibiotic 1 464 468
Nitrofurfuryl methyl ether 9 108
Nitrogen 9 108 110
ammonia 1 324 327
band spectrum (photograph) 2 90
compounds 9 109 110
cryogenic properties 5 572
electron *configuration* 4 504
hydrazine 6 530
inversion temperature 7 538
ionization potential 4 504
nitrate 9 102
occurrence 9 109
organic quantitative analysis 9 308
in petroleum 10 55
Nitrogen—cont
preparation 9 108
production 1 637
properties 9 109
in the sea 12 109
velocity of sound in 12 513
Nitrogen cycle 9 110 111
ammonification 9 110
in biosphere 2 245
denitrification 9 111
ecology 4 396
nitrification 9 111
nitrogen fixation 9 111
plant metabolism 10 356
Rhizobiaceae 11 546
Nitrogen dioxide 9 114
Nitrogen excretion 9 111 113
urea cycle 9 112 113
Nitrogen fertilizers 5 237
Nitrogen fixation 9 113
nitrogen cycle 9 111
Nitrogen free extract 1 426
Nitrogen mustard chemical warfare 3 44 45
mutagenic agent 4 66 8 674
Nitrogen oxides 9 113 114
liquid propellant 11 6
pentoxide 9 103 105 114
tetroxide 9 114
Nitroglycerine 5 151
Nitrohydroxylamate 9 110
Nitroisoquinoline 7 289
Nitromagnesite 9 102
Nitromersol 1 483
Nitromethane 9 104 115 14 526
diesel fuel 4 121
solvent 12 496
1 Nitronaphthalene 9 2
Nitronium ion nitration 9 103
Nitroparaffin 1 250 9 115*
o Nitrophenol 14 526
p Nitrophenol 14 526
Nitropropane 9 104 115
5 Nitropyridine 11 111
4 Nitropyridine N oxide 11 111
Nitroquinoline 11 101
Nitrosamine 1 306
Nitrosation 1 306
Nitroso (quinone oxime) dye 4 299
Nitroso compounds 9 106 107
Nitrosobacter winogradskyi 2 29
Nitrosobenzene 1 409
Nitrosococcus 9 107 111 11 65
Nitrosocystis 11 65
Nitrosogloea 9 107
Nitrosomonas 2 29 64 8 129 9 111 11 65 12 459
Nitrosomonas europaea 9 107
Nitrosospira 9 107 11 65
Nitrosyl chloride process 5 72
Nitrosyl compounds 9 114
Nitrosylsulfuric acid 4 105
o Nitrotoluene 14 526
p Nitrotoluene 14 526
Nitrous acid 9 106 114
diazotization 4 105
Nitrous acid test 1 305
Nitrous oxide 9 113 114
velocity of sound in 12 515
Nitryl chloride nitration 9 105
Nitsche, H 2 535 5 7
Nival inversions 13 488
Nivation hollows 12 592
Niveau spheroid 13 516
Nixon, W C 8 360
Njovera 13 574
NMR (nuclear magnetic resonance) 8 41 45
Nobel, A 4 81 5 151
Nobelium 9 115 116*, 14 67
Noble, A 2 83
Noble's copper cylinder 2 65
Noble fir 5 274
Noble gas plasma plasma spray coating 8 282
Noble gases *see* Inert gases
Noble metals Brillouin zone theory 2 338 339
gold 6 230 231
iridium 7 257 258
mercury 8 228 232
osmium 9 432 433
palladium 9 523 524
platinum 10 410 412
rhodium 11 550
ruthenium 11 655
silver 12 329 331
Nocardia 1 45 55, 5 497 8 678 9 116 12 461
Nocardia asteroides 1 541, 9 116
Nocardia lurida 1 466 467
Nocardiosis 5 563 9 116 10 429
Noctiluca 2 220 8 168 9 63
Noctiluca scintillans 4 197
Noctilucent cloud 1 99
Noctuidae 7 461 8 600
Nocturnal species 3 324 325
Nodal point 9 565
Noddack, W 11 513
Nodding motion 9 252 254
Node (astronomy) orbital *motion* 9 372
Node (physics) 13 36
Nodes of Ranvier 2 236 9 42 63
Nodosaria affinis 5 455
Nodosariidea 5 491 455
Nodosaurus 11 484
Nodular chert 5 56 57
Nodular goiter 6 229
Nodular iron 2 541
Nodule (rock) 12 134
Noeggerathia 9 116
Noeggerathiales 9 116
Noeggerathiostrobus 9 116
Noetherian rings 11 579
Noguchia 2 352
Noguchia cuniculo 2 352
Noguchia granulosis 2 352

Neutron cross section—*cont*
fission 5 288 289
measurement 9 87–88
radiative capture 5 288
Neutron diffraction 9 88 91
in chemical crystallography 9 89 90
inelastic scattering 9 91
lattice vibrations 7 415
magnetic scattering 9 89 91
techniques 9 89
Neutron fission *see* Fission, nuclear
Neutron hydrogen scattering 12 58
Neutron moderator 9 84
Neutron neutron bonds 9 207
Neutron optics 9 91
Neutron proton scattering 12 57 59
Neutron scattering 9 88 91
Neutron surveys petroleum engineering 10 58
Neutron well logging 14 472
Neutrophil 2 263, 6 396
Nevadian orogeny Jurassic 7 326
Nevarox beryllium alloys 2 175
Névé snow field 12 391
Névé line 12 392
Nevelskoi Mountain 1 523
Neville Winter acid 9 3
Newkia 2 570, 11 65
Newkia ramosa 2 570
Nevus *see* Mole (skin)
New Britain 4 358
New Caledonia 9 482
New England Upland 9 145
New General Catalogue 9 24
New Guinea 4 357
New Ireland 4 358
New Jersey process zinc 14 614
New Madrid earthquakes 4 354
New Providence Island 14 474
New Siberian Islands 1 523
New Zealand 1 669 673
coal fields (location) 8 448 449
coal resources (table) 8 454
land area (table) 1 669
map 1 670
rivers 1 671
see also Australia
Newark Group 14 84
Newark Series 11 387 398
arkose in 1 532
Newcastle disease 9 91
fluorescent antibody method 8 383
Newcomb 5 4 535 6 123, 265
Newcomb, T. M. 8 607
Newcomen T. 8 119
Newfoundland 1 522 524, 9 144
Newlands, J. A. R. 6 176
Newman, H. H. 7 178
Newman, M. H. A. 2 289
Newman, M. S. 5 72
Newman method hindered esters 5 75
News ink 7 113
Newsphotos facsimile transmission 5 177
Newt 12 6
Newton 9 91
Newton, Isaac 1 604, 2 192, 579, 3 505, 7 166, 500, 8 161, 175, 194, 9 371, 10 570, 11 145, 427, 435–458, 12 254, 372, 556, 611, 14 430
force 5 436
gravitation 6 263 265
heat convection 3 442
Newton's rings 7 187
optics 9 362 363
second law of motion 7 359–360
Newton's equation of viscosity 14 332
Newton's formula 10 631
Newton Gregory interpolation formula 9 229
Newton Island 8 90
Newton's law of cooling 2 420, 3 442–445*
Newton's law of gravitation 6 263–265
Newton's laws of motion 9 91
rectilinear motion 8 602
second law
definition of force 5 435 436
electron motion in vacuum 4 510 512
third law of motion 7 360
Newton's method, roots 5 47
Newtonian binomial coefficients 10 631
Newtonian dynamics 7 360
Newtonian fluid 5 322 9 91 92*
viscosity 14 333
viscous flow 14 334
Newtonian frame of reference 5 492
Newtonian hydrodynamics 11 452 453
coservate 5 227
Newtonian particle laws 5 60
Newtonian spectrograph 1 615
Newtonian telescope 13 448 451
Newtontopp 1 523
Neyraudia reynaudiana 6 405
Ngauruhoe Mountain 1 671
Ngauruhoe volcano 1 675
NGC (New General Catalogue) 9 24
Ni Span C alloy 7 267
Ni Span Hi alloy 7 267
Ni Span Lo alloy 7 267
Niacin 9 92 93
in food 5 371
Niacin—*cont*
industrial production 9 92
sources and result of deficiency 4 236, 14 340
tryptophan conversion by Vitamin B_6 14 342
Niacinamide 9 92, 11 110
Niagara Escarpment 9 154
Niagara Falls 5 69
Niagaran series 12 527
Nib (cocoa) 3 252
Nibbling 8 6 7, 9 93
Nicalloy 7 264
Nicaragua 9 161
Niccolite 9 93*, 94
Niche 1 408, 5 15
food chain 5 379–380
Nichols, E. F. 11 238
Nichols, M. N. 13 554
Nichols Buff sandstone 10 75
Nicholson, W. 4 453
Nichrome 1 259, 3 104
Nichrome A 7 265
Nichrome V 9 96
Nickel 9 93 100
analytical methods 9 95
compounds 9 94 95
corrosion 3 493
crystal structure 3 509
electron configuration 4 504
extraction and refining 11 120
extractive metallurgy 8 278
ferromagnetism 5 230 232
Hall effect 6 321
ionization potential 4 504
occurrence 9 94 95
properties 9 95
uses 9 94
velocity of sound in 12 516
Nickel alloys 9 95 97
alloyed nickel 9 95 96
permalloy 10 22
Nickel cadmium alkaline batters 13 158
Nickel carbonyl 8 279
Nickel iron alkaline battery 13 157 159
Nickel metallurgy 9 97 100
Nickel ore garnierite 6 41
niccolite 9 93
pentlandite 9 623
Nickel plating 4 531 532
Nickel silver 3 469 9 97 12 331
Nickel stainless steel 13 31 206
Nickel zinc 8 35
Nickeliferous laterite ore 9 99
Nickeliferous sulfide ore 9 98
Nicol W. 10 419
Nicol prism 9 346 10 419
polarimeter 10 446
Nicomedites osmani zone 14 82
Nicotiana 8 239
Nicotiana alfinis 10 334
Nicotiana rustica 13 661
Nicotiana rustica—*cont*
insecticide 7 112
Nicotiana tabacum 9 100 10 489 13 662
insecticide 7 112
Nicotinamide 11 110, 12 56
isonicotinic and hydrazide 7 282
Nicotine 9 100
carotid body 2 531
insecticide 7 112 11 110
in niacin production 9 92
oxidation of 2 3b
poison 10 434
tobacco 13 661
Nicotinic acid bioassay 2 196
effect on brain metabolism 12 564
manufacturing process 11 113
oxidation by bacteria 2 36
pyridine compound 11 17
see also Niacin
Nicrophorus 3 296
Nictitating membrane 3 182 171
Nielsen, C. 2 216
Niemann Pick disease 8 261
Niepce, J. N. 10 617
Nier, A. O. 6 135, 11 392 13 522
Nier type mass spectrometer 6 131
Nieuenweld 1 104
Nieuwkoop, P. 9 77
Nifuraldezone 1 464 465
Niger River 1 104, 109
Night blindness 14 336
Night blooming cereus 2 396
Night glow 1 149
Night lizard 13 25
Nighthawk 9 101
Nightingale, F. 9 253
Nightjars 2 418
Nigiri hills 1 580
Nigre 12 391
Nigua 12 365
Nihau (island) 9 491
Nike Ajax missile 1 543
Nike Hercules missile 1 543
Nile crocodile 5 551
Nile River 1 104
Niltondale 3 268
Niloric Negro 1 460
Nilsonia 7 327
Nilvar 7 267
Nimbostratus 5 212
Nimonic 7 265, 9 96
Nimonic 90 7 266
Nine banded armadillo 1 534 11 419
Nine point circle 1 405, 5 15
Ninhydrin 1 584
Niobium 9 101 102
electron configuration 4 504

ihydroguaretic acid
3 376
caster 14 495
dco air liquefier 3 574 575
ephrine 1 76 4 236
chemical classification
6 479
physiological action 6 481
poison action of autonomic
agents 10 455
structural formula 6 484
synthesis 1 77
tyrosine 14 176
gaard gravimeter 13 515
nan stage 14 82
ne Alps 5 117
nite 6 1
rmia 3 433 434
rmal 9 158
rmal distribution 2 226,
1 257 13 69
rmal faults 13 417
rmal incidence
perihelometer 11 214
rmal modes of vibration
6 342* 8 525 13 57 58
see also Mode of vibration
rmal salt 12 16
rmality concentration scales
3 561
stoichiometry 13 146
rmalizing steel 6 330 331
rman Wells 9 158
rth America 9 138 164
Appalachian highlands
9 144 150
Appalachian provinces
9 143 150
Arctic margin plains 9 152
Canada *see* Canada
Canadian Shield 9 140 141
Central America 9 163 164
coal fields (location)
8 448 449
coal fields (map) 8 455
coal resources (table) 8 454
Cordilleran North America
9 155 163
global position 9 140
Interior provinces 9 152-
155
lake region 7 387
landform map 9 139
location 9 140
monsoon influence 8 583
New England Maritime
province 9 144 145
oil and gas fields
(locations) 8 447
physiographic provinces
9 140 141
prairies 10 362 363
resources of 4 345
Southeastern Coastal Plain
9 150 152
North American blastomycosis
see Blastomycosis
North American gravimeter
13 516
North American Nebula 7 220
North Atlantic Current 1 626,
9 109 9 249
North Atlantic Deep Water
1 626
North Cape Current 1 626
North Equatorial Current
1 626, 9 247 249
North Esk River 1 671
North Iceland Current 9 249
North Island 1 673
North magnetic pole 6 141
9 161
North Pacific Current 9 249
North Polar Ocean *see* Arctic
Ocean
North Pole 1 524 6 125 9 161*
equinox 5 62
ice island stations 7 4
observed movement 6 123
polar wandering 10 446
North Sea 5 114 9 164 165*
271
salinity 9 165
surface currents 9 165
surface temperatures 9 165
tidal current speeds 9 251
water mass characteristics
9 165
North Star *see* Polaris
North Vietnam plateau 1 580
Northerly turning error 1 166
Northern bushel 14 235
Northern clingfish 6 229
Northern Cross *see* Cygnus
Northern diver 6 81
Northern gannet 6 58
Northern Hemisphere constel
lations 5 412 413
Northern mole cricket 9 416
Northern redhorse 5 647
Northern sea lion 12 98
Northern shrike 12 307
Northern white cedar 1 500
Northwest Passage 9 166 167
Norton's theorem (electric net
works) 9 76
Norway lobster 4 31
Norway maple 8 99
Norwegian Current 1 626 9 249
Norwegian Sea 5 115 9 251 271
Nose 9 167
Nose cone 9 167 168
ablation materials 9 168
blunt 9 167
boundary layer flow 9 168
cone angle 9 167
heating 9 167
heating rate 9 168
reentry 11 389 391
shock wave 9 168
slender 9 167
Nose disorders 9 168 169
Nose fly 8 680
Noselite 5 214
Nosema apis 3 560
Nosema bombycis 7 469, 8 403
Nosema disease 3 560
Nosema helminthorum 13 12
Nosema notabilis 13 11
Nosocomial infection 7 95
Nosodendridae 3 277
Nosopsyllus fasciatus 12 345
14 125
Notice 1 451 9 111
NOT circuit digital computer
4 178 181
NOT function 15 358
Notacanthidae 4 41
Notacanthiformes 9 169* 442
Notacanthus nasus 9 169
Notatin 1 468
Notch (metal) 8 268
Notch bar testing 8 272 274
Notch effect 10 399
Notching (sheet metal) 12 253
Note (tone) *see* Tone (music
and acoustics)
Notemigonus chrysoleucas
12 255
Nothochampsa 3 353
Nothojagus 3 187
Nothosauria 11 484 12 40*
Notidanoid 12 157
Notidanoidea 12 157
Notochord 12 354
neurulation 9 81
Notoryctus 3 550
Notodelphioida 3 562 9 169
170*
ecology 9 169 170
morphology 9 169
reproduction 9 170
taxonomy 9 169
Notodelphys 9 169
Notodontidae 7 464
Notoedres 12 29
Notogaean realm Australian
region 14 620
oceanic region 14 620
zoogeographic region
14 620
Notomastus 11 511
Notommata 11 633
Notomvota 4 560 9 170*
Notonectidae 6 401
Notoplana 10 466
Notostigmophora 3 60
Notostira 6 404
Notostraca 3 562 9 170 171*
Nototremo 10 252
Notoungulata 8 82 9 171 172*
Notioprogonia 9 171
Toxodontia 9 171
Typotheria 9 172
Notropis cornutus 12 255
Notum 1 555
Noturus flavus 2 552
Nouvelle Calédonie 9 482
Nova 9 172 173* 15 303
magnitude 9 172
spectra 9 173
Nova-cont
stages 9 172 173
types 9 172
Nova Scotia 9 111 145
Novaculite 3 56
Novaya Zemlya (archipelago)
1 525
Novaya Zemlya 1 522 3 117
Novobiocin 1 464 468 473
9 175 176*
activity 9 175
pharmacology 9 175
production 9 175
Novocain 1 405
Novolac resin 10 115
Nozzle 9 174 175
atomizing 9 174
condensation 9 175
convergent divergent 6 56
design considerations 9 174
energy exchanges 9 174
gas dynamics 6 56 57
isentropic flow 7 271 272
isotope separation 7 296
jet flow 7 305
jet propulsion 9 174
jet velocity 7 311
rough walled 9 174
smooth tapered 9 174
steam 9 174
supersonic 9 174
throttled flow 15 615
wind tunnel 9 174
n p scattering 12 57 59
NP 2 (ice island) 1 525
NPA herbicide 6 422
n p-n transistor alloy junction
7 319
grown junction 7 319
NRC (noise reduction coeffi
cient) 1 18
N T E (distillation) 4 251
Nu value optical materials
9 350 352
Nubian goat 6 227
Nubuck 7 447
Nucellus flower 5 552
Nuchal flexure 9 45
Nucifraga columbiana 9 254
Nuclear aircraft propulsion
7 211 9 175 176
aircraft application 9 175
atomic recoil propulsion
9 176
closed liquid cycle 9 175
ion propulsion 7 243 247
open air cycle 9 175
operational requirements
9 176
range capability 9 176
shielding 9 175
space application 9 176
Nuclear battery 9 176 178
gas ionization 9 178
high voltage 9 176
hydrogen 3 (tritium)
9 176

Noguchia simiae 2 352
Noise, acoustic 9 116 117
aircraft noise 1 182 184
ambient noise 9 117
background noise 9 117
boundary-layer noise 1 184
jet noise 1 92 93, 183-184*, 5 591
noise control *see* Noise control
noise measurement 9 130-133
physical specifications 9 116 117
propeller noise 1 182-183
rocket engines 1 183
vortex noise 1 182-183
white noise 9 117
Noise, electrical 9 117-120
antenna noise 9 119
atmospheric electricity 9 117
bonding, electrical 2 282
communications, electrical 3 318 319
convariance function 9 118
electron tube circuits 9 117
ergodicity 9 119
gas tube 6 62
grounding, electronic equipment 6 279 281
information theory 7 99 102
interference, electrical 7 181
interstellar noise 9 117
limiting sensitivity 12 181
mathematical analysis 9 118 119
measurement 9 118
microphonic 8 365
noise figure 9 120
nonrandom 9 118
power spectral density 9 118
radar 11 208 209
radiated 9 117
random 9 117
semiconductors 9 117
shielding 12 254 254
shot noise 9 119
signal to noise ratio 9 119
sources 9 117
static 9 117, 13 54
telemetering 13 429
thermal noise 9 119
vacuum tube 14 250 251
vacuum tube amplifier 1 347
Noise and redundancy theorem 7 103
Noise control 9 120 130
aircraft noise 1 182 184, 9 122
annoyance feelings 9 128
articulation and intelligibility tests 9 125 126
Noise control—*cont*
bearing noise 9 123
community reaction 9 128
compressor noise 9 123 124
damage risk criteria 9 126-127
ear protectors 4 324
fan noise 9 124
gear noise 9 124-125
hearing loss 9 126 127
human criteria 9 125-128
major noise sources 9 122 125
masking of speech 9 125
mufflers 8 623 624
noise and work performance 9 127 128
noise measurement 9 130 133
noise reduction coefficient 1 18
noise reduction techniques 9 120 122
psychocountics 11 75
rail-transportation noise 9 125
sound absorption 1 17 19
speech-interference level 9 125
Noise control in buildings 9 129 130
acceptable noise levels 9 129
sound absorption 1 17 19
Noise factor communications receivers 12 310
Noise figure 9 120
measurement 9 130
microwave tube 8 425
radar receiver 11 209
Noise filter radio 9 130
Noise generator electrical 9 130
in computers 1 382
diode 9 130
gas discharge tube 9 130
hot wire 9 130
reflex klystron 9 130
Noise insulation *see* Insulation sound
Noise measurement 9 130 133
electrical 9 118
sound analyzer 9 132 133
sound level meter 9 131 132
Noise reduction 9 120 122
aircraft 1 187
jet engines 1 184
silencer 12 310
see also Noise control
Noise reduction coefficient (NRC) 1 18
Noise suppression 13 309
Noise temperature microwave tube 8 425
Nollet, J 10 210
Nomen dubium 14 626
Nomen nudum 14 626
Nomenclature, botanical *see* Plant taxonomy
Nomenclature, chemical chemical symbols and formulas 3 42 44
organic compounds 9 305 308
Nomenclature, zoological *see* Animal systematics
Nomeus 10 523
Nomina conservanda 14 627
Nomograph 9 133 137
circular 9 137
determinant as basis 9 136
function, representation 9 131
perpendicular scales 9 134
scale 9 134
stationary scales 9 134
types 9 135 136
Non Abelian group 6 282, 11 187
Non Aristotelian logics 7 582
Non Markovian process queueing theory 11 188
Nonaeosane 1 249
Nonaeosanoic acid 2 474
Nonadecane 1 249
Nonadecylic acid 2 474
Nonane 1 249
n Nonane 10 65
Nonanoic acid 2 475
Nonsequous systems electrolytic conductance 4 487
Nonbenzenoid aromatic systems 1 547 548
Noncalcic Brown soils 12 438
Noncentral quadrics 11 135
Noncommutative algebra 11 184
Nonconformity 14 191
Nonconservation of parity *see* Parity (quantum mechanics)
Nonconservative force *see* Force
Noncooperative game 6 29
Noncrystalline solid *see* Amorphous solid
Nondegenerate central quadric 11 135
Nondestructive testing of metal 8 287 288
radiography 11 301 306
ultrasonic inspection 8 288 290
Nondirectional beacons 4 231
Nondisjunction chromosome 8 671
Nonelectrolyte 9 147
Nonene (trimer) 10 46
Nonequilibrium states 7 451
Noneuclidean geometry *see* Geometry noneuclidean
Nonferrous melt shop batch melter 1 502
continuous melter 1 502
direct arc furnace 1 502
Nonferrous metals and alloys annealing 6 378
hardening 6 379
heat treatment 6 378 379
Nonferrous pyrometallurgy *see* Pyrometallurgy nonferrous
Nonfusion welding 14 468
Nonholonomic system 3 403
Nonideal gases 13 61 64
Nonideal solutions 12 438
Nonmental frame of reference 5 492
Noninfection hypersensitivity 6 589
Nonion 5 455
Nonion costiferus 5 455
Nonionic surface active agents 13 321 322
Nonisomorphic graphs 6 215
Nonisotopic carriers 9 179
Nonlinear scales curve fitting 3 610 631
Nonlinear systems vibration 14 312
Nonmetal 9 137 138
periodic table 10 14
Nonohmic resistance *see* Resistance, electrical
Nonparametric inference statistics 13 74
Nonpolarized electrolytic capacitors 2 447
Nonradiative collision 12 53
Nonreducing sugars 2 442
Nonselective absorption 5 266
Nonselective herbicide 6 420
Nonsense syllable: memory 8 216
Nonsine waves symmetry 14 436 437
Nonsingular matrix 8 181
Nonsinusoidal waveform *see* Waveform, nonsinusoidal
Nonsteady state experiments in towing tank 14 6
Nonstoichiometric compound 9 138* 12 479
definite composition 1 of 4 43
Nonsymmetrical varistor 14 281
Nontronite 3 365
Nonwoven fabrics 13 340 341
Nonzero sum game 6 26, 29
Noon 13 643
Noosphere 2 239 240
Nootka cypress 5 667
Nopalea cochinellifera 2 386
Noradrenaline 4 585
endocrine mechanisms 4 592
Norbergite 6 316
Norbornylene 5 641
Nordberg main diesel engine 8 110

Nuclear warhead 1 535 544
Nuclear weapons 1 535 544
Nucleate boiling heat convection 3 443
Nucleation 9 208
crystal growth 3 585 587
crystallization 5 601
precipitation (chemistry) 10 373
supersaturation 13 506
Nuclei mirror 9 202 203
Nucleic acid 1 423 8 258 9 208-14*, 10 132
amino acid 1 313
bacterial biosynthesis 2 62
bacterial cell chemistry 2 12
biochemistry 2 190
biosynthesis 9 213
cell protoplast 2 613
deoxyribonucleic acid function 9 215
deoxyribonucleic acid structure 9 212
deoxyribose 8 258
life, origin of 7 497 498
monosaccharide 8 582
nucleotide 8 258
purine 8 258
pyrimidine 8 258
radiation effect on 11 218
ribonucleic acid 11 562
ribonucleic acid function 9 210
ribonucleic acid structure 9 208
ribose 8 258
riboside 8 258
structure 8 258
thymine 8 258
uracil 8 258
virus 14 331
Nucleic acid metabolism 8 258
Nucleic acid metabolism diseases 9 258 259
gout 8 258
lupus erythematosus 8 259
virus infection 8 259
Nucleogony 8 689
Nucleolitetida 4 371
Nucleolitidae 9 214
Nucleolitoida 4 360 9 214 215*
Nucleolus 2 603 3 654
cell division 2 602 603
ribonucleoprotein 9 216
Nucleon 9 215
charge multiplets 8 249
elementary particle 4 542 544
energy levels 9 206
isotopic spin 7 296 297
Nucleon nucleon potential 9 207
Nucleon scattering 12 59
Nucleonics 9 215
Nucleonium 13 363
Nucleophilic reagent 2 165 166 4 526, 13 229
Nucleophilic substitution reaction coordination chemistry 3 460
at saturated carbon 13 129, 229
in synthetic organic chemistry 9 400
Nucleoprotein 2 612, 9 215 218*
deoxyribonucleoproteins 9 215
histone 9 217
nucleic acid 9 208
protamines 9 216
pyrimidine 11 115
radiation effect 11 218
ribonucleoproteins 9 216
Nucleoside 11 115
Nucleotide 4 66 11 115
adenylic acid 1 65
biochemistry 2 199
metabolic disorders 8 258
Nucleotide diphosphopyridine *see* Diphosphopyridine nucleotide (DPN)
Nucleus blood 2 263 264
cell (biological) 2 597
cell constancy 2 601
cell structures 2 614
cytokinesis 3 652
cytology (molecular basis of) 3 634
cytoplasm 3 656
cytoplasmic inheritance 3 660
muscle 8 635 636
meiosis 8 209
mitosis 8 250
nerve cell 9 51 53
plant metabolism 10 347
spermatogenesis 12 602
see also Cell nucleus
Macronucleus
Micronucleus,
Nucleus (of comet) 3 312
Nucleus atomic 9 218
collective model 9 206
density 9 203
liquid drop model 5 287 288
mass 9 203 205
parity 9 205 206
shape 9 205
shell model 9 205
size 9 202 203
spin (angular momentum) 9 202 208
structure 9 201 208
Nuclide 9 218
radioactive 11 274 276
Nuclide enrichment biosphere geochemistry of 2 240
Nucula 9 612, 13 403
Nucula delphinodonta 13 403
Nuda 3 608 9 218*
Beroida 2 169 3 609 9 218
Nudechinicidae 6 431
Nudibranch 9 218 219*, 345
Nudibranchia 9 219
nudibranch 9 218
Nudes ardentes 14 354
Null hypothesis statistics 13 74
Nullarbor Plains 1 672
Nullipores 3 476
Number average molecular weights 10 477
Number indicator tube 9 219
charactron 9 219
gas 9 219
glow 9 219
Number systems 1 219 9 220 223*
algebra 1 239
binary system 9 221
decimal system 9 220 221
digital computer 4 176
octal system 9 223
Number theory 9 224 227
algebraic number theory 9 225 226
analytic number theory 9 226 227
congruences 9 224
diophantine approximations 9 227
notation 8 173
reciprocity laws 9 225
Numbering plan telephone system 13 350
Numenius americanus 3 625
Numenius borealis 3 625
Numenius phaeopus 3 625
Numenius tahitiensis 3 10
Numerical analysis 9 227 229
interpolation 9 228 229
numerical integration 9 227 228
Numerical integration exterior ballistics 2 81
numerical analysis 9 227 228
Numerical weather prediction weather (forecasting and prediction) 14 450
Numidia meleagris 6 291
Numididae 6 18
Nummulites 5 431 434 435 8 356 9 229*
Nummulitic 9 507 508 13 524
Nummulitinae 5 435
Nunatak 1 524
Nung Shen 1 475
Nunivak Island 1 525
Nupercaine 11 193
Nuptial flight 12 406
Hymenoptera 6 573 585
Nurse cell 13 525
Nursing 9 229 230
history 9 230
role in government health 9 230
types of school 9 230
Nursing (infant behavior) 2 144
Nusselt number heat convection 3 442
Nut 9 230 231
applications 9 231
types 9 231
Nut (botany) 4 542
Nut and bolt screw fastener 12 85
Nut crop culture 9 231 232
brazil nut 2 321
cashew 2 538
English walnut 4 615
pecan 9 608
Nutation gyroscope 6 509
precession 10 509
radar antenna 11 204
Nutation (astronomy and mechanics) 9 232 234
Nutation (mechanics) 9 232 234
projectiles 9 233
of tops 9 232 233
Nutational wandering of terrestrial poles *see* Nutation (astronomy and mechanics)
Nutations plant movements 10 367
Nutcracker 9 234
Nutgall tannin 13 390
Nuthatch 9 234
Nutmeg 9 234 235* 11 336
spice and flavoring 12 613
Nutrient food 5 479
Nutrient elements concentrations in sea 12 109 111
sea water fertility 12 118 122
Nutrients source in estuaries 5 83
Nutrition 9 235
animal feed composition 1 426 427
autotrophic 5 99
bacterial *see* Bacterial nutrition
biochemistry 2 199
heterotrophic 5 99
holophytic 5 99
holozoic 5 99
Mastigophora 8 169 170
saprozoic 5 99
vitamin 14 340
Nutrition factor R 5 369
Nutrition factor S 5 369
Nutrition factor U 5 369
Nuttall, J M 11 282
Nuttallia 6 315
Nuttalliella namaqua 7 298
Nuzzling movements behavior, ontogeny of 2 144
Nyasa, Lake 1 107
Nyctaginaceae 2 643
Nyctalopia 14 340 341
Nyctea scandiaca 9 460
Nyctibiidae 2 448

Nuclear battery—*cont.*
krypton 85 9 176
low-voltage 9 177
polonium-210 9 177
scintillator-photocell 9 178
strontium 90 9 176
thermoelectric 9 177
Nuclear binding energy *see* Binding energy, nuclear
Nuclear bomb *see* Atomic bomb, Hydrogen bomb
Nuclear capture *mesons* 8 250-251
Nuclear chain reaction *see* Chain reaction, nuclear
Nuclear chemistry 9 178 180
see also Radiochemistry
Nuclear collisions *see* Scattering experiments, nuclear
Nuclear cross section *see* Cross section, nuclear
Nuclear disintegration 9 198-201, 11 277
nuclear reactions 9 198-201
photodisintegration 9 198
radioactivity 11 277
Nuclear emulsion plates particle detectors 9 584
Nuclear energy 4 602, 9 193 196*
see also Nuclear power, other entries under Nuclear
Nuclear engineering 9 180 181
nuclear reactors 11 349 370
nucleonics 9 215
radioactive waste disposal 11 271
radiochemical laboratories 11 297-299
reactor physics 11 364 370
Nuclear explosion 9 181-184
air burst 9 181-182
atomic bomb 1 648
blast effects 9 181
cosmogony 3 506
detection 9 183-184
energy of 9 181-182
hydrogen bomb 6 548
nuclear effects 9 182
radiation shelter 9 182
radioactive fallout 11 266
thermal effects 9 182
underground burst 9 182-184
Nuclear fallout *see* Radioactive fallout
Nuclear fission *see* Fission, nuclear
Nuclear forces 9 207-208
charge independence 9 207-208 12 58 59
charge symmetry 9 207, 13 362 364
invariance 13 362 364
nuclear scattering experiments 12 57 60
Nuclear forces—*cont*
quantum field theory 11 152
Nuclear fuels 9 184-190
batch extraction 9 189
breeding 9 184-185
conversion 9 184-185
countercurrent extraction 9 189 190
dissolution of spent fuel 9 188-189
fast reactors 9 186
fuel reprocessing plants 9 190
fuel requirements 9 186
preparation of uranium fuel 9 187-188
reprocessing 9 188-190
reserves of uranium and thorium 9 186-187
solvent extraction 9 188-190
thorium 13 610 612
Nuclear fuels reprocessing 9 188-190
Nuclear fusion *see* Fusion, nuclear
Nuclear induction 8 44
Nuclear interaction cloud chamber 5 213 214
meson 8 249 250
Nuclear isomerism *see* Isomerism, nuclear
Nuclear magnetic moment *see* Nuclear moments
Nuclear magnetic resonance 8 44-45
measurement of nuclear moments 9 192 193
Nuclear magnetism 8 43
Nuclear magnetometers 1 93 91 8 64 65
Nuclear magneton *see* Magneton
Nuclear moments 9 190-193
in crystals 9 191 193
electron paramagnetic resonance spectroscopy 4 514 516
in free atoms 9 190 193
in free molecules 9 191 193
measurement of 9 192 193
nuclear paramagnetism 9 518
nuclear structure 9 205
radio frequency spectroscopy 11 301
Nuclear paramagnetism *see* Paramagnetism
Nuclear particle recording photographic 10 161
Nuclear physics 9 193*, 13 548 549
elementary particle 4 542 544
high-energy 9 193
low energy 9 193
Nuclear physics—*cont*
multipole radiation 8 626-627
nucleonics 9 215
quantum mechanics 11 153-162
radioactivity 11 275-289
reactor physics 11 364 370
Nuclear potential barrier *see* Potential barrier
Nuclear power 9 193-196
advantages 9 193 194
central-station electrical plants 9 194-195
disadvantages 9 194
economics 9 194 196
fuel requirements 9 186
power generation 9 194
power plants for propulsion 9 195-196
in surface ships 12 263 266
Nuclear propulsion 7 210 211, 12 265
aircraft carriers 12 262
marine machinery 8 120
submarines 13 215
see also Nuclear rocket
Nuclear quadrupole moments magnetic resonance 8 45
Nuclear radiation 9 196
diamond color 4 98
nuclear explosion 9 182
radioactive fallout 11 266 268
radioactivity 11 275
Nuc
9
Hodgkin's disease 6 460
ionizing radiation 9 196
in medicine 9 197
particulate radiation 9 196
see also entries under Radiation
Nuclear reaction 9 198 201
alpha particle induced reactions 9 201
in atmosphere 11 269 270
atomic bomb 1 648
barn 2 101
capture reactions 9 200 201
carbon nitrogen cycle 2 472 473
chain reaction 3 6
conservation laws 9 199 200
deuteron induced reactions 9 201
in the earth *see* Terrestrial nuclear reactions
fission 5 287 290
fusion 5 591 595
neutron 9 81
neutron induced reactions 9 201
nuclear cross sections 9 200
nuclear fuels 9 185
Nuclear reaction—cont
nuclear scattering experiments 12 57 60
proton induced reactions 9 200 201
proton proton chain reaction
Q value 9 199
in radioisotope production 11 310 312
reaction mechanisms 9
spallation reaction 12
in stars 4 552 556, 13 109
thermonuclear reactions 13 589 590
Nuclear reactor *see* Reactor, nuclear
Nuclear relaxation magnetic 8 42
Nuclear rocket 7 211, 9 201
cryogenic engineering 3 570
deuterium 9 201
fission reactors 9 201
fusion reactors 9 201
lithium 9 201
plutonium 219 9 201
propellant 9 201
specific impulse 9 201
thrust 9 201
tritium 9 201
uranium 233 9 201
Nuclear scattering experiments *see* Scattering experiments, nuclear
Nuclear selection rules *see*
hyperons 6 588
Nuclear structure 9 201 20
binding energy 2 191
collective model 9 20
isotopes 7 291
isotopic spin 7 290 29
liquid drop model 5 288
magic numbers 9 201
mirror nuclei 9 202 20
neutron 9 85 85
nuclear densities 9 203
nuclear forces 9 207 2
nuclear fusion 5 592
nuclear masses 1 654 9 203 205
nuclear parity 9 205
nuclear shapes 9 205
nuclear sizes 9 202 203
nuclear spins 9 202 20
potential barrier 11 285
shell model 9 205
stability valley 9 204
Nuclear submarines 11 9
13 215
Nuclear transmutations *see* Transmutations, nuclear

O

Oahu island of 9 431
Oak 9 237 238*, 12 79
  eastern oaks 9 237
  microradiographs 8 367
  sound velocity 12 516
  western oaks 9 237 238
Oak gallnut 13 390
Oak hedgehog gall 6 581
Oak wilt 14 71 73
Oakley K 10 252
Oarfish 7 349
Oasis 9 238
Oat bin 1 140
Oats 10 374
  food 5 573
Ob Dry Plain 1 585
Obelia 3 255 9 241 242*, 11 448
Obelia geniculata 6 554
Oberon 14 214
Obesity 8 260 9 242*
  hormones in 9 242
  lipid metabolism 7 534
Oblate spheroid 4 561 12 611
Oblateness planetary 6 264
Oblateness of Earth 10 39
Oblique drawing 10 214 216
Oblique illumination (microscope) 8 304
Oblique prism 10 623
Oblique spherical triangles 14 100
Obliquity of ecliptic 4 593
Oboe 8 665 666* 9 19
O Brien B 3 128
O Brien M 11 185
Obsequent stream 5 357
Observation errors 10 206
Observatory astronomical 9 242 243
Observatory type magnetometer 8 64
Obsessive compulsive reaction 9 243 244
Obsidian 9 244
  igneous rock type 11 590
  natural glass 14 347
  rhyolite 11 560
  water content 14 347 348
Obstruction theory (topology) 5 254
Occhialini G P 7 506
Occipital bone 12 373
Occipital lobe 9 57
Occluded front 5 539
Occlusion (chemistry) 10 572
Occlusion (meteorology) 13 162
Occult blood 3 192 202
Occultation 9 244
Occupation numbers Boltzmann statistics 2 279
  Bose Einstein statistics 2 304
Ocean basin floor provinces 13 218 220
  formation 13 223 224
  life in 4 39
  sediments 8 135 137
  sial and sima 13 412 413
  structure 13 221 222
Ocean currents 9 244 255
  alternating tidal streams 9 251
  Antarctic Ocean 1 447-480
  Arctic Ocean 1 525 527
  Atlantic Ocean 1 624 626
  Carruthers meter 9 253
  current measuring devices 9 251 253
  deep circulation of marginal seas 9 249 250
  deep circulation in the oceans 9 250 251
  depth of frictional influence 9 245
  discontinuity layers 9 245
  dynamic computations 9 245
  dynamics of 9 244 247
  eastern boundary currents 9 249
  Ekman current meter 9 252 253
  Ekman spiral 9 245
  external pressure forces 9 244 245
  generation of longshore currents 12 301
  geomagnetic electrokinetograph (GEK) 9 253
  Gulf Stream 6 294 296
  Indian Ocean 7 56 59
  internal pressure forces 9 244 245
  layer of no motion 9 245
  measurement of currents 9 251 253
  measurement of mixing 9 254
  nearshore circulation system 12 301
  neutrally buoyant float 9 251 252
  rate of mixing measurement 11 270
Ocean currents—*cont*
  Roberts radio current meter 9 252 253
  rotating tidal streams 9 251
  slope of discontinuity layer 9 245
  Southeast Asian Waters 12 531 532
  surface currents 9 247 249
  Swallow type neutrally buoyant float 9 252
  thermohaline convection 9 250
  tidal current components 13 636
  tidal streams 9 251
  western boundary currents 9 247
  wind stress 9 245 247
Ocean depth measurement *see* Depth measurement (ocean)
Ocean floor distribution of elevations and depths 13 216
  echinoderms on 4 363
  greatest depths 4 526
  physiographic provinces 13 216 220
  sediments on 8 135-137
  topographic features *see* Submarine topography
Ocean liner 12 258
Ocean meteorological relations 9 263 264* 12 103 105
  air-sea boundary 9 263
  carbon dioxide transfer 1 635 11 270
  conduction 12 103
  evaporation 12 103
  gas exchange 12 105
  heat and water vapor 12 103
  hydrologic and energy relations 9 264
  microseisms 12 156
  momentum exchange 12 103
  ocean current systems 9 264
  projection of droplets 12 103 104
  radiation 12 103
  ripples 14 417
  sea salts in atmosphere 1 634, 12 103
  sea water salinity 9 264
  storm surge 13 165
Ocean meteorological relations—*cont*
  surface wind stress 9 245 247*, 263 14 496 497
  tracer studies 1 635, 9 254 255, 11 270 271
  see also Marine influence on weather and climate, Naval meteorology, Ocean waves
Ocean surface *see* Sea level fluctuations Sea level (datum planes), Sea state
Ocean tide 13 632 640
  see also Tidal currents
Ocean water masses 12 112 114
  Antarctic Ocean 1 439
  Atlantic Ocean 1 626
  biogeographical regions 12 121
  characteristic properties 9 253 254 12 112
  indicator organisms 12 121
  Indian Ocean 7 58
  Pacific Ocean 9 487 488
  processes of formation 12 110
  water mass types 12 113
  see also Ocean currents
Ocean waves 9 255 260
  breaking waves 12 100
  capillary waves 14 417
  deep water wave length 12 300
  directional spectrum of sea 9 258
  equations of motion 9 256
  fetch 9 259
  forecasting 9 8, 259
  frequency spectrum of wave record 9 259
  generation of sea waves 9 255 256
  interference patterns 12 100
  internal waves 14 417 418
  microseisms 12 156
  particle motion in 12 303 304
  ripples 14 417
  sea state 12 98 100
  shallow water transformation 12 300
  subsurface gages 9 260
  surface gages 9 259 260
  transport of sediment 12 300

Nyctinasty 10 366
Nyctiphanes 5 108
Nyctophobia 10 119
Nyctotherus 6 452, 11 59
Nyctribiidae 4 212
Nydrazid *see* Isonicotinic acid hydrazide
Nyen chen Tangla I 577
Nygmia phaeorrhoea 7 470-472
Nylon 5 243, 9 235
  dyeing 4 310
  insulation, electric 7 157
Nylon 6 10 460
Nylon-6,6 10 460
Nylon-6,10 10 460
Nymph 5 32, 143, 9 275
Nymphalidae 2 381, 7 464
Nymphalis 7 471
Nymphon hirtipes I 557
Nymphonidae 4 41; 11 106
Nyquist, H 3 427; 7 99
Nystus 6 409
Nystus ericae 6 405
Nyssa 3 188, 14 144
Nyssa sylvatica 14 144
Nystatin I 473 5 563 9 23
  236*
  antibiotic I 464 468
  assay 9 235
  chemistry 9 235
  microbial activity 9 23
  pharmacology 9 236
  production 9 236

Ohio River 7 115 116, 13 520
Ohm G S 13 584 14 483
Ohm 9 276 277
absolute 4 458 459
acoustic 7 55
mho 8 546
Ohm's law 4 222 9 277*
departures from 9 277
direct current circuit theory 4 222
magnetohydrodynamics 8 57 58
in terms of current density 3 628
Ohmmeter 9 277 278
circuit 9 277
megger 8 208 209
resistance measurement 11 492
scale 9 277
Oicomonas 8 569
Oidium 8 440
Oikawa I 9 77
Oikomonadidae 11 45
Oikomonas 11 45
Oikopleura dioica 7 406
Oil hydrogenation 6 553
hydrolysis 8 559
lubricant 7 601 606
nonedible 5 188 190
shark liver 12 243
weed herbicide 6 422
see also Fat and oil edible
Fat and oil nonedible
Oil accumulation *see* Petroleum (origin)
Oil analysis 9 278 279
crude-oil analysis 9 279
flash point 5 296
pour point 10 550
Oil and gas field development 9 279 292
costs and duration of production 9 291
development of field 9 280 291
drilling unit 9 281
legal and practical restrictions 9 281 282
paraffin deposits 9 287
pool unitization 9 282
production (1958) 9 280
related oil field conditions 9 279 280
selecting number of wells 9 280 281
Oil and gas field exploitation 9 282 288
API gravity 9 283
aspects of production rate 9 282
bailers 9 286
barrel standard 9 283
centrifugal well pumps 9 285 286
corrosion 9 287
Oil and gas field exploitation—*cont*
electrochemical corrosion 9 287
emulsions 9 287
factors of method selection 9 282
field and reservoir conditions 9 282
gas conservation 9 287
gas lift 9 285
gas separators 9 286
hydraulic long stroke pumping 9 285
hydraulic subsurface pumps 9 285
instruments 9 287
lease tanks 9 286
lifting 9 284
market and regulatory factors 9 282
mechanical pumping 9 284
natural flow 9 284
offshore production 9 288
oxygen corrosion 9 287
permeability 9 283
porosity 9 283
production methods in producing wells 9 283 286
production problems 9 287 288
productivity index 9 283
pumping with sucker rods 9 284
salt dome 12 19
salt water disposal 9 288
sonic pumps 9 286
sour corrosion 9 287
sucker rod type pumps 9 284
swabs 9 286
sweet corrosion 9 287
useful terminology 9 282 283
world distribution 8 446 447
Oil and gas storage 9 289 290
balancing reservoir storage 9 290
general crude-oil storage 9 289
hydrocarbon liquids 9 289
patterns of gas storage 9 289 290
problems of crude oil volatility 9 289
salt formation storage 9 289
underground storage 9 289
Oil and gas well drilling 9 290 292
cable tool drill 2 384 9 290
hole diameter 9 290
rotary tool drill 9 290, 11 630 631*
Oil and gas well drilling—*cont*
turbodrill method 9 290 14 154
vibratory drill 9 290
Oil and gas wells 9 290 303
acidizing process 9 291
barefoot completion 9 295 296
biscuit type punch cores 9 292
bits 9 292
blowout preventers 9 291 293
boring and drilling 9 291 292
bullet type perforator 9 297
cable tool drilling 9 291
casing strings 9 295 296
cementing casing 9 295 296
christmas tree 9 297 298
churn drilling 9 291
circulating media 9 291
completion techniques 9 295 296
core drilling 9 293
directional drilling 9 293 294
drag bit 9 293
drilling mud 9 291
explosives stimulating production 9 299 300
fishing tools 9 295
fracturing process 9 299
gun perforating 9 296 297
high pressure well control 9 294 295
jet type perforator 9 297
liner type completion 9 296
mud pump 9 291 292
multiple completion 9 297 298
operational sampling and logging 9 292 293
percussion type punch cores 9 292 293
personnel of petroleum producing industry 9 291
power and power transmission 9 291
prepack gravel liners 9 300
production stimulation techniques 9 299 300
pumping unit, completion 9 297 298
punch cores 9 292 293
rock bit 9 293
rotary drilling 9 291
sand consolidation 9 300
sand exclusion 9 300
screen liner 9 300
side wall coring tool 9 294
side wall sample gun 9 293
socket (circulating) 9 293
Oil and gas wells—*cont*
squeeze cementing 9 299
water-exclusion methods 9 299 299
water exclusion plug back 9 299
weighted fluids 9 294
whipstock tool 9 294 295
see also Oil and gas field development, Oil and gas field exploitation Oil and gas well drilling Oil well derricks
Oil drop experiment 4 501 502
Oil field brines *see* Oil field waters
Oil field model 9 309 310
forces and movement models 9 309
models versus mathematical analysis 9 310
size scaled models 9 309
Oil field waters 9 310 311
commercial value 9 310
composition 9 310
concentration 9 310
geological use 9 310
origin 9 310
Oil film damping waves 14 417
Oil, fuel *see* Fuel oil
Oil furnace 5 570 9 303*
thermostat 15 593
Oil furnace black 2 465
Oil gas process 5 553 555
Oil mining 9 303 307
European experience 9 303
Gilsonite 9 305
mine draining of reservoirs 9 306
North American tar sands 9 305
selection of method 9 307
subsurface mining 9 303
subsurface oil mining 9 303 304
surface mining 9 303
United States oil shale mining 9 304
Oil of citronella 3 147
Oil of coriander 3 480
Oil of fennel 5 215
Oil of sweet birch 5 71
Oil of vitriol *see* Sulfuric acid
Oil of wintergreen 2 247, 12 8
Oil sand 9 307
energy sources 4 602
mineral fuel areas 8 448 449
mining 9 305
petroleum geology 10 61
Oil shale 9 307 309
composition 9 307
destructive distillation 4 80

Ocean waves—*cont*
wave-measuring devices 9 259-260
wave statistics and stochastic models 9 256-257
Oceanian zoogeographic region 14 620
Oceanic basalts 2 106
Oceanic crust 12 155, 13 220 223
Oceanic heat flow 4 332
Oceanic islands 9 261 263
floras and faunas 7 273
island arcs 9 263
submarine volcanoes 9 261
Oceanic zone (marine ecosystem) 8 107
Oceanite 2 105, 7 514
Oceanographic codes sea height 12 99
swell condition 12 100
see also Meteorological codes
Oceanographic instrumentation 9 266 267
bathythermograph 2 110 111
current measurement 9 251 253
geophysical measurements 6 165 169*, 13 221
sea water properties 12 114 118
underwater cameras 14 192-194
wave measurement 9 259 260
see also Depth measurement (ocean)
Oceanographic surveys 9 266 268
Atlantic Ocean 1 622
bathyscaph observations 2 109
biological stations 9 268
deep sea expeditions 4 59
equipment 9 266 267
geological stations 9 268
geophysical measurements 13 221
gravity observations 13 514 515
hydrographic stations 9 268
ice island 7 4
new devices 9 267 268
oceanographic stations 9 268
Polarfront Survey 9 251
research ships 9 266 267
SCUBA use of 12 89
seismic stations 6 168 169, 9 268
ship's laboratories 9 267
SOFAR signaling 12 413
Southern Ocean 1 454
underwater television 14 199 200
Oceanography 4 346, 6 171, 9 264-271*
applications of research 9 269 271
development of 9 265-266
hydrography 6 553
research problems 9 268-269
research ships 9 266-267
see also Marine ecosystem, Marine fisheries, Marine geology, Marine resources, Ocean currents, Ocean waves, Oceanographic surveys, Sea water, Sea water fertility, Tide, Underwater sound, and specific names of oceans and seas
Oceanology 9 265
Oceans and seas 9 271-272
antiroots of 13 519 520
fertility of 12 119
fresh water supply 3 182
land areas drained by 6 565
subdivisions of 9 271
see also Hydrosphere, geochemistry of, Ocean basin, Ocean currents, Ocean floor, Ocean water masses, Ocean waves, Sea water, Tide
Ocellus 12 380
Ocelot 9 272
OCH 6 421
Ochoa S 9 213
Ochoin series 10 21
Ocholophobia 10 119
Ochotona princeps 5 452, 9 452
Ochotonidae 5 452, 7 582 583
Ochre 10 224
Ochrida, Lake 5 115
Ochrobium 12 309
Ochroma lagopus 2 86
Ochromonas fluidibunda 8 168 169
Ochromonas malhamensis 1 699, 11 58
Ochrotricha 14 87
Ochteridae 6 401
Ochmene 13 496
Ocotillo 3 190
2,3 4,5 6,7,8 Octachloro 2,3 5a,4,7,7a hexahydro 4,7 methanoindene 7 140
Octachlorotrisulane 12 321
Octacosane 1 249
2,5,9 15,17 24,28 32 36 41 45 49 53 60 64 68,72 85 Octadeca methylhexahepta contane 1 249
Octadecane 1 249
Octaethylcholestratrioxane 12 525
Octagon 9 272*, 10 471
Octahedral shear stress 8 269
Octahedrite (meteorite) 8 315
Octahedron 9 272-275*, 10 471
chemical structures 3 35
polytopes, regular 10 492
Octahydroindole 7 65
Octal number system 9 223, 273
Octamethylcyclotetrasiloxane 12 319, 323, 486
Octamethyltrisiloxane 12 323
Octane 1 249, 9 273*
alkane 9 273
natural gas 9 5
Octane number 3 309 310, 9 273*
aircraft fuel 1 178
combustion knock 3 309 310
gasoline 6 69
molecular structure 10 69
reforming (petroleum refining) 11 403
tetraethyllead 13 529
n Octane 10 65
Octans 3 413 414
Octant 12 234
Octaphenylcyclotetrasiloxane 12 323
Octave 9 273
musical acoustics 8 661 664
musical scale 12 47
Octave band analyzer 9 135
Octochlorocyclohexanone 6 421
Octocoralia *see* Alcyonaria
Octode 9 273
Octopoda 3 275, 9 273 274*
Cephalopoda 2 615
Octopodidae 4 41, 9 274
Octopus 2 614, 9 274*
Octopus bairdi 9 274
Octopus bimaculatus 9 274
Octopus vulgaris 9 274
Octupole moment, nuclear *see* Nuclear moments
Octupole radiation 8 627
Ocular *see* Eyepiece
Ocular muscles, embryology 5 167
Oculina 3 474
Oculomotor nerve 9 557
cranial nerve 4 537
embryology 9 47
Ocypode 4 31
Ocyropsis 7 570
Odd cold nuclei 9 201
Odd-α sphincter 4 161
Oder 5 121
Odinudae 4 212
Odobenidae 2 523, 14 581
Odobenus 14 581
Odobenus rosmarus 14 581
Odocoileus hemionus 4 42
Odocoileus virginiana 4 42
Odometer 12 600
Odonata 7 131, 9 274 275*
Anisoptera 9 275
classification 9 275
dragonfly 4 271
Insecta fossils 7 139
Odonata—*cont*
life history, habits, and enemies 9 275
Zygoptera 9 275
Odontoceti 2 660 661
Odontodactylus 13 150
Odontognathae 9 276
Hesperornis 6 426 427
Hesperornithiformes 9 276
Ichthyornithes 7 8
Odontolite 14 165
Odontopleura ovata 14 165
Odontopteryx toliapicus 1 694
Odontostomatida 9 276
Odontotermes obesus 12 496
Odor chemoreception 3 491
Odorous house ant 6 583
Odum, E. 2 215, 223 4 544 546 13 504
Odum, H. T. 2 216 4 549 13 505
Odynerus 12 405
Oecanthus 9 418
Oecanthus niveus 9 416
Oecetis 6 404
Oecetis testata 6 405
Oecophorid 7 464
Oecophoridae 7 464
Oedemeridae 3 277
Oedogonium 1 296, 5 85
Oegophiurida 4 560 9 276*
Oegopoda 4 31
Oenesis 7 471
Oenothera 3 670, 5 535 10 349
Oerlikon mechanism 1 581
Oersted *II C.* 1 292 4 462
Oersted 9 276
Oersted (geomagnetism) 8 146
Oesophagostomum 13 105
Oesophagostomum columbianum 12 247
Oestridae 4 212
myiasis 8 600
Oestrus ovis 8 600 12 247
Oesterhaf Upt of 5 117
Offices acceptable noise levels 9 129
Offner 10k 7 111
Offset lithography 10 600
planographic printing 10 602 603
dot Offset method 10 600
Offset presses, planographic perfecting press 10 603
printing 10 600
printing plate 10 613 616
relief letterpress presses 10 621 622
Offshore bar 3 90 8 339
Offshore drilling, natural gas 9 5
Texas towers 13 533
wells 9 2*
Ogallala Mountains 9 156
Ogmorhynchus mobilifera 9 413
Ogston's hypothesis 1 623
Ohio buckeye 2 359

Ohio River 7 115 116 13 520
Ohm, G S 13 584, 14 485
Ohm 9 276 277
  absolute 4 458 459
  acoustic 2 55
  mho 8 546
Ohm's law 4 222 9 277*
  departures from 9 277
  direct current circuit theory 4 222
  magnetohydrodynamics 8 57 58
  in terms of current density 3 628
Ohmmeter 9 277 278
  circuit 9 277
  megger 8 208 209
  resistance measurement 11 492
  scale 9 277
Oicomonas 8 169
Oidium 8 440
Oikawa 1 9 77
Oikomonadidae 11 45
Oikomonas 11 45
Oikopleura dioica 7 406
Oil hydrogenation 6 555
  hydrolysis 6 559
  lubricant 7 601-606
  nonedible 5 188 190
  shark liver 12 243
  weed herbicide 6 422
  see also Fat and oil edible; Fat and oil nonedible
Oil accumulation *see* Petroleum (origin)
Oil analysis 9 278 279
  crude-oil analysis 9 279
  flash point 5 296
  pour point 10 550
  and gas field development 79 292
  costs and duration of production 9 281
  development of field 9 280 281
  drilling unit 9 281
  egal and practical restrictions 9 281 282
  paraffin deposits 9 287
  pool unitization 9 282
  production (1959) 9 280
  related oil field conditions 9 279 280
  selecting number of wells 9 280 281
  and gas field exploitation 282 298
  API gravity 9 295
  aspects of production *rate* 9 282
  bailers 9 286
  barrel, standard 9 283
  centrifugal well pumps 9 285 286
  corrosion 9 287
Oil and gas field exploitation—*cont*
  electrochemical corrosion 9 287
  emulsions 9 287
  factors of method selection 9 282
  field and reservoir conditions 9 282
  gas conservation 9 287
  gas lift 9 285
  gas separators 9 286
  hydraulic long stroke pumping 9 285
  hydraulic subsurface pumps 9 285
  instruments 9 287
  lease tanks 9 286
  lifting 9 284
  market and regulatory factors 9 282
  mechanical pumping 9 284
  natural flow 9 284
  offshore production 9 288
  oxygen corrosion 9 287
  permeability 9 285
  porosity 9 285
  production methods in producing wells 9 283 286
  production problems 9 287 288
  productivity index 9 283
  pumping with sucker rods 9 284
  salt dome 12 19
  salt water disposal 9 288
  sonic pumps 9 286
  sour corrosion 9 287
  sucker rod type pumps 9 284
  swabs 9 286
  sweet corrosion 9 287
  useful terminology 9 282 283
  world distribution 8 446 447
Oil and gas storage 9 289 290
  balancing reservoir storage 9 290
  general crude oil storage 9 289
  hydrocarbon liquids 9 289
  patterns of gas storage 9 289 290
  problems of crude-oil volatility 9 289
  salt formation storage 9 289
  underground storage 9 289
Oil and gas well drilling 9 290 292
  cable tool drill 2 584, 9 290
  hole diameter 9 290
  rotary tool drill 9 290, 11 630 631*
Oil and gas well drilling—*cont*
  turbodrill method 9 290 14 154
  vibratory drill 9 290
Oil and gas wells 9 290 303
  acidizing process 9 299
  barefoot completion 9 295 296
  biscuit type punch cores 9 292
  bits 9 292
  blowout preventers 9 294 295
  boring and drilling 9 291 292
  bullet type perforator 9 297
  cable tool drilling 9 291
  casing strings 9 295 296
  cementing casing 9 295 296
  christmas tree 9 297 298
  churn drilling 9 291
  circulating media 9 291
  completion techniques 9 295 296
  core drilling 9 293
  directional drilling 9 293 294
  drag bit 9 293
  drilling mud 9 291
  explosives stimulating production 9 299 300
  fishing tools 9 295
  fracturing process 9 299
  gun perforating 9 296 297
  high pressure well control 9 294 295
  jet type perforator 9 297
  liner type completion 9 296
  mud pump 9 291 292
  multiple completion 9 297 299
  operational sampling and logging 9 292 293
  percussion type punch cores 9 292 293
  personnel of petroleum producing industry 9 291
  power and power trans-
  [illegible]
  pumping unit, completion 9 297 298
  punch cores 9 292 293
  rock bit 9 293
  rotary drilling 9 291
  sand consolidation 9 300
  sand exclusion 9 300
  screen liner 9 300
  side wall coring tool 9 294
  side wall sample gun 9 293
  socket (circulating) 9 293 294
Oil and gas wells—*cont*
  squeeze cementing 9 294
  water exclusion methods 9 298 299
  water-exclusion plug back 9 299
  weighted fluids 9 294
  whipstock tool 9 294 297
  see also Oil and gas field development; Oil and gas field exploitation; Oil and gas well drilling; Oil well derricks
Oil drop experiment 4 501 502
Oil field brines *see* Oil field waters
Oil field model 9 509 510
  forces and movement models 9 509
  models versus mathematical analysis 9 510
  size scaled models 9 509
Oil field waters 9 510 511
  commercial value 9 510
  composition 9 510
  concentration 9 510
  geological use 9 510
  origin 9 510
Oil film damping waves 14 417
Oil fuel *see* Fuel oil
Oil furnace 5 570 9 505*
  thermostat 13 595
Oil furnace black 2 465
Oil gas process 5 553 555
Oil mining 9 303 307
  European experience 9 305
  Gilsonite 9 305
  mine draining of reservoirs 9 306
  North American tar sands 9 305
  selection of method 9 307
  subsurface mining 9 305
  subsurface oil mining 9 303 304
  surface mining 9 305
  United States oil shale mining 9 304
Oil of [illegible]
Oil of wintergreen 2 247 12 8
Oil sand 9 307
  energy sources 4 602
  mineral fuel areas 8 448 449
  mining 9 305
  petroleum geology 10 61
Oil shale 9 307 309
  composition 9 307
  destructive distillation 4 80
  energy sources 4 602

Ocean waves—*cont*
wave measuring devices 9 259 260
wave statistics and stochastic models 9 256 257
Oceanian zoogeographic region 14 621
Oceanic basalts 2 106
Oceanic crust 12 155 13 220 222
Oceanic heat flow 4 222
Oceanic islands 9 261 265
floras and faunas 7 273
island arcs 9 265
submarine volcanoes 9 261
Oceanic zone (marine ecosystem) 8 107
Oceanite 2 105 7 514
Oceanographic codes *see* Weight 12 99
swell condition 12 109
see also Meteorological codes
Oceanographic instrumentation 9 266 267
bathythermograph 2 110 111
current measurement 9 251 253
geophysical measurements 6 165 166* 13 221
sea water properties 12 114 116
underwater cameras 14 192 194
wave measurement 9 259 260
see also Depth measurement ocean
Oceanographic surveys 9 266 268
Atlantic Ocean 1 622
bathysraph observations 2 106
biological stations 9 268
deep sea expeditions 4 39
equipment 9 266 267
geological stations 9 268
geophysical measurements 13 221
gravity observations 13 514 515
hydrographic stations 9 268
ice island 7 4
new devices 9 267 268
oceanographic stations 9 268
Polarstern ships 9 251
research ships 9 266 267
SCLERA use of 12 89
seismic stations 6 162 166 9 268
ships laboratories 9 267
SOLAS grading 12 415
Southern Ocean 3 458
underwater television 14 190 194
Oceanographs 4 346, 6 171, 9 264 271*
applications of research 9 269 271
development of 9 265 266
hydrographs 6 555
research problems 9 268 269
research ships 9 266 267
see also Marine ecosystem Marine fisheries Marine resources, Ocean currents Ocean waves Oceanographic surveys Sea water Sea water fertility Tide Underwater sound and specific names of oceans and seas
Oceanologs 9 265
Oceans and seas 9 251 272
antarctic of 13 519 520
fertility of 12 119
fresh water supply 3 182
land areas drained by 6 565
subdivisions of 9 251
see also Hydrosphere properties of Ocean basin Ocean currents Ocean floor Ocean waves Sea water Tide
Ocellus 12 180
Ocelot 9 252
OCH 6 421
Ochoa 5 9 215
Ochoan series 10 23
Ocholophids 4 10 119
Ochotona princeps 5 452 9 452
Ochotonidae 5 452 7 502 505
Ochre 10 224
Ochrida, Lake 5 115
Ochrolechum 12 309
Ochrona lapsa 2 80
Ochromonas isabiensis 8 168 169
Ochromonas malhamensis 1 459 13 58
Ochroniscbia 14 87
Ochteridae 6 491
Ochterus 13 496
Ocnerida 3 149
2 5 6 7 8 9 Octachlorides 2 3 Se 4 7 78 hexachloro 4 7 methanotendene 7 149
Octachloronaphthalene 12 221
Octacosane 1 249
2 5 9 15 17 24 29 32 36 41 45 49 53 57 61 to 32 hexachloro methylbenzylpentadiene 1 249
Octadecane 1 249
Octadecylchlorotrichlorosilane 12 225
Octagon 9 257* 10 473
Octahedral shear stress 8 274
Octahedrite (meteorite) 9 215
Octahedron 9 272 273*, 10 471
chemical structures 3 55
polytopes regular 10 492
Octahydrindole 7 65
Octal number system 9 257* 273
Octamethylcyclotetrasiloxane 12 210 223 486
Octamethyltrisiloxane 12 223
Octane 1 249 9 273*
alkane 9 273
natural gas 9 5
Octane numbers 3 500 510 9 273*
aircraft fuel 1 176
combustion knock 3 500 510
gasoline 6 69
molecular structure 10 69
reforming (petroleum refining) 11 405
tetraethyllead 13 529
n Octane 10 65
Octans 3 415 414
Octanit 12 254
Octaphenylcyclotetrasiloxane 12 223
Octave 9 273
musical acoustics 8 661 664
musical scale 12 47
Octave band analyser 9 133
Octochlorocyclopentene 6 421
Octocorallia *see* Alcyonaria
Octode 9 273
Octopoda 3 275 9 273 274*
Cephalopoda 2 645
Octopodidae 6 41 9 274
Octopus 2 644 9 274*
Octopus bairdi 9 274
Octopus bimaculatus 9 274
Octopus vulgaris 9 274
Octupole moment nuclear *see* Nuclear moments
Octupole radiation 8 627
Ocular *see* Eyepiece
Ocular muscles embryology 5 167
Oculina 5 474
Oculomotor nerve 9 537
cranial nerve 5 537
embryology 9 47
Oculopsis 4 74
Oculus 7 [illegible]
Odd-odd nuclei 9 274
Oddi, sphincter of 4 161
Odes 5 121
Odiniidae 4 212
Odontanthrax 2 [illegible] 34 283
Odontaspis 14 284
Odontaspis ferox 14 284
Odontaspis taurus 14 284
Odontaspis ferox 14 284
Odontaspis taurus 14 284
Odontata 4 [illegible] 9 274 5* 9 5
Texas Towers 13 [illegible] wells 9 [illegible]
Odontine Mountains 9 [illegible]
Odontoglossum [illegible]
Odontolabis lowei 5 [illegible]
Odontoleberidae 5 [illegible]
Odontolite 2 [illegible]
Odontomachus 13 [illegible]
Odontopteridae 6 [illegible]
Zygoptera 9 [illegible]
Odontoscelis 5 [illegible]
Odontostylidae 5 [illegible]
Odontotermitidae 5 [illegible]
Hesperotermitidae 5 [illegible]
Ichthyotermitidae 7 [illegible]
Odontotrite 14 [illegible]
Odontotyphlus vesta 14 [illegible]
Odo tipterus [illegible]
Odontomantidae 9 [illegible]
Odontotermes obesus 5 [illegible]
Odor chemoreceptors 5 [illegible]
Odorous house ant 6 [illegible]
Odum E 2 [illegible] 4 [illegible] 13 504
Odum H T 2 [illegible] 4 [illegible] 13 506
Odyneurus 12 407
Oecanthus 9 418
Oecetis inconspicua 9 [illegible]
Oecetis 6 [illegible]
Oeciacus vicarius 6 [illegible]
Oecophoridae 7 [illegible]
Oecophoridae 7 [illegible]
Oedemeridae 5 [illegible]
Oedogoniales 1 [illegible] 3 [illegible]
Oegopsida 4 [illegible] 9 [illegible]
Oenone 7 [illegible]
Oenothera 8 [illegible] 3 [illegible] 10 [illegible]
Oerlikon mechanism 3 [illegible]
Oersted 11 C 1 [illegible] 4 [illegible]
Oersted 9 [illegible]
Oersted spectrometer 6 [illegible]
Oesophagus *see* Digestive system
Oesophagus 4 [illegible]
Oestrelidae 9 [illegible]
Oestridae 9 [illegible]
Oestrus 9 [illegible]
Oestrus ovis 9 [illegible] 12 [illegible]
Oestrid Alps of 5 [illegible]
Officers, agricultural [illegible]
9 [illegible]
Offset ink 7 [illegible]
Offset lithography 5 [illegible]
photographic prints 10 [illegible]
Offset machine 10 [illegible]
Offset presses, [illegible] perfecting press 10 [illegible]
printing 10 [illegible]
printing plate 10 [illegible] relief or [illegible] printing 10 [illegible]
Offshore bars 5 [illegible]
Offshore drilling [illegible] 9 [illegible]
Texas Towers 13 [illegible] wells 9 [illegible]
Ogilvie Mountains 9 [illegible]
Ogmorhynchidae [illegible]
Ogotoria hispanica [illegible]
Ohm, Georg [illegible]

River 7 115 116, 15 320
G S 13 594 14 485
9 276 277
psolute 4 458 459
coustic 7 35
pho 8 346
ilm 4 222 9 277*
epartures from 9 277
irect-current circuit the ory 4 222
nagnetohydrodynamics 8 57 59
n terms of current density 3 628
meter 9 277 278
ircuit 9 277
negger 8 208 209
resistance measurement 11 492
scale 9 277
monas 8 169
um 8 440
wa L 9 77
monadidae 11 45
monas 11 45
opleura dioica 7 406
hydrogenation 6 553
hydrolysis 6 559
lubricant 7 601 606
nonedible 5 183 190
shark liver 12 243
weed herbicide 6 422
see also Fat and oil, edible, Fat and oil, nonedible
accumulation *see* Petroleum (origin)
analysis 9 278 279
crude-oil analysis 9 279
flash point 5 296
pour point 10 550
l and gas field development 9 279 282
costs and duration of production 9 281
development of field 9 280 281
drilling unit 9 291
legal and practical restrictions 9 281 282
paraffin deposits 9 287
pool unitization 9 282
production (1959) 9 280
related oil field conditions 9 279 280
selecting number of wells 9 280 281
Oil and gas field exploitation 9 282 288
API gravity 9 283
aspects of production rate 9 282
bailers 9 296
barrel, standard 9 283
centrifugal well pumps 9 285 286
Oil and gas field exploitation—cont
electrochemical corrosion 9 287
emulsions 9 287
factors of method selection 9 282
field and reservoir conditions 9 282
gas conservation 9 287
gas lift 9 285
gas separators 9 286
hydraulic long stroke pumping 9 285
hydraulic subsurface pumps 9 285
instruments 9 287
lease tanks 9 286
lifting 9 284
market and regulatory factors 9 282
mechanical pumping 9 284
natural flow 9 284
offshore production 9 288
oxygen corrosion 9 287
permeability 9 283
porosity 9 283
production methods in producing wells 9 283 286
production problems 9 287 288
productivity index 9 283
pumping with sucker rods 9 284
salt dome 12 19
salt water disposal 9 288
sonic pumps 9 286
sour corrosion 9 287
sucker rod type pumps 9 284
swabs 9 286
sweet corrosion 9 287
useful terminology 9 282 283
world *distribution* 8 446 447
Oil and gas storage 9 289 290
balancing reservoir storage 9 290
general crude oil storage 9 289
hydrocarbon liquids 9 289
patterns of gas storage 9 289 290
problems of crude-oil volatility 9 289
salt formation storage 9 289
underground storage 9 289
Oil and gas well drilling 9 290 292
cable tool drill 2 384 9 290
hole diameter 9 290
rotary tool drill 9 290 11 630 631*
Oil and gas well drilling—cont
turbodrill method 9 290 14 134
vibratory drill 9 290
Oil and gas wells 9 290 303
acidizing process 9 299
barefoot completion 9 295 296
biscuit type punch cores 9 292
bits 9 292
blowout preventers 9 291 295
boring and drilling 9 291 292
bullet type perforator 9 297
cable tool drilling 9 291
casing strings 9 295 296
cementing casing 9 295 296
christmas tree 9 297 298
churn drilling 9 291
circulating media 9 291
completion techniques 9 295 296
core drilling 9 293
directional drilling 9 293 294
drag bit 9 293
drilling mud 9 291
explosives stimulating production 9 299 300
fishing tools 9 298
fracturing process 9 299
gun perforating 9 296 297
high pressure well control 9 294 295
jet type perforator 9 297
liner type completion 9 296
mud pump 9 291 292
multiple completion 9 297 298
operational sampling and logging 9 292 293
percussion type punch cores 9 292 293
personnel of petroleum producing industry 9 293
power and power transmission 9 291
[illegible] completion 9 297 298
punch cores 9 292 293
rock bit 9 293
rotary drilling 9 291
sand consolidation 9 300
sand exclusion 9 300
screen liner 9 300
side wall coring tool 9 294
side wall sample gun 9 295
socket (circulating) 9 293 294
Oil and gas wells—cont
squeeze cementing 9 298
water exclusion methods 9 298 299
water exclusion plug back 9 299
weighted fluids 9 294
whipstock tool 9 294 295
see also Oil and gas field development, Oil and gas field exploitation, Oil and gas well drilling, Oil well derricks
Oil drop experiment 4 501 502
Oil field brines *see* Oil field waters
Oil field model 9 309 310
forces and movement models 9 309
models versus mathematical analysis 9 310
size scaled models 9 309
Oil field waters 9 310 311
commercial value 9 310
composition 9 310
concentration 9 310
geological use 9 310
origin 9 310
Oil film damping waves 14 417
Oil fuel *see* Fuel oil
Oil furnace 5 570 9 303*
thermostat 15 593
Oil furnace black 2 465
Oil gas process 5 553 555
Oil mining 9 303 307
European *experience* 9 303
Gilsonite 9 305
mine draining of reservoirs 9 306
North American tar sands 9 305
selection of method 9 307
subsurface mining 9 303
subsurface oil mining 9 303 304
surface mining 9 303
United States oil shale mining 9 304
Oil of citronella 5 147
Oil of coriander 5 490
Oil of wintergreen 2 247, 12 8
Oil sand 9 307
energy sources 4 602
mineral fuel areas 8 448 449
mining 9 305
petroleum geology *10 61*
Oil shale 9 307 309
composition 9 307
destructive distillation 4 80
energy sources 4 602

Ocean waves—*cont*
wave measuring devices 9 259 260
wave statistics and stochastic models 9 256-257
Oceanian zoogeographic region 14 620
Oceanic basalts 2 106
Oceanic crust 12 155, 15 220-225
Oceanic heat flow 4 332
Oceanic islands 9 261 263
floras and faunas 7 273
island arcs 9 263
submarine volcanoes 9 261
Oceanic zone (marine ecosystem) 8 107
Oceanite 2 105, 7 514
Oceanographic codes sea height 12 99
swell condition 12 100
see also Meteorological codes
Oceanographic instrumentation 9 266 267
bathythermograph 2 110 111
current measurement 9 251-255
geophysical measurements 6 165 169*, 15 221
sea-water properties 12 114 118
underwater cameras 14 192-194
wave measurement 9 259 260
see also Depth measurement (ocean)
Oceanographic surveys 9 266 268
Atlantic Ocean 1 622
bathyscaph observations 2 109
biological stations 9 268
deep sea expeditions 4 39
equipment 9 266-267
geological stations 9 268
geophysical measurements 15 221
gravity observations 15 514 515
hydrographic stations 9 268
ice island 7 4
new devices 9 267 268
oceanographic stations 9 268
Polarfront Survey 9 251
research ships 9 266-267
SCUBA, use of 12 89
seismic stations 6 168 169, 9 268
ship's laboratories 9 267
SOFAR signaling 12 415
Southern Ocean 1 438
underwater television 14 199 200
Oceanography 4 316, 6 171; 9 264 271*
applications of research 9 269 271
development of 9 265 266
hydrography 6 553
research problems 9 268-269
research ships 9 266-267
see also Marine ecosystem, Marine fisheries, Marine geology, Marine resources, Ocean currents, Ocean waves, Oceanographic surveys, Sea water, Sea water fertility, Tide, Underwater sound, and specific names of oceans and seas
Oceanology 9 265
Oceans and seas 9 271-272
antiroots of 15 519 520
fertility of 12 119
fresh-water supply 3 182
land areas drained by 6 565
subdivisions of 9 271
see also Hydrosphere, geochemistry of, Ocean basin, Ocean currents, Ocean floor, Ocean water masses, Ocean waves, Sea water, Tide
Ocellus 12 180
Ocelot 9 272
OCH 6 421
Ochoa, S 9 213
Ochoan series 10 24
Ocholophobia 10 119
Ochotona princeps 5 452 9 452
Ochotonidae 3 452, 7 382 383
Ochre 10 224
Ochrida, Lake 5 115
Ochrobium 12 309
Ochroma lagopus 2 86
Ochromonas ludibunda 8 168 169
Ochromonas malhamensis 1 699 11 58
Ochrotrichia 14 87
Ochteridae 6 401
Ochmene 15 496
Ocotillo 3 190
2 3,4 5 6,7,8 8 Octachloro 2,3 3*a* 4,7 7*a* hexahydro 4 7 methanoindene 7 110
Octachlorotrisulane 12 321
Octacosane 1 249
2,5,9 13 17 21 28 32 36 41 45,49 53 60 61 68 72 85 Octadeca methylhexahepta contane 1 249
Octadecane 1 249
Octaethylecloteatrisloxane 12 325
Octagon 9 272*, 10 471
Octahedral shear stress 8 269
Octahedrite (meteorite) 8 315
Octahedron 9 272 273*, 10 471
chemical structures 5 35
polytopes, regular 10 492
Octahydroindole 7 63
Octal number system 9 223, 273
Octamethylcyclotetrasiloxane 12 319, 325, 486
Octamethyltrisiloxane 12 325
Octane 1 249, 9 273*
alkane 9 273
natural gas 9 5
Octane number 3 309 310, 9 273*
aircraft fuel 1 178
combustion knock 3 309 310
gasoline 6 69
molecular structure 10 69
reforming (petroleum refining) 11 403
tetraethyllead 13 529
n Octane 10 65
Octans 3 413-414
Octant 12 234
Octaphenylcyclotetrasiloxane 12 325
Octave 9 273
musical acoustics 8 661 664
musical scale 12 47
Octave band analyzer 9 133
Octochlorocyclohexanone 6 421
Octocorallia *see* Alcyonaria
Octode 9 273
Octopoda 3 275 9 273 274*
Cephalopoda 2 645
Octopodidae 4 41 9 274
Octopus 2 641 9 274*
Octopus bairdi 9 274
Octopus bimaculatus 9 274
Octopus vulgaris 9 274
Octupole moment, nuclear *see* Nuclear moments
Octupole radiation 8 627
Ocular *see* Eyepiece
Ocular muscles embryology 5 167
Oculina 5 474
Oculomotor nerve 9 557
cranial nerve 3 537
embryology 9 47
Ocypode 4 51
Ocyropus 7 570
Odd odd nuclei 9 201
Odds sphuncter 4 161
Oder 5 121
Odinidae 4 212
Odobenidae 2 525 14 384
Odobenus 14 384
Odobenus rosmarsus 14 384
Odocoileus hemionus 4 42
Odocoileus virginiana 4 42
Odometer 12 600
Odonata 7 151 9 274 275*
Anisoptera 9 275
classification 9 275
dragonfly 4 271
Insecta fossils 7 139
Odonata—*cont*
life history, habits, and enemies 9 275
Zygoptera 9 275
Odontoceti 2 660, 661
Odontodactylus 13 150
Odontognathae 9 276
Hesperornis 6 426 427
Hesperornithiformes 9 276
Ichthyornithes 7 8
Odontolite 14 165
Odontopleura ovata 14 105
Odontopteryx toliapicus 1 694
Odontostomatida 9 276
Odontotermes obesus 12 496
Odor, chemoreception 5 491 51
Odorous house ant 6 581
Odum, E 2 215, 225, 4 [illegible] 3*a* 13 504
Odum, H T 2 216, 4 [illegible] 15 505
Odynerus 12 403
Oecanthus 9 418
Oecanthus niveus 9 416
Oeciacus 6 408
Oeciacus vicarius 6 405
Oecophorid 7 464
Oecophoridae 7 464
Oedemeridae 3 277
Oedogonium 1 236, 3 85
Oegophiurida 4 360, 9 276*
Oegopsida 4 51
Oeneis 7 471
Oenothera 3 659, 5 533, 10 331
Oerlikon mechanism 1 534
Oersted, H C 1 292 4 462
Oersted 9 276
Oersted (geomagnetism) 6 146
Oesophagostomum 15 195
Oesophagostomum columbianum 12 247
Oestridae 4 212
myiasis 8 680
Oestrus ovis 8 680 12 247
Oetzthal, Alps of 5 117
Offices acceptable noise levels 9 129
Offset ink 7 111
Offset lithography 10 600
planographic printing 10 602 603
d r Offset method 10 608
Offset presses planographic perfecting press 10 621
printing 10 601
printing plate 10 615 616
relief (letterpress) processes 10 621 622
Offshore bar 5 80 8 135
Offshore drilling, natural gas 9 5
Texas Towers 13 551
wells 9 284
Ogilvie Mountains 9 358
Ogmoopsis nodulifera 9 510
Ogston's hypothesis 1 621
Ohio buckeye 2 359

Oogenesis—cont
gonadotrophic hormones 9 551
meiosis 8 299
periodicity of oogenesis 9 551
reproductive system 11 474
submerged meiosis 9 550
Oogonium Chlorophyta 3 80 83
oogenesis 9 550
reproduction plant 11 454
Oolite 12 134
Oolite and psolite 9 551 552
limestone 7 515 516
Oort's constant 6 12
Oospora citri aurantii 10 506
Oospora lactis 5 188 14 604
see also Geotrichum candidum
Oospore 10 199
Ootheca Isoptera 7 284 288
Orthoptera 9 416
Opacifier 8 285
Opacity 9 552
Opah 7 389
Opal 9 552
in chert 3 56
gem 8 99
Opal glass 9 553
Opalina ranarum 3 121
Opalinid 3 120-122
Opaque medium 9 552
Oparin, A. I. 7 497
Open caisson 2 589
Open channel *see* Channel, open
Open circuit 9 552
location 3 136
Open-cut *mining see* Mining, open cut or pit
Open hearth process 13 95 99
Open link hose 5 578
Open loop control system 3 429-9 550*, 11 446
alarm systems 1 222
chemical process control 3 53
classification 9 535
clock control systems 3 205 206
disadvantages 9 536
repeater synchro 11 447-448
simplicity 9 536
stability 9 536
transfer characteristic 3 430
with power amplification 9 535
without power amplification 9 535
Open path molecular still 4 252
Open steel 13 97 99
Open stopes (mining) 8 480 481
Open systems, thermodynamics of (biology) 9 552 555
application 9 554
biological systems 9 552
theory 9 553
Open wire transmission lines 14 48
Opening machine cotton 13 552
Opera glasses 9 556
Operational calculus 9 540
dynamic range 9 536
interrelations 9 536
linear programming 7 522 525
methodology 9 557
nature of results 9 557
objectives 9 536
results 9 536
scope 9 557 558
subjects 9 557
see also Game theory
Operator quantum mechanical quantum theory, nonrelativistic 11 164 166
Operator theory 9 558 561
axiom 9 559
finite dimensional case 9 559 560
infinite dimensional case 9 560 561
notation 8 174
quantum theory, nonrelativistic 11 164 166
Operator training 9 561
Opercula 5 162 171
Opercularia 11 54
Operculina 5 451
Operculum 4 520, 8 635
Ophelidae 10 462
Opheodrys aestivalis 6 268
Opheodrys vernalis 6 268
Ophiacantha 9 545
Ophiacodonta 9 616
Ophiactidae 9 544
Ophiceras commune zone 14 82
Ophiderpeton 1 221
Ophidia 7 474
see also Serpentes
Ophiobolus graminis 14 485
Ophiocanopidae 9 544
Ophiocistioidea 4 572
Ophiocystioidea 4 560, 9 542*
Ophiocytium 3 255
Ophioderma brevispina 2 541
Ophioglossales 9 542* 10 546
Ophioglossum 9 542
Ophionyssus natricis 8 253
Ophiophagus hannah 13 25
Ophiophagus (Naja) hannah 5 248
Ophiopluteus *larva* 9 544
Ophiostomataceae 5 121
Ophiothrix angulata 2 541
Ophitic texture basalt 2 105
diabase 4 93
igneous rocks 7 12
Ophiuchus 3 412 415
Ophiura 9 545
Ophiura sarsi 2 541
Ophiurae 4 560 9 542*
Ophiurida 4 560 9 542*
Euryalae 5 124*, 9 542
Ophiurae 9 542
Ophiuroidea 4 560 571, 9 545 546*, 13 53
alimentary system 9 544
brittle star 2 541
ecology 9 545
muscular system 9 544
nervous system 9 544
Oegophiurida 4 560, 9 276*, 545
Ophiurida 4 560 9 542*
relation to man 9 545
reproduction 9 544
skeleton 9 545 544
Stenurida 4 560, 9 545, 13 125*
water vascular system 9 544
Ophryocystis mesnili 12 65
Ophryoscolex 5 5
Ophryotrocha 10 464
Ophthalmia 2 352
Ophthalmia neonatorum 6 235
Ophthalmic placode 9 47
Ophthalmoplegia 8 659
Opiates 1 566 9 545*
Opik Ernst 13 503
Opilioacaridae 9 528
Opiliones *see* Phalangida
Opisthaptor 4 548 14 77
Opisthobranchia 8 559 9 545*
Nudibranchia 9 219
Tectibranchia 13 406
Opisthocoela 9 545*, 12 8
Opisthocoelous vertebra 12 354
Opisthocomidae 6 18
Opisthoglyphodont fang 13 27
Opisthomi *see* Mastacembeliformes
Opisthonephros 7 542, 14 222 226 227
urinary system 14 222
Opisthopatus 9 529
Opisthorchis felineus 10 414
Opisthorchis sinensis 3 207
Opisthosoma 1 557, 12 79
Opisthoteuthis 13 533
Opium 8 598, 9 5
opiates 9 545
Papaverales 9 539
poppy 10 498
Opius 5 580
Opomyzidae 4 212
Opossum 12 362 9 545 546*, 14 307
gestation period 6 182
Opossum shrimp 3 564 10 1
Oppenheim's disease 8 659
Oppenheimer, J. R. 9 200
Opsin 10 181, 12 566, 14 541
Opsonic index 9 546
Opsonin 9 201 9 546*, 10 91
Optic apraxia 1 494
Optic atrophy 5 171
Optic axis crystal 3 584 592
Optic capsule 12 358
Optic chiasma 9 42 63, 14 535
Optic nerve 8 537, 14 535
embryology 9 47
neuritis 5 171
Optic tectum 9 58
Optic thalamus 14 535
Optical aberration *see* Aberration, optical
Optical absorption *see* Absorption (electromagnetic radiation)
Optical activity 9 546 548
asymmetric synthesis 1 620 621
crystals 9 547
diastereoisomer 4 102
enantiomorph 4 587
organic compounds 9 547 548
polarimetric analysis 10 416
racemization 11 108
rotatory dispersion 11 632 633
see also Stereochemistry
Optical antennas *see* Antenna *(aerial)*
Optical *binaries see* Binary stars
Optical bleaches 13 558
Optical branches 7 415
Optical comparators 3 329 330
Optical density 4 107
color centers 3 295
Optical direction cosine *see* Direction cosine, optical
Optical fibers 9 548 549
Optical filter *see* Filter, optical
Optical flat 9 549 550
comparison of lineal measurement 9 550
determination of surface contour 9 550
Optical glass 6 208 9 550 553
Optical homing system guided missile 6 291
Optical image *see* Image, optical
Optical indicatrix 3 587 591
Optical instruments aberrations 1 3 7
astronomical instruments 1 608 613

Oil shale—*cont*
mineral fuel areas 8 447-448
oil-forming shales 9 307
origin 9 307
petroleum geology 10 61
recovery of oil 9 308
reserves 9 309
uses of shale oil 9 309
Oil shale retort solids pump 12 482
Oil-water separation: petroleum engineering 10 59
Oil-well derricks 9 300-303
attachments 9 302
bracing 9 302
derrick types 9 300 301
foundation 9 303
guying 9 303
Ideco full-view mast 9 301
load capacity 9 302-303
material 9 301
monkey board 9 303
Moore jackknife mast 9 302
pipe stabbing board 9 302
portable masts 9 300
principal load members 9 301-302
size 9 301
water table 9 302
wind capacity 9 303
working platforms 9 302
Oilbird 2 448
Oiler, naval 12 267 268
Oilless bearings 1 258
Oilwell cement 2 627
Ointicica oil 4 290
Okapi 1 568
Okhotsk Sea 9 271
Okra 9 311
Oktone 6 421
Olacaceae 12 25
Olbers, H 1 596
Olbers, H W M 2 582
Old Bahama Channel 14 474
Old Faithful geyser 6 183
Old Man of La Chapelle aux Saints 9 22
Old Red Sandstone 4 85-86, 11 387
Old World screw-worm 8 680
Old World sparrow 12 562
Oldham, John 5 487
Oldham, R D 4 339
Oldham's coupling 5 525; 5 487, 9 311
Oldhamite 8 313
Olds, J 8 605
Oldshue-Rushton extractor 12 499
Olea europeae 9 317
Oleaceae 1 576, 6 115
Oleandomycin 1 464 468, 5 66
Olearia rami 9 563
Oleate 9 311-312
Olefin 6 533
Olefin—*cont.*
addition reaction 1 63
alkylation 1 253
epoxidation 5 43-44
hydrogenation 6 552
hydrolysis 6 559
hydroxylation reaction 6 570
ozonization 9 479
see also Alkene
Olefin sulfide 9 312
Oleic acid 2 245, 5 184, 9 311, 10 356
triglyceride 14 92
Oleic acid (cis) 2 475
Olein 6 553
Olenellus 2 425, 6 136, 14 105
2-oleodistearin 5 185
2-oleopalmitostearin 5 185
Oleoresin 12 612
Oleoresinous varnish 14 281
paint 9 493
Olericulture 14 286
Olethreutid 7 464
Olethreutidae 7 464
Olfaction 3 50 51
Olfactory capsule 12 358
Olfactory cells 12 384
Olfactory learning 12 184
Olfactory lobe 12 358
Olfactory nerve 3 537
embryology 9 47
Olfactory pallium 9 59
Oligemia 3 141-144
Oligocene 6 136, 142, 9 312 313*
fauna 9 313
strata 9 310
Oligochaeta 1 429, 431, 9 313 315*
Annelida fossils 1 431
classification 9 315
earthworm 4 355
Opisthopora 9 315
Plesiopora plesiotheca 9 315
Plesiopora prosotheca 9 315
Prosopora 9 315
Oligochromemia 3 141 144
Oligoclase 5 213, 9 315*
Oligocythemia 3 141 144
Oligocytherest fullonica 10 429
Oligodendroglia 9 42 63
Oligomer 10 478
Oligomera 9 315
Brachiopoda 2 314 315
Branchiotremata 9 315
Chaetognatha 3 1 2
Tentaculata 13 491
Vermes 9 315
Oligomeric Lake 5 523
Oligopygidae 6 463
Oligosaccharide 2 452, 9 315 316*, 13 236
composition 9 315
maltose 8 81
Oligosaccharide—*cont*
nomenclature 9 316
properties 9 316
raffinose 11 326
Oligotrichida 9 317*, 11 53, 13 5
Oligotrophic lake 5 529
Oliguria 3 192-202
Olindias 14 10
Olive 5 423, 9 317*
Olive oil 5 189, 190
Olive thrips 13 628
Oliver, L 6 484
Olividae 9 34, 11 19
Olivine 9 317
magnesium occurrence 8 19
in meteorites 8 313
occanite 2 105
Olivine basalt 10 86
petrographic province 10 50
Olivine diabase 10 86
Olivine gabbro 10 12
Olivine leucitite 7 480
Ollier's disease 4 314
Ollulanus 13 193
Olpidiopsis 10 200
Olpidium 10 199, 200
Olympic Mountains 8 617, 9 162
Olynthus 2 395
Omasum 4 158
Omega 9 15, 20 318*
Ommastrephes gigas 2 645
Ommastrephes sagittus 13 30
Ommatidium 7 125
photoreception 10 180
Omophromidae 3 276
Omphacite 1 667, 4 583
Omphralidae 4 212
Onchocerca cervicalis 5 260
Onchocerca gibsoni 5 260
Onchocerca gutterosa 5 260
Onchocerca volvulus 4 218 5 257 259, 260
Onchocerciasis 4 218
Filarioidea 5 258 260
Oncholaimidae 4 616
Onchomelania 12 64
Onchotelson brevicaudatus 10 197
Oncicola canis 1 19
Oncology 9 318 326* 10 100
adenocarcinoma 9 321
basal cell carcinoma 9 321
cachexia 2 385
carcinogenesis biochemistry of 9 324 326
carcinogenesis factors in 9 322 323
characteristics 9 318 320
classification 9 320
diagnosis 9 322 324
etiology 9 321 322
lymphoma leukemia tumor 9 321
Oncology—*cont*
neoplasia 9 37 38
pseudotumor 9 320
stomach disorders 13 1-9
thyroid gland disorders 13 627
treatment 9 322 324
tumor 9 318 321, 14 135 136
see also Cancer (biology)
Oncopeltus 6 409
Oncopeltus fasciatus 6 403
Oncorhynchus gorbuscha 12 14
Oncorhynchus keta 12 14
Oncorhynchus kisutch 12 14
Oncorhynchus nerka 12 14
Oncorhynchus tschawytscha 12 14
Oncosphere 2 650, 13 395
Ondatra zibethica 8 668
Ondontalgia 13 676
One gene-one enzyme hypothesis 7 498
One-shot color camera 2 430
One spot stink bug 6 405
Onega, Gulf of 5 115
Onega, Lake 5 116
Onesquethawan Stage 4 87
ONIA GEGI process 5 333
Onicola canis 1 516
Onion 6 39, 9 326 327*
chromosome number 3 10
diseases 9 327
harvesting 9 326
smut 9 327
varieties 9 326
Onion oil 5 71
Onion thrips 13 628
Onniscoidea 9 327-329
morphology 9 327 329
phylogeny 9 328
Oniscus 7 283
Oniscus asellus 12 552
Onnes, K 13 296
Onoclea sensibilis 5 262
Onomatophore 14 172
Onsager, L 4 112, 486, 9 330 15 576, 585
Onsager reciprocal relations 15 576
Onsager theory of polar molecules 4 112
Onuphidae 10 461
Onychodectes 13 346
Onychomycosis 6 274
Onychopalpida 9 328 329
Onychophora 9 329 330
Oogenaceae 5 123
Oosx 2 397, 9 330*, 12 521
germ 6 99
Oosx marble 13 152
Oocyte oogenesis 9 330
ovary 9 455
Oocystis 1 255
Ooencyrtus 6 581
Oogenesis 7 225, 9 330 331*, 11 474

Ore and mineral deposits—*cont*
classification of deposits 9 377 381
clay deposits origin 3 167
concentration 9 376
contact metasomatic deposits 9 378
diamond 4 98 99
epigenetic deposits 9 376
forms of mineral deposits 9 376 377
gangue minerals 9 376
gem stones 6 96 97
gossans 9 381
hematite 6 395
hydrothermal deposits 9 378 379
hypogene deposits 9 376
limonite 7 519
localization of deposits 9 382
lodes 9 376-377
magmatic deposits 9 377
metasomatism 9 377
mineralogenetic provinces and epochs 9 381 382
native elements 9 4
ore shoots 9 377
organic deposits 9 380
oxidation and *supergene enrichment* 9 381
pay ore 9 377
pegmatite *deposits* 9 378 610 612*
placer *deposits* 9 380
pneumatolytic ore 10 425
primary deposits 9 376
prospecting methods 11 19 24
regional metamorphism deposits 9 380 381
replacement 9 377
residual *deposits* 9 380
secondary deposits 9 376
sedimentary deposits 9 379 380
sequence of deposition 9 381
source and transport of ores 9 382
sulfide phase *equilibria* 13 246
supergene deposits 9 376
syngenetic deposits 9 376
taconite 13 386
temperatures of formation 6 128
thorium reserves 9 186 187
uranium reserves 9 186-187
veins 9 376 377
wall rock alteration 9 379
zoning of mineralization 9 379
see also Mineral Ore deposits, geochemistry of, and entries under specific ores and minerals
Ore assay value 8 497 498
Ore carrier 12 255
launching (illustration) 12 289
Ore deposits, geochemistry of 9 383 388
composition of fluid 9 386
current trends in investigation 9 388
environment of ore deposition 9 386 387
mechanisms of ore transport and deposition 9 387 388
mineral and chemical composition 9 383
ore forming fluids 9 383 385
oxidation and secondary enrichment 9 388
pressure of the fluids 9 386
source of metals 9 383 385
temperatures of deposition 9 386
zoning and paragenesis 9 383 386
see also Ore and mineral deposits, Silicate phase equilibria, Sulfide phase equilibria
Ore dressing 9 388 391
beneficiation 9 389 391
crushing and pulverizing 5 557
flotation 5 312 315
lead metallurgy 7 431-432
magnetic separation methods 8 46-47
severance 9 388 389
Oreamnos americanus 6 227
Orectolobidae 12 157
Oredont 1 568
Oregano 12 613
Oregon Coast Range 9 162
Oregoniateuthis springer 4 107
Oreophrynella quelchi 10 638
Oreopithecus 10 590
Organ electronic 8 667
Organ Hammond 8 667
Organ pipe 8 667
Organ of Berlese 6 400 410
Organ of Corti 4 322 6 352
Organ of Leydig 7 630
Organ of Ribaga 6 400 410
Organ pipe coral 13 581
Organelles 2 587
Organic acids (plants) 10 353-355
acid metabolism of the succulents 10 354 355
functions 10 353 354
Organic chemical synthesis 9 391-392
Organic chemical synthesis—*cont*
addition reactions 9 391 392
biochemistry 2 199
condensation reactions 9 392
displacement reactions 9 391
elimination reactions 9 392
ethyl acetoacetate 5 87 89
ethyl malonate 5 91 93
Grignard reaction 6 269 271
polymerization reactions 9 392
rearrangement reactions 9 392
sources 10 43
substitution reaction 9 391
Organic chemistry 9 392 398
chemical symbols and formulas 5 43
resonance (molecular structure) 11 502 504
see also Carbon
Organic coating protective 15 311 312
Organic coenzyme 4 206
Organic compounds heterocyclic compounds 6 427-429
origin of 7 497
origin of life 7 497
Organic crystal 5 26
Organic *evolution* 5 130 135
Organic inhibitor 7 112
Organic liquids 11 223
Organic matter petroleum 10 56
Organic peroxides 10 29
carbanion 2 449
carbonium ion 2 472
condensation reaction 5 573 577
electrophilic and nucleophilic reagent 4 526
heterolytic reactions 9 400
homolytic reactions 9 399 400
substitution *reaction* 15 229 230
Organic phosphorus chemicals 7 141
Organic quantitative analysis 9 398 399
Organic reaction mechanism 9 399 400
Organic *reef* 9 401* 11 389
barrier reef 2 103
bioherm 2 207
Organic scintillator *see* Scintillation counter
Organic selection 8 13
Organism living *first type of* 7 496 499
free energy source 7 498
Organism, living—*cont*
origin of 7 496 499
Organization cell *see* Cell organization
Organizer, embryonic *see* Embryonic organizer
Organoalkali compounds 9 402
Organoarsenic compound 9 401
chemical warfare 5 46
Organoboron compounds 9 403
Organocadmium compound 6 271, 9 403
Organocadmium reagents 7 339
Organochlorine compounds 5 73 76
Organochlorosilane 12 323 324
Organofluorine compound 5 333 335
Organogold compounds 6 231
Organoindium compound 9 403
Organoleptic analysis 5 71
Organolithium compounds 5 576, 7 545
Organomagnesium halide 6 269, 9 403
Organomercury compounds 9 403
Organometallic compound 7 119, 9 401-404*
condensation reaction 5 573 577
Grignard reaction 6 269 271
Indium 7 62
Reformatsky reaction 11 403
tetraethyllead 15 529
thallium 15 541 545
tin 15 619
Organophosphorus compound 9 404 405
chemical warfare 5 46
insecticide 7 141 142
Organopolysiloxane *see* Silicone resins
Organorubidium compounds 11 648
Organoselenium compounds 12 165
Organosilicon compounds silicon 12 322
silicone resins 12 324
Organosiloxane 12 323-324
Organosulfur compound 9 405 406
chemical warfare 5 46
chloramine T 5 66
disulfide 4 259
mercaptan 8 228
olefin sulfide 9 312
polysulfide resins 10 491
saccharin 12 1
sulfamic acids 15 245
sulfanilic acid 15 245
sulfenyl chlorides 13 245
sulfinic acid 15 251

Optical instruments—*cont*
binoculars 2 192
diffraction grating 4 139-141
eyepiece 5 173
ghost images 6 183 184
gun sights 6 298 299
interferometer 4 136, 7 190 191
rangefinder 11 338-340
resolving power 11 499-500
Schmidt camera 12 68
spectroscope 12 589 590
spherical and aspheric surfaces 12 608 609
telescope 13 448-452
tracking instruments 9 358-362
see also Astronomical instruments
Optical interferometer 7 190
Optical isomerism 9 346-348
complex compounds 3 335
Optical lantern 7 309
Optical lens *see* Lens, optical
Optical materials 9 350 353
chromatic aberration 3 89 91
crystalline materials 9 353
dispersion 9 350 352
glass and glass products 6 209
optical fibers 9 318 349
optical glass 9 350 353
reflection 11 391
refractive index 9 350 352
Optical methods of chemical analysis 9 355
colorimetric analysis 3 301
fluorimetric analysis 5 351
nephelometric analysis 9 39 40
polarimetric analysis 10 437
refractometric analysis 11 408 409
spectrophotometric analysis 12 586
Optical microscope *see* Microscope optical
Optical parameter 11 127
Optical prism *see* Prism, optical
Optical projection 11 1 3
Optical pyrometer 11 126 127
range 11 127
temperature measurement 13 486
Optical rangefinder *see* Range finder, optical
Optical recording 9 353 358
cinematography 3 124-129
distortion and noise in reproduction 9 357
film developing and printing 9 356
Optical recording—*cont*
film transport mechanism 9 355-357
modulator 9 354 355
monophonic system 9 353 357
sound track 9 353-358
stereophonic system 9 357-358
Optical rotatory dispersion 10 447
Optical sensitizing of photographic film 10 157
Optical sound head motion picture projectors 3 124
Optical spectrum 9 362
Optical surfaces 12 609
aspheric 1 591, 12 608 609*
spherical 12 608 609
testing of, by interference 7 187
Optical systems chromatic aberration 3 89 91
geometrical optics 9 363 369
images 7 29 31
Optical tracking instruments 9 358 362
astronomical photography 1 615
ballistic cameras 9 360 362
cinetheodolites 9 358 362
spatial position determination 9 359 360
tracking telescopes 9 360 362
Optical view finder *see* View finder optical
Optics 9 362 369* 13 548
crystal 5 587 592
electron 4 514
electrooptics 4 625
geometrical 9 363 369
light 7 499 507
microwave 8 416 418
mirror 8 507
neutron 9 91
physical 9 369
refraction 11 405 408
Optics, geometrical 9 363 369
aberration 1 3 7
afocal systems 9 365
characteristic function 9 363 364
conjugate points 9 365
diffraction 9 369
focal length 5 366
Gaussian optics 9 364 366
image error theory 9 366 368
interpolation theory 9 369 369
mirror optics 8 506 510
off axis points 9 366
optical images 7 29 31
optical lenses 7 451 454
Optics, geometrical—*cont*
optical projection systems 11 1-3
point source 9 363
reflection and refraction laws 9 363
spherical and aspheric surfaces 12 608 609
telescope 13 448-452
types of optical systems 9 365 366
Optics, physical 9 369
Raman effect 11 332-334
Optimization, dynamic 3 51
Optimization, static 3 51
Optype 3 348
Opuntia 3 190, 10 372, 13 124
Opuntia camanchica 11 621
Opuntia cylindrica 8 240
Opuntiales 9 369*, 10 346
cactus 2 386
O rings 6 68
OR circuit cryotron 3 577
digital computer 4 178 181
OR function 13 358
OR gate switching circuit 13 345
Oraefajokull 1 523
Oral gland 9 369-370
development 9 370
oral glands in mammals 9 369 370
secretions 9 370
Oral pathology 4 65
Oral surgery 4 61
Orange 9 370 371
Orange 11 7 60
Orange oil 5 71
Orange peel grab bucket 6 243
Orange pigments 10 224
Orange River 1 109
Orange spectrometer 2 182 183
Orange tip 7 461
Orangutan 9 371
Orb weaving spider 1 559
Orbitoidae 10 461
Orbit artificial satellite 12 32 36
circular 12 545
elliptical 12 545
Orbit celestial celestial mechanics 2 580 585
of comets 3 511 515
perturbation (astronomy) 10 37
Orbital (wave function) 4 515
Orbital angular momentum of electron 4 516 518
quantum theory nonrelativistic 11 175
quenching 9 550
Orbital hybridization 3 458
Orbital motion 9 371 372
aphelion 1 490
apsides 1 495
artificial satellites 12 32 36
Orbital motion—*cont*
binary stars 2 186-191
celestial mechanics 2 580 585
cosmogony 3 509
of Earth 4 536 537
elliptical orbits 9 371 372
hyperbolic orbits 9 372
orbital velocity 9 372
Orbital quantum number 11 162
Orbital velocity 9 372
Orbitoididae 5 435
Orbitolinidae 5 431
Orchard oriole 9 407
Orchelimum vulgare 6 281
Orchid 9 372 373
Orchidaceae 9 372, 373 10 336
climax plant formations 3 186 192
Orchidales 9 373*, 10 336
Orchids 2 201
Orchil 7 495
Orchitis 8 632, 11 481
Orcinus 8 13
Oreonectes limosus 4 30
Ordal, E. J. 7 373
Order (crystals) 1 264 265
Order (taxonomy) 13 404
Order disorder (alloys) 1 264 265
Order disorder in crystals 12 127
Order of reaction (chemical) 7 355-356
Ordered state crystal defects 3 581
Ordering set theory 12 205
Ordering magnetic 1 469 470
Ordinary differential equations 4 126
Ordinary index crystal optics 3 590
Ordinary linear second-order equations 4 127
Ordinary ray crystal optics 3 588
Ordovician 6 136 142, 9 373 376*
animal life 9 521
deformation in North America 9 375
life 9 374 375
plant life 9 501
rocks 9 373 374
tectonic provinces 9 376
Ordway, F. J. 5 580
Ore 8 441
assaying 1 599
estimation 8 498
processing 8 276 278
sampling 8 497 498
storage at mines 8 495 496
Ore and mineral deposits 9 376 393
chemical evaporites 9 389
chimneys 9 377

Oscillograph—*cont*
direct writing 9 426
electrocardiograph 9 426
electromagnetic oscillograph 9 426
light beam 9 426
optical system 9 426
see also Oscilloscope, cathode ray Recording instruments, graphic
Oscillographic polarography 10 455
Oscilloscope cathode ray 5 508 9 425 432*
attenuators and gain controls 9 428
bandpass 9 429
basic elements 9 427
calibrated sweeps 9 430
cathode ray tube 2 554-560*, 9 428
dc amplifiers 9 428
deflection sensitivity 9 428
differential input amplifiers 9 428
distortion 9 429
dual trace oscilloscopes 9 430
electrical measurements 9 431
electron motion in 4 513 514
frequency measurement 9 431
high speed 9 431
horizontal sweep 9 429
linear sweep generation 13 334
Lissajous figures 7 542 543
phase angle measurement 10 107
phase difference measurement 9 431 432
photography of 2 559 560* 9 349 432
precision sweep delay 9 430
rise time 9 429
signal amplifier 9 428
signal delay networks 9 429
speed of response 9 426
sweep amplifiers 9 430
sweep generator 9 429
sweep waveform generator 9 430
switch electronic 13 343-344
synchronization 9 429
synchroscope 13 373
time interval measurement 9 430
time marker 9 430
trigger selector and amplifier 9 429
triggered sweep 9 429
unblanking circuits 9 430
use in sonar 12 503 504
Oscilloscope, cathode ray—*cont*
voltage measurement 9 432
Oscillospira guillermondi, Chatton et Perard 2 536
Oscillospiraceae 2 536
Osculating plane 6 151
Osgood W F 3 340, 396
Oshima Volcano 14 353
Oslo Fiord 5 115
Osmate 9 433
Osmeridae 12 386
Osmerus mordax 12 386
Osmiridium 9 432
platinum ore 10 411
Osmium 9 432 433
analytical techniques 9 433
electron configuration 4 504
extractive *metallurgy* 8 278
ionization potential 4 504
metallurgical extraction 9 433 10 411 412
principal compounds 9 433
properties 9 432-433
uses 9 432
Osmoregulatory mechanisms 9 433-441
biological mechanisms 9 433 434
countercurrent systems 9 438 439
dependence on membrane properties 9 345 436
electroosmosis 9 440
evolution 9 453
filtration across capillaries 9 437
fixed ionic charges 9 436
forced ionic exchange and carrier systems 9 435
Franck Mayer hypothesis 9 438
Gibbs Donnan forces 9 436 437
hydrostatic forces 9 436 437
lipid pore concept 9 436
mechanisms of water transport 9 436 441
membrane permeability 9 436
miscellaneous forces related to water transport 9 440-441
neurohormonal control systems 9 441
osmotic gradient in plant cells 9 437-439
oxidation reduction systems 9 434 435
plasmolysis 9 439 440
resin network 9 436
transport processes 9 434 436
Osmosis 9 441
electroosmosis 4 526
Osmosis—*cont*
molecular weight determination 8 557 558*, 10 477
solution 12 499
Osprey 5 178 6 345
Ossein 12 552
Ossification 2 284
bone centers 12 353
endochondral 12 352
intracartilaginous 12 352
intramembranous 12 352
Osseous elements, formation of 12 352
Ostariophysi *see* Cypriniformes 9 442
Osteichthyes 1 415, 420, 9 442* 12 360
Actinopterygii 1 57 58* 9 442
classification 9 442
fossils 9 442 446
phylogeny 9 442
Sarcopterygii 9 442, 12 29*
Osteichthyes fossils 9 442-446
Actinopterygii 1 57 58* 9 443
Chondrostei 9 443
classification 9 443
coelacanths 9 445
Crossopterygii 3 555* 9 445 446
Dipnoi 4 210 211* 9 446
Holostei 9 443
rhipidistians 9 445
Sarcopterygii 9 445 12 29*
Teleostei 9 443
Osteitis fibrosa 12 369
Osteitis fibrosa cystica 9 561
Osteoarthritis 1 534
joint (anatomical) disorders 7 315
Osteoblast 12 352 364
Osteochondroma 12 369
Osteochondrosis deformans tibia 12 368
Osteocyte 12 364
Osteogenesis imperfecta 12 368
Osteogenic cell 12 352
Osteogenic sarcoma 9 320
Osteoglossid 3 223
Osteolaemus 3 552
Osteolepidoti *see* Osteolepiformes
Osteolepiformes 3 555, 9 442, 446
Osteolepis 12 48
Osteolepis macrolepidotus 9 446
Osteoma 9 320
Osteomalacia 12 369
rickets 13 567
vitamin D deficiency 14 343
Osteometry 1 461
Osteomyelitis 1 466 467, 9 446, 12 368, 13 36 38
myiasis 8 680
Osteon 2 283, 12 365
Osteopetrosis 1 695, 12 368
Osteopoikilosis 12 368
Osteosclereids 12 145
Ostracoda 1 420 2 633, 9 446*
Osterhout R 9 455
Osterlagia 13 193
Osterlagia circumcincta 12 247
Ostiole 12 606
Ostomidae 3 277
Ostracoda 1 560 561, 3 562, 9 447 449*
Cladocopa 3 151 152*, 562 9 447
fossil 9 448 449
morphology 9 447 448
Myodocopa 3 562 8 681 682*, 9 447
Paleocopa 9 447 510 511*
Platycopa 9 447 10 412
Podocopa 9 447, 10 429 430*
production and development 9 448
Ostracoderm 1 414 9 449*
Heterostraci 6 430 431
Ostracods fossil 9 448 449
Ostracum 8 560
Ostrea edulis 9 476
Ostrea gigantea 9 476
Ostrea lurida 9 476 12 236
Ostrea virginica 9 476
Ostreidae 1 427
Ostrich 9 449* 13 206
Ostrya 5 178
Ostrya knowltoni 6 479, 7 268
Ostrya virginiana 6 479 7 268
Ostwald W 1 39
Ostwald's *dilution law* 4 486
Ostwald process 9 105
Ostwald theory 1 39 40
Ostwald viscometer 14 353
Otaia 11 93
Otariidae 2 525, 12 98, 122
Othnidae 3 276
Otic capsule 12 358
Otitid fly 4 212
Otitidae 4 212 6 286
Otitis media 1 466 467
Otobius megnini 7 298
Otoceras woodwardi zone 14 82
Otocryptops sexspinosa 3 61
Otodectes cynotis 12 30
Otolith 5 48 12 249
phonoreception 10 125
Otomycosis 1 589
Otopheidomenidae 8 253
Otopheidomenis zalestes 7 472
Otter 9 449-450
Otto N A 7 196 9 450
Otto cycle 9 450 451
air standard cycle 9 451
four-stroke cycle 9 450

Organosulfur compound—*cont*
sulfonamide 13 251
sulfonation 13 252
sulfone (chemical) 13 253
sulfonic acid 13 253 254
sulfonyl chloride 13 254
sulfoxide 13 254
thiazole 13 599 601
thio compounds 13 603
thioaldehyde and thioketone 13 603 604
thioether 13 605
thiophene 13 606
see also Sulfur
Organotin compounds 13 619
Organozinc compounds 3 376, 6 271, 9 403
Reformatsky reaction 11 403
Organozinc reagent 7 339
Organs of Zuckerkandl 1 488
Oribatei 12 29
Oribatulidae 12 30
Oriental arborvitae 1 500
Oriental cockroach 9 416
Oriental lacquer 7 376
Oriental peach moth 7 472
Oriental pearl 9 606
Oriental rat flea 12 341
Oriental region 14 622
fauna 14 622
Oriental rice borer 7 472
Oriental roach 3 251
Oriental sore 4 218
Oriental topaz 13 676
Orientation polarization 10 447
Orifice 9 406
flow measurement 5 315 317
jet flow 7 305
Orinoco crocodile 3 552
Orinoco River 8 134, 12 529
O rings 6 68
Oriole 9 407
Orion 3 412 413 9 23, 402*
Orion Nebula 9 24 27 402*
Orion variable stars 14 279
Orionids 6 322, 8 308
Oriskany sand 9 290
Orius 6 408
Orleans vinegar process 14 325
Orlon 5 214
dyeing 4 310
Ormer 1 2 3
Ormyridae 6 571
Ornamental plant 9 407 408
diseases of ornamental herbs 9 408
diseases of ornamental shrubs 9 408
Ornamental stone 13 151-152
Ornecidae 7 461
Ornithadoros 11 426
Ornithine 1 529 2 46, 14 215
excretion 5 137 143
nitrogen excretion 9 113
transcarbamylase 9 112
Ornithine—*cont*
tyrothricin 14 177
Ornithischia 4 200 201, 11 481
Ankylosauria 11 481
Archosauria 1 521
Ceratopsia 11 481
Jurassic 7 527
Ornithopoda 11 484
Stegosauria 11 484
Ornithoros 6 408
Ornithodoros coriaceus 7 298
Ornithodoros hermsi 7 298
Ornithodoros moubata 7 298
Ornithodoros rudis 7 298
Ornithodoros talaje 7 298
Ornithodoros tholozani 7 298
Ornithodoros turicata 7 298
Ornithogalum tempskyanum 12 228
Ornithonyssus bacoti 8 253
Ornithopoda 11 484
Ornithopter 9 408 409
aerodynamic speed limit 9 409
designs 9 409
efficient flight 9 408
flight tests 9 409
see also Aircraft
Ornithorhynchus 8 584, 13 590 674
Ornithorhynchus anatinus 11 51
Ornithosis 11 70
Ornithosuchus 11 484, 13 546
Orobanche 13 664
Orogeny 9 409 414
continental drift hypothesis 9 412
contracting earth hypotheses 9 411 412
convection currents hypothesis 9 412 413
crumpling of surface rocks 9 410
diastrophism 4 103
distribution of mountains 9 410
geosynclines 9 410
gravitational sliding 9 413
island arcs 9 411
Permian 10 27
regional compression 9 412
rock metamorphism and igneous intrusion 9 411
sedimentation (geology) *12 142*
see also Tectonic patterns
Tectonophysics
Orographic precipitation 6 561
Orographical snow line 12 392
Oropharynx 8 619
Orotidine 5′ phosphate 2 59
Orova fever 2 552, 4 218
Orozuzkites 5 291
Orphington 3 58
Orpiment 1 350 9 412*
Orsat apparatus 6 46
Orthacoustic recording characteristic 4 238
Orthaspidotherium 3 394
Orthesia insignis 6 475
Orthite 1 255
Orthoacetate 9 414
Orthoacetic acid 1 50
Orthoarsenic acid 1 550
Orthoarsenite 1 551
Orthoboric acid 2 292
Orthocarbonate 9 413
Orthocenter 3 140
Orthochromatic film 10 157
Orthoclase 5 210 211, 9 413*, 12 476
feldspar species 5 207
Orthocresolphthalein 7 60
Orthodontia 4 64
Orthodromes 6 267
Orthoester 9 413-414
Orthoferrite 5 219 220
Orthoferrosilite 11 129
Orthoformate 9 414
Orthogneiss 6 226
Orthogonal coordinate transformations 12 557
Orthogonal polynomials 9 414 415
Orthogonality 11 166
Orthogonalized plane wave method 2 93
Orthographic representation 4 609
Orthographic view 4 70
Orthographus 6 259
Orthohydrogen 6 541 545
Orthohydroxyphenylmercuric chloride 1 485
Orthonectida 8 253, 9 415*
Orthonema 9 609
Orthoperidae 5 278
Orthophosphate 10 151
Orthophosphate esters 10 156
Orthophosphite ion 10 151
Orthopidae 6 499
Orthoptera 7 151 159 9 416 418* 12 229
cockroach 3 251 252
cricket 3 547
families of orthoptera 9 416-418
grasshopper 6 261
katydid 7 551
mantis 8 93 94
Orthoptroxene 9 410
Orthoquartzite 9 418*, 12 211
mineral cements 9 418
mineral composition 9 418
Orthorhombic crystal system 3 601 605
Orthorhombic lattice 3 591 595
Orthorhombic pyroxene 9 419
Orthorhapha 4 212
Orthoschists *see* Schist
Orthoscopic eyepiece see Eyepiece
Orthostatanates 13 632
Orthotropic materials 4 42
Ortler group 3 117
Orton, E. Jr. 11 127
Orussidae 6 574
Orussus 6 576
Orvicular structure 7 11 13
Oryctenopus viper 14 133
Oryctenopus gaudys 14 133
Oryza sativa 11 562
Oryzomys 11 345
Oryzopsis 3 190
Os priapi 9 621
copulatory organ 3 472 473
Osage-orange 9 419
Osagian stage 2 473
Osborne, T. 1 417
Osbornite 8 513
Oscarella 4 53 56, 6 456 10 516
Oscillation 9 419
anharmonic oscillator 1 407
atomic 1 17, 407
center of 9 617
control systems 3 435
damped 4 11 12 9 419
damping 4 11 13
due to instabilities 7 11 14
forced see Forced oscillation
free 5 457, 9 419
harmonic motion 6 541 542
motorboating 8 616
parasitic 9 554
vacuum tube amplifier 1 347
vibration 14 311
Oscillator, electrical 9 413 42
basic principles 9 419
blocking *see* Blocking oscillator
feedback 5 290
harmonic 9 419 425
Hartman 4 495
microwave *see* Microwave tube
relaxation *see* Relaxation oscillator
Oscillator, mechanical anha
atomic 1 407
atomic 1 17
energy of 14 312
forced oscillation 5 45
458
harmonic see Harmo
oscillator, mechanical
signal generator 12 309
vibration 14 311
Oscillatoria 1 402 2 131 3 65
11 47, 453 12 67
Oscillatoria erythraea 8 129
Oscillatory waves (liquids)
14 452 453
Oscillograph 9 426
aircraft testing 1 191
cathode ray 9 426 442

Oscillograph—*cont*
direct writing 9 426
electrocardiograph 9 426
electromagnetic oscillograph 9 426
light beam 9 426
optical system 9 426
see also Oscilloscope, cathode ray, Recording instruments, graphic
Oscillographic polarography 10 455
Oscilloscope, cathode ray 5 508 9 426-432*
attenuators and gain controls 9 428
bandpass 9 429
basic elements 9 427
calibrated sweeps 9 430
cathode ray tube 2 554 560* 9 428
dc amplifiers 9 428
deflection sensitivity 9 428
differential input amplifiers 9 428
distortion 9 429
dual trace oscilloscopes 9 430
electrical measurements 9 431
electron motion in 4 513 514
frequency measurement 9 431
high speed 9 431
horizontal sweep 9 429
linear sweep generation 13 334
Lissajous figures 7 542 543
phase angle measurement 10 107
phase difference measurement 9 431 432
photography of 2 559 560*, 9 349 432
precision sweep delay 9 430
rise time 9 429
signal amplifier 9 428
signal delay networks 9 428
speed of response 9 426
sweep amplifiers 9 430
sweep generator 9 429
sweep waveform generator 9 430
switch electronic 13 343 344
synchronization 9 429
synchroscope 13 373
time interval measurement 9 430
time marker 9 430
trigger selector and amplifier 9 429
triggered sweep 9 429
unblanking circuits 9 430
use in sonar 12 503 504
Oscilloscope cathode ray—*cont*
voltage measurement 9 432
Oscillospira guillermondi, Chatton et Perard 2 536
Oscillospiraceae 2 536
Osculating plane 6 151
Osgood, W. F. 3 340 396
Oshima Volcano 14 353
Oslo Fiord 5 115
Osmate 9 433
Osmeridae 12 386
Osmerus mordax 12 386
Osmiridium 9 432
platinum ore 10 411
Osmium 9 432 433
analytical techniques 9 433
electron configuration 4 504
extractive metallurgy 8 278
ionization potential 4 504
metallurgical extraction 9 433 10 411 412
principal compounds 9 433
properties 9 432 433
uses 9 432
Osmoregulatory mechanisms 9 433 441
biological mechanisms 9 433 434
countercurrent systems 9 438 439
dependence on *membrane properties* 9 345 436
electroosmosis 9 440
evolution 9 433
filtration across capillaries 9 437
fixed ionic charges 9 436
forced ionic exchange and carrier systems 9 435
Franck-Mayer hypothesis 9 438
Gibbs-Donnan forces 9 436 437
hydrostatic forces 9 436 437
lipid pore concept 9 436
mechanisms of water transport 9 436 441
membrane permeability 9 436
miscellaneous forces related to water transport 9 440 441
neurohormonal control systems 9 441
osmotic gradient in plant cells 9 437 439
oxidation-reduction systems 9 434 435
plasmolysis 9 439 440
resin network 9 436
transport processes 9 434 436
Osmosis 9 441
electroosmosis 4 526
Osmosis—*cont*
molecular weight determination 8 337 558* 10 477
solution 12 498
Osprey 5 178 6 315
Ossein 12 352
Ossification 2 284
bone centers 12 353
endochondral 12 352
intracartilaginous 12 352
intramembranous 12 352
Osseous elements, formation of 12 352
Ostariophysi *see* Cypriniformes 9 442
Osteichthyes 1 415, 420, 9 442* 12 360
Actinopterygii 1 57 58* 9 442
classification 9 442
fossils 9 442 446
phylogeny 9 442
Sarcopterygii 9 442, 12 29*
Osteichthyes fossils 9 442 446
Actinopterygii 1 57 58* 9 443
Chondrostei 9 443
classification 9 443
coelacanths 9 445
Crossopterygii 3 555* 9 445 446
Dipnoi 4 210 211* 9 446
Holostei 9 445
rhipidistians 9 445
Sarcopterygii 9 445 12 29*
Teleostei 9 445
Osteitis fibrosa 12 369
Osteitis fibrosa cystica 9 561
Osteoarthritis 1 554
joint (anatomical) disorders 7 315
Osteoblast 12 352 364
Osteochondroma 12 369
Osteochondrosis deformans tibia 12 368
Osteocyte 12 364
Osteogenesis imperfecta 12 368
Osteogenic cell 12 352
Osteogenic sarcoma 9 320
Osteoglossid 3 223
Osteolaemus 3 552
Osteolepidoti *see* Osteolepiformes
Osteolepiformes 3 555 9 442, 446
Osteolepis 12 48
Osteolepis macrolepidotus 9 446
Osteoma 9 320
Osteomalacia 12 369
rickets 11 567
vitamin D deficiency 14 343
Osteometry 1 461
Osteomyelitis 1 466 467, 9 446, 12 368 13 36 39
myiasis 8 690
Osteon 2 283, 12 365
Osteopetrosis 1 695 12 368
Osteopoikilosis 12 368
Osteosclerosis 12 145
Osteostraci 1 420 2 613, 9 446*
Osterhout, R. 9 435
Osteriagia 13 193
Osteriagia circumcincta 12 247
Ostiole 12 606
Ostomidae 3 277
Ostracoda 1 560 561, 3 562, 9 447 449*
Cladocopa 3 151 152*, 562 9 447
fossil 9 448 449
morphology 9 447 448
Myodocopa 3 562, 8 681 682*, 9 447
Paleocopa 9 447, 510 511*
Platycopa 9 447 10 412
Podocopa 9 447, 10 429 430*
production and development 9 448
Ostracoderm 1 414 9 449*
Heterostraci 6 430 431
Ostracods fossil 9 448 449
Ostracum 8 560
Ostrea edulis 9 476
Ostrea gigantea 9 476
Ostrea lurida 9 476 12 236
Ostrea virginica 9 476
Ostreidae 1 427
Ostrich 9 449* 13 206
Ostrya 5 178
Ostrya knowltoni 6 479 7 268
Ostrya virginiana 6 479, 7 268
Ostwald, W. 1 39
Ostwald's dilution law 4 486
Ostwald process 9 105
Ostwald theory 1 39 40
Ostwald viscometer 14 353
Otala 11 93
Otariidae 2 523, 12 99 122
Othnidae 3 276
Otic capsule 12 358
Otitid fly 4 212
Otitidae 4 212 6 286
Otitis media 1 466 467
Otobius megnini 7 298
Otoceras woodwardi zone 14 82
Otocryptops sexspinosa 3 61
Otodectes cynotis 12 50
Otolith 5 48, 12 249
phonoreception 10 125
Otomycosis 1 599
Otopheidomenidae 8 253
Otopheidomenis zalestes 7 472
Otter 9 449-450
Otto, N. A. 7 196, 9 450
Otto cycle 9 450 451
air standard cycle 9 451
four-stroke cycle 9 450

Organosulfur compound—cont.
sulfonamide 13 251
sulfonation 13 252
sulfone (chemical) 13 253
sulfonic acid 13 253-254
sulfonyl chloride 13 254
sulfoxide 13 254
thiazole 13 599 601
thio compounds 13 603
thioaldehyde and thioketone 13 603 604
thioether 13 605
thiophene 13 606
see also Sulfur
Organotin compounds 13 619
Organozinc compounds 3 376, 6 271, 9 403
Reformatsky reaction 11 403
Organozinc reagent 7 339
Organs of Zuckerkandl 1 488
Oribatei 12 29
Oribatulidae 12 30
Oriental arborvitae 1 500
Oriental cockroach 9 416
Oriental lacquer 7 376
Oriental peach moth 7 472
Oriental pearl 9 606
Oriental rat flea 12 344
Oriental region 14 622
fauna 14 622
Oriental rice borer 7 472
Oriental roach 3 251
Oriental sore 4 218
Oriental topaz 13 676
Orientation polarization 10 417
Orifice 9 406
flow measurement 5 315 317
jet flow 7 305
Orinoco crocodile 3 552
Orinoco River 8 134, 12 529
O rings 6 68
Oriole 9 407
Orion 2 412 413 9 23 407*
Orion Nebula 9 24 27, 407*
Orion variable stars 14 279
Orionids 6 322, 8 308
Orinkany sand 9 290
Orius 6 408
Orleans vinegar process 14 525
Orlon 5 244
dyeing 4 310
Ormer 1 2-3
Ormyridae 6 574
Ornamental plant 9 407 408
diseases of ornamental herbs 9 408
diseases of ornamental shrubs 9 408
Ornamental stone 13 151 152
Ornesidae 7 461
Ornighoderes 11 426
Ornithine 1 529 2 46, 14 215
excretion 5 157 143
nitrogen excretion 9 113
transcarbamylase 9 112
Ornithine—cont.
tyrothricin 14 177
Ornithischia 4 200 201, 11 481
Ankylosauria 11 483
Archosauria 1 521
Ceratopsia 11 484
Jurassic 7 327
Ornithopoda 11 481
Stegosauria 11 484
Ornithocoris 6 408
Ornithodoros coriaceus 7 298
Ornithodoros hermsi 7 298
Ornithodoros moubata 7 298
Ornithodoros rudis 7 298
Ornithodoros talaje 7 298
Ornithodoros tholozani 7 298
Ornithodoros turicata 7 298
Ornithogalum tenuifolium 12 228
Ornithonyssus bacoti 8 253
Ornithopoda 11 481
Ornithopter 9 408 409
aerodynamic speed limit 9 409
designs 9 409
efficient flight 9 408
flight tests 9 409
see also Aircraft
Ornithorhynchus 8 584, 13 590 673
Ornithorhynchus anatinus 11 51
Ornithosis 11 70
Ornithonyssus 11 481 13 546
Orobanche 13 664
Orogeny 9 409 413
continental drift hypothesis 9 412
contracting earth hypotheses 9 411 412
convection currents hypothesis 9 412 413
crumpling of surface rocks 9 410
diastrophism 4 103
distribution of mountains 9 410
geosynclines 9 410
gravitational sliding 9 413
island arcs 9 411
Permian 10 27
regional compression 9 412
rock metamorphism and igneous intrusion 9 411
sedimentation (geology) 12 142
see also Tectonic patterns
Tectonophysics
Orographic precipitation 6 561
Orographical snow line 12 392
Oropharynx 8 619
Orotidine 5' phosphate 2 59
Orova fever 2 532 4 218
Orozeuktes 5 291
Orphington 3 58
Orpiment 1 550 9 412*
Orsat apparatus 6 46
Orthoacoustic recording characteristic 4 258
Orthaspidotherium 3 391
Orthesia insignis 6 475
Orthite 1 255
Orthoacetate 9 414
Orthoacetic acid 1 50
Orthoarsenic acid 1 550
Orthoarsenite 1 551
Orthoboric acid 2 292
Orthocarbonate 9 413
Orthocenter 3 130
Orthochromatic film 10 157
Orthoclase 5 210 211, 9 413* 12 476
feldspar species 5 207
Orthocresolphthalein 7 60
Orthodontia 4 64
Orthodromes 6 267
Orthoester 9 415 414
Orthoferrite 5 219 220
Orthoferrosilite 11 129
Orthoformate 9 414
Orthogneiss 6 226
Orthogonal coordinate transformations 12 557
Orthogonal polynomials 9 414 415
Orthogonality 11 166
Orthogonalized plane wave method 2 93
Orthographic representation 4 609
Orthographic view 4 70
Orthogriptus 6 259
Orthohydrogen 6 544 545
Orthohydroxyphenylmercuric chloride 1 483
Orthonectida 8 253 9 415*
Orthonema 9 609
Orthoperidae 3 278
Orthophosphate 10 151
Orthophosphate esters 10 156
Orthophosphate ion 10 151
Orthopsidae 6 399
Orthoptera 7 151 159, 9 416 418* 12 229
cockroach 3 251 252
cricket 3 547
families of orthoptera 9 416 418
grasshopper 6 261
katydid 7 551
mantis 8 85 86
Orthoptroxene 9 419
Orthoquartzite 9 418* 12 241
mineral cement 9 418
mineral composition 9 418
Orthorhombic crystal system 3 601 605
Orthorhombic lattice 5 591 595
Orthorhombic perovskite 9 419
Orthorrhapha 4 212
Orthoschista see Schist
Orthoscopic eyepiece see Eye piece
Orthotitanates 13 632
Orthotropic materials 4 422
Ortller group 3 117
Orton, E. Jr. 11 127
Orussidae 6 574
Orussus 6 576
Orvicular structure 7 [illegible]
Oryctenopus afer 14 133
Oryctenopus gaudini 14 133
Oryza sativa 11 562
Oryzomys 11 545
Oryzopsis 3 190
Os penis 9 621
copulatory organ 5 [illegible] 475
Osage orange 9 419
Osagian stage 2 471
Osborne, T. 1 417
Osbornite 8 515
Oscarella 4 35 36 6 476 10
Oscillation 9 419
anharmonic oscillator 1 407
atomic 1 17, 407
center of 9 617
control systems 5 435
damped 4 11 12, 9 419
damping 4 11 15
due to instability 7 145
forced see Forced oscillation
free 5 437 9 419
harmonic motion 6 311
motorboating 8 618
parasitic 9 554
vacuum tube amplifier 1 547
vibration 14 311
Oscillator electrical 9 419
basic principles 9 419
blocking see Blocking oscillator
feedback 5 290
harmonic 9 419 425
Hertzian 4 495
microwave see Microwave tube
relaxation see Relaxation oscillator
Oscillator, mechanical see atomic 1 407
atomic 1 17
energy of 14 312
forced oscillation 5 438
harmonic see Harmonic oscillator mechanics
signal generator 12 [illegible]
vibration 14 311
Oscillatoria 1 404 2 151 5 11 47 451 12 67
Oscillatoria erythraea 8 [illegible]
Oscillatory waves (liquids) 14 452 455
Oscillograph 9 426
aircraft testing 1 104
cathode ray 9 426 432

Oxygen—*cont*
isotope exchange reactions 6 151
isotopic composition 1 662
liquid 7 419
lowest rotational levels 8 551
occurrence 9 473
organic quantitative analysis 9 393
oxide 9 466 467
ozone 9 477-480
peroxide 10 29
production 1 637, 4 469, 9 474
properties 9 473-474
in steel manufacture 13 97-103
use 9 471 475
velocity of sound in 12 513
vibrational levels 8 550
water 14 387
Oxygen 18 ester structure 5 72 73
Oxygen breathing apparatus 8 570
Oxygen converters (cryogenics) 8 570
Oxygen cutting (metals) 14 469
Oxygen debt (respiration) 11 509
Oxygen difluoride 5 332
Oxygen electrode 4 472
Oxygen partial pressure 2 200
Oxygen recycling (space flight) 12 542
Oxyhalide 10 424
Oxyhemoglobin 6 411
oximetry 9 469
Oxyhornblende 3 336
Oxyhydrogen burner 9 472
Oxyhydrogen torch 6 544
Oxyluciferin 2 221
Oxyphil cell 9 559
Oxyrrhis 11 56
Oxyrrhis marina 8 169
Oxysperura mansoni 13 6 7
Oxystomata 4 34
Oxytetracycline 1 476 4 54 9 474 475*, 13 527
antibiotic 1 464 468
Oxytocin 4 235, 6 479, 9 629
amino acids 1 308
endocrine mechanisms 4 592
hormone neuro hypophyseal 6 485
lactation 7 377 378
ovary 9 455
Oxytocin—*cont*
pituitary gland 10 251
reproductive behavior 11 461
reproductive system 11 477
Oxytricha 6 508
Oxytropis 3 190
Oxytropus 10 439
Oxyura jamaicensis 4 291
Oxyurata *see* Oxyurina
Oxyuriasis 9 475
Oxyuridae 9 475
Oxyurina 1 571, 9 475*
Oxyuris equi 9 476
Oxyuris vermicularis 3 200
Oxyuroidea 9 475 476
general morphology 9 475
Heterakis gallinarum 9 476
life cycles 9 475
other species 9 476
Oxyuriasis 9 475 476
Probstmayria vivipara 9 476
Subulura brumpti 9 475
Oyashio Current 9 493
Oyster 1 427, 5 419 9 476 477*
culturing 9 477
habitat 9 476
harvesting and use 9 476
pearl oysters 9 477
Oyster—*cont*
reproduction 9 476
structure 9 476
Oyster beds 8 133
Oyster drill 9 477
Ozark Province 9 153
Ozarks 6 455
Ozokerite 9 477*, 14 443
Ozone 1 635 9 477 480*
atmosphere 1 627 629
atmospheric chemistry 1 635
bioclimatology 2 201
chemical oxidant 9 464
mesosphere origin 8 252
occurrence 9 478
preparation 9 478
production 4 467
properties and uses 9 477 478
sterilization 13 156
water treatment 14 401
Ozonide 9 478 479
sodium 12 409
Ozonization 9 479 480
industrial utilization 9 480
mechanism 9 479 480
technique 9 480
Ozonolysis 9 478 480

Otto cycle—*cont*
PV diagram 7 197
spark-ignition engine 7 197
two stroke cycle 9 450
Otto Lardillon method (trajectories) 2 81
Ottoia 1 431
Ottonia 5 98
Ottrelite 5 77
Ottrelite schists 10 202
Otus asio 9 460
Ouachita Mountains 9 153
Ouachita Province 9 153
Ouachita upland 9 151
Ouachitite 7 389-390
Oughtred, W 8 626
Oulangia 12 76
Oulujarvi, Lake 5 116
Ounce 8 188
Ouricury 14 443
Outer orbital complex 3 458
Outer space 12 537
detection of nuclear explosions 9 184
Outfitting (ships) 12 290
Outwash plains 10 262
Ovactis aequatorialis 2 654
Oval of Cassini 7 450
Ovalbumin 1 221, 11 40
Ovalipes ocellatus 4 55
Ovarian artery 1 487
Ovarian hormones 9 453
estrogens 9 453
progesterone 9 453
Ovary 4 236, 5 179, 9 451 455*
anatomy 11 468 469
estrus 9 454
flower 5 332
gonad 6 235
gonad organogenesis 11 464
hermaphroditism 6 424
histology 9 451 453*, 11 474
lactation 9 455
menstrual cycle 9 454
ovarian hormones 9 453
physiology 9 453-455
Ovary, comparative anatomy 11 468 469
Ovenbird 9 455*, 14 384
Overburden (mining) 8 472, 479
Overcurrent protection circuit breaker 3 135-136
electric protective devices 4 446-447
Overdamping *see* Damping
Overdominance hypothesis (heterosis) 6 430
Overdrive 9 455 456
automotive vehicle 1 688
controls 9 456
free-wheeling device 9 455
operation 9 455
overrunning clutch 9 455
planetary gear system 9 455
purpose 9 455
Overgrazing 3 185
Overhead trolley conveyors 3 450
Overhead valve engine 14 263
automotive 1 687
Overheating 6 519
Overmodulation 1 351
Overpotential *see* Overvoltage
Overrunning clutch 3 225
Overseas telephone service 10 624
Overt behavior 4 413
Overton, E 10 211
Overtone (music and acoustics) 9 456
Overvoltage 9 456 458
activation overvoltage 9 457-458
concentration overvoltage 9 457
decomposition potential 4 37
electrodeposition analysis 4 474
protection 4 447
see also Polarographic analysis
Ovex 8 518
Ovibos moschatus 8 668
Oviduct 11 478
Oviduct, comparative anatomy 11 469 470
Ovis musimon 12 244
Ovis orientalis 12 244
Ovivora thalassemae 11 58
Ovulation 6 235
endocrine mechanisms 4 597
reproductive system 11 474, 475
Ovule 12 144
flower (botany) 5 332
Ovulinia axaleae 9 408
Ovum 9 458 460
egg membranes 9 460
regulative and mosaic eggs 9 459 460
reproductive system 11 469
see also Flower (botany), Ovary
Owen Stanley Mountains 9 482
Owenia 10 463
Owenidae 10 462
Owens, R B 11 325
Owens Lake 9 163
Owl 9 460
Owl Creek Mountain 9 157
Owlet 7 464
Owlet nightjar 2 448
Oxa 6 428
1,2 5 Oxadiazole 1 703
Oxalate 5 74, 9 460*
Oxalate coating 8 284
Oxalic acid 2 475, 9 460 461*
wood chemicals 14 527
Oxalis 5 485, 7 436
Oxaloacetate 1 589
Oxaloacetic acid 2 17, 31, 245, 14 17
Krebs cycle 7 370
nitrogen excretion 9 113
Oxamide 1 303
Oxamycin *see* Cycloserine
1,2,3,5-Oxathiadiazine 6 428
1,4 Oxazine 8 598
Oxazine dye 4 303
Oxazole 1 702, 9 461-462*
1,2-Oxazole 1 702, 6 428
1,3 Oxazole 1 702
Oxazolidine 9 461
Oxazoline 9 461
5 Oxo-2-oxazoline 9 461
Oxbow lake 5 311
Oxen 2 561
Oxford, A E 6 274
Oxfordian stage 7 325
Oxidant chemical fuel 3 29
oxidation process 9 464
Oxidase 2 17
Oxidation aldehyde 1 228
alkane 1 250
biological *see* Biological oxidation
in electrochemical process 4 466
incomplete *see* Fermentation
beta Oxidation 7 534
Oxidation catalyst 2 548
Oxidation number 9 464 465*, 14 258
Oxidation ponds sewage disposal 12 218
Oxidation process 9 462 464
inorganic processes 9 462
organic processes 9 462 464
oxidant 9 464
oxygen 9 471
see also Biological oxidation, Fermentation Oxidation reduction
Oxidation reduction 9 464 466
acid and base 1 39 42
electrochemical process 4 469
electrochemistry 4 470
electrode potential 4 473
electrolysis 4 483
oxidation number 9 464 465
oxidizing agent 9 467 469
peroxide 10 29
photosynthesis 10 185
reactions 9 465 466
titration, potentiometric 13 660 661
Oxidation reduction enzymes 5 23
Oxidation reduction reactions authigenic minerals 1 674
titration 13 656
Oxide 9 466 467
calcium 2 398 399
carbon 2 463
Oxide—*cont*
cerium 2 655
chlorine 3 72
nitrogen 9 113 114
silicon 12 521
sodium 12 409
see also entries under other elements and specific names
Oxide films 3 494
Oxidizer combustion 3 306
lithium perchlorate 7 341
solid propellant 11 8
Oxidizing agent 9 467 468
bleaching 2 258 259
chlorate 3 66
chromate 3 89
manganese compound 8 89
ozone 9 478
perchlorate 10 9
permanganate 10 22
peroxide 10 29
Oxime 9 468 469
aldehyde 1 229
Oximetry 9 469 471
Oxindole 7 62, 64
Oxine 11 193
Oxirane compounds 5 43
Oxo alcohols 6 542
petrochemical 10 46
Oxo process catalysts 3 216
Fischer-Tropsch process 5 284
hydroformylation 6 542
Oxo reaction 2 547
hydrogenation 6 552
Oxonation 1 225
Oxonium ion 6 550
hydrolysis 6 557
Oxyacetylene torch 13 684
flame 14 468
Oxyacodon 3 394
Oxycellulose 2 258 259
Oxycephalus 6 586
Oxyclaenus 2 522
Oxydactylus longipes 1 569
Oxydendrum arboreum 12 525
Oxyethyl group 10 497
Oxygen 2 521, 9 471 474*
analysis 9 474
anoxia 1 455
atomic weight 1 662
cryogenic properties 3 572
distribution 9 474
distribution in ocean 12 105
distribution in sea 12 106
electron configuration 4 501
exchange between sea and atmosphere 12 105
geochemical inventory 1 650
inversion temperature 7 538
ionization potential 4 494

P

P band (radar) 11 201
P blood factor 2 269
P chart (quality control) 11 140
P seismic waves 12 151 152
  earth interior 4 339
P wave heart 3 138
PA system *see* Public address system
Paal Knorr synthesis 11 151
PABA *see para* Aminobenzoic acid
Pacemaker, heart 2 483 3 139
Pachastrella 3 88
Pachycerianthus multiplicatus 2 654
Pachydiscus 1 528
Pachygyria 9 69
Pachyma 8 677
Pachyma cocos 8 677
Pachynema 8 210
Parkypleurosaurus edwardsi 12 41
Pachyrhinosaurus 4 201
Pachytene 11 86
Pacific giant salamander 12 6
Pacific Islands 9 481 483
  Aleutian Islands 1 523
  off Asia 1 520
  East Indies 4 355 358
  Galapagos 12 530
  Hawaiian Islands 9 481-482
  Luzon 9 482
  Mindanao 9 483
  New Caledonia 9 482
  New Zealand 1 669
  Palawan 9 483
  Philippines 9 482 483
  Tasmania 1 669 672
  Visayan Islands 9 482 483
Pacific mountain systems 8 617 618
Pacific Ocean 9 483 489
  area drained by 6 565
  cotidal chart for M_2 13 637
  dissolved oxygen at surface 9 487
  ...ition of gases ...
  ...ation of properties ... depth 9 487 488
  ...ation of volcanic ...ds 9 262
Pacific Ocean—*cont*
  islands *see* Pacific Islands
  nutrients at surface 9 487
  pelagic sediments 8 135
  phosphate phosphorus 9 488
  salinity at surface 9 486 487
  seas tributary to 9 271
  silicate silicon 9 488
  surface currents 9 483
  temperature at the sea surface 9 485 486
  see also Southeast Asian waters
Pacific pond turtle 14 167
Pacific salmon 5 223 12 14
Pacific silver fir 5 278
Pacific yew 14 605
Pacinian corpuscle 5 47-49, 8 196 12 180
  kinesthetic sensation 7 550
  nervous system 9 42 63
Pack carburizing 13 312 313
Pack Dala plateau 3 577
Packaging of equipment 9 488 489
  access 9 489
  arrangement of components 9 489
  component design 13 379
  environmental specifications 9 489
  heat transfer considerations 9 489
  maintainability 9 489
  microcircuitry 8 348 350
  micromodules 8 349
  miniaturization of equipment 8 468 471
  mutual interference 9 489
  printed circuits 10 593 597
  size 9 489
  systems engineering 13 379
  weight 9 489
Packed tower (gas absorption) 6 45
Packed tower extractor 12 499
Packing 9 489
  extraction tower 12 499
  fractionating column 5 492
Packing fraction 9 489
  atomic weight 1 663
Packing house 9 489
  refrigeration 11 415
Packings column 4 250
Paddle 8 523
Paddlefish 1 46
Padparadsha (orange sapphire) 12 26
Paedogenesis 9 489
  neoteny 9 58
  parasitology 9 555
Paedomorphosis 1 414
Paenungulata 11 128
Paeon elongatus 7 477
Paget's disease 2 326
Paging systems (telephone) 13 442
Paguridea 4 31
Pagurus 3 531 563 4 31, 8 76
Pahoehoe 14 349
Pahoehoe lava 3 365
Pājanne, Lake 5 116
Pain 1 403
  analgesics 1 366
  cutaneous *see* Pain cutaneous
  deep *see* Pain deep
  hypnosis 6 594
  referred 9 492
Pain cutaneous 9 490 491
  itch 7 297 298
  narcotic 9 4
  pain deep 9 491
  pain adaptation 9 490
  pain distribution 9 490
  pain receptors 9 490
  pain sensation versus pain reaction 9 491
  pain thresholds 9 490
  paresthesia 9 564
  quality of pain 9 491
  specific nature of 9 489
  thermotherapy 13 594
  tickle 13 631
Pain deep 9 491 492
  headache 6 345
  hyperalgesia 9 492
  narcotic 9 4
  opiates 9 345
  receptors for deep pain 9 491
  referred pain 9 492
  sciatica 12 71
Paint 9 492 494
  drier (paint) 4 273
  drying oil 4 290
  enamel nonvitreous 4 587
  lacquer 7 576
  luminous *see* Luminous paint
  pigment 10 223 225
Paint—*cont*
  primer (surface coating) 10 592 593
  solvent thinned paints 9 493
  surface coating (protective) 13 311 312
  thinner 13 603
  water thinned paints 9 493
Paint screen process 10 619
Painted bunting 2 371
Painted Desert 10 42
Painted lady butterfly 2 391
Painted snipe 3 10
Painted turtle 3 23, 14 167
Painter 3 515
Pair creation *see* Pair production (*electron positron*)
Pair production (electron positron) 9 495
  cosmic rays 5 490
  external 9 495
  internal 9 495
  light 7 506
Paired associate list memory 8 217
  verbal learning 14 302
Paktong 9 97, 12 331
Palaeotheres 10 19
Palaeacanthocephala 9 495 496
  Corynosoma 9 496
  Leptorhynchoides thecatus 9 495
Palaeanodon 4 411
Palaeanodonta 4 411
Palaechinoida 4 360, 371, 9 496*
Palaechinus elliptieus 9 496
Palaecrita vernata 2 436
Palaeoconcha 9 614
Palaeochiropteryx 3 64
Palaeoisopus 9 496
Palaeoisopus problematicus 9 496
Palaeolaginae 7 383
Palaeolagus 7 383
Palaeobentopus 11 106
Palaeotremata 1 566
Palaemon 4 25
Palaemonidae 4 29 12 308
Palaeocaridae 1 596
Palaeocaris 1 596
Palaeognathae 11 347
Palaeonemertini 1 433, 9 496*
Palaeophis 11 484
Palaeopneustidae 12 561

anama Canal 9 164
ship clearance 12 257
anama Canal Zone 9 164
anama hat 13 365
anax quinquefolia 6 188
anax schinseng 6 188
anax, island of 9 482
ancarida 5 565 9 527 529*
Thermosbaenacea 5 563, 5 105 9 527 529*, 13 592
anchromatic film 10 157
ancreas 1 365 4 93 150 5 204 9 529 534*
anatomy 9 531 532
biochemistry 9 534
embryology 9 529 531
endocrine gland 4 588 589
endocrine tissue 9 532
exocrine tissue 9 532
glucagon 9 531, 533 534, 629* 4 153, 493, 6 479, 7 561
HGF factor 9 535
histology 9 532
insulin 7 163 164
islet morphogenesis 9 529
mitochondria 8 519
physiology 9 532 534
ancreas disorders 9 534 536
cystic fibrosis 9 534-535
diabetes 4 93, 9 535
pancreatitis 9 535
tumors 9 535
ancreas of Asellu 7 631
ancreatectomy 9 534
ancreatic duct 4 155
ancreatic secretion 4 170
ancreatitis 6 14 9 535
gallbladder 6 14
ancreozymin 4 171 593
ancytopenia 3 141 144
anemia 1 401 402
leukopenia 7 486
anda 9 536
andalus 5 566 4 29
andanales 9 536* 10 346
Pandanaceae 9 536
Sparganiaceae 9 536
Typhaceae 9 536
Pandanus 11 621
Pandanaceae 2 418
Pandarus 2 418
Pandarus sayrus 2 417
Pandemic (influenza) 7 99
Pandier 11 4 569 6 174
Pandion *haliaetus* 6 343
Pandionidae 5 178 6 345
Pandorina 1 255 2 601 10 273 11 43
Panel heating and cooling 9 536
heat transfer 9 536
radiant heating 11 213
use for cooking 9 536
Panelboard, electric 14 520
Paneth cell 4 161
Pangolin 1 442
see also Pholidota
Panicle 7 98
Panicum 3 190 8 127
Panmixis human genetics 6 503
population genetics 10 508
Panmycin *see* tetracycline
Panning (placer mining) 8 476 477
Panning 11 21
Panoramic camera 2 430
Panoramic sight 10 17-18
Panorpa 8 206
Panstrongylus 6 405
Panstrongylus megistus 6 409
Pansy 2 184
Panthalis 1 430
Panther 3 515
Pantodonta 8 82 9 536 537*
Pantograph 7 528 9 537*
Pantoic acid 9 537
Pantolambda 9 537
Pantolambdodon 9 537
Pantolambdodontidae 9 537
Pantolestes 7 143
Pantolestidae 7 143
Pantophthalmidae 4 212
Pantopoda *see* Pycnogonida
Pantopon 9 4
Pantotheine 7 531
Pantothenic acid 4 256, 9 537 539*, 14 340
biotassay 2 194
food 5 371
saline 14 259
Pantotheria 8 82 9 538*, 13 549
Dryolestidae 9 539
Paurodontidae 9 538
Symmetrodonta 8 82
Panulirus 5 563
Panulirus argus 7 570
Panulirus interruptus 4 30 7 570
Panus stipticus 2 222
Panus stipticus phosphorescens 2 222
Papain 5 20 26 376
epithelium 5 41-43
Papanicolaou G 11 476 481
Papanicolaou technique 5 192 202
Papaver somniferum 8 598 10 498
Papaverales 9 539
Papaveraceae 9 539
Papaverales 9 538 539* 10 346
cauliflower 2 569
horseradish 6 492 493
kale 7 323
mustard 8 670
poppy 10 498
radish 11 322
rape 11 341
rutabaga 11 655
turnip 14 164
Papaverine 9 4, 545
alkaloid 1 248
Paper and paper products 9 539 541
abaca 1 1
dye 4 300
dyeing 4 311
filter 6 262
flameproofing 5 291
hemicellulose 6 309
insulation, electric 7 158
manufacture 9 540 541
photographic 10 156
products 9 541
raw materials 9 539 540
Paper birch 2 247
Paper capacitors 2 447
Paper chromatography 3 92 96
lipid metabolism 7 530
protein isolation 11 36
Paper electrophoresis 3 97
Paper nautilus 9 7
Paper wasp 6 582
Papilio 7 462
Papilio cresphontes 7 463 470
Papilio glaucus 2 381 7 470 11 52
Papilio glaucus turnus 2 381
Papilio polyxenes 2 381 11 52
Papilio troilus 7 466 11 52
Papilionidae 7 464
Papilla 5 195 197
Papilla amphibiorum 10 124
Papilla of Vater 4 161
Papilloma 9 520
wart 14 586
Papillomatosis infectious (rabbit) 8 383 384 9 541*
Papparaci fever 4 218
Pappus theorems of 13 310
Pappus of Alexandria 2 642
Paprika 9 541
spice and flavoring 12 613
Papua 4 357
Papualand 4 355
Papularia 4 53
Papularia sphaerosperma 4 53
Papulospora 8 677
Papulospora pisicola 8 677
PAR *see* Precision approach radar (PAR)
Parabanic acid 14 217
Parabathynella 13 367
Parabola 1 500 9 541 542*
conic section 3 399
Parabolic cylinder quadric surface 11 135
Parabolic reflector 7 27
rooking 12 470
heating 12 470
Parabolic reflector antenna *see* Antenna (aerial)
Parabolic trajectory 2 79 80
Parabolic velocity *see* Escape velocity
Paraboloid 9 542 543
antennas 1 449
Paraboloid—*cont*
quadric surface 11 135
surface and solid of revolution 13 310 311
Paraboloidal mirror 12 608
Paraboloidal reflector 11 5
radar antenna 11 203
Paracelsus 5 86 14 611
Paraceratherium 10 19
Paraceratites binodosus zone 14 82
Paraceratites trinodosus zone 14 82
Parachor 9 543
Parachordodes 6 238
Parachute 9 543 544
ability to deploy 9 544
aerodynamic behavior 9 544
application 9 545
characteristics 9 543
dynamic behavior 9 544
porosity 9 543
strength of materials 9 544
weight 9 544
Paracimex 6 408
Paracoccidioides brasiliensis *see Blastomyces brasiliensis*
Paracoccidioidomycosis 2 257 5 563
Paracolobactrum 5 3
Enterobacteriaceae 5 3 2
paracolon bacilli 9 544
Paraconformity 14 191
Paracrinoidea 4 360, 368 9 544*
Paracyanogen 3 636
Paradoxic pain 9 564
Paradoxical cold 13 490
Paradoxides 2 425
Paradoxides bohemicus 14 104
Paraelectric phase 5 225 226
Paraffin 9 544
alkane 1 248
in crude oil 10 65
hydrocarbon 6 535
in petroleum 10 54 55
in petroleum production 9 237
speed of sound in 14 431
wax 10 72 14 445 445
Paraffinic oil 13 683
Paraform 5 472
Paraformaldehyde 5 472
Parafossarulus 3 207
Paraganglia 1 488
endocrine gland 4 588
Paragnathia formica 6 225
Paragneiss 6 226
Paragonimiasis 9 544 545* 10 428
Paragonimus 14 80
Paragonimus westermani 9 544
Paragonite 8 346
Paragordius 6 238, 9 34

Palaeopterygii *see* Actinopterygii
Palaeostachya 2 392
Palaeotaurus 11 484
Palaeospondyloidea 9 496 497
Palaeotremata 1 566
Palatal (consonant) 10 121
Palate 9 497-498
  soft 4 166, 9 497-498
Palatine bone 12 373
Palatine gland 9 369
Palatine tonsil 4 165, 13 668
Palawan, island of 9 483
Pale crepe rubber 11 635
Pale group 5 117
Palea 5 334
Palearctis vernata 7 469, 472
Palearctic Region 14 620
Paleanodont 4 411
Paleoanthropinae 5 478
Paleobiochemistry 9 498-499
  chemical fossils 5 29
  life, origin of 7 496 499
  petroleum (origin) 10 56-57
  thermal history of fossils 6 130 135, 9 516-518
Paleobotany 9 499-507
  Angiospermae 9 503
  Arcto Tertiary geoflora 9 506
  Bryophyta 9 502
  casts 9 500
  caytoniales 9 503
  Cenozoic floras 9 506-507
  plants 9 501-502
  of coal 3 239 242
  compressions 9 500
  Coniferales 9 503
  Cordaitales 9 503
  Cycadales 9 503
  Cycadeoidales 9 503
  floras of the geologic eras 9 503 507
  geofloras 9 506 507
  geologic distribution of plant groups 9 502 503
  Ginkgoales 9 503
  Gymnospermae 9 503
  impressions 9 500
  Lycopsida 9 502
  Madro Tertiary geoflora 9 506
  Mesozoic floras 9 505 506
  molds 9 500
  Neotropical Tertiary geoflora 9 506
  occurrence of fossil plants 9 499
  Paleozoic floras 9 504 505
  petrifactions 9 500 501*, 10 42
  Precambrian floras 9 503
  preservation of fossil 9 499
  Psilopsida 9 502
Paleobotany—*cont*
  Pteridospermae 9 503
  Pteropsida 9 502-503
  significance of fossil plants 9 501
  Sphenopsida 9 502
  Thallophyta 9 502
Paleocene 6 136, 142, 9 507 508*, 13 169
  fauna 9 508
  nomenclature 9 508
  strata 9 508
Paleocerebellum 9 59
Paleocharaceae 3 11
Paleoclimatology 9 508 510
  climatic zones 9 509
  marine sediments 8 141 145*, 9 509
  paleomagnetism *see* Paleomagnetism
  Pleistocene climates 6 195
  pluvial periods 1 108
  terrestrial sediments 9 509
Paleocopa 9 446 447, 510-511*
Paleoctopus newboldi 9 274
Paleoecology 9 512 516
  biogeographic zones 9 512
  biotope 9 513
  coastal environment 8 132 133
  foraminiferal assemblages 5 430
  fossils and rocks 5 475, 9 513 514
  geochemical aspects *see* Paleoecology (geochemical aspects)
  nature of evidence 9 515 515
  neritic environment 8 135 135
  pelagic environment 8 135 137
  relations to other sciences 9 515 516
  rocks 9 513 514
  scope and aims 9 512
  thanatocenose 9 513
Paleoecology (geochemical aspects) 9 516 518
  aragonite calcite ratios 9 516
  magnesium content 9 517
  paleoecologic applications 9 518
  skeletal mineralogy 9 516
  strontium content 9 517 518
Paleogene 9 507 509, 13 169 524
Paleogeography 9 518 520
  coal paleobotany 3 239 242
  fossil 5 476
  isopach map 9 519
  map projections 9 519
  palinpastic maps 9 519
  stratigraphic map 9 519
Paleogeography—*cont*
  tectonic interpretation 9 519
  time and correlations 9 519
  of Triassic 14 82
  see also Paleoclimatology, Paleoecology
Paleogeology 9 520
Paleomagnetism 9 509, 11 596 597
  archeology 1 515
Paleontology 6 141-142, 9 520 522*
  Cryptozoic history of life 9 522
  evolution 9 520
  micropaleontology 8 355 357
  paleocology 9 520
  paleogeography 9 520
  Phanerozoic history of invertebrates 9 522
  see also Paleobiochemistry, Paleobotany, Paleoichnatology, Paleoecology, Paleogeography
Paleopallium 9 59
Paleoparadoxia 4 80
Paleoparadoxidae 4 80
Paleorhinus 13 546
Paleoscorpionida 8 215
Paleostriatum 9 59
Paleotuchus 3 552
Paleotemperature 6 132 134
Paleothalamus 9 59
Palaeotremata 9 497
Paleotropical region 14 620
Paleozoic 9 522-523
  animal life 9 521
  floras 9 501 505
  permian 10 23
Palgorskite 5 165
Palinpastic map 9 519
Palinura 1 563
Palinuridae 4 30
Palisade cell 7 437
Palisades 9 148
Palladium 9 523 524
  compounds 9 523 524
  electron configuration 4 501
  extractive metallurgy 8 278
  ionization potential 4 501
  metallurgical extraction 9 523, 10 411 412
  properties 9 523
  uses 9 523
Palladium chloride 12 475
Pallas 1 596 598
Pallet (industrial trucks) 7 87
Pallet (shipworm) 12 291
Pallium 9 42 63
Pallopteridae 4 212
Palm 9 524
Palm bug 6 401
Palm kernel oil 5 189
Palm kernels 9 232
Palm oil 5 189
  nut crop culture 9 232
Palm tree 2 183
Palmae 9 524
Palmales 9 524*, 10 346
  betel nut 2 183
  carnauba 2 522
Palmarosa oil 5 71
Palmella stage 3 98 100
Palmitamide 1 305
Palmitate 9 524
Palmitic acid 2 474, 5 194, 9 524 10 356
  lipid metabolism 7 533
  triglyceride 14 92
Palmitoleic acid 10 356
Palmityl chloride 1 45
Palmula reticulata 5 433
Palmyridae 10 461
Palpatores 10 92
Palpicornia *see* Hydrophilidae
Palpigradi 1 496, 558 932
Paludicella 6 459
Paludicella articulata 3 61, 6 299
Palygorskite 1 560, 4 161
  structural characteristics 5 166
Palynology 9 525 527
  alete spores 9 525
  colpate grains 9 525
  colporate grains 9 525
  fossil record 9 525
  identification 9 526
  measurement and evaluation 9 526
  microfossil assemblages 9 526
  monolete spores 9 525
  morphology 9 525
  paleoclimatic conditions 9 526
  petroleum exploration 9 527
  porate grains 9 525
  recovery 9 526
  stratigraphic correlation 9 527
  triletе spores 9 525
Palythoa 3 255
PAM II 97
Pamaquine 8 77, 11 105
Pamirs 1 577
Pampa 12 526
Pamphilidae 6 574
Pamphilius persicus 6 580
Pan crab 14 565
Pan troglodytes 3 62
Pan twist 10 232

Parenchyma—*cont*
periderm 10 11
plant tissue systems 10 578
variations 9 563
wood 14 524 525
xylem 14 591
Parenchymula larva 2 394, 4 54
Parental behavior care of young 11 460
incubation of eggs 11 459
nest building 11 458 459
physiological regulation 11 460-462
pregnancy and birth 11 459 460
Paresis, general 9 564
syphilis 13 375
Paresthesia 1 596, 9 564*, 10 100
multiple sclerosis 8 626
Pareulepidae 10 461
Parexocoetus mesogaster 5 363
Parhelia 8 321
sundog 13 291
Parian ware 10 546
Paricutin volcano 14 350 353
Paridae 13 655
Parides 7 470
Parietal bone 12 375
Parietal cell 4 160
Parietal eye nervous system 9 58
pineal body 10 237
Parietal lobe nervous system 9 57
Parietales 9 564*, 10 346
Paris green 1 550 551
insecticide 7 140
Parity (quantum mechanics) 9 565 567
conservation 9 565 567
electron configuration 4 503 505
hyperon 6 587 588
intrinsic parity 9 566
meson 8 247 249
multipole radiation 8 626 627
nonconservation 9 565 567
nuclear 9 205 206
nuclear reactions 9 199
orbital parity 9 565 566
quantum theory *nonrelativistic* 11 173 175
selection rules 12 160 161
space time 12 558
spin and momentum correlations 9 566
symmetry laws 13 362 364
Parity transformation (space time) 12 557
Parker C 10 125
Parker T J 9 310
Parker Dam 9 160
Parkes process lead metallurgy 7 433
pyrometallurgy, nonferrous 11 125
silver metallurgy 12 333
Parkinsonism, postencephalitic 9 547
Parkinson's disease 9 547, 567*
nervous system disorders 9 71
Parmelia 7 495
Parnassian 7 464
Parnassius 7 470
Parnidae *see* Dryopidae
Parotid gland 4 164, 9 370
mumps 8 632
Parotitis 8 632
Parr, A E 12 31
Parr, S W 3 229
Parrot 7 594, 9 567*
Pars anterior 10 247
Pars cystica 6 14
Pars distalis 10 247
Pars glandularis 10 247
Pars intermedia 10 247
Pars nervosa 10 247
Pars neuralis 10 247
Pars tuberalis 10 247
Parsec 9 567
Parseval, M A 8 179
Parseval identity 5 488 12 194
Parsley 9 568
Parsnip 9 568
Parsons, C. 8 120
Parsons, T 10 32
Parthenium argentatum 6 286 10 336
Parthenogenesis 9 568
Annelida 1 430
aphid 1 490
Arthropoda 1 556
artificial 4 573
Cladocera 5 150 151
Crustacea 3 566
fertilization 5 234
Gastrotricha 6 77
Hymenoptera 6 573 583
parasitology 9 555
reproduction plant 11 450
sexual dimorphism 12 236
thrip 13 613
Thysanoptera 13 628
Parthenomerogony 8 244
Partial *see* Partial tone
Partial difference equations interpolation 7 219
Partial differential equations 4 127
analog solution 1 385
computer solution of 1 367
perturbation 10 39
Partial differentiation 9 569 571
chain rule 9 568 569
differential 9 568
homogeneous functions 9 570
Partial differentiation—*cont*
implicit functions 9 569 570
Jacobian 9 570
Lagrange's method 9 570
see also Differentiation
Partial fractions 7 167
Partial molal quantities
activity (thermodynamics) 1 59
free energy 5 495
see also Solution
Partial pattern concept 2 137
Partial plasma engine 4 490
electromagnetic propulsion 4 490
Partial tone 9 571
musical acoustics 8 661
Particle 9 571
angular momentum 1 406-407
collision 3 290 291
degrees of freedom 4 44
dynamics 7 360
elementary *see* Elementary particle
kinematics 7 347* 360
Newton s law of motion 9 91
scattering by 12 51-53
Particle accelerator 9 571 585
alternating-gradient synchrotron 9 573, 579 580*
applications 9 571
betatron 2 183, 9 573 580 581*
characteristics 9 572 573
circular 9 574 581
classification 9 571 572
Cockcroft Walton accelerator 3 250 251
Cockcroft Walton generator 9 573
cyclotron 3 645, 9 571 577*
electron synchrotron 9 573, 576 578
electrostatic 9 572 574
fixed field cyclotron 9 576 577
impulse generator 9 573
linear 9 573, 581-584
microtron 9 581
proton synchrotron 9 573 578 579*
radioisotope production 11 310-315
relativistic electrodynamics 11 429 430
resonance transformer 9 573, 11 504 505
synchrocyclotron 9 573, 576-577
Van de Graaff 9 571, 573
Particle board (wood fiber products) 14 530
Particle detector 9 584-585
background count 2 3
bubble chamber 2 359 359
Cerenkov counter 2 653
characteristics 9 584 585
cloud chamber 3 212 214
crystal counter 3 580
detection of neutrons 9 84 85
Geiger Müller counter 6 91 93
information provided 9 594
ionization chamber 7 252 253
liquid scintillation detector 12 75 76
low level counting 7 594 596
monitoring 8 571 572
radioisotope (biology) 11 307
scintillation counter 12 74 76
spark counter 12 561
types 9 584
Particle dynamics 7 360
perturbation (mathematics) 10 39
relativistic electrodynamics 11 428 431
Particle field theory 11 152
Particle indistinguishability 11 161 162*, 178 179
Particle properties 9 585 587
dust and mist collection 4 296
electrostatic precipitator 4 538 539
particle concentration 9 585
particle mechanics 9 585-587
particle size 9 585, 12 349 350
Particle radiation 1 98, 11 213 214*
Particle shape anisotropy 5 233 234
Particle velocity, effective *see* Effective particle velocity
Particle velocity, instantaneous 12 510
Parting (assaying) 1 593
Partition (sound transmission) 1 519
Partition chromatography 3 93, 95
Partition coefficient (solution) 12 491
Partition function 13 61
Partition noise (radar) 11 208
Partridge 9 587 588
Parts (integration) 7 167
Paruhdae 14 384
warbler 14 384
Parus atricapillus 3 58

Paragorgia 6 238
Paraguay River 12 529
Parahydrogen 6 544 545
Paramfluenza viruses 6 394
Parakeet 7 594, 9 567
Paraldehyde 6 595, 14 16
Paralic sedimentation 12 142
Paralichthys oblongus 10 417
Paralimnoria 5 291
Paralithodes 4 32
Paralithodes camtschatica 3 530, 14 565
Parallax (astronomy) 9 545-546*, 13 39
  annual (heliocentric) 9 545
  diurnal (geocentric) 9 545
  Eros 5 65
  horizontal 9 545
  measurement of solar parallax 4 336
  photographic measurement of 9 545
  secular 9 545 546
  solar 9 545
  trigonometric 9 545
  use of data 9 545-546
Parallax (photography) 2 429
Parallel circuit 3 132 9 546
  susceptance 13 330
Parallel crank linkage 5 485
Parallel evolution 8 13
Parallel motion mechanism
  see Straight line mechanism
Parallel plate capacitor 2 440 441
Parallel resonance 11 502
Parallel resonant circuit 13 390
Parallel-T networks 2 443
Parallelepiped 9 546 547
  crystal structure 3 593
  cube 3 611
  see also Polyhedron
Parallelism (earth's axis) 6 125
Parallelogram 9 547
  area 1 528
  law of 2 410
  rectangle 11 385
Parallels (geometry) 6 155
Paralysis *see* Nervous system disorders Paralysis agitans, Poliomyelitis
Paralysis agitans 9 547
  nervous system disorders 9 71
Paralytic poliomyelitis 10 456
Paramagnetic cooling *see* Adiabatic demagnetization
Paramagnetic Faradav effect 5 182-183
Paramagnetic materials 10 23
Paramagnetic relaxation 8 42 43
Paramagnetic resonance 8 45
  measurement of nuclear moments 9 192 193
Paramagnetic susceptibility 13 331-332
Paramagnetism 9 547-550
  adiabatic demagnetization 3 572-574
  Curie temperature 3 623
  electron paramagnetic resonance spectroscopy 4 514 516
  electronic 9 548
  iron-group ions 9 550
  Langevin theory 9 548
  magnetochemistry 8 53 54
  neutron diffraction 9 90 91
  nuclear 9 548
  paramagnetic substances 9 547 548
  paramagnetic susceptibility 13 331 332
  Pauli paramagnetism 9 550
  quantum theory 9 548 549
  rare earth ions 9 549
  relation to diamagnetism 4 96-97
  Van Vleck paramagnetism 9 549-550
Paramecium 2 639, 6 110, 583 9 550 551* 11 55 229 449, 511 12 231
  mitochondria 8 519
Paramecium aurelia 3 659 11 59, 12 231
Paramecium bursaria 11 60
Paramecium caudatum 9 551
Paramere Coleoptera 3 275 288
Parameter 9 551
Parameter (biometrics) 2 224
Parametric amplifier 9 551 552
  amplification 9 551
  bandwidth 9 552
  equivalent circuit 9 551
  idler circuit 9 552
  nonlinear reactive mixing 9 551
  pump 9 551
  regenerative down converter 9 552
  regenerative up converter 9 551
  traveling wave parametric amplifier 9 552
  varactor 14 276
Parametric curves 9 552 553
Parametric equation 1 491 9 552 553*
Parametric surface 9 553
Paramo 12 527
Paramolybdate 8 565
Paramuricea kukenthali 6 238
Paramylum 5 98
  Mastigophora 8 169
  Protozoa 11 51 60
Parana pine 3 187
Paraná River 12 529
Paranasipides lacustris 1 396
Paranebalia longipes 9 23
Paranoia 9 553
Paranoid schizophrenia 12 66
Paranoid state 9 553 554*, 12 177
  paranoia 9 553
Paranthura infundibulata 1 462
Paranyrocidae 1 436
Paraonidae 10 461
Paraperiodic acid 7 239, 10 13
Paraperipatus 9 329
Parapertussis 9 554
Paraphase amplifiers 10 101-102
Paraphronima 6 586
Paraphysis 9 46, 58
Parapithecus 10 590
Paraplacodus 12 41
Paraplacodus broili 12 41
Paraproct 3 275-288
Parapronoe crustulum 6 586
Parapsoriasis 12 369
Paraquadrula 12 28
Paraquay River 12 529
Pararhagadochir trachelia 4 564
Pararhopalia 1 490
Pararosaniline 4 301
Parasalenidae 4 372
Parascaris equorum 1 572
Paraschists *see* Schist
Paraselloidea 1 575
Parasexuality 5 108
Parasite 1 236
  see also Parasitism, Parasitology medical
Parasitic antennas *see* Antenna (aerial)
Parasitic arrays antenna 1 447
Parasitic beetle 3 277
Parasitic castration 9 554
  Rhizocephala 11 547
Parasitic infestation *see* Parasitology medical
Parasitic oscillation 9 554
  feedback 9 554
  frequency of oscillation 9 554
Parasitic thermo emfs 13 578
Parasitica 6 574
Parasitism 3 285 4 487
  environment 5 12 15
Parasitology 9 555
Parasitology medical 9 555 557
  achievements 9 556
  balantidiasis 2 75
  biological variation 9 556
  Chagas disease 3 5
  clonorchiasis 3 207
  epidemiology 9 556
  fascioliasis 5 183
  fasciolopsiasis 5 185
  filariasis 5 258
  guinea worm infection 6 292
  heterophyiasis 6 430
Parasitology, medical—cont.
  hookworm disease 6 478
  impact on human affairs 9 556
  infection 7 94
  leishmaniasis 7 449
  malaria 8 77
  paragonimiasis 9 554
  phyla involved 9 556
  pinworm infection 10 279
  pneumoconiosis 10 427
  pneumonia 10 428
  structural variation 9 556
  toxoplasmosis 14 7
  trichinosis 14 85
  trichomoniasis 14 86
  whipworm disease 14 488
Parasitodorcadia uncinata 9 478
Parastrirullum 11 65 13 2
Parastratidae 4 51
Parauchenia 13 546
Parasympathetic nervous system 1 689, 9 557*, 13 565
Paratecaster sparricus 8 344
Parathemisto 6 586
Parathemisto bispinosa 1 583
Parathion 7 141
Parathormone endocrine mechanisms 4 592
  parathyroid gland 9 557
Parathyroid 4 588
Parathyroid gland 2 400 4 458, 9 557 561*, 12 566
  anatomy 9 558
  bone theory 9 561
  citrate theory 9 561
  embryology 9 557 558
  histology 9 558 559
  hypoparathyroidism 9 561
  physiology 9 560 561
  renal theory 9 561
  secretory regulation and action 9 561
Paratomy 9 315
Paratyphoid fever 9 561 562* 594 14 173
  Salmonella 12 14
Paratyphoid gastroenteritis 9 562
  Salmonella 12 14
Paratungstates 14 110
Paratype (taxonomy) 14 172
Paratyphoid bacilli 14 173
Paratyphoid fever 5 3
Paravial ray equation 4 511
Parazoa 1 420, 9 562
  Porifera 10 513 519
Parazoanthus 3 255
Pardosa 1 494
Parenchyma 2 643, 3 495, 9 562 563*
  cell 10 116
  cell contents 9 563
  cell shape 9 563
  cell walls 9 563
  origin 9 562

ıcock 9 602
ıfowl 9 602
ık Berry 1 523
ık factor (ac circuit) 1 271
ık reading meter 9 151
aking circuit 14 90
:anut 9 602 605*, 10 374
bacteria 9 603
blanching 9 604
cleaning 9 604
description 9 602
diseases 9 603
dry roasting 9 604
extraction of oil 9 605
fungi 9 603
harvesting 1 131, 9 603
insect pathogens 9 603
nematode pathogens 9 603
nonparasitic diseases 9 603
nut crop culture 9 232
oil roasting 9 605
origin 9 602
peanut butter 9 604
processing 9 604
shelling 9 604
storing 9 604
value 9 603
viruses 9 604
Peanut windrower 1 131
Pear 9 605-606
commercial production 9 606
commercial types 9 605
cultivation 9 606
harvesting 9 606
propagation 9 606
Pear psylla 6 473
Pear slug 6 580
Pear thrips 13 628
Pearl 1 428 9 606-607*
baroque 9 607
button 5 100
cultured 9 607
formation 9 606
fresh water 9 606
Gem 6 99
green *see* green pearl 1 3
mother-of pearl 9 606
Oriental 9 606
producing areas 9 606
salt water 9 606
Pearl culture 9 477
Pelecypoda 9 615
Pearl nautilus 9 6
Pearl shell 6 75
Pearlite 6 580, 13 90
Pearson K 1 461
Pearson correlation 13 74
Peary R E 7 4
Peary Land 1 524
Pease D C 8 377
Peat 6 517 9 607 12 140
coal 5 228 229
deposits 12 140
dopplerite 4 268
humus 6 517
Peat—*cont*
ion exchange 7 242
moss 8 635
musci 8 635
Peaucellier, C. N. 13 166
Pebble 5 398, 6 261, 11 590
Pebble mill 3 559, 9 607
Pecan 6 441, 9 607 608*
nut crop culture 9 232
Peccary 1 567, 9 608*
Pechan prism 8 508
Pechelbronn oil field 9 303 306
Pechora 5 121
Peck 8 188
Peck order 12 404
Pecopteris 9 504
Pecora 1 568
Pecten 10 181
eye 5 162 171
photoreception 10 182
Pecten hindsii 12 49
Pecten irradians 12 49
Pecten jacobeus 12 49
Pectenidae 1 427
Pectic substances 2 616
Pectin 6 297, 9 608 609*
esterase 9 608
leaf anatomy 7 436-441
mucilage 8 621 622
plant metabolism 10 353
preparation and properties 9 608 609
uses 9 608
Pectinaria 10 461
Pectinariidae 10 462
Pectinase 2 19 5 27 28
Pectinatella gelatinosa 2 354
Pectinatella magnifica 10 201, 13 75
Pectine 12 79
Pectinibranchia 9 609*, 11 18
Pectinic acid 9 608
Pectinophora gossypiella 7 467
Pectinura 9 344
Pectinura cylindrica 9 343
Pectolite 9 609
Pectoral girdle 12 363
Pedalia 8 575
Pedalium 3 612
Pediastrum 1 235
Pedicel 5 328 7 98
anatomy 5 329
Pedicellaria 1 599 13 52
Echinoidea 4 375
Pedicellina 5 7
Pediculus 1 434
Pediculati *see* Lophiiformes
Pediculus humanus 1 433, 7 593 14 80 175
relapsing fever 11 426
Pediculus humanus var *capitis* 14 176
Pediculus humanus var *corporis* 14 176
Pediculus humanus var *humanus* 14 176
Pediculus humanus var *vestimenti* 14 176
Pedigree (human) 6 500 501
Pedilidae 5 277
Pediment 4 75, 77
Pedimonas 10 213
Pedinidae 4 376
Pediococcus 7 381
Pediococcus cerevisiae 5 423
Pedionomidae 6 286
Pedipalpi 9 609
Pedipalpida 1 558
Pedodontia 4 64
Pedology 9 609-610, 12 449
Peduncle 5 328 7 98
anatomy 5 328
Peek, B M 7 322 323
Peel River 9 158
Peel strength (adhesive) 1 66
Peening 9 610
Peeper 5 537
Peg beetle 3 276
Pegaloductus 2 314
Pegasidae 9 610
Pegasiformes 9 442, 610*
Pegasus 3 412-414 9 610
Pegasus draconis 9 610
Pegmatite 9 610 612*, 10 86
composition 9 610-611
fracture fillings 9 611
gabbro 9 610
granitic 9 610
nepheline syenite 9 610
ore and mineral deposits 9 378
origin 9 611-612
replacement bodies 9 611
shape 9 610
structure 9 611
syenite 9 610
texture 9 611
thorianite in 13 609
thorite in 13 610
zones of mineralization 9 611
Peipus, Lake 5 116
Peirce, C S 7 409
Pekeris C L 4 349
Peking man 5 477 9 612*
Pel Ebstein fever 6 460
Pelagia 3 255 12 90 165
Pelagic limestone 7 516
Pelagic sediments 8 135-137* 12 137
Atlantic Ocean 1 623 624
Pelagic species deep sea fauna 4 39-40
marine fisheries 8 113
Pelagic zone 4 39 5 14
Pelargonamide 1 303
Pelargonate 5 74
Pelargonic acid 2 473-474
Pelargonidin chloride 1 454
Pelagothauria 4 40, 418
Pelean eruptions 14 354
Pelecanidae 9 615
Pelecaniformes 1 694, 9 612*
cormorant 5 481
frigate bird 5 536-537
gannet, 6 38 39
pelican 9 615
Pelecanoididae 10 637
Pelecanus 9 612
Pelecanus erythrorhynchos 9 615
Pelecanus occidentalis 9 615
Pelecinid wasp 6 574
Pelecinidae 6 574
Pelecypoda 8 559 9 476, 612 615*
Anisomyaria 1 427-428*, 8 559
clam 5 152
economic importance 9 615
Eulamellibranchia 5 100 101, 8 559
fossils *see* Pelecypoda fossils
morphology 9 612
mussel 8 669 670
Protobranchia 8 559 11 45*
Septibranchia 8 559, 12 187*
shell 9 613
shipworm 12 291
Taxodonta 8 559, 13 403 404*
Pelecypoda fossils 9 613 614
classification 9 613
Desmodonta 9 614
Dysodonta 9 614
geologic record 9 614
Heterodonta 9 614
Palaeoconcha 9 614
Taxodonta 9 614, 13 403-404*
Pelican 9 615
Pelican flower 1 532
Peligot E M 14 209
Pelite 11 590
Pelitic rocks 11 591
hornfels 6 487
Pell's equation 9 225
Pellagra 4 236
niacin 9 92
Pellat current balance 3 627
Pelletier, P 11 190, 13 207
Pelletierine 1 248
Pellicle 8 509
Pellicularia filamentosa 7 47 8 677
Pellicularia koleroga 3 265
Pelloderm 10 11
Pelobates 1 433
Pelobatidae 1 433 13 661
Pelodera strongyloides 9 29
Pelodictyon 11 553
Pelodytes 1 433
Pelomedusidae 3 22
Pelomyxa carolinensis 6 439 11 58
Pelopidae 12 30

Parus niger 11 32
PAS *see para* Aminosalicylic acid
Pascal, Blaise 5 400, 8 53, 9 588
Pascal's law 1 101, 9 588
Paschen, F. 9 588, 12 559
Paschen-Back effect 9 588
  Zeeman effect 14 610
Paschen Runge mounting 4 141
Paschen series 1 657
Paspalum dilatatum 4 3
Paspalum notatum var *Pensacola* 3 528
Pass band 5 267
Passalidae 3 276
Passalurus ambiguus 9 476
Passamaquoddy 14 399 400
Passenger car *see* Automobile
Passenger pigeon 3 302, 4 270
Passenger ship *see* Ship, merchant
Passer domesticus 12 562, 572
Passer montanus 12 562
Passeriformes 1 694, 9 588 589*
  blackbird 2 255
  bluebird 2 271
  bobolink 2 273
  bunting 2 371
  canary 2 455
  cardinal 2 480
  catbird 2 550
  chat 3 11
  chickadee 3 58
  cowbird 3 528-529
  creeper 3 541
  crossbill 3 554-555
  crow 3 556 557
  dickcissel 4 108
  finch 5 273
  flycatcher 5 362
  grackle 6 244
  grosbeak 6 275
  jay 7 304
  junco 7 517
  kingbird 7 561
  kinglet 7 561
  lark 7 404-405
  magpie 8 74
  martin 8 136
  mockingbird 8 525
  nutcracker 9 234
  nuthatch 9 234
  oriole 9 407
  ovenbird 9 455
  pewee 10 88
  phoebe 10 119
  phylogeny and distribution 9 589
  raven 11 348
  redstart 11 389
  robin 11 589
  sparrow 12 562
  starling 13 54
  swallow 13 333
  tanager 13 398
Passeriformes—*cont*
  taxonomy 9 589
  thrasher 13 612
  thrush 13 615
  towhee 14 1
Passerina amoena 2 371
Passerina ciris 2 371
Passerina cyanea 2 371
Passerina versicolor 2 371
Passive immunization
  biological 2 217
  immunity 7 34
Passive radar 9 589
Passive sonar *see* Sonar
Passivity (corrosion) 3 489
Pasteur, Louis 1 475, 2 66, 68, 5 215; 6 413, 7 496, 9 595, 10 200, 13 125, 14 601
Pasteurella 1 466 467, 2 351
  fluorescent-antibody method 8 583
Pasteurella haemolytica 2 351
Pasteurella multocida 2 351
  hemorrhagic septicemia 6 413
Pasteurella pestis 2 351, 10 255, 428
Pasteurella pseudotuberculosis 2 351, 11 67
Pasteurella tularensis 2 351, 14 134
Pasteurellosis *see* Hemorrhagic septicemia
Pasteuria 2 10
Pasteuria ramosa 6 593
Pasteuriaceae
  Hyphomicrobiales 6 593
Pasteurization 9 589 590
  milk 4 2, 8 433
  sterilization 13 133
Pastinaca 7 437
Pastinaca sativa 9 568
Pasture disclimax 3 182-186
Patagia 7 459 473
Patagonian Plateau 12 524
Patapsco formations 9 506
Patella 7 232, 520, 11 19 14 114
Patellacea 6 76
Patellidae 1 591, 11 19
Patellina 5 435
Patent 9 590-593
  aeronautics and astronautics 9 593
  assignment 9 592
  design 9 590
  electrical 9 590
  electronic 9 590
  enforcement 9 592
  foreign filing 9 593
  foreign patents 9 593
  interferences 9 592
  invention 9 591-592
  inventor 9 592
  licenses 9 593
  marking 9 593
  mechanical 9 590
Patent—*cont*
  nuclear and atomic energy 9 593
  plant 9 590
  procedure 9 590-591
  rights 9 590
  witnesses 9 592
Patent grade (wheat flour) 14 484
Paterson, M S 11 598
Path (graph theory) 6 253
Path coefficients (biometrics) 2 229
Path equation (electron motion in vacuum) 4 510 511
Pathogen 2 350, 7 94, 9 593*
  immunity 7 33
Pathogen (soil) 9 593 594
  animal 9 593-594
  human 9 593-594
  plant 9 594
Pathogenic yeasts 14 602
Pathogenicity *see* Virulence
Pathologic traits, inheritance of 6 509-513
Pathology 9 594 595
  areas of investigation 9 595
  classification of changes 9 595
  clinical 3 192-202
  disease 9 594
  etiologic agents 9 595
  pharmacology 10 97
  tissue reaction 9 594 595
Patras, Gulf of 5 115
Patroclus (asteroid) 14 114
Pattee H H 8 367
Patten, B 2 216, 4 387
Patterson, B 9 538
Patulin 1 468
Patuxent formation 9 506
Paucity of mineral phases 4 383
Pauli, Wolfgang 4 96, 5 137 7 505 9 83 550 11 148, 12 615
Pauli exclusion principle *see* Exclusion principle
Pauli paramagnetism *see* Paramagnetism
Pauli spin matrices 11 187
  Cayley klein parameters 2 578
Pauling, Linus 3 458, 461, 4 519, 11 34, 40 41, 12 474
Pauling process 9 113
Pauling scale (electronegativity) 4 519 520
Paulo Afonso Falls 12 530
Pauly reaction 6 457
Paunch *see* Rumen
Paurodontidae 9 538
Pauropoda 1 565, 8 682, 9 595 596*
Pauropus silvaticus 1 565, 9 596
Paussidae 3 276
Pavement 9 596 598
  airport 1 216
  asphalt 1 590 591, 9 597
  bituminous 9 597
  concrete 9 598
  dynamic loads 9 596
  evaluation of subgrade 9 597
  flexible 9 597
  hardness of 6 358
  highway engineering 6 451
  macadam 9 597
  portland cement 9 598
  research 9 598
  rigid 9 598
  soil properties 9 597
  static loads 9 596
  structural capacity required 9 596
  traffic load 9 596
  type of soil 9 597
Pavement ant 6 581
Pavo 5 412, 414*
Pavlov, I 4 165, 11 397
Pavo cristatus 9 602
Pavo muticus 9 602
Pawl 9 598 599
  cam pawl 9 599
  ratchet wheel 9 598
Pavilla 10 92
Paxillosa 4 360, 9 599*
Paxillosida 4 372
Pay formation (petroleum engineering) 10 59
Payne Gaposchkin C. H 4 546, 9 172
Payoff (game theory) 6 24 30
PBX *see* Telephone private branch exchange (PBX)
PCM 11 98
PCP 6 422
PDM 11 97
Pea 9 599 601*, 12 145
  diseases 9 600
  foliage disease 9 600
  harvesting 9 599
  production 9 600
  propagation 9 599
  root diseases 9 600
Pea crab 4 54
Pea weevil 3 278
Peace River 9 155
Peach 9 601 602
  cultivation 9 601
  diseases 9 601 602
  harvesting 9 601
  nectarine 9 29
  propagation 9 601
Peach leaf curl 1 574
  fruit (tree) diseases 5 546 548
Peach sawfly 6 540
Peach scab 9 601

Peanock 9 602
Pealoni 9 602
Peak Berry 1 529
Peak factor (ac circuit) 1 271
Peak reading meter 9 131
Peaking circuit 14 90
Peanut 9 602 605*, 10 374
bacteria 9 603
blanching 9 604
cleaning 9 604
description 9 602
diseases 9 603
dry roasting 9 604
extraction of oil 9 605
fungi 9 603
harvesting 1 131, 9 603
insect pathogens 9 603
nematode pathogens 9 603
nonparasitic diseases 9 603
nut crop culture 9 232
oil roasting 9 605
origin 9 602
peanut butter 9 604
processing 9 604
shelling 9 604
storing 9 604
value 9 603
viruses 9 604
[illegible]indrower 1 151
03-606
nercial production 606
nercial types 9 605
vation 9 606
esting 9 606
igation 9 606
lla 6 473
[illegible] 6 580
ips 13 628
28 9 606 607*
que 9 607
on 5 100
ared 9 607
ration 9 606
water 9 606
6 99
n see green pearl 1 3
her-of pearl 9 606
rital 9 606
lucing areas 9 606
water 9 606
ture 9 477
cypoda 9 613
utilus 9 6
ell 6 75
6 380 13 90
K 1 461
correlation 13 74
[illegible] E. 7 4
and 1 524
C. 8 377
17 9 607 12 140
[illegible] 3 228 229
mits 12 140
plerite 4 268
nus 6 517

Peat—cont
ion exchange 7 242
moss 8 633
muci 8 635
Peaucellier, C. N 13 166
Pebble 5 398, 6 261, 11 590
Pebble mill 5 559 9 607
Pecan 6 441, 9 607 608*
nut crop culture 9 232
Peccary 1 567, 9 608*
Pechan prism 8 508
Pechelbronn oil field 9 303-306
Pechora 5 121
Peck 8 188
Peck order 12 404
Pecopteris 9 504
Pecora 1 568
Pecten 10 181
eye 5 162-171
photoreception 10 182
Pecten hindsii 12 49
Pecten irradians 12 49
Pecten jacobeus 12 49
Pectenidae 1 427
Pectic substances 2 616
Pectin 6 297, 9 608 609*
esterase 9 608
leaf anatomy 7 436-441
mucilage 8 621-622
plant metabolism 10 353
preparation and properties 9 608 609
uses 9 608
Pectinaria 10 461
Pectinariidae 10 462
Pectinase 2 19 5 27 28
Pectinatella gelatinosa 2 354
Pectinatella magnifica 10 201, 13 75
Pectine 12 79
Pectinibranchia 9 609* 11 18
Pectinic acid 9 608
Pectinophora gossypiella 7 467
Pectinura 9 344
Pectinura cylindrica 9 343
Pectolite 9 609
Pectoral girdle 12 361
Pedalia 8 575
Pedalium 5 612
Pediastrum 1 235
Pedicel 5 328 7 98
anatomy 5 329
Pedicellaria 1 599, 13 52
Echinoidea 4 375
Pedicellina 5 7
Pedicinus 1 434
Pediculati *see* Lophiiformes
Pediculus humanus 1 433, 7 595, 14 80 175
relapsing fever 11 426
Pediculus humanus var. *capitis* 14 176
Pediculus humanus var. *corporis* 14 176
Pediculus humanus var. *humanus* 14 176
Pediculus humanus var. *vestimenti* 14 176
Pedigree (human) 6 500 501
Pedilidae 5 277
Pediment 4 75, 77
Pedimonas 10 213
Pedinidae 4 376
Pediococcus 7 381
Pediococcus cerevisiae 5 423
Pedionomidae 6 286
Pedipalpi 9 609
Pedipalpida 1 558
Pedodontia 4 64
Pedology 9 609 610, 12 449
Peduncle 5 328, 7 98
anatomy 5 328
Peek, B. M 7 322 325
Peel River 9 158
Peel strength (adhesive) 1 66
Peening 9 610
Peeper 5 537
Peg beetle 5 276
Pegalodiscus 2 314
Pegasidae 9 610
Pegasiformes 9 442, 610*
Pegasus 5 412 414, 9 610
Pegasus draconis 9 610
Pegmatite 9 610 612*, 10 86
composition 9 610-611
fracture fillings 9 611
gabbro 9 610
granitic 9 610
nepheline syenite 9 610
ore and mineral deposits 9 378
origin 9 611-612
replacement bodies 9 611
shape 9 610
structure 9 611
syenite 9 610
texture 9 611
thorianite in 13 609
thorite in 13 610
zones of mineralization 9 611
Peipus Lake 5 116
Peirce, C. S 7 409
Pekeris, C. L. 4 349
Peking man 5 477, 9 612*
Pel Ebstein fever 6 460
Pelagia 5 255 12 90 105
Pelagic limestone 7 516
Pelagic sediments 8 135 137*, 12 137
Atlantic Ocean 1 623-624
Pelagic species, deep sea fauna 4 39 40
marine fisheries 8 113
Pelagic zone 4 59 5 14
Pelargonamide 1 305
Pelargonate 5 74
Pelargonic acid 2 473 474
Pelargonidin chloride 1 454
Pelagothauria 4 40, 418
Pelean eruptions 14 354
Pelecanidae 9 615
Pelecaniformes 1 694, 9 612*
cormorant 5 481
frigate bird 5 536 537
gannet, 6 38 39
pelican 9 615
Pelecanoididae 10 637
Pelecanus 9 612
Pelecanus erythrorhynchos 9 615
Pelecanus occidentalis 9 615
Pelecinid wasp 6 574
Pelecinidae 6 574
Pelecypoda 8 559, 9 476, 612 613*
Anisomyaria 1 427 428*, 8 559
clam 3 152
economic importance 9 613
Eulamellibranchia 5 100 101, 8 559
fossils *see* Pelecypoda fossils
morphology 9 612
mussel 8 669 670
Protobranchia 8 559, 11 45*
Septibranchia 8 559 12 187*
shell 9 613
shipworm 12 291
Taxodonta 8 559, 13 403 404*
Pelecypoda fossils 9 613 614
classification 9 613
Desmodonta 9 614
Dysodonta 9 614
geologic record 9 614
Heterodonta 9 614
Palaeoconcha 9 614
Taxodonta 9 614, 13 403 404*
Pelican 9 615
Pelican flower 1 532
Pelgot, E. M 14 209
Pelite 11 590
Pelitic rocks 11 591
hornfels 6 487
Pell's equation 9 225
Pellagra 4 236
niacin 9 92
Pellat current balance 3 627
Pelletier, P 11 190, 13 207
Pelletierine 3 248
Pellicle 8 509
Pellicularia filamentosa 7 478 8 677
Pellicularia koleroga 5 265
Pelloderm 10 11
Pelobates 3 433
Pelobatidae 1 433, 13 661
Pelodera strongyloides 9 29
Pelodictyon 11 553
Pelodytes 1 435
Pelomedusidae 5 22
Pelomyxa carolinensis 6 459, 11 58
Pelopidae 12 30

Parus niger 11 32
PAS *see para*-Aminosalicylic acid
Pascal, Blaise 3 400, 8 53, 9 588
Pascal's law 1 101, 9 588
Paschen, F. 9 588, 12 559
Paschen-Back effect 9 588
  Zeeman effect 14 610
Paschen Runge mounting 4 141
Paschen series 1 657
Paspalum dilatatum 4 3
Paspalum notatum var *Pensacola* 5 528
Pass band 5 267
Passalidae 3 276
Passalurus ambiguus 9 476
Passamaquoddy 14 399-400
Passenger car *see* Automobile
Passenger pigeon 3 302, 4 270
Passenger ship *see* Ship, merchant
Passer domesticus 12 562, 572
Passer montanus 12 562
Passeriformes 1 694, 9 588 589*
  blackbird 2 255
  bluebird 2 271
  bobolink 2 273
  bunting 2 371
  canary 2 435
  cardinal 2 480
  catbird 2 550
  chat 3 11
  chickadee 3 58
  cowbird 3 528-529
  creeper 3 541
  crossbill 3 554-555
  crow 3 556 557
  dickcissel 4 108
  finch 5 273
  flycatcher 5 362
  grackle 6 244
  grosbeak 6 275
  jay 7 304
  junco 7 317
  kingbird 7 361
  kinglet 7 361
  lark 7 404 405
  magpie 8 74
  martin 8 156
  mockingbird 8 525
  nutcracker 9 234
  nuthatch 9 234
  oriole 9 407
  ovenbird 9 455
  pewee 10 88
  phoebe 10 119
  phylogeny and distribution 9 589
  raven 11 548
  redstart 11 589
  robin 11 589
  sparrow 12 562
  starling 13 54
  swallow 13 333
  tanager 13 388
Passeriformes—*cont*
  taxonomy 9 589
  thrasher 13 612
  thrush 13 615
  towhee 14 1
Passerina amoena 2 371
Passerina ciris 2 371
Passerina cyanea 2 371
Passerina versicolor 2 371
Passive immunization, *biologicals* 2 217
  immunity 7 34
Passive radar 9 589
Passive sonar *see* Sonar
Passivity (corrosion) 3 489
Pasteur, Louis 1 475, 2 66, 68, 5 215, 6 413, 7 496, 9 595, 10 200, 13 125, 14 601
Pasteurella 1 466-467, 2 351
  fluorescent antibody method 8 383
Pasteurella haemolytica 2 351
Pasteurella multocida 2 351
  hemorrhagic septicemia 6 413
Pasteurella pestis 2 351, 10 255, 428
Pasteurella pseudotuberculosis 2 351, 11 67
Pasteurella tularensis 2 351, 14 134
Pasteurellosis *see* Hemorrhagic septicemia
Pasteuria 2 10
Pasteuria ramosa 6 593
Pasteuriaceae
  Hyphomicrobiales 6 593
Pasteurization 9 589 590
  milk 4 2, 8 433
  sterilization 13 133
Pastinaca 7 437
Pastinaca sativa 9 568
Pasture dischmax 3 182 186
Patagia 7 459-473
Patagonian Plateau 12 524
Patapsco formations 9 506
Patella 7 232, 520, 11 19, 14 114
Patellacea 6 76
Patellidae 1 591, 11 19
Patellina 5 435
Patent 9 590-595
  aeronautics and astronautics 9 593
  assignment 9 592
  design 9 590
  electrical 9 590
  electronic 9 590
  enforcement 9 592
  foreign filing 9 593
  foreign patents 9 593
  interferences 9 592
  invention 9 591-592
  inventor 9 592
  licenses 9 593
  marking 9 593
  mechanical 9 590
Patent—*cont*
  nuclear and atomic energy 9 593
  plant 9 590
  procedure 9 590 591
  rights 9 590
  witnesses 9 592
Patent grade (wheat flour) 14 494
Paterson, M S 11 598
Path (graph theory) 6 253
Path coefficients (biometrics) 2 229
Path equation (electron motion in vacuum) 4 510-511
Pathogen 2 350, 7 94, 9 593*
  immunity 7 33
Pathogen (soil) 9 593 594
  animal 9 593-594
  human 9 593 594
  plant 9 594
Pathogenic yeasts 14 602
Pathogenicity *see* Virulence
Pathologic traits, inheritance of 6 509-513
Pathology 9 594-595
  areas of investigation 9 595
  classification of changes 9 595
  clinical 3 192-202
  disease 9 594
  etiologic agents 9 595
  pharmacology 10 97
  tissue reaction 9 594-595
Patras, Gulf of 5 115
Patroclus (asteroid) 14 114
Pattee, H H 8 367
Patten B 2 216, 4 387
Patterson, B 9 538
Patulin I 468
Patuxent formation 9 506
Paucity of mineral phases 4 385
Pauli, Wolfgang 4 96, 5 137, 7 503, 9 83, 550, 11 148, 12 615
Pauli exclusion principle *see* Exclusion principle
Pauli paramagnetism *see* Paramagnetism
Pauli spin matrices 11 187
  Cayley-Klein parameters 2 578
Pauling, Linus 3 458 461, 4 519, 11 34, 40 41 12 474
Pauling process 9 113
Pauling scale (electronegativity) 4 519 520
Paulo Afonso Falls 12 530
Pauly reaction 6 457
Paunch *see* Rumen
Paurodontidae 9 538
Pauropoda 1 565 8 682, 9 595 596*
Pauropus silvaticus 1 565, 9 596
Paussidae 3 276
Pavement 9 596 598
  airport 1 216
  asphalt 1 590 591, 9 597
  bituminous 9 597
  concrete 9 598
  dynamic loads 9 596
  evaluation of subgrade 9 597
  flexible 9 597
  hardness of 6 338
  highway engineering 6 451
  macadam 9 597
  portland cement 9 598
  research 9 598
  rigid 9 598
  soil properties 9 597
  static loads 9 596
  structural capacity required 9 596
  traffic load 9 596
  type of soil 9 597
Pavement ant 6 581
Pavo 3 412, 414*
Pavlov, I 4 165, 11 397
Pavo cristatus 9 602
Pavo muticus 9 602
Pawl 9 598 599
  cam pawl 9 599
  ratchet wheel 9 598
Pavilla 10 92
Pavillosa 4 360 9 599*
Pavillosida 4 372
Pay formation (petroleum engineering) 10 39
Payne-Gaposchkin, C. H 4 546, 9 172
Payoff (game theory) 6 24 30
PBX *see* Telephone private branch exchange (PBX)
PCM 11 98
PCP 6 422
PDM 11 97
Pea 9 599 601*, 12 145
  diseases 9 600
  foliage disease 9 600
  harvesting 9 599
  production 9 600
  propagation 9 599
  root diseases 9 600
Pea crab 4 34
Pea weevil 5 278
Peace River 9 155
Peach 9 601 602
  cultivation 9 601
  diseases 9 601 602
  harvesting 9 601
  nectarine 9 28
  propagation 9 601
Peach leaf curl 1 574
  fruit (tree) diseases 5 546 548
Peach sawfly 6 580
Peach scab 9 601

lase 3 22
le 9 629
ond 1 307, 11 34 35
a nature 9 629
nthesis 9 629
orm 14 551
occus 8 350
ones 1 170
onization 2 8
ostreptococcus 7 381
canda 3 563 10 1 2*
Amphipoda 1 339 341*, 3 563, 5 103, 10 1
Cumacea 3 563, 622*, 5 103 10 1
Isopoda 3 563, 5 103, 7 285 284*, 10 1
morphology 10 1 2
Mysidacea 3 563 5 103, 8 683 685*, 10 1
relationships among Peracarida 10 2
Spelaeogriphacea 3 563, 5 103 10 1, 12 601*
Tanaidacea 3 563, 5 103, 10 1, 11 388 389*
racetic acid 5 44, 10 29
production 1 29
Peracid epoxidation 5 43
hydroxylation reaction 6 571
Peraneme 5 98
Peranema trichophorum 5 99, 8 170
Perastatate ion 1 595
Perbenzoic acid 5 44
Perbunan 11 640
Perca flavescens 10 9
Percent alcohol hydrometer scale 6 562
Percentage (solution) 3 361
Perception 1 595, 10 2 9*
agnosia 1 213
behavior ontogeny of 2 143
changes and events 10 8 9
definition 10 2
environmental spaces 10 7
as an exploratory process 10 2
guessing supposing, or surmising 10 5 6
hallucination 6 323
methodology 10 6
motivating of behavior 6 4
personal theory 10 33
persons and cultural environment 10 8
problems 10 7 10
as a process of monitoring behavior 10 5
surfaces and permanent objects 10 7-8
Perception, extrasensory *see* Extrasensory perception (ESP)
Perch 10 9*, 13 537
marine fisheries 8 113
white 12 249
Percheron mare 6 489
Perchlorate 3 73, 10 9*
production 4 466
Perchloric acid 3 73
Perchloroethylene 3 74, 75
solvent 12 496
Perchloromethyl mercaptan 13 245
Perchromate 3 105-106, 10 29
Perchromic acid 3 105
Percidae 4 13, 10 10
Perciformes 2 111, 170, 9 442, 10 9 10*, 15 530
adaptive radiation 10 10
barracuda 2 103
bass 2 103
bluefish 2 271
crappie 3 539
darter 4 15
economics 10 10
mackerel 8 9
perch 10 9
sculpin 12 89
sheepshead 12 249
sunfish 13 291
Percolation filtration petroleum processing 10 70
Percomorphi *see* Perciformes
Percopsiformes 9 442, 10 10*
Percopsis transmontana 10 10
Percussion, center of *see* Center of percussion 9 617
Percussion caps 10 592
Percussion drill 8 475
cable tool drill 2 384
rock drill 3 417
Percussion instruments 8 665 666
Percussion welding 11 495
Perdix perdix 9 588
Perekop, Gulf of 5 115
Perennial plants 10 10 11
Peres, A 11 437
Pereskia aculeata 8 241
Perey, M 5 493
Perfect *binding* book manufacture 2 288
Perfect flower 5 526
Perfect gas 6 41
flow of fluids 5 323
Perfect information game theory 6 26
Perfect numbers 9 224
Perfect recall game theory 6 26
Perfecting press 10 620
Perfectly inelastic collision 3 291
Perforated tray *extractor* 12 499
Perforating sheet metal 12 253
Performic acid 5 44
Pergidae 6 574
Perhapsatron 10 234
Perianth 2 324 5 527
Periarteritis nodosa 7 623, 8 658
joint (anatomical) disorders 7 315
Peribolaster lictor 12 619
Pericardial cavity 3 137 138
Pericarditis 6 361, 7 622
chronic 6 361
fibrinous 6 361
hemorrhagic 6 361
purulent 6 361
serofibrinous 6 361
Pericardium 6 357
Pericarp 2 324, 3 543 544
fruit 5 543-544
lychee 7 623
Pericline law 5 207
Pericycle 10 11*, 15 105, 115 116
Periderm 2 97, 10 11-12*
cork 10 12
cork cambium 10 11
leaf anatomy 7 436 441
origin 10 11
Peridinium 11 53
Peridinium unbonatum 11 55
Peridium spinipes 11 52
Peridot 6 99, 9 317
gem 6 99
Peridotite 10 12 13*, 86, 11 590, 12 156, 198
composition 10 12
composition of mantle 8 532
laterite, ferruginous 7 407
occurrence 10 12
Saint Paul's Rocks 8 532
structure 10 12
texture 10 12
Peridroma 7 470, 472
Periechocrinites 4 566
Perigee 6 126, 10 13*
artificial satellites 1 33-36, 12 34
tide 13 635
Perigone 5 526 534
Perigyny 5 526 534
Perihelion 6 125, 10 13*
orbital motion 9 371-372
Perijove 1 495
Perilampidae 6 547
Perilla oil 4 290
printing ink vehicles 7 113
Perilymph 4 319
Perilymphatic sac 4 319
Perineurium 9 42 63
Period (periodic phenomena) 10 13
periodic motion 10 13
sine wave 10 101
Period parallelogram 4 562
Periodate 7 238, 10 13*
Periodic acid 7 238
Periodic functions 4 561
Periodic heat conduction 3 388-389
Periodic kilns 7 235, 346
Periodic magnetic focusing, traveling wave tube 14 70
Periodic motion 10 13
anharmonic oscillator 1 407
harmonic motion 6 341 345
vibration 14 511
Periodic perturbations 10 37
Periodic phenomena 5 487
Periodic table 10 13 15
acid base properties 10 14
actinide elements 1 54 55
alkali metals 1 246
alkaline earth metals 1 246-247
atomic volumes 10 14
chemical structures 3 32 42
chemistry 3 46
halogen elements 6 324
inert gases 7 90
ionization potential 10 15
lanthanide contraction 7 399 400
metal 10 14
metalloacid elements 8 292
nonmetal 10 14
period 10 13
valence 10 14
Periodicity in organisms 10 15 17
environment 5 12 15
mechanism of persistent rhythms 10 16 17
migratory behavior 8 428
persistence of the rhythms 10 16
Periodontal membrane 13 674
Periodontia 4 64
Periodontium 13 674
Periodotite 7 16
Periosteum 2 284, 12 364
Periostracum Mollusca 8 560 Pelecypoda 9 615
Peripatopsis 9 329
Peripatus 8 14, 9 329 10 252
Peripheral theory emotion 4 584
Peripheral vision 14 336 338
Periphylla 3 255, 4 39, 9 329
Periphyton 5 528, 533
Periplaneta 1 565
Periplaneta americana 1 19 23, 3 251, 9 416
Periptychidae 3 394
Periptychus 3 394
Peripylina 12 27
Perisarc 9 242
Periscelidae 4 212
Perischoechinoidea 4 560, 10 17*
Bothriocidaroida 2 306, 4 560
Cidaroida 3 120, 4 560

Pelmatozoa 4 360-364, 9 615*
Blastoidea 2 256*; 4 360
Carpoidea 2 532*, 4 360
Crinoidea 3 547-550*; 4 360
Cystidea 3 649*; 4 360
Edrioasteroidea 4 360, 412*
Eocrinoidea 4 360, 5 32*
Paracrinoidea 4 360, 9 544*
Peloplocaceae 3 65
Peloponnesos Peninsula 5 116
Pelseneer, P 9 613
Pelt (leather and fur) 7 447-448
Peltier, J C A 13 580, 584
Peltier effect 13 580-582
Peltogaster 1 562
Peltogasterella socialis 11 547
Pelton wheel 9 615-616
performance criteria 10 591
Pelvic girdle 12 363
skeletal system 12 351-367
Pelvis 1 397, 9 616*
trunk 14 120
Pelycosauria 1 415, 9 616*, 11 484
Edaphosauria 9 616
Ophiacodontia 9 616
Sphenacodontia 9 616
Pemphredon 6 579
Pen meters 4 268
Penaeidea 4 24-34
Penaeus 4 26
Penaeus setiferus 3 567, 4 29, 12 308
Penck, Walther 5 357
Pendergast, J 6 400
Pendulum 9 616 618
ballistic 2 83, 9 618
Blackburn 7 541
center of oscillation 9 617
center of percussion 9 617
clocks 3 203-205
compound 9 616 618
Dimensional analysis 4 195
Foucault *see* Foucault pendulum
gravity 9 616-618
Kater's 9 618
pendulum motion 9 616 618
Schuler *see* Schuler pendulum
spherical 9 618
time interval measurement 13 646
torsional 6 342*; 9 618
Pendulum apparatus (gravity) 13 513
gravity measurements 13 513
Sterneck's 13 514
Vening Meinesz 13 514
Pendulum-galvanometer seismograph 12 147
Pendulum scale 14 462
Pendulum seismograph 12 147
Pendulum stability (submarines) 12 272
Penella 3 462
Peneplain 5 179
Piedmont 9 147
Peneplain concept 6 164
Peneroplidae 5 433
Peneroplis pertusus 5 432
Penetrameter 11 304
Penetrance, gene 9 618
blood groups 2 267
human genetics 6 511
Penetration depth (superconductors) 13 297
Penetration twin (minerals) 8 464-465
in Staurolite 13 75
Penguin 9 618 619*, 12 607
Adelie 12 607
emperor 12 607
Galapagos 12 607
Penicillin 1 475, 574, 8 678, 9 619 621*, 13 374, 528
allergy, atopic 1 257
antibiotic 1 464 468
antimicrobial activity 9 620
assay 9 619
biosynthesis 9 620
chemistry 9 619
chemotherapy 3 53
paresis, general 9 564
pharmacology 9 620
synthesis 13 600
therapeutic use 9 620
Penicillinase 2 29
Penicillium 2 380, 3 484, 5 123, 9 235, 13 141, 541, 14 483
Moniliaceae 8 569
Penicillium camemberti 1 574
Penicillium charlesii 8 92
Penicillium chrysogenum 1 466-467, 574, 8 569
Penicillium digitatum 5 547, 8 569, 10 306
Penicillium expansum 8 569, 571, 13 141
Penicillium griseofulvum 5 563, 6 274
Penicillium italicum 5 547, 8 569
Penicillium janczewskii 6 274
Penicillium javanicum 5 188
Penicillium nigricans 6 274
Penicillium notatum 1 466-467 5 28 8 569
Penicillium rastrickii 6 274
Penicillium roqueforti 1 574 3 15, 8 432
Penicillium spinulosum 11 195
Penicillium ulricae 6 274
Peninsulas 5 116
Penis 9 621
bone 5 472 473
copulatory organ 3 472 473
histology 11 473
reproductive system 11 467
Pennales 3 119
Pennant, P 5 562
Pennaria 3 255
Pennatula 3 255
Pennatula phosphorea 9 621
Pennatulacea 1 228, 3 255, 9 621-622*; 12 92
Pennella 2 418
Pennellidae 2 418
Penneman, R. A 1 501
Pennides 13 408
Pennine 3 77
Pennine Alps 5 117, 8 184, 13 408
Pennisetum glaucum 8 440
Pennsylvanian 6 136, 142, 9 622
animal life 9 521
plant life 9 504
see also Carboniferous
Penny Highlands 1 523
Penobscot Bay 14 399
Pensacola Mountains 1 440
Penstocks 4 10
dam 4 10
Penta prism 8 508
Pentaborane (9) 2 290
Pentaborane (11) 2 290
Pentachloroethane 3 75
Pentachlorophenol 6 422; 10 112
Pentacontane 1 249
Pentacosane 1 249
Pentacosanoic acid 2 474
Pentacrinus 7 327
Pentacyclic terpene 14 112
Pentadecane 1 249
3-(n Pentadecyl) catechol 10 112
Pentadecylic acid 2 474
1,2 Pentadiene 14 207-209
1,4 Pentadiene 6 533, 14 207-209
cis 1,3-Pentadiene 14 207-209
trans 1,3 Pentadiene 1,3 14 207-209
1,3-Pentadiyne 1 245, 6 533
Pentaerythritol 5 472, 9 622*
polyhydroxy alcohol 10 473
production 1 29
Pentaerythritol tetranitrate 5 151, 579
Pentagon 9 623*, 10 471
Pentagonal bipyramid chemical structures 3 35
Pentagrid converter 9 623
Pentahedron 10 471
Pentalonia nigronervosa 1 2
Pentamerus 12 329
Pentamethylbenzyl pararosaniline hydrochloride 7 60
Pentane 1 249
i-Pentane 9 5
n Pentane 9 5, 10 65
1,5 Pentanediol 6 223
5 Pentanone 7 339
Pentaploid 10 488
Pentaprism view finder 2 429-430
Pentastomida 9 623-624
Cephalobaenida 2 643, 9 623
Porocephalida 9 625, 10 529
Pentatomidae 6 401
1-Pentene 14 207 209
cis-2 Pentene 14 207 209
trans-2 Pentene 14 207 209
2 Pentenylpenicillin 9 619
Pentether 10 423
Pentland Firth 9 251
Pentlandite 9 94, 97, 624*
Pentobarbital 6 595
Pentode, vacuum 9 624-627*, 14 252 253
amplification factor 9 626
characteristics 9 625
dynamic plate resistance 9 626
electrode arrangement 9 624
electrostatic field 9 625
mutual conductance 9 626
plate-current cutoff 9 627
potential profile 9 625
remote cutoff 9 627
sharp cutoff 9 627
tube coefficients 9 626
Pentolite 5 151
Pentosan 6 558
Pentose 8 578
Pentose phosphate pathway 2 40
Pentremites 2 256, 4 366
n Pentyl radical 1 252
tert Pentyl radical 1 252
1 Pentyne 14 207 209
2-Pentyne 14 207 209
Penumbra 9 627
shadow 12 238
Penumbra error x ray microscopes 8 367 368
Penumbral eclipse 4 582
Peperomia 5 37
Pepinsky, R 14 570
Pepo 5 542
Pepper 9 627
paprika 9 541
pimento 10 232
Pepper (black) 9 627-628, 12 615
Pepperidge 14 144
Peppermint 9 628
Peppermint oil 8 227
Pepsin 5 203, 9 628*
enzyme 5 20 21
protein metabolism 11 4
Pepsinogen 4 167, 13 149
pepsin 9 628
protein metabolism 11 4
Pepsis 6 582
Peptic ulcer 6 72 75, 9 628 629*, 14 179
stomach disorders 13 15

Petrichiae 6 412 413
Peter the First Range 1 577
Peters, M S 6 367
Peters, R 3 44
Petiole 7 454
Petit, A. 12 574
Petit mal 5 40
Petitmodiac Estuary 14 399
Petitgrain oil 13 497
PETN 5 151
Petrel 10 657
Petri plate 2 6
Petrie F. 1 515
Petrifaction 10 42
calcified types 10 42
coal balls 10 42
formation 10 42
geochemical processes 10 42
opal 9 552
silicified *types* 10 42
Petrified forests 10 42 43
Petrinae 3 277
Petrobiona 10 92
Petrobiona massiliana 2 396
Petrochemical 10 43-48
raw materials and *products* 10 44
see also Petroleum processing
Petrofabric analysis 10 48 49
field measurements 10 49
hand specimens 10 49
sedimentary rocks 12 151
thin sections 10 49
Petrofabric diagram 10 49
Petrogenesis 12 516
Petrogeny's residua system 12 516
Petrographic microscope 10 49
Petrographic province 10 49 52
anorthosite 10 52
basalt andesite rhyolite 10 51
basic ultrabasic 10 51
flood basalts 10 50
granodiorite granite 10 51
leucite basalt potash trachybasalt 10 51
nepheline syenite 10 52
olivine basalt trachyte 10 50
spilite keratophyre 10 51
ultrabasic rock 10 52
Petrography 10 52 54
coal petrography 3 232
disaggregated samples 10 52
magnetic separation 10 52
microscopic 10 53
mineral fractions, separation 10 52
mineral fractions, study 10 53
mode of a rock 10 53
Petrolata 14 444
Petrolatum 10 54*, 14 445
petroleum products 10 72
Petroleum 10 54 56
aromatics 10 55
carbon 2 462
chemical composition 10 54
components other than hydrocarbons 10 55
cycloparaffins 10 55
energy sources 4 601
formation 13 2
hydrocarbon properties 10 55
hydrocarbon types 10 54 55
migration 10 56-57
mineral fuel areas 8 444-447
natural sources of hydrocarbons 6 535
occurrence 10 60 61
oil analysis 9 278 279
origin of 10 56 57
paraffins 10 54 55
physical properties 10 54
pyrolysis 11 118
resins 6 536
seismic exploration for 12 148
specific gravity 10 54
see also Petroleum (*origin*) Petroleum engineering, Petroleum geology Petroleum processing Petroleum products
Petroleum (origin) 10 56 57
chemical fossils 3 29
primary migration 10 56
secondary migration 10 57
Petroleum acid 10 55
Petroleum coke 3 271, 272
graphite 6 257
Petroleum dewaxing *see* Dewaxing (petroleum)
Petroleum engineering 10 57-60
corrosion 10 59
drilling 10 57
electrical surveys 10 58
gamma ray surveys 10 58
gas cap drive 10 59
gas expansion 10 59
gas-oil separation problems 10 58 59
gravity drainage 10 59
neutron surveys 10 58
oil water separation 10 59
pay formation 10 59
production forecasts 10 59
recovery problems 10 59
recycling 10 59
secondary recovery 10 59 81 83
stripping 10 59
water drives 10 59
Petroleum ether 10 72
Petroleum geology 10 60 64
facies (geology) 5 175
petroleum deposits 10 60 61
reservoir fluids 10 64
reservoir rocks 10 61 63
reservoir traps 10 63
Petroleum grease 10 72
Petroleum incendiaries 7 54
Petroleum jelly 14 444
products 10 72
Petroleum lubricants 7 602
Petroleum microbiology 10 64*
exploration 10 64
formation 10 64
production 10 64
Petroleum processing 10 65 71
acid treatment 10 70
alkylation 1 253 354
aromatization 1 549
breaking the large molecules 10 68
clay contact adsorption treatment 10 70 71
coking (petroleum refining) 3 275
cracking 3 532 535 10 68 69
dehydration 10 70
desalting 10 70
desulfurization 10 70
dewaxing (petroleum) 4 91
isomerization 7 281-282
lubricant 7 601 606
lubricating oil processing 10 66 67
naphtha 9 2
oil analysis 9 278 279
propane 11 6
rebuilding the desired chemical compounds 10 69
reforming (petroleum refining) 11 403 404
separating the crude oil 10 65 68
solvent treatment 10 71
sweetening 10 70
treating processes 10 69 71
vapor phase treatment 10 71
wax petroleum 14 445
see also Petroleum products
Petroleum products 10 71 73
aircraft fuel 1 177-179
distillate *fuel* 4 246
fuel oil 5 556 557
gasoline 6 68 71
jet fuel 7 506
kerosine 7 537
liquefied petroleum gas 7 540
major products 10 71
minor products 10 71
Petroleum products—*cont*
naphtha 9 2
oil analysis 9 278 279
petrochemical 10 43 48
petrolatum 10 54
wax, petroleum 14 445
Petroleum prospecting *see* Prospecting, petroleum
Petroleum reservoir *engineering* 10 73-81
compression energy 10 76-78
computing components of flow 10 76
Darcy's law 10 74 76
depletion drive 10 78
energy and producing mechanisms 10 76
gravity drainage drives 10 79
material balance equation 10 73
multi phase production 10 75
oil or gas in place 10 73
permeability 10 74 76
recent developments 10 80
reservoir engineering analysis 10 79
solution gas drives 10 78
water-drive reservoirs 10 77
Petroleum secondary recovery 10 59, 81 83*
energy supplement 10 81
fluid contamination 10 82
fluid displacement 10 82
fluid segregation 10 82
miscible displacement 10 83
mobility ratio 10 82
oil retention 10 82
residual oil 10 82
surface active materials 10 83
Petroleum wax *see* Wax, petroleum
Petrolisthes tridentatus 4 31
Petrologic province 12 142
Petrology 6 137 139, 10 85 88*
coal petrology 3 232, 240 242
high pressure phenomena 6 441 446
igneous rocks 10 85 84
metamorphic *rocks* 10 86-88
sedimentary rocks 10 84 85
structural petrology 13 205
Petromyzon 2 485 8 651, 9 46 529
Petromyzon marinus 7 388 10 88
Petromyzontia *see* Petromyzontiformes
Petromyzontiformes 10 88
Petroselinum crispum 9 568

Perischoechmoidea—*cont*
Echinocystitoida 4 359, 360
Palaechinoida 4 360, 9 496
Periscope 10 17-18*; 13 213
depth 13 213
prism, optical 10 624
submarine 10 18
tank 10 17-18
Periscopic sextant 12 234
Periskop lens system 7 452-453
Perissodactyla 8 82, 10 18*, 12 364
donkey 4 262-263
horse 6 488
Perissodactyla fossils 10 18-20
rhinoceros 11 545
tapir 13 395
Peristalsis 4 166
Peristerite 5 213
Peritectic transition 5 58
Peritoneal cavity 1 3
Peritoneum 1 3, 10 20*
Peritonitis 1 492, 6 73, 7 623, 10 20*
infection 10 20
Peritonsillar abcess 13 178
Peritrichida 6 467, 10 20-21*, 11 53
Peritrichous flagellation 2 63
Peritrophic membrane 7 124
Periwinkle 9 609, 10 21*
Perkin, W H 4 298
Perkin reaction 3 374
aldehyde 1 230
Perla 10 415, 13 153
Perlite 10 21*, 11 560, 14 347
Perlman, I 5 624, 14 66
Permafrost 5 540, 9 152, 10 21-22*
Arctic and subarctic islands 1 523
climax plant formations 3 186-192
hydrolaccolith 6 556
polygonal ground 10 472
soil mechanics 12 455
Permalloy 1 260, 10 22*
magnetic alloy 7 264
4-79 Permalloy 8 35
45 Permalloy 8 35
Permanent-magnet moving-coil voltmeter 14 370
Permanent-mold casting 2 542
Permanent teeth 13 674
Permanent thermocline 13 561
Permanganate 8 89, 10 22*
chemical oxidant 9 464
Permasyn motor 1 284
Permeability (naval architecture) 12 275
Permeability (porous media) 10 74-76
Permeability (soil) 12 454
Permeability, magnetic 8 49, 10 22 23*; 13 296
absolute 10 22
Ampere's law 1 332
electrical standards 4 458
magnetic units 4 460-461
measurement 10 23
relative 10 22-23
for sea water 12 106 107
of superconductors 13 296-297
Permeameter 10 23, 12 454
constant head type 12 454
falling head type 12 454
Permeases 1 311
Permendur 8 35
magnetic alloy 7 264
Permian 6 136, 142, 10 23-27*
animal life 9 521
Australia 10 25
deserts 10 26 27
glaciation 10 26
Glossopteris flora 10 26
India 10 26
life 10 27
North America 10 23
orogeny 10 27
plant life 9 504-505
Russia 10 23
South Africa 10 25
South America 10 26
tillite 10 26
Perminvar 7 264
45 25 Perminvar 8 35
Permissible explosive 5 151
Permittivity 10 27
Coulomb's law 3 516
dielectric constant 4 111-112
dielectrics 4 114-115
electrical units 4 460-461
Permutable observations 7 411
Permutations 3 305
Pernicious anemia 3 195, 4 236
circulation disorders 3 141-144
hematocrit determination 3 195
vitamin B_{12} 14 342
Perognathus 6 440
Perognathus baileyi 3 473
Perognathus hispidus 3 473
Peromyscus 8 618
Peronella japonica 7 234
Peronosporales 10 200
Peronospora 10 200
Peronospora destructor 9 327, 10 310
Peronospora manshurica 12 535
Peronospora pisi 9 601
Peronospora tabacina 13 663
Perophora 1 574
Perothopidae 3 277
Perovskite 10 27-28
Perovskite type ferroelectrics 5 225 229
Peroxidase 2 19
Peroxide 10 28-29
bleaching 2 259
chemical oxidant 9 464
electrochemical process 4 466
in ethers 5 85
inorganic peroxides 10 28
organic peroxides 10 29
persulfate 10 37
Peroxide effect' addition reaction 1 63
Peroxyanion compound 10 29
Peroxydicarbonate 10 28
Peroxydiphosphate 10 28
Peroxydisulfate 10 28, 37
Peroxydisulfuric acid 13 262
Peroxymolybdate 8 565
Peroxymonosulfate 10 28, 37
Peroxymonosulfuric acid 13 262
Peroxyniobate 9 102
Peroxysulfate 10 37
Peroxytantalate 9 102
Peroxytitanate complex 12 582
Perpendicular 9 138
geometry, euclidean 6 153
Perpetual calendar 2 415
Perpetual motion 10 29-30
Perpetuum mobile 10 29
Perrhenic acid 11 544
Perrier, C 15 405
Perrin, J 1 697
Perrisodactyla 8 82, 10 18*
Perron, O 7 412
Perry, R L 8 429
Persea 3 187, 189
Persea americana 1 696
Perseid shower 8 306 308
Perseids 10 38
Persephona punctata 4 53
Persephonaster neozelanicus 9 599
Perseus 3 412-413, 10 30*
Persian Gulf 1 580, 7 56, 9 249 271
pearl fisheries 9 606
Persian Gulf red 10 224
Persian lamb 7 448
Persian melon 10 30
Persian walnut 14 384
nut crop culture 9 232
Persimmon 4 358
Persiston 1 255
Personality disorders, transient 1 8
Personality theory 10 30-37
behavior consistencies 10 30 31
Freudianism 5 535
personality assessment 10 34 36
personality research 10 36
study approaches 10 31 33
Personnel decontamination 4 58
Perspective drawing 10 214 216
Perspective view, descriptive geometry 4 70
Persulfate 10 28, 37*
Persulfuric acids 13 262
production 4 466
Perthite 5 211 212, 10 37*
Perthitic texture 7 12 13
Pertitanate 10 29
Perturbation (astronomy) 10 37-39
celestial mechanics 2 382
commensurable motion 10 38
effect on comets 3 314 315 10 38
long term 10 37
method of special perturbations 10 37
nongravitational causes 10 38
orbits of planets 10 37
periodic 10 37
satellite orbits 10 38 39
short term 10 37
Perturbation (mathematics) 10 39-41
canonical transformations 2 438-439
degenerate 10 40 41
examples 10 39
iteration method 10 39 40
Perturbation (quantum mechanics) 10 41
quantum field theory 11 152-153
Pertussis *see* Whooping cough
Peru Chile Trench 8 576, 9 45
Atacama trench 4 526
monoplacophorans in 8 576
Peru Current 9 485
Perylene 4 516
Peshkov, V 6 595
Pestalotia 8 213
Pestalotia guepini 8 213
Pestalotia palmarum 8 213
Pestalotia theae 8 213
Pestalozzia 3 254
Pesticide 10 41-42
miticide 8 518
nematocide 9 28 29
rodenticide 11 615
see also Agriculture, Agricultural chemistry, Fumigant, Fungitat and fungicide, Herbicide, Insecticide
Pet foods 5 406-407
Petal 5 329
Echinoidea 4 375
Petalichthyida 1 528
Petalite 7 545, 544
Petalodontidae 2 216
Petalomonas 5 98
Petalostemon 3 190
Petaluridae 9 275
Petasma 5 105

se modulation—*cont*
fundamental properties 10 103
microwaves 8 414
noise response 10 105
phase modulator 10 103
se modulation detector 10 109
se modulators 8 550, 9 103-106*
Armstrong circuit 10 104 105
phase shift circuit 10 103 104
phase shifter modulator 10 105
phasitron 10 105 106
se order 1 278
se-order indicator 10 108
se relation indicators 10 109
se rotation 1 278
se rule 5 55
sulfide phase equilibria 13 243
se rule Gibbs 14 111
se sequence 1 278
se sequence indicator 10 108
se shift 4 256 257
ase shift circuit 10 103 104
ase shift discriminator 4 235
frequency-modulation detector 5 516
ase shift modulator 10 104 105
ase-shift oscillator 9 420-421
ase space 13 59 60
Boltzmann transport equation 2 281
Hamilton's equations of motion 6 330
probability (physics) *10 833*
hase stability particle accelerators 9 576
hase transformation 14 27
hase transitions ferroelectrics 5 228
hase velocity 10 106
contrasted to group velocity 6 285
light 7 302
microwave transmission lines 8 423
wavelength measurement 14 439
haseolus 2 115
haseolus acutifolius var *latifolius* 2 116
haseolus lunatus 2 116
haseolus multiflorus 2 116
haseolus vitus 2 12 335
haseolus vulgaris 2 116
Phasianidae 5 58, 6 18, 291, 9 587, 602 *10 109*, 11 135
Phasianus colchicus 6 18, 10 109
Phasing lamps 10 109
Phasitron 5 514
Phasitron tube 10 105 106
Phasmid 9 32
Phasmidae 9 416
walking stick 14 582
Phasmidia 1 571
Phasmidiea *see* Secrementea
Phasor 5 46
electromagnetic radiation 4 494
fields 11 396
Pheasant 6 18, 10 109 110
Pheidole 6 581
beta Phellandrene 13 496
Phellem 13 118
meristem, lateral 8 243
Phellia 1 52 54
Phelloderm 13 118
Phellogen 13 118
meristem, lateral 8 243
periderm 10 11
Phellum 10 11
Phenacetin 10 110
Phenacodontidae 5 594, 6 598
Phenacodus 5 594
9 10 Phenanthraquinone *11 194*
Phenanthrene 1 548, 10 110*
coal tar chemical 5 236
optical activity 9 548
Phenanthrene (steroid) glycoside 6 224
1, 10 Phenanthroline 4 275
Phenarsazine chloride 9 401
Phenazine 4 104
Phene 6 112
Phengodes 5 281
Phengodidae 5 277
Phenobarbital 5 41 6 595 *11 114*, 14 217
Phenocopies 10 110 111
gene action 6 111
Phenocryst 10 111*, 14 547
in andesite 1 597
in basalt 2 105
igneous rocks 7 11
in lamprophyre 7 389
in leucite rock 7 480
in limburgite 7 514
in porphyry 10 521
in rhyolite 11 560
in *syenite* 13 361
Phenol 1 476 5 76 10 111 113*
para-aminophenol 1 320
catechol 2 550-551
coal tar chemical 5 236
complex phenols 10 112 113
cresol 3 542
hydroquinone 6 565
naphthol 9 5
petrochemical 10 46
Phenol—*cont.*
in petroleum 10 55
picric acid 10 214
production 6 449, 10 112
resorcinol 11 506
structure and nomenclature 10 111-112
uses 10 111
Phenol coefficient method 2 197
Phenol formaldehyde resin 10 113-114
fabrication and use 10 114
polymerization 10 113 114
see also Polymer
Phenol red 7 60
Phenolic compound 7 *111*
Phenolic polymer 11 223
Phenolic resin lamination 10 406
molding 10 405
paint 9 493
see also Phenol formaldehyde resin
Phenolphthalein 7 61
indicator, acid base 7 60
Phenolsulfonphthalein 7 60
Phenolsulfonphthalein test 5 192 202
Phenoplast *see* Phenol formaldehyde resin
Phenothiazine 1 122, 475, 480, 6 292 12 248 14 16
Phenotype gene action 6 104 *113*
penetrance, gene 9 618
Phenoxy radical 7 111
Phenoxymethylpenicillin 9 619
alpha Phenoxyethylpenicillin *9 619*
Phenyl diketopyrazolidine 5 93
Phenyl glycoside 6 224
Phenyl isocyanate 11 118
Phenyl ketone *see* Benzophenone
Phenyl mercuric acetate 6 421
Phenyl methyl ketone *see* Acetophenone
1-Phenyl-3-methyl 5 pyrazolone 11 110
Phenyl thiocarbamide 13 401
Phenylacetic acid 9 620, *10 114*
2,3,6 Phenylacetic acid 6 423
Phenylacetylene 6 535
Phenylalanine 1 76 2 35, 195, 5 41 6 508 7 164, 10 114, 231, 483 13 624
amino acids 1 508-519
in histone 9 217
metabolic disorders *8 258*
plant metabolism 10 557
in protamines 9 217
Protozoa 11 51-60
tyrothricin 14 177
Phenylalanine—*cont.*
see also Adrenal gland
L-Phenylalanine 11 41
Phenylalanine hydroxylase 6 106
Phenylbenzene *see* Biphenyl
1 Phenylbenzotriazole 2 449
Phenylchlorosilane 12 325
2 Phenylcinchoninic acid 11 195
alpha Phenylcinnamic acid 7 279
1 Phenylcyclohexene 6 535
Phenyldichloroarsine 9 401
Phenylethylamine 7 289
Phenylethylene *see* Styrene
Phenylfluorone 6 178
Phenylhydrazine· aldehyde 1 229
Monosaccharide 8 579
Phenylhydrazone 7 62
aldehyde 1 229
Phenylhydroxylamine 1 408
Phenylisocyanate 1 408
Phenylisothiocyanate 1 408
Phenylketonuria 4 236, 8 258
gene action 6 106
Phenyllactic acid 10 114
2 (Phenylmercuriamino) ethanol acetate 5 564
Phenylmercuric acetate 1 483
Phenylmercuric nitrate 1 483
Phenylpyruvic acid 2 57, 4 256, 10 114
metabolic disorders 8 258
Phenylpyruvic oligophrenia 10 114 115*, 11 81
pigmentation 10 225
N Phenylquinonimine 1 408
Phenyltitanium triisopropoxide 9 404
Phenyltrichlorosilane 12 319, 322-325
Pheochromocytoma 1 74
clinical pathology 5 192 202
Pheophorbid 2 78
Pheophytin 3 78
Pheronema 1 358
Pheucticus ludovicianus 6 275
Pheucticus melanocephalus 6 275
Phialea temulenta 6 261
Phialophora fastigiata 4 52
Phialophora verrucosa 3 106
Phialospores 4 53, 8 569, 571
Philacte canagica 6 256
Philaenus leucophthalmus 6 471
Philippine Deep 9 482
Philippine falconet 5 178
Philippine Islands 9 482 483
Phillips, M 9 200
Phillipsite 14 611
Phillyrin 6 219
Philodendron 1 497
Philodinavus 2 114

Petroselinum crispum var *tuberosum* 9 568
Petrunkevitch, A. 1 498
Petterson, O 9 266
Pettijohn, F J 4 261, 12 24, 142, 241, 13 209
Petunia 12 127
Perturbed problem 10 39
Petzite 6 250
Petzval, Josef 9 568
Petzval condition 9 568
Petzval curvature 1 6
Petzval objective optical lenses 7 453-454
Pewee 10 88
Pewter 10 88-89
  tin alloys 13 650
Peyer's patches 4 161
Peyronie's disease 11 482
Pexicula 8 213
Pexicula corticola 8 213
Pezizella lythri 13 172
Pfeiffer's bacillus *see* *Haemophilus influenzae*
Pfeiffer reaction 7 638
Pfitzinger isatin method 11 193
Pfitzinger process quinoline derivatives 7 65
Pfitzinger scheme 11 192
Pfund, A H 10 450
pH 1 40, 10 89*
  in diagenesis 4 95
  hydrogen ion 6 551
  isoelectric point 7 275
  titration, potentiometric 13 660 661
Phacolith 10 421
Phacus 1 235
Phacus pyrum 5 98
Phacus stokesii 5 99
Phaenocephalidae 3 276
Phaenocora 11 511
Phaeodictyae 14 128
Phaeodictyosporae 5 563
Phaeodidymae 5 563, 12 604
Phaeohelicosporae 5 563
Phaeophragmiae 8 215 12 604, 14 128
  Fungi Imperfecti 5 563
  Stilbellaceae 13 141
  Tuberculariaceae 14 128
Phaeophyta 1 237, 10 89 91*, 189, 320, 346, 13 545
  algae 1 237
  classification 10 90
  Cyclosporeae 10 90
  economic importance 10 89
  Heterogeneratae 10 90
  Isogeneratae 10 90
  morphology 10 89 90
  Nematophytales 9 34
  reproduction 10 89
Phaeoplax 5 579
Phaeoscolecosporae 5 563
Phaesporae 12 604
  Fungi Imperfecti 5 563
  Melanconiales 8 213
Phaeostaurosporae, Fungi Imperfecti 5 563, 8 213
Phage- soil microorganisms 12 462
  typing 4 208
  see also Bacteriophage
Phagocyte 2 9
Phagocytic reaction 1 475
Phagocytosis 1 469, 2 605; 10 91*
  bilirubin 2 186
  cell membranes and monolayers 2 607
  inflammation 7 97-98
  opsonin 9 346
  thermotherapy 13 593
Phagotrophs 8 129
Phalacridae 3 278
Phalacrocoracidae 3 481
Phalacrocorax 9 612
Phalacrocorax auritus 3 481
Phalaenidae 3 633
Phalaenoptilus 6 440
Phalaenoptilus nuttallii 2 448
Phalanges 5 428, 6 533
Phalangeal formula 12 364
  in birds 12 364
  in Caudata 12 364
  the foot 12 364
  the hand 12 364
  in mammals 12 364
  in Reptilia 12 364
Phalangida 1 496, 558, 10 91 92*
  Cyphophthalmi 10 92
  Laniatores 10 92
  Palpatores 10 92
Phalangium 10 92
Phalangium cinereum 1 496
Phalansteridae 11 45
Phalansterium 11 45
Phalarope 3 10, 10 92*
Phalaropidae 10 92
Phalaropodidae 3 10
Phalaropus fulicarinus 10 92
Phalloidine 8 660
Phanerite *see* Aphanite
Phaneritic rock 7 16
  igneous rocks 7 10
Phanerocephala 10 461
Phanerozoic Eon 9 522, 13 169
Phanerozonia 1 598, 4 360, 10 92*
  Notomyota 4 360 9 170, 10 92
  Paxillosa 4 360, 9 599, 10 92
  Pustulosa 10 92
  Valvata 4 360, 10 92 14 260
Phanotron 8 236
Phanotron tube 6 61
Phantastron delay circuit 13 645
Phantom midge 4 212
Pharaoh ant 6 581
Pharbitis 11 376
Pharetrone Calcispongia 10 519
Pharetronida 2 396; 10 92*, 513, 519
Pharmaceutical chemistry 10 92-93
  pharmacy 10 97-98
Pharmaceuticals testing 10 93-94
  biologicals 2 218
  finished-product testing 10 94
  manufacturing procedures 10 93
  raw materials 10 93
Pharmacodynamics 10 97
Pharmacognosy 10 94 96
  pharmacy 10 97-98
  sources of materials 10 94 95
  synthetic materials 10 96
  types of materials 10 95 96
  uses of materials 10 95
Pharmacology 10 97
  bioassay 2 198
  pharmacy 10 97-98
Pharmacotherapy
  pharmacology 10 97
Pharmacy 10 97-98
  general pharmacy practice 10 98
  hospital 10 98
  manufacturing 10 98
  medicine 10 97-98
  pharmaceutical chemistry 10 93, 97-98
  pharmaceutical education 10 98
  pharmaceutical jurisprudence 10 98
  pharmaceutical research 10 98
  pharmacognosy 10 94 96, 97, 98
  pharmacology 10 97-98
Pharomachrus mocino 14 114
Pharotaxis 13 403
Pharyngeal pouch 13 618
Pharyngobdellae 1 531
Pharynx 4 150, 10 98 100*, 13 618
  digestive system 4 150 175
  embryology 10 98-99
  gross derivatives 10 100
  histology 10 99 100
  pharyngeal derivatives 10 99
Pharynx disorders 10 100
Phascolarctos cinereus 7 368
Phascolonus 8 155
Phascolosoma 9 434, 12 346
Phase (alternating current) 1 269
Phase (astronomy) 10 100
  of Jupiter 7 522
  of Mars 8 147
  of Saturn 12 38
Phase (periodic phenomena) 10 100 101
Phases, interface of *see* Interface of phases
Phase angle 10 101
  parallel ac circuits 1 273
  series ac circuit 1 271
Phase angle measurement 10 106 109
  electronic phase angle meter 10 106-107
  electronic switch 10 108
  Lissajous figures 7 542 54
  10 107
  oscilloscope methods 10 107 108
  phase meter 10 102 103
  phase-order indicator 10 108
  phase-relation indicators 10 109
  power factor meter 10 561-562
  synchronizer 10 109
  synchroscope 10 109
  three voltmeter method 10 106
Phase changer microwaves 8 413 414
Phase diagram 5 55
  alloys 1 260 265
  in fused salt systems 5 57
  helium 4 6 392
  for silicates 12 316
  in sulfide systems 13 246 251
Phase diagrams (alternating current) 1 270
Phase difference measurement 9 451 452
Phase discrimination multiplexing 1 352
Phase distortion 4 256-257
Phase equilibrium *see* Equilibrium, phase
Phase inverter 10 101 102
  fidelity 10 101
  paraphase amplifiers 10 101 102
  push pull amplifier 11 10
  transformer inverter 10 1
Phase meter 10 102 103, 106
  power factor meter 10 561-562
  synchroscope 10 109
  see also Phase angle measurement
Phase modulation 8 527, 10 103
  advantages 10 103
  angle modulation 1 405
  applications 10 103
  duration (PDM) 8 529

...sphorus—*cont*
in the sea 12 109
...osphorus 32 12 367, 14 8
leukemia 7 485
...osphorus dichloride trifluo
ride 10 135
...hosphorus fertilizers
5 237 238
superphosphate 5 237
Phosphorus insecticide
7 141 142
Phosphorus iodide 7 238
Phosphorus pentoxide 10 134
Phosphorus trichloride 1 30,
9 404
Phosphorylase 2 461 5 23
bacterial enzyme 2 18
enzyme 5 20
Phosphotransacetylase 2 31
Phosphotransferase 10 370
Phosphotungstic acid 14 140
Phot 10 137
Photic zone 12 106
Photidae 6 37
...mus 2 221, 3 286 7 128
...mus pyralis 5 282
...to lay-off shipbuilding
2 288
...tobacterium 11 64
...tobacterium phosphoreum
25, 598
...otoblepharon 2 220
...otocathode 13 463
phototube 10 192 194
...otocell *see* Photoelectric
devices
...hotochemical apparatus
photosynthesis 10 188
...hotochemical bioclimatology
2 200
Photochemical decomposition
see Photolysis (photo-
chemistry)
Photochemical dissociation *see*
Photolysis (photochemistry)
Photochemical reactions 3 5,
10 137 138*
Photochemistry 10 137 138
chain reaction chemical
3 6
energy relationships
10 138
free radical production
5 497
light absorption 10 138
light sources 10 138
organic reaction mech
anism 9 400
photochemical reactions
3 5 10 137 138
photochemistry 10 137 138
quantum yield 10 137
see also Radiation
chemistry
Photoclerk 10 144
Photoclinometer 10 138 140
Photocomposing machine
10 145, 616, 14 170
Photoconduction 10 151
Photoconductive cell
10 140 142*, 151
antimony sulfide 10 140
cadmium sulfide 10 140
lead selenide 10 140
lead sulfide 10 140
Photoconductive detector
infrared 7 106
Photoconductive gain factor
10 141
Photoconductivity 10 140-142
alkali halides 10 140
application 10 140
exciton induced 10 141
gain factor 10 141
germanium 10 141 142
high gain 10 141 142
intrinsic 10 141
lattice sites 10 140
light amplifier 7 507
mechanism 10 140
potassium iodide 10 140
secondary 10 141
silver halides 10 141
Photoconductor 10 140 142
Photocopying processes
10 142 148 160 161
electrolysis 10 147
electrostatic processes
10 146 147
map reproduction 8 97 98
microfilming 8 350
10 147 148
plan copying 10 146
silver halide photocopying
10 144 145
thermography 10 145 146
transfer processes 10 145
Photodetachment solar
atmosphere 12 55
Photodetectors infrared 7 103
Photodiode 10 148 149* 151
Photodisintegration nuclear
reactions 9 198
terrestrial 13 521 522
Photoelastic polariscope 10 149
Photoelastic stress pattern
2 285
Photoelasticity 10 149 151
birefringence 2 248
determination of principal
stresses 10 150
fringe patterns 10 149
interference fringes 10 150
isochromatic fringes
10 149
isoclinic fringes 10 150
isopachic fringes 10 150
model materials 10 149
PhotoStress method
10 151
polariscope 10 149 150
shear stresses 10 150
Photoelasticity—*cont*
three-dimensional mea-
surements 10 150-151
Photoelectret 4 422
Photoelectric color system 8 73
Photoelectric colorimetry 5 302
Photoelectric devices 10 151
photoconductive cell
10 140
photodiode 10 148-149
phototransistor 10 192
photovoltaic cell 10 197
Photoelectric effect 7 503
Photoelectric effect, external
10 152
Photoelectric infrared
7 105-106
Photoelectric law, Einstein
10 152
Photoelectric photometer
10 171
Photoelectric sunshine re
corder 13 292
Photoelectric threshold energy
10 153
Photoelectric well logging
14 472
Photoelectricity 10 151 152
Auger effect 1 667* 10 151
auto ionization 10 151
photoconduction 10 151
photoionization 10 151
photovoltaic effect 10 151
see also Photoelectric
devices Photoemission
Photoelectron 10 152
Photoemission 10 152 155
alkali halides 10 154
exciton induced
10 154 155
exciton state 10 154
extrinsic 10 154
intrinsic 10 154
light 7 503
metals 10 152
photoconductivity 10 141
photoelectricity *see*
Photoelectricity
photoelectron 10 152
phototube 10 192
quantum mechanics
11 154-155
semiconductors 10 153
surface effect 10 152
volume effect 10 152 153
Photoengraving 10 613
electron-beam etching
8 349
Photoetching printed circuit
10 594
Photofacsimile 5 177
Photoflash lamp 10 155
Photofluorography 11 315
Photofluoroscopy 11 301
Photoformer 1 381 382
Photogelatin process
10 603 616
Photogenic cell 7 129
Photogeology 11 25
Photogrammetry 10 155-156
aerial photography
1 82, 10 156
contour mapping 3 425
photography 10 160,
stereoplotting 10 156
Photograph electrical trans-
mission 13 447
see also Photography
Photographic emulsion 10 168
infrared sensitized 7 106
Photographic film 10 156
Photographic lenses *see* Lens
optical
Photographic materials
10 156 158
characteristics 10 157
emulsions 10 156 157
exposure index 10 157
film 10 156
graininess 10 157
papers 10 156
plates 10 156
silver halides 10 156-157
spectrochemical analysis
12 579
storage 10 158
supports 10 156
Photographic paper 10 156
Photographic photocopying
10 142
Photographic plates 10 156
Photographic recording *see*
Optical recording
Photographic zenith telescope
1 610 611
Photography 3 123 129*,
10 158-168*
aerial *see* Aerial photo-
graph
after processes 10 163
antifoggant 10 162
apparatus 10 165-166
arc lamp 1 503
astronomical *see* Astro
nomical photography
bireflex printing 10 166
branches 10 159
cameras 2 428 432
cathode-ray tube *see*
Cathode-ray tube
color *see* Photography
color
contact printer 10 166
contact printing 10 158
contrast 10 164
darkroom equipment
10 165 166
densitometer 10 164
development 10 162 163
document copying 10 160
electronic shutter 10 160
electrooptical shutter
10 160
enlargers 10 166

Philohela minor 3 10, 14 541
Philomedes carcharodonta 8 682
Philomedes longiseta 8 682
Philometra 4 271
Philopteridae 8 78
Phimosis 11 482
Phinney, B. O. 6 185
Phiomia 10 636
Phlebitis 10 115
Phlebolepis 3 262
Phlebolith 13 615
Phlebothrombosis 13 614
  circulation disorders 3 141-144
Phlebotomus 2 533, 4 218, 7 449
  Trypanosomatidae 14 124
Phlebotomus fever 10 115
Phlebotomus papatasi 10 115
Phleger, F. B. 8 142
Phlegethontius quinquemaculatus 7 472
Phlegethontius (=*Protoparce*) *quinquemaculatus* 7 469
Phlegethontius sextus 7 469, 472
Phleum pratense 13 646
Phocidae 2 523
Phoenicia cuprina 8 680
Phoenicia sericata 8 680
Phloeidae 6 401
Phloem 10 115-118*, 13 105
  companion cell 10 116
  of conifers 10 118
  of dicotyledons 10 118
  fibers 10 116-117
  necrosis 14 76
  parenchyma cell 10 116
  plant translocation (organic solutes) 10 579
  primary 10 117
  secondary 10 117-118
  sieve cell 10 115 116
  sieve elements 10 115
  sieve tube members 10 115-116
Phloeoa 6 400
Phlogopite 2 246, 8 346, 10 118-119*
Phobia *see* Phobic reaction
Phobic reaction 10 119
Phobos 8 152
Phobosuchus 3 554
Phoca vitulina 12 122
Phocaena phocaena 10 522
Phocaena vomerina 10 522
Phocaenidae 10 522
Phocidae 12 122
Phoebe 5 362, 10 119*; 12 40
Phoebis 7 473
Phoenicopteridae 3 120, 5 295
Phoenicopteriformes 3 120
Phoenicopterus ruber 5 295
Phoeniculidae 3 473
Phoenix 3 412, 414*
Phoenix dactylifera 4 17, 9 524
Pholadidae 5 100, 9 613
Pholidogaster 1 335
Pholidota 1 442, 4 412, 8 82, 10 119*
Pholidota fossils 10 120
Phoma 5 298, 10 313, 12 604
Phoma apiicola 12 604, 605
Phoma betae 12 604
Phoma boehmeria 11 334
Phoma lingam 2 383, 12 604
Phoma rostrupii 12 604
Phomaceae *see* Sphaeriodaceae
Phomales *see* Sphaeropsidales
Phomopsis 12 604
Phomopsis conorum 12 605
Phomopsis pseudotsugae 12 604
Phon 10 120
  loudness 7 587
Phonation speech 12 593-600
Phoneme 10 120
Phonetic symbols 10 121
Phonetic transcription 10 121
Phonetics 10 120-121
  alveolar 10 121
  bilabial 10 121
  consonants 10 121
  dental 10 121
  glottal 10 121
  labiodental 10 121
  palatal 10 121
  psychoacoustics 11 72-73
  velar 10 121
Phonocardiography 10 121-123
Phonoctonus 6 400
Phonograph 4 236-244, 10 123*
  hysteresis motor 6 600
  pickups 4 240-241
  record production 4 534
  record surface noise 13 54
  recorder 4 237
  records 4 239 244
  reproducer 4 239-241
Phonolite 7 16, 480, 10 86, 123-124*
Phonon 10 124
  heat conduction in earth 4 333
  thermal conductivity 5 390-391
Phonoreception 10 124 129
  invertebrates 10 128 129
  vertebrates 10 124 128
Phony disease (fruit tree) 5 546 548
Phoradendron flavescens 8 517
Phoresy 10 129
  ecologic interactions 4 385
  Mesostigmata 8 253
Phoridae 4 212
Phormia regina 8 680, 12 247
Phormidium 3 636, 14 398
Phorone 1 54
Phoronida 1 414, 420, 10 129 131*
  habitat and distribution 10 129
  morphology 10 129 130
Phoronida—*cont*
  reproduction 10 131
Phoronidea 7 585
Phoronis hippocrepia 10 131
Phoronis ovalis 10 130
Phoronis vancouverensis 10 131
Phoronopsis harmeri 10 130
Phororhacos 4 104
Phosdrin 7 141
Phosgene 2 463, 3 76
  lung irritant 5 45
  polyester resins 10 468
Phosphagen 2 137
Phosphatase 2 18
Phosphate 10 131*, 134
  see also Organophosphorus compound
6-Phosphate 2 459
Phosphate bonds 2 48
Phosphate crown glass 9 351
Phosphate metabolism 10 131-132
  biochemistry 2 199
  phosphorylation reaction 10 132
Phosphate process water softening 14 403
Phosphate rock 1 489, 5 258
  phosphorus 10 133
Phosphatic sediments 12 140
Phosphatide 7 531, 10 132*
  cell protoplast 2 613
  functions 10 132
  glycerophosphatides 10 132
  lipid 7 529
  mitochondria 8 520
  occurrence 10 132
  sphingophosphatides 10 132
Phosphatidic acid 2 12
Phosphatidyl ethanolamine *see* Cephalin
Phosphatidyl inositol 7 529, 10 132
Phosphatidyl serine 10 132
Phosphating chemical coating 8 284
Phosphine 6 546
  organophosphorus compound 9 404 405
Phosphite 9 404
6 Phospho-delta-gluconolactone
  triphosphopyridine nucleotide (TPN) 14 110
Phosphodiesterase 5 22
Phosphoenolpyruvic acid 1 515, 2 51, 460, 10 114, 370 14 125, 176
Phosphoglucoisomerase 6 219
Phosphoglucomutase 5 24, 6 218
6 Phosphogluconic acid 2 460, 6 219
3 Phosphoglyceraldehyde 9 92, 10 370
2-Phosphoglyceric acid 2 16 55, 459, 10 370
3-Phosphoglyceric acid 2 39, 459, 10 370
Phosphoglycero mutase 10 370
Phosphohexoisomerase 5 24, 10 370
Phosphohexokinase 10 370
Phosphohexose 5 20
Phospholipid 2 53, 265 6 214
  metabolic disorders 8 259
  see also Phosphatide
Phosphonate 9 404
Phosphopyridine 2 55
Phosphopyridine nucleotide 6 412
Phosphor 1 15, 7 611
  brightness 2 561
  cathode ray tube 2 558 559
  color kinescope 7 549
  electroluminescence 4 462
  glow curves 13 585 586
  kinescope 7 548
  luminescence 7 611-617
  persistence 2 558 559
Phosphor bronze 3 469, 470
Phosphor screen 2 558 559
Phosphorescence 1 15*, 7 610-611, 10 132 133*
  cathode ray tube phosphors 2 558 559
  relation to absorption 1 15
  temperature dependence 10 133
  see also Phosphor
5-Phospho ribosyl pyrophosphate 2 60
Phosphoribosyl pyrophosphate 1 315
Phosphoric acid 1 56
Phosphorite 11 590
Phosphoroscope 1 15
Phosphorothionate 7 142
Phosphorus 10 133 137
  in biogeochemical cycle 2 244
  blood chemistry 3 197
  chemiluminescence 3 46
  electron configuration 4 504
  incendiary 7 54
  ionization potential 4 504
  occurrence and manufacture 10 135
  organic quantitative analysis 9 398
  organometallic compounds 9 403
  organophosphorus compound 9 404
  phosphate 10 131
  phosphorus chemistry 10 133 135
  principal compounds and uses 10 135 137

otosynthesis—cont
electron transfer in chloroplasts 10 190
energy transfer between pigment molecules 10 189 190
first type of 7 498
in flashing light 10 187
the Hill reaction 10 188
magnitude 10 185
measuring photosynthesis 10 185 186
minimum quantum requirement 10 186
molecular biophysics 8 543
multistage process 10 184 185
in the oceans 6 566 567
photochemical apparatus 10 188
photochemistry 10 137 138
photophosphorylation 10 191
physiological action spectra 10 208 209
plant metabolism 10 547 549
productivity in sea 12 119
regulatory process in sea 12 [illegible]
saturat
solar e
status a
10 1
turnos
10 190
Photosynthetic bacteria 2 55, 64
Photosynthetic organisms 7 498
Photosynthetic oxygen 1 651
Photosynthetic plants 2 239
Phototaxis 13 403
Phototracing 10 146
Phototransistor 10 151 192*
Phototropism 10 563 564
Phototropotaxis 13 403
Phototube 10 192 197*, 14 243
dark current 4 33 10 194 196
gas 10 192 193
multiplier *see* Phototube multiplier
photocathode 10 192 194
photoemission 10 152
principles of operation 10 192 193
quantum efficiency 10 193 194
sensitivity to incident light 10 193
spectral sensitivity characteristics 10 193
types of service 10 195
uses 10 192
vacuum 10 192
Phototube, multiplier 10 195 197
dark current 10 196
dynode 10 196
dynode coatings 10 196
operation 10 196
scintillation counter 12 74 76
sensitivity 10 196
Phototube photometer 10 171
Phototypesetting 3 346 348
Photovoltaic cell 10 151, 197*
exposure meter 5 155
solar battery 12 465 466
solar engine 12 469
see also Solar battery
Photovoltaic effect 10 197
photoelectricity 10 151
Photronic photocell *see* Photovoltaic cell
Photronic reproducer 10 147
Photuris 2 211, 7 129
Phoxichilidiidae 11 106
Phoxinus laevis 10 125
Phragmites 4 53
Phragmobasidiomycetes *see* Heterobasidiomycetidae
Phragmosporae 5 563
[illegible]
Phronima japonica 6 586
Phronima libellula 6 586
Phronima sedentaria 6 586
Phronima semilunata 6 586
Phryganea vestita 2 386
Phrynosoma 4 201, 6 486, 13 25
Phrysus 5 34
Phthalate 5 74
Phthalazine 4 104
Phthalic acid 10 197 198
phthalimide 10 198
Phthalic anhydride 9 2, 10 198
polyester resins 10 466
Phthalimide 10 198
Gabriel's synthesis 1 306
Phthalocyanine blue 4 306 10 224
Phthalocyanine dye 4 306
Phthalocyanine green 10 224
Phthanite 3 56
Phthirius pubis 1 434, 7 593
Phthisis 14 130
Phytalocyanin 5 256
Phycobilins 3 78
Phycocyanin 3 636 637, 10 177, 189, 11 534 12 67
Phycoerythrin 10 189 11 534, 12 67
Phycomycetes 5 561 8 678 688, 10 198 201*
Blastocladiales 10 198 200
Chytridiales 10 198 200
ecology 10 199
Entomophthorales 10 198 200
Eumycetes 5 106-108
Hyphochytriales 10 198 200
Lagenidiales 10 200
Leptomitales 10 198 200
Monoblepharidales 10 198 200
morphology 10 198
Mucorales 10 198 200
Peronosperales 10 200
physiology 10 199
reproduction 10 198
Saprolegniales 10 198 200
soil microorganisms 12 461
Phycosecidae 3 278
Phylactolaemata 2 356, 10 201 202* 13 75
Phyletic evolution 8 10
Phyllite 10 202*, 11 591
Phyllobothrioidea *see* Tetraphyllidea
Phyllobranchiate gill 4 26
Phyllocarida 10 202
Nebaliacea 3 562
Phylloclade 13 111, 124
Phyllode 4 375
Phyllodocidae 10 461
Phylloglossum 7 623
Phylloglossum drummondii 7 624
Phyllogrаptus 2 253
Phyllolepida 1 528
Phyllonite 10 202
Phyllophaga 3 287
Phylloquinone 5 371
Phyllosilicates 12 311
Phyllosoma 5 566
Phyllosoma larva 4 26
Phyllospongia papyracea 4 109
Phyllosticta 12 604
Phyllosticta betae 12 604
Phyllosticta phaseolina 3 529
Phyllosticta solitaria 12 604
Phyllostictales *see* Sphaeropsidales
Phyllotaxis 13 114
Phyllotaxy 7 435
Phylloxera vitifoliae 6 475
Phylo 1 430 10 463
Phylogenesis see Organic evolution
Phylum 13 404
Phymanthus crucifer 1 53
Phymatidae 6 401
Phymatotrichum 9 603
Phymatotrichum omnivorum 3 514, 529, 9 600, 12 535
Phymosomatidae 10 202
Phymosomatoida 4 360, 371; 10 202*
Physa 6 438 9 518, 11 93
Physalia 3 255, 5 202, 11 449, 12 346
Physalia pelagica 10 525
Physaloptera 13 6
Physarales 8 687
Physarum polycephalum 8 677, 688
Physella heterostropha 12 388
Physeter 2 660
Physeter catodon 1 500
Physical acoustics 1 518
Physical albedo *see* Albedo (optics)
Physical anthropology *see* Anthropology, physical
Physical chemistry 10 202-204
adsorption 1 78 82
catalysis 2 546 549
colloids 10 204
electrochemistry 4 470 471, 10 204
energy relationships 10 205
equilibria 10 205 204
equilibrium, chemical 5 49 55
equilibrium, phase 5 54-60
gases, solids and liquids 10 203
intermolecular forces 7 195
kinetics 7 355 359, 10 204
molecular structure 10 204
molecular structure and spectra 8 547-556
molecular weight 8 556-558
photochemistry 10 137 138
quantum chemistry 11 144
radiochemistry 11 299
solutions 10 203
thermochemistry 13 559 561
thermodynamics (chemical) 13 572-577
Physical geography *see* Geography, physical
Physical geology 6 137 140
Physical law 10 204
Physical measurement 10 205 207
accuracy 10 206
calibrational errors 10 206
at high pressures 6 447
instrumentation *see* Instrumentation
observation errors 10 206
scientific methods 12 74
standards 10 205
systems of units 14 203 204
techniques 10 206
see also entries under physical quantity to be measured
Physical meteorology 8 325-327

Photography—*cont*
exposure 10 164
exposure meter 5 155
fixing 10 163
fluorescence method 10 159
fog 10 162
high-speed 10 160, 13 187-190
infrared 10 159
intensification 10 163
Kerr cells 10 160
lantern slides 7 399
latent image 7 407, 10 162
magnetooptical shutter 10 160
materials 10 158
microfilming 8 850
microphotography 10 161
microradiography 11 305
of missiles 9 360-362
negative 10 158
nuclear-particle recording 10 161
optical tracking instruments 9 360-362
oscilloscope, cathode-ray 9 432
particle detectors 9 584
photochemistry 10 137-138
photocopying processes 10 142
photoflash lamp 10 155
photogrammetry 10 160
photometry 10 161
polaroid radiography 11 305
positive 10 158
projection printers 10 166
reduction 10 163
reflected method 10 159-160
reflex printing 10 166
schlieren 12 67-68, 298
sensitometry 10 163 164
shadow 10 160
spark 13 187-190
spectrography 12 578
speed 10 165
stereoscopic 10 160
stroboscopic 10, 160, 13 187-190
theory 10 162 163
thermographic process 10 166
tone reproduction 10 165
toning 10 163
ultraviolet 10 159-160
underwater *see* Under water photography
washing 10 163
Photography, color 10 166 168
additive processes 10 167
Curtis analyzer 10 167
Photography, color—*cont.*
lenticular film process 10 167
monopack method 10 167
printing processes 10 168
screen-unit process 10 167
subtractive processes 10 167
triple projection 10 167
Photogravure 10 603, 617
press 10 622
Photointaglio etching 10 617
Photoionization 12 560
corona discharge 3 487
in gaseous nebulae 9 26
photoelectricity 10 151
Photolithography 10 145, 615
Photoluminescence 10 168
Photolysis (photochemistry) 10 168-170
atmosphere 1 628
atmosphere, geochemistry of 1 630
free radical 5 497
Gurney-Mott theory 10 168-169
large crystals 10 169
photography 10 162
Photolytic decomposition *see* Photolysis (photochemistry)
Photolytic oxygen 1 631
Photomagnetic capture (neutrons) 12 58
Photomechanical halftone 10 610
Photomechanics *see* Printing plate
Photometer 10 170-173
barrier layer cell 10 171
brightness meter 10 171
Cottrell visibility meter 10 173
distribution 10 172
flicker 10 170
hydrophotometer 12 118
illuminometer 10 170 171
integrating sphere 10 171-172
Luckiesh-Moss visibility meter 10 173
Lummer-Brodhun 10 170
multiplier-phototube type 12 105
photoelectric 10 171
phototube 10 171
reflectometer 10 172
spectrophotometer 10 172
spectrophotometric analysis 12 586
visibility meter 10 172 173
visual 10 170
Photometric bench 10 174
Photometric brightness *see* Luminance
Photometric titration 13 657
Photometric units· candle 2 436
candlepower 2 436
foot-candle 5 429
· foot-lambert 5 429
lambert 7 388
lumen 7 610
lumen-hour 7 610
lux 7 623
phot 10 137
stilb 7 610
Photometry 10 173-175
biochemistry 2 199
candle 2 436
candlepower 2 436
flame *see* Flame photometry
illuminance 7 23
inverse-square law 10 173
Lambert's cosine law of incidence 10 173
laws 10 173
luminance 7 610, 10 174
luminosity factor 7 617
luminous efficiency 7 617
luminous energy 7 617
luminous flux 7 617, 10 174
luminous intensity 7 618, 10 174
measurements 10 173-174
photography 10 161
photometers 10 170-173
photometric standards 10 174
stars 1 615
surveys 10 174
Photomicrograph 8 293
Photon 10 175*, 11 144
Bose-Einstein statistics 2 305
change 4 544
composition (type) 3 346 347
Compton effect 3 353 359
elementary particle 4 542 544
gamma rays 6 34 35
gas 2 305
nuclear radiation (biology) 9 196
pair production (electron positron) 9 495
Photon (type composition) 3 346 347
Photoneutron 9 84
Photoperiodism 1 125
Photoperiodism in plants 10 175 179
action spectrum 10 176 177
agricultural science (plant) 1 125
applications of 10 179
critical day length 10 175
critical night length 10 175
description 10 176
Photoperiodism in plants—*cont.*
indeterminate plant (day neutral) 10 175
long-day plant 10 175
nature of the light reaction 10 176
photoperiod induction treatment 10 175
photoresponses 10 177 178
photoreversible reaction 10 178 179
physiological action spectra 10 209
plant hormones 10 342
short day plant 10 175
terminology 10 175
Photophobia 6 345
Photophore gland 4 107, 5 108, 10 179 180*
Clupeiformes 5 222 225
Myctophiformes 8 679
Notacanthiformes 9 169
Photophosphorylation 10 191
Photopic vision 5 170; 14 335 338
Photopion production 12 59-60
Photoreception 10 180 184
insect physiology 7 126
photoreceptor cell 7 125
Platyhelminthes 10 413
retinene isomers 10 181 182
Photoreceptor 9 544
Photoresistive cell *see* Photoconductive cell
Photoresponses (photoperiodism) 10 177 178
Photoretinitis 11 537
Photosensitivity 4 54
Photoshadowgraph 11 301
Photosonics camera 9 362
Photosphere 10 184*, 15 268
Photostat 10 144
print 10 161
PhotoStress method (photoelasticity) 10 151
Photosynthesis 2 611, 10 179 184-192*, 191, 11 508, 550
accessory pigments 10 189
bacterial chemosynthesis 10 191
bacterial metabolism 2 34
bacterial photosynthesis 10 191
in the biosphere 2 239 240
carbohydrate 2 451
carbon dioxide reduction 10 190 192
carotenoid 2 528
chemical role of chlorophyll 10 190
chlorophyll 3 78
compensation depth 12 106
compensation intensity in sea 12 106
distribution of chlorophyll 10 189 190

Piezoelectricity—*cont*
network elements 10 219 220
resonator 10 219 221
Rochelle salt 11 589
vibration modes 10 220 221
see also Piezoelectric crystal
Piezometer 6 526
Pig 1 567
Pig iron 7 259
cast iron 2 540
extraction from ore 7 262
Pigeon 4 270
Pigeon milk 4 156
Columbiformes 3 302
Esophagus 3 70
Pigeon tremex 6 580
Pigeonite 10 225
Piggy back crab 14 565
Pigment 10 223 225
anthocyanin 1 454
anthraquinone pigments 1 456 457
carbon black 2 465
chromate 5 89
colored pigments 10 224
ink 7 313
lead 7 426
leaf 5 92
paint 9 493
plastic compounding 10 476
printing in color 10 607
respiratory 12 546
rubber 11 636
special pigments 10 224 225
transparent pigments 10 224
white pigments 10 223 224 15 635
see also Dye; Pigmentation
Pigment, animal carotenoid 2 527
melanin 10 225
in protective coloration 11 31
Pigment blue 15 4 306
Pigment cell 5 98, 7 174
Pigment dyeing 4 310
Pigment printing 15 543
Pigmentation 10 225 226
blood borne pigments 10 226
control of pigmentation 10 225
exogenous pigments 10 226
focal abnormalities 10 225
generalized abnormalities 10 225
melanin 10 225
other organs 10 226
protective coloration 11 31 33
Pigmy rattlesnake 11 547
Pignut hickory 6 441
Pigon, A 13 397
Pijper, A 2 64
Pika 5 452
Lagomorpha 7 382
Pike 5 223
blue 14 383
walleyed 14 383
Pike perch 14 383
Pilacraceae 13 140
Pilargiidae 10 461
Pilasters 5 481
Pilchard 8 113
Pile 10 228
Pile dikes 11 539
Pile driver 2 369, 10 226 227*
equipment 3 418
see also Pile foundation
Pile foundations 10 226 227
bearing capacities 10 227
bulb of pressure 10 227
designs 10 228 229
end bearing 10 226
friction 10 226
pile driving 10 227
types 10 228
Pileated woodpecker 14 541
Pilidae 9 609
Pilidium 11 558
Pill beetle 3 278
Pillar (underground mining) 8 481 483
Pillbox antenna *see* Antenna (aerial)
Pillbug 1 563, 7 285, 9 527 12 532
Pillemer, L 11 15
Pillow lavas 7 14 15
Pillow structure 12 615
Pilobolus 10 200
Pilocarpine 7 52, 10 435
Pilodictis olivaris 2 552
Piloerection 13 591
Pilophorus 6 400
Pilot assay 1 593
Pilot blacksnake 2 255
Pilot plant 10 229
Pilot production 10 229 230
facilities 10 229
objectives 10 229 230
Pilot seat ejection 1 189
Pilotage *see* Piloting
Pilotaxitic texture andesite 1 398
basalt 2 105
Piloting 9 12 10 230 232*
air altitude 10 231
airborne radar 1 164 166
dead reckoning 10 230
differential distance 10 231
direction 10 230 231
directional loop antennas 9 13
fix 10 230 232
landmarks 10 230
marine depth 10 231
Piloting—cont
marine navigation 8 129
marks 10 230
measurements 10 230 231
points 10 230
in polar regions *10 443*
position determination 10 231
radio 9 13-15
Pilotless aircraft *see* Drone
Pilsner beer 8 80
Piltdown man 10 232
Pimelic acid 2 475
Pimenta officinalis 1 265, 8 685
Pimenta racemosa 8 685
Pimento 10 232
Pimpinella anisum 1 427
Pin, clevis *see* Clevis pin
Pin, cotter *see* Cotter pin
Pin, taper *see* Taper pin
Pin cherry 3 56
Pin oak 9 237
Pina 10 232
Pinacoceras metternichi zone 14 82
Pinacocyte 2 393
Porifera 10 513
Pinacol formation 3 375
Pinch effect 10 232 235
Ampere's law 10 232
discharge 8 59 60
energy loss 10 234 235
experimental studies 10 233-235
induction furnace 10 233
instability 10 234
magnetohydrodynamics 8 59
manifestations 10 232-233
pinch machines 10 235
plasma physics 10 585 587
thermonuclear applications 10 233
Pincher Creek pool 9 5
Pinctada 1 428 9 606
Pinctada margaritifera 9 606
Pinctada martensii 9 607
Pincus, G 11 479
Pincus's nerve 9 61
Pincushion distortion 1 6
Pindos Ranges 5 118
Pine, J 13 522
Pine 10 235 236* 13 113
Pine barren 5 182 186
Pine grosbeak 6 275
Pine nuts 9 232
Pine oil 10 236 237
Pine snake 2 371
Pine tree array (antennas) 1 447
Pineal body 10 237
parietal eye 10 237
Pineal gland endocrine gland 4 588
Pineapple 10 237-238
Pinene 10 238
2 Pinene 6 534
alpha Pinene 6 534
hydrocarbon resin 6 536
Pinfish 8 573
Ping (sonar) 12 503
Pinga *see* Cachaca
Pinger 9 251
Pinguicula 14 132
Pinguinus impennis 1 667, 3 10
Pinhole camera 7 452
Pinicola enucleator 6 275
Pining cobalt deficiency 3 248
Piñion 6 62
Pink eye 5 171, 10 238*
Pink salmon 12 14
Pinna 5 261
ear 4 518
Pinned connections 13 202
Pinnipedia 2 523
seal (zoology) 12 122
Pinnotheres 6 466
Pinnotheridae 4 34
Pinnularia 2 239, 4 103
Pinnule 5 261
Pinocytosis 2 588; 5 138
metabolic disorders 8 259
osmoregulatory mechanisms 9 441
Pint 8 188
Pinta 10 238*; 13 374
Pintail 4 290, 291
Pinus 5 38, 14 591
Pinus albicaulis 10 236
Pinus banksiana 5 451
Pinus cembra 10 236
Pinus echinata 10 236
Pinus elliottii 10 236
Pinus flexilis 10 236, 288
Pinus jeffreyi 10 236
Pinus lambertiana 10 235
Pinus monticola 10 236
Pinus mugo 10 236
Pinus nigra 10 235, 236
Pinus palustris 10 236, 14 527
Pinus ponderosa 4 60, 10 236, 14 288
Pinus resinosa 10 235, 236
Pinus strobus 10 235
Pinus sylvestris 10 236
Pinus taeda 10 236
Pinus thunbergi 10 236
Pinworm 10 238 239
Pinworm infection 10 239
Piobert effect 8 271
Pion 8 247
see also Meson
Pioneer IV 10 271, 14 265
Pioneer Metal 7 266
Piophilidae 4 212
Pipa 9 545 *10 252 12 10*
Pipa pipa 9 545
Pipe clay products 3 167
drilling 9 291 292
pipeline 10 241
Pipe flow 10 239-241
Fanning equation 5 343

Physical optics *see* Optics, physical
Physical quantities, measurement of 14 203 204
Physical science 10 207
Physical standard 13 36
Physicomathematical methods 2 233
Physics 10 207-208
acoustics 1 48-49
astrophysics 1 619-620
atomic physics 1 652
biophysics 1 232, 2 232
continuum physics 5 255-256
electricity 4 461 463
electromagnetism 4 496
elementary particles 4 542 544
field physics 10 207
health physics 6 546
heat 6 262
high pressure physics 6 446-447
low-temperature physics 7 596 598
magnetism 8 47-48
mathematical physics 8 174 175
mechanics 10 207
minimal principles 8 471
molecular physics 8 546
nuclear physics 9 193
optics 9 362-363
plasma physics 10 385-397
quantum field theory 11 150-153
rheology 11 544
solid state physics 12 479 481
theoretical physics 13 547-549
Physiographic provinces 9 140
North America 9 140-164
submarine topography 13 216-220
Physiological acoustics 10 208
Physiological action spectra 10 208-209
beneficial effects of light 10 208
destructive effects of light 10 208
mechanism 10 209
photosynthesis 10 208 209
Physiological biophysics 2 232
Physiological development (behavior) 2 153-142
Physiological zero 13 490
Physiology, bacterial *see* Bacterial physiology
Physiology, general 10 209 212
areas of general physiology 10 211-212
development 10 209 210
models 10 211
Physiology, general—*cont*
use of the electron microscope 10 211
Physocephalus sexalatus 13 6
Physocyprria pustulosa 9 447
Physogastry 3 275-288
Physopsis 12 64
Physosomata 6 586
Physostigma venenosum 10 96
Physostigmine 7 63, 10 436
pharmacognosy 10 96
Phytalmiidae 4 212
Phytelephas macrocarpa 14 287
Phyterals of coal 3 232, 240
Phytic acid 10 473
inositol 7 121
Phytobenthos 5 528, 533
Phytobenthos, fresh-water 5 528
Phytoene 2 54
Phytofluene 2 54
Phytoglycolipid 7 529, 10 132
glycolipid 6 223
Phytol 10 360, 13 498
Phytolacca americana 10 440
Phytolaccaceae 2 643
Phytomastigina *see* Phytomastigophorea
Phytomastigophorea 1 408, 3 579, 10 212, 11 52
Chloromonadida 3 77-78, 10 212, 11 52
Chrysomonadida 3 117, 10 212, 11 52
Cryptomonadida 3 579, 10 212, 11 52
Dinoflagellida 4 197, 10 212, 11 52
Euglenida 5 98 100, 10 212, 11 52
Heterochlorida 6 427, 11 52
Phytomonadida 10 212-213, 11 52
Phytomonadida 10 212-213*, 11 52
Phytomonadina *see* Phytomonadida
Phytomonas 14 125
Phytophagous mite 8 518
Phytophthora 9 408, 10 200, 317, 12 535
Phytophthora cactorum 13 172
Phytophthora cinnamomi 9 408, 14 74
Phytophthora citrophthora 5 547, 548
Phytophthora fragariae 13 172
Phytophthora gummosis 5 548
Phytophthora infestans 1 119 10 554
Phytophthora palmivora 2 385, 3 253
Phytophthora parasitica 9 236
Phytophthora parasitica var *nicotianae* 13 663
Phytoplankton 8 128
compensation intensities 12 106
growth factors 12 119
micronutrient vitamin B_{12} 12 121
Phytosaurus 13 545, 546
Phytoseiidae 8 253
Phytosphingosine 12 611
Phytosterol 13 139
Phytotron 4 400, 403
Phytyl bromide 14 344
Pi 3 130
Pi meson 11 152
see also Meson
Pi section 9 75
Pi theorem 4 194-195
Pia mater 8 224
Piaget, J 10 36
Piano 8 665 667
Piazzi, G 1 596, 2 653
Pica nuttallii 8 74
Pica pica 8 74
Picard formula 7 165
Picard's theorem 3 342
Piccard, Auguste 2 110
Piccard, J 2 110, 6 264
Piccolo 8 665 666
Picea abies 13 19
Picea engelmanni 3 188, 10 299, 13 19, 14 289
Picea glauca 3 188, 13 19
Picea mariana 3 188, 13 19
Picea pungens 13 19
Picea rubens 3 188, 13 19
Picea sitchensis 3 188, 13 19
Piceance Creek Basin 8 447
Pichia 12 2, 14 601
Picidae 10 213, 14 541
Piciformes 1 694, 10 213*
flicker 5 300
sapsucker 12 26 27
Pick, H 5 297
Pick's disease 9 69
Pickerel 10 213
Pickering, W H 10 420, 12 40
Picking textile 13 535
Pickles and relishes 5 407, 425
Pickling metals 4 532
Pickup, phonograph 4 240 241
Pickup, vibration *see* Vibration pickup
Pickup reaction nuclear 9 200
Picoline 11 110
coal tar chemical 3 256
3 Picoline 9 92
alpha Picolinic acid 11 115
Picos d'Europa group 5 118
Picotite 12 618
Picrate 10 213 214
Picric acid 4 299, 10 213-214*
Picrite 10 86, 214*
Picrite basalt 2 105, 10 86
Picrolite 12 197
Picrotoxin 10 434
Pictet Spengler process 7 289
Pictor 3 413-414
Pictorial drawing 10 214 215
Pictothyris 2 315
Pidgeon, L. M 8 20; 11 122
Pidgeon process calcium 11 119
magnesium 11 119
Pied billed grebe 6 268
Piedmont 9 146 147
Piedmonttreppen 5 357
Piedrasia hortas 8 682
Pier 10 216
bridge 2 335 337
Pierce, G W 10 221
Pierce, J R 14 69
Pierce crystal oscillator 9 424
Pierce's disease (grape) 6 252
Pierce gun traveling wave tube 14 69
Pierce Smith converter 9 68
Piercing: sheet metal 12 253
Piercing machines (mining) 8 473
Pieridae 2 381, 7 464
Pieris 7 472
Pieris rapae 7 472
Pierson, W. J 9 257
Piesmidae 6 401
Piezoelectric ceramics 10 219
Piezoelectric crystal 10 216 217*, 12 318
applications 10 217
characteristics 10 216 217
harmonic oscillator 9 423
manufacture 10 216 217
materials 10 216
pieroelectricity 10 217
quartz 12 521
quartz clock 11 182
Rochelle salt 11 589
standing wave detector 13 36
Piezoelectric gage 2 84
Piezoelectric generator 14 152
Piezoelectric hysteresis *see* Hysteresis, piezoelectric
Piezoelectric materials 2 650
Piezoelectric moduli 4 226
Piezoelectric resonator 10 219 221
Piezoelectric transducers 8 458
Piezoelectricity 10 217 225
applications 10 221
band pass filter 10 221 222
barium titanate 13 653
ceramics 10 219
converse 10 217
dielectric crystals 10 217
direct 10 217
electromechanical coupling 10 219
ferroelectrics 5 226 227
matrix formulation 10 218 219
mineralogy 8 466
molecular theory 10 219
necessary condition 10 217 218

Plains—*cont*
stream erosion features 10 257
stream deposition features 10 259
till plains 9 154
wind formed features 10 263
Plains wanderer 6 286
Plakina 4 55, 6 476
Plakortis 4 56
Plan-copying 10 146
Plan position indicator
delayed sweep 11 208
offset-center display 11 208
radar presentations 11 207
stabilization 11 208
use in pilotage 1 164 165
Planaria 1 698 7 633, 10 181
Planck, M 1 652, 4 462, 6 372 7 503, 9 363, 10 265, 11 133, 12 575 13 567, 574 14 200 258, 568
Planck's constant 10 265
precise value 1 652
quantum mechanics 11 153 154
Planck *oscillator* 12 575
Planck's radiation law 6 372 373 10 265
Bose Einstein statistics 2 305
Plane 10 263
analytic geometry 1 388
inclined *see* Inclined plane 7 55
Plane, wood 14 543 544
hand 14 543
power 14 543 544
Plane curves geometry 6 151
Plane mirror 8 506 509
Plane of the ecliptic 6 125, 10 268
Plane polarized light 9 546
Plane polygon 10 471
Plane quadrilateral 11 135
Plane table 10 266
alidade 1 264
Plane table survey 13 678
Plane trigonometry *see* Trigonometry plane
Plane waves *electromagnetic* radiation 4 494
propagation 14 426
solutions 14 419 420
wave motion 14 427 428
Planer 10 266
machining operations 8 7
mining machinery 8 489
mining 8 446
Planet 10 266 271
albedo 1 223
apparent motions 10 267
asteroids 1 596 598
atmosphere 1 630 631, 10 270
Bode's law 10 266 267
Planet—*cont*
brightness 10 270
celestial mechanics 2 579 583
chemical composition 5 507
classification 10 266
configurations 10 267
density 10 269
elliptic motion 10 268
gravity 10 269
heat radiation 10 270 271
inferior conjunction 10 267
Kepler's laws 10 266
occultation 9 244
orbital elements 10 268 269
orbital motion 9 371 372
of other stars 10 271
outside solar system 10 271
masses 10 269
perturbations 10 37-39
phase (astronomy) 10 100
physical elements 10 270
precession 10 571
radiations 10 270
radio emission from 11 245
rotation periods 10 270
sidereal period of revolution 10 269
sizes 10 269
spectra 7 615-616
superior conjunction 10 267
symbols 10 269
synodic period 10 268 269
telescopic aspect 10 267
unknown planets 10 271
see also entries under *planet names*
Planet artificial 10 271
Planet carrier planetary gear train 10 273 274
Planet Depth 4 326
Planet motions disturbances 10 37 39
Planet orbits perturbation (astronomy) 10 37
Planet pinions planetary gear train 10 273 274
Planetarium 10 271-273
Planetary atmospheres 1 630 631
Planetary gear train 10 273 274
Planetary nebula 9 24 27
Planetary perturbations 10 37 39
Planetary precession 10 571
Planetary probe 12 546
Planetetherium 4 68
Planetoid *see* Asteroid
Planform 13 309
wing 14 508
Planimeter 1 375
Planing machining operations 8 6
woodworking 14 543 544
Plankton 2 206
Foraminifera 5 430 431
fresh water ecosystem 5 526
limnology 7 519
reproduction 5 527
Tintinnina 13 651
variability 5 527
vertical distribution 5 527
Plankton, fresh water 5 526 529
Plankton rain 5 527 528
fresh-water ecosystem 5 521 534
Planktonic plant production 12 119
Planktoniella 8 106
Planoconcave lens 7 451
Planographic composition printing 10 601 602
Planographic plates 10 602, 614-617
Planographic printing 10 600 603
deep-etch plates 10 602
direct lithography 10 600
indirect lithography 10 600 601
lithography 10 600
offset lithography 10 602 603
planographic composition 10 601-602
planographic plates 10 602
Planorbis glabratus 9 447
Planosos 12 439
Plan position indicator (PPI) moving target indication 8 620
radar 8 415
sonar 12 503
Plant 10 274-275
chemurgy 3 54
endocrine mechanisms 4 596
grafting of *see* Grafting of plants
radiation effect 11 232 235
see also following entries, as Plant mineral nutrition *of*, Plant disease Plant growth, Plant hormone
Plant mineral nutrition *of* 10 275 284
anatomy 10 277 278
cell membrane permeability 10 278
diffusion of ions into plants 10 279
Donnan equilibria 10 279
factors affecting 10 282 283
fertilizer 5 236 239
free space *concept* 10 281
hereditary absorption potential of species 10 278
Plant, mineral nutrition of—*cont*
interionic effects 10 278
ion concentration of external solution 10 276
ionic exchange 10 280
ionization of minerals in soils 10 275-276
kinds of available ions 10 276 277
metabolic activity of absorption cells 10 280 284
plant disease 10 303
process of mineral absorption 10 279
redistribution of minerals 10 283 284
role of carriers 10 281
translocation of mineral compounds 10 283
Plant, minerals essential to 10 284 286
diagnosis 10 284
mineral deficiency symptoms in plants 10 286
plant disease 10 303
utilization of minerals in *plants* 10 284 286
Plant water relations of 10 286 297
absorption of water 10 293
cellular water relations 10 286
stomatal mechanism 10 288
translocation of water 10 291
transpiration 10 289
effects of environment on transpiration 10 289
Plant anatomy 10 297-298
Plant breeding *see* Breeding (plant)
Plant bug 6 401
Plant cells 2 611
Plant classification 10 298
Plant community 10 298 300
characteristic species 10 298
classification 10 300
climax 10 299 300
dynamics 10 299
structure of plant communities 10 299
Plant debris, mineralization 10 42
Plant disease 10 300 315
Basidiomycetes 2 107
causes 10 302
dissemination of plant pathogens 10 312 314
economic importance 10 300
fungistat and fungicide 5 564

Pipe flow—*cont*
fluid flow properties 5 345
head losses 10 240
laminar flow 5 324· 10 239
measurement 5 316-318
Poiseuille law 5 343
transition velocity 10 239-240
turbulent flow 5 324, 10 239 241
Pipe organ 8 667
Pipe-stabbing board 9 302
Pipe threads 12 88
Pipe valve 14 260-261
Pipecolinic acid 11 113
Pipefish 6 71
Pipeline 10 241*, 14 65
gilsonite 6 186
transportation 14 65
water supply engineering 14 405
Piper belle 2 183, 10 241
Piper cubeba 3 611, 10 241
Piper nigrum 9 627, 628, 10 241
Piperaceae 3 611, 9 627, 10 241
Piperales 10 241*, 346
pepper (black) 9 628
cubeb 3 611
Piperanne I 122, 475, 571, 4 105
Piperidine 11 110, 113
Piperidine-2 carboxylic acid 11 113
Piperidone 7 377
Piperonyl butoxide 7 142
Pipet 10 241-242
Pipilo 14 1
Pipilo erythrophthalmus 14 1
Piping marine machinery 8 126
Pippard, A B 13 300
Pipridae 9 589
Piptoblast 13 75
Piranga flava 13 388
Piranga ludoviciana 13 388
Piranga olivacea 13 388
Piranga rubra 13 388
Pirani, F 11 437
Pirani gage 10 242*, 14 240
Pirata 1 498
Piretella aemaea 9 511
Piricularia oryzae 11 564
Pirothyris 2 315
Pisces (constellation) 3 412-414, 10 242*
Pisces (zoology) I 420, 10 242 243*, 13 530
Agnatha 10 242
Chondrichthyes 5 85-86, 10 243
ecology 10 243
economics 10 243
fish 5 284
Osteichthyes 9 442 10 243
Placodermi 10 243
recent species 10 245
vertebrate 13 530
Pisces Australinus 1 496, 3 412-413*
Piscicola 6 457
Pisionidae 10 461
Pismo clam 3 152
Pisolite 12 134
see also Oolite and pisolite
Pistachio 10 243-244*; 12 26
nut crop culture 9 232
Pistacia vera 10 243
Pistil botany 5 326-334
compound 5 327
inferior 5 327
ovary 5 327
simple 5 327
stigma 5 327
style 5 327
superior 5 327
Pistillate flower 5 326
Pistol 1 537-538
Piston corer (oceanography) 8 146
Piston engine steam 13 78
Piston flow meter 5 316, 318-319
Piston radiator 12 512-515
Piston ring wear radioactive tracer study 14 8-9
Pistosaurus 12 41
Pisum sativum 9 599
Pit mining *see* Mining, open-cut or pit
Pit viper 13 25
Pitch 10 244
coal tar 3 236
Pitch (acoustics) 10 244
musical 8 662
octave 9 273
Pitch coke coal tar 3 236
Pitch Lake, Bermudez 1 590
Pitch lakes 8 622
Pitch-oil 3 236
Pitch pine 10 236
Pitchblende 8 278, 10 457, 11 269, 14 209, 210
anomalous lead 7 430
Ar^{36} to Ar^{38} ratio in 13 522
geologic time scale 6 135
ore reserves 9 186
radium source 11 323
Pitcher plant 10 244 245*, 12 128
Pitching moment coefficient 1 200
Pitching motion ships 12 273
Pitchstone 10 245* 521 11 560 14 347
Pith 10 245 246*, 13 105, 114
Pithecanthropus 1 417, 5 478
Pithecanthropus erectus 5 478, 7 505
Pithecanthropus pekinensis 5 478
Pitman *see* Connecting rod
Pitocin 6 485
Pitometer log 4 21
Pitot static tube: air velocity measurement 1 221
aircraft speed measurement 4 21
ship's speed measurement 4 21
Pitot tube 10 246
accuracy 10 246
application 10 246
flow measurement 5 316-317
Pitressin 6 485
Pitted outwash plain 6 197
Pitting corrosion 3 490
Pitt-Rivers, R 13 626
Pituicyte 10 249
Pituitary dwarfism 6 597
Pituitary gland 4 235, 6 480, 596, 10 246-251*
adrenal cortex steroid I 71
adrenocorticotrophin 10 250
anatomy 10 247-248
anterior lobe 10 248
anterior pituitary 10 250
blood supply 10 248 249
chorionic gonadotrophins 10 250
endocrine gland 4 588
endocrinology 4 598
growth hormone 10 250-251
histology 10 248 249
intermediate lobe 10 249
luteotrophin 10 250
melanocyte stimulating hormones 10 251
neurohypophysis 10 249
pars tuberalis 10 249
physiology 10 249-251
pituitary gland disorders 10 252
posterior lobe 10 251
thyrotrophin 10 250
Pituitary gland disorders 10 252
Pituitrin 6 485
Pituophis catenifer 2 370
Pituophis melanoleucas 2 371
Pityaceae 5 476
Pityriasis 14 602
Pityrosporum ovale 5 578, 14 602
Pival 11 615
pK 10 252
Placebo 10 97
Placenta 5 241 9 454 455
allantois 1 256
Placentation 10 252 254
physiological exchange 10 253 254
placental modifications 10 252 253
Placentation (botany) 5 326 334
axile 5 328 332
basal 5 332
central 5 328 332
laminal 5 332
parietal 5 328 332
Placer deposits 9 380
claim 8 472
platinum mineral 10 410 411
Placer mining *see* Mining, placer
Placid 7 362
Placobdella parasitica 11 576
Placode dorsolateral 9 47
epibranchial 9 47
labyrinthic 9 47
nervous system 9 42 63
ophthalmic 9 47
postlabyrinthic 9 47
prelabyrinthic 9 47
ventral 9 47
Placoderm 1 414, 420 10 254 255*
Antarctic 1 462 463
Placodontia 11 484 12 41
Placodus 11 484
Placoid scale 12 47 48 242
Plage astronomy 13 270 280
Plagiaulacidae 8 627
Plagioclase feldspars 5 212 214
in epidiorite 5 39
in latite 7 409
reaction series 10 85
Plagiomene 4 68
Plagiostomum 1 258
Plagiostomum morgani 1 257
Plague 10 255 256
antibiotics action against 1 466 467
Brucellaceae 2 351
bubonic 12 344
epidemic 5 34
pathogen (soil) 9 594
streptomycin therapy 13 179
sylvatic 12 344
taxonomy 2 350
Plaice 5 315
marine fisheries 8 115
Plain weave 13 535
Plains 10 256 265
Asia 1 580
coastal plains 5 244 245
distribution 10 257
flood plains 5 310
geographic distribution 15 500 501
glaciated plains 10 261 265
interrupted plains 10 263 265
Mackenzie 9 152
Mississippi alluvial 9 132
origin 10 257
solution marked 10 258 259
South America 12 524 525

Plant tissue systems—*cont*
pith 13 115
sheathed 10 42
xylem 10 378
Plant translocation (organic solutes) 10 379 382
importance of conductive tissues 10 379 380
mechanism 10 382
requirements for organic nutrients 10 381
Plant virus 1 424 10 382 385*
chemical composition 10 384
economic importance 10 384 385
plant disease 10 304
structure 10 384
transmission of 10 385
types of virus diseases 10 382 383
virus symptoms 10 382
see also Virus
Plant wound 10 366
Plantaginales 10 346 385*
Plantago 6 297
Plantago psyllium 10 385
Plantain 2 90
Planting Planters 1 128
Planula 12 76 92 165, 13 75
coral 3 474
Planula larva 1 455 6 554, 7 304 8 254
Coelenterata 3 255 261
Planuloidea *see* Moruloidea
Plaque 2 70
Plasma electromagnetic propulsion 4 490
equation of state 6 57
magnetogas dynamics 8 54 55
magnetohydrodynamics 8 55-63
pinch effect 10 232
see also Plasma physics 10 385 397
Plasma (blood) 2 264 266
Plasma (ionized gas) earth's core 4 329
Plasma arc torch 8 281
Plasma cell 2 264
connective tissue 3 402 403
Plasma engines *see* Electromagnetic pumps
Plasma jet spray coating 8 282
Plasma physics 10 385 397* 395
adiabatic invariants 10 391 392
astronomical geophysics 1 606
bremsstrahlung values 10 396 397
collision processes 10 394 395
Plasma physics—*cont*
confinement criteria 10 392
creation of 10 386 388
criterion for plasma phenomena 10 385-386
Debye screening distance 10 385-386
degrees of freedom 10 395
diamagnetism 10 388
drift velocities 10 389 391
dynamical friction 10 395
excitation radiation 10 396
instabilities 10 392 394
macroscopic 10 385
magnetic mirror 10 388
magnetohydrodynamics 8 55
microscopic 10 385
nuclear fusion 5 592
particle dynamics 10 389 392
pinch effect 10 387
plasma spray coating 8 282 283
pressure balance 10 388
radiation mechanisms 10 395-397
relaxation time 10 394 395
Rutherford scattering 10 394
stellarator 10 387
waves 10 392 393
Plasma spray coating 8 282 283
Plasmal 10 397
Plasmalogens 10 132, 397
Plasmodesmata 2 616, 619
Plasmodiidae 6 313
Plasmodiophora brassicae 2 385
Plasmodiophorales 7 375
Plasmodiophorina 8 677
Plasmodium 8 677
Plasmodium berghei 6 315
Plasmodium cathemerium 6 315
Plasmodium circumflexum 6 314
Plasmodium cynomolgi 6 315
Plasmodium elongatum 6 315
Plasmodium falciparum 6 315, 8 77
Plasmodium gallinaceum 6 314
Plasmodium hexamerium 6 314
Plasmodium inui 6 315
Plasmodium knowlesi 6 315
Plasmodium lophurae 6 315
Plasmodium malariae 6 315 8 77
Plasmodium mexicanum 6 315
Plasmodium nucleophilum 6 315
Plasmodium ovale 6 315, 8 77
Plasmodium polare 6 315
Plasmodium relictum 6 314, 13 11
Plasmodium rouxi 6 315
Plasmodium vaughani 6 315
Plasmodium vivax 6 315, 8 77
Plasmodroma 10 397
Mastigophora 10 397
Sarcodina 10 397
Sporozoa 10 397
Plasmolysis 9 439 440, 10 288
cellular water relations 10 288
Plasmon 3 658 659
Plasmopara halstedii 13 292
Plasmopara viticola 6 251
Plasmotomy 3 226-227
Plaster 10 397
Plaster mold casting 2 543
Plaster of paris 2 399 6 301 10 397-398*
Plastic potentials 10 541
Plastic clay 11 409
Plastic deformation forging 5 470-472
stress and strain 13 182
Plastic deformation (creep) earthquake mechanisms 12 149
Plastic deformation of metal 10 398-402
creep 10 400 401
ductility 10 398 400
malleability 10 401 402
see also Elasticity, Metal, mechanical properties of, Metal forming
Plastic film capacitor 2 446
Plastic flow drawing of metal 4 272
prestressed concrete 10 586
in rocks 5 569
Plastic pressing 2 649
Plastic scintillator *see* Scintillation counter
Plastic slip in crystals 3 583 584
Plastic strain wave 8 271
Plastic sulfur 13 256
Plasticity 10 402 403
contrasted with anelasticity 1 400 401
rubber 11 637
in soils 12 455
Plastics definition 10 474
dyeing 4 311
radiation damage 11 225
Plastics fabrication 10 403 407
calendering 10 403
casting 10 403 405
coatings 10 403 404
compression molding 10 404 405
extrusion 10 404, 406
films 10 403-404
injection molding 10 405
laminating 10 405-406
molding 10 404 405
polyacrylate resin 10 458-459
Plastics fabrication—*cont*
polyacrylonitrile resin 10 460
polyamide resin 10 460-461
polyester resins 10 466 468
polyether resins 10 468-470
polyfluoroolefin resin 10 470 471
polymer properties 10 477
sheet forming 10 406-407
transfer molding 10 405
see also Polymer
Plasticizer 7 376, 10 476
Plasticizing (food) 5 598
Plastid 3 98 5 99
Platanus 5 39
Platanus acerifolia 13 360
Platanus occidentalis 10 116, 13 360
Platanus orientalis 13 360
Plataspidae 6 401
Plate *distillation* 4 250
fractionating column 5 491-492
plate tower 6 44
printing *see* Printing plate
vibration 14 314
Plate, structural 10 407-410
bases for design 10 407
buckling 10 410
circular plate 10 407
column 3 304
elastic deflection 10 407
elliptical plate 10 408
square plate 10 409-410
Plate-circuit rectification meter 14 254
Plate detectors 1 360
Plate girder *see* Girder, plate
Plate glass 6 207
Plate *hemolysis, blood see* Blood plate hemolysis
Plate modulated Class C *amplifier* 1 355
Plate modulators 1 354-355
Plate, photographic 10 156
Plate photometer 1 615
Plate resistance *see* Dynamic plate resistance
Plate-thigh beetle 5 278
Plate transformer 10 560
Plateau 10 410
Asia 1 577-580
basalts 10 30
Plateau of the Shotts 1 107
Platelet 2 264, 12 565
Platelet count, blood 3 196
Platen presses 10 620
relief printing 10 600
Plateosaurus 4 199
Platform balance 2 74
Plating *see* Electroplating of metals Metal coatings
Platinum 10 410-412
alloy 10 411

Plant disease—*cont*
infection and development of disease 10 308
Leptostromataceae 7 476
Melanconiales 8 212-213
Moniliales 8 570
Mycetia Sterilia 8 676
Myriangiales 8 682
nature of 10 301-302
pathogens 10 304
plant virus 10 382 385
rhizosphere 11 548
rust (microbiology) 11 654
smut (microbiology) 12 387
soil pathogens 9 593-594
in storage 10 314
tree 14 71-76
wood decay 14 528
see also entries under specific plants and diseases as Corn
Plant disease control 10 315-319
chemicals 10 315 316
cultural practices 10 315
disease resistance 10 316
quarantine 10 318 319
Plant evolution 10 319-322
evolutionary history 10 320
evolutionary processes 10 319
polyploidy 10 489
Plant facilities 10 322 325
fire prevention 10 323
layout 10 322
location 10 322
maintenance 10 323
materials handling 8 170 171, 10 323
in plant transportation 10 325
production lines 10 323
safety 10 323
Plant fermentation 10 323 325
effect of oxygen 10 324
forms of 10 324
materials used 10 324
production methods 10 644
products 10 324
role of 10 325
Plant fossils *see* Paleobotany
Plant geography 2 204, 10 325 328*
flora 10 325
floristics 10 325-328
postglacial vegetation and climate 10 326
vegetation 10 325
vegetational plant geography 10 328
Plant growth *10 328 340*
abscission 10 337 338
apical dominance 10 334
bud dormancy 10 335
Plant growth—*cont*
defoliant 4 45
dew 4 90
embryonic growth 10 330
factors 10 329
floral initiation and development 10 333
fruit development 10 334
germination 10 335
gibberellin 6 184-185
growing season 6 285
growth correlations 10 330
growth periodicity 10 337
inhibitors 10 345
plant hormones 10 329
photoperiodism in plants 10 175-179
reproductive growth 10 332
seasonal thermoperiodicity 10 338 339
tissue culture 10 338
vegetative meristematic activity 10 331
Plant growth, flower 10 333
Plant histology 10 298
Plant hormones 1 695
10 340 343*
action of growth hormone 10 341
cell protoplast 2 613
flowering hormone 10 342
gibberellin 6 184 185
known plant hormones 10 340
nomenclature 10 340
occurrence 10 340
other growth regulators 10 342
plant growth 10 329
uses 10 342
Plant keys 10 343 345
floral charts 10 345
floral diagram 10 345
floral formulas 10 345
floral symbols 10 345
Plant kingdom 10 346
bacteria taxonomy of 2 10
plant 10 274 275
Plant layout drawing 4 611
Plant metabolism 10 347 360
absorption mineral ion 10 280
acid metabolism of the succulents 10 354
alkaloid 10 359 360
amide 10 353 359
amino acid 10 353 359
anthocyanins 10 360
ascorbic acid 10 353 354
biochemistry 2 199
carbohydrate metabolism 10 349 353
carotenoid 2 527, 10 360
cellulose 10 352 353
energy metabolism 10 347-349
Plant metabolism—*cont.*
essential oils 10 360
flavones 10 360
functions 10 353 354
herbicide 6 420 424
lipid metabolism 10 355-356
nitrogen metabolism 10 356-360
nucleic acid 10 359
organic acids 10 353 355
pectin 10 353 354
pentoses and pentosans 10 352
plant fermentation 10 323 325
plant translocation (organic solutes) 10 379
protein 10 353 359
purine 10 359
pyrimidine 10 359
resins 10 360
rubber 10 360
starch 10 351-352
sucrose 10 352
tannins 10 360
terpene metabolism 10 360
Plant microfossils 8 355
Plant migration 10 525
Plant *morphogenesis* 10 361 363
atypical growth 10 361-362
correlation 10 361
differentiation 10 361
ecological factors 10 362
grafts and chimeras 10 362
hereditary factors 10 362 365
polarity 10 361
regeneration 10 361
symmetry 10 361
Plant movements 10 363-367
chemotropism 10 366
electrotropisms 10 365
geotropism 10 364 365
haptotropism 10 366
hydrotropism 10 366
nastic movements 10 366
nutations 10 367
phototropism 10 363 364
tactic movements 10 366
thigmotropisms 10 365 366
traumatotropism 10 366
turgor movements 10 367
Plant names 10 367 368
authority for plant names 10 368
international rules of botanical nomenclature 10 368
Plant nutrition and weathering processes 14 459
Plant organ 10 368 369
flower 10 368 369
fruit 10 368 369
leaves 10 368
root 10 368
Plant organ—*cont*
seed 10 368 369
stem 10 368
Plant pathogens 1 574
Plant physiology 10 369
carotenoid 2 527
photosynthesis *see* Photosynthesis
plant growth *see* Plant growth
plant hormones *see* Plant hormones
plant metabolism *see* Plant metabolism
plant movements *see* Plant movements
plant respiration *see* Plant respiration
plant, minerals essential to *see* Plant, minerals essential to
plant, mineral nutrition of *see* Plant, mineral nutrition of
plant, water relations of *see* Plant, water relations of
Plant respiration 10 369 373
concentration of substrate *10 372*
energy transfer 10 371
environment 10 372 374
factors affecting 10 372
food production 10 374
food use 10 374
glycolysis 10 370
Krebs cycle 10 370
mechanism of 10 370
respiration and agriculture *10 374*
safe storage moisture contents (seeds) 10 374 375
time 10 372
Plant societies 10 375 376
dominance societies 10 375
life form societies 10 375 376
seasonal societies 10 375
structural societies 10 375
Plant taxonomic literature 10 377
floras 10 377
indexes 10 377
Plant taxonomy 10 377 378
Plant tissue systems 10 378 379
calciffiet 10 42
collenchyma 3 290
cortex 15 115
endodermis 15 115
epidermis, plant 5 37 40 10 378 15 114
ground tissue 10 378
pericycle 15 115
periderm 10 379
phloem 10 378

Plant tissue systems—*cont*
pith 15 115
silicified 10 42
xylem 10 328
Plant translocation (organic solutes) 10 379 382
importance of conductive tissues 10 379 380
mechanism 10 382
requirements for organic nutrients 10 381
Plant virus 1 424, 10 382 385*
chemical composition 10 384
economic importance 10 384 385
plant disease 10 384
structure 10 384
transmission of 10 385
types of virus diseases 10 382 385
virus symptoms 10 382
see also Virus
Plant wound 10 566
Plantaginales 10 346 385*
Plantago 6 297
Plantago psyllium 10 385
Plantain 2 90
Planting *Planters* 1 128
Planula 12 76 92 165, 15 75
coral 3 474
Planula larva 1 455, 6 554, 7 304, 8 254
Coelenterata 3 255 261
Planuloidea *see* Morulaidea
Plaque 2 70
Plasma electromagnetic propulsion 4 490
equation of state 6 57
magnetogas dynamics 8 54 55
magnetohydrodynamics 8 55-65
pinch effect 10 232
see also Plasma physics 10 385 397
Plasma (blood) 2 264 266
Plasma (ionized gas) earth's core 4 529
Plasma arc torch 8 281
Plasma cell 2 264
connective tissue 5 402 403
Plasma engines *see* Electromagnetic pumps
Plasma jet spray coating 8 282
Plasma physics 10 385 397* 395
adiabatic invariants 10 391 392
astronomical geophysics 1 609
bremsstrahlung values 10 396 397
collision processes 10 394 395
Plasma physics—*cont*
confinement criteria 10 392
creation of 10 386 388
criterion for plasma phenomena 10 385 386
Debye screening distance 10 385-386
degrees of freedom 10 395
diamagnetism 10 388
drift velocities 10 389 391
dynamical friction 10 395
excitation radiation 10 396
instabilities 10 392 394
macroscopic 10 385
magnetic mirror 10 388
magnetohydrodynamics 8 55
microscopic 10 385
nuclear fusion 5 592
particle dynamics 10 389 392
pinch effect 10 387
plasma-spray coating 8 282 285
pressure balance 10 388
radiation mechanisms 10 395 397
relaxation time 10 394 395
Rutherford scattering 10 394
stellarator 10 387
waves 10 392 393
Plasma spray coating 8 282-285
Plasmal 10 397
Plasmalogens 10 152, 397
Plasmodesmata 2 616, 619
Plasmodiidae 6 313
Plasmodiophora brassicae 2 585
Plasmodiophorales 7 375
Plasmodiophorina 8 677
Plasmodium 8 677
Plasmodium berghei 6 315
Plasmodium cathemerium 6 315
Plasmodium circumflexum 6 314
Plasmodium cynomolgi 6 315
Plasmodium elongatum 6 315
Plasmodium falciparum 6 315 8 77
Plasmodium gallinaceum 6 314
Plasmodium hexamerium 6 314
Plasmodium inui 6 315
Plasmodium knowlesi 6 315
Plasmodium lophurae 6 315
Plasmodium malariae 6 315, 8 77
Plasmodium mexicanum 6 315
Plasmodium nucleophilum 6 315
Plasmodium ovale 6 315 8 77
Plasmodium polare 6 315
Plasmodium relictum 6 314 13 11
Plasmodium rouxi 6 315
Plasmodium vaughani 6 315
Plasmodium vivax 6 315, 8 77
Plasmodroma 10 397
Mastigophora 10 397
Sarcodina 10 397
Sporozoa 10 397
Plasmolysis 9 439 440, 10 288
cellular water relations 10 288
Plasmon 3 658 659
Plasmopara halstedii 13 292
Plasmopara viticola 6 251
Plasmotomy 3 226 227
Plaster 10 397
Plaster mold casting 2 543
Plaster of paris 2 399 6 301, 10 397 398*
Plastic, potentials 10 541
Plastic clay 11 409
Plastic deformation forging 5 470 472
stress and strain 15 182
Plastic deformation (creep) earthquake mechanisms 12 149
Plastic deformation of metal 10 398 402
creep 10 400 401
ductility 10 398 400
malleability 10 401-402
see also Elasticity, Metal, mechanical properties of, Metal forming
Plastic film capacitor 2 446
Plastic flow drawing of metal 4 272
prestressed concrete 10 586
in rocks 5 369
Plastic pressing 2 649
Plastic scintillator *see Scintillation counter*
Plastic slip in crystals *3 585 584*
Plastic strain wave 8 271
Plastic sulfur 13 256
Plasticity 10 402 403
contrasted with anelasticity *1 400 401*
rubber 11 637
in soils 12 453
Plastics definition 10 474
dyeing 4 311
radiation damage 11 223
Plastics fabrication 10 403 407
calendering 10 403
casting 10 403 405
coatings 10 403 404
compression molding *10 404 405*
extrusion 10 404 406
films 10 403 404
injection molding 10 405
laminating 10 405 406
molding 10 404 405
polyacrylate resin 10 458-459
Plastics fabrication—*cont*
polyacrylonitrile resin 10 460
polyamide resin 10 460 461
polyester resins 10 466-468
polyether resins 10 468 470
polyfluoroolefin resin 10 470-471
polymer properties 10 477
sheet forming 10 406 407
transfer molding 10 405
see also Polymer
Plasticizer 7 376, 10 476
Plasticizing (food) 5 398
Plastid 3 98, 5 99
Platanus 5 39
Platanus acerifolia 13 360
Platanus occidentalis 10 116, 13 360
Platanus orientalis 13 360
Plataspidae 6 401
Plate distillation 4 250
fractionating column 5 491-492
plate tower 6 44
printing *see* Printing plate
vibration 14 314
Plate, structural 10 407 410
bases for design 10 407
buckling 10 410
circular plate 10 407
column 3 304
elastic deflection 10 407
elliptical plate 10 408
square plate 10 409-410
Plate circuit rectification meter 14 254
Plate detectors 1 360
Plate girder see Girder, plate
Plate glass 6 207
Plate hemolysis blood *see* Blood plate hemolysis
Plate-modulated Class C amplifier 1 355
Plate modulators 1 354 355
Plate, photographic 10 156
Plate photometer 1 615
Plate resistance *see* Dynamic plate resistance
Plate thigh beetle 3 278
Plate transformer 10 560
Plateau *10 410*
Asia 1 577-580
basalts 10 50
Plateau of the Shotts 1 107
Platelet 2 264 12 565
Platelet count, blood 3 196
Platen presses 10 620
relief printing 10 600
Plateosaurus 4 199
Platform balance 2 74
Plating *see* Electroplating of metals, Metal coatings
Platinum 10 410-412
alloy 10 411

Platinum—*cont*
analytical techniques 10 412
assay of 1 593
chemical and physical properties 10 411
chloroplatinate 3 83
electron configuration 4 504
extractive metallurgy 8 278
hydrogen electrode 6 549
ionization potential 4 504
metallurgical extraction 10 411-412
native state 9 4
natural occurrence 10 410 411
principal compounds 10 412
uses 10 411
see also Iridium
Platinum sponge 6 549
Plato hydrometer (Balling) scale 6 562
Platonic solid 10 475, 491
Platt, J B 9 78
Platyasterida 1 598, 4 560, 10 412*
Platybelodon 10 636
Platyceratacea 6 76
Platycopa 3 562, 9 447, 10 412*
Platyctenea 3 608, 10 412*
13 491
Platydorina 8 169
Platydorina caudata 11 53
Platyfish 3 649
Platygaster 6 579
Platygasteridae 6 574
Platyhelminthes 1 413, 420, 10 412 415*
Cestoda 2 658 659*, 10 413-414
Cestoidea 2 659
economic and biological importance 10 413
morphology 10 413
regeneration 11 419-420
reproduction 10 415
Trematoda 10 413, 414, 14 77 80*
Turbellaria 10 413, 414
Platymaia 4 41
Platymonas 8 170
Platypoditae 3 278
Platypsyllidae 3 276
Platypsyllus castoris 3 286
Platyptilia carduidactyla 7 468
Platyscelus 6 586
Platyspondylia 12 568
Plava 4 75, 10 415*
Pleasing fungus beetle 3 278
Plecoptera 7 154, 10 415-416*, 13 153
Insecta fossils 7 159
Plectidae 10 416
Plectognathi 13 530
see also Tetraodontiformes
Plectoidea 10 416
Plectrophenax nivalis 2 571
Plectrum 4 320
Plectus 6 436 441
Plegadis chihi 7 1
Plegadis falcinellus 7 1
Pleidae 6 401
Pleiades 10 416
reflection nebula 7 220
Pleiosauria 11 484
Pleiotropism 10 416
Pleistocene 6 136, 142, 10 416 417*
chronology 6 194
climate 6 133
climate fluctuations 6 192
fossil man in 5 477-478
Glacial Epoch 6 190
time units 6 195
Pleistophora 13 598
Pleochroism 10 417*, 14 88
gem 6 96
Pleodorina 1 235
Pleodorina californica 8 169
Pleodorina illinoisensis 11 53
Pleonaste 12 618
Pleospongia Archaeocyatha 1 509
Pleotia 5 98
Plerocercoid 12 559
Plerocercoid larva 2 659; 11 43, 67
Pleroglyra 12 77
Plerotic water 6 276
Plesiadapidae 10 589
Plesiosaur 11 484, 12 41
Plesiosaurus 7 327, 11 484
Plesiotrathis 4 107, 13 531
Plesiotype 14 172
Plestiodon fasciatus 12 375
Plethodon 12 6
Plethodontidae 2 568-569
Plethora 3 142 143
Pleura 7 618
Pleuracanthodii 4 419, 10 417*, 12 360
Pleuracanthus 10 417
Pleural rib 12 363
Pleurasipidothemium 3 594
Pleuritis 7 622
Pleurobrachia 3 646 4 26
Pleurocercidae 9 609
Pleurodeles waltlii 11 465 468
Pleurodira 3 22
Pleurodynia 3 530
Pleuromeia 10 417
Pleuromeiaceae 7 276
Pleuromeiales 7 625, 10 346, 417*
Pleuron 1 555
Crustacea 3 562 569
Pleuronectidae 5 515
Pleuronectiformes 9 442, 10 417-418*
flounder 5 515
Pleuropneumonia 10 418
Pleuropneumonia-like organism (PPLO) 8 679; 10 418
Pleurostigmophora 3 60
Pleurotomariacea 6 75
Pleurotricha 11 59
Plexiglas chromatic aberration 5 90 91
optical materials 9 350
Plexus of Auerbach 4 150-175
Plicae circulares 4 160
Plicae transversales recti 4 163
Plicate vernation 2 361
Pliensbachian stage 7 325
Plinian eruptions 14 354
Pliocene 6 136, 142, 10 418 419*
Pliolagus 7 383
Pliopithecus 10 590
Pliotron *see* Triode, vacuum
Plissé printing 13 543
Ploceidae 12 562
Plodia interpunctella 7 468, 472
Plotosidae 3 648
Plough 14 235
Plow types 1 126-127
Plowing 1 126
agricultural soil and crop practices 1 126 127
Plucking 6 202
of rock 5 277
Plug cock 14 260-261
Plug fuse 5 578
Plug gage 6 4
Plum 10 419-420
plum and prune diseases 10 420
propagation and commercial production 10 419-420
varieties 10 419
Plum curculio 3 287, 14 461
Plum sawfly 6 580
Plumatella 2 354
Plumatella repens 10 201, 13 75
Plumatellidae 10 201
Plumbago 6 256
Plumbic acid 7 424
Plume moth 7 464
Plume patterns atmospheric pollution 1 644
Plumularia 3 255
Plumule 5 195 12 145 13 114
Plunger relay 11 441
Pluria 11 449
Pluto 10 420
albedo 1 223
Plutology 6 170
Pluton 7 375 376, 10 420 422* characteristics of 10 84
Plutonic rock igneous rock 7 10
igneous 7 15 16
Plutonium 10 422 425*, 11 66
compounds 9 42
electron configuration 4 504
fission 5 287 288
nuclear fuels 9 184 186*, 11 358
preparation of the element 10 423 424
principal compounds 10 424 425
properties 10 422
terrestrial abundance 13 592
uses 10 422
Plutonium 239 atomic bomb 1 648
Pluvial periods 1 105
Pluvialis dominicus 5 10, 7 345
Plyer, E. K 7 592
Plymouth Rock (chicken) 3 58
Plywood 10 425*, 13 119
P M (time) 13 643
PM *see* Phase modulation
10 103
PMA 6 421
PMP 11 615
PMR 8 363 366
P-N hook multiplication 14 57
P-N junction 12 171
biasing 7 318
diode 7 317-319
photodiode 10 143 149
rectification 7 318
variable capacitance 7 319
varistor 14 281
Pneumatic caisson 2 590
air pressure 2 590
bends 2 590
Pneumatic conveyor 2 568
Pneumatic processes steel manufacture 13 94 95
Pneumatic radiometer 7 106
Pneumatic scales 14 463
Pneumatic servomechanisms *see* Servomechanism
Pneumatic tire 13 651
Pneumatolysis 8 299 10 425*
metamorphic rocks 8 299
Pneumatophore 8 90
Pneumatophorus diego 8 9
Pneumococcus 10 425 427
antigens 10 426
cultural characteristics 10 426
fluorescent antibody method 8 585
heart disorders 6 318 362
identification 10 426
morphology 10 425
pathogenicity 10 427

Pneumococcus—cont
pneumococcidal agents 10 426
Quellung reaction 10 426, 11 188
solubility in bile 10 426
somatic C carbohydrate 10 426
somatic protein antigen 10 426
types 10 427
type III 9 212
variants 10 427
Pneumoconiosis 7 620-621
Pneumocystosis 10 427 428
Pneumoencephalitis 9 91
Pneumonia 1 466 468, 2 319 434, 7 618 619 9 594, 10 429*, 13 36 38
complications 10 429
diseases 10 428
known causes 10 428
prognosis 10 428
therapy 10 428
Pneumonic plague 10 255
Pneumonitis 10 429
PNIP junction transistor 7 320
PNP transistor alloy-junction 7 319
grown junction 7 319
surface barrier 13 322
Po River 5 121
Poa compressa 2 272
Poa pratensis 2 272 6 261
Pochard 3 436
Pocillopora 12 76
Pocillopora acuta 12 77
Pocillopora damicornis espitosa 12 76
Pocilloporid corals 12 78
Pockels effect 7 337 338
Pocket gopher 6 237
Pocket meters 4 268
Pocock R 8 682
Pocono sandstone 9 149
Pod rot 2 385
Podargidae 2 448
Podarke 10 465
Podascon 5 33
Podbielniak W J 6 46
Podbielniak centrifugal extractor 12 500
Podicipitidae 6 268 10 429
Podicipitiformes 1 694 10 429* grebe 6 268
Podilymbus podiceps 6 268
Podmus 6 410
Podobranchia 4 25
Podocarpus 3 187 401
Podocopa 5 562 9 447 10 429 430*
Bairdiidae (Nesideidae) 10 429
Cypridae 10 429
Cytheracea 10 430
Cytheridae 10 429
Podocopa—cont
Darwinulidae 10 429
Podogona *see* Ricinulei
Podon 5 151
Podophrya 13 237
Podophyllin 10 440
Podophyllum peltatum 10 440
Podoplea Copepoda 6 343
Podosphaera leucotricha 5 66, 546
Podzolic soils 12 442
Podzols 12 439
Poecilidae 3 649
Poecilosclerida 2 647, 4 56, 10 430 431*, 513
Poecilostoidea 10 431
Poecilus mesereri 10 431
Poggendorff compensation method for measuring emf 4 473
Poggendorff's first method 10 543
Pogonip 5 367
Pogonochore 10 499
Pogonophora 2 313, 10 431* Athecanephria 2 315, 10 431
Thecanephria 2 313 10 431
Pohl, R 4 484
Poi 4 13
Poikilitic structure 8 296
Poikilitic texture 7 11-12
Poikilocytosis 5 195
Poikilotherm 13 590
Poikilothermic carnivore *see* Terrestrial ecosystem
Poincaré, H 3 508, 7 90, 585, 8 176, 11 433 434, 13 683 14 200, 265
Poincaré recurrence theorem 13 60
Poinsot ellipsoid 10 432-433
Poinsot's method 10 431-433
Cardan's suspension 10 432
ellipsoid equations 10 432
Poinsot motion 5 102
Point 10 433
geometry euclidean 6 153
Point Barrow 9 166
Point-circle 1 389
Point-conic 3 400
Point-contact diode 10 433 silicon 12 324
Point contact transistor 10 433-434
Point-detonating (PD) fuze 1 540
Point group 6 282 crystallography 5 603
Point initiating base-detonating (PIBD) fuze 1 540
Point lattice defects 5 294 297
Point source 10 433 geometrical optics 9 369 inverse square law 7 224-225
Point system, American type size 14 171
Poise (definition) 14 332
Poiseuille, J L M 2 252
Poiseuille flow 8 60
Poiseuille's law 2 581-582, 4 480, 525, 5 343
Poison 10 434 438*, 14 5-6
antidotes 14 6
categories 14 5
chemical correlations 10 435
chemistry 10 434
deaths from 14 5
health aspects 10 437
history of 14 5-6
mechanism of action 10 436
origin 10 434
pharmacology 10 97
potency 10 437
physiological actions 10 435
systemic 14 5
toxicological analysis 5 440
treatment for 14 6
Poison Control Centers 10 437, 14 6
Poison gas 5 44-46
Poison gland 10 438*, 11 348, 12 390
Poison ivy 4 67, 10 438*, 12 26, 13 124
hypersensitivity 6 589
Poison oak 12 26
hypersensitivity 6 589
Poison sumac 10 438-439*, 12 26
Poisonous plants 10 439-440
Poisson, S D 8 48, 10 631
Poisson bracket canonical transformations 2 438 quantum theory, nonrelativistic 11 167
Poisson distribution 2 230, 235, 4 258
biometrics 2 230
distribution (probability) 4 258
Poisson's equation 1 585 4 451, 12 610
Poisson's law 10 631
Poisson's loss formula 3 321
Poisson process (transition probabilities) 13 145 144
Poisson's ratio elasticity 4 419 marine sediments 8 137 138
Poisson's transformation formula 7 165
Poitevin A L 10 615
Poker 6 25
Polaranthus 4 201
Polanyi potential theory 1 81
Polar bear 2 118
Polar body oogenesis 9 330
Polar coordinate navigation systems 10 446
Tacan 13 381-382
Vortac 14 375
Polar coordinate system 3 454-455
Polar directivity pattern 4 235
Polar easterlies 14 495
Polar flattening 13 516
Polar front 5 539
atmospheric low 1 642
jet systems 8 329
upper pressure patterns 8 335
Polar front jet systems 8 329
Polar meteorology 10 440-442
Polar molecule 10 442
intermolecular forces 7 195
Polar navigation 10 442-445
celestial determination of direction 10 444
celestial navigation problems 10 445
celestial sphere 10 443
chart reliability 10 443
charts 10 442
compass limitations 10 443
coordinates 10 442
dead reckoning difficulties 10 443
directions 10 442
distance or speed problems 10 444
electronic aid limitations 10 443
light conditions 10 442
meteorological factors 10 443
navigational grid 10 442
piloting hazards 10 443
time patterns 10 443
Polar night jet 10 441
Polar nuclei, botany 5 326 334
Polar planimeter 7 172
Polar projections 10 442
Polar regions 10 443
Polar triangle 10 445*, 14 100
Polar wandering 10 445
coal measures 1 440
rock magnetism 11 596-597
tectonophysics 13 418
Polarimeter 9 346
polarimetric analysis 10 446-448
Polarimetric analysis 10 447-448
Polarimetry 10 446-448
Polaris 10 447*, 14 235
Polaris missile 1 485, 544*
Polaris submarines 1 544
Polariscope 10 452
gem-testing 6 97
photoelasticity 10 149-150
Polarity (electricity) 10 447

Platinum—*cont*
analytical techniques 10 412
assay of 1 593
chemical and physical properties 10 411
chloroplatinate 3 83
electron configuration 4 504
extractive metallurgy 8 278
hydrogen electrode 6 549
ionization potential 4 504
metallurgical extraction 10 411-412
native state 9 4
natural occurrence 10 410-411
principal compounds 10 412
uses 10 411
see also Iridium
Platinum sponge 6 549
Plato hydrometer (Balling) scale 6 562
Platonic solid 10 473, 491
Platt, J B 9 78
Platyasterida 1 598, 4 360, 10 412*
Platybelodon 10 636
Platyceratacea 6 76
Platycopa 3 562, 9 447, 10 412*
Platyctenea 3 608, 10 412*
13 491
Platydorina 8 169
Platydorina caudata 11 55
Platyfish 3 649
Platygaster 6 579
Platygasteridae 6 574
Platyhelminthes 1 413, 420, 10 412-415*
Cestoda 2 658 659*, 10 413-414
Cestodea 2 659
economic and biological importance 10 413
morphology 10 413
regeneration 11 419-420
reproduction 10 413
Trematoda 10 413, 414, 14 77-80*
Turbellaria 10 413, 414
Platymaia 4 41
Platymonas 8 170
Platypodidae 3 278
Platypsyllidae 3 276
Platypsyllus castoris 3 286
Platyptilia carduidactyla 7 468
Platyscelus 6 586
Platyspondylia 12 368
Playa 4 75, 10 415*
Pleasing fungus beetle 3 278
Plecoptera 7 134, 10 415-416*, 13 153
Insecta fossils 7 139
Plectidae 10 416
Plectognathi 13 530
see also Tetraodontiformes
Plectoidea 10 416
Plectrophenax nivalis 2 371
Plectrum 4 320
Plectus 6 436-441
Plegadis chihi 7 1
Plegadis falcinellus 7 1
Pleiadae 6 401
Pleiades 10 416
reflection nebula 7 220
Pleiosauria 11 484
Pleiotropism 10 416
Pleistocene 6 136, 142, 10 416-417*
chronology 6 194
climate 6 133
climate fluctuations 6 192
fossil man in 5 477-478
Glacial Epoch 6 190
time units 6 195
Pleistophora 13 398
Pleochroism 10 417*, 14 88
gem 6 96
Pleodorina 1 235
Pleodorina californica 8 169
Pleodorina illinoisensis 11 53
Pleonaste 12 618
Pleospongia Archaeocyatha 1 509
Pleotia 5 98
Plerocercoid 12 559
Plerocercoid larva 2 659, 11 43, 67
Plerogyra 12 77
Plerotic water 6 276
Plesiadapidae 10 589
Plessiosaur 11 484, 12 41
Plessiosaurus 7 527, 11 484
Plesioteuthis 4 107, 13 531
Plesiotype 14 172
Plestiodon fasciatus 12 373
Plethodon 12 6
Plethodontidae 2 568-569
Plethora 3 142-145
Pleura 7 618
Pleuracanthodii 4 419, 10 417*, 12 360
Pleuracanthus 10 417
Pleural rib 12 363
Pleurastipidotherium 3 594
Pleuritis 7 622
Pleurobrachia 3 646, 4 26
Pleurocercidae 9 609
Pleurodeles waltlii 11 465, 468
Pleurodira 3 22
Pleurodynia 3 530
Pleuromeia 10 417
Pleuromeiaceae 7 276
Pleuromeiales 7 625, 10 346, 417*
Pleuron 1 555
Crustacea 3 562 569
Pleuronectidae 5 315
Pleuronectiformes 9 442, 10 417-418*
flounder 5 315
Pleuropneumonia 10 418
Pleuropneumonia-like organism (PPLO) 8 679, 10 418
Pleurostigmophora 3 60
Pleurotomariacea 6 75
Pleurotricha 11 59
Plexiglas® chromatic aberration 3 90-91
optical materials 9 350
Plexus of Auerbach 4 150-175
Plicae circulares 4 160
Plicae transversales recti 4 163
Plicate vernation 2 361
Pliensbachian stage 7 325
Plinian eruptions 14 354
Pliocene 6 136, 142, 10 418 419*
Pliolagus 7 383
Pliopithecus 10 590
Pliotron *see* Triode, vacuum
Plissé printing 13 543
Ploceidae 12 562
Plodia interpunctella 7 468, 472
Plotosidae 3 648
Plough 14 235
Plow types 1 126-127
Plowing 1 126
agricultural soil and crop practices 1 126 127
Plucking 6 202
of rock 5 277
Plug cock 14 260 261
Plug fuse 5 578
Plug gage 6 4
Plum 10 419-420
plum and prune diseases 10 420
propagation and commercial production 10 419-420
varieties 10 419
Plum curculio 3 287, 14 461
Plum sawfly 6 580
Plumatella 2 354
Plumatella repens 10 201, 13 75
Plumatellidae 10 201
Plumbago 6 256
Plumbic acid 7 424
Plume-moth 7 464
Plume patterns atmospheric pollution 1 644
Plumularia 3 255
Plumule 5 195, 12 145, 13 114
Plunger relay 11 441
Pluria 11 449
Pluto 10 420
albedo 1 223
Plutology 6 170
Pluton 7 575 576, 10 420 422* characteristics of 10 84
Plutonic rock igneous rocks 7 10
igneous 7 15 16
Plutonium 10 422 425*, 14 66
compounds 9 42
electron configuration 4 504
fission 5 287 288
nuclear fuels 9 184 186*, 11 358
preparation of the element 10 423-424
principal compounds 10 424 425
properties 10 422
terrestrial abundance 13 522
uses 10 422
Plutonium 239 atomic bomb 1 648
Pluvial periods 1 108
Pluvialis dominicus 3 10, 7 345
Plyer, E K 7 502
Plymouth Rock (chicken) 3 58
Plywood 10 425*, 13 119
P M (time) 13 643
PM *see* Phase modulation
PMP 11 615
PMR 8 365 366
P-N hook multiplication 14 37
P N junction 12 171
biasing 7 318
diode 7 317 319
photodiode 10 148 149
rectification 7 318
variable capacitance 7 319
varistor 14 281
Pneumatic caisson 2 590
air pressure 2 590
bends 2 590
Pneumatic conveyor 2 368
Pneumatic processes steel manufacture 15 94 95
Pneumatic radiometer 7 106
Pneumatic scales 14 463
Pneumatic servomechanism *see* Servomechanism
Pneumatic tire 13 651
Pneumatolysis 8 299 10 425*
metamorphic rocks 8 299
Pneumatophore 8 90
Pneumatophorus diego 8 9
Pneumococcus 10 425 427
antigens 10 426
cultural characteristics 10 426
fluorescent antibody method 8 395
heart disorders 6 358 362
identification 10 426
morphology 10 425
pathogenicity 10 427

Polyethylene glycol
10 470*, 497
Polyethylene terephthalate
14 18
polyester resins 10 467-468
Polyfluoroolefin resin
10 470-471
Kel F insulation 6 529,
7 157
polymonochlorotrifluoro-
ethylene 10 471
polytetrafluoroethylene
10 471
see also Polymer,
Polyvinyl resins
Polyformaldehyde 10 470
Polygalacturonase 14 604
Polygamous flower 5 526
Polyglutamic acid 1 457
Polyglycol 7 604
Polygnathidae 3 406
Polygon 10 471
area 1 529
hexagon 8 434 435
octagon 9 272
parallelogram 9 547
pentagon 9 625
permafrost 10 21
polytopes, regular
10 491
see also Polytope, regular
Polygonaceae 10 472
Polygonal ground 9 152
10 471-472*
Polygonales 10 346, 472*
buckwheat 10 472
rhubarb 11 556
Polygonia 7 471
Polygonum 5 353
Polygonum orientale 10 472
Polygonum viviparum
10 332
Polygordiidae 1 317
Polygordius 14 114
Polygraph lie detector *see*
Lie detector
Polyhalite 10 330
Polyhalogen compounds 6 526
halogenated hydrocarbon
6 525
Polyhedral structures,
chemical 3 35 39
Polyhedron 10 472 473* 624
cube 3 611
octahedron 9 272 273
parallelepiped 9 546-547
polytopes, regular 10 491
prism 10 622 623
pyramid and frustum
11 107
solid (geometric) 12 473
tetrahedron 13 550
see also Prism, Prismatoid
and pyramid, Solid
(geometric)
Polyhydroxy alcohol 10 473
ethylene glycol 5 93
glycerol 6 220 221
glycol 6 223
pentaerythritol 9 622
petrochemical 10 46
polyethylene glycol 10 470
Polyisobutylene polyolefin
resins 10 486
Polyisocyanate *see*
Polyurethane resins
Polyisoprene 10 487
cis 1, 4 Polyisoprene 11 638
rubber 11 643
Polykrikos 8 169
Polylauryl methacrylate 10 459
Polyplophus 6 435
Polymastigida 10 473 474*
11 52
Polymastigina see
Polymastigida
Polymer 4 92, 10 474 475*
fiber, man made 5 246
hydrocarbon resin 6 536
plastics fabrication
10 403 407
polyacrylate resin
10 458 459
polyacrylonitrile resin
10 459
polyamide resin 10 460 461
polyester resins 10 466 468
polyether resins 10 468-470
polyfluoroolefin resin
10 470-471
polystyrene resin 10 491
polysulfide *resins* 10 491
polyvinyl resins 10 494
rheology 11 545
silicone *resins* 12 524
see also Amino resins
Polymer emulsion 10 481
Polymer latex 10 481
Polymer plastics 5 541
Polymer properties 10 475 478
compounding 10 476 477
crystallinity 10 476
fabrication 10 477
measurement of molecular
properties 10 477
molecular properties
10 475 576
molecular weight and
distribution 10 475
see also Polymer
Polymer solutions 12 52
Polymera 10 478
Polymers of polyolefin resins
10 486 487
Polymerization 10 478 485
addition 10 480
chain reaction, chemical
3 6
inhibitor (chemical)
7 110-111
molecular association
8 538
Polymerization—*cont*
organic chemical synthesis
9 592
petroleum processing 10 69
petroleum products 10 71
phenol formaldehyde
resin 10 113-114
polyacrylate resin 10 458
polyacrylonitrile resin
10 459
polyamide resin 10 460 461
polyester resins 10 466
polyether resins 10 468 470
polyfluoroolefin resin
10 470 471
polystyrene resin 10 491
polysulfide resins 10 491
polyurethane resins 10 494
polyvinyl resins 10 494
see also Polymer
Polymerization catalysis 13 653
Polymerurus 3 2
Poly 3 methyl butene 1 10 486
Polymethyl methacrylate
11 223
Polymictic lake 5 523
Polymolybdate 8 565
Polymonochlorotrifluoro
ethylene 10 471
Polymorphic transformations
8 293
Polymorphinidae 5 435
Polymorphism (biology)
Bryzoa 2 356
Cheilostomata 5 16 17
sexual dimorphism 12 237
Polymorphism (crystal
lography) 10 483
Polymorphism, balanced
genetic *see* Balanced genetic
polymorphism
Polymorphonuclear cell 10 91
Polymyositis 8 658
Polymyxin 1 475 10 483 484*
12 196
amino acids 1 308
chemical properties 10 483
purification 10 483
toxicity 10 484
Polymyxin B 1 464 468 10 483
Polymyxin D hydrochloride
10 484
Polynesians 1 459
Polynitroaromatic 7 111
Polynoidae 10 461
Polynomial systems of
equations 10 484 485
Polynomials 4 234
orthogonal *see* Orthogonal
polynomials
Polynuclear hydrocarbon
6 534, 10 485*
anthracene 1 456
biphenyl 2 247
diphenylmethane 4 206
indene 7 56
naphthalene 9 2 5
Polynuclear hydrocarbon—*cont*
phenanthrene 10 110
Polynucleotides 7 497
Polynya 10 444
Polyodon spathula 1 46
Polyodontidae 1 46,
10 461
Polyol *see* Polyhydroxy
alcohol
Polyolefin 4 117 118
fiber 5 244 245
Polyolefin resins 10 485-487
polydienes 10 487
polyethylene 10 485-486
polyisobutylene 10 486
polymerization catalysis
13 653
polypropylene 10 486
propylene 11 18
see also Polyfluoroolefin
resin, Polymer; Poly
merization, Polyvinyl
resins
Polyoma virus 8 583
Polyopisthocotylea 8 573
Polyostotic fibrous dysplasia
10 225
Polyoxyethylation of alcohol
10 487
see also Polyether *resins*
Polyoxyethylene 10 469
Polyoxymethylene polyether
resins 10 470
Polyoxyolefin resins- polyether
resins 10 469-470
Polyoxypropylene 10 469
Polyp oncology 9 319
reproductive system
disorders 11 481
Polyp (Coelenterata) 3 256
Polyp (nasal) 12 343
Polypentene-1 10 486
Polypeptide 4 170
amino acids 1 308
bacitracin 2 5
insulin 7 164
Polypetalae 1 517
Polyperaly 5 527
Polyphaga 3 276
Polyphase ac circuits *see*
Alternating current circuit
theory
Polyphase power factor meter
10 562
Polyphase power measurement
4 436
Polyphase wattmeter 14 416
Polyphase generators *see*
Alternating-current
generator
Polyphase induction motor
7 74 77
magnetomotive force 7 74
resistance of the rotor bars
7 76
rotating magnetic field
7 74

Polarity (quadric) 6 157
Polarizability (dielectric) 13 330
Polarizability, molecular 8 548
  molecules 4 112
  refraction (molar) 11 404
Polarization (dielectrics) 10 447*; 13 330
  dielectric hysteresis 4 115-116
  electret 4 422
  electrical units 4 461
  ferroelectrics 5 224-229
  ionic crystals 7 251
  theory 4 111-112
Polarization catastrophe 4 112
Polarization by scattering light 10 450
Polarization of waves 10 448
  antennas 1 447, 453
  electromagnetic 10 448
  microwave optics 8 417-418
Polarized electrolytic capacitors 2 447
Polarized light 7 499, 10 448 454*
  analyzing devices 10 452
  birefringent crystals 10 449
  circularly polarized 10 450
  crystal optics 5 587-592
  dichroic crystals 10 449
  elliptically polarized 10 450
  Faraday effect 5 181-182
  interstellar matter 7 219-222
  Jones calculus 10 453-454
  light 7 499
  linear polarizing devices 10 449
  linearly polarized 10 450
  Mueller matrices 10 454
  optical activity 9 546
  photoelasticity 10 149 151
  polarimetric analysis 10 447
  polarization by scattering 10 450
  production of 10 451 452
  reflection 11 393-395
  retardation theory 10 453-454
  rotatory dispersion 11 632 633
  scattering 12 51
  sheet polarizers 10 449-450
  starlight 7 222
  types 10 450
  wave plate 10 451-452
Polarized neutrons 9 85
  neutron *diffraction 9 89*
Polarizer 3 589 591
Polarizing microscope 5 225
Polarographic analysis 10 454-456
  apparatus 10 455
Polarographic analysis—*cont.*
  applications 10 455
  other polarographic techniques 10 455
  other voltammetric methods 10 456
  see also Overvoltage, Titration, amperometric
Polarography *see* Polarographic analysis
Polaroid radiography 11 305
Polaroid Land camera 10 158
Pole blight, western white pine 14 74
Pole star 10 447
Pole strength magnet 8 26
Poles magnetic field 8 31
Polian vesicle 12 346
  Echinoidea 4 375
Poliantte 11 117
Polio virus 1 424, 5 3, 10 456, 14 327, 331
  fluorescent antibody method 8 383
Poliomyelitis 1 424, 466-467, 4 235, 9 71, 10 456 457*; 14 328
  biologicals 2 218
  diagnosis 10 456
  epidemiology 10 456
  pathogenesis 10 456
  vaccine 10 456
Polish wheat 14 480
Polishing 10 457
  buffing 2 362
  leather and fur processing 7 447
  machining operations 8 6
  metallographic specimens 8 293
  superfinishing 10 457
  wood finishing 14 533
Polishing sand 12 22
Polissar, M J 8 641, 643
Politses 6 582 12 406
Politses annularis 12 406
Polithionite 7 459
Politic cherts 3 56
Pollaczek, F 11 189
Pollen 2 129 5 330 332
  flower (botany) 5 326 334
  grain 11 454
  hayfever 6 345
  postglacial vegetation studies 10 526
  study of *see* Palynology
Pollination 2 128, 11 454
  entomology 5 5
Pollen basket 6 576
Pollinium 5 326 334
Pollock 6 2
Pollucite 10 457*, 12 476
  cesium ore 2 656
  rubidium ore 11 647
Pollutant 5 82
Polluted stream reoxygenation 12 216
Pollution, atmospheric *see* Atmospheric pollution
Pollution, estuarine *see* Estuarine oceanography
Pollution, water *see* Water pollution
Pollux 6 104, 13 41
Polonium 10 457-458
  compounds 10 458
  determination 10 458
  electron configuration 4 504
  ionization potential 4 504
  properties 10 457
  radioactivity 11 278
  uses 10 457
Pólya, G 6 255
Polya model of contagion 10 628
Polyacrylate resin 10 458-459
  casting 10 405
  see also Polyacrylonitrile resin, Polymer; Polyvinyl resins
Polyacrylic fiber 5 244-245
Polyacrylonitrile resin 10 459-460
Polyacrylonitrile resin *see also* Polyacrylate resin, Polymer; Polyvinyl resins
Polyalkene 10 460
  diene 4 117-118
Polyalkylbenzene 3 235
Polyamide fiber dyeing 4 310
  fiber, man-made 5 243 244
  polymer properties 10 475
Polyamide resin 10 460-461
  see also Polymer
Polyangiaceae 8 687
Polyatomic molecule 8 548-556
Polyazo dye 4 300
Polybasite 12 329
Polybdenum glance 11 545
Polybius henslowii 3 531
Polyblend 10 477
Polyblepharides 8 168, 10 213
Polybrachiidae 13 545
cis 1, 4 Polybutadiene 11 645
Polybutenes 14 207
Polycarbonate 10 468
Polychaeta 1 429 431, 10 461 466*
  Annelida fossils 1 431
  Errantia 10 461
  food and ecology 10 465
  morphology 10 462-465
  Sedentaria 10 461
  taxonomy 10 461 462
Polycheles crucifer 4 30
Polycladida 10 414, 465-466* 14 144
Polyclimax 3 183 184, 13 234
Polyconic projection 8 97
Polycope 3 151
Polycopidae 3 151
Polycrystal 6 245
Polycrystalline solids 3 580
Polycteniidae 6 401
Polycyclic systems 1 548
Polycycline *see* tetracycline
Polycystic kidney 7 342
Polycythemia 3 196, 6 395, 13
Polycythemia vera 3 141 144, 6 395
  leukemia 7 480
Polydactyly 13 492
Polydiallyl esters 10 468
Polydienes 10 487
Polydipsia 2 273
Polydiscerpene 6 536
Polydolopidae 8 155
Polydora 10 461
Polyembryony 2 356, 4 149, 11 449
  Orthonectida 9 415
  parasitology 9 555
Polyenes *see* Polyalkene
Polyergus 6 582
Polyergus lucidus 1 457
Polyester fibers 5 244
  dyeing 4 310
Polyester film 10 403
Polyester resins 10 466 468
  alkyd 10 466
  aromatic polycarbonates 10 468
  casting 10 405
  lamination 10 406
  polydiallyl esters 10 468
  polyethlene terephthalates 10 467-468
  unsaturated polyester 10 466-467
  see also Polymer
Polyesterification 5 75
Polyesterurethane 11 645
Polyestrous 5 70
Polyether 10 487
Polyether resins 10 468 470
  epoxidation 10 468 470
  epoxy resin 5 44, 10 469
  plastics fabrication 10 468 470
  polyoxymethylene 10 47
  polyoxyolefin resins 10 469 470
  see also Polymer
Polyetherurethane 11 645
Polyethylene 14 207
  fiber 4 310
  film 10 404
  food engineering 5 402
  insulation electric 7 356
  meteorological balloons 8 318
  petrochemical 10 45
  polyolefin resins 10 445 4
  production 8 449
  radiation damage 11 223

Polyethylene glycol 10 470*, 487
Polyethylene terephthalate 14 13
polyester resins 10 467 468
Polyfluoroolefin resin 10 470-471
Kel F insulation 6 329, 7 157
polymonochlorotrifluoroethylene 10 471
polytetrafluoroethylene 10 471
see also Polymer; Polyvinyl resins
Polyformaldehyde 10 470
Polygalacturonase 14 604
Polygamous flower 5 326
Polyglutamic acid 1 457
Polyglycol 7 604
Polygnathidae 3 406
Polygon 10 471
area 1 529
hexagon 6 434 435
octagon 9 272
parallelogram 9 547
pentagon 9 623
permafrost 10 21
polytopes, regular 10 491
see also Polytope, regular
Polygonaceae 10 472
Polygonal ground 9 152 10 471 472*
Polygonales 10 346, 472*
buckwheat 10 472
rhubarb 11 556
Polygonia 7 471
Polygonum 5 333
Polygonum *orientale* 10 472
Polygonum *tinctorum* 10 332
Polygordiidae 1 517
Polygordius 14 114
Polygraph lie detector *see* Lie detector
Polyhalite 10 330
Polyhalogen compounds 6 326
halogenated hydrocarbon 6 325
Polyhedral structures chemical 3 35 39
Polyhedron 10 472 473* 624
cube 5 611
octahedron 9 272 273
parallelepiped 9 546 547
polytopes regular 10 491
prism 10 622 623
pyramid and frustum 11 107
solid (geometric) 12 473
tetrahedron 13 530
see also Prism, Prismatoid and prismoid Solid (geometric)
Polyhydroxy *alcohol* 10 473
ethylene glycol 5 93
glycerol 6 220 221
glycol 6 223
pentaerythritol 9 622
petrochemical 10 46
polyethylene glycol 10 470
Polyisobutylene polyolefin resins 10 486
Polyisocyanate *see* Polyurethane resins
Polyisoprene 10 487
cis-1, 4 Polyisoprene 11 638
rubber 11 643
Polykrikos 8 169
Polylauryl methacrylate 10 459
Polylophus 6 435
Polymastigida 10 473 474*, 11 52
Polymastigina *see* Polymastigida
Polymer 4 92, 10 474 475*
fiber, man made 5 246
hydrocarbon *resin* 6 536
plastics fabrication 10 403-407
polyacrylate resin 10 458-459
polyacrylonitrile resin 10 459
polyamide resin 10 460 461
polyester resins 10 466-468
polyether resins 10 468 470
polyfluoroolefin resin *10 470 471*
polystyrene resin 10 491
polysulfide resins 10 491
polyvinyl resins 10 494
rheology 11 545
silicone resins 12 524
see also Amino resins
Polymer emulsion 10 481
Polymer latex 10 481
Polymer plastics 5 541
Polymer properties 10 475 478
compounding 10 476-477
crystallinity 10 476
fabrication 10 477
measurement of molecular properties 10 477
molecular *properties* 10 475 576
molecular weight and distribution 10 475
see also Polymer
Polymer solutions 12 52
Polymera 10 478
Polymers of *polyolefin resins* 10 486-487
Polymerization 10 478 483
addition 10 480
chain reaction chemical 3 6
inhibitor (chemical) 7 110 111
molecular association 8 538
Polymerization—*cont*
organic chemical synthesis 9 392
petroleum processing *10 69*
petroleum products 10 71
phenol formaldehyde resin 10 113 114
polyacrylate resin 10 458
polyacrylonitrile resin 10 459
polyamide resin 10 460 461
polyester resins 10 466
polyether resins 10 468-470
polyfluoroolefin resin 10 470 471
polystyrene resin 10 491
polysulfide resins 10 491
polyurethane resins 10 494
polyvinyl resins 10 494
see also Polymer
Polymerization catalysis 15 653
Polymerurus 5 2
Poly 3 methyl butene 1 10 486
Polymethyl methacrylate 11 223
Polymictic lake 5 523
Polymolybdate 8 565
Polymonochlorotrifluoroethylene 10 471
Polymorphic transformations 8 293
Polymorphinidae 5 435
Polymorphism (biology) Bryzoa 2 356
Cheilostomata 3 16 17
sexual dimorphism 12 237
Polymorphism (crystallography) 10 483
Polymorphism, balanced genetic *see* Balanced genetic polymorphism
Polymorphonuclear cell 10 91
Polymyositis 8 658
Polymyxin 1 475 10 483-484* 12 196
amino acids 1 308
chemical properties 10 483
purification 10 483
toxicity 10 484
Polymyxin B 1 464 468 10 483
Polymyxin D hydrochloride 10 484
Polynesians 1 459
Polynitroaromatic 7 111
Polynoidae 10 461
Polynomial systems of equations 10 484 485
Polynomials 4 254
orthogonal *see* Orthogonal polynomials
Polynuclear hydrocarbon 6 534 10 485*
anthracene 1 456
biphenyl 2 247
diphenylmethane 4 206
indene 7 56
naphthalene 9 2 3
Polynuclear hydrocarbon—*cont*
phenanthrene 10 110
Polynucleotides 7 497
Polynyx 10 444
Polyodon spathula 1 46
Polyodontidae 1 46 10 461
Polyol *see* Polyhydroxy alcohol
Polyolefin 4 117-118
fiber 5 244 245
Polyolefin resins 10 485-487
polydienes 10 487
polyethylene 10 485-486
polyisobutylene 10 486
polymerization catalysis 15 653
polypropylene 10 486
propylene 11 18
see also Polyfluoroolefin resin, Polymer; Polymerization, Polyvinyl resins
Polyoma virus 8 383
Polyopisthocotylea 8 573
Polyostotic fibrous dysplasia 10 225
Polyoxyethylation of alcohol 10 487
see also Polyether resins
Polyoxyethylene 10 469
Polyoxymethylene polyether resins 10 470
Polyoxyolefin resins polyether *resins 10 469-470*
Polyoxypropylene 10 469
Polyp oncology 9 519
reproductive system disorders 11 481
Polyp (Coelenterata) 5 256
Polyp (nasal) 12 343
Polypentene 1 10 486
Polypeptide 4 170
amino acids 1 308
bacitracin 2 3
insulin 7 164
Polypetalae 1 517
Polypetaly 5 327
Polyphaga 3 276
Polyphase ac circuits *see* Alternating current circuit theory
Polyphase power factor meter 10 562
Polyphase power measurement 4 436
Polyphase wattmeter 14 416
Polyphase generators *see* Alternating-current generator
Polyphase induction motor 7 74-77
magnetomotive force 7 74
resistance of *the rotor* bars 7 76
rotating magnetic field 7 74

Polarity (quadric) 6 157
Polarizability (dielectric) 13 330
Polarizability, molecular 8 548
  molecules 4 112
  refraction (molar) 11 404
Polarization (dielectrics) 10 447*; 13 330
  dielectric hysteresis 4 115-116
  electret 4 422
  electrical units 4 461
  ferroelectrics 5 224 229
  ionic crystals 7 251
  theory 4 111-112
Polarization catastrophe 4 112
Polarization by scattering light 10 450
Polarization of waves 10 448
  antennas 1 447, 453
  electromagnetic 10 448
  microwave optics 8 417 418
Polarized electrolytic capacitors 2 447
Polarized light 7 499, 10 448 454*
  analyzing devices 10 452
  birefringent crystals 10 449
  circularly polarized 10 450
  crystal optics 5 587-592
  dichroic crystals 10 449
  elliptically polarized 10 450
  Faraday effect 5 181-182
  interstellar matter 7 219 222
  Jones calculus 10 453-454
  light 7 499
  linear polarizing devices 10 449
  linearly polarized 10 450
  Mueller matrices 10 454
  optical activity 9 346
  photoelasticity 10 149 151
  polarimetric analysis 10 447
  polarization by scattering 10 450
  production of 10 451-452
  reflection 11 393-395
  retardation theory 10 453-454
  rotatory dispersion 11 632 633
  scattering 12 51
  sheet polarizers 10 449-450
  starlight 7 222
  types 10 450
  wave plate 10 451-452
Polarized neutrons 9 85
  neutron diffraction 9 89
Polarizer 3 589-591
Polarizing microscope 5 225
Polarographic analysis 10 454 456
  apparatus 10 455
Polarographic analysis—*cont*
  applications 10 455
  other polarographic techniques 10 455
  other voltammetric methods 10 456
  see also Overvoltage; Titration, amperometric
Polarography *see* Polarographic analysis
Polaroid radiography 11 305
Polaroid-Land camera 10 158
Pole blight, western white pine 14 74
Pole star 10 447
Pole strength magnet 8 26
Poles magnetic field 8 31
Polian vesicle 12 346
  Echinoidea 4 375
Polianite 11 117
Polio virus 1 424, 5 3, 10 456, 14 327, 331
  fluorescent-antibody method 8 583
Poliomyelitis 1 424, 466-467, 4 235, 9 71, 10 456-457*, 14 328
  biological 2 218
  diagnosis 10 456
  epidemiology 10 456
  pathogenesis 10 456
  vaccine 10 456
Polish wheat 14 480
Polishing 10 457
  buffing 2 362
  leather and fur processing 7 447
  machining operations 8 6
  metallographic specimens 8 293
  superfinishing 10 457
  wood finishing 14 533
Polishing sand 12 22
Polissar M J 8 641 645
Polistes 6 582, 12 406
Polistes annularis 12 406
Polithionite 7 459
Politic cherts 5 56
Pollaczek, F 11 189
Pollen 2 129, 5 330-332
  flower (botany) 5 326-334
  grain 11 454
  hayfever 6 345
  postglacial vegetation studies 10 526
  study of *see* Palynology
Pollination 2 128 11 454
  entomology 5 5
Pollen basket 6 576
Pollinium 5 326 334
Pollock 6 2
Pollucite 10 457*, 12 476
  cesium ore 2 656
  rubidium ore 11 647
Pollutant 5 82
Polluted stream reoxygenation 12 216
Pollution, atmospheric *see* Atmospheric pollution
Pollution, estuarine *see* Estuarine oceanography
Pollution, water *see* Water pollution
Pollux 6 104, 13 41
Polonium 10 457-458
  compounds 10 458
  determination 10 458
  electron configuration 4 504
  ionization potential 4 504
  properties 10 457
  radioactivity 11 278
  uses 10 457
Pólya, G 6 255
Polya model of contagion 10 628
Polyacrylate resin 10 458 459
  casting 10 405
  see also Polyacrylonitrile resin, Polymer; Polyvinyl resins
Polyacrylic fiber 5 244-245
Polyacrylonitrile resin 10 459 460
Polyacrylonitrile resin *see also* Polyacrylate resin, Polymer; Polyvinyl resins
Polyalkene 10 460
  diene 4 117-118
Polyalkylbenzene 3 255
Polyamide fiber dyeing 4 310
  fiber, man-made 5 243-244
  polymer properties 10 475
Polyamide resin 10 460-461
  see also Polymer
Polyangiaceae 8 687
Polyatomic molecule 8 548-556
Polyazo dye 4 300
Polybasite 12 329
Polybdenum glance 11 543
Polybius henslowii 3 531
Polyblend 10 477
Polyblepharides 8 168, 10 213
Polybrachiidae 13 545
cis 1 4 Polybutadiene 11 645
Polybutenes 14 207
Polycarbonate 10 468
Polychaeta 1 429 431, 10 461-466*
  Annelida fossils 1 431
  Errantia 10 461
  food and ecology 10 465
  morphology 10 462 465
  Sedentaria 10 461
  taxonomy 10 461 462
Polycheles crucifer 4 30
Polycladida 10 414, 465 466*, 14 144
Polyclimax 5 183 184 13 234
Polyconic projection 8 97
Polycope 3 151
Polycopidae 3 151
Polycrystal 6 245
Polycrystalline solids 3 589
Polycteniidae 6 401
Polycyclic systems 1 543
Polycycline *see* tetracycline
Polycystic kidney 7 342
Polycythemia 3 196, 6 393, 11
Polycythemia vera 3 141 144, 6 395
  leukemia 2 490
Polydactyly 13 492
Polydiallyl esters 10 468
Polydienes 10 487
Polydipsia 2 273
Polyditerpene 6 536
Polydolopidae 8 155
Polydora 10 461
Polyembryony 2 356, 4 149, 11 449
  Orthonectida 9 415
  parasitology 9 553
Polyenes *see* Polyalkene
Polyergus 6 582
Polyergus lucidus 1 437
Polyester fibers 5 244
  dyeing 4 310
Polyester film 10 403
Polyester resins 10 466 468
  alkyd 10 466
  aromatic polyearbonate 10 468
  casting 10 405
  lamination 10 406
  polydiallyl esters 10 46
  polyethylene terephthalates 10 467 468
  unsaturated polyester 10 466 467
  see also Polymer
Polyesterification 5 75
Polyesterurethane 11 645
Polyestrous 5 79
Polyether 10 487
Polyether resins 10 468 470
  epoxidation 10 468 47
  epoxy resin 5 44, 10 46
  plastics fabrication 10 468 470
  polyoxymethylene 10 4
  polyoxyolefin resins 10 469 470
  see also Polymer
Polyetherurethane 11 645
Polyethylene 14 207
  fiber 4 310
  film 10 404
  food engineering 5 472
  insulation, electric 7 15
  meteorological balloon 8 318
  petrochemical 10 45
  polyolefin resins 10 445
  production 6 449
  radiation damage 11 22

Population genetics—*cont*
anthropology, physical 1 459
balance between selection and mutation 10 510
biometrics 2 230
genetic selection 10 510
gene frequencies 10 511 512
genotypic selective values 10 509
Hardy Weinberg formula 5 558
inbreeding 10 508
mating systems 10 508
mendelian population 10 507
migration and intermixture 10 508
mutation pressure 10 507
natural selection 10 509
panmixis 10 508
random drift 10 511
selection against dominants 10 510
selection pressure and equilibrium 10 509
stability of an equilibrium 10 510
opulation map 2 535
opulation I objects 6 10
opulation II objects 6 10
opulin 6 219
opulus 10 498, 12 8
opulus balsamifera 10 498 12 229
opulus deltoides 4 253, 10 12, 498
opulus grandidentata 10 498
opulus nigra 10 498
Populus tremuloides 10 497
Populus trichocarpa 10 498
Porcelain 10 512 513
imulation *electric* 7 138
Porcelain crab 4 51
Porcelain enamels 8 285
Porcellanid crab 4 51
Porcellanidae 4 51
Porcellanite chert 3 56
Porcellidium retentae 6 544
Porcellio 1 563 3 563 7 293
Porcellio scaber 9 527
Porcupine 10 513
Porcupine Plains 9 158
Pore mites 14 115
Porencephaly 9 69
Porgy 8 223
Pori (pollen) 9 525
Porina 14 528
Porochlora pomiformis 2 111
Porifera 1 429 10 513 519*
sexual reproduction 10 517 518
Calcarea 3 395 395 10 513
commercial sponge fisheries 10 519 519
Porifera—*cont*
Demospongiae 4 54 57, 10 513
feeding and digestion 10 515
fossils *see* Porifera fossils
general structure and cell types 10 513 514
Hexactinellida 6 432 434, 10 513
organisms associated with sponges 10 519
reactions of sponges 10 515
regeneration 10 518, 11 418 419
reproduction 10 516 617
sexual reproduction 10 516 517
skeleton 10 516
taxonomy 10 513
water-current system physiology 10 514 515
Porifera fossils 10 519 520
Calcispongia 10 519
Demospongia 10 519
geologic record 10 519
Hyalospongia 10 519
see also Archaeocyatha
Porites 3 255, 12 76
Portid corals 12 78
Pork tapeworm 3 642 13 393
Porocephalida 10 520
Porocephalidae 10 520
Porocephalus crotali 9 624
Porocidaris 4 369
Porocyte 2 393
Porogamy 5 326 334
Poroxylaceae 3 478
Poroxylon 3 478
Porphin 3 18
Porphobilinogen 2 58
Porphyra 11 554
Porphyra umbilicalis 8 92
Porphyrin 2 612, 5 105 10 520 521*
bacterial metabolism 2 59
chlorophyll 3 79
glycine 6 221
hemoglobin 6 410
Porphyrites 10 522
Porphyritic basalt 2 105
Porphyritic granite 10 521
Porphyritic obsidian 10 521
Porphyritic rhyolite 10 521
Porphyritic rock 7 11
Porphyritic textures 7 11 12
Porphyroblast 10 111 521
igneous rocks 7 11
texture 10 521
Porphyropsin 10 182
Porphyry 10 521 522
Porphyula martinica 6 18
Porpita 3 255
Porpoise 10 522
Porpoise oil 3 189
Porret, R 4 525
Porro prism 8 508
Porsanger Fiord 5 115
Porsild Mountains 1 523
Port (harbor) *see* Harbor
Port Orford cedar 2 578, 3 647
Portable handsaw 14 545
Portal cirrhosis 7 562
Porter, R F 5 580
Porter ale 8 80
Porthetria dispar 7 470, 472
Portland cement 10 522 523
air entraining *see* Air-entraining portland cement
concrete 3 362
hydraulic 10 522 523
manufacture 10 522
mortar 8 599
plaster 10 397
types 10 522 523
Portland-pozzolan cement 2 627
Portlandian stage 7 325
Portugal Current 1 625
Portuguese man-of-war 10 523 524*, 12 346, 13 338
Portunidae 4 34
Portunion flavidus 5 33
Position effect chromosome mutation 8 671
Position isomerism 7 277
Position servomechanism 12 199
Positional astronomy 1 608 609
Positioning tooling 13 671
Positive photography 10 158
Positive column glow discharge 6 215 216
Positive crystal 3 591
Positive feedback 5 199
see also Feedback
Positive genetics 5 98
Positive meniscus lens 7 451
Positive negative theory 1 42
Positive rays *see* Canal rays
Positive semiconductor *see* Semiconductor
Positive series 12 190
Positron 4 502 10 524*
beta rays 2 181 185
electron 4 502
elementary particle 4 545
muon decay 8 247
pair production 9 495
relativistic quantum theory 11 180
Positronium 10 524 525* 13 365
decay 10 525
energy levels 10 524 525
quantum electrodynamics 11 150
Post E L 7 582
Post, L von 10 526
Post, R F 10 589
Postbranchial body *see* Ultimobranchial bodies
Postcardinal system, changes during development 2 485
Postcardinal veins 2 499
Postcentral gyrus 12 502
Postdeflection acceleration 2 557
Postencephalitic Parkinsonism 9 547
Posterizing printing in color 10 608
Postglacial vegetation and climate 10 525-526
Postganglionic neurons 13 364
Postlabyrinthic placode 9 47
Postnecrotic cirrhosis 7 562
Postprecipitation 10 573
Postulate 10 526*, 13 546
contrasted with hypothesis 6 598
geometry, euclidean 6 154
Postural edema 4 410
Posture regulation of 10 527-530
body reflexes acting on body 10 529
body righting reflexes 10 529
decerebrate rigidity 10 527
labyrinthine acceleratory reflexes 10 529
lengthening reaction 10 528
neck-righting reflexes 10 529
placing and hopping reactions 10 529
righting reflexes 10 529
stretch receptor and its control 10 529
stretch reflex regulation 10 528
tonic labyrinthine reflexes 10 529
tonic neck reflexes 10 529
visual righting reflexes 10 529
Postzygapophysis 14 307
Pot galvanizing 8 279
Potable alcoholic beverage 4 253
Potamididae 6 429
Potamogalinae 7 143
Potamogeton 6 394
Potamonidae 4 34
Potamoplankton 5 533
Potamotrem 12 347
Potash alunite 1 298
fertilizer 10 531
potassium *fertilizers* 5 238, 7 22
Potash salts Permian deposits 10 25
potassium occurrence 10 550
Potash trachybasalt 10 51

Polyphase induction motor—*cont*
slip 7 76
speed torque characteristics 7 76
squirrel-cage rotor 7 75
stator 7 74
wound rotor 7 77
Polyphase power measurement 4 436
Polyphase rectifier 11 384-385
Polyphase wattmeter 14 416 417
Polyphosphate 3 41
Polyphosphoryl chloride 10 135
Polyphyodont dentition 13 673
Polyplacophora 8 559, 575, 10 487*
Amphineura 1 539
Polyploidy 3 113, 10 487-489*
distribution 10 489
gene action 6 107
hybridization 10 489
mutation 8 671
plant breeding 2 330, 10 489
Polypodiaceae 5 37
Polypodium 13 116, 14 284
Polypody 9 170
Polypody fern 5 261
Polyporus 3 265, 14 528
Polyporus tuberaster 8 677
Polypropylene 14 207
petrochemical 10 46
polyolefin resins 10 486
Polypteriformes 1 57-58, 9 442, 10 489 490*
Clupeiformes 5 222-223
Polypterus 10 248, 12 48, 13 337
Polypterus endlicheri 10 490
Polysaccharide 1 365, 2 452, 626, 4 91, 7 274, 10 490*
chitin 3 64
glycogen 6 222
glucoside 6 219
gum 6 296, 297
hemicellulose 6 398 399
hyaluronic acid 6 522
inulin 7 223
levan 7 486
mannan 8 92
mucilage 8 621
pectin 9 608 609
Polysaprobic zone 5 521 534
Polysilicate 12 322
Polysiloxane 12 324
Polysiphonia 11 555
Polysomaty 3 115
Polysomy 3 115
Polysphincta 6 580
Polysphondylium 1 49
Polyspora lini 5 298
Polystigma rubrum 14 650
Polystigmina 14 650
Polystoma integerrimum 8 574
Polystyrene 7 156, 14 207
infrared spectrum of 7 108-109
optical materials 9 350
radiation damage 11 223
sheets 10 407
Polystyrene resin 10 490 491
casting 10 405
styrene 13 209
see also Polymer, Polyvinyl resins, Polyester resins
Polysulfide 13 257
disulfide 4 259
Polysulfide resins 10 491
see also Polymer
Polysulfide rubber 11 641
Polyterpene hydrocarbon resin 6 536
see also Terpene
Polytetrafluoroethylene lubricant 7 604
polyfluoroolefin resin 10 471
radiation damage 11 223
Polythiol 13 603
Polythionate 3 41, 13 262
Polythionsulfite 3 41
Polythrincium trifolii 8 570
Polytoma 10 212, 11 56, 450
Polytope, regular 10 491-492
Polytrichum juniperinum 2 354
Polytropic process 10 492-493
Polytypism 10 485
Polyurethane resins 10 493-494
see also Polymer
Polyurethane rubbers 11 642 643
Polyuria 2 273
clinical pathology 3 192 202
pancreas 9 534
Polyvinyl acetals 10 494
Polyvinyl acetate 10 494 495
Polyvinyl alcohol 14 18
polyhydroxy alcohol 10 473
polyvinyl resins 10 495
Polyvinyl alcohol fiber 5 244
Polyvinyl butyral 10 494
Polyvinyl chloride 10 495
insulation, electric 7 157
Polyvinyl cyanide *see* Polyacrylonitrile resin
Polyvinyl ethers 10 496
Polyvinyl fiber 5 244 245
Polyvinyl fluoride 10 496-497
Polyvinyl formal 10 494
Polyvinyl pyrrolidone 1 255
polyvinyl resins 10 497
Polyvinyl resins 10 494 497
polyvinyl acetals 10 494
polyvinyl acetate 10 494 495
polyvinyl alcohol 10 495
polyvinyl chloride 10 495-496
polyvinyl ethers 10 496
Polyvinyl resins—*cont.*
polyvinyl fluoride 10 496-497
polyvinyl pyrrolidone 10 497
polyvinylcarbazole 10 495
polyvinylidene chloride 10 496
see also Polyacrylate resin, Polyacrylonitrile resin, Polyfluoroolefin resin; Polymer, Polyolefin resins, Polystyrene resin
Polyvinylcarbazole 10 495
Polyvinylidene chloride 10 496
Polyvinylpyrrolidine 2 637, 11 131
Polyzoa *see* Bryozoa
Polyzoae 2 355
Pomatiasidae 9 609
Pomatomidae 2 271, 10 10
Pomatomus saltatrix 2 271
Pome 5 542
Pomegranate 10 497
Pomeranz-Fritsch synthesis 7 289
Pomorske, Bay of 5 115
Pomoxis annularis 3 539
Pomoxis nigromaculatus 3 539
Pompilidae 6 574
Poncelet, J V 11 3
Poncirus trifoliata 5 546
Ponderosa pine 4 60
Ponerinae 12 405
Ponerine ant 12 405
Pong, C J 11 599
Pongidae 3 62, 6 238 9 370, 10 590
Pongo pygmaeus 9 370
Ponor sinkhole 7 335
Pons 2 651
Pontic Sea 2 251
Pontine flexure 9 45
Pontobdella muricata 11 556
Pontocypris clemensi 8 682
Pontodoridae 10 461
Pontoon bridge 2 334
Pontus Range 1 577
Pool (oil and gas) *see* Petroleum engineering, Petroleum geology
Pool-cathode mercury-arc tube 8 236
arc-back 8 237
arc conduction 8 236
cathode spot 8 236
grid 8 237
ignitor 8 237
metal tank 8 238
multianode tube 8 238
Popilius disjunctus 3 285
Popillia japonica 2 150, 5 287
Poplar 2 361 10 497 498*, 12 8
Lombardy 12 256
Poplar—*cont*
tacamahac 10 498
Poppet valve 14 251 252
Poppy 10 498
plant 8 598
seed 12 613
Population 2 225
analysis 6 503
sea water fertilizer 12 119
in statistics 13 66 75
world 1 458
Population dispersal 10 498 500
barriers to dispersal 10 500
dispersal phases 10 498
dispersal units 10 498
ecesis 10 499 500
plant evolution 10 320
transportation 10 498 499
Population dispersion 10 500 503
actions of environmental agencies of transport 10 502 503
analysis of dispersion 10 501 502
behavior patterns in reproduction 10 503
contagious or clumped dispersion 10 501
factors affecting dispersio 10 502 503
influence of temporal changes 10 503
intensity of competition 10 503
optimal population density 10 503
physical features of the habitat 10 503
principal types of dispersion 10 500
random or haphazard dispersion 10 500 501
social factors 10 503
uniform dispersion 10 50
Population dynamics 10 505 507*, 13 232
actual population growth 10 505
age structure 10 507
carrying capacity 10 505
cycles 10 506
density factors 10 505
environmental resistance 10 505
fluctuations 10 506
optimum yield 10 506
population control or regulation 10 504
population growth 10 50
population size and densi 10 503 504
underpopulation effects 10 505
Population genetics 10 507 512

pulation genetics—*cont*
anthropology, physical 1 459
balance between selection and mutation 10 510
biometrics 2 230
gametic selection 10 510
gene frequencies 10 511 512
genotypic selective values 10 509
Hardy Weinberg formula 6 338
inbreeding 10 508
mating systems 10 508
mendelian population 10 507
migration and intermixture 10 508
mutation pressure 10 507
natural selection 10 509
panmixis 10 508
random drift 10 511
selection against dominants 10 510
selection pressure and equilibrium 10 509
stability of an equilibrium 10 510
Population map 2 535
Population I objects 6 10
Population II objects 6 10
Populin 6 219
Populus 10 488, 12 8
Populus balsamifera 10 498, 12 229
Populus deltoides 4 293, 10 12, 498
Populus grandidentata 10 498
Populus nigra 10 498
Populus tremuloides 10 497
Populus trichocarpa 10 498
Porcelain 10 512 513
insulation electric 7 158
Porcelain crab 4 51
Porcelain enamels 8 285
Porcellanid crab 4 51
Porcellanidae 4 51
Porcellanite chert 3 56
Porcellidium ravenae 6 344
Porcello 3 563 3 563, 7 283
Porcello saber 9 327
Porcupine 10 513
Porcupine Plains 9 158
Pore mites 14 115
Porencephaly 9 69
Porgy 8 223
Pori (pollen) 9 525
Poria 14 328
Porichlax porosissimus 2 111
Porifera 1 420 10 513 519*
asexual reproductions 10 517 518
Calcarea 3 393 395 10 513
commercial sponge fisheries 10 518 519
Porifera—*cont*
Demospongiae 4 54 57, 10 513
feeding and digestion 10 515
fossils *see* Porifera fossils
general structure and cell types 10 513 514
Hexactinellida 6 432 434 10 513
organisms associated with sponges 10 519
reactions of sponges 10 515
regeneration 10 518, 11 418 419
reproduction 10 516 617
sexual reproduction 10 516 517
skeleton 10 516
taxonomy 10 513
water current system physiology 10 514 515
Porifera fossils 10 519 520
Calcispongia 10 519
Demospongia 10 519
geologic record 10 519
Hyalospongia 10 519
see also Archaeocyatha
Porites 3 255, 12 76
Poritid corals 12 78
Pork tapeworm 3 642 13 393
Porocephalida 10 520
Porocephalidae 10 520
Porocephalus crotali 9 624
Porocidaris 4 369
Porocyte 2 393
Porogamy 5 526 534
Poroxylaceae 3 478
Poroxylon 3 478
Porphin 3 18
Porphobilinogen 2 58
Porphyra 11 554
Porphyra umbilicalis 8 92
Porphyrin 2 612 5 105 10 520 521*
bacterial metabolism 2 59
chlorophyll 3 79
glycine 6 221
hemoglobin 6 410
Porphyrites 10 522
Porphyritic basalt 2 105
Porphyritic granite 10 521
Porphyritic obsidian 10 521
Porphyritic rhyolite 10 521
Porphyritic rock 7 11
Porphyritic textures 7 11 12
Porphyroblast 10 111, 521
igneous rocks 7 11
texture 10 521
Porphyropsin 10 182
Porphyry 10 521-522
Porphyula martinica 6 18
Porpita 3 255
Porpoise 10 522
Porpoise oil 5 189
Porret R 4 525
Porro prism 8 508
Porsanger Fiord 5 115
Porsild Mountains 1 523
Port (harbor) *see* Harbor
Port Orford cedar 2 578, 3 647
Portable handsaw 14 543
Portal cirrhosis 7 562
Porter, R F 5 580
Porter ale 8 80
Porthetria dispar 7 470, 472
Portland cement 10 522 523
air entraining *see* Air-entraining portland cement
concrete 3 362
hydraulic 10 522-523
manufacture 10 522
mortar 8 599
plaster 10 397
types 10 522 523
Portland-pozzolan cement 2 627
Portlandian stage 7 325
Portugal Current 1 626
Portuguese man-of-war 10 523 524*, 12 346, 13 338
Portunidae 4 34
Portunion flavidus 5 33
Position effect, chromosome mutation 8 671
Position isomerism 7 277
Position servomechanism 12 199
Positional astronomy 1 608-609
Positioning tooling 13 671
Positive photography 10 158
Positive column glow discharge 6 215 216
Positive crystal 3 591
Positive feedback 5 199
see also Feedback
Positive genetics 5 98
Positive meniscus lens 7 451
Positive negative theory 1 42
Positive rays *see* Canal rays
Positive semiconductor *see* Semiconductor
Positive series 12 190
Positron 4 502 10 524*
beta rays 2 181 183
electron 4 502
elementary particle 4 543
muon decay 8 247
pair production 9 495
relativistic quantum theory 11 180
Positronium 10 524 525*, 13 363
decay 10 525
energy levels 10 524 525
quantum electrodynamics 11 150
Post, E L 7 582
Post L von 10 526
Post R F 10 588
Postbranchial body *see* Ultimobranchial bodies
Postcardinal system, changes during development 2 485
Postcardinal veins 2 499
Postcentral gyrus 12 502
Postdeflection acceleration 2 557
Postencephalitic Parkinsonism 9 547
Posterizing printing in color 10 608
Postglacial vegetation and climate 10 525-526
Postganglionic neurons 13 364
Postlabyrinthic placode 9 47
Postnecrotic cirrhosis 7 562
Postprecipitation 10 573
Postulate 10 526*, 13 546
contrasted with hypothesis 6 598
geometry, euclidean 6 154
Postural edema 4 410
Posture, regulation of 10 527-530
body reflexes acting on body 10 529
body-righting reflexes 10 529
decerebrate rigidity 10 527
labyrinthine acceleratory reflexes 10 529
lengthening reaction 10 528
neck-righting reflexes 10 529
placing and hopping reactions 10 529
righting reflexes 10 529
stretch receptor and its control 10 528
stretch reflex regulation 10 528
tonic labyrinthine reflexes 10 529
tonic neck reflexes 10 529
visual righting reflexes 10 529
Postzygapophysis 14 307
Pot galvanizing 8 279
Potable alcoholic beverage 4 253
Potamididae 6 429
Potamogalinae 7 143
Potamogeton 6 394
Potamonidae 4 34
Potamoplankton 5 533
Potamosiren 12 347
Potash alunite 1 298
fertilizer 10 531
potassium fertilizers 5 238, 7 22
Potash salts Permian deposits 10 25
potassium occurrence 10 530
Potash trachybasalt 10 51

Potassium 10 530 532
analytical methods 10 532
availability 10 531
blood chemistry 3 197
chemical properties 10 531
electron configuration 4 504
extractive metallurgy 8 278
handling 10 531
heat generation in earth 4 532
ionization potential 4 504
metallurgical extraction 10 530
occurrence 10 530
physical properties 10 530-531
principal compounds 10 531 532
resistivity 11 497
uses 10 530
Potassium-42 14 8
Potassium-argon age 13 421
Potassium-argon method 11 593
Potassium bromide 5 294 297
Potassium chlorate 5 72
Potassium chloride 5 294-297
luminescence 7 614
optical materials 9 353
Potassium chromate 5 106
Potassium chrome alum 7 597
Potassium cyanate 6 421
Potassium dichromate 5 106
Potassium feldspars 5 207
Potassium fertilizers 5 238
Potassium hexachloroplatinate (IV) 5 334
Potassium iodide 1 482 5 563, 13 11
Potassium mercuric iodide 1 482
Potassium minerals 11 593
Potassium pentachloro ammineplatinate (IV) 5 334
Potassium perchlorate 5 73
Potato harvester 1 130
starch 13 50
virus X 9 210
Potato Irish 10 532 534
characteristics 10 532 533
chemical composition 10 533
diseases 10 534
bacteria 10 534
fungus 10 534
mechanical injury 10 534
nematode 10 534
virus 10 534
harvesting 1 130
use 10 533 534
varieties 10 533
Potato, sweet 10 534 536
breeding 10 535
diseases 10 536
Potato, sweet—*cont*
processing 10 535
true yam 10 536
types 10 534-535
see also Yam
Potato leafhopper 9 603
Potential magnetic field 8 32
zeta-Potential electroosmosis 4 525
Potential, chemical 5 49
Potential, electric 10 536-537*, 538
electrical units 4 461
equipotential surface 10 537
measurement 4 473
on mountain slopes 13 507
superposition 10 537
in thunderstorms 13 617
Potential, electrode *see* Electrode potential
Potential barrier 10 537
nuclear reactions 9 201
semiconductors 12 171
surface 12 69
radioactivity 11 282
Potential difference 10 537
breakdown potential 2 324
capacitance 2 440 441
contact potential difference 3 421
potential electric 10 536
Potential drop 9 277
Potential energy 4 600-601
elastic 4 600
electrical 4 600 601
as function of position 6 341
gravitational 4 600 601, 6 264 265
harmonic motion 6 341
as stored energy 13 565
Potential flow wake of vessels 14 380
Potential flow analyzer *see* Electrolytic tank
Potential temperature (meteorite) 1 632
isentropic surfaces 7 272 273
Potential transformer 7 149 151
Potential well nuclear scattering 12 58
nuclear structure 9 205
Potentials (mathematics) 10 537 539
electricity 10 538
fluid flow 10 538 539
gravitation 10 537 538
heat conduction 10 538
other concepts 10 539
magnetism 10 538
Potentials (physics) 10 539 542
of arbitrary fields 10 541
elastic 10 541
electromagnetic 10 541
fluid 10 540 541
Potentials—*cont*
gravitational 10 540
mass-point mechanics 10 540
plastic 10 541
retarded 10 541 542
thermodynamic 10 541
Potentials, resting *see* Resting potentials
Potentiometer (variable resistor) 10 542 543
arbitrary function generator 1 379 381
construction 10 542-543
multiturn 10 543
noisy 12 310
in servomechanisms 12 201
slide wire 10 542
trimmer 10 543
use 10 542
wire wound 10 542 543
Potentiometer (voltage measurement) 10 543-545
Brooks deflectional 10 543-544
constant-current dc 10 543
constant-resistance dc 10 544
Drysdale ac polar 10 544 545
electrode potential 4 473
quadrature 10 545
Tinsley-Gall ac polar 10 545
Potentiometric titration *see* Titration, potentiometric
Poterion 13 10
Potier reactance drop 1 283
Potier triangle synchronous generator 1 283
Potomac River 9 146, 14 393
Potoo 2 448
Pott's disease 14 129
Potter wasp 6 574, 12 405
Potter's flint 2 648
Potters 10 545 546
Poulsen, Valdemar 14 518
Poultry disease 1 695
Poultry production 10 546 550
baby chick industry 10 547
brooding 10 547
diet 10 547-548
economics 10 550
egg 4 414
egg production 10 548-549
environmental problems 10 549
health 10 549
heredity 10 549
incubation 10 546
marketing 10 549
turkeys, ducks, and geese 10 550
Poultry products 5 414
Pound R V 11 438
Pound 8 188 10 550*
Pound avoirdupois 14 461
Pound Troy 14 461
Pound weight 14 461
Poundal 10 550
Poundal foot 5 429
Pour plate procedures 5 615
Pour point 10 550
Pour point depressants 7 634
de Pourtales, L F 9 256
Pourtalesia 4 573
Pourtalesiidae 6 463
Powder 9 585
Powder metallurgy 10 550 553
beryllium 2 178
cermet 2 655 656
metal forming 8 296 297
sintering 12 341 342
Powder post beetle 2 131, 3 277, 14 538
Powder Schooping 8 221
Powdery mildew 1 574 2 99 13 664
grape 6 252
pea 9 601
Powell, C. F. 8 247
Powell, J. W. 4 102
Powellite 8 562
Power 10 553
acoustic *see* Acoustic power
algebra 1 259
applied to mining 8 489 491
bel 2 159
electric *see* Electric power
electrical units 4 461
exponent 5 155
fusion 5 591 595
horsepower 6 492
nuclear *see* Nuclear power
thermoelectric 13 579 584
waveform, nonsinusoidal 14 437
wind *see* Wind power
Power (optical systems) 9 365
Power, algebra 1 259
Power amplifier 10 555 556
audio 10 555
class A 10 553 554
class AB 10 554
class B 10 554
class C 10 554
magnetic 8 27 29
magnetron 8 71 72
push pull 11 104 105
radio transmitter 10 555
Power cables 5 595
Power cost 10 558 559
Power dissipation 9 277
dielectric 4 114 115
Power factor 10 554*, 561 562
ac circuits 1 275
angle *see* Phase angle
dielectric 4 114 115
insulation 7 155

r factor— *cont*
sinusoidal waveforms
14 437
r factor correction
rochronous condenser
13 369
rs factor meter 10 561 562
see also Phase meter
er generation, electric *see*
lectric power generation
er line *see* Power transmis-
on lines
er loss, dielectric 4 114 115
er measurement electric
e Electric power measure
ment
wer-output meters 4 457
wer plane 14 543 544
wer plant 10 534-559
capacity 10 534 537
capacity in United States
10 536
costs 10 548
efficiency 10 557 559
fuel cost 10 538
gas furnace 6 58
heat balance 10 556
heat rate 10 555
investment 10 558
load 10 537
load factor 10 557
power economy 10 559
prime mover 10 590-592
site 10 535
steam 13 81
thermal performance
10 559
vapor cycle 14 271 274
water power 14 399-400
see also Electric power
generation
Power plant circuits 4 435
Power polygon 2 274
Power saw 14 542 543
Power scoop 14 207
Power series 12 191 192
Power shovel 3 416
excavator 5 135 134
mining, open-cut or pit
3 472-476
strip mining 3 479
Power steering *see* Steering
power
Power supply, electronic
10 559 561
battery 10 561
choke (filter) 5 84
control-grid 10 561
filament 10 560
filters 5 267 271*, 10 560
heater 10 560
high voltage 10 561
plate 10 560 561
rectifier 12 385 386
ripple voltage 10 561
voltage multiplier
14 366 367
Power supply, electronic—*cont*
voltage regulator circuits
14 362 364
Power supply for mines
8 490 491
Power supply, standby 13 155
Power system voltage regulator
14 364 366
Power systems, electric *see*
Electric power systems
Power take-off tractor 14 11
Power transfer 7 37 38
Power transformer 14 24 27
Power transmission lines
14 51 54
Power vibrator 14 321 325
Powered conveyors 5 449
Poynting J H 14 619
Poynting Robertson effect
14 619
Poynting's vector 10 562
Pozzolans 5 565
p p scattering 12 58 59
PPI *see* Plan position
indicator
PPM 11 99
Praeanastides 1 396
Praseodymium 8 278
Praesepe 2 436 6 522
Prairie 3 190 10 562 563*
vegetation distribution
14 290 291
Prairie chicken 6 295
10 563-564*
Prairie dog 10 564* 13 51
Prairie willow 14 495
Prandtl L 1 202 307
5 542, 15 689 14 160
Prandtl hypothesis 5 536
Prandtl number 3 441 442
Prandtl's *one seventh* power
law 10 241
Prandtl Meyer expansion fan
10 564
Prantea 6 225
Prantea form 6 225
Prantea milloti 6 225
Prantl K. 10 298 577
Praseodymium 4 504
10 564 565*
Pratt Hanford isostatic
system 15 519
Pratt truss 14 121
bridge 2 332
Pratylenchus 14 169
Pratylenchus brachyurus
9 604
Präusnitz Küstner reaction
1 257
Prawn 4 24 12 308
Praying mantis 9 416
Preacher bird 14 529
Preadaptation 8 12
Pre Alps 13 408
Preamplifier 10 565
Precambrian 6 136-137,
10 565-567
Precambrian—*cont*
Archeozoic 3 515 516
atmosphere 1 631
basement rock 2 107
flora 9 503
life in seas 9 522
mountain areas 10 567
occurrence of rocks 10 565
Proterozoic 11 44
shield areas 10 566
time scale 6 136-137
Precardinal veins changes
during development 2 435
Precast concrete 10 567 569
floor 10 569
lift slab method 10 568
roof 10 569
tilt up construction
10 568
Youtz Slick method
10 568
Precentral gyrus 8 612 613
Precession 10 568 570
airplane maneuvers 10 570
electron orbits 1 654
gyroscope 6 508
gyroscope motion 10 570
Larmor 7 405
motion of a spinning top
10 568 569
nutation 9 232 234
10 569
satellite orbits 12 35
Precession of equinoxes
10 570-571
effects 10 571
nutation 9 234
physical causes 10 571
planetary precession
10 571
Precious metal gem mounting
6 105
gold 6 230
palladium 9 525 524
platinum 10 410 412
silver 12 529 531
Precious stones 10 571
Precipitate 8 295
Precipitation (chemistry)
10 571 573
gravimetric analysis
6 262
hydrometallurgy 6 559 560
impurities 10 572 573
Liesegang rings 7 495 496
methods for reducing co-
precipitation 10 573
nucleation 9 208
pyrometallurgy non-
ferrous 11 123
separation (chemical and
physical) 12 185
solubility product constant
10 572 12 494
supersaturation 13 306
titration 13 656
Precipitation (meteorology)
10 573 575
Asia 1 542 545
atmospheric electricity
1 636
average fluctuations
9 170
basic types 6 561
cloud physics 5 214 218
condensation 10 575
deposition 13 317 319
drought 4 275
fog 5 567
frontal zone 5 539
frozen types 10 573
geographical distribution
10 575
hail 6 317
hydrometeorology
6 560 562
intense local 6 561
liquid types 10 573
mean annual 3 179 180
measurement 10 575 576
mechanisms of release
5 215
monsoon 8 545
Newfoundland 1 524
prediction 14 451
radar detection 8 520
rain-cloud systems 3 215
rain shadow area 11 551
snow 12 531
water conservation
14 392 395
weather conditions 10 575
see also Rainfall
Precipitation (mineral)
10 42
Precipitation gages 10 576
Precipitation hardening treat
ment 6 379
Precipitator, electrostatic *see*
Electrostatic precipitator
Precipitin 10 576 577
Precipitin reaction antigen
antibody 1 473
gamma globulin 6 54
Precipitin test 5 201 10 577*
Precision approach radar
(PAR) 10 577 578
Precision balance 14 461 462
Precision casting 2 543
Precognition 5 149
Predaceous diving beetle 3 2
Predation 4 586-587
environment 5 12 15
Predetermined element time
14 555 556
Prediction weather *see*
Weather (forecasting and
prediction)
Preen gland 12 61
Preferred orientation *in ex-*
perimentally deformed
rocks 11 598

Potassium 10 530 532
analytical methods 10 532
availability 10 531
blood chemistry 3 197
chemical properties 10 531
electron configuration 4 504
extractive metallurgy 8 278
handling 10 531
heat generation in earth 4 532
ionization potential 4 504
metallurgical extraction 10 530
occurrence 10 530
physical properties 10 530-531
principal compounds 10 531-532
resistivity 11 497
uses 10 530
Potassium-42 14 8
Potassium-argon age 13 421
Potassium argon method 11 595
Potassium bromide 3 294 297
Potassium chlorate 3 72
Potassium chloride 3 294-297
luminescence 7 614
optical materials 9 353
Potassium chromate 3 106
Potassium chrome alum 7 597
Potassium cyanate 6 421
Potassium dichromate 3 106
Potassium feldspars 5 207
Potassium fertilizers 5 238
Potassium hexachloroplatinate (IV) 3 334
Potassium iodide 1 482, 5 563, 13 11
Potassium mercuric iodide 1 482
Potassium minerals 11 593
Potassium pentachloro ammineplatinate (IV) 3 334
Potassium perchlorate 3 73
Potato harvester 1 130
starch 13 50
virus X 9 210
Potato, Irish 10 532 534
characteristics 10 532 533
chemical composition 10 533
diseases 10 534
bacteria 10 534
fungus 10 534
mechanical injury 10 534
nematode 10 534
virus 10 534
harvesting 1 130
use 10 533 534
varieties 10 533
Potato sweet 10 534 536
breeding 10 535
diseases 10 536
Potato, sweet—*cont*
processing 10 535
true yam 10 536
types 10 534 535
see also Yam
Potato leafhopper 9 603
Potential magnetic field 8 32
zeta-Potential electroosmosis 4 525
Potential, chemical 5 49
Potential, electric 10 536-537*, 538
electrical units 4 461
equipotential surface 10 537
measurement 4 473
on mountain slopes 13 507
superposition 10 537
in thunderstorms 13 617
Potential electrode *see* Electrode potential
Potential barrier 10 537
nuclear reactions 9 201
semiconductors 12 171
surface 12 69
radioactivity 11 282
Potential difference 10 537
breakdown potential 2 324
capacitance 2 440 441
contact potential difference 3 421
potential electric 10 536
Potential drop 9 277
Potential energy 4 600 601
elastic 4 600
electrical 4 600 601
as function of position 6 341
gravitational 4 600 601
6 264 265
harmonic motion 6 341
as stored energy 13 565
Potential flow wake of vessels 14 580
Potential flow analyzer *see* Electrolytic tank
Potential temperature (meteorite) 1 632
isentropic surfaces 7 272 273
Potential transformer 7 149 151
Potential well nuclear scattering 12 58
nuclear structure 9 205
Potentials (mathematics) 10 537 539
electricity 10 538
fluid flow 10 538 539
gravitation 10 537 538
heat conduction 10 538
other concepts 10 539
magnetism 10 538
Potentials (physics) 10 539 542
of arbitrary fields 10 541
elastic 10 541
electromagnetic 10 541
fluid 10 540 541
Potentials—*cont.*
gravitational 10 540
mass-point mechanics 10 540
plastic 10 541
retarded 10 541-542
thermodynamic 10 541
Potentials, resting *see* Resting potentials
Potentiometer (variable resistor) 10 542-545
arbitrary function generator 1 379-381
construction 10 542-545
multiturn 10 543
noisy 12 310
in servomechanisms 12 201
slide-wire 10 542
trimmer 10 543
use 10 542
wire wound 10 542 543
Potentiometer (voltage measurement) 10 543 545
Brooks deflectional 10 543-544
constant current dc 10 543
constant-resistance dc 10 544
Drysdale ac polar 10 544-545
electrode potential 4 475
quadrature 10 545
Tinsley Gall ac polar 10 545
Potentiometric titration *see* Titration, potentiometric
Poterion 13 10
Potter reactance drop 1 283
Potter triangle synchronous generator 1 283
Potomac River 9 146, 14 393
Potoo 2 448
Pott s disease 14 129
Potter wasp 6 574, 12 405
Potter's flint 2 648
Potterv 10 545 546
Poulsen, Valdemar 14 518
Poultry disease 1 695
Poultry production 10 546 550
baby chick industry 10 547
brooding 10 547
diet 10 547 548
economics 10 550
egg 4 414
egg production 10 548 549
environmental problems 10 549
health 10 549
heredity 10 549
incubation 10 546
marketing 10 549
turkeys ducks, and geese 10 550
Poultry products 5 414
Pound R \ 11 439
Pound 8 188 10 550*
Pound avoirdupois 14 461
Pound Troy 14 461
Pound weight 14 461
Poundal 10 550
Poundal foot 5 429
Pour plate procedures 3 613
Pour point 10 550
Pour point depressants 2 672
de Pourtales, L. F. 9 286
Pourtalesia 4 373
Pourtalesidae 6 463
Powder 9 585
Powder metallurgy 10 550 553
beryllium 2 178
cermet 2 655 656
metal forming 8 286 287
sintering 12 341 342
Powder post beetle 2 131 3 277, 14 538
Powder Schooping 8 281
Powdery mildew 1 574 2 99 13 664
grape 6 252
pea 9 601
Powell, C. F 8 247
Powell, J W 4 102
Powellite 8 562
Power 10 553
acoustic *see* Acoustic power
algebra 1 259
applied to mining 8 489 491
bel 2 159
electric *see* Electric power
electrical units 4 461
exponent 5 155
fusion 5 591 595
horsepower 6 492
nuclear *see* Nuclear power
thermoelectric 13 579 584
waveform, nonsinusoidal 14 437
wind *see* Wind power
Power (optical systems) 9 363
Power, algebra 1 259
Power amplifier 10 553 554
audio 10 553
class A 10 553 554
class AB 10 554
class B 10 554
class C 10 554
magnetic 8 27 29
magnetron 8 71 72
push pull 11 104 105
radio transmitter 10 553
Power cables 5 595
Power cost 10 554 559
Power dissipation 9 277
dielectric 4 114 115
Power factor 10 554*, 561 562
ac circuits 1 275
angle *see* Phase angle
dielectrics 4 114 115
ation 7 155

Prime mover—*cont*
reaction turbine 11 549
steam engine 13 78 80
steam turbine 13 85 89
turbine 14 147 148
types 10 591
Prime numbers 9 224
Prime vertical (astronomy) 1 607
Primer (paint) 9 493
ner (explosive) 10 592
blasting 2 255
detonator 4 84
mer (surface coating) 0 592 593
metal coatings 8 283
meval cloud 4 546
mirovalline 9 504
ming wood finishing 14 532
mitive crane fly 4 212
mitive gut 10 593
mitive man *see* Fossil man
mitive oceans 7 497-498
mmo 6 586
'rimordial lead 4 231
'rimula kewensis 10 489
'rimulales 10 546, 593*
'rimuline 4 303
Primuline dye base 13 600
Prince of Wales Island 1 523
Prince of Wales Strait 9 166
Principal axes of inertia 8 566
Principe Island 1 106
Principle axis theorem 11 574
Principle of priority 14 625
Principal *print* 11 184
Prins reaction formaldehyde 5 473
hydroxylation reaction 6 571
Print *through* (magnetic recording) 8 41
Printed circuit 8 470, 10 593 597*
advantages 10 594
breadboarding 2 323
capacitance components 10 596
embossing 10 597
etching 10 594
film deposition processes 10 594 597
material removal processes 10 594
miniaturization of equipment 8 470
mold and die processes 10 597
plating process 10 596 597
photoetching 10 594
resistance components 10 596
screening method 10 596
stamping 10 597
stencil etching 10 594
Printer's stick 3 344
Printing 10 597 605
book manufacture 2 286 288
collotype 10 603
color *see* Printing in color
composition (type) 3 344-348
ink 7 112 114
intaglio 10 603
letterpress 10 598 600
photocopying processes 10 145-148
photogelatin printing 10 603
photography 10 166
planographic 10 600 603
printing plate 10 609 617
printing press 10 618 622
relief 10 598 600
screen 10 605
stencil processes 10 605
type 14 169 172
see also entries under specific names such as Letterpress printing
Printing in color 10 605 609
added color plates 10 607
angled prints 10 607
black printer 10 606
blow ups 10 608
color plates 10 612
color-correction masks 10 607
conversions 10 608
deficiencies of pigments 10 607
electronic scanning 10 607
fake color work 10 608
flat color work 10 608
fluorescence process 10 609
posterizing 10 608
screen angle 10 606 607
screened positives 10 606
separation negatives 10 606
short run three-color system 10 607 608
split fountain 10 609
two plate halftones 10 608
Printing inks 7 112-113
Printing plate 10 609 617
Benday 10 610 611
book manufacture 2 287
color 10 612 613
copperplate engraving 10 610
duplicate 10 614
electronic engravers 10 613 614
engraving 10 610
halftone 10 611 612
intaglio 10 617
line engravings 10 610
offset printing 10 615 616
planographic 10 614 617
printing in color 10 606
printing press 10 618 619
steel engraving 10 610
Printing plate—*cont*
type (printing) 14 169 172
wood engravings 10 609 610
Printing press 10 598 600, 618 622*
book manufacture 2 287
intaglio process 10 622
letterpress 10 619
offset 10 601
printing plates 10 618 619
relief (letterpress) 10 619 621
rotogravure 10 622
Printing ink vehicles 7 113
Prionotidae 3 406
Prionolobus rosenkrantzi zone 14 82
Prionoxystus robiniae 7 466
Prism 10 622 623
in periscope 10 18
see also Polyhedron
Prism, optical 10 623 624
Amici (roof) prism 8 507 508
diopter 4 205
dispersing prism 10 623
dispersion by 1 15
Dove (Delaborne) prism 8 508
Littrow 12 590
mirror optics 8 507 509
Pechan prism 8 508
Penta prism 8 508
Porro prism 8 508
power 4 205
rangefinder 11 338 340
reflecting prisms 8 507-509, 10 623
refraction of light by 11 406
resolving power 11 500
rhomboid prism 8 508
spectroscope 12 589 590
zoom lens 10 624
Prism diopter 4 205
Prism spectograph 12 590
Prism transit 1 610
Prismatic astrolabe *see* Astrolabe prismatic
Prismatic coefficient 12 269
Prismatic photocopier 10 145
Prismatoid and prismoid 10 624
prism 10 622 623
pyramid and frustum 11 107
see also Polyhedron
Prismoid 10 624
Prismoidal formula 12 608
Pritchard H O 4 520
Pritzel G A 10 377
Privacy systems (scrambling) 10 624
radio communications 10 624
television 13 458
Private branch exchange, telephone *see* Telephone private branch exchange (PBX)
Priset 9 408
Proaccelerin 2 266, 3 195
Probability 10 624 630
Boltzmann statistics 2 280
conditional 10 626 627
dependent trials 10 628
distribution 4 257
events 10 625
expectations 10 629 630
finite spaces 10 625 626
independence 10 626 627
independent trials 10 627 628
infinite spaces 10 626
large numbers laws of 10 630
Markov chains 10 628
notation 8 174
nuclear fission 5 288 289
quantum theory, nonrelativistic 11 163 164, 171-172
random noise 9 118
random variables and their distributions 10 628 629
reliability studies 11 413
sample space 10 625
statistics 13 66 75
stochastic process 13 141 144
Probability density (statistics) 13 67
Probability in physics 10 630 633
approximations 10 631 633
Bernoulli's problem 10 630 631
ensembles 10 633
Gauss error law 10 632
Gibbs theory 10 633
kinds of errors 10 632
phase space 10 633
in statistical mechanics 10 632 633
theory of errors 10 632
Probability point function 8 587
Probability in statistical mechanics 10 632 633
Probability theory 6 115
communications systems 5 320
Probable error 1 651
see also Error
Proband 6 500
Probit transformation 2 232
Problem solving (psychology) 10 633-636
behavior ontogeny of 2 146
concept formation 10 634 635
group problem solving 10 635
heuristics 10 635 636

Preferred orientation—*cont*
in metamorphic rocks 8 296 297
petrology 10 48 49, 54
rock fabric studies 13 205
in schists 12 63
in sedimentary rocks 12 151
in shales 12 241
Preemergence treatment (soil) 12 465
Preformation embryology 4 574
Preformist instinctive behavior 7 147
Pregnancy 10 578 579*, 13 153, 599
ectopic 10 579
maternal changes 10 578
multiple 10 579
reproductive behavior 11 459-460
termination of 10 579
test 5 538, 11 478
toxemias of 14 4 5
Pregnane *see* Adrenal gland
Pregnane 3 (alpha), 20 (alpha)-diol *see* Pregnanediol
Pregnanediol 9 454, 10 645
Pregnenolone 1 71
Preharvest desiccation 4 43
Preheater, air 4 405-404
Prehistoric man *see* Fossil man
Prehnite 5 77, 10 579-580*
Prelabyrinthic placode 9 47
Preloaded spring 12 292 293
Premise 7 578
Premixed flame 5 292
Premolar 4 65 66
Premunition 7 34
Prenj Planina 5 118
Prenova 9 172 173
Prepakt process 5 365
Prephenic acid 2 57, 10 114, 14 176
Prepuce 9 621 11 472
Preputial gland 12 61
Prerecorded magnetic tapes 8 41
Presbyopia 5 171-172
Presence (sound reproduction) 12 520
Preservation archeological chemistry 1 512 513
biological specimens 8 405
of wood *see* Wood preservation
Preservative (food) 5 578
Prespa, Lake 5 116
Press, hydraulic *see* Hydraulic press
Press camera 2 429 430
Press Ewing vertical seismometer 12 148
Press fit 10 580
allowance, mechanical 1 258
Press forging 5 471
Press forming 12 250
Pressing (ceramics) 2 648
Pressure 10 580
atmospheric *see* Air Pressure
and cavitation 2 572 575
earth interior 4 339 340
gas: interior ballistics 2 82 84
high-pressure physics 6 446-447
hydrostatic *see* Hydrostatics
kinetic theory 7 352
sound *see* Sound pressure
Pressure altimeter *see* Altimeter, pressure
Pressure-change detector 12 483
Pressure control, automatic 10 580
process control 10 637
transducers *10 585 584*
Pressure electricity *see* Piezoelectric crystal
Pressure gages 10 581
closed tanks 7 491
gas purge systems 7 490-491
liquid level measurement 7 489
open tanks 7 490 491
trapped gas system 7 490 491
Pressure gradient microphone 8 362 363
Pressure measurement 10 581 582
atmospheric 1 155 158*, 8 440-441, 10 581
barometer 2 102, 10 581
bellows element gage 10 582
bell type gage 10 581 582
Bourdon spring gage 2 511 513
Bourdon tube 10 582
diaphragm element gage 10 582
electrical transducers 10 582
expansible metallic element gage 10 582
gage pressure 10 581
liquid column gage 10 581
manometer 8 92 93, 10 581
measurement standards 10 582
strain gage 15 167
transducer 10 585 584
see also Vacuum measurement
Pressure medium 2 466
Pressure microphone 8 359
Pressure piping 13 640
Pressure regulating valve 10 580
Pressure seal *see* Seal, pressure
Pressure-sensitive wire 10 583
Pressure spectrum level 12 518
Pressure standards 10 582
Pressure temperature effect (biological cell) *see* Cell (pressure-temperature effect)
Pressure transducer 10 583-584
capacitive 10 584
carbon pile 10 583
crystal 10 584
differential transformer 10 584
inductive type 10 584
magnetic 10 583 584
pressure-sensitive wire 10 583
reluctance type 10 583 584
resistive 10 583
solion 12 483
strain gage 10 585, 15 167
Pressure vessel 10 584 585
cold seal 13 248
construction 10 584-585
design 10 585
internally heated 13 248
thick-walled 10 585
thin walled 10 585
Tuttle 13 248
Pressure volume (*PV*) card 7 197
Pressurization of tunnels 14 145
Pressurized water reactor 11 352
ship propulsion 11 365
Prestressed concrete 10 585 587
basic principles 10 585-587
circular prestress 10 587
continuous beams 10 586
creep 5 541, 10 586
plastic flow 10 586
posttensioning 10 586 587
pretensioning 10 586 587
stresses 10 585 586
tendons 10 586
Prevailing westerlies 14 495
Prévost reaction 6 571
Prezygapophysis 14 307
prf *see* Pulse repetition frequency
Priacodon 14 89
Priamus (asteroid) 14 114
Priamus monkey 8 572
Priapulida 2 425 429
Priapuloidea 1 413, 420, 10 587*
Priapulus bicaudatus 10 587
Priapulus caudatus 10 587
Priapulus horridus 10 587
Priapulus tuberculato-spinosus 10 587
Price current meter 13 172
Prickly pear 3 190
Priestley, J 1 637, 4 462, 9 471
Prilling 10 587
Primacord 5 152, 579
Primaquine 6 511, 8 77
Primary amine 1 305
Primary atypical pneumonia 1 466-467
fluorescent antibody study 8 393
Primary battery 10 587 589
aqueous-electrolyte 10 587 588
fused electrolyte 10 589
ion-exchange membrane 10 588
mercury battery 8 253 254
solid electrolyte 10 588
wavy electrolyte 10 588 589
zinc silver cell 10 588
see also Dry cell; Wet cell
Primary *cadmium standard* wavelength 14 441
Primary cosmic rays *see* Cosmic rays
Primary creep *see* Creep of materials
Primary feeders 4 423
Primary gneiss 6 226
Primary lead 4 351, 7 427
Primary magma 8 17 18*, 10 85
Primary minerals 8 444
Primary nondisjunction 3 315
Primary pit field 2 613
Primary rainbow 11 331
Primary selective feeders 14 520
Primary substation *see* Electric power substation
Primary water 6 277
Primary wave (seismic) 12 151 152
Primates 1 416 8 82 10 589*
baboon 2 1
chimpanzee 5 62
fossil 10 589 590
gorilla 6 254 259
monkey 8 572
orangutan 9 370
Primates (fossil) 10 589 590
Prime meridian 9 457
Prime mover 10 590 592
acceleration 10 591 592
displacement 10 591
engine 4 603 604
governor 6 259 263
impulse turbine 7 49
internal combustion engine 7 196 209
performance criteria 10 591

opane 1 245, 249, 11 6*
cryogenic properties 5 572
fuel gas 5 552
liquefied petroleum gas (LPG) 7 540
opane air 5 556
opane bubble chamber *see* bubble chamber
opanediol 14 16
) Propanediol 1 52
ropanol 11 6
ropazine 6 423
ropellant 11 6-10
chemical fuel 3 30
explosion and explosive 5 152 153
liquid 11 6 8
metal base fuel 8 290 292
oxygen 9 473
powder 1 539
rocket engine 11 601
solid 11 8 10
specific impulse 12 577 578
opeller air 11 10 12
axial momentum 11 12
construction 11 11
controllable pitch 11 10
design 11 11
efficiency 11 12
factors affecting efficiency 11 11
feathering 11 10
fixed pitch 11 10
for gas turbines 11 11
governor 6 239
materials 11 11
noise 1 182 185 11 12
pitch control mechanisms 11 10 11
profile drag 11 12
reversible pitch 11 10
rotational momentum loss 11 12
tip vortex loss 11 12
types 11 10
Propeller marine 11 12 15
cavitation 2 572 576, 11 14
controllable pitch 11 14
cycloidal 11 14 15
fluid mixing processes 8 332
geometry 11 12 13
marine engine 8 111
marine machinery 8 116
model tests 11 12
number of blades 11 14
number of propellers 11 13 14
supercavitating 2 575 576
theory 11 12
vibrations 11 14
Propeller anemometer 1 403
air velocity measurement 1 221
Propeller noise (aircraft) *see* Aircraft noise
Propeller wake 14 382
Propene 1 245
cryogenic properties 5 572
Proper motion (stars) 13 47
Proper space time interval 12 557
Properdin 3 533, 11 15*
immunity 7 55 55
Property lines (surveying) 13 329
Prophage 2 9
Prophase 8 108
mitosis 8 521
beta Propiolactone 1 463, 475, 7 380
Propionamide 1 303
Propionate 5 74
Propionibacteriaceae 5 96, 11 15-16*
Butyribacterium 11 16
Propionibacterium 11 15
Zymobacterium 11 16
Propionibacterium 2 42 3 497 11 15
Propionibacterium freudenreichii 14 342
Propionibacterium shermanii 3 14
Propionic acid 2 474 5 66 11 16
fermentation 2 42
food preservation 5 426
Propionyl chloride 1 43
Propionyl CoA 7 277, 13 613
Propjet 14 149
Propliopithecus 10 500
Propodite 3 564
Propodus 3 564
Proportion (algebra) 1 241
Proportional controller 3 432
Proportional limit 13 185
Proposition 13 546
logic 7 578
Propositional calculus 7 579 580
Propositus 6 500
Proprioceptive sense 9 55
Proprioceptor biological equilibrium 3 47-49
sensation 12 177
Propionibacteriaceae 2 11
Propulsion 11 16 18
aircraft *see* Aircraft propulsion
aircraft engine 1 157
aircraft engine performance 1 171 177
aircraft fuel 1 177 179
aircraft turbine 14 148-152
chemical rocket 7 210
comparison of specific impulses 4 490
electrical 7 211
electromagnetic *see* Electromagnetic propulsion
engines 4 603 604
helicopter 6 384
hydroduct 1 486
Propulsion—cont
interplanetary *see* Interplanetary propulsors
Ion 7 211, 243 247*
jet *see* Jet propulsion
lift 11 17
magnetoplasma 7 211
momentum theory 11 16
nuclear 7 210 211, 12 265
nuclear aircraft *see* Nuclear aircraft propulsion
nuclear rocket 9 201
photon 7 212
power and efficiency 11 17
propellant 11 6 10
pulse jet 11 94 95
ramjet 11 335 336
rocket 11 600
rocket engine 11 601 611
rocket sled 11 614
rocket staging 11 611 612
ships 12 276 294
specific fuel consumption 11 18
specific impulse 11 18
solar engine 12 468 470
space technology 12 544
spacecraft structure 12 548
thrust 11 17
turbine *see* Turbine propulsion
turbofan 14 154 155
turbojet 14 155 157
turboprop 14 157 158
turboram jet 14 158 160
Propyl alcohol 11 6
Propyl gallate 5 185
n-Propyl radical 1 252
Propylene 11 18* 14 207 209
glycerol production 6 221
petrochemical 10 46
polyacrylonitrile resin 10 459
polyolefin resins 10 486
Propylene chloride 5 75
Propylene chlorohydrin 11 18
Propylene dichloride 5 561
Propylene glycol 1 475 5 75
petrochemical 10 46
1 2 Propylene glycol 6 223
Propylene oxide 10 46 470
2 n-Propyl 4 *methyl*pyrimidyl (6) dimethylcarbamate 7 142
6 Propylthiouracil 11 114
Propyltrichlorosilane 12 522 525
Prorastomus 12 547
Prorhynchidae 1 258
Propyne 1 245 255
Prorodon 6 500 467
Prosobranchia 8 559 11 18 19*
Prosoma 1 557 12 79
Prosopis 5 190
Prosopyle 10 514
Pro-SPCA 2 266
Prospecting, mineral 11 19 24
air borne magnetic survey 11 21 22
air borne radioactivity surveys 11 24
botanical methods 6 117 118 11 24
dip needle survey 11 22
direct methods 11 20 21
electrical methods 11 22
electrical resistivity surveys 11 22 23
electromagnetic surveys 11 22 23
float tracing 11 21
geochemical methods 6 115 118, 11 24
gravity methods 11 23
ground magnetic survey 11 21 22
ground radioactivity methods 11 25
indirect methods 11 21 24
local ore guides 11 20
magnetic declination survey 11 22
magnetic methods 11 21 22
ore guides 11 20
panning work 11 21
potentiometer traverses 11 25
radioactivity methods 11 23 24
regional ore guides 11 20
sampling 11 21
seismic methods 11 25, 12 156-157
self-potential surveys 11 25
testing 11 21
thermal methods 11 25
Prospecting, petroleum 11 24 27
ancient deltaic sediments 4 50
base maps 11 25
core drilling 11 25
drilling 11 25
Foraminifera fossils 5 435
geological laboratory methods 11 26
geological prospecting 11 25 26
geophysical prospecting 11 26 27
gravity surveys 11 27
lithofacies maps 5 175
magnetic surveys 11 26
photogeology 11 25
regional geology 11 26
seismic apparatus 12 148
seismic surveys 11 27
structure drilling 11 25
subsurface geology 11 26
surface geology 11 25
wildcat wells 11 25
Prosseria grandis 11 62

Problem solving (psychology)—*cont*
individual differences 10 635
Problem time 4 124
Proboscidea 8 82, 10 636*, 11 128
elephant 4 557
Proboscidea fossils 10 636 637
Proboscis 7 459
Probstmayria 9 475
Probstmayria *vivipara* 9 476
Procambium 13 114, 116
Procaryanina 9 496
Procaryota 10 320
Procavidae 6 598
Procellariidae 10 637
Procellariiformes 1 694; 10 637*
Albatross 1 222
Procellonidae 12 532
Procephalothrix 9 496
Procercoid larva 11 67
Process cheese 3 15-16
Process control 10 637 638
automatic pressure control 10 580
automation 1 679
chemical *see* Chemical process control
food engineering 5 382
temperature control, automatic 15 488
Process engineering *see* Chemical engineering
Process furnaces 5 576 577
Process ink 7 133
Process specifications 10 642
Proclus 6 154
Procoela 4 208, 10 638 639*
Procoelous vertebra 12 354
Diplasiocoela 4 208 209
Proconsul 10 590
Proconsortin 2 266, 3 195
Procoryphodon 9 537
Procotyla 7 633
Procryptus 15 26
Proctiger 3 275 288
Proctodeum 5 275 298, 4 150-175
Proctotrupidae 6 574
Procyon 10 639*, 13 41
Procyon lotor 11 198
Procyonidae 2 523, 9 536
Prodajus bilobatus 5 33
Prodigiosin 1 476
Prodinoceratidae 4 196
Prodryas persephone 7 138
Producer: community 3 324-325
ecology 4 590
Producer gas 5 552, 555
Product (mathematics) 1 238
Product design 10 639
Product of inertia 10 639 640
Product modulator 1 553
Product moment correlation 15 74
Product specifications 10 642
Productidae 10 27
Production, mass *see* Mass production
Production control 10 644
Production design 10 642
Production engineering 10 640 642
assembly methods 1 594
automation 1 676 679, 10 641
coordination of man and machine 10 641
initial phase 10 640
mass production 8 163 164
materials handling machines 8 171
over all production 10 640 641
pilot plant 10 229 230
pilot production 10 229 230
planning 10 640
plant facilities 10 322-323
position in organization 10 640
product design 10 639
purpose 10 640
quality control 11 138-142
Production equipment 10 645
Production lines 10 323
Production methods 10 642 644
accessories 10 643
assembly 1 594
design 10 642
equipment obsolescence 10 643
machining operations 8 6 9
processes 10 642 644
selection of equipment 10 643 644
specifications 10 642
standard materials 10 642 643
supporting services 10 644
tools 10 645
Production planning 10 644
Gantt chart 6 39
use of simulators 12 540
Productivity, biological 2 215 216
ecosystem 4 407
Productivity index (petroleum reservoir) 9 285
Productus giganteus 2 515
Proestrus 5 79
reproductive system 11 476
Profile, soil 12 414
Profilometer 4 552
Profundal zone 3 325 327
limnology 7 519
Proganosauria 8 251
Progesterone 1 398, 4 236, 5 79; 6 235; 10 644-645*; 13 138
adrenal cortex steroid 1 71
in biosynthesis 1 78
endocrine mechanisms 4 592
gonad 6 235
ovary 9 453
reproductive behavior 11 461
reproductive system 11 474, 475, 477
sterol 13 139
Proglyphodont fang 13 27
Prognathism 1 461
Progne 8 156
Progne chalybea 8 156
Progne subis 8 156
Program control (automation) 1 679
Programming, digital computer *see* Digital computer programming
Progression (mathematics) 10 646 647
arithmetic 10 646
geometric 10 646
harmonic 10 646
series 12 189
sum sequence 10 646
Progressive line 1 594
Prohungarites similis zone 14 82
Proichthydium 6 77
Project Manhigh 12 541
Project Mercury 12 540
Projectile exterior ballistics 2 78 82
interior ballistics 2 82 84
nutation 9 235
tests 2 76 78
translational motion of 11 572
Projection microradiography 8 565 566
Projection planes 4 70
Projection printer (photographs) 10 166
Projection systems, optical 11 2 5
cinematography 5 124 129
condensers 11 2
lantern slides 4 599
lenses 11 2
light sources 11 1 2
object holders 11 2
screens 11 2 5
Projection thermography *see* Thermography
Projection welding 11 495
Projection x ray microscope 8 402
Projective geometry 3 400 11 5*
conic section 3 400
Projective group 6 156
Projective space 6 133
Projector (light) 7 27 11 3 4*
arc lamp 1 503
cinematograph 5 124 125
ellipsoidal reflector 11 3
floodlight 11 4
lens 11 4
light beacons 11 4
paraboloidal reflector 11 3
searchlights 11 4
spotlight 11 4
Projector (planetarium) 10 271 273
Prokoenenia 1 496
Prolactin 4 592, 6 450
reproductive behavior 11 461, 471, 478
Prolamine 11 4, 39
Prolate spheroid 4 561, 12 611
Prolimacodes badia 7 468
Proline 2 46, 7 164 11 3*, 150
amino acids 1 309 319
in histone 9 217
plant metabolism 10 317
in protamines 9 217
tyrotrecin 14 177
Promeristem 8 238
Prometaphase 8 521
Promethium 11 5
electron configuration 4 504
Promitolepora 12 603
Promlin 13 255
Prominences, solar 13 274 294
Prominents 7 464
Promoter (catalytic) 2 545
Prompt neutrons 5 290
Pronoemenia 1 490
Pronephric tubules 14 221
Pronephroms 14 227
Pronephros 7 341, 14 226, 228
urinary system 14 222
Pronghorn antelope 3 445 567
Pronunciation (phonetics) 10 121
Prony brake 4 514, 13 5 6*
Proof (alcohol) 4 254
Proof gold 6 230
Proof press 10 620
Prop root 8 90
Propadiene 14 207 209
1,2 Propadiene 1 245
Propagation constant 14 49
Propagation of sound in atmosphere 12 515 517
in gases 12 513 516
in liquids 12 516 518
in sea water 12 107
in solids 12 513 516
Propagule 10 498
Propaliticidae 5 275

Proton synchrotron 9 573, 578-579
Proton transfer 1 41
Protonymphon larva 11 105
Protoopalina 11 56
Protoparce quinquemaculata 8 600
Protopathic pain 9 564
Protopectin 9 608
Protophyta 11 47
  Microtatobiotes 8 403
  Schizomycetes 12 65
  Schizophyceae 12 67
Protoplanets atmosphere, geochemistry of 1 631
  cosmogony 3 507
Protoplasm 2 589, 11 47 50*
  cell organization 2 609
  of marine organisms 12 109
  mechanical properties 11 49
  method of viscosity measurement 11 48
  physical properties 11 47 48
  plant, mineral nutrition of 10 278
  protoplasmic cohesion 11 48 49
  protoplasmic similarity of organisms 11 48
  tension at the cell surface 11 49 50
Protoplasmic selectivity 6 420
Protoplast, cell *see* Cell protoplast
Protopodite 3 564
Protoporphyrin chlorophyll 5 79
  porphyrin 10 520 521
Protopsis 11 55
Protopteridium 9 504
Protopterus 4 211, 6 437, 7 622, 9 531, 13 337
Protopterus annectens 4 210
Protosaur 11 484
Protorosauria 5 124 11 50 51*, 484
Protoscolex bathori 3 431
Protaselene 3 394
Protostrea 12 347
Protospondyli *see* Semionotiformes
Protospongia 11 45-46
Protostar atmosphere geochemistry of 1 631
  cosmogony 3 506
Protostele 7 624 13 116
  Filicales 5 260 264
  stele 13 105 106
Protostroma 4 413
Protosuchia 3 553
Protosuchus 3 553, 11 484
Protosun 1 631
Protozoites 9 54
Prototheria 1 415 8 82, 11 51*
  Monotremata 8 82, 11 51
  Monotremata fossils 8 584
Prototropy *see* Tautomerism
Prototype (equipment) 11 51
Protoxylem 14 591
Protozoa 2 604, 11 47, 51 60*
  amino acids 11 57
  animal evolution 1 411
  animal kingdom 1 420
  chromatophores 11 56
  cilia and myonemes 11 55
  Ciliophora 3 120 122, 11 52
  colonies and aggregates 11 53
  contractile vacuole 11 56 57
  excretion 5 138
  flagella 11 55
  food reserves 11 56
  holozoic nutrition 11 57
  inclusions 11 56 57
  life cycles 11 58
  locomotor organelles 11 54 55
  Mastigophora 8 168 170, 11 52
  microbiology 8 348
  mitochondria 11 56
  morphology 11 53 57
  nutrition 11 57 58
  nutritional requirements 11 57
  parasitic species 11 60
  pathogen 9 593
  Plasmodroma 10 597
  regeneration 11 418
  reproduction 11 58 60
  Sarcodina 11 52 12 27 29
  sexual reproduction 11 58 60
  soil microbiology 12 459
  soil microorganisms 12 462
  Sporozoa 11 52, 13 11
  trichocyst 11 55 56
Protozoea 4 28
Protozoology 11 60
Protrachyceras archelaus zone 14 82
Protrachyceras reitzi zone 14 82
Protractor 1 404, 11 60*
Protremata 1 566 11 60 61*
  Articulata (Brachiopoda) 1 566
Protura 1 495 565, 7 134, 11 61*
Proudman, J. 13 638
Proustite 11 61*, 12 329
Provasoli, L. 1 698
Provenance (sedimentary petrology) 12 140-142
Provence, Alps of 5 117
Proventriculus 4 152 13 149
  Coleoptera 5 275 288
  digestive system 4 158
  feeding mechanisms and digestion 5 200 206
Provinces (oil and gas) 10 61
Provinces (petrographic) *see* Petrographic province
Province (physiographic) *see* Physiographic provinces
Province (petrologic) *see* Petrologic province
Provirus 4 208
Provitamin 2 528
Proxima Centauri 1 267
Proximate analysis 1 392, 11 143
Proximity fuze 1 288, 536, 540
Prozone phenomenon 1 111
Prunus 3 495, 7 437
Prunus americana 10 419
Prunus amygdalus 1 265, 495
  almond 1 265
Prunus armeniaca 1 494, 5 545
Prunus avium 3 55 56 5 545
Prunus besseyi 3 55
Prunus cerasifera 10 419
Prunus cerasus 3 55, 5 545
Prunus domestica 5 545, 10 419
Prunus hortulana 10 419
Prunus insititia 10 419
Prunus mahaleb 3 55
Prunus mume 1 495
Prunus pensylvanica 3 56
Prunus persica 5 545
  peach 9 601
Prunus salicina 5 545 10 419
Prunus serotina 3 56 10 439
Prunus serrulata 3 56
Prunus virginiana 3 56
Prurigo 7 297
Pruritus 4 54
  vaginal disorders 14 256
Prussian blue 5 218 7 259 10 224
Prussic acid 2 538
Prymnesium parvum 1 700
Psallus seriatus 6 405
Psalterium 4 158
Psammite 11 590 591
Psammitic rocks 11 591
Psammodontidae 2 316
Psammon 5 529
Psammosere 13 232
Pschorr reaction 4 107
Psedera 3 188
Pselaphidae 3 276
Psephenidae 3 278
Psephite 11 590
Psephurus gladius 1 46
Pseudacris 5 538
Pseudagenia 5 203
Pseudalidae 13 193
Pseudarchaster 10 92
Pseudarchaster abernethyi 9 599
Pseudechinus islandicus 6 431
Pseudemys floridana 3 23
Pseudo terminal bud 2 360
Pseudoadiabatic lapse rate 1 632
Pseudoalleles 11 61 62
  allele 1 257
  cis trans effect 11 61
  cistron concept 11 62
  mutation 8 671
  possible examples in man 11 62
Pseudobornia 9 504, 11 62
Pseudobornia ursina 11 62
Pseudoborniales 11 62
Pseudobranchus 2 568, 8 187
Pseudobranchus striatus 11 517
Pseudorocerus 6 476
Pseudorocerus citri 8 187
Pseudocoel 5 8
Pseudocoelomata 1 420, 11 62*
  Aschelminthes 11 62
  Entoprocta 11 62
Pseudoconformity 14 191
Pseudocyclidae 2 418
Pseudocycnus 2 418
Pseudocynodictis 2 523
Pseudodiadematidae 10 202
Pseudoglobulin 6 215
Pseudohaliotrema carbunculus 8 573
Pseudohalogen cyanide 3 634
  cyanogen 3 636
Pseudohermaphroditism 6 424
Pseudoinert gas type ions 3 34
Pseudolarix amabilis 7 404
Pseudolynchia canariensis 6 315
Pseudomonad 13 1
Pseudomonadaceae 11 62-64
  Acetomonas 11 63
  Aeromonas 11 64
  Alginomonas 11 64
  Azotomonas 11 64
  bacteria, taxonomy of 2 11
  Halobacterium 11 64
  Kluyvera 11 64
  milk 8 432
  Mycoplana 11 64
  Photobacterium 11 64
  Protaminobacter 11 64
  Pseudomonadales 11 65
  Pseudomonas 11 63
  Xanthomonas 11 63
  Zoogloea 11 64
  Zymomonas 11 64
Pseudomonadales 11 64 65
  bacteria taxonomy of 2 11
  Caulobacteraceae 2 570
  Nitrobacteriaceae 9 107
  Pseudomonadineae 11 65
  Schizomycetes 12 65 66
  Siderocapsaceae 12 309
  Spirillaceae 13 1
Pseudomonadineae 11 65 66
  bacteria taxonomy of 2 11
  Methanomonadaceae 8 340
  Nitrobacteriaceae 9 107
  Pseudomonadaceae 11 62
  Thiobacteriaceae 13 604

Prostate disorders 6 326, 11 27-28, 482
Prostate gland 5 234, 11 28*, 473
  reproductive system 11 472
Prostatitis 6 236, 11 482
Prosthesis 11 28-30
  application 11 29 30
  coupling to living tissue 11 29-30
  fatigue life 11 29
  materials for replacing bone 11 29-30
  nonirritating qualities 11 29
Prosthetic group *see* Coenzyme
Prosthodontia 4 64
Prostoma 11 560
Protacarus crani 1 24 25
Protactinium 11 30-31
  electron configuration 4 504
  fission 5 287
  radioactivity 11 278
Protalus ramparts 12 392
Protamine 3 110
  amino acid in 9 217
  arginine 9 216
  nucleoprotein 9 216
  protein 11 39
Protaminobacter 11 64
Protamphisopus wianamattensis 10 197
Protandry 11 31
  Annelida 1 430
  Bryozoa 2 356
  oyster 9 476
  sex determination 12 228
  sexual dimorphism 12 235
  Tanaidacea 13 389
Protanomaly 3 300
Protanopia 3 300
Proteaceae 11 31
Proteales 10 346, 11 31*
Proteases 5 27 28, 202 203
Protection reaction (immunology) 1 473
Protective coloration 11 31-33*, 15 26
  aposematic 11 32
  chromatophore 3 98-103
  cryptic 11 31
  mimicry 11 32
  validity 11 33
Protective devices, electric *see* Electric protective devices
Protective gas masks 6 58 59
Protective relays 4 446 448, 11 440 442
Protector blocks 3 325
Proteeae 5 2
Proteida 2 568, 12 7
Protein 11 33 39
  abnormal formation 8 257
  adsorption 11 36
  albumin 1 224 11 39
Protein—*cont*
  albuminoids 11 39
  animal feed composition 1 425-426
  amino acid sequence analysis 11 38
  antibody 1 468
  bacterial aerobic oxidation 2 37
  bacterial biosynthesis 2 61
  bacterial cell chemistry 2 12
  biochemistry 2 199
  casein 2 537
  cell protoplast 2 612
  cell walls in plants 2 617
  classification 11 39
  column chromatography 11 36
  countercurrent distribution 11 36
  criteria of purity 11 37-38
  cyanoethylation 3 635
  cytochrome 3 652
  denaturation 11 35
  dialysis and dilution 11 36
  end group analysis 11 38
  fibrinogen 5 254
  fibrous 11 40
  food 5 371
  formation of protein salts and other complexes 11 36
  gamma globulin 6 33
  gelatin 6 93
  globular 11 40
  globulin 6 215 11 39
  glutelin 6 220, 11 39
  ground substance component 2 610
  hemoglobin 6 410
  histones 11 39
  hormone 6 480
  humus 6 518
  immune precipitation 11 37
  isoantigen 7 274
  isoelectric point precipitation 11 36
  isolation 11 35 37
  metabolism *see* Protein metabolism
  mitochondria 8 520
  myelin sheath component 2 237
  nucleoprotein 9 215 218
  nutrition 9 235
  paper chromatography 11 36
  peptide 9 629
  plant metabolism 10 356
  preparative electrophoresis 11 37
  preparative ultracentrifugation 11 37
  in primary cell wall
Protein—*cont*
  in plants 2 617
  prolamine 11 4, 39
  properdin 11 15
  protamines 11 39
  radiation effect on 11 217
  ribonucleic acid 11 562
  salting out 11 35
  shape 11 38
  size 11 38
  structure 11 34
  virus 14 331
  see also Polymer
Protein, fibrous 11 40
Protein, globular 11 40 41
Protein fractionation 1 310
Protein metabolism 11 41-43
  adrenal cortex steroid 1 71
  biochemistry 2 199
  disorders *see* Protein metabolism disorders
  essential amino acids (man) 11 41
  in feces formation 11 42
  gout 6 239
  in intestine 11 42
  nutritive value 11 42
  plasma protein synthesis 11 43
  role in diet 11 41
  specialized tissue 12 567
  tissue 11 43
  uric acid 14 218
Protein metabolism disorders 8 256 258
  amyloid 8 257
  formation of abnormal proteins 8 257
  hemoglobins 8 257
  hyperproteinemia 8 256, 257
  myeloma 8 257
Protein structure 8 254 255
Protein synthesis 8 255
Proteinase 2 19 5 22
Proteocephalidae 11 43
Proteocephaloidea 10 414 11 43 44*
  Gestoidea 2 659
Proteocephalus 11 43
Proteohipid 7 530
Proteolytic enzyme 4 167 170
Proteomyxa *see* Proteomyxida
Proteomyxida 11 44*, 52, 12 27
Proteoses 4 170
Proterogenic relics 8 297
Proterospongia 8 169
Proterospongia haeckeli 9 562
Proterostomia 11 44
Proterotheriidae 7 553
Proterotherium 7 553
Proterozoic 11 44
Proteus 1 466 467, 5 1, 6 429 7 330, 632, 9 173 11 44 45*, 12 7, 15 528
  Enterobacteriaceae 5 1 2
  IMViC test 7 49
Proteus mirabilis 11 44
Proteus morgani 11 44
Proteus rettgeri 11 44
Proteus vulgaris 2 20 4 3 6* 11 44, 15 179
Prothallial cell 12 159
Prothallium 5 262
Prothoracic gland 7 123
Prothrombin 2 265, 3 195, 13 614
Prothrombin time, blood 3 1
Prothrombinase 3 195
Protista 11 45
  microfossils 8 333
Protium 6 544
Protobatrachus 1 336
Protobranchia 8 339 11 45*
Protocatechuic acid 2 35
Protocephalon 1 560
Protoceratops 4 201 11 454
Protochlorophyll 3 78
Protochordata 3 265
Protochrysis 3 579
Protoclalata 3 120 122
Protococcus 3 80
Protocucujidae 3 278
Protoderma 5 37, 13 114
Protodrilidae 1 517
Protoenstatite 4 616, 11 219
Protogyny 11 45*, 15 389
Protohippus 8 13
Protohyrnia 6 572
Protolysis 1 526
Protolytic reactions 1 41
Protomastigida 11 45 46 52
  choanoflagellates 11 46
  taxonomy 11 45 46
  Trypanosomatidae 11 46 14 122 125
Protomerite 5 100
Protomyxzostomidae 10 461
Proton 6 550, 11 46 47*
  antiproton 1 491 492
  cosmic rays 3 498 502
  elementary particle 4 542 545
  g factor 9 192
  mass and charge measurements 11 46
  nuclear reactions 9 194 20
  nuclear structure 9 201 21
  as nucleon 9 215
  range in matter 11 46 47
Proton induced reaction 9 200 201
Proton magnetometer 6 150
  archeology 1 515
Proton precession magnetometer 1 94, 8 65
Proton proton bonds 9 207
Proton proton chain 11 47, 15 107 108
  carbon nitrogen cycle 2 473
Proton proton scattering 12 58 59

hrometrics 11 82 84
absolute humidity 11 85
density 11 84
dew point temperature 11 85
dry bulb temperature 11 82
enthalpy 11 84
latent heat 11 84
pressure 11 84
psychrometric chart 11 82
relative humidity 11 85
sensible heat 11 84
total heat 11 84
wet bulb temperature 11 82
ychrophilic bacteria 2 7
ychropotes 4 418
yllia pyricola 6 473
yllidae 6 473
yllipiocus 11 71
yllium seed 6 297
ychotic disorders *see* Psychosis
p type semiconductor see Semiconductor
PT boat 12 267
Pt Cobalt 8 35
Ptarmigan 6 18, 285, 11 84 85*
Ptenoglossate radula 8 561
Pteranodon 11 88 484
Pteraspidiformes *see* Pteraspidomorphi
Pteraspidomorphi 1 420 11 85*
Coelolepida 2 262*, 11 85
Heterostraci 6 430-451*, 11 85
Pteraster 1 600
Pteraspis 6 431, 11 85
Pteraster bathami 12 619
Pterasteridae 12 619
Pterichthyodea (Pterichthys) 1 465
Pteridine 4 104
Pteridomonas 11 548
Pteridophyta 3 186 192
Pteridospermae 9 503 505, 11 85-87*
Calamopityaceae 11 87
classification 11 85
Lyginopteridaceae 11 87
Medullosaceae 11 85
Pteridae 1 428, 9 477 613
Pterine 3 99
Pteriomorphe 3 99
Pterobranch 1 414
Pterobranchia 11 87
Pterochore 10 499
Pterodidae 3 302
erocnemia pennata 11 543
erodactyl 12 363
erodactyloidea 11 88
terodactylus 7 327, 11 484
terodrilus alcicornus 9 515
Pteroidea 9 622
Pteronalidae 6 574
Pteromedusae 3 255
Pteronidea ribesii 6 580
Pterophoridae 7 464
Pterophyllum 7 327
Pteroplax 4 565
Pteropod 9 545
Pteropod ooze 8 135 136*, 12 139
Pteropsida 10 346, 11 87*
Angiospermae 1 404*; 10 346
Filicineae 5 264, 10 346
fossil plants 9 502 503
Gymnospermae 6 300*, 10 346
Marattiales 8 100
Pteropus 2 109
Pterosaur 11 484
Pterosauria 11 87-88*, 484
Archosauria 1 521
Pteroylglutamic acid (PGA) *see* Folic acid
Pterygota 1 565 11 88*
Endopterygota 4 599
Exopterygota 5 143, 11 88
Hemimetabola 6 399* 7 134
Holometabola 6 465* 7 134
Insecta 7 134
Pterygotus 5 124
Pterygotus buffaloensis 1 557
Pterylae 5 195 197
Ptilidae 3 276
Ptilinum 4 212
Ptilodactylidae 3 278
Ptilodontidae 8 627 628
Ptilodus 8 627
Ptinidae 3 277
Ptolemy 3 412
Ptyalin 4 164, 9 369
amylase 1 365
Ptyalism 8 619
Ptychagnostus 14 105
Ptychocheilus lucius 8 505
Ptychocrinus 4 366
Ptychodactiaria 3 255, 11 88*
Ptychodactis 3 255 11 88
Ptyctodontida 1 528
Puberulic acid 1 476 14 117
Puberulonic acid 14 117
Pubic symphysis 9 616
Pubis 9 616 12 358
Public address system 11 88 90
acoustical power 11 88
loudspeakers 11 88
oscillation or singing 11 89
sound levels 11 88
speaker location 11 89
Public health 11 90 91
Puccinia antirrhini 14 217
Puccinia arachidis 9 603
Puccinia asparagi 10 307, 11 654
Puccinia condita 14 481
Puccinia graminis 2 99
Puccinia graminis avenae 11 654
Puccinia graminis tritici 10 307, 312, 11 654, 14 481
Puccinia helianthi 13 292
Puccinia hordei 2 99
Puccinia malvacearum 11 654
Puccinia poaesudeticae 6 261
Puccinia polysora 3 485
Puccinia sorghi 3 485
Pucciniaceae 14 217
Puerperal sepsis 13 178
Puerto Rico 14 475
Puerto Rico Trench 13 225
Moho, depth of 8 532
Puffball 6 469
Puffer 13 530
Puffin 3 10, 11 91*
Pug 7 464
Puget Sound 9 162
Pugging 2 648
Pulex irritans 5 299, 12 345
Pullery 7 445
Pulley 11 91 93
application 11 91
belt drive 2 161, 11 91
block and tackle 2 261, 6 460
cone 11 91
construction 11 91
crossed belt drive 11 91
crowned 11 92
flat 11 92
loose 11 92
rope sheaves 11 93
stepped 11 91
tight 11 92
V-belt 11 92
Pullularia pullulans 4 52
Pulmonary anthrax 1 457
Pulmonary artery 1 497
Pulmonary aspergillosis 1 589
Pulmonary circulation 1 552
fetal 2 494
physiology of 2 504
Pulmonary disease 1 601
Pulmonary edema 4 410 7 621
Pulmonary emphysema 11 532
Pulmonary infarct 7 621
Pulmonary stenosis 2 513
Pulmonary trunk 2 498
Pulmonary vein anomalies 2 521
changes during development 2 485
Pulmonata 8 559, 11 93*, 12 383 389
fresh water pulmonates 11 93
habitat 11 93
life cycle 11 93
terrestrial pulmonates 11 93
Pulp (tooth) 13 674
Pulping processes cellulose 2 625
wood 9 539, 14 529 530
Pulque 4 255
Liliales 7 514
Pulse altimeter 1 289
Pulse amplitude modulation 11 97
crosstalk 11 100
guard time 11 100
pulse modulator 11 99
telemetering 13 427
time-division multiplex 11 100
Pulse carrier 11 97
Pulse characteristics 1 346
Pulse-code modulation 11 98
pulse modulator 11 101-103
quantization 11 98
sampling 11 98
Pulse compression radars 3 425
Pulse duration modulation 11 97
guard time 11 100
noise bandwidth relation 11 98
pulse modulator 11 100
Pulse forming networks 11 94
Pulse generator 11 93 94
blocking oscillator 2 262
delay line 4 48
induction coil 7 71 72
pulse forming networks 11 94
thyratron 11 94
see also Trigger circuit
Pulse height analyzer 12 75
Pulse jet 11 94 95
combustion chamber 11 95
flap valves 11 95
thrust 11 95
Pulse length modulation *see* Pulse duration modulation
Pulse modulation 8 529 11 95 99*
amplitude (PAM) 8 528
basic concepts 11 97
code (PCM) 8 529
coding and multiplexing 11 99
ease of multiplexing 11 97
microwaves 8 414
modulators 11 99-103
navigation uses 9 14
position (PPM) 8 528
properties of ordinary samples 11 96
pulse carrier 11 97
pulse-amplitude modulation 11 97
pulse-code modulation 11 98
pulse duration modulation 11 97
pulse position modulation 11 98
radio 11 242
repeatering 11 99
sampling 11 96 97

Pseudomonas 1 466-467, 2 33, 3 65, 5 1; 6 217, 7 328-330, 8 310, 433, 9 173, 454, 10 64, 11 65, 548
Pseudomonadaceae 11 63
Pseudomonas aeruginosa 1 476, 5 1, 67, 11 66*, 13 179, 528
Pseudomonadaceae 11 63
Pseudomonadineae 11 66
Pseudomonas allicola 9 327
Pseudomonas fluorescens 11 63
Pseudomonas glycinea 12 534
Pseudomonas hydrophila 2 378
Pseudomonas lachrymans 3 612
Pseudomonas lindneri 2 40
Pseudomonas mallei 8 214
Pseudomonas marginalis 7 478
Pseudomonas pisi 9 600
Pseudomonas pseudomallei 8 214, 11 65, 66
Pseudomonas pyocyanae see Pseudomonas aeruginosa
Pseudomonas saccharophila 2 40, 49, 52, 11 65, 13 236
Pseudomonas salinaria see Halobacterium halobium
Pseudomonas solanacearum 9 603, 13 665
Pseudomonas syringae 1 495, 3 529
Pseudomonas tabaci 13 663
Pseudomorph 8 443
metasomatism 8 304
serpentine 12 198
Pseudomucinous cystadenoma 11 480
Pseudopedicellina 5 7
Pseudoperonospora cubensis 3 613
Pseudopezza ribis 3 625, 8 212
Pseudophoracea 6 75
Pseudophyllidea 10 414, 11 66 67*
Cestoidea 2 659
sparganosis 12 559
Pseudopleuronectes americanus 5 315
Pseudoprotodon 14 87
Pseudo random sampling numbers 8 587
Pseudorbitoididae 5 435
Pseudoscalar 9 566
Pseudoschizogaster zone 10 24
Pseudoscorpionida 1 496, 558, 11 67*
Pseudosphegina carpenteri 1 299
Pseudosphere 6 161
Pseudosporidae 11 44
Pseudostaulla 13 150
Pseudostratified epithelium 5 42
Pseudosuchian 13 545
Pseudotachylite 8 296, 681
Pseudotrakidae 12 157
Pseudotriton 3 113
Pseudotsuga 12 78
Pseudotsuga menziesii 4 269
Pseudotsuga taxifolia 4 269, 11 546, 14 288
Pseudotuberculosis 11 67-68
Brucellaceae 2 351
Pseudotumor 9 520
Pseudovector 2 412-413*; 9 566
Psi function 6 32-33
Psicofuranine 1 476
Psidium guajava 6 286
Psilidae 4 212
Psilocybe mexicana 8 661
Psilomelane 11 68
Psilophytales 10 346, 11 68*
Psilophytineae 10 346, 11 68*
Psilophytales 10 346, 11 68
Psilotales 10 346, 11 68
Psilophyton 9 504
Psilopsida 10 346, 11 69*
fossil plants 9 502
Psilophytales 11 68
Psilophytineae 10 346, 11 68 69
Psilotales 11 69
Psilotales 10 346, 11 69*
Psilotum 11 69
Psittachotherium 15 386
Psittacidae 9 567 11 69
Psittaciformes 1 694 11 69*
cockatoo 3 249 250
lovebird 7 594
parrot 9 567
Psittacosaurus 4 201
Psittacosis 1 425 10 428 11 69 70*
fluorescent antibody study 8 383
Psittacosis lymphogranuloma viruses 13 528
Psittacus 11 69
Psittacus erithacus 9 567
Psocathropos 11 71
Psocid 11 70
Psocoptera 7 134 11 70 71*
Insecta fossils 7 139
Psolidae 4 58
Psolus 4 58, 6 467
Psolus phantapus 4 58
Psoralea 5 190
Psoriasis 11 71* 12 369
Psoroptes equi 12 30
Psoroptes ovis 12 247
Psoroptic mange 12 30
Psorosis 5 346 348
Psychiatry 11 81
psychic energizer 11 71 72
tranquillizers 14 16
see also Psychotherapy
Psychic energizer 11 71-72
isonicotinic acid hydrazide 7 283
Psychic stress (space flight) 12 542
Psychidae 7 464
Psychoacoustics 9 125-128, 11 72-74*
articulation testing 11 72-74
criteria for residential areas 11 74
noise control 9 125-128
noise control criteria 11 73
speech interference criteria 11 73-74
studies of hearing 11 72
studies of speech 11 72
Psychoanalysis 8 602, 11 74*
dynamic theory 11 74
economic theory 11 74
Freudianism 5 534, 535
manic depressive psychosis 8 91
topographic theory 11 74
Psychodidae 4 212
Psychogalvanic response 11 74 75
measurement methods 11 75
stimuli 11 75
Psychokinesis 5 160
Psychological hedonism 8 605
Psychology, physiological and experimental 11 75 76
behavior ontogeny of 2 132 148
behavioral psychophysics 2 157
body rhythm 2 273
emotion 4 583
effector systems 4 415
Freudianism 5 534
frustration 5 549
hearing 6 346
hypnosis 6 595
instinctive behavior 7 146
intelligence 7 178
learning theories 7 441 443
motivation 8 602 608
neurophysiology 9 80
perception 10 2 9
personality theory 10 30 37
posture regulation of 10 527 530
reflex unconditioned 11 399
reticular formation (brain) 11 535
sensation 12 177
somesthesis 12 501
verbal learning 14 301 305
vision 14 334
see also Human engineering
Psychometric test 10 35
Psychomotor attack 5 40
Psychoneurosis *see* Neurosis
Psychopharmacologic drugs 11 76 77
biochemical aspect 11 76
hypnosis 6 595
psychic energizer 11 71
study methods 11 76-77
tranquilizer 14 16-17
use 11 76
Psychopharmacology 10 97
Psychophysical methods 11 77-79
classical 11 77
direct ratio discrimination 11 79
method of average error 11 77
method of constant stimuli 11 78
method of limits 11 77
Psychophysics, behavioral *see* Behavioral psychophysics
Psychosis 4 51; 11 72, 79*
abnormal behavior 1 7-8
insulin shock 7 164
involutional melancholia 7 236
manic depressive 8 91
paranoia 9 553
paranoid state 9 553
paresis, general 9 564
psychoanalysis 11 74
senile dementia 12 573
psychopharmacologic drugs 11 76
psychosurgery 11 79
psychotherapy 11 80
psychotoxemimetic drug 11 80
Psychosomatic reaction somatization 12 501
stress in animals 13 191
Psychosurgery 11 79 80
Psychotechnology *see* Human engineering
Psychotherapy 1 601, 11 80*
analytic (exploratory) method 11 80
directive method 11 80
electrotherapy 4 542
Psychotomimetic drug 11 80 82
LSD 25 11 81
mescaline 11 81
relation to research on psychosis 11 81
Psychotropic compound 14 16
Psychrometer 6 515 9 554 11 82*
Asman 11 82
sling 11 82
wet and dry bulb thermometers 11 82
see also Hygrometer
Moisture-content measurement
Psychrometric chart 6 519 533

Pyridoxine—cont
in serotonin metabolism 12 196
see also Vitamin B_6
Pyridylmethyl metals 11 111
Pyrimethamine 8 77
Pyrimidine 2 65, 4 104, 11 115 115*
bacterial aerobic oxidation 2 55 56
bacterial biosynthesis 2 59
metabolic disorders 8 258
Pyrgoidae 4 212
Pyrite 11 115 116
iron ore 7 258
Pyroantimonate 1 477
Pyroarsenate 1 550
Pyroboric acid 2 292
Pyrocatechol *see* Catechol
Pyrocatechuic acid *see* Catechol
Pyroceram 6 208
Pyrochlore 9 101
Pyrochroidae 3 277
Pyroclastic materials 14 548-549
Pyroclastic rocks 11 116
Pyroelectricity 11 116 117
mineralogy 8 466
piezoelectricity 10 218
Pyrogallol 10 112
Pyrolan 7 142
Pyrolusite 8 83, 11 117*
Pyrolysis 11 117 118
charcoal 5 10
coal 11 118
coal chemicals 5 236
coke 5 272
destructive distillation 4 80
diene synthesis 4 112
free radical 5 497
furnace construction 5 576 577
metal vapor plating 5 281 282
natural gas 11 118
petroleum 11 118
thermal cracking 5 532 533
see also Cracking
Pyrometallurgy 11 118 119
Pyrometallurgy, ferrous 7 259 263
Pyrometallurgy, nonferrous 11 119 125
beryllium metallurgy 2 176 178
calcination 11 121
chlorination 11 121
copper 5 465
drossing 11 125
drying 11 121
lead 7 431-434
nickel 9 97 100
preparatory processes 11 119 121
reduction processes 11 121-124
reduction to liquid metal 11 123 124
reduction to solid metal 11 124
refining processes 11 124 125
roasting of sulfides 11 119 121
sintering 11 121
slag refining 11 125
tin metallurgy 13 650
titanium 13 655
volatilization processes 11 125
Pyrometasomatism 10 84
Pyrometer 11 125-127
bolometer 11 127
optical 11 126 127
radiation 11 125-126
temperature measurement 13 489
use 11 126
Pyrometric cone 11 127 128
temperature indicator 13 489
Pyrometry *see* Temperature measurement
Pyromorphite 1 439, 11 128*
alpha Pyrone 11 107
gamma Pyrone 11 107, 108
Pyronemite 10 86
Pyronine 1 463
Pyroxenite 10 86
Pyrope 4 383 6 40
Pyrophoric nickel 9 95
Pyrophorus 5 281
Pyrophorus pellucens 5 281
Pyrophosphate 10 156, 552
Pyrosoma atlanticum 13 543
Pyrosomid 14 140
Pyrosomida 13 543
Pyrosulfurous acid 13 260
Pyrosulfuryl halide 13 263
Pyrotechnics 11 128
army armament 1 540
match 8 170
Pyrotheria 8 82, 11 128*
Pyrotherium 11 128
Pyrotherium sorondi 11 128
Pyroxene 11 129 130
augite 1 667
compositional relationships 11 129
crystal structure 11 129
diopside 4 205
enstatite 4 616
jadeite 7 301
in meteorites 8 313
occurrence 11 129
phase relations 11 129
physical properties 11 129
pigeonite 10 223
spodumene 13 9
Pyroxenite 7 16, 10 12 11 130*
Pyrrhocorid bug 6 401
Pyrrhocoridae 6 401
Pyrrhotite 11 130
Pyrrhula pyrrhula minor 10 127
Pyrrhuloxia sinuata 2 480
Pyrrole 11 130-131
bacterial biosynthesis 2 57 59
indole 7 62 65
Pyrrolidine 11 130
Pyrrolidone 7 376, 11 131
Pyrroline 11 131
delta Pyrroline 2 carboxylic acid 11 5
Pyrrophyta 11 131 132
Algae 1 235-237
Desmophyceae 11 132
Dinophyceae 11 132
plant kingdom 10 346
Thallophyta 13 545
Pyrus communis 5 545, 9 605
Pyrus malus 1 493
Pyrus nivalus 9 605
Pyrus serotina 9 605
Pyruvate 2 215
Pyruvic acid 13 598
biotin 2 245
decarboxylation by yeast enzyme 5 25, 9 92
glycolysis 10 370
Krebs cycle 10 371
metabolic disorders 8 261
plant metabolism 10 349
in plasma 2 266
reduction by diphosphopyridine nucleotide reduced 4 207
thiamine and carbohydrate metabolism 2 166
transamenation with glutamic acid 14 17
Pyruvic carboxylase 5 20
Pyrylium ion 11 107
Pythagoras 11 132, 13 27
Pythagorean brotherhood 9 623
Pythagorean theorem 8 175, 11 132*, 13 27
Pythagorean tuning 8 662 664
Pythidae 3 276
Pythium clover diseases 3 222
corn diseases 3 484
cotton diseases 3 513
flax diseases 5 298
melon diseases 8 214
ornamental plant diseases 9 408
pea diseases 9 600
peanut diseases 9 603
Phycomycetes 10 200
sorghum diseases 12 508
wheat diseases 14 483
Pythium irregulare 8 214
Pythium splendens 7 528
Pythium ultimum 8 214
Python 11 132
Squamata 13 25
vertebrae 12 365, 14 507
Python reticulatus 11 132
Squamata 13 25
snake 12 390
Pyxis 3 412, 5 542

Pulse modulator 11 99-103
pulse-amplitude modulation 11 99
pulse-code modulation 11 101-103
pulse-duration modulation 11 100
pulse position modulation 11 101
Pulse position modulation 11 98
pulse modulator 11 101
Pulse repetition frequency radar 11 200
Pulse rise time amplifier frequency response 1 346, 9 429
bandwidth relationship 1 346, 9 429
Pulse time modulation *see* Pulse-position modulation
Pulse transformer sets 9 571, 573
Pulse width (radar) 11 200
Pulse-width modulation *see* Pulse-duration modulation
Pulsed extractor 12 499
Pulsed radar *see* Radar
Pulverized coal 5 568
Pulverizer, ball-bearing *see* Ball-bearing pulverizer
Pulverizer coal 5 569
Pulverizing 5 557-562
airswept conical ball mill 5 560
ball mills 5 559
ball race pulverizer 5 561
bubristone pulverizer 2 362, 5 558
cascade pulverizers 5 560
coal 5 568
grinding mill 6 274
Krupp mill 5 559
Pebble mill 5 559 9 607
roller pulverizers 5 560
Tube mill 5 560
tumbling pulverizers 5 558 14 155
see also Crushing and pulverizing
Pulvinus (leaf) 7 436 441
Puma 3 515
Pumice 11 103* 506 590 14 347
igneous rocks 7 13
Pump 11 103 104
air lift 4 246
centrifugal *see* Centrifugal pump
cryogenic 5 571
direct acting 4 245
displacement *see* Displacement pump
electromagnetic 4 492 493*, 11 104
fuel *see* Fuel pump
marine machinery 8 122
Pump—*cont*
mechanical 11 103
mine drainage 8 495
reciprocating 4 245
rotary 4 246
steam 4 245
vacuum 4 246
valve 14 262
Pumpellyite 6 212
Pumping machinery 11 103-104
centrifugal 11 103
conduction 11 104
displacement *11 103*
electromagnetic 11 104
induction 11 104
mechanical 11 103
Pumping station (water supply) engineering 14 406
Pumpkin 11 104*, 13 28
Pumpkinseed 13 291
Puna 4 342, 12 527
Punch cores 9 292 293
Punched-card data processing systems 4 14 15
collator 4 14
key punch 4 14
printer 4 14
reproducing machine 4 14
Punched card systems 4 14 15
Punched cards storage device 15 159
Punched paper tape data processing systems 4 15
storage devices 15 159
Punica granatum 10 497
Punching forging 5 470
sheet metal 12 253
Pupa 4 214
Pupa, Lepidoptera 7 461
Puparium 4 212
Pupil 5 162-171
Pupipara 4 212
Puppis 3 412
Purana group 10 567
Purbeckian stage 7 525
Purcell Range 9 157
Pure culture *see* Culture, pure
Pure tones 8 160 13 66
Purex process 10 425
Purification reagent chemicals 11 370
Purine 2 65 4 104 9 208 11 115, 14 218
bacterial aerobic oxidation 2 35 36
bacterial biosynthesis 2 60
glycine 6 221
metabolic disorders 8 258
Purine fermentation 2 47
Purine metabolism 15 677
Purkinje cells 6 234
Purkinje effect 7 23
Puromycin 1 476
antibiotic 1 464 468
Puron 7 264
Purple beech 2 130
Purple of Cassius 6 230
Purple gallinule 6 18
Purple grackle 2 254
Purple martin 8 156
Purple-osier willow 14 493
Purple pigments 10 224
Purple sail 12 546
Purple sulfur 13 256
Purple sulfur bacteria 2 8
taxonomy 11 551
Purple Top Globe 14 164
Purple vetch 14 310
Purpura 6 412, 7 484
Purse crab 4 35-36
Purse web spider 1 498
Push pull amplifier 11 104-105
class of operation 11 104
distortion 11 104
driver stages 11 105
operation 11 104
phase inverter 10 101; 11 105
servomotor control 12 204
Push-pull negative-resistance circuit 14 253
Pusher bar conveyors 3 450
Pushkov, N. 14 265
Puss moth 7 464
Pusterthal, Alps of 5 117
Puszta 3 190
Putamen 8 615
Putnam, P C 8 452-454
Putrefaction 4 23
death 4 22 24
fermentation 5 215
Putrescine 1 306
Pycnidium 4 254, 12 605
Pycnogonida 3 22, 11 105 106*
Arthropoda 1 557
Palaeoisopus 9 496
Palaeopantopoda 11 106
Pantopoda 11 106
Pycnogonidae 11 106
Pycnogonum stearnsi 11 105
Pycnometer method 4 65
Pycnospores 12 606
Pye D R 7 198
Pyelitis 7 345
Pyelonephritis 7 345
Pygmies ventricosus 14 115
Pygasteriidae 11 106
Pygasteroida 4 93 360 571, 11 106 107*
Pygidium 1 555
Pygmy squid 2 644
Pygopodidae 15 24
Pygoscelis adeliae 12 607
Pylephlebitis 7 365
Pyloric ceca 4 160
Pylorus 4 159
Pyocyanase 1 476
Pyocyanin 1 468 11 66
Pyonephrosis 7 345
Pyorrhea 11 107* 13 676
Pyosalpinx 11 480
Pyralid 7 464
Pyralididae 7 464
Pyralis farinalis 7 468
Pyralspite series 6 40
Pyramat 7 142
Pyramid and frustum 11 107
see also Polyhedra
Pyramid of numbers 11 107
community 5 324 325
Pyramidal system 9 59
Pyramidal tract 12 596
anatomy 8 614 615
functions 8 615
motor systems 8 614 615
Pyramidella 13 406
Pyramidellidae 9 545 13 406
Pyrimidine 11 115
Pyramidomonas 11 53
Pyramids (ecosystem) 4 406 407
Pyran 11 107 108
Pyrargyrite 11 108 109*, 12 329
Pyrausta nubilalis 7 468 473
Pyrazinamide 1 464 468
Pyrazine 4 104
Pyrazole 1 702 11 109 110*
Pyrazoline 11 109
Pyrenees 5 118, 13 409
Pyrenochaete 12 604
Pyrenochaete terrestris 12 604
Pyrenoid 5 99
Protozoa 11 51-60
Pyrenophora 4 53
Pyrethrin 7 142
Pyrethrum 11 110
Pyrex glass 9 353
Pyribenzamine 1 474, 11 111
Pyridazine 4 104
Pyridine 2 13 11 110 115*
bacterial aerobic oxidation 2 36 37
coal tar chemical 5 295
isomerism, molecular 7 278
quinoline 11 190 194
Pyridine carboxylic acid 11 115
Pyridine 3 carboxylic acid 11 110
Pyridine *N*-oxide 11 111, 112
Pyridinium salts 11 112
2 Pyridone 11 111
Pyridone rings 14 342
Pyridoxal 11 541 542
biotaxar 2 194
vitamin B_6 14 531
Pyridoxal phosphate 1 514 2 13 14 3 264
Pyridoxamine 14 541
biotaxar 2 194
vitamin B_6 14 531
5 Pyridoxic acid 2 37
Pyridoxine biotaxar 2 194
in brain metabolism 12 564
food 5 571
oxidation to succinic acid 2 36
pyridine 11 110

Q

Q 11 133 134
antennas 1 446
of cavity resonator 2 576 577
damping 4 12
ferrite 5 221
forced oscillation 5 438
Q band 11 201
Q fever 1 425 10 428, 11 133*
Q iodides 7 299
Q measurement cavity 7 40
decrement method 7 40
resonance curve method 7 40
resonant rise method 7 39
tuned circuit 7 40
Q meter 7 39 11 133 134*
measurement circuit 11 134
uses 11 133
Q value 9 199
QRS wave heart 5 138
Quadrant 8 188, 12 234
Quadrant angle 2 81
Quadrant electrometer 14 371 416
Quadrantids 8 308
Quadratic formula 1 241
see also Algebra 1 241
Quadrature (astronomy) 10 267 268, 13 634
Quadrature (electricity) 11 134
Quadrature potentiometer 10 545
Quadric cone 5 394
Quadric cylinder 5 646
Quadric surface 1 391 11 134 135*
central quadrics 11 134 135
ellipsoid and spheroid 4 560
hyperboloid 6 585 586
noncentral quadrics 11 135
paraboloid 9 542 543
surface and solid of revolution 13 310 311
Quadrics geometry, noneuclidean 6 157
Quadridentate ligand 3 17
Quadrigeminal body 9 42 63
Quadrigula 1 235
Quadrilateral 10 471, 11 135*
area 1 529
parallelogram 9 547
rectangle 11 383
square 13 27 29
Quadrula 5 100
Quadrupole interaction 9 191 193
Quadrupole moment nuclear 8 45 9 190 193, 205
Quadruple radiation 8 626 627
Quagga 14 607
horse 6 488
Quahog 5 152, 5 100
Quail 6 18 11 135 136*
Quail Montezuma 2 205
Quaking aspen 10 497
Qualification test 11 136
criteria 11 136
component testing 13 380
Qualitative analysis infrared spectroscopy 7 110
Qualitative chemical analysis 11 136 138
chemical microscopy 3 31
selectivity 11 136 137
sensitivity 11 136 137
spot test analysis 13 13
Quality control 11 138 142
analysis of variance 1 387
benefits 11 139
control 11 138
control chart 3 425-429*, 11 140
cost 11 139
F test of significance 11 142
food 5 385 384
inspection 7 145 11 138
inspection by attributes 11 140
inspection by variables 11 141
organization 11 139
p chart 11 140
pharmaceuticals testing 10 94
process control methods 11 139 140
standards 11 139
t test of significance 11 141
testing 7 145
X and *R* chart 11 140
Quality factor 5 438 11 133
Quantitative analysis infrared spectroscopy 7 110
organic *see* Organic quantitative analysis
Quantitative analytical method 14 374
Quantitative chemical analysis 11 142 144
calibration of apparatus *11 143 144*
calibration of method 11 145
classification of procedures 11 143
electrodeposition analysis 4 473 475
gravimetric analysis 6 262 263
Quantitative geochronometry 11 592
Quantitative inheritance 6 109 110
human genetics 6 505 506
Quantity flow meters 5 319 320
Quantization 11 144
atomic structure and spectra 1 653 654
pulse code modulation 11 98
quantum mechanics 11 157 158
Quantum (physics) 11 144
Quantum chemistry 11 144 148
hydrogen molecular ion 11 146 147
hydrogen molecule 11 147
resonance (molecular structure) 11 147 148
Schrodinger equation 11 145
variation method 11 145 146
Quantum defect 1 659
Quantum defect method 14 490
Quantum detector infrared radiation 7 106
radiometry 11 518
free electromagnetic field 11 148 149
g factor 11 150
interacting fields 11 149
Lamb shift 11 150
positronium 11 150
vacuum interactions 11 150
Quantum field theory 11 150-153
Quantum field theory—*cont*
elementary particle 4 542
gravitational field 11 151
graviton 6 266
mesons 11 152
neutrino 9 85
nuclear forces 11 152
pair production (electron positron) 9 495
particle fields 11 152
perturbations 11 152 153
quantum electrodynamics 11 148 150
scalar field 11 151
solution of field equations 11 152 153
spin 12 615
symmetry laws 11 153
Quantum mechanics 7 505 504, 11 153 162*
angular momentum 1 406 407* 12 615
atomic structure and spectra 1 653 662 11 158
band theory of solids 2 91-93
and causality 2 571
Cayley Klein parameters 2 578
complementarity 11 156-157
Compton effect 11 154 155
correspondence principle 11 161
diffraction 11 154
eigenfunction 4 416
eigenvalue 4 416
electron diffraction 4 506, 508
electron spin 4 516 518
energy level 4 601
excited state 5 135
exclusion principle 5 137
ground state 6 275 276
harmonic oscillator 6 343
interference 11 154
isotopic spin 7 296 297
metastable state 8 305
particle indistinguishability 11 161-162
photoelectric effect 11 154 155
Planck's constant 11 153 154
Planck's radiation law 6 372-375

Quercus marilandica 9 237
Quercus michauxi 9 237
Quercus nigra 9 237
Quercus palustris 9 237
Quercus phellos 9 237
Quercus prinus 9 237
Quercus robur 9 238
Quercus rubra 9 237
Quercus suber 3 189
Quercus velutina 9 237
Quercus virginiana 9 237
Quetsch 4 255
Quetzel 14 114
Queue length 11 189
Queueing theory 11 188 190
see also Linear programming Systems engineering
Quevenne hydrometer scale 6 562
Quick return mechanism 5 486
Quick vinegar process 14 325-326
Quicklime 7 514 515
Quillaja 3 189
Quillback 13 236
Quinacrine 1 50, 8 77
Quinaldine 11 192, 193
Quinaldinic acid 11 193
Quinazoline 4 104
Quince 11 190
Quince seed gum 6 297
mucilage 8 621
Quincke, G 4 525, 13 174
Quinhydrone 11 194
Quinhydrone electrode 6 551
Quinidine 11 193
Quinine 11 190
antimicrobial agent 1 475 8 77
cinchona 3 122
poison 10 434
quinoline 11 193
Quinn, W H 12 301
Quinoa 11 190
Quinol 6 565
Quinoline 11 113, 190 194*
coal tar chemical 5 236
isoquinoline 7 288 289
Quinoline carboxylic acid 11 193
Quinoline dye 4 302, 11 194
Quinoline-*N*-oxide 11 192
Quinoline 8 sulfonic acid 11 191, 193
Quinoline yellow 4 302
Quinolinic acid 11 191
Quinolinium methiodide 11 191
Quinolinium quaternary salts 11 191
4 Quinolone 11 192
Quinone 11 194 195
hydroquinone 6 565
inhibitor (chemical) 7 111
Quinophthalones 11 194
Quinoxaline 4 104
Quinsy 13 178
Quintant 12 234
Quiscalus quiscula 6 244
Quotient (algebra) 1 238

Quantum mechanics—*cont.*
probability considerations 11 158 159
quantization 11 143, 157-158
quantum chemistry 11 144
quantum field theory 11 150 153
quantum numbers 11 162
quantum statistics 11 161-162
quantum theory, nonrelativistic 11 163-179
relation to classical mechanics 2 438
Schrodinger's wave equation 11 160 161, 12 69
selection rules 12 160 163
specific heat of solids 12 574 577
spin 12 615
Stern-Gerlach experiment 11 157-158
superposition principle 13 304
transformation theory *15 22 23*
uncertainty principle 11 154
wave function 11 159 160
wave particle duality 11 154 156
Quantum numbers 11 162
angular momentum 11 162
atomic structure and spectra 1 654 661
azimuthal 11 162
electron configuration 4 503
electron spin 4 517 518
exclusion principle 5 137
magnetic 11 162
orbital 11 162
principal 11 162
quantum mechanics 11 157
selection rules 12 160 163
spin 11 162
Quantum state degeneracy 4 44
ground state 6 275 276
Quantum statistical mechanics 13 65 66
Quantum statistics 11 162 163
Bose Einstein statistics 2 301 305
Fermi Dirac statistics 5 215 217
nuclear reactions 9 199 200
quantum mechanics 11 161 162
quantum theory nonrelativistic 11 179
Quantum theory absorption 1 15 34
magnetic resonance 8 44
optics 9 363
Quantum theory—*cont.*
potential barrier 11 169-170
superposition principle 13 304
x-rays 14 567-568
see also Quantum electrodynamics, Quantum field theory, Quantum mechanics; Quantum theory, nonrelativistic, Quantum theory, relativistic
Quantum theory, nonrelativistic 11 163 179
Compton effect 5 353 359
Coulomb potential 11 175-177
energy operator 11 167-169
expectation values 11 170 172
Hamilton-Jacobi theory 6 331-332
harmonic oscillator 11 170
illustrative applications 11 166 170, 174 178
intermolecular forces 7 195 196
invariance 11 173
kinetic energy 11 167
kinetic theory 7 351 352
matrix mechanics 8 181 182
momentum 11 166 167
normalization 11 163 164
operators 11 164 166
orbital angular momentum 11 175
orthogonality 11 166
paramagnetism 9 548 549
parity 9 565 567, 11 173 175
particle indistinguishability 11 178 179
probability considerations 11 171 172
probability density 11 163 164
radiation 11 177 178
real eigenvalues 11 165 166
removal of degeneracy 11 177
spin 11 164
time dependent Schrodinger equation 11 172 174
time evolution of wave packet 11 175
transition probability 11 173 174
uncertainty principle 11 172
wave function 11 165 166
Quantum theory, relativistic 11 179 180
atomic structure and spectra 1 655 658
Quantum theory, relativistic—*cont*
Dirac equation 11 179 180
fine structure 5 273
hole theory of positron 11 180
invariance 11 179
Klein Gordon equation 11 180
pair production (electron-positron) 9 495
quantum electrodynamics 11 149
Quantum theory of valence 14 258
Quantum transformation theory *see* Transformation theory, quantum
Quantum yield photochemistry 10 157
Quarantine animal disease 7 94
plant disease 10 318 319
Quarnero (gulf) 5 115
Quarrying 11 180 181
blast hole drilling 2 295-298
blasting 2 256
channeling 11 181
crushed stone 11 181
dimension stone 11 180 181
drilling and broaching 11 181
primary blasting 11 181
roofing slate 5 169
secondary blasting 11 181
Quart 8 188
Quarter evil *see* Blackleg
Quarter horse 6 488 492
Quarter squares multiplier 1 371
Quartile 13 68
Quartz 11 182
amethyst 1 302
authigenic minerals 1 674
in chert 5 56
deformation studies 11 599
diagenesis in sandstones 4 91
dispersion 1 16
in geodes 6 119
geologic thermometry 6 134
in meteorites 8 515
onyx 9 550
orthoquartzite composition 9 418
piezoelectric crystal 10 216
properties 11 182
rotatory dispersion 11 632 633
rutilated 11 656
thermal conductivity 5 390 391
varieties 11 182
velocity of sound in 12 526
Quartz basalt 2 105
Quartz clock 11 182
Quartz crystal 11 182
Quartz crystal oscillator 9 [illegible]
Quartz diabase 10 86
Quartz diorite 7 16, 13 60
Quartz gabbro 6 1
Quartz glass 12 [illegible] 321
Quartz horizontal magnometer 8 65
Quartz latite 4 1, 7 16 11 [illegible]
Quartz pebble conglomerate 5 599
Quartz spectrograph 12 [illegible]
Quartz topaz 15 676
Quartzite 11 182 [illegible] 597
use as abrasive 13 152
flagging stone 13 152
refractory 11 409
Quartzose sandstone 9 418
Quartzose shale 12 [illegible]
Quasi free electron theory *see* Free electron theory of metals
Quaternary 6 [illegible] 11 [illegible]
Quaternary ammonium compounds 1 475
Quaternary ammonium hydroxides 11 185
Quaternary ammonium salts 11 185 184
Quaternions 11 184 187
division 11 185
multiplication 11 184 185
Quebracho 11 187 188
leather and fur processing 7 446
Queen Alexandra Range 1 [illegible]
Queen Bee 2 [illegible]
Queen conch 3 361
Queen Elizabeth Islands 3 525
Queen Maud Mountains 1 [illegible]
Queenston shale 13 [illegible]
Quelling reaction 11 [illegible]
gram negative diplococci 6 247
pneumococci 10 [illegible]
Quenching hardening 6 [illegible]
steel 15 [illegible]
surface hardening of steel 13 312 314
Quenching of orbital angular momentum *see* Paramagnetism 9 550
Quercetin 5 [illegible]
Quercus 5 188 12 [illegible]
Quercus agrifolia 9 [illegible]
Quercus alba 9 [illegible]
Quercus bicolor 9 [illegible]
Quercus cerris 9 [illegible]
Quercus coccinea 9 [illegible] 15 [illegible]
Quercus falcata 9 [illegible]
Quercus gambelii 10 [illegible]
Quercus ilex 9 [illegible]
Quercus kelloggii 9 [illegible]
Quercus laurifolia 9 [illegible]
Quercus lobata 9 [illegible]
Quercus macrocarpa 9 [illegible]

R

R-center 3 295
Rabbet plane 14 545
Rabbit 11 197
  gestation period 6 182
  see also Lagomorpha
Rabbit bot 4 212
Rabbit fever 12 544
  see also Tularemia
Rabbit papilloma virus 11 229
Rabe, P 11 190
Rabe W 4 356
Rabi, I I 1 649, 8 540
Rabies 1 425 10 119, 11 197*
  in bats 2 109
  control 11 197
  diagnosis 11 197
  epidemiology 11 197
  fluorescent antibody method 8 383
  infectious agent 11 197
  pathogenesis 11 197
  prophylaxis 11 197
Racemon 11 198
Race, R. R 8 408
Racemase 3 315
Raceme 7 98
Racemic substance 11 198
Racemic tartaric acid 13 398 399
Racemization 11 198 199
  see also Stereochemistry
Racer 2 255
Raceway (wiring) 14 521
Rachiglossate radula 8 561
Rachilla 5 534
Rachis 7 98
Racial classification 1 458-459
  see also Human variation
Racial differences 8 504
Rack and pinion 6 85
Rack and spur gear differential 3 369
Rad 11 616
Radar 4 265 268 11 199 212* 212
  accuracy 11 209
  Air Traffic Control Transponder System 1 159
  aircraft intercept 11 199
  airplane landing 11 199
  airplane traffic control 11 199
  airport surface detection equipment 1 216
  altimeters 11 199
  angular resolution 11 210
Radar—*cont*
  antenna scan speed 11 210
  antenna scanning 11 204 205
  antennas 11 201 204
  ATR tube 11 212
  automatic guidance 11 199
  automatic tracking 11 205
  beacons 9 15
  bombsights 11 199
  C band 11 201
  carrier frequency bands 11 201
  conical scan 11 204
  cosecant squared pattern 11 204
  detection 11 199
  dipole arrays 11 203
  displays *see* Radar presentations
  Doppler 4 265 268
  duplexer 11 200, 211
  duty cycle 11 200
  early warning 11 199
  echo box test 4 378
  echoes from Moon 11 245
  electronic scanning 11 205
  fan beam 11 204
  fire control 11 199
  FM CW 3 425
  fundamentals of operation 11 200
  glint noise 8 516
  ground clutter 8 620
  high precision 11 199
  highway speed control 11 199
  historical development 11 199
  homing system 6 290
  intermediate frequency *amplifier* 11 200
  ionospheric effects 11 201
  jamming techniques 4 522 7 502
  K band 11 201
  L band 11 201
  local oscillator 11 200
  mapping 11 200
  maser 8 136
  maximum range 11 210
  meteor observations 8 509
  microwave *transmission lines* 11 211
  mixer 11 200
  modulator 11 200
  monopulse 8 577
Radar—*cont*
  moving target indication 8 620 621
  naval meteorology 9 8
  navigation uses 9 14-15; 11 199
  noise 11 208
  output power test 4 378
  P band 11 201
  passive 9 589
  picket destroyers 12 264
  picket submarines 13 211
  precision approach 10 577 578
  propagation 11 201-202
  pulse compression radars 3 425
  pulse radar system parameters 11 210
  pulse radar transmitter 11 211 212
  pulse repetition frequency 11 200
  pulse width 11 200
  Q band 11 201
  radar cross section 11 209-210
  radar equation 11 200
  radome 11 325
  range 11 201
  range resolution 11 210
  ranging 11 199
  S band 11 201
  scan pattern 11 204
  scintillation 11 210
  search 11 199
  signal analysis 4 521
  signal detection 11 209
  signal to-noise ratio 11 209
  spectrum test 4 378
  storm tracking 8 320
  submarine detection 11 199
  superrefraction 11 201
  surveillance 11 199, 13 325
  synchronizer 11 200
  system performance test 4 378
  target characteristics 11 209 210
  TR tube 11 212
  track while scan systems 11 205
  tracking 11 199
  tropospheric *attenuation* 11 201
  waveforms 11 201
  weather avoidance 8 320
Radar—*cont*
  weather observation 11 199
  wind observation 8 319 320
  X band 11 201
  see also Microwave
Radar, airborne *see* Airborne radar
Radar, continuous-wave *see* Continuous-wave radar
Radar, Doppler *see* Doppler radar
Radar, monopulse 8 577
Radar, passive 9 589
Radar, surveillance 11 199, 13 325
Radar, traffic control *see* Traffic-control radar
Radar antenna 11 202 204
  beam pattern 11 202
  beamwidth 11 202
  bedspring antenna 11 203
  dielectric lenses 11 203
  gain 11 202
  lens antennas 11 203
  lobes 11 202
  metal plate lenses 11 203
  paraboloidal reflector 11 203
Radar map presentations
  hyperbolic sweep 13 336
  use in pilotage 1 164-165
Radar presentations 11 205-208
  A display 11 206
  B display 11 208
  J display 11 207
  plan position indicator 11 207
  rotating radial sweep generation 13 335
  three dimensional displays 11 208
Radar transmitter 11 211 212
  coherent radars 11 211
  echo box test 4 378
  energy storage circuit 11 211
  klystron 11 211
  magnetron 11 211
  microwave tube 11 211
  modulator 11 211
  traveling wave tube 11 211
  spectra 12 593
Radechon storage tube 15 160

Radiation pyrometers—*cont*
thermal element 11 126
Radiation resistance 1 450 451
Radiation shelter 9 182
Radiation shielding 11 238 240
attenuation processes 11 238 239
lead 7 42b
radiation sources 11 238 239
radiochemical laboratories 11 298
shielding materials 11 240
spacecraft structure 12 551
typical shields 11 240
Radiation sterilization 13 135
Radiation temperature heat 6 535
Radiative capture fission 5 288
Radiative collision 12 53
Radiator 11 241
acoustic 12 511 515
cast iron 11 241
finned tube 11 241
liquid cooling system 4 604
related devices 11 241
types 11 241
Radical (algebra) 1 239
Radical substitution (chemistry) 13 229 230
Radicle 11 621 12 145
Radiella sol 8 159
Radio 11 241 243
altimeter *see* Altimeter, radio
amateur 1 298 299
amplitude modulation 1 363 365*, 11 242
antenna *see* Antenna (aerial)
applications 11 241
broadcasting 11 247-251
broadcasting antennas 1 443 455
broadcasting networks 11 251 254
broadcasting transmitter *see* Radio transmitter
carrier frequencies 11 242
channels 11 242
code telegraphy 11 241
FCC regulations 11 242
filters 5 267 271
frequency modulation 5 520 521* 11 242
frequency shift transmission 11 242
general principles 11 241
information transmission 11 241
jamming 4 521, 7 302
pulse transmission 11 242
radar 11 199 212
railroad 11 328
receiver 11 256 259
transmitter 11 263 266
uses 11 242
Radio—*cont*
volume requirements 11 242
Radio aids to navigation *see* Navigation systems, electronic
Radio astronomy 11 243 247
applications 11 247
centimeter waves from planets 11 245
cosmic radio sources 11 245 246
cosmology 11 246 247
decameter waves from Jupiter 11 245
generation of radio waves by nature 11 244
hydrogen line radiation 11 246
maser 8 156
navigation uses 9 16
observations from satellites 11 247
observatories 9 243
radar echoes from Moon 11 245
radio telescope 11 261-263
radio waves from Moon 11 244
radio waves from the Sun 11 244
significance of 11 243 244
study of Milky Way 6 10-11
Radio broadcasting 11 247 251
AM 1 363
broadcast channel classification 11 248
broadcast service area 11 248
carrier power 11 248
clear channel 11 249
directional antenna usage 11 248
FCC requirements 11 248
field intensity measurements 11 249
FM 5 521 11 250
frequency allocations 11 247, 260
frequency tolerance 11 248
local channel 11 249
networks 11 251 254
regional channel 11 249
scope 11 247
short wave international broadcasting 11 250
signal propagation 11 248
signal strength 11 248
station coverage 11 249
stereophonic broadcasting 11 250
transmission theory and methods 14 54 61
transmitter locations 11 250
Radio broadcasting networks 11 251-254
Radio broadcasting networks—*cont*
channels for program transmission 11 253
circuit designations 11 253
delay equalization 11 254
in an-out feeds 11 253
leg of a network 11 252
local loop 11 253
maintenance of program levels 11 254
reversible circuit 11 252
round robin 11 251
spectral lines 11 253
station to station feed 11 253
tap from the network 11 253
United States 11 251
velocity of propagation 11 254
Radio compass *see* Compass, radio
Radio emission (Jupiter) 7 525 524
Radio emission (Sun) 13 283
Radio frequency amplifier 1 545, 11 301, 14 558
Radio frequency bridges 7 40
Radio frequency power measurement 4 437 439
thermistor 13 556
Radio frequency spectroscopy 11 301* 12 587
molecular beams 8 540-541
Radio-frequency transformer 14 27-28
Radio inertial guidance 6 289
Radio nebula 9 24
see also Radio astronomy
Radio range 11 254 256
A N range 11 254 255
consol 11 255 256
navaglobe 11 256
Navarho 11 256
Vhf omnidirectional radio range 11 256
Radio receiver 11 211, 256 259*
amplification 11 256
antennas 11 259
automatic frequency control (AFC) 1 675
automatic gain control (AGC) 1 675
detection 11 257
diversity reception 11 259
frequency modulation 11 258
heterodyne principle 6 429
intermediate frequency amplifier 7 194
noise filter radio 9 130
pentagrid converter 9 623
performance 12 309 310
regenerative 11 258
selectivity 11 256 12 163
Radio receiver—*cont*
servicing 3 135, 12 309 310
single sideband (SSB) receivers 11 258 259
static 13 54
superheterodyne 11 257
tuned radio frequency 11 257
tuning circuit 11 256
Radio spectrum allocations 11 259 261
allocation of frequency bands 11 259
amateur radio 1 298
assignment of specific frequencies 11 260
control agencies 11 260
extremely high frequency band 11 260
Federal Communications Commission 11 261
high frequency band 11 260
international control 11 261
International Frequency Registration Board 11 261
International Telecommunication Union 11 261
low frequency band 11 260
medium frequency band 11 260
radio broadcasting 11 247
spectrum conservation 1 351
super-high frequency band 11 260
television 13 457
ultra high frequency band 11 260
United States control 11 261
very high frequency band 11 260
very low frequency band 11 260
Radio telemetry 13 426
bandwidth required 13 428
crosstalk 13 428
information efficiency 13 428
minimum required received signal strength 13 428
Radio telescope 11 261 263
diffraction limitation 11 261
discrimination between signal sources 11 262 263
forms of 11 263
Radio transmitter 11 263-266
amplitude modulation 11 263-264
frequency modulation 11 264 265

Radial acceleration see Acceleration
Radial aircraft engine 3 167
Radial cleavage 7 250
Radial drainage 11 583
Radial force see Central force 7 414
Radial paper chromatography 5 95
Radial saw 14 543
Radial velocity- binary stars 2 187
galaxy 6 7, 12
of gaseous nebulae 9 26
stars 1 616 617, 13 47
Radian 8 189
Radian measure 1 500, 11 212-213*
Radiant energy 7 617
see also Radiation
Radiant heating 11 213
panel heating and cooling 9 556
radiator 11 241
Radiant section furnace 5 575 576
Radiata 1 420, 11 215*
Coelenterata 3 255 261, 11 215
Ctenophora 3 608 610, 11 215
Radiation 6 369 11 213 214*
absorption 1 11 19
antennas 1 449 453, 14 55 56
Cerenkov radiation 2 653
electromagnetic 4 493 496, 11 213
food preservation 5 426
genetic effects 11 232
gravitational 6 296
heat radiation 6 369 373
heat transfer 13 566
infrared 7 104 110
inverse square law 7 224 225
isotope 7 299
multipole 8 626 627
nuclear 9 196
oncology 9 522
particle 11 214
photoelectric devices 10 353
plasma physics 10 395 397
shielding of 11 228 12 253 254
wound 12 511 515
solar see Solar radiation
space see Space radiations
Van Allen see Van Allen radiation
Radiation, terrestrial 11 214-215
Abbot silverdisk pyrheliometer 11 214
Albrecht net radiometer 11 215
Radiation, terrestrial—cont.
Angstrom compensation pyrheliometer 11 214
energy in solar beam 11 214
Gier and Dunkle instrument 11 215
greenhouse effect 6 269
heat balance, terrestrial atmospheric 6 363
hemispherical pyrheliometer 11 214
Kimball Epply instrument 11 214
Moll Gorczynski instrument 11 182
net radiation measurement 11 215
normal incidence pyrheliometer 11 214
radiation measuring devices 11 214 215
total solar energy 11 214
Radiation belt earth 10 271
Radiation biochemistry 11 215 218
amino acids 11 217
biological reduction-oxidation systems 11 216
dilution effect mode of action 11 215
direct action theory 11 216
direct plus indirect action 11 216
enzymes 11 217
indirect action theory 11 215
nucleic acid and nucleoproteins 11 218
proteins 11 217
measurement of radiation sensitivity 11 216
oxygen effect mode of action 11 215
protection effect mode of action 11 215
Radiation biology 11 218 219
action of ultraviolet light 11 219
dose effects 11 218
infrared radiation (biology) 7 107
ionizing radiation effects 11 218
linear energy transfer (biology) 7 522
mutation 8 675 674
nuclear radiation (biology) 9 196 198
radiation cytology 11 221
radiation injury (biology) 11 225
radiation microbiology 11 235
radioactivity 11 209
radioisotope (biology) 11 305
Radiation biology—cont.
theory 11 219
ultraviolet radiation (biology) 14 189
Radiation biophysics 2 232
see also Mutation, Radiation biology
Radiation chemistry 11 219 221
energy transfer 11 220
representative processes 11 220 221
see also Photochemistry
Radiation cytology 11 221 223
chromosome restitution and rejoining 11 222
culture, tissue 5 620
effect on cell division 11 222
oxygen effect on chromosome breaks 11 221
radiation sensitivity factors in chromosome breaks 11 222
relationship of chromosome breaks to dosage 11 221
Radiation damage (inanimate materials) 11 225 225
effects of neutrons 11 223 224
extent 11 224
to liquids 11 223 225
mechanisms 11 223 224
nuclear fuels 9 186
radioactive minerals 11 209
to solids 11 224 225
in thorite 13 610
Wigner energy 11 225
Radiation detector 9 564 565
Radiation efficiency (antennas) see Antenna (aerial)
Radiation energy see Radiation
Radiation inhibitor 11 637
Radiation injury (biology) 11 225 236
acute radiation syndrome 11 228 229
blood forming tissues 11 226
bones and teeth 11 228
culture tissue 5 620
effect of constitutional variables 11 229 231
effects of internally deposited radioelements 11 234
effects of radiation on plants 11 232 233
effects on cell division 11 226
effects on embryo and fetus 11 231
effect on genes 11 225 226
endocrine glands 11 226
eye 11 227
Radiation injury (biology)—cont.
gastrointestinal tract 11 227
genetic effects 11 232
gonads 11 227
immunity 7 31
indirect biological effects of radiation 11 233
killing of cells 11 227
lungs 11 228
modification of 11 236
natural mutation rate 11 232
nervous system 11 228
physical factors of radiation 11 233
practical hazards of working radiation 11 234 236
radiation induced cancer 11 229
radiation induced mutations 11 232
radioactive fallout 11 207 208
radiosensitivity 11 225
shortening of the life span 11 229
skin 11 227
syndrome, acute 11 228 229
urinary system 11 228
vascular system 11 228
Radiation inversions (meteor) 13 488
Radiation measuring instruments 11 214 215
Radiation microbiology 11 236 238
applied radiation microbiology 11 238
events leading to biological effect 11 237 238
lethal effects 11 236
mutagenic effects 11 236
nature of the target 11 236
physiological and biochemical changes 11 237
target theory considerations 11 236
Radiation monitoring see Monitoring (ionizing rad ation)
Radiation pressure 11 238
on comets 5 515
interstellar matter 7 222
Poynting's vector 10 502
Radiation pyrometers 11 125 126
accuracy 11 126
applications 11 126
high temperature 11 126
low temperature 11 126
range 11 126
temperature measurement 13 483
speed of response 11 126

Radiation pyrometers—*cont*
thermal element 11 126
Radiation resistance 1 450 451
Radiation shelter 9 182
Radiation shielding 11 238 240
attenuation processes 11 238 239
lead 7 426
radiation sources 11 238 239
radiochemical laboratories 11 298
shielding materials 11 240
spacecraft structure 12 551
typical shields 11 240
Radiation sterilization 13 135
Radiation temperature heat 6 575
Radiative capture fission 5 288
Radiative collision 12 53
Radiator 11 241
acoustic 12 511 515
cast iron 11 241
finned tube 11 241
liquid cooling system 4 604
related devices 11 241
types 11 241
Radical (algebra) 1 239
Radical substitution (chemistry) 13 229 230
Radicle 11 621 12 145
Radiella sol 5 159
Radio 11 241 243
altimeter *see* Altimeter, radio
amateur 1 298 299
amplitude modulation 1 363 365*, 11 242
antenna *see* Antenna (aerial)
applications 11 241
broadcasting 11 247 251
broadcasting antennas 1 443 455
broadcasting networks 11 251 254
broadcasting transmitter *see* Radio transmitter
carrier frequencies 11 242
channels 11 242
code telegraphy 11 241
FCC regulations 11 242
filters 5 267 271
frequency modulation 5 520 521* 11 242
frequency shift transmission 11 242
general principles 11 241
information transmission 11 241
jamming 4 521, 7 502
pulse transmission 11 242
radar 11 199 212
railroad 11 328
receiver 11 256 259
transmitter 11 263 266
uses 11 242
Radio—*cont*
volume requirements 11 242
Radio aids to navigation *see* Navigation systems, electronic
Radio astronomy 11 243 247
applications 11 247
centimeter waves from planets 11 245
cosmic radio sources 11 245 246
cosmology 11 246 247
decameter waves from Jupiter 11 245
generation of radio waves by nature 11 244
hydrogen line radiation 11 246
maser 8 156
navigation uses 9 16
observations from satellites 11 247
observatories 9 243
radar echoes from Moon 11 245
radio telescope 11 261 263
radio waves from Moon 11 244
radio waves from the Sun 11 244
significance of 11 243 244
study of Milky Way 6 10 11
Radio broadcasting 11 247 251
AM 1 363
broadcast channel classification 11 248
broadcast service area 11 248
carrier power 11 248
clear channel 11 249
directional antenna usage 11 248
FCC requirements 11 248
field intensity measurements 11 249
FM 5 521 11 250
frequency allocations 11 247 260
frequency tolerance 11 248
local channel 11 249
networks 11 251 254
regional channel 11 249
scope 11 247
short wave international broadcasting 11 250
signal propagation 11 248
signal strength 11 248
station coverage 11 249
stereophonic broadcasting 11 250
transmission theory and methods 14 54 61
transmitter locations 11 250
Radio broadcasting networks 11 251 254
Radio broadcasting networks—*cont*
channels for program transmission 11 253
circuit designations 11 253
delay equalization 11 254
in an-out feeds 11 253
leg of a network 11 252
local loop 11 253
maintenance of program levels 11 254
reversible circuit 11 252
round robin 11 251
spectral lines 11 253
station to station feed 11 253
tap from the network 11 253
United States 11 251
velocity of propagation 11 254
Radio compass *see* Compass radio
Radio emission (Jupiter) 7 525 524
Radio emission (Sun) 13 283
Radio frequency amplifier 1 345, 11 301 14 358
Radio frequency bridges 7 40
Radio frequency power measurement 4 437 439
thermistor 13 556
Radio frequency spectroscopy 11 301*, 12 587
molecular beams 8 540-541
Radio frequency transformer 14 27 28
Radio inertial guidance 6 289
Radio nebula 9 24
see also Radio astronomy
Radio range 11 254-256
A N range 11 254 255
consol 11 255 256
navaglobe 11 256
Navarho 11 256
Vhf omnidirectional radio range 11 256
Radio receiver 11 211 256-259*
amplification 11 256
antennas 11 259
automatic frequency control (AFC) 1 675
automatic gain control (AGC) 1 675
detection 11 257
diversity reception 11 259
frequency-modulation 11 258
heterodyne principle 6 429
intermediate frequency amplifier 7 194
noise filter radio 9 130
pentagrid converter 9 623
performance 12 309 310
regenerative 11 258
selectivity 11 256 12 163
Radio receiver—*cont*
servicing 3 135, 12 309 310
single sideband (SSB) receivers 11 258 259
static 13 54
superheterodyne 11 257
tuned radio frequency 11 257
tuning circuit 11 256
Radio spectrum allocations 11 259 261
allocation of frequency bands 11 259
amateur radio 1 298
assignment of specific frequencies 11 260
control agencies 11 260
extremely high frequency band 11 260
Federal Communications Commission 11 261
high frequency band 11 260
international control 11 261
International Frequency Registration Board 11 261
International Telecommunication Union 11 261
low frequency band 11 260
medium frequency band 11 260
radio broadcasting 11 247
spectrum conservation 1 551
super high frequency band 11 260
television 13 457
ultra high frequency band 11 260
United States control 11 261
very high frequency band 11 260
very low frequency band 11 260
Radio telemetry 13 426
bandwidth required 13 428
crosstalk 13 428
information efficiency 13 428
minimum required received signal strength 13 428
Radio telescope 11 261 263
diffraction limitation 11 261
discrimination between signal sources 11 262 263
forms of 11 263
Radio transmitter 11 263 266
amplitude-modulation 11 263 264
frequency modulation 11 264 265

Radial acceleration *see* Acceleration
Radial aircraft engine 1 167
Radial cleavage 2 230
Radial drainage 11 583
Radial force *see* Central force
7 414
Radial paper chromatography 3 96
Radial saw *14 545*
Radial velocity: binary stars 2 187
galaxy 6 7, *12*
of gaseous nebulae 9 26
stars 1 616 617, 15 47
Radian 8 189
Radian measure 1 500, *11 212-213**
Radiant energy 7 617
see also Radiation
Radiant heating 11 213
panel heating and cooling 9 556
radiator 11 241
Radiant section furnace 5 575-576
Radiata 1 420, 11 213*
Coelenterata 3 253-261, 11 213
Ctenophora 3 608-610, *11 213*
Radiation 6 369, 11 213-214*
absorption 1 11-19
antennas 1 449-453, 14 55-56
Cerenkov radiation 2 653
electromagnetic 4 493-496, 11 213
food preservation 5 426
genetic effects 11 232
gravitational 6 266
heat radiation 6 369 373
heat transfer 13 566
infrared 7 104-110
inverse-square law 7 224-225
isotopic 7 269
multipole 8 626-627
nuclear 9 196
oncology 9 322
particle 11 214
photoelectric devices 10 151
plasma physics 10 395-397
shielding of 11 238, 12 253-254
sound 12 511 515
solar *see* Solar radiation
space *see* Space radiations
Van Allen *see* Van Allen radiation
Radiation, terrestrial 11 214-215
Abbot silverdisk pyrheliometer 11 214
Albrecht net radiometer 11 215
Radiation, terrestrial—*cont*
Angstrom compensation pyrheliometer 11 214
energy in solar beam 11 214
Gier and Dunkle instrument 11 215
greenhouse effect 6 269
heat balance, terrestrial atmospheric 6 363
hemispherical pyrheliometer 11 214
Kimball Epply instrument 11 214
Moll-Gorczynski instrument 11 182
net radiation measurement 11 215
normal-incidence pyrheliometer 11 214
radiation-measuring devices 11 214-215
total solar energy 11 214
Radiation belt, earth 10 271
Radiation biochemistry 11 215-218
amino acids 11 217
biological reduction-oxidation systems 11 216
dilution effect mode of action 11 215
direct action theory 11 216
direct plus indirect action 11 216
enzymes 11 217
indirect action theory 11 215
nucleic acid and nucleoproteins 11 218
proteins 11 217
measurement of radiation sensitivity 11 216
oxygen effect mode of action 11 215
protection effect mode of action 11 215
Radiation biology 11 218-219
action of ultraviolet light 11 219
dose effects 11 218
infrared radiation (biology) 7 107
ionizing radiation effects 11 218
linear energy transfer (biology) 7 522
mutation 8 673-674
nuclear radiation (biology) 9 196 198
radiation cytology 11 221
radiation injury (biology) 11 225
radiation microbiology 11 236
radioactivity 11 289
radioisotope (biology) 11 306
Radiation biology—*cont*
theory 11 219
ultraviolet radiation (biology) 14 189
Radiation biophysics 2 252
see also Mutation; Radiation biology
Radiation chemistry 11 219-221
energy transfer 11 220
representative processes 11 220 221
see also Photochemistry
Radiation cytology 11 221 223
chromosome restitution and rejoining 11 222
culture, tissue 5 620
effect on cell division 11 222
oxygen effect on chromosome breaks 11 221
radiation sensitivity factors in chromosome breaks 11 222
relationship of chromosome breaks to dosage 11 221
Radiation damage (inanimate materials) 11 223 225
effects of neutrons 11 223-224
extent 11 224
to liquids 11 223 225
mechanisms 11 223-224
nuclear fuels 9 186
radioactive minerals 11 269
to solids 11 224 225
in thorite 15 610
Wigner energy 11 225
Radiation detector 9 584-585
Radiation efficiency (antennas) *see* Antenna (aerial)
Radiation energy *see Radiation*
Radiation inhibitor 11 637
Radiation injury (biology) 11 225-236
acute radiation syndrome 11 228-229
blood-forming tissues 11 226
bones and teeth 11 228
culture, tissue 5 620
effect of constitutional variables 11 229 231
effects of internally deposited radioelements 11 234
effects of radiation on plants 11 232 233
effects on cell division 11 226
effects on embryo and fetus 11 231
effects on genes 11 225 226
endocrine glands 11 228
eye 11 227
Radiation injury (biology) *cont*
gastrointestinal tract 11 227
genetic effects 11 232
gonads 11 227
immunity 7 34
indirect biological effects of radiation 11 235
killing of cells 11 226
lungs 11 228
modification of 11 235
natural mutation rate 11 232
nervous system 11 228
physical factors of radiation 11 233
practical hazards of using radiation 11 234
radiation induced cancer 11 229
radiation-induced mutations 11 232
radioactive fallout 11 268
radiosensitivity 11 235
shortening of the life span 11 229
skin 11 227
syndrome, acute 11 229
urinary system 11 228
vascular system 11 228
Radiation inversions (meteorology) 13 488
Radiation-measuring instruments 11 214 215
Radiation microbiology 11 236-238
applied radiation microbiology 11 238
events leading to biological effect 11 237 238
lethal effects 11 236
mutagenic effects 11 236
nature of the target 11 237
physiological and biochemical changes 11 236
target theory considerations 11 236
Radiation monitoring *see* Monitoring (ionizing radiation)
Radiation pressure 11 238
on comets 5 515
interstellar matter 7 220 222
Poynting's vector 10 452
Radiation pyrometers 11 125-126
accuracy 11 126
applications 11 126
high temperature 11 126
low-temperature 11 126
range 11 126
temperature measurement 15 489
speed of response 11 126

Radiation pyrometers—*cont*
thermal element 11 126
Radiation resistance 3 450 451
Radiation shelter 9 182
Radiation shielding 11 238 240
attenuation processes 11 238-239
lead 7 426
radiation sources 11 238 239
radiochemical laboratories 11 298
shielding materials 11 240
spacecraft structure 12 551
typical shields 11 240
Radiation sterilization 13 135
Radiation temperature heat 6 575
Radiative capture fission 5 288
Radiative collision 12 55
Radiator 11 241
acoustic 12 511 515
cast iron 11 241
finned tube 11 241
liquid cooling system 4 604
related devices 11 241
types 11 241
Radical (algebra) 1 239
Radical substitution (chemistry) 13 229 230
Radicle 11 621 12 145
Radiella sol 3 159
Radio 11 241 243
altimeter *see* Altimeter, radio
amateur 1 298 299
amplitude modulation 1 363 365*, 11 242
antenna *see* Antenna (aerial)
applications 11 241
broadcasting 11 247 251
broadcasting antennas 1 443 453
broadcasting networks 11 251 254
broadcasting transmitter *see* Radio transmitter
carrier frequencies 11 242
channels 11 242
code telegraphy 11 241
FCC regulations 11 242
filters 5 267 271
frequency modulation 5 520 521*, 11 242
frequency shift transmission 11 242
general principles 11 241
information transmission 11 241
jamming 4 521 7 302
pulse transmission 11 242
radar 11 199 212
railroad 11 328
receiver 11 256 259
transmitter 11 263 266
uses 11 242
Radio—*cont*
volume requirements 11 242
Radio aids to navigation *see* Navigation systems electronic
Radio astronomy 11 243 247
applications 11 247
centimeter waves from planets 11 245
cosmic radio sources 11 245 246
cosmology 11 246 247
decameter waves from Jupiter 11 245
generation of radio waves by nature 11 244
hydrogen line radiation 11 246
maser 8 156
navigation uses 9 16
observations from satellites 11 247
observatories 9 243
radar echoes from Moon 11 245
radio telescope 11 261 263
radio waves from Moon 11 244
radio waves from the Sun 11 244
significance of 11 245 244
study of Milky Way 6 10 11
Radio broadcasting 11 247 251
AM 1 363
broadcast channel classification 11 248
broadcast service area 11 248
carrier power 11 248
clear channel 11 249
directional antenna usage 11 248
FCC requirements 11 248
field intensity measurements 11 249
FM 5 521, 11 250
frequency allocations 11 247, 260
frequency tolerance 11 248
local channel 11 249
networks 11 251 254
regional channel 11 249
scope 11 247
short wave international broadcasting 11 250
signal propagation 11 248
signal strength 11 248
station coverage 11 249
stereophonic broadcasting 11 250
transmission theory and methods 14 54 61
transmitter locations 11 250
Radio broadcasting networks 11 251 254
Radio broadcasting networks—*cont*
channels for program transmission 11 253
circuit designations 11 253
delay equalization 11 254
in an-out feeds 11 253
leg of a network 11 252
local loop 11 253
maintenance of program levels 11 254
reversible circuit 11 252
round robin 11 251
spectral lines 11 253
station-to station feed 11 253
tap from the network 11 253
United States 11 251
velocity of propagation 11 254
Radio compass *see* Compass, radio
Radio emission (Jupiter) 7 323 324
Radio emission (Sun) 13 283
Radio frequency amplifier 1 345, 11 301 14 358
Radio frequency bridges 7 40
Radio frequency power measurement 4 437 439
thermistor 13 556
Radio frequency spectroscopy 11 301*, 12 587
molecular beams 8 540 541
Radio frequency transformer 14 27 28
Radio inertial guidance 6 289
Radio nebula 9 24
see also Radio astronomy
Radio range 11 254 256
A N range 11 254 255
consol 11 255 256
navaglobe 11 256
Navarho 11 256
VHF omnidirectional radio range 11 256
Radio receiver 11 211, 256 259*
amplification 11 256
antennas 11 259
automatic frequency control (AFC) 1 675
automatic gain control (AGC) 1 675
detection 11 257
diversity reception 11 259
frequency modulation 11 258
heterodyne principle 6 429
intermediate frequency amplifier 7 194
noise filter radio 9 130
pentagrid converter 9 623
performance 12 309 310
regenerative 11 258
selectivity 11 256 12 163
Radio receiver—*cont*
servicing 3 135, 12 309 310
single sideband (SSB) receivers 11 258 259
static 13 54
superheterodyne 11 257
tuned radio frequency 11 257
tuning circuit 11 256
Radio spectrum allocations 11 259 261
allocation of frequency bands 11 259
amateur radio 1 298
assignment of specific frequencies 11 260
control agencies 11 260
extremely high frequency band 11 260
Federal Communications Commission 11 261
high frequency band 11 260
international control 11 261
International Frequency Registration Board 11 261
International Telecommunication Union 11 261
low frequency band 11 260
medium frequency band 11 260
radio broadcasting 11 247
spectrum conservation 1 351
super high frequency band 11 260
television 13 457
ultra high frequency band 11 260
United States control 11 261
very high frequency band 11 260
very low frequency band 11 260
Radio telemetry 13 426
bandwidth required 13 428
crosstalk 13 428
information efficiency 13 428
minimum required received-signal strength 13 428
Radio telescope 11 261-263
diffraction limitation 11 261
discrimination between signal sources 11 262 263
forms of 11 263
Radio transmitter 11 263 266
amplitude modulation 11 263-264
frequency modulation 11 264 265

Radio transmitter—*cont*
independent sideband 11 265
single-sideband 11 265
tank circuit 13 390
Radio wave propagation 11 319 322
beyond-horizon transmission 11 320 321
diffraction 11 320
fading 1 563, 11 320
ground effects 11 320
ground wave 1 563
influence of solar disturbances 13 285
ionosphere 7 254-255
ionospheric reflection 1 563
line of sight transmission 11 319 320
medium-frequency 1 563
meteor burst communication 11 321
microwaves 8 415
noise 11 321-322
radar 11 201-202
radio astronomy 11 243-247
radio broadcasting 11 248
radiotelephony 13 438-439
reflection 11 321
refraction 11 320
scatter transmission 11 321
sky wave 1 563
Radio waves generation 11 244
detection of nuclear explosions 9 183-184
extraterrestrial 11 241
see also Radiowave propagation, Transmission theory and methods
Radioactive contamination removal 4 37 38
see also Radioactive fallout
Radioactive decay constant 5 288-289
lead isotopes 7 427
nuclear rocket propulsion 7 211
time-interval measurement 13 646
see also Alpha decay, Beta decay
Radioactive fallout 11 266 268
cesium-137 11 268
fallout hazards 11 267-268
fallout radiation 11 266
local fallout 11 266 267
nuclear explosion 9 184
stratospheric fallout 11 267
strontium 90 11 268
trophospheric fallout 11 267
tropopause height 11 270-271
Radioactive isotope *see* Radioisotope
Radioactive lead 14 8
Radioactive minerals 11 268-269
monazite 8 566
nuclear fuel reserves 9 186-187
radiation damage 11 269
thorianite 13 609
thorium minerals 11 269
uraninite 14 209
uranium minerals 11 268
uranyl minerals 11 269
Radioactive species produced by cosmic rays 11 269-271
primary cosmic radiation 11 269
radioactive nuclides 11 270
secondary cosmic radiations 11 269
stable nuclides 11 270
Radioactive tracers *see* Tracer, radioactive
Radioactive waste disposal 8 131-132, 11 271-275*
future wastes from industry 11 272 273
gaseous wastes 11 272
liquid wastes 11 271-272
in the ocean 8 131
solid wastes 11 272
Radioactive well logging 14 471
Radioactivity 11 275 289
alpha ray decay 11 281 284
applications 11 289 290
average beta energy 11 285
Avogadro number 1 698
beta ray decay 11 284-286
beta rays 2 181 183
curie 3 623
decontamination 4 37 38
delayed neutrons 9 85-86
detection of nuclear explosions 9 183
dual decay 11 274
earth heat production 4 332
electron capture 4 503
electron capture transitions 11 286
exponential decay law 11 274
fission 5 288 289
gamma ray decay 11 286 289
gamma rays 6 34-35
Geiger Nuttall rule 11 282
half life 6 318 319
half period 11 275
heat production in earth 4 332 333
induced radioactivity 11 277
internal conversion 11 287 288
Radioactivity—*cont*
isomeric transitions 11 288 289
Kurie plots 11 286
low-level counting 7 594-596
mean life 11 274
natural radioactivity 11 276 277
neutrino 9 83
nuclear fuels 9 184 186
nuclear potential barrier 11 282-283
radioactive decay constant 11 273 274
radioactive equilibrium 11 276
radioactive fallout 11 266-268
radioactive series decay 11 275 280
radioactive transformation series 11 277-280
radioactive waste disposal 11 271-275
radioactivity standards 11 290 291
radiochemistry 11 299 300
radiometric assay 11 317
transition rates and decay laws 11 273-275
types 11 273
see also Beta decay, Radium, Thorium
Radioactivity (applications) 11 289 290, 14 7 9
analytical chemistry 11 290
in biology 11 289
in industry 11 289 290
isotope dilution techniques 7 293 294
marine sediments, rates of deposition 8 139
in medicine 11 289
neutron activation analysis 11 290
oceanic circulation measurement 9 254 255
oceanic mixing processes 9 254 255
prospecting methods 11 23 24
rock age determination 11 591 594
Radioactivity standards 11 290 291
curie 3 623
Radioautography *see* Autoradiography
Radiobiological effectiveness 7 522 11 221
Radiobiology 11 315
see also Radiation biology
Radiocarbon dating 11 291 297
ancient carbon 11 294 295
Radiocarbon dating—*cont*
applications of radiocarbon dating 11 296 297
background radiation reduction 11 292
black carbon counter 11 295
C^{14}/C^{12} ratios in fresh water systems 11 294
contamination with recent carbon 11 295
contemporary carbon 11 294-295
contemporary distribution of C^{14} 11 294
counting error 11 293
deviation in concentration 11 294
fossil man 5 477
gas proportional counter 11 293
isotope fractionation 11 294 295
laboratory error sources 11 293
limitations of method 11 293 296
measurement of radiocarbon 11 291 293
neutron shielding 11 293
Pleistocene chronology 6 194
postdepositional alteration 11 295
radiation counter 11 292
radioactive decay of carbon 14 11 291
removal rate of newly formed C^{14} 11 294
stable isotope ratio determinations 11 294 295
time variations in production rate 11 294
tree ring ages, comparisons 11 295
Radiochemical laboratory 11 297-299
operations 11 298
remote manipulation 11 298 299
safety 11 299
shielding 11 298
ventilation 11 297
Radiochemistry 11 299 301
analysis 9 179
biochemistry 2 199, 11 215 218
isotopic exchange reaction 11 300 301
isotopic tracer studies 11 301
see also Nuclear chemistry, Nuclear reaction, Tracer, radioactive
Radiocolloid formation 9 179
Radiogenic argon 11 594

ogenic heat in earth 4 332-
3 411-412
ogenic lead 11 594
earth (age of) 4 331
lead isotopes geochemistry
of 7 427
ogenic strontium 11 593
ography 1 299 13 425
ography 11 301 304
absorption laws 11 302
electronic radiography
11 303
equipment 11 302
Instantaneous radiography
11 303
kymography 11 303
of metals 11 304 306
microradiography 8 365
monochromatic
radiography 11 303
photographic film 11 302
principles and techniques
11 302 304
radiograph transmission
11 303 304
radium 11 322
radon 11 326
stereoscopic 10 160, 11 303
tomography 11 303
see also Radiology
Radiography of metals 11 304
306
electronic radiography
11 305
film radiography 11 304
fluoroscopy 11 305
*micror*adiography 11 305
polaroid radiography
11 305
Radiohydrogen 1 692
Radioiodine 13 621, 625
Radioisotope 11 306 14 7-9
activation analysis 1 59
in atmosphere 1 635
atmosphere, geochemistry
of 1 630
cosmic ray produced
11 269 271
dilution *see* Isotope
dilution techniques
handling 11 446
irradiation by 7 269
lead 14 8
production 11 310 315
radioactivity 11 277
shipping 11 314 315
Radioisotope (assay) 11 306
see also Radiometric assay
Radioisotope (biology) 11 306-
310
applications 11 308 310
interpretation of *tracer*
kinetics 11 307 308
methods 11 306
Radioisotope production
11 310 315
Radioisotope production—*cont*
fission product separation
11 313 314
radioisotope shipping
11 314 315
reactor production 11 310-
313
Radiolaria *see* Radiolarida
Radiolarian earth 11 315*, 12
139
Radiolarian ooze 8 135-136*,
11 315
Radiolarida 1 57, 422, 11 52,
315*, 12 27
chromosome number 5 107
Radiolarite 11 315, 12 139
Radiology 11 315 317
diagnostic 11 315
nuclear radiation (biology)
9 197
therapeutic 11 316
Radioluminescence 7 610
Radiometer Albrecht 11 215
Golay pneumatic 11 318
noise measurement 9 118
Radiometer, acoustic 11 316
317
Radiometric assay 11 306, 317*
see also Radioisotope
(assay)
Radiometry 11 317 318
bolometer 2 276
infrared detector 7 103
performance of detectors
11 318
quantum detectors 11 318
radiomicrometer 11 319
terrestrial radiation
11 214-215
thermal detectors 11 317
318
Radiomicrometer 11 319
Radiophares 4 231
Radiosensitivity (biology)
11 233
Radiosonde 8 318 319
data 14 458
radiowind system 8 318
Radiotelegraphy 1 364
amateur radio 1 298
amplitude modulation
radio 1 364
bandwidth requirements
2 94
code telegraphy 11 241
frequency diversity
reception 13 423-424
frequency shift keying
13 423
frequency shift
transmission 11 242
overseas 13 423
single sideband
transmission 13 423
space-diversity
reception 13 423 424
Radiotelephony
amateur radio 1 298
amplitude modulation
radio 1 364
frequency-modulation
radio 5 520 521
overseas 13 438 440
privacy 10 624
systems 1 364
Radiotheodolite 8 319
Radiotherapy radon 11 326
see also Radiology, Radio
isotope (biology) Ther-
motherapy, Ultraviolet
radiation biology
Radiothorium 11 278
Radish 11 322
Radium 11 322 324
analysis 11 324
carnotite 2 527
electron configuration
4 504
extractive metallurgy
8 278
ionization potential 4 504
metallurgy 11 323
occurrence 11 323
principal compounds
11 323 324
properties and uses 11 322
323
radioactivity 11 278
see also Radioactivity
Radium F 10 457-458
Radius 11 324
Radius (bone) 1 533
Radius of gyration 11 324
Radius vector 8 455
Radix 2 number system 4 176
Radome 11 325
impedance mismatch
11 325
materials 11 325
reflections 11 325
shell thickness 11 325
Radon 11 325 326
decay products *in*
atmosphere 1 630
electron configuration
4 504
ionization potential 4 504
radioactivity 11 278
see also Radium
Radula 6 415
Mollusca 8 560
oyster drill 9 477
Radula spores 8 568 570
Radux 9 20
Raetikon 5 117
Raffinate 12 498
Raffinose 2 452 11 326*
plant translocation
(organic solutes) 10 379
Rafflesia 1 532
Rafflesia arnoldi 1 532
Rafflesiacea 1 532
Rafters 13 620
Raglan Range 1 523
Rahn, J. H. 4 259
Rana clavata 4 428
Raiffa, H. 6 29
Rail 6 286, 11 326 327*
Railletella 2 643
Railroad engineering 11 327
331
air brake 1 142
alignment and grades
11 329
automatic scales 11 329
ballast 11 330
bridge 2 535
car retarders 11 329
classification yard 11 328
clearances 11 329
communications 11 328
construction standards
11 329
crossings 11 330
crossties 11 330
freight car 11 327
hump 11 329
locomotive 7 570 573
motive power 11 327
rail 11 330
rail transportation noise
9 125
refrigerator car 11 418
roadbed 11 329
rolling stock 11 327
sidings 11 330
signaling 11 327-328
superelevation 11 330
switches and frogs 11 330
telemetering 13 426
tie plates 11 330
track gage 11 330
track spacing 11 329
tunnels 14 141-144
yard operation 11 328
Railroad locomotive 7 570-573
Railroad signaling 11 327-328
automatic block 11 328
automatic train control
11 328
reverse signaling 11 328
speed control 11 328
Railroad traffic control system
14 15
Railway brake 2 518
Railway guns 1 539
Railway transportation 14 65
Rain forest 2 204
Rain gage 10 576
Rain prediction 14 451
Rain shadow 11 331
Rain making experiments
3 217-218
Rainbow 8 321, 11 331
dispersion 3 16
Rainbow vein 6 186
Raindrops 3 215 216
Rainey's corpuscles 12 30

Rainfall 10 573-575
artificial stimulation 3 217-218, 14 457
drought 4 275
fluctuation in 3 170
formation of 5 215
hurricane 6 520
measurement 10 576
over continents 5 177-179
radar detection 8 320
record observed 6 561
and soil erosion 12 432
steppe 15 125
thunderstorm 13 616
tornado 13 685
see also Precipitation (meteorology), Hydrometeorology, Cloud physics
Rainforest 5 467, 14 289
Africa 1 106
Asia 1 586-587
South America 5 468
Rainsquall 15 21
Raitt, R. W 8 532, 12 60
Rajadae 4 429
Rajiformes 4 418, 11 331*
Rallidae 3 462; 6 286; 11 326
Rallus elegans 11 326
Ram effect: gas turbine 6 65
Raman, C. V. 11 332
Raman effect 11 332-334
discovery of 11 332
theory 11 333-334
Raman spectroscopy 11 332-333*, 12 587-588
Ramanujan, S 9 226
Rampo Depth 4 326
Rambler 15 124
Ramie 11 334-335*, 12 79, 14 255
diseases 11 334
fiber, natural 5 250
Ramjet 1 175-176, 208, 7 308, 11 335-336*
characteristics 11 335
combustion 11 336
flight speed 11 336
fuels 11 336
performance 1 175-176
specific fuel consumption 11 335, 12 574
take-off 11 336
thrust 11 335
turboram jet 14 158
Ramon flocculation test 1 487
Ramonia tipuhiformis 7 466
Ramp function generator 4 191
Ramphastidae 10 213
Ramsay, Sir W 1 530, 6 591, 7 572, 9 36, 14 562
Ramsden eyepiece *see* Eyepiece
Ramsey, R. W 8 638
Ramsey, W H 4 340
Ramus 11 634
Rana 9 452, 12 361
Rana catesbeiana 5 537, 10 126
Rana clamitans 1 335
Rana esculenta 4 570
Rana fusca 11 527
Rana pipiens 1 333, 4 208, 5 538
Rana septentrionalis 1 333
Rana sylvatica 1 333
Rana temporaria 11 475
Rana virgatipes 12 8
Ranales 10 346
camphor-tree 2 433
nutmeg 9 235
tulip tree 14 135
Ranatra 6 404
Rance River 14 399
Random copolymer 10 478
Random drift population genetics 10 511
Random noise 9 117
acoustic noise 9 116-117
covariance function 9 118-119
electron-tube circuits 9 117
ergodicity 9 118
mathematical analysis 9 118-119
power spectral density 9 118-119
probability 9 118
radiated 9 117
semiconductors 9 117
Random noise generator *see* Noise generator, electrical
Random sampling 13 68
Random sampling numbers
Monte Carlo method 8 587
Random-signal generators 1 582
Random variables
distributions 10 628-629
statistics 13 66 75
Randomized block experiment 13 73
Randomized complete block design 5 144
Randox 6 421
Raney cobalt 6 543
Raney nickel 1 228
Range (beta rays) 2 181 182
Range goats 6 227
Range land conservation 11 337-338
grazing land economics 11 337
overgrazing, corrective legislation 11 337
problems, present and future 11 338
range inventory 11 337-338
range management plan 11 338
Range land conservation—*cont*
significant advances 11 338
types of grazing lands 11 337
Range management 4 400
Range paralysis *see* Neurolytm phomatosis
Range recorder (sonar) 12 505
Rangefinder, optical 11 338-340
camera rangefinders 11 339
cameras 2 431
coincidence rangefinders 11 339-340
depression rangefinder 11 340
heightfinders 11 340
military types 11 339-340
in periscope 10 18
prism, optical 10 624
rangefinder errors 11 340
split field rangefinder 11 339
stadia methods of rangefinding 11 340
stereoscopic rangefinders 11 340
superposed field rangefinder 11 339
Rangifer 2 522
Rangifer caribou 11 425
Rangifer tarandus 11 425
Rangitikei River 1 671
Ranidae 4 208, 5 538
Ranunculus lousianensis 4 33
Rank, D H 7 502
Rank, O 5 535, 11 74, 80
Rankine, W J M 13 166
Rankine body 12 523
Rankine cycle 11 341, 14 271-274
ion propulsion 7 243-244
Rankine Hugoniot curve 5 149
Rankine-Hugoniot equations (shock waves) 12 295
Rankine temperature scale 15 486-487
Ranidae 4 208
Ranney oil mining system 9 506
Ranney well 14 405
Ranunculaceae 10 483
Ranunculus 1 247, 15 122
Ranvier node 8 199
Raoult's law 12 487
distillation 4 247
molecular weight 8 557
Rapakivi granites 11 341
Rape 11 341 342
Rapeseed 11 341
oil 9 189
Raphanobrassica 10 489
Raphanus 8 239
Raphanus sativus 10 489, 11 322
Raphe 12 144
Raphia 5 37
Raphidae 5 302
Raphus cucullatus 5 302
Rapid Selector 10 148
Rapid sequence camera 2 4
Rapidoglossate radula 8 561
Rapids 5 360
fall line 5 179
Raramys delicatus 11 615
Rare gases *see* Inert gases
Rare-earth elements 11 342-3
cerium 2 655
dysprosium 4 315
erbium 5 64
europium 5 123
gadolinium 6 2
holmium 6 465
lanthanide contraction 7 399 400
lanthanum 7 400
lutetium 7 625
magnetochemistry 8 33
in monazite 8 566
neodymium 9 34
occurrence 11 342
praseodymium 10 564
promethium 11 5
properties 11 343 344
samarium 12 19 20
scandium 12 50
separation 11 342 345
terbium 13 494
thulium 13 616
uses 11 342
see also Actinide element
Rare-earth glass 9 352
Rare-earth ions 9 549
Rare earth minerals 11 342
Ras Dashan 1 107
Rasahus 6 409
Raschig process 10 112
Rasorite 2 501
Raspberry 5 548 549, 11 34
345*
anthracnose 11 344
and blackberry diseases 11 344 345
fruit worms 5 278
orange rust 11 344 345
verticillium wilt 11 344
virus diseases 11 345
Raster (television) 13 334, 4
Rastrites 6 259
Rat 11 345
chromosome number 3 3
RAT (Rocket assisted torped 1 496
Rat bite fever 2 70, 11 345-348*, 15 1
Rat Island 1 523
Rat snake 2 255
Rat tailed maggot 5 562 8 8
Ratchet 11 346
pawl 9 598 599
see also Escapement
Ratchet-wheel counter 3 517
Ratcliffe, F N 12 407
Rate constant kinetics 7 555

Rate gyros 6 510
Rate-of-climb indicator 11 346 347
Rate-of flow mass meters 5 320 321
Rate-of flow volume meters 5 315 319
Rateau C. E. A. 8 120
Rathke's pouch 10 247
Ratio 1 238 241
Ratio detector 5 517 519
  frequency modulation 5 517 519
Ratio test 12 190
Rational indices, law of 3 605
Rational numbers 1 239 9 224, 11 371
Rationalized mks system 4 460 461
Rattes 11 347
Ratoon stunting disease 13 243
Rattail 6 2
Rattan palm 1 587
Rattlesnake 11 347, 12 389
Rattus 4 384
Rattus norvegicus 10 256, 11 345, 527
Rattus rattus 10 256 11 345
Rattus rattus frugivorous 12 64
Raulin Thom medium 6 184
Rauwolfia 6 115 10 359, 11 347*
  pharmacognosy 10 95
Rauwolfia serpentina 11 347
Raven 11 347 348
Raw humus 5 464 465
Raw water 11 348
  treatment 11 348
Raw inosodes 8 321
Ray 5 416 11 348*
  fossil 2 111
Ray *see* Half life
Ray, John 1 422 12 571
Ray acoustics 1 518
Ray ellipsoid 3 588 589
Ray finned fishes *see* Actinopterygii
Ray tracing formulas 9 363 369 12 608-609
Raydist 9 15 20
Rayet, G 6 391
Rayfin 1 37 58
Rayl 7 36
Rayleigh, John William Strutt (Lord) 4 249 8 320, 11 373
Rayleigh, John William Strutt, third baron 6 303
Rayleigh, Lord 12 51 52, 515
Rayleigh criterion resolving power 11 499 500
Rayleigh current balance 3 627
Rayleigh equation 4 248
  gas dynamics 6 53
Rayleigh flow 6 53
Rayleigh-Gans scattering 12 52 53
Rayleigh interferometer 7 190
  light 7 504
Rayleigh Jeans radiation law 6 372
Rayleigh line 11 333
Rayleigh prism system 10 623
Rayleigh's ratio 12 51
Rayleigh scattering 11 332 333, 12 51
Rayleigh's theorem of reciprocity 11 373
Rayleigh waves 12 151
Rayon 5 242 246*, 14 526
Razor clam 5 100
Razor-billed auk 1 667
Razran, G 11 398
RBE *see* Relative biological efficiency
RC circuit 1 374, 4 223
  ac circuit 1 273
RC-coupled amplifier 1 665, 14 355 357
  high frequency gain 14 356
  interstage transfer function 14 357
  low-frequency gain 14 356
  midband region 1 346
  midfrequency gain 1 346, 14 356
  pass band 14 356 357
  vacuum-tube amplifier 1 343
RC filter 5 268
RC time constant 13 644
RCA Interchemical Color Corrector in color 10 607
RDX 5 151, 6 435
Reactance 11 348 349
  acoustic 7 36
  capacitive *see* Capacitive reactance
  inductive *see* Inductive reactance
  mechanical 7 37
  reactor, electric 11 349
Reactance tube modulator 5 514 515
Reaction (ecological) 3 324 325, 5 13
Reaction chemical *see* Chemical reaction
Reaction, nuclear *see* Nuclear reaction
Reaction coordinate diagram 9 399
Reaction force Newton's laws 9 91
Reaction principle propulsion 11 16 18
Reaction rate kinetics 7 355 356
Reaction rims 8 17, 297
  igneous rocks 7 14
Reaction series petrology 8 17 10 85
Reaction turbine 11 349, 14 148
  see also Turbine
Reaction type vibration machine 14 321
Reactivator 13 186
Reactive power measurement 14 368-369
Reactor, electric 11 349
  current limiting 11 349
  saturable 12 37
  series reactors 11 349
  shunt reactor 11 349
  see also Coil, Inductor
Reactor, nuclear 11 349 370
  alarm systems 1 222
  Čerenkov radiation 2 653
  classification 11 357-360
  control and instrumentation 11 355
  control drives and systems 11 355 356
  coolant 11 358
  coolant system components 11 352 353
  core design and materials 11 353 355
  dual purpose reactors 11 360
  electric power generation 4 452
  excessive pressure 1 222
  experimental reactors 11 360
  fast reactors 9 186
  fluid flow in 11 351 352
  fuel cladding 11 354
  fuel composition 11 358
  fuel distribution 11 358
  fuel materials 11 354 355
  fusion reactor 5 591 595
  heat conduction in 3 387-388
  heat removal from 11 349 353
  ion propulsion 7 243
  moderators 11 355
  neutron energy 11 357 358
  as neutron source 9 84
  nuclear fuels 9 184 188
  nuclear power 9 194 196
  power generation systems 11 357
  power rating 11 358
  power reactors 11 359
  process heat 11 360
  production reactors 11 358 359
  radiation damage 11 224 225
  radiation warning 1 222
  radioisotope production 11 310-315
  reactor coolants 11 350 351
  reactor instrumentation 11 356
  reactor physics 11 364 370
Reactor, nuclear—*cont*
  reactor safety 11 356 357
  research reactors 11 359-360
  runaway warming 1 222
  ship propulsion *see* Reactor, ship propulsion
  space vehicle 1 605
  structural materials 11 353-354
  thermal stress considerations 11 352
  thermoelectric power 11 358
  xenon formation in 14 562
Reactor, nuclear (classification) 11 357 360
Reactor, saturable 12 37
Reactor, ship propulsion 11 361-363
  marine machinery 8 116
  reactor types 11 363
  shipboard problems 11 361-362
Reactor physics 11 364 370
  albedo 1 223
  buckling 11 367
  critical mass 3 550
  criticality 11 364-367
  delayed neutrons 9 85 86
  diffusion coefficient 11 367
  fast effect 11 365
  fission 5 288
  fission neutrons per fuel absorption 11 366
  infinite multiplication constant 11 366
  migration area 11 367
  neutron age 11 366 367
  neutron cross section 9 86 88
  reactivity 11 367
  reflectors 11 367 368
  resonance escape probability 11 365
  thermal diffusion area 11 367
  thermal utilization factor 11 365 366
Read, J 3 357
Read, W 3 584
Readex microprint 10 148
Reading glass 7 454
Readout integrator 12 482
Reagent chemicals 11 370-371
  purification 11 370
  selective 11 371
  specific 11 371
  standards of purity 11 370 371
Real flow 5 321
Real gas 6 41
  dynamics 6 57
  flow of fluids 5 323
Real numbers 11 371
Real time 3 360

Rainfall 10 573-575
artificial stimulation 3 217-218, 14 457
drought 4 275
fluctuation in 3 170
formation of 3 215
hurricane 6 520
measurement 10 576
over continents 3 177-179
radar detection 8 320
record observed 6 561
and soil erosion 12 432
steppe 13 125
thunderstorm 13 616
tornado 13 685
see also Precipitation (meteorology), Hydrometeorology, Cloud physics
Rainforest 5 467; 14 289
Africa 1 106
Asia 1 586-587
South America 5 468
Rainsquall 13 21
Raitt, R W 8 532, 12 60
Rajadae 4 429
Rajiformes 4 418, 11 331*
Rallidae 3 462, 6 286, 11 326
Rallus elegans 11 326
Ram effect gas turbine 6 65
Raman, C V 11 332
Raman effect 11 332-334
discovery of 11 332
theory 11 333-334
Raman spectroscopy 11 332-335*, 12 587-588
Ramanujan, S 9 226
Ramapo Depth 4 326
Rambler 13 124
Ramie 11 334-335*, 12 79; 14 235
diseases 11 334
fiber, natural 5 250
Ramjet 1 175-176, 208, 7 308, 11 335-336*
characteristics 11 335
combustion 11 336
flight speed 11 336
fuels 11 336
performance 1 175-176
specific fuel consumption 11 335; 12 574
take-off 11 336
thrust 11 335
turboram jet 14 158
Ramon flocculation test 1 487
Ramosia tipulifformis 7 466
Ramp-function generator 4 191
Ramphastidae 10 213
Ramsay, Sir W 3 530, 6 591, 7 372, 9 36 14 562
Ramsden eyepiece *see* Eyepiece
Ramsey, R. W 8 638
Ramsey, W H 4 340
Ramus 11 634
Rana 9 452, 12 361
Rana catesbeiana 5 537, 10 126
Rana clamitans 1 353
Rana esculenta 4 570
Rana fusca 11 527
Rana pipiens 1 333, 4 208, 5 538
Rana septentrionalis 1 353
Rana sylvatica 1 355
Rana temporaria 11 475
Rana virgatipes 12 8
Ranales 10 346
camphor-tree 2 433
nutmeg 9 235
tulip tree 14 155
Ranatra 6 404
Rance River 14 399
Random copolymer 10 478
Random drift population genetics 10 511
Random noise 9 117
acoustic noise 9 116 117
covariance function 9 118 119
electron-tube circuits 9 117
ergodicity 9 118
mathematical analysis 9 118-119
power spectral density 9 118-119
probability 9 118
radiated 9 117
semiconductors 9 117
Random noise generator *see* Noise generator, electrical
Random sampling 13 68
Random sampling numbers
Monte Carlo method 8 587
Random-signal generators 1 382
Random variables
distributions 10 628-629
statistics 13 66-75
Randomized block experiment 13 75
Randomized complete block design 5 144
Randox 6 421
Raney cobalt 6 545
Raney nickel 1 228
Range (beta rays) 2 181-182
Range goats 6 227
Range land conservation 11 337-338
grazing land economics 11 337
overgrazing, corrective legislation 11 337
problems present and future 11 338
range inventory 11 337 338
range management plan 11 338
Range land conservation—*cont*
significant advances 11 338
types of grazing lands 11 337
Range management 4 400
Range paralysis *see* Neurolymphomatosis
Range recorder (sonar) 12 503
Rangefinder, optical 11 338-340
camera rangefinders 11 339
cameras 2 431
coincidence rangefinders 11 339-340
depression rangefinder 11 340
heightfinders 11 340
military types 11 339-340
in periscope 10 18
prism, optical 10 624
rangefinder errors 11 340
split field rangefinder 11 339
stadia methods of rangefinding 11 340
stereoscopic rangefinders 11 340
superposed field rangefinder 11 339
Rangifer 2 522
Rangifer caribou 11 425
Rangifer tarandus 11 425
Rangitikei River 1 671
Ranidae 4 208, 5 538
Raninoides louisianensis 4 33
Rank, D H 7 502
Rank, O 5 535, 11 74, 80
Rankine, W J M 13 166
Rankine body 12 523
Rankine cycle 11 341*, 14 271-274
ion propulsion 7 243-244
Rankine Hugoniot curve 5 149
Rankine Hugoniot equations (shock waves) 12 295
Rankine temperature scale 13 486 487
Ranidae 4 208
Ranney oil mining system 9 306
Ranney well 14 405
Ranunculaceae 10 488
Ranunculus 1 247, 13 122
Ranvier node 8 199
Raoult's law 12 487
distillation 4 247
molecular weight 8 557
Rapakivi granites 11 341
Rape 11 341 342
Rapeseed 11 341
oil 5 189
Raphanobrassica 10 489
Raphanus 8 239
Raphanus sativus 10 489, 11 322
Raphe 12 144
Raphia 5 37
Raphidae 5 302
Raphus cucullatus 5 302
Rapid Selector 10 148
Rapid-sequence camera 2 430
Rapidoglossate radula 8 561
Rapids 5 360
fall line 5 179
Raramys delicatus 11 615
Rare gases *see* Inert gases
Rare-earth elements 11 342 344
cerium 2 655
dysprosium 4 515
erbium 5 64
europium 5 123
gadolinium 6 2
holmium 6 465
lanthanide contraction 7 399 400
lanthanum 7 400
lutetium 7 623
magnetochemistry 8 53
in monazite 8 566
neodymium 9 34
occurrence 11 342
praseodymium 10 564 565
promethium 11 5
properties 11 343 344
samarium 12 19 20
scandium 12 50
separation 11 342 343
terbium 13 494
thulium 13 616
uses 11 342
see also Actinide elements
Rare-earth glass 9 552
Rare-earth ions 9 549
Rare earth minerals 11 342
Ras Dashan 1 107
Rasahus 6 409
Raschig process 10 112
Rasorite 2 301
Raspberry 5 548 549, 11 344 345*
anthracnose 11 344
and blackberry diseases 11 344 345
fruitworms 5 278
orange rust 11 344 345
verticillium wilt 11 344
virus diseases 11 345
Raster (television) 13 554, 475
Rastrites 6 259
Rat 11 345
chromosome number 3 107
RAT (Rocket assisted torpedo) 1 486
Rat bite fever 2 70, 11 345 348*, 15 1
Rat Island 1 323
Rat snake 2 255
Rat tailed maggot 5 362, 8 680
Ratchet 11 346
pawl 9 598 599
see also Escapement
Ratchet wheel counter 3 517
Ratcliffe, F N 12 407
Rate constant kinetics 7 355

Rate gyros 6 310
Rate-of-climb indicator 11 346 347
Rate-of flow mass meters 320-321
-of flow volume meters 315 319
au, C. E. A. 8 120
ke's pouch 10 247
o 1 238 241
o detector 5 517 519
frequency modulation 5 517 519
o test 12 190
onal indices law of 3 605
onal numbers 1 239, 9 224, 371
onalized mks system 4 460-1
ies 11 347
on stunning disease 13 243
ail 6 2
an palm 1 587
desnake 11 347, 12 389
tus 4 384
tus norvegicus 10 256, 345, 527
tus rattus 10 256, 11 345
tus rattus frigivorous 12 64
lin Thom medium 6 184
u olfia 6 115, 10 359
347*
pharmacognosy 10 95
u olfia serpentina 11 347
en 11 347 348
humus 5 464 465
water 11 348
treatment 11 348
insondes 8 321
5 416 11 348*
fossil 2 111
see Half life
John 1 422 12 571
acoustics 1 518
ellipsoid 3 588 589
finned fishes see Actinopterygii
tracing formulas 9 363-69, 12 608 609
dist 9 15 20
et G 6 391
lin 1 57 58
l 7 56
leigh John William Strutt Lord, 4 248, 8 320 11 373
leigh John William Strutt, third baron 8 305
leigh Lord 12 51 52 515
leigh criterion resolving power 11 499 500
leigh current balance 3 627
leigh equation 4 218
gas dynamics 6 53
leigh flow 6 53
leigh-Gans scattering 12 52 53
Rayleigh interferometer 7 190
light 7 504
Rayleigh-Jeans radiation law 6 372
Rayleigh line 11 333
Rayleigh prism system 10 623
Rayleigh's ratio 12 51
Rayleigh scattering 11 332-333, 12 51
Rayleigh's theorem of reciprocity 11 373
Rayleigh waves 12 151
Rayon 5 242 246*, 14 526
Razor clam 5 100
Razor billed auk 1 667
Razran, G 11 398
RBE see Relative biological efficiency
RC circuit 1 374, 4 223
ac circuit 1 273
RC-coupled amplifier 1 665, 14 355 357
high-frequency gain 14 356
interstage transfer function 14 357
low frequency gain 14 356
midband region 1 346
midfrequency gain 1 346 14 356
pass band 14 356-357
vacuum tube amplifier 1 343
RC filter 5 268
RC time constant 13 644
RCA Interchemical Color Corrector in color 10 607
RDX 5 151 6 435
Reactance 11 348-349
acoustic 7 36
capacitive see Capacitive reactance
inductive see Inductive reactance
mechanical 7 37
reactor, electric 11 349
Reactance tube modulator 5 514 515
Reaction (ecological) 5 324-325, 5 13
Reaction chemical see Chemical reaction
Reaction nuclear see Nuclear reaction
Reaction coordinate diagram 9 399
Reaction force Newton's laws 9 91
Reaction principle propulsion 11 16 18
Reaction rate kinetics 7 355 356
Reaction rims 8 17, 227
igneous rocks 7 14
Reaction series petrology 8 17 10 85
Reaction turbine 11 349, 14 148
see also Turbine
Reaction type vibration machine 14 321
Reactivator 13 186
Reactive power measurement 14 368 369
Reactor, electric 11 349
current limiting 11 349
saturable 12 37
series reactors 11 349
shunt reactor 11 349
see also Coil, Inductor
Reactor, nuclear 11 349 370
alarm systems 1 222
Čerenkov radiation 2 653
classification 11 357-360
control and instrumentation 11 355
control drives and systems 11 355 356
coolant 11 358
coolant system components 11 352 353
core design and materials 11 353 355
dual purpose reactors 11 360
electric power generation 4 432
excessive pressure 1 222
experimental reactors 11 360
fast reactors 9 186
fluid flow in 11 351 352
fuel cladding 11 354
fuel composition 11 358
fuel distribution 11 358
fuel materials 11 354 355
fusion reactor 5 591 595
heat conduction in 5 387 388
heat removal from 11 349 353
ion propulsion 7 243
moderators 11 355
neutron energy 11 357 358
as neutron source 9 84
nuclear fuels 9 184 188
nuclear power 9 194 196
power generation systems 11 357
power rating 11 358
power reactors 11 359
process heat 11 360
production reactors 11 358 359
radiation damage 11 224 225
radiation warning 1 222
radioisotope production 11 310 313
reactor coolants 11 350 351
reactor instrumentation 11 356
reactor physics 11 364 370
Reactor, nuclear—*cont*
reactor safety 11 356 357
research reactors 11 359-360
runaway warning 1 222
ship propulsion see Reactor, ship propulsion
space vehicle 1 605
structural materials 11 353 354
thermal stress considerations 11 352
thermoelectric power 11 358
xenon formation in 14 562
Reactor, nuclear (classification) 11 357-360
Reactor, saturable 12 37
Reactor, ship propulsion 11 361 363
marine machinery 8 116
reactor types 11 363
shipboard problems 11 361 362
Reactor physics 11 364 370
albedo 1 223
buckling 11 367
critical mass 3 550
criticality 11 364 367
delayed neutrons 9 85 86
diffusion coefficient 11 367
fast effect 11 365
fission 5 288
fission neutrons per fuel absorption 11 366
infinite multiplication constant 11 366
migration area 11 367
neutron age 11 366-367
neutron cross section 9 86 88
reactivity 11 367
reflectors 11 367 368
resonance escape probability 11 365
thermal diffusion area 11 367
thermal utilization factor 11 365 366
Read, J 3 357
Read, W 3 584
Readex microprint 10 148
Reading glass 7 454
Readout integrator 12 492
Reagent chemicals 11 370-371
purification 11 370
selective 11 371
specific 11 371
standards of purity 11 370-371
Real flow 5 321
Real gas 6 41
dynamics 6 57
flow of fluids 5 323
Real numbers 11 371
Real time 3 360

Real variable 11 371-372
functions 11 372
real numbers 11 371
Realgar 11 372
arsenic ore 1 550
structure 13 258
Reamer 11 372-373
Rearrangement collision 12 53
Rearrangement reactions 9 392
Reasoning 7 578
Reaumur temperature scale 13 486 487
Rebecca 9 20
Reber, Grote 11 216
Rebolder 13 186
Rebreathing masks 6 59
Receiver radar see Radar radio 11 256-259
telephone 13 430
television 13 469-475
Receiving antennas see Antenna (aerial)
Receiving gage 6 5
Receiving tubes 14 243
Recent 6 136, 142, 11 373*
Receptacle 2 324
Receptacle, flower 5 329
Receptor-effector mechanisms 8 196-197
Receptor organ 6 58, 12 179
Recessive Mendelism 8 223
Recessiveness, blending, dominance see Dominance, recessiveness, blending 4 262
Rechargeable battery see Storage battery
Reciprocal ellipsoid see Index ellipsoid
Reciprocal innervation 11 400
Reciprocal lattice 14 568-569, 572
Reciprocal sensitivity (physical system) 12 181
Reciprocal space 2 538
Reciprocating engine aircraft 1 167-170
Brayton cycle 2 320 321
exhaust noise 1 183
internal combustion engine 7 196-209
steam 13 78
Reciprocating pump displacement 4 245
steam 8 122
Reciprocity, principle of 11 373-375
electrical networks 11 374
electromagnetic systems 11 375
electrostatic systems 11 374
examples of reciprocal systems 11 375
gyrator 6 301
network theory, electrical 9 76
nonreciprocal devices 11 375
Reciprocity, principle of—cont
Rayleigh's theorem of reciprocity 11 373
Reciprocity laws number theory 9 225
Reckertia 3 77
Recognition score 8 218
Recoil motion 2 83
Recoilless rifle 1 537-538, 2 82-84
Recombination, bacterial 2 21
Recombination, genetic 11 375-380
bacteria and viruses 11 380
cytological observations in crossing over 11 379
delimitation of individual genes 11 379
effect of independent assortment 11 375
effects of crossing over 11 376
effects of linkage 7 526, 11 376
gene conversion 11 379 380
genetic maps 11 376 377
interference in crossing over 11 379
linkage groups 11 376
mechanism of crossing over 11 378
mitotic crossing over 11 379
multiple exchanges in crossing over 11 378
relation of genetic and cytological maps 11 377 378
strand relations in crossing over 11 379
tetrad analysis 11 378
molecular basis 11 380
Recomposed granite 1 535
Recon 11 379
gene 6 101 105
Reconstitution regeneration 11 418
Record changer and player 4 239 240
Recorder, disk see Disk recording
Recorder tape see Magnetic recording
Recording 11 380
disk 4 236 244
flight test data 1 194
instruments see Recording instruments graphic
magnetic 8 36 41
optical 9 353 358
of sound 12 518
television 13 458
Recording characteristics 4 238 239
magnetic recording 8 39 40
Recording instruments, graphic 11 380 383
circular charts 11 380
direct acting instruments 11 381
indirect-acting instruments 11 382
oscillograph 9 426
strip charts 11 380
X-Y recorder 11 383
see also Oscilloscope, cathode ray
Recording Optical Tracking Instrument 9 360
Recording storage tube 13 160
Records, phonograph compensation 4 238-239, 241
compatibility 4 244
disk recording 4 236 244
groove dimensions 4 241
manufacture 4 239
surface noise 4 243
16⅔-rpm 4 239-241
33⅓-rpm 4 239 241
45 rpm 4 239-241
78-rpm 4 239 241
Recrystallization 5 601
purification of reagent chemicals 11 370
temperature of nonferrous metals and alloys 6 378
Rectangle 11 383
area 1 528
square 13 27-28
Rectangular cavity resonator 2 577
Rectangular coordinate system 3 454
Rectangular drainage 11 585
Rectangular hyperbola 6 585
Recticornia 6 586
Rectirostrum 5 413-414
Rectifier 11 383 386
bridge 11 385
contact see Contact rectifier
controlled see Controlled rectifier
current ratings 11 386
diode, vacuum 4 205
full wave 11 384
gas tube 6 61 11 383
half wave 11 383-384
ignitron 7 20 22
inverse voltage 11 386
mechanical 8 189 190
mechanical see Mechanical rectifier
mercury-vapor see Mercury vapor rectifier
Metallic disk see Semiconductor rectifier
parallel 11 385
phanotron 6 61, 8 236
polyphase 11 384 385
power supply 10 560 561
reetigon 6 61
Rectifier—cont
ripple voltage 10 561, 11 385, 580
six phase 11 385
three phase 11 384
vacuum tube 11 383
vibrator 11 393
voltage multiplier circuit 14 366 367
semiconductor see Semiconductor rectifier
Rectifier voltmeter 14 373
Rectifying column 1 638
Rectigon 6 61
Rectigraph 10 144
Rectilinear coordinate system 3 454
Rectilinear figures 14 96 97
Rectilinear motion see Motion, rectilinear
Rectocelle 11 481
Rectum 1 487, 3 292, 4 42, 152, 162, 11 386*
Recurrent assemblages (artifacts) 1 514
Recurrent selection (plant) 2 329
Recurvirostra americana 1 697
Recycling operation 10 59
Red abalone 1 2 5
Red admiral butterfly 2 381
Red alder 11 386
Red algae 11 554
Red and Yellow Mediterranean soils 12 438
Red ash 1 576
Red bellied woodpecker 14 341
Red blood cell 2 265
see also Blood, Hemoglobin, Hematopoiesis
Red breasted merganser 4 291
Red bug 3 59, 14 815
Red cinnabar 8 228
Red clay, abyssal 8 135 137
Red clover 5 220
Red coral 3 474
Red durum wheat 14 480
Red dwarf star 11 387
Red fir 4 269
Red fox 5 490
Red fuming nitric acid see dimethyl hydrazine 11 6
Red giant star 6 184*, 13 39 45 109 14 279
Red-headed pine sawfly 6 540
Red legged grasshopper 9 416
Red maple 2 560, 8 99
Red mud 1 291
Red nickel ore 9 94
Red nitric acid 11 6
Red oak 9 237
Red pigments 10 224
Red Poll cattle 2 566
Red radiation 14 441
Red salmon 12 14
Red Sea 1 107, 108 7 56, 58 8 207, 9 249, 271

d shafted flicker 5 300
d shift 11 357
cosmology 3 510
galaxies 6 9 12
light 7 505 506
ed shouldered hawk 6 345
ed Spot Jupiter 7 322 323
ed squill 11 615
ed squirrel 13 51
ed stele 13 172
ed tide catastrophic death 9 516
Dinoflagellida 4 197
Pyrrophyta 11 132
ed top grass 11 387
ed wine 14 507
Red winged blackbird 2 254
Red winter wheat 14 480
Red wolf 14 522
Red Yellow Podzolic soils 12 459
Redbed 11 387 389
Catskill delta 4 88 89
hematite 6 395
shales 12 241
Tatarian 10 23
Redberry *Eugenia* 7 268
Redbird 2 490
Reddish Brown Lateritic soils 12 440
Redei's theorem 6 255
Redgum 13 336
Redhead duck 4 291
Redheaded woodpecker 14 541
Redhorse 13 236
Redi, Francesco 7 496
Redia 4 148 5 185
Redox process 10 429
Redrawing operations sheet metal 12 251
Redstart 11 389, 14 394
Redstone missile 1 540
Redtop grass 11 387
Reduced latitude 6 322
Reduced pressure 6 45
Reduced temperature 6 45
Reducing agents (chemistry) 9 458
hydride, metal 6 531
nonferrous pyrometallurgy 11 122
Reducing atmosphere theory (origin of life) 7 497
Reducing sugars 2 452
Reduction (chemical reactions) 9 464 466
alcohol production 1 225
of aldehydes 1 228
amination by 1 394
electrochemical process 4 466
nonferrous pyrometallurgy 11 121 124
in pyrometallurgy 11 118
Reduction (data) *see* Data reduction
Reduction formulas 14 95
Reduction gears 8 111
Reduction of gravity 13 517-518
Bouguer 13 517-518
free air 13 517
isostatic 13 518
Reduction photography 10 163
Reduviidae 5 6, 6 401, 7 364, 14 487
Reduvius personatus 7 364
Redwood 2 205 3 187, 11 389
Ree, Lake 5 116
Reed 13 535
Reed Sternberg cell 6 460
Reef 11 389
algae, fossil 1 237
atoll 1 646-647
barrier reef 2 103
Capitan Reef 10 24
coral 3 474 475, 12 76, 123
fossil sponges 10 519
talus breccia 2 326
Reef builder worm 10 461
Reefer (ship) 12 267
Reels magnetic recording 8 38
Reentrant cavities 2 577
Reentry 11 389 391
aerodynamic drag 11 390
aerodynamic heating 1 104
atmosphere entry 11 390
ballistic zero lift 12 551
deceleration 11 390, 12 551
heat dissipation 12 554
heating rate 12 551
hypersonic flight 6 591
missile 8 514
nose cone 9 167 168
space vehicle 1 606
spacecraft structure 12 551 556
wing structure 14 510
Reeves, H 4 11 98
Reevon 5 244
Reference, frame of *see* Frame of reference
Reference junction 13 563
Referred pain, deep 9 492
Refined food processing 5 381
Refined oil 10 72
Refinery oil gas 5 552
Refinery sludges 10 72
Refining lead 7 433
nonferrous pyrometallurgy 11 124 125
pyrometallurgy 11 118
Refining (petroleum) 10 65 71
Refining zone 14 619
Reflectance spectra 12 583
Reflected waves 12 151
Reflecting antenna *see* Antenna (aerial)
Reflecting power electroplating of metals 4 534
Reflecting prism 10 623
Reflecting telescope 13 448 452
Reflection (electromagnetic radiation) 7 499 11 391 395*
albedo 1 222 225
Reflection (electromagnetic radiation)—*cont*
Fresnel s law 11 391
frustrated total internal reflection 7 182 185
geometrical optics 9 363
interference of waves 7 186-189
ionic crystals 7 251
light 7 499
microwave optics 8 416-417
mirror optics 8 506 510
normal incidence reflectivity 11 391-393
oblique incidence 11 393-394
plane parallel interfaces 11 391 392
polarized components 11 393 394
radar antennas 11 203
radio-wave propagation 11 321
reflection from dielectric 11 391-394
reflection from metals 11 394 395
selective 1 17, 11 394
thin films 11 392 394
Reflection (sound) 11 395 396
architectural acoustics 1 519
echos 4 377-378
reverberation 11 537 539
Reflection light 7 24
diffuse 7 24
mat surface 7 25
semimat surface 7 25
spectral characteristics 7 25
specular 7 24
Reflection and transmission coefficients 11 396 397
acoustics 1 518 11 397*
optics 11 396-397
transmission lines and networks 11 397 14 50
wave guides 11 396 397
Reflection coefficient 11 396 397
Reflection grating 4 139 141
Reflection nebulae 7 219 220, 9 24
Reflection of space 13 362 363
Reflection shooting 6 169 170
frequency range 12 148
seismology 12 157
Reflection symmetries 13 362 363
Reflection x ray microscopy 8 402
Reflectivity 11 391 395
defined 11 391
Fabry Perot interferometer 7 193
of interference *filters* 7 182 185
Reflectivity—*cont*
interference of waves 7 187-189
mirror optics 8 510
Reflectometer, light 10 172
Reflectometer, microwave 7 45-46*, 11 397
Reflector antenna 1 447
ellipsoidal 11 3-4
elliptical 7 27
navigation systems 9 18
parabolic 7 27
paraboloidal 11 3-4
radar antenna 11 203
Reflector boiler 12 469
Reflector microphone 8 364
Reflector, passive navigation systems 9 18
Reflex, conditioned 4 42, 11 397-399*
behavioral psychophysics 2 158
factors in conditioning 11 397
instrumental conditioning 11 399
learning theories 7 441
neural mechanisms 11 398
operant conditioning 11 399
properties of conditioning 11 398
Reflex, labyrinthine accelerator 10 529 530
Reflex, righting 10 529
Reflex, tonic labyrinthine 10 529
Reflex tonic neck 10 529
Reflex, unconditioned 4 42, 11 399-402*
behavioral psychophysics 2 158
convergence 11 400
divergence 11 400
excitation 11 400
flexion 11 401
inhibition 11 400
intersegmental 11 402
lengthening 11 401
reciprocal innervation 11 400
reflex arc 11 399-400
reflex pathway classification 11 401
regulation of posture 10 527
segmental 11 401
stepping 11 401
stretch 11 401
suprasegmental 11 402
Reflex act 4 42
Reflex arc 9 54 55, 11 399-400
nervous system (invertebrate) 9 65
Reflex camera 2 429
Reflex finders cameras 2 428
Reflex klystron oscillator 7 367

Reflex-klystron oscillator—*cont*
Applegate diagram 7 368
bunching action 7 368
electronic modes 7 368
frequencies 7 368
Reflex printing 10 166
Reflex sight 6 298
Reflux distillation 4 249
Reformatsky reaction 1 230; 11 402 403*
aldehyde 1 230
condensation reaction 3 376
ketone 7 339
Reforming (petroleum refining) 11 403-404
cracking 5 532 535
dehydrogenation 4 46
fuel gas supplements 5 553-556
Refractaloy 7 265
Refracted waves 12 151
Refracting telescope 13 448-452
Refraction (molar) 11 404-405
Refraction, double *see* Birefringence
Refraction of waves 11 405-408
atmospheric 11 407
conical 5 592
crystal optics 5 587-592
double refraction 11 406-407
electromagnetic waves 11 406 408
electron diffraction 4 506-507
geometrical optics 9 363
light 7 499
microwave optics 8 416-417
optical lenses 7 451-454
radio wave propagation 11 320
rainbow 11 331
refraction (molar) 11 405
refractometric analysis 11 408-409
seismic waves 11 408
seismology 12 151
shore processes 12 300
Snell's law 11 405 408
sound 1 632, 11 408, 12 413, 516
atmospheric acoustics 1 632
SOFAR 12 413
spherical and aspheric surfaces 12 608 609
visible light 11 406 407
water waves 11 408
wave motion 14 425-429
Refraction shooting 6 168-169*; 12 148
seismology 12 156
soil site investigations 12 455
Refractive index 3 89 90*, 8 186
dichroism 4 107-108
electron optics 4 514
Faraday effect 5 181-182
Maxwell's equations 8 186
optical materials 9 350 352
reflection 11 391-395
refraction (molar) 11 404
Refractive materials, artificial 1 449
see also Optical materials, Refraction of waves
Refractometer 6 97, 11 408
Refractometric analysis 11 407-409
Refractometry *see* Refractometric analysis
Refractory 11 409 411
aluminosilicate refractories 11 409
dolomite refractories 11 410
furnace construction 5 577
heat resisting alloy 7 266
magnesite refractories 11 409 410
manufacture 11 410
miscellaneous materials 11 410
properties 11 410 411
silica 11 409
see also Abrasive
Refractory alloys spacecraft structure 12 556
Refractory clay 7 330
Refractory porcelain 7 374
Refractory sand 12 22
Refrigerant 11 414-415
Refrigerated truck 11 411
Refrigeration 11 411 415
absorption cycle 11 413
air cooling 1 147
air cycle 11 414
carbon dioxide 2 466
cold storage 3 274
compressor 3 549-553, 11 415
condenser, vapor 11 415
cooling tower 3 452
cryogenics 3 572 575
cycle *see* Refrigeration cycle
evaporator 11 415
expansion valve 11 415
ice manufacture 7 4 6
marine *see* Marine refrigeration
liquefaction of gases 7 536
marine machinery 8 125
packing house 9 480
plant 14 271 272
refrigerants and equipment 11 414
ton of 13 666
Refrigeration—*cont*
vapor compression cycle 11 412
Refrigeration cycle 11 415-417
cryogenics 3 574 575
modifications to reverse Carnot cycle 11 416
reverse Brayton cycle 11 417
reverse Carnot cycle 11 416
Refrigerator 11 417 418
cryogenics 3 572 575
electric 11 417
gas *see* Gas refrigerator
magnetic 3 574
thermostat 13 593
Refrigerator car 11 418
Regadrella 6 433, 13 10
Regain moisture content 8 533
Regalecus glesne 7 389
Regan, C T 9 442
Regen, J 10 129
Regeneration (biology) 11 418 424
Bryozoa 2 356
nerve 11 423-424
Ophiuroidea 9 344
plant morphogenesis 10 561
Polychaeta 10 465
Porifera 10 518
regeneration in invertebrates 11 418 421
regeneration in vertebrates 11 421 424
regenerative capacity 11 418
Rhynchocoela 11 559
Regeneration (engineering) 11 424
Regenerative detector 1 361
Regenerative heat cycle steam engine 14 272 275
Regenerative open hearth furnace 13 95
Regenerative radio receiver 11 258
Regenerative reheat cycles 10 558
Regenerator (stripping column) 13 186
Regional channels (broadcasting) 1 363, 11 249
Regional climax 13 234
Regional limits 4 102
Regional metamorphism 8 304 11 591
stress cause of 10 88
temperature, result of 10 88
Regional planning 7 592
river development 11 582 583
Register air 11 424
location 11 424
Register circuit 13 349
Regolith 11 424 425
Regosols 12 440
Regression (mathematics) statistics 13 74
see also Biometrics
Regular flower 5 527
Regular hexagon 6 454
Regular polygon 10 471
Regular polytopes 10 491-492
Regular solutions 12 488 490
Regularia 4 370, 11 425*
Regulation 11 425
Regulation of posture 10 527-530
Regulative egg 5 168, 9 459
Regulator 11 425
Regulator, voltage *see* Voltage regulator
Regulex 4 230
Regulus 7 455, *13 41*
Regulus calendula 7 361
Regulus I missile 1 543 544
Regur 12 437
Reheating (steam) 11 425
reheat cycle 14 273
Rehm, W 9 458
Reichelderfer, F W 2 93
Reichenbach, H 7 579
Reichenstein, J F M von 13 482
Reichert Meissl value fat and oil, nonedible 5 189
wax 14 444
Reichstein, T 1 232, 575, 6 482
Reid vapor pressure 14 274
aircraft fuel 1 178
Reighardia 2 643
Reighardiidae 2 643
Reindeer 11 425
Reines, F 9 83
Reinforced concrete 11 426
column 3 371
concrete beam 3 367 370
loads 11 426
prestressed 10 585 587
steel 11 426
see also Concrete
Reinforcing filler rubber 11 636
Reinsert compound 11 191, 195
isoquinoline 7 289
Relapsing fever 1 431, 5 7, 11 426, 13 2
Ixodides 7 298
in man 11 426
prevention 11 426
transmission 11 426
type species characteristics 11 426
Relative acceleration 11 427
Relative biological efficiency (RBE) 9 197, 11 221
Relative error 12 510
Relative humidity 6 515*, 11 83

elative humidity—*cont*
air conditioning 1 144
bioclimatology 2 201
measurement 6 572 573, 8 535
elative humidity measurement psychrometrics 11 82 84
wet- and dry bulb thermometers 11 82
elative motion 11 426 428
friction 5 535 536
relative acceleration 11 427
relative velocity 11 427
space time 12 556 557
elative permittivity *see* Dielectric constant
elative velocity 11 427
elativistic cosmology *see* Cosmology
elativistic electrodynamics 11 428-431
circular particle accelerators 11 430 431
electromagnetic radiation 11 431
invariance of Maxwell equations 11 428
linear particle accelerators 11 429-430
particle accelerators 9 574
relativistic beams 11 428 429
synchrotron radiation 11 431
elativistic mechanics 11 431-433
first law of motion 11 431 432
four-dimensional formulation 11 432
longitudinal mass 11 432
relativistic hydrodynamics 11 432 439
relativity 11 434-435
rest mass 11 535
second law of motion 11 432
transverse mass 11 432
uniformly accelerated motion 11 432
Relativistic quantum theory 11 179 140
Relativistic wave equation 11 157
Relativity 11 433 438
and causality 2 571
clock paradox 5 206 207
deflection of light 11 438
Einstein's elevator 11 436
Einstein's law of gravitation 11 436 437
Einstein shift 4 417
expanding universe 6 9
Fitz Gerald Lorentz contraction 11 434
Relativity—*cont*
four dimensional formulation 11 434 435
fourth dimension 5 490
frame of reference 5 492 493
general theory 11 435 438
gravitational waves 11 437
graviton 6 266
inertia of energy 7 90
law of geodesic motion 11 436-437
light 7 504 506
Lorentz transformations 7 585 586
moving frames of reference 11 433 434
observational tests of general theory 11 438
orbit of Mercury 11 438
principle of covariance 11 436
principle of equivalence 11 435-436
quantum field theory 11 151 153
relativistic electrodynamics 11 428 431
relativistic mechanics 11 431-433
rest mass 11 535
Schwarzschild's solution 11 437
solutions of field equations 11 437 438
special (restricted) theory 11 433 435
time-dilatation 11 434
verification by solar-eclipse photographs 4 381
Relaxation (physics) 8 541
Relaxation, magnetic *see* Magnetic relaxation
Relaxation oscillator 11 438 440
astable multivibrator 11 439
blocking oscillator 2 262 11 438
gas tube 11 438 439
glow tube 11 438
multivibrator 8 628 632
pulse generator 11 93 94
saw tooth generator 12 43
solid state devices 11 439
thyratron 11 439
transistor 11 439
trigger circuit 14 90 91
vacuum tube 11 439
Van der Pol oscillator 11 439
Relaxation process magnetic 8 42
Relaxation spectra 4 115
Relaxation time (electrons) 11 440
Relaxation time (electrons)—*cont*
Boltzmann transport equation 2 282
kinetic theory 7 553 555
Relaxation times (magnetic) 8 41 43
Relaxation time (plasma physics) 10 594-595
Relaxin 11 477
Relay 11 440-442
armature or clapper type 11 441
balanced beam 11 442
blowout coil 2 270
contact arrangements 11 441
contacts 3 420
differential principle 11 442
electromagnet 4 489
function 11 442
induction 4 446
induction-cylinder 11 441
induction-disk 11 441
instantaneous 11 440
mechanical design 11 440
nomenclature 11 441
plunger 4 446 11 441
protective 4 446 448
storage devices 13 159
switching 4 178
thermal 11 442
time action 11 440
Reliability of equipment 11 443-445
air armament 1 534 535
component design 13 379
electronic circuits 9 134
engineering application 11 445
failure rate 11 443
guided missile 6 291
joint probability 11 443 444
maintainability 8 75
mathematical basis 11 443
miniaturization of equipment 8 468 471
molecular electronics 8 545
number of failures 11 443
number of survivors 11 443
parallel reliability 11 444
probability 11 443
reliability predictions 11 444
reliability program 11 445
series reliability 11 444
single unit 11 443
systems engineering 13 379
vacuum tube reliability 14 251
Relict faunas 7 273 274
in Black Sea 2 255
macroevolution 8 14
Relief features on maps 2 534 5 425 13 677
Relief (letterpress) processes
aniline presses 10 620
flat bed presses 10 620
offset presses 10 621 622
platen presses 10 620
printing press 10 619 621
rotary presses 10 620
Relief printing flat bed presses 10 599 600
platen presses 10 600
printing 10 598 600
rotary presses 10 598 599
special presses 10 600
typesetting 10 598
Relief valve 12 3, 14 260 261
safety valve 12 3
Reluctance 11 445 446
magnetic units 4 461
in parallel 11 446
in series 11 446
Reluctance motor 11 446
alternating current motor 1 284
torque 13 371 372
Reluctance torque synchronous motor 13 371-372
Remainder term series 12 192
Rem 11 616
Remalloy 8 35
Remane, A 11 633
Remanence 4 489 6 599
electromagnet 4 489
Remanent magnetization of rocks 11 595
Remiges 5 195 197
Remington, C L 7 463, 473
Remora 4 358
Remote control system 11 446-447
alarm systems 1 222
electric power substation 4 440
master-slave manipulator 11 446
repeater, synchro 11 447
telemetering 11 446
television 11 446
Remote cutoff 9 627
Remote guidance drone aircraft 4 274
Remote manipulators radiochemical laboratories 11 298 299
Remsen I 12 1
Renal artery 1 487
Renal calculi 3 194
Renal capsule 14 221
Renal colic 7 343
Renal disease 9 40
Renal failure 7 344
Renal function 14 229 232
tests 3 193
Renal plasma flow 14 231
Renal portal veins 2 499
Rendering fat and oil, nonble 5 190
food 5 388

Rendzina soil 12 437
René 41 7 266
Renewable fuse 5 578
Renewal time (estuary) 5 82
Renierite 6 176
Renilla 3 255, 9 65
Renilla amyethystina 9 621
Renner, Paul 14 171
Rennet 3 11
  pepsin 9 628
Rennin 4 167, 5 27, 204, 14 232-233
  endocrine gland 4 588
  protein metabolism 11 42
Rense, W 13 272
Rep 11 616
Repair ship 12 267
Repeater submarine telephone cable 13 439
Repeater, synchro 11 447-448*, 13 368 369
  single input 11 447
  two inputs 11 447-448
Repeating theodolite *see* Theodolite
Reppe, J W 1 37, 3 640
Reppe process 5 565
Reppe synthesis 4 117
Reprecipitation 10 573
Representation theorem information theory 7 102
Reprocessing (nuclear fuel) *see* Nuclear fuels
Reproducer, disk *see* Disk recording
Reproduction, animal 11 448-450
  asexual reproduction 11 448-449
  autogamy 11 450
  binary fission 11 448
  budding 11 448 449
  conjugation 11 449-450
  fertilization 11 450
  fragmentation 11 448
  multiple fission 11 448
  parthenogenesis 11 450
  polyembryony 11 449
  schizogony 11 448
  sexual reproduction 11 449 450
  sporulation 11 448
  syngamy 11 450
Reproduction, plant 11 450-454
  asexual reproduction 11 450 452
  deviations 11 454
  fertilization 11 454
  grafting of plants 6 245
  plant growth 10 329
  pollination 11 454
  seed development 11 454
  sexual reproduction 11 452 454
Reproduction, sound *see* Sound reproduction
Reproductive behavior 11 454-462
  care of the young, birds 11 460
  care of young, mammals 11 460
  courtship and pair formation 11 455-456
  egg fertilization 11 456
  egg incubation 11 459
  Hymenoptera 6 573-583
  nest building, birds 11 458
  nest building, fishes 11 459
  nest building, mammals 11 458
  parental behavior 11 458-462
  physiological regulation 11 456-457, 460
  pregnancy and birth 11 459
  reproductive territory 11 455
  sexual behavior 11 455-458
Reproductive growth (plant) 10 332
Reproductive system 7 136, 11 462-480*
  androgen 11 477
  auxiliary glands histology 11 473
  breeding season 11 475
  comparative anatomy 11 468 473
  copulatory organs 11 466 467, 472-473
  corpus luteum histology 11 474
  embryology 11 462-468
  endocrine function in reproduction 11 476-478
  estrogen 11 477
  estrus and menstrual cycles 11 475 476
  excretory ducts histology 11 473
  external genitalia histology 11 474
  factors controlling fertility 11 479 480
  fallopian tube 5 179, 11 474
  female genital tract differentiation 11 466
  female reproductive system histology 11 474
  genital ridge 11 462 463
  genital tract development 11 465 466
  gestation period 6 182
  gonadal abnormalities in embryology 11 465
  gonad development 11 462 463
  gonad organogenesis 11 464
  histology 11 473-474
  hormonal control 11 477
Reproductive system—*cont*
  hormonal control in embryology 11 467-468
  indifferent stage in embryology 11 465-466
  Insecta 7 136
  lesions 11 479
  male ducts 11 471 472
  male genital tract differentiation 11 466
  male reproductive system histology 11 473
  mating 11 476
  medullary cords origin 11 464
  menstruation 11 476
  neural humoral control 11 479
  neuroendocrine function 11 478 479
  ovarian organogenesis 11 463
  ovaries 11 464, 468-469, 474
  oviducts 11 469 470
  ovum maturation 11 474
  penis 11 473-474
  physiology 11 474-480
  pituitary hormones 11 476-477
  scrotum 11 473
  sex determination in embryology 11 462
  sex reversal of the gonad in embryology 11 465
  sterility, factors controlling 11 479-480
  testes 11 464, 470-471, 473
  testicular organogenesis 11 463
  urinary system role in embryology 11 462
  uterus 11 474, 14 236
  vagina 11 474
Reproductive system disorders 11 480-482
  female system 11 480 481
    benign tumors 11 481
    cervix uteri 11 481
    malignant tumors 11 481
    ovaries 11 480 481
  pelvic endometriosis 11 481
    uterus 11 481
    vagina 11 481
    vulva 11 481
  hermaphroditism 6 425
  male system 11 481 482
    epididymis 11 482
    penis 11 482
    prostate 11 482
    testicles 11 481 482
    urethra 11 482
    vas deferens and seminal vesicles 11 482
Reproductive territory 11 455
Reptantia 4 28
Reptilelike dinosaur 11 484
Reptilia 1 420, 8 13, 11 482-483*, 15 530
  Amniota 1 328
  Anapsida 11 483
  Archosauria 11 483
  characteristics *11 482 483*
  Chelonia 11 482
  comparison of 11 483
  Crocodilia 3 551 555, 11 482
  Eurapsida 11 483
  Lepidosauria 11 483
  Parapsida 11 483
  phylogeny 11 483
  Rhynchocephalia 11 482
  skink 12 373
  Squamata 11 482
  Synapsida 11 483
Reptilia fossils 11 483 484
  Anapsida 11 484
  Archosauria 11 484
  fossil groups 11 484
  Ichthyopterygia 11 484
  Lepidosauria 11 484
  paleoecology 11 484
  Synapsida 11 484
  Synaptosauria 11 484
Repulsion induction motor 11 485
Repulsion motor 1 285, 11 484-485*
  brushes 5 328
  commutator 5 328
  repulsion induction motor 11 485
  repulsion start, induction run motor 11 485
Repulsion start, induction run motor 11 485
Résal's equation 2 84
Rescue chamber (submarine) 13 213-214
Reseda luteola 5 296
Reserpine 10 95, 359, 14 16
Reserve battery 11 485-487
  electrolyte activated batteries 11 486
  gas activated batteries 11 486
  thermal batteries 11 486
  water-activated batteries 11 485
  see also Battery (electric)
Reservoir 5 99, 11 489, 14 399-400
  distribution 14 406
  silting in 14 399
  source of water 14 405
  storage 14 406
  water 14 406
  water conservation 14 392
Reservoir rock 10 61-65
Reservoir traps (petroleum) 10 63
Residential wiring 5 393
Residual current 10 455
Residual fuel oil 10 72

Residual insecticide 7 140
Residual magnetism 4 224
Residual oil 10 54 55
Residual rare ionic crystals 7 251
reflection 11 394
Residual regolith 11 425
Residual resistivity 11 497
Residual soils 4 614
Residual valence 3 458
Residue theorem number theory 9 224
Residue gas 9 3
petroleum engineering 10 58
Residues petroleum products 10 72
Residuum crude oil fraction 10 60
Resilience 11 487
elastic strains 13 185
Resin 11 487* 14 215 217
adhesive 1 66
adhesive, structural 1 67
amber 1 299
definition 10 474
ion exchange 7 241 243
paint 9 405
in textile finishing 13 539 540
see also Polymer
resin acids 11 629
resin duct 12 128
resin of guaiac 7 314
resinite 5 252
resist printing 13 542
Resistance 4 458 459* 11 493
electric 12 487
electrical measurements 11 490 493
parallel combination 4 222
printed circuit components 10 596
series combination 4 222
Resistance (ships) 12 276 279
ship design 12 289 290
Resistance acoustic 7 36
Resistance drug see Drug resistance
Resistance electrical 11 487
electrical units 4 461
of insulators at low temperatures 3 592
IR drop 7 257
iron alloys 7 264 265
lattice vibrations 7 412 413
measurement 11 490 495
of metals at low temperatures 3 581 592
microbiology 12 169
ohm 9 276 277
Ohm's Law 9 277
standards of 4 458 459
see also Resistivity, electrical
Resistance mechanical 4 11, 7 37
forced oscillation 5 437
see also Friction
Resistance brazing 2 322
Resistance commutation 5 527
Resistance decade 11 494
Resistance heating 6 577, 11 487 490*
direct heating 11 487
electrical input 11 489
heat transfer 11 488
iron alloys 7 264 265
molten salts 11 488
operating voltage 11 490
ovens and furnaces 11 487
resistor materials 11 488
temperature control 11 490
Resistance measurement 11 490 495
ac resistance 11 492
applications 11 495
electrical circuit testing 5 157
comparison methods 11 492
comparison by potential drop 11 492
deflection methods 11 492
high resistance 11 491
inductive resistance 11 491
Kelvin bridge 7 334 335
low resistance 11 491
megger 8 208 209
ohmmeter 9 277 278 11 492
resistance decade 11 494
resistance standards 11 493
spurious leakage paths 11 491
voltmeter ammeter method 11 492
Wheatstone bridge 14 485 492
Resistance ratio bridge 2 442
Resistance standards 11 493
primary 11 493
secondary 11 493
Resistance testing insulation see Insulation resistance testing
Resistance thermometer 13 588
low temperature thermometers 7 600
Resistance upset welding 14 468
Resistance welding 11 495 496
current controls 11 496
flash welding 5 296* 11 497
heat generated 11 495
mechanical structure 11 495
percussion 11 495
principles 11 495
projection 11 495
seam 11 495
spot 11 495 13 12
Resistance welding—cont
upset 11 495
welding and cutting of metals 14 467 468
welding time controls 11 496
Resistive ink 10 596
Resistivity, electrical 11 496 497*, 13 296
conductivity 3 391 392
of the earth 13 507
electrical conductivity of metals 11 496 497
electrical units 4 461
of ice 13 513
insulation, electric 7 155
mineral prospecting 11 22 23
pressure variation 11 496 497
residual resistivity 11 497
soil site investigations 12 455
sources of resistivity 11 497
of superconductors 13 296 300
temperature variation 11 496
thermal conductivity 3 390
Resistivity, thermal 3 390
Resistivity well logging 14 471
Resistor 11 497 499
adjustable 1 664 11 498
attenuator 1 664
ballast see Ballast resistor
composition resistor 11 498
construction 11 498
for electronic circuits 11 498
film type resistor 11 498
inductive wire wound 11 498
instrument resistors 11 497
IR drop 7 257
noise 9 117
noninductive wire wound 11 498
pad 1 664
potentiometer 10 542 543
power resistors 11 497
printed circuit 10 596
Q measurement 11 134
rheostat 11 545
standard 4 458 459
temperature variable 2 75 103 13 555 588
Thomas 4 459
use 11 497
wire wound resistors 11 498
Resoflavine 11 4 501
Resolution (racemic mixtures) 25 126
Resolution wavelength spectrochemical analysis 12 579
see also Resolving power (optics)
Resolver synchro 13 569
coordinate system converters 1 585 584
sine-cosine generator 1 578
Resolving power (optics) 11 499
chromatic resolving power 11 499 500
diffraction grating 4 140, 11 500
Fraunhofer diffraction 4 135 136
of interferometers 11 500
of microscopes 11 500
optical images 7 30
of prisms 11 500
of telescopes 11 500 13 449 450
Resolving power (spectrometers) 2 185
Resonance (acoustics and mechanics) 11 500 501, 13 365*
instruments 10 206
vibration isolation 13 518
Resonance (alternating current circuits) 1 270, 11 501-502
antiresonance 1 274, 482, 11 502
bandwidth 11 501
multiple resonance 11 502
parallel circuit 1 274, 482, 11 502
Q 11 133
resonance curve 11 501
series circuit 1 273, 11 501
Resonance (molecular structure) 11 502 504
aromatic hydrocarbon 1 547
benzene 11 502
bond energies 11 504
carbanion 2 449
carboxylic acid 2 474 476
chemical binding 3 25-26
chemical structures 3 59
quantum chemistry 11 147 148
vinylogy 14 326
Resonance, antiferromagnetic 8 46
Resonance ferrimagnetic 8 46
Resonance, ferromagnetic 8 45 46
Resonance mechanical 8 191
Resonance, nuclear 9 88
Resonance paramagnetic 8 45
Resonance escape probability 11 365
Resonance fluorescence see Fluorescence
Resonance level, nuclear fission 5 289
Resonance transformer 9 573*, 11 504 506
radiography 11 302
Resonant cavity impedance standards 7 58

Rendzina soil 12 437
René 41 7 266
Renewable fuse 5 578
Renewal time (estuary) 5 82
Renierite 6 176
Renilla 3 255; 9 65
Renilla amethystina 9 621
Renner, Paul 14 171
Rennet 5 11
  pepsin 9 628
Rennin 4 167; 5 27, 204, 14 232-233
  endocrine gland 4 588
  protein metabolism 11 42
Rense, W 13 272
Rep 11 616
Repair ship 12 267
Repeater submarine telephone cable 13 439
Repeater, synchro 11 447-448*; 13 368 369
  single input 11 447
  two inputs 11 447-448
Repeating theodolite *see* Theodolite
Reppe, J W 1 37, 3 640
Reppe process 5 565
Reppe synthesis 4 117
Reprecipitation 10 573
Representation theorem information theory 7 102
Reprocessing (nuclear fuel) *see* Nuclear fuels
Reproducer, disk *see* Disk recording
Reproduction, animal 11 448-450
  asexual reproduction 11 448-449
  autogamy 11 450
  binary fission 11 448
  budding 11 448 449
  conjugation 11 449-450
  fertilization 11 450
  fragmentation 11 448
  multiple fission 11 448
  parthenogenesis 11 450
  polyembryony 11 449
  schizogony 11 448
  sexual reproduction 11 449 450
  sporulation 11 448
  syngamy 11 450
Reproduction, plant 11 450-454
  asexual reproduction 11 450 452
  deviations 11 454
  fertilization 11 454
  grafting of plants 6 245
  plant growth 10 329
  pollination 11 454
  seed development 11 454
  sexual reproduction 11 452 454
Reproduction, sound *see* Sound reproduction
Reproductive behavior 11 454-462
  care of the young, birds 11 460
  care of young, mammals 11 460
  courtship and pair formation 11 455-456
  egg fertilization 11 456
  egg incubation 11 459
  Hymenoptera 6 575-583
  nest building, birds 11 458
  nest building, fishes 11 459
  nest building, mammals 11 458
  parental behavior 11 458-462
  physiological regulation 11 456-457, 460
  pregnancy and birth 11 459
  reproductive territory 11 455
  sexual behavior 11 455 458
Reproductive growth (plant) 10 332
Reproductive system 7 136, 11 462-480*
  androgen 11 477
  auxiliary glands histology 11 473
  breeding season 11 475
  comparative anatomy 11 468-475
  copulatory organs 11 466-467 472 475
  corpus luteum histology 11 474
  embryology 11 462 468
  endocrine function in reproduction 11 476 478
  estrogen 11 477
  estrus and menstrual cycles 11 475 476
  excretory ducts histology 11 473
  external genitalia histology 11 474
  factors controlling fertility 11 479 480
  fallopian tube 5 179, 11 474
  female genital tract differentiation 11 466
  female reproductive system histology 11 474
  genital ridge 11 462 463
  genital tract development 11 465 466
  gestation period 6 182
  gonadal abnormalities in embryology 11 465
  gonad development 11 462 463
  gonad organogenesis 11 464
  histology 11 473-474
  hormonal control 11 477
Reproductive system—*cont*
  hormonal control in embryology 11 467-468
  indifferent stage in embryology 11 465-466
  Insecta 7 136
  lesions 11 479
  male ducts 11 471-472
  male genital tract differentiation 11 466
  male reproductive system histology 11 473
  mating 11 476
  medullary cords origin 11 464
  menstruation 11 476
  neural humoral control 11 479
  neuroendocrine function 11 478-479
  ovarian organogenesis 11 463
  ovaries 11 464, 468-469, 474
  oviducts 11 469 470
  ovum maturation 11 474
  penis 11 473 474
  physiology 11 474-480
  pituitary hormones 11 476-477
  scrotum 11 473
  sex determination in embryology 11 462
  sex reversal of the gonad in embryology 11 465
  sterility, factors controlling 11 479 480
  testes 11 464, 470 471, 473
  testicular organogenesis 11 463
  urinary system role in embryology 11 462
  uterus 11 474, 14 236
  vagina 11 474
Reproductive system disorders 11 480 482
  female system 11 480-481
    benign tumors 11 481
    cervix uteri 11 481
    malignant tumors 11 481
    ovaries 11 480 481
  pelvic endometriosis 11 481
    uterus 11 481
    vagina 11 481
    vulva 11 481
  hermaphroditism 6 425
  male system 11 481 482
    epididymis 11 482
    penis 11 482
    prostate 11 482
    testicles 11 481 482
    urethra 11 482
    vas deferens and seminal vesicles 11 482
Reproductive territory 11 455
Reptantia 4 28
Reptilelike dinosaur 11 484
Reptilia 1 420, 8 33, 11 482-485*, 13 530
  Amniota 1 328
  Anapsida 11 483
  Archosauria 11 483
  characteristics 11 482 483
  Chelonia 11 482
  comparison of 11 483
  Crocodilia 5 551 555, 11 482
  Eurapsida 11 483
  Lepidosauria 11 483
  Parapsida 11 483
  phylogeny 11 485
  Rhynchocephalia 11 482
  skink 12 373
  Squamata 11 482
  Synapsida 11 483
Reptilia fossils 11 485-494
  Anapsida 11 484
  Archosauria 11 484
  fossil groups 11 484
  Ichthyopterygia 11 484
  Lepidosauria 11 484
  paleoecology 11 484
  Synapsida 11 484
  Synaptosauria 11 484
Repulsion induction motor 11 485
Repulsion motor 1 285, 11 485*
  brushes 5 528
  commutator 5 528
  repulsion induction motor 11 485
  repulsion-start, induction-run motor 11 485
Repulsion start, induction-run motor 11 485
Résal's equation 2 84
Rescue chamber (submarine) 15 213 214
Reseda luteola 5 296
Reserpine 10 95, 359, 14 16
Reserve battery 11 485-487
  electrolyte activated battery 11 486
  gas-activated batteries 11 486
  thermal batteries 11 486
  water-activated batteries 11 485
  see also Battery (electric)
Reservoir 5 99 11 489, 14 39 400
  distribution 14 406
  silting in 14 399
  source of water 14 405
  storage 14 406
  water 14 406
  water conservation 14 392
Reservoir rock 10 61-65
Reservoir traps (petroleum) 10 65
Residential wiring 5 593
Residual current 10 455
Residual fuel oil 10 72

Reticulitermes flavipes 7 285, 13 494
Reticuloendothelial system
hematopoiesis 6 396 398
jaundice 7 502 503
Reticulosa 10 513 11 536 537*
Reticulum 4 159
endoplasmic 2 388
Retina 5 160, 12 566, 14 335
anatomy and histology 5 160
embryology 5 163, 165
histogenesis 5 164
ora serrata 5 163
pars caeca retinae 5 163
pars iridica retinae 5 164
tunica vasculosa lentis 5 164
Retinaculum 7 450 475
Retinene 12 566 14 341
isomers 10 181 182
photoreception 10 181
11-cis-Retinene 10 182
Retinitis 11 537
etiology 11 537
reaction to injury 11 537
Retinitis pigmentosa 11 537
Retinoblastoma 5 171
Retinula cell 7 125 10 180
Retort pyrometallurgy 11 122
Retrices 5 195 197
Retroflex action 8 606 607
Retrograde metamorphosis 8 304
Retrograde motion (astronomy) 11 537
Phoebe 12 40
Retrolental fibroplasia 5 171-172
Retrograde 12 344
Retting 5 250
textile microbiology 13 542
Retusa 13 406
Retinus, A. 1 461
Reuleaux Franz 8 195
Reunion Islands 9 263
Reuss F. 4 325
Reuvella 5 435
Reverberation 11 537 539
architectural acoustics 1 318
bottom 12 504
chamber 1 665
decay rate 11 538
echo 4 377
mean free path 11 538
reverberation time 11 537 538
reverberation time formulas 11 538 539
wear 12 504
surface 12 504
volume 12 504
Reverberatory furnace 8 544 545, 11 125
Reversal speed aeroelasticity 1 86
Reverse circulation drilling 2 297
Reverse-current protection 4 447
Reverse plate 10 610
Reverse phase rotation protection 4 447
Reverse reactions (chemical) 7 358
Reversed phase partition chromatography 3 95
Reversible adiabatic process see Isentropic process
Reversible process 13 572
Revetment 11 539 540
groins 11 540
mattresses 11 539
pile dikes 11 539
types 11 539
Revillagigedo Islands 9 263
Revolute vernation 2 361
Revolution (earth motion) 6 124 125
Revolution counter 13 382 383
Revolver 1 537 538
Reymet 5 245
Revmond, P. du B. 8 178
Reynaud's disease 6 58
Reynolds, C. A. 13 299
Reynolds, O. 2 309, 5 341, 12 278
Reynolds' law 14 2 5
Rey[illegible]
ship propulsion 12 279 280
subsonic flight 13 226
supersonic aerodynamics 13 293
viscous flow 14 334
RF see Radio frequency series of entries
Rh blood groups 2 268 269 3 201, 8 172
antibody complete 2 268
genetics 2 268 269
hemolytic disease of the newborn 2 268
terminology Fisher Race 2 268
terminology, Wiener 2 268
Rhabdias bufonis 11 540
Rhabdiasoidea 11 540 541
Rhabditoidea 11 541
Rhabditis 9 30
Rhabditis 2 601 5 234
Rhabditis terricola 9 32
Rhabditoidea 11 541
Rhabdocalyptus 7 638
Rhabdochromatium see Rhabdomonas
Rhabdocoela 10 414, 11 541 543 14 144
Catenulida 11 541
Dalyelloida 11 541 542
Kalyptorhynchia 11 542
Macrostomida 11 541
Rhabdocoela—cont
Neorhabdocoela 11 541-542
Temnocephalida 11 542 543
Typhloplanoida 11 542
Rhabdome 7 125
Rhabdomere 7 125 10 180
Rhabdomonas 11 552
Rhabdomyoma 8 659
Rhabdomyosarcoma 8 659
Rhabdopleura 6 258, 11 87, 513
Rhabdosoma 6 586
rhabdosome 6 259
Rhabdospora pinea see Brunchorstia destruens
Rhachis 5 195
Rhachitomi 1 534 7 375, 11 543*
Rhacophoridae 4 208
Rhaetian Alps 5 117
Rhaetian stage 14 82
Rhagionidae 4 212
Rhagoletis 4 219
Rhagoletis pomonella 4 217
Rhagon stage 4 55
Rhagovelia 6 400, 406
Rhamnaceae 3 189 11 543
Rhamnales 10 546, 11 543
Rhamnose 8 578
Rhamnus 3 189
Rhea 11 543
Rhea americana 11 543
Rheidae 11 543
Rheiformes 1 694 11 543* 13 651
Rhenium 11 543 544
electron configuration 4 504
extractive metallurgy 8 278
ionization potential 4 504
Rheology 11 544 545
Rheoperv 6 93
Rheostat 11 545
carbon-disk 11 545
electrolytic 11 545
metallic 11 545
motor starting 4 229
sliding contact 11 545
Rheotaxis 13 405
Rhesus blood groups see Rh blood groups
Rhesus monkey chromosome number 3 107
see also Rh blood groups
Rheum officinale 10 472
Rheum rhaponticum 10 472 11 556
Rheumatic fever 1 466 467 534 4 235 6 580 7 315 11 545*
Rheumatic heart 6 358
Rheumatic nodule 6 358
Rheumatic valvulitis 6 358 362
Rheumatism 7 315; 11 545, 13 669
Rheumatoid arthritis 1 554, 7 315, 13 138 596
Rhigonematidae 9 475
Rhincodontidae 12 157
Rhine River 5 122
Rhine wine 14 507
Rhinebothrium 13 530
Rhineodon typus 12 243
Rhinestone 12 321
Rhinitis 9 168 169
Rhinoceridae 11 545
Rhinoceros 10 19, 11 545 546*
Rhinoceros beetle 2 130
Rhinoceros bicornis 11 546
Rhinoderma darwini 12 10
Rhinoestrus purpureus 8 680
Rhinophore 12 180
Rhinotermitidae 7 284
Rhipicephalus 7 299
Rhipicephalus evertsi 13 630
Rhipicephalus sanguineus 5 257; 7 299, 13 14
Rhipiceridae 3 277
Rhipidistia see Osteolepiformes
Rhipidistians 9 445
Rhipidogyra 3 261
Rhipidomelloides 12 329
Rhipiphoridae 3 277
Rhizidiomyces 10 200
Rhizobiaceae 2 11, 3 96, 11 546 547*
Rhizobium 1 232, 2 65, 243, 9 111, 11 511 546, 548 12 460
Rhizobium japonicum 11 546
Rhizobium leguminosarum 9 111 11 546
Rhizobium lupini 11 546
Rhizobium meliloti 11 546
Rhizobium phaseoli 11 546
Rhizocephala 1 562, 3 145, 562, 9 555 11 547*
barnacle 2 102
parasitic castration 9 554
Rhizochloridina 6 427
Rhizoctonia 10 517
alfalfa 1 234
coconut root rot 3 254
cotton seedling disease 3 513
cow pea disease 3 529
flax root rot disease 5 298
Irish potato stem disease 10 534
Mycelia Sterilia 8 677
peanut disease 9 603
strawberry root disease 13 172
Rhizoctonia crocorum 8 677
Rhizoctonia solani cotton seedling disease 3 513
cowpea disease (sore shin) 3 529
jute disease 7 328
Muskmellon disease 8 214

Resonant cavity—*cont*
klystron 7 366
measurement of Q 7 40
measurement of R_0/Q_0 7 40
wave equation 14 420
see also Cavity resonator
Resonant cavity wavemeter 14 440
Resonant circuit 15 390
Resonant circuit oscillators 9 421-422
Resonant detector 7 106
Resonant frequency 13 365
acoustic resonator 11 505
of rooms 1 518
Resonant frequency bridge 5 507 508
Resonant lines 14 420
Resonator, acoustic 11 505-506
damping 11 505 506
energy absorption 11 506
Helmholtz resonator 11 505
mufflers 623 624
musical instruments 8 665, 667
piezoelectric crystal 10 217
resonant frequency 11 505
Resonator, cavity *see* Cavity resonator
Resonator, electrical (tank) *see* Tank circuit
Resonator, Helmholtz 11 505
Resonator, mechanical 4 12
Resorcine violet 4 301
Resorcinol 10 112, 113, 11 506
Respiration 11 506 509
availability of oxygen 11 508
avian 11 529-530
circulation and respiratory organs 11 507
compensation depth 12 106
compensation intensity in sea 12 106
diffusion and circulation 11 506
diffusion respiration 11 506
mammalian 11 530-531
Mastigophora 8 170
oxygen consumption 11 508
oxygen partial pressure and consumption 11 508-509
oxygen requirements 11 507
regulation of respiration 11 509
see also Respiratory system
Respiration, external 11 509-510
alveolar ventilation 11 510
Respiration, external—*cont*
anoxia 1 435
diffusing capacity of lung 11 509
Respiration activity 11 530
Respiration (bacteria) 2 7
Respiration (photosynthesis) 10 186
Respiratory center 11 509
carotid body 2 531
Respiratory disease adenovirus 1 65
Respiratory enzymes biological oxidation 2 214
Respiratory organ gill 6 186
lung 7 618
Respiratory pigments 11 510 513
chlorocruorin 11 512
composition 11 510 511
Crustacea 3 565
distribution 11 511
hemerythrin 11 513
hemocyanin 11 512
oxygen-carrying capacity 11 512
Sipunculoidea 12 346
structure 11 511
Respiratory quotient 2 26, 11 508
Respiratory system 11 513 532
adaptations in terrestrial animals 11 531-532
air movement in lung 11 529
amphibian gill development 11 517-518
amphibian lung embryology 11 521
anatomy 11 522 525
anoxia 1 435
avian respiration 11 529-530
bird lung embryology 11 521
blood supply 11 524
branchial gill development 11 514
breathing 11 525 526
breathing mechanism 11 530
bronchopulmonary segments 11 523 524
bronchus 2 349
buccopharyngeal breathing 11 528
chloride excreting cell in gills 11 518
cyclostome gill development 11 515
dead space 11 528
dipnoan gill development 11 516
elasmobranch gill development 11 514
Respiration system—*cont*
embryology of the lung 11 519 522
epithelium 11 525
gill anatomy 6 186
gills branchial system 11 518 519
gill comparative physiology 11 518 519
gill development 11 513 518
gill ectoderm and endoderm development 11 518
gill filament 11 518
histology 11 525
Holocephali gill development 11 515
human embryo lung 11 521-522
Insecta 7 135
lamellae (gill) 11 518
lung 7 618, 11 525-532
mammalian respiration 11 530-531
myoelastic fibers 11 530
nerve supply 11 524 525
osmotic and ionic regulation in gills 11 518
other amphibian respiratory devices 11 518
other respiratory devices of fish 11 516 517
other vital requirements 11 525
pleura 11 525
pressure change and ventilation 11 530-531
primitive chordate gill development 11 513
reptilian lung embryology 11 521
reptiles 11 528
respiration external 11 510
respiration in aquatic animals 11 531 532
suspension of breathing 11 531
teleostome gill development 11 516
thoracic cavity 11 522 523
thoracoabdominal breathing 11 528 529
vertebrate respiratory regulation 11 531
visceral arches 11 513 514
vital capacity 11 528
Respiratory system disorders 11 532
anoxia 1 435
lung disorders 7 618, 11 532
pulmonary circulatory diseases 11 532
Respiratory tree 6 465 467 12 91
Response 11 533
biological *see* Beh
ontogeny of Be
Disease, Immune
Reflex, conditioned
flex, unconditioned
sation, Sense o
Virulence
linear 11 533
logarithmic 11 533
magnetic 8 59 40
Rest mass 11 533
inertia of energy 7 90
relativistic mechanics 11 431
Resting potentials 2 235
Restitution, coefficient o
Coefficient of restitution
Restle, F. 7 443
Restoration (archeological chemistry) 1 512
Restoring force (harmonic 6 541 542, 545
Restoring torque (mecha oscillator) 6 545
Reststrahlen see Residual r
Resultant of forces 11 535
collinear forces 11 536
concurrent forces 11 53
coplanar forces 11 536
force 5 436 457
three dimensional force system 11 536
Resuperheat cycle 14 273
Resurrection plant 12 157
Retaining rings 12 290, 13
Retaining wall 11 534 535
cantilever wall 11 535
counterfort wall 11 535
drainage 11 544
earth pressure 11 536
gravity walls 11 535
semigravity walls 11 53
soil mechanics 12 458
surcharge 11 534
types 11 534 535
weep holes 11 534
Retardants flameproofing 5 295
Retardation analysis 3 95
Retardation theory polar light 10 455
Retarder chemical 7 111 concrete 3 564
Rete testis 11 475, 13 524
Retentivity *see* Remanence
Reticular cell 15 618
Reticular fiber 3 402 403
Reticular formation (brain) 9 55 11 535 536
anatomy 11 535
influence on behavior 11 535
Reticulariaceae 8 687
Reticulated beetle 3 276
Reticulite 11 103
Reticulitermes 12 407

Rice—cont
uses 11 563
varieties 11 563 564
Rice mechanism 5 498
Rice weevil 5 287
Richards, A 14 229
Richards F A 2 521
Richardson Dushman equation *see* Richardson equation (thermionic emission)
Richardson equation (thermionic emission) 12 68 69, 13 553 554*, 14 245, 553
Richardson Highway 9 159
Richart F 12 574
Richmondena cardinalis 2 480
Richter C P 8 603
Richter H T 9 97
Richterite 1 569
Ricinidae 8 78
Ricinulei 1 496, 558, 559 11 566*
Ricinus communis 2 544
Rickets 4 236 8 258, 11 566-567*, 12 360
vitamin D 14 345
Rickets Dr H T 11 568
Rickettsia 1 466 467, 6 429, 11 567, 568
Microtatobiotes 8 403
pathogen 9 593
Rickettsia akari 11 567
Rickettsia australis 13 631
Rickettsia conorii 5 257, 13 631
Rickettsia manchuriae 14 175
Rickettsia mooseri 14 175
Rickettsia prowazekii 11 567, 13 14 14 175
Rickettsia quintana 14 80
Rickettsia rickettsii 13 13
Rickettsia sibirica 8 403 13 631
Rickettsia tsutsugamushi 11 569 14 175
Rickettsia typhi 14 175
Rickettsiaceae 11 567
Rickettsiae 8 349 13 527
Rickettsiales 11 567
Anaplasmataceae 11 567
Bartonellaceae 11 567
Chlamydiaceae 11 567
Rickettsiaceae 11 567
Rickettsialpox 1 466 467, 11 567 568*, 13 15
Rickettsiella 11 567
Rickettsioses 11 568 570, 13 529
carbomycin 2 461
Carrion's disease 2 532
diseases caused 11 569
fièvre boutonneuse 5 257
growth 11 568
immunology 11 569 570
morphology 11 568
para aminobenzoic acid 1 319
prevention 11 570
Q fever 11 155
Rickettsioses—cont
reproduction 11 568
rickettsialpox 11 567
serology 11 569
staining characteristics 11 569
study techniques 11 569
tick bite fever, South African 13 630
tick typhus, North Queensland 13 631
tick typhus, Siberian 13 631
treatment 11 570
trench fever 14 80
typhus, scrub 14 173
typhus fever, endemic (flea borne) 14 175
typhus fever, epidemic (louse borne) 14 175
vectors 11 570
Rider balance 2 72
Ridge terrace 13 499
Riebeckite 1 536
Rieckman, E. 13 515
Riemann B 6 161
Riemann, G F B 2 403 406, 3 396 6 152, 154 155, 7 160 9 226
Riemann Christoffel tensor 6 163 164
Riemann hypothesis 9 226
Riemann integral 7 166 167
Riemann Lebesgue lemma 5 488
Riemann surface 3 397 6 283
Riemann's theorem 3 396
Riemann zeta function 9 226
Riemannian geometry 2 406
Riemannian geometry *see* Geometry, Riemannian
Riemannian n space 2 406
Riemannian space 6 152 12 559
Riemer Tiemann synthesis 1 231
Riesling 14 507
Riesman D 10 52
Riesz, F 7 172, 412
Riesz Fischer theorem 5 488
Rifle 1 537 538
automatic 1 537 538
Browning automatic 1 537 538
Garand (M1) 1 537
M14 1 537 538
M15 1 537 538
recoilless 1 538
semiautomatic 1 537 538
sights 6 298
Rifle grenades 1 539 540
Rifling 1 539
Rift mountains 13 220
Rift valley 11 570
Africa 1 107
submarine 13 220
Rift valley—cont
tectonic patterns 13 413
see also Graben
Rig, rotary 9 291-292
Riga, Gulf of 5 115
Rigel 11 570*, 13 41
Righi Leduc effect 4 453, 13 586
Right ascension 1 607
celestial navigation 2 584
Right circular cone 3 394
Right circular cylinder 3 646
Right-hand rule 1 332
electromagnetic pumps 4 492 493
Right prism 10 623
Righting reflex 5 47 49
Rigid body 1 331, 11 570*
statics 13 54 56
Rigid body dynamics 11 570-577
angular momentum 11 573
angular motion 11 573 574
center of mass 2 628*, 11 570 571
combined rolling and sliding 11 577
instantaneous axis 11 576
moments and products of inertia 11 574
principal axes 11 574
rolling motion 11 575 576
rotation about translating axis 11 573
rotational motion 11 572 574, 632
sliding motion 11 576 577
torque 11 573
translation motion 11 571 572
work and energy relations 11 574 575
Rigid circular piston sound 12 512 514
Rigid link acceleration 1 26
Rigid pavements 9 598
Rigidity gyroscope 6 308
Rigidity decerebrate *see* Decerebrate rigidity
Rigidity modulus *see* Shear modulus
Rigil Kent 2 628
Rigor mortis 4 22
Rilfi erosion 12 430, 444 445
Rime 5 367 540
Rimifon *see* Isonicotinic acid hydrazide
Rimmed steel 13 97 99
Rinderpest 14 328
Ring 11 577 578
stresses 11 577
Ring billed gull 6 296
Ring canal 13 52
Ring chain tautomerism 13 402 403
Ring closure chelate stability 3 21 22
Ring counter 3 517
Ring-dikes 10 422
Ring dove 3 302
Ring gages 6 4
Ring gear 10 273 274
Ring gear, automotive 13 315
Ring isomerism 7 279 280
Ring Nebula 9 24
Ring necked pheasant 6 16
Ring pox disease 1 495
Ring settings 6 104
Ring test 10 577
Ring test reaction 1 473
Ring theory 11 578 579
advanced aspects 11 579
Boolean algebra 2 289 290
difference rings 11 579
homomorphism 11 579
ideals 11 579
types of rings 11 578 579
Ringing circuit 14 91
Rings of Saturn 12 38 40
Ringworm 12 370
Ringwulst 5 168
Rinner, K. 4 330
Rio Colorado 12 524, 527
Rio Grande 9 151
Rio Grande River 14 395
Rio Lempa 9 164
Rio Negro 12 529
Rio Orinoco 12 524
Rio San Juan 9 164
Rio Tuy 12 527
Rip currents 12 301
Riparia riparia 13 333
Riparian doctrine 14 393 394
Ripping sawing 14 542
Ripple *see* Wave (capillary)
Ripple tank 11 579 580
analogy with wave phenomena 11 580
experimental equipment 11 580
theory 11 579
Ripple voltage 11 579 580
power supply filters 10 561
Ripplemarks 12 134
Ripples beach sands 12 304
Riprap 13 152
Ripsaw 14 542
Rise time pulse 9 429
Risley prism system 10 623 624
Riss (Glacial) 6 195
Riss/Würm (Interglacial) 6 195
Rissoacea 6 77
Ristocetin 1 464-468
Ritsema, A 13 420
Ritz W 11 580
Ritz's combination principle 11 580 581
atomic structure and spectra 1 654
Rivanol 1 51
River 11 581 583
aggrading 11 584
channel stability 11 584

Rhizoctonia solani—cont
Mycelia Sterilia 8 677
Ornamental shrub disease 9 408
pea root disease 9 600
root rot disease 10 307
soybean disease 10 306, 12 535
Rhizoglyphus 12 29
Rhizomastigida 11 52, 547-548*
Rhizomastigina *see* Rhizomastigida
Rhizome 5 62, 260, 13 111, 124
Rhizomorphic dropper 13 124
Rhizophagidae 3 278
Rhizophora 3 186, 8 90, 11 621
Rhizophore 12 157
Rhizophydium 10 199, 200
Rhizopoda *see* Rhizopodea
Rhizopodea 11 52, 548* 12 27
Amoebida 11 52, 548
Foraminiferida 5 435, 11 52, 548, 12 27
Mycetozoida 11 52, 548
Proteomyxida 11 44, 52, 548, 12 27
Protozoa 11 51 60
Testacida 11 52, 548
Rhizopus 3 514, 9 603, 10 200, 314
Rhizopus nigricans 5 561, 9 602, 13 172
Rhizopus oryzae 7 378
Rhizosolenia 8 106 128
Rhizosolenia alata var *indica* 8 128
Rhizosphere 11 548 549
bacterization 11 549
mycorhiza 11 548 549
Rhizostoma 3 235 11 549
Rhizostomeae 3 235 11 549*
Rho theta systems 10 446
Rhodamine B 4 302
Rhodanine 13 600
Rhodes 5 117
Rhodesian man 5 478 11 549-550*
Rhodeus 11 478
Rhodium 11 550
alloys 11 550
compounds 11 550
electron configuration 4 504
extractive metallurgy 8 278 10 411 412
ionization potential 4 504
properties *11 550*
uses 11 550
Rhodnius 3 3 6 405
Rhodnius prolixus 6 409
Rhodobacterineae 2 11, 55 11 550 553*
Amoebobacter 11 552
Athiorhodaceae 11 552
Chlorobacteriaceae 11 552
Chlorobacterium 11 553
Chlorobium 11 553
Rhodobacterineae—*cont*
Chlorochromatium 11 553
Chromatium 11 552
Glathrochloris 11 553
Cylindrogloea 11 553
Lamprocystis 11 552
Microchloris 11 553
Pelodictyon 11 553
Rhabdomonas 11 552
Thiocystis 11 552
Thiodictyon 11 552
Thiopedia 11 552
Thiophysocystis 11 552
Thiorhodaceae 11 551
Thiosarcina 11 551
Thiospirillum 11 552
Rhodochrosite 11 553
carbonate minerals 2 467
Rhododendron lace bug 6 405
Rhodomicrobium 12 65
Rhodomicrobium vannielii 6 593
Rhodonite 11 553 554
Rhodophyta 1 237 10 189, 320, 346, 11 554 556*, 13 545
algae 1 237
economic importance 11 554
pigmentation 11 554
reproduction 11 555
Rhodopseudomonas 11 552
Rhodopseudomonas gelatinosa 2 50
Rhodopsin 12 309, 566, 14 336, 341
eye 5 162 171
photoreception 10 181
Rhodospirillum 2 61, 11 552
Rhodotorula 3 578 14 601
Rhodotorula glutinis 14 600
Rhodoxanthin 2 528 529
Rhodymenia 8 107
Rhodymenia palmata 11 554
Rhomb 11 556
Rhombencephalon 9 58
Rhombic antenna *see* Antenna (aerial)
Rhombic sulfur 13 255 256
Rhombifera 4 460 465, 11 556*
Rhombogen 4 109
Rhomboid prism 8 508
Rhombus 11 135 383
Rhone River 5 120 122
Rhopalocera 7 463
Rhopalomeridae 4 212
Rhopalopsyllum mymphaceae 1 1
Rhopalosomatidae 6 574
Rhopalura metschnikowi 9 415
Rhopalura ophiocomae 9 415
Rhopalus 6 409
Rhopalosma 11 549
Rhubarb 10 472 11 556*
Rhumb lines 6 267 8 97 9 16
Rhus diversiloba 10 438
Rhus radicans 10 438 439
Rhus vernicifera 12 26 14 282
Rhus vernix 10 438, 439
Rhyacophila 14 87
Rhynchobdellae 11 556
Glossiphonitdae 11 556
Ichthyobdellidae 11 556
Rhynchocephalia 7 473, 11 484 557*, 13 22
Rhynchocephalian 11 484
Rhynchocoel 11 557
Rhynchocoela 1 420, 433, 11 557-560
Anopla 1 433, 11 559
asexual reproduction 11 558-559
classification 11 559
ecology 11 559
embryology 11 558
Enopla 4 616, 11 559
morphology 11 557-558
phylogenetic relationships 11 559
regeneration 11 558 559
see also Acoelomata
Rhynchonellacea 13 485
Rhynchospatha pachyrhyncha 9 567
Rhynchosporium secalis 2 99
Rhynchotrema capax 13 485
Rhynia 11 68
Rhyniella praecursor 3 290
Rhynochetidae 6 286
Rhynophrynidae 9 345
Rhyolite 7 16, 10 86, 11 560-561*, 590, 14 347
alkali 11 560
devitrification in 11 560
fluidal structures 11 560
normal 11 560
occurrence 11 560
origin 11 560
petrographic province 10 51
potassic 11 560
sodic 11 560
spherulitic structures in 11 560
structure 11 560
texture 11 560
Rhyolite porphyry 10 521, 11 590
Rhyolitic lava 7 421
Rhyolitic vitric tuff 14 134
Rhysodidae 3 276
Rhythm body *see* Body rhythm
Rhythms periodicity in organisms 10 15
Rhytidolomia 6 404
Rhytirhynchus 2 515
Ria coasts 5 243 244
RIAA characteristics 4 298, 5 45
Rib anatomy 12 365
abdominal 12 355
dorsal 12 363
morphogenesis 12 355
pleural 12 363
sacral 12 363
ventral 12 363
Ribbon frame camera 10 160
Ribbon snake 6 41
Ribbon type pressure microphone 8 359 360
Ribbon type velocity microphone 8 362
Ribbonfish 7 389
Ribes 3 625, 6 237, 10 312, 318 11 654
Ribes nigrum 3 625
Ribodon 12 347
Riboflavin 2 195, 4 226, 11 561 562*, 14 340
bioassay 2 194
cell protoplast 2 613
chemical synthesis 11 561
fermentation 11 561
food 5 371
industrial production 11 561
Ribonuclease 13 33
Ribonucleic acid (RNA) 1 421 2 12, 203 588, 608, 610 4 66, 5 33, 9 208 210, 10 356 359, 11 562*, 13 33
biosynthesis 9 213 214
chromosome 3 109 110
cytology (molecular basis) 3 654
function 9 210 211
gene action 6 107
metabolic disorders 8 258
nucleic acid 9 208
ribonucleoprotein 9 216
structure 9 209 210
virus 14 351
Ribose 8 578, 582
metabolic disorder 8 258
D(−) ribose 2 455
D-ribose 8 582
Ribose 5 phosphate *2 17*
Ribosde metabolic disorders 8 258
Ribosome 2 588 610
cytoplasm 5 658
ribonucleic acid 11 562
Ribulose 10 185
Ribulose 1,5 diphosphate 2 35
D Ribulose 5 phosphate 2 16
Ribulose 5 phosphate 2 660 10 351
Ricci G 2 405 8 175
Ricci Curbastro, G 11 200
Ricci Einstein tensor 6 164
Rice 10 374, 11 562 563*, 13 30
converted 11 566
cultural practices 11 564
description 11 563
diseases 11 564
economic importance 11 563
food 5 373
origin 11 563
polished 11 563
processing 11 563 566
production 11 563

Rice—cont
uses 11 563
varieties 11 563 564
Rice mechanism 5 498
Rice weevil 3 287
Richards A 14 229
Richards F A 2 321
Richardson Dushman equation *see* Richardson equation (thermionic emission)
Richardson equation (thermionic emission) 12 68 69, 13 553 554*, 14 243, 353
Richardson Highway 9 159
Richert F 12 574
Richmondena cardinalis 2 450
Richter, C. P 8 603
Richter H T 9 97
Richterite 1 569
Ricinidae 8 78
Ricinulei 1 496 558, 559, 11 566*
Ricinus communis 2 544
Rickets 4 236 8 258, 11 565-567*, 12 360
vitamin D 14 343
Ricketts, Dr H T 11 568
Rickettsia 1 466 467, 6 429 11 567, 568
Microtatobiotes 8 405
pathogen 9 595
Rickettsia akari 11 567
Rickettsia australis 13 631
Rickettsia conorii 5 257 13 631
Rickettsia manchuriae 14 175
Rickettsia mooseri 14 175
Rickettsia prowazekii 11 567, 13 14 14 175
Rickettsia quintana 14 80
Rickettsia rickettsii 13 13
Rickettsia sibirica 8 404 13 631
Rickettsia tsutsugamushi 11 569 14 175
Rickettsia typhi 14 175
Rickettsiaceae 11 567
Rickettsiae 8 348, 13 527
Rickettsiales 11 567
Anaplasmataceae 11 567
Bartonellaceae 11 567
Chlamydiaceae 11 567
Rickettsiaceae 11 567
Rickettsialpox 1 466-467 11 567 568* 13 15
Rickettsiella 11 567
Rickettsioses 11 569 570* 13 529
carbuncvon 2 461
Carrion's disease 2 532
diseases caused 11 569
fièvre boutonneuse 5 257
growth 11 568
immunology 11 569 570
morphology 11 568
para aminobenzoic acid 1 319
prevention 11 570
Q fever 11 153
Rickettsioses—cont
reproduction 11 568
rickettsialpox 11 567
serology 11 569
staining characteristics 11 569
study techniques 11 569
tick bite fever South African 13 630
tick typhus North Queensland 13 631
tick typhus, Siberian 13 631
treatment 11 570
trench fever 14 80
typhus, scrub 14 175
typhus fever endemic (flea borne) 14 175
typhus fever epidemic (louse borne) 14 175
vectors 11 570
Rider balance 2 72
Ridge terrace 13 499
Rieberkite 1 536
Rieckman E 13 515
Riemann, B 6 161
Riemann, G F B 2 403 406 5 396 6 152 154 155 7 160 9 226
Riemann Christoffel tensor 6 163 164
Riemann hypothesis 9 226
Riemann integral 7 166 167
Riemann Lebesgue lemma 5 499
Riemann surface 5 397 6 293
Riemann's theorem 3 396
Riemann zeta function 9 226
Riemannian geometry 2 406
Riemannian geometry *see* Geometry Riemannian
Riemannian n space 2 406
Riemannian space 6 152 12 559
Riemer Tiemann synthesis 1 231
Riesling 14 507
Rieyman D 10 32
Riesz F 7 172 412
Riesz-Fischer theorem 5 498
Rifle 1 537 538
automatic 1 537 539
Browning automatic 1 537 538
Garand (M1) 1 537
M14 1 537 538
M15 1 537 538
recoilless 1 538
semiautomatic 1 537 539
sights 6 298
Rifle grenades 1 539 540
Rifling 1 539
Rift mountains 13 220
Rift valley 13 570
Africa 1 109
submarine 13 220
Rift valley—cont
tectonic patterns 13 413
see also Graben
Rig, rotary 9 291 292
Riga, Gulf of 5 113
Rigel 11 570*, 15 41
Righi Leduc effect 4 455, 13 586
Right ascension 1 607
celestial navigation 2 584
Right circular cone 3 591
Right circular cylinder 3 616
Right hand rule 1 532
electromagnetic pumps 4 492 493
Right prism 10 623
Righting reflex 5 47 49
Rigid body 1 531 11 570*
statics 13 54 56
Rigid body dynamics 11 570 573
angular momentum 11 573
angular motion 11 573 574
center of mass 2 629* 11 570 571
combined rolling and sliding 11 577
instantaneous axis 11 576
moments and products of inertia 11 574
principal axes 11 574
rolling motion 11 575 576
rotation about translating axis 11 573
rotational motion 11 572 574 652
sliding motion 11 576-577
torque 11 573
translation motion 11 571 572
work and energy relations 11 574 575
Rigid circular piston sound 12 512 514
Rigid link acceleration 1 26
Rigid pavements 9 594
Rigidity gyroscope 6 308
Rigidity decerebrate *see* Decerebrate rigidity
Rigidity modulus *see* Shear modulus
Rigil Kent 2 629
Rigor mortis 4 22
Rill erosion 12 450 444 445
Rime 5 567 540
Rimsfon *see* Isomeconic acid hydrazide
Rimmed steel 13 97 99
Rinderpest 14 328
Ring 11 577 578
stresses 11 577
Ring billed gull 6 296
Ring canal 13 52
Ring-chain tautomerism 13 402 405
Ring closure chelate stability 9 21 22
Ring counter 3 517
Ring dikes 10 422
Ring dove 3 502
Ring gages 6 4
Ring gear 10 275 274
Ring gear, automotive 15 515
Ring isomerism 7 279 280
Ring Nebula 9 24
Ring necked pheasant 6 18
Ring pox disease 1 495
Ring settings 6 101
Ring test 10 537
Ring test reaction 5 475
Ring theory 11 578 579
advanced aspects 11 579
Boolean algebra 2 290 290
difference rings 11 579
homomorphism 11 579
ideals 11 579
types of rings 11 578 579
Ringing circuit 14 91
Rings of Saturn 12 34 40
Ringworm 12 370
Ringwulit 5 168
Rinner K 4 350
Rio Colorado 12 524 527
Rio Grande 9 155
Rio Grande River 14 395
Rio Lempa 9 164
Rio Negro 12 529
Rio Orinoco 12 524
Rio San Juan 9 164
Rio Tuy 12 527
Rip currents 12 301
Riparia riparia 13 535
Riparian doctrine 14 393 394
Ripping sawing 14 542
Ripple *see* Wave (capillary)
Ripple tank 11 579 580
analogy with wave phenomena 11 580
experimental equipment 11 580
theory 11 579
Ripple voltage 11 579 580
power supply filters 10 561
Ripplemarks 12 134
Ripples beach sands 12 504
Riprap 13 132
Ripsaw 14 542
Rise time pulse 9 429
Risley prism system 10 623 624
Riss (Glacial) 6 195
Riss/Wurm (Interglacial) 6 195
Rissoacea 6 77
Ristocetin 1 464 468
Ritsema A 13 420
Ritz W 11 580
Ritz's combination principle 11 580 581
atomic structure and spectra 1 654
Rivanol 5 51
River 11 581 583
aggrading 11 584
channel stability 11 584

Rhizoctonia solani—cont
Mycelia Sterilia 8 677
Ornamental shrub disease 9 408
pea root disease 9 600
root rot disease 10 307
soybean disease 10 306, 12 535
Rhizoglyphus 12 29
Rhizomastigida 11 52, 547-548*
Rhizomastigina *see* Rhizomastigida
Rhizome 5 62, 260, 13 111, 124
Rhizomorphic dropper 13 124
Rhizophagidae 3 278
Rhizophora 3 186, 8 90, 11 621
Rhizophore 12 157
Rhizophydium 10 199, 200
Rhizopoda *see* Rhizopodea
Rhizopodea 11 52, 548*, 12 27
Amoebida 11 52, 548
Foraminiferida 5 435, 11 52, 548, 12 27
Mycetozoida 11 52, 548
Proteomyxida 11 44, 52, 548, 12 27
Protozoa 11 51 60
Testacida 11 52 548
Rhizopus 3 514, 9 603, 10 200, 314
Rhizopus nigricans 5 561, 9 602 13 172
Rhizopus oryzae 7 378
Rhizosolenia 8 106 128
Rhizosolenia alata var *indica* 8 128
Rhizosphere 11 548 549
bacterization 11 549
mycorhiza 11 548 549
Rhizostoma 3 255, 11 549
Rhizostomeae 3 255 11 549*
Rho theta systems 10 446
Rhodamine B 4 302
Rhodanine 13 600
Rhodes 5 117
Rhodesian man 5 478, 11 549 550*
Rhodeur 11 478
Rhodium 11 550
alloys 11 550
compounds 11 550
electron configuration 4 501
extractive metallurgy 8 278, 10 411 412
ionization potential 4 504
properties 11 550
uses 11 550
Rhodnius 3 3 6 405
Rhodnius prolixus 6 409
Rhodobacteriaceae 2 21, 55, 11 550 553*
Amoebobacter 11 552
Athiorhodaceae 11 552
Chlorobacteriaceae 11 552
Chlorobacterium 11 553
Chlorobium 11 553
Rhodobacteriineae—*cont*
Chlorochromatium 11 553
Chromatium 11 552
Clathrochloris 11 553
Cylindrogloea 11 553
Lamprocystis 11 552
Microchloris 11 553
Pelodictyon 11 553
Rhabdomonas 11 552
Thiocystis 11 552
Thiodictyon 11 552
Thiopedia 11 552
Thiopholcoccus 11 552
Thiorhodaceae 11 551
Thiosarcina 11 551
Thiospirillum 11 552
Rhodochrosite 11 553
carbonate minerals 2 467
Rhodolenden lace bug 6 405
Rhodomicrobium 12 65
Rhodomicrobium vannielii 6 593
Rhodonite 11 553 554
Rhodophyta 1 237, 10 189, 320 346 11 554-556*, 13 545
algae 1 237
economic importance 11 554
pigmentation 11 554
reproduction 11 555
Rhodopseudomonas 11 552
Rhodopseudomonas gelatinosa 2 30
Rhodopsin 12 309, 566, 14 336, 341
eye 5 162 171
photoreception 10 181
Rhodospirillum 2 64, 11 552
Rhodotorula 3 578, 14 601
Rhodotorula glutinis 14 600
Rhodoxanthin 2 528 529
Rhodymenia 8 107
Rhodymenia palmata 11 554
Rhomb 11 556
Rhombencephalon 9 58
Rhombic antenna *see* Antenna (aerial)
Rhombic sulfur 13 255 256
Rhombifera 4 360 365, 11 556*
Rhombogen 4 109
Rhomboid prism 8 508
Rhombus 11 135 588
Rhone River 5 120 122
Rhopalocera 7 463
Rhopalomeridae 4 212
Rhopalosiphum nymphaeae 1 1
Rhopalosomatidae 6 574
Rhopalura metschnikowi 9 415
Rhopalura ophiocomae 9 415
Rhopalus 6 409
Rhopalosoma 11 549
Rhubarb 10 472 11 556*
Rhumb lines 6 267 8 07 9 16
Rhus diversiloba 10 458
Rhus radicans 10 458 459
Rhus vernicifera 12 26 14 282
Rhus vernix 10 458, 459
Rhyacophila 14 87
Rhynchobdellae 11 556
Glossiphonidae 11 556
Ichthyobdellidae 11 556
Rhynchocephalia 7 473, 11 484, 557*, 13 22
Rhynchocephalian 11 484
Rhynchocoel 11 557
Rhynchocoela 1 420, 433, 11 557-560
Anopla 1 433, 11 559
asexual reproduction 11 558 559
classification 11 559
ecology 11 559
embryology 11 558
Enopla 4 616 11 559
morphology 11 557 558
phylogenetic relationships 11 559
regeneration 11 558 559
see also Acoelomata
Rhynchonellacea 13 485
Rhynchopsitta pachyrhyncha 9 567
Rhynchosporium secalis 2 99
Rhynchotrema capax 13 485
Rhynia 11 68
Rhyntella praecursor 3 290
Rhynochetidae 6 286
Rhynophrynidae 9 345
Rhyolite 7 16 10 86, 11 560-561*, 590, 14 347
alkali 11 560
devitrification in 11 560
fluidal structures 11 560
normal 11 560
occurrence 11 560
origin 11 560
petrographic province 10 51
potassic 11 560
sodic 11 560
spherulitic structures in 11 560
structure 11 560
texture 11 560
Rhyolite porphyry 10 521 11 560
Rhyolitic lava 7 421
Rhyolitic vitric tuff 14 151
Rhysodidae 3 276
Rhythm body *see* Body rhythm
Rhythms periodicity in organisms 10 15
Rhytidolomia 6 401
Rhytirhynchus 2 315
Ria coasts 3 213 214
RIAA characteristics 4 238, 5 45
Rib anatomy 12 363
abdominal 12 355
dorsal 12 363
morphogenesis 12 355
pleural 12 363
sacral 12 363
ventral 12 363
Ribbon frame camera 10 160
Ribbon snake 6 41
Ribbon type pressure microphone 8 359 360
Ribbon type velocity microphone 8 362
Ribbonfish 7 389
Ribes 3 625, 6 237, 10 312, 314 11 654
Ribes nigrum 3 625
Ribodon 12 347
Riboflavin 2 195, 4 236, 11 561-562*, 14 340
bioassay 2 194
cell protoplast 2 615
chemical synthesis 11 561
fermentation 11 561
food 5 371
industrial production 11 561
Ribonuclease 13 33
Ribonucleic acid (RNA) 1 425 2 12, 263 588, 608, 610 4 66, 5 33, 9 208 210, 10 356 359 11 562*, 13 33
biosynthesis 9 213 214
chromosome 3 109-110
cytology (molecular basis) 3 654
function 9 210 211
gene action 6 107
metabolic disorders 8 258
nucleic acid 9 208
ribonucleoproteins 9 216
structure 9 204 210
virus 14 331
Ribose 8 578, 582
metabolic disorder 8 258
D(−)-Ribose 2 455
D ribose 8 582
Ribose 5 phosphate 2 17
Ribosde metabolic disorders 8 258
Ribosome 2 588, 610
cytoplasm 3 658
ribonucleic acid 11 562
Ribulose 10 185
Ribulose 1,5 diphosphate 2 43
D Ribulose 5 phosphate 2 16
Ribulose 5 phosphate 2 460 10 351
Ricci G 2 401 8 175
Ricci Curbastro G 14 200
Ricci Einstein tensor 6 164
Rice 10 374 11 562 563*, 13 50
converted 11 566
cultural practices 11 564
description 11 563
diseases 11 564
economic importance 11 563
food 5 373
origin 11 563
polished 11 563
processing 11 565 566
production 11 563

Rock structures fabric analysis 10 49
rock masses 10 48
Rock wave *see* Tides
Rock wool 6 208
Rocker (placer mining) 8 477
Rocker arm valve 14 263
Rocket 1 540*, 11 600
aircraft 1 536
army armament 1 540
cryogenic engineering 3 570
engine 11 600
exterior ballistics 2 78 82
fire-control systems 5 280-281
folding fin 1 541
Hedge Hog 1 484 485
meteorological observations 8 321 322
Mouse trap 1 484
naval 1 541
nuclear *see* Nuclear rocket
smoke 1 540
solar battery installations 12 466
Tartar 1 541
trajectory 2 78 82
use in aeronomy 1 99
vehicle 11 600
Zuni 1 541
Rocket assisted torpedo 1 486
Rocket astronomy 11 600*, 15 272
Rocket bays 1 536
Rocket engine 11 601 611
chemical 7 210
conservation of momentum principle 3 408
exhaust velocities *11 601*
guided missile applications 11 609
hybrid rockets 11 609
liquid propellant 7 308 309 11 603
manufacture 11 610
noise 1 183
performance 11 601
propellant 11 6 10
propulsion 11 16 18
rocket staging 11 611 612
solid propellant 7 309 310 11 606
space flight 11 610
specific impulse 11 601 12 578
storage transportation and servicing 11 611
testing 11 610
thrust 11 17, 602
Rocket launcher 1 535 538
bazooka 1 540
Rocket sights 1 537
Rocket sled testing 1 189 191, 11 612 614*
acceleration tests 5 19
Rocket sled testing—*cont*
aircraft canopy ejection 1 189 191
aircraft seat ejection 1 189 191
aircraft vibration tests 1 190
escape mechanism 11 613
flutter testing 11 613
instrumentation 11 614
missile components 11 615
parachute recovery 11 613
propulsion motors 11 614
rain erosion testing 11 615
structures and materials 11 613
test facilities 11 612
test sled 11 612
track programs 11 613
water braking system 11 613
Rocket staging 11 611 612
astronautical engineering 1 604
booster 11 611
sustainers 11 611
Rocketsonde system 8 322
Rockfall 7 398
Rockfish 10 10
Rockslide 7 398
Rock stratigraphic units 13 169
Rockwell hardness 6 337
metal 8 275
Rocky Mountain belt 13 410
Rocky Mountain spotted fever 1 466 467 10 428 13 13 14 15, 328 629
Ixodides 7 299
Rocky Mountain system 8 618 9 156 159
Rod 8 188
Rod drawing of metal 4 272
Rod vibrations 14 313 315
Rodent bot 4 212
Rodentia 8 82, 11 614*
beaver 2 127
chinchilla 3 62 63
chipmunk 3 63
guinea pig 6 292
hamster 6 332 333
Hystricomorpha 11 614
lemming 7 450
muskrat 8 668
Myomorpha 11 614
porcupine 10 513
prairie dog 10 564
rat 11 345
fossils 11 614 615
rodenticide 11 615
Sciuromorpha 11 614
Rodentia fossils 11 614 615
Rodenticide 11 615
Rodhe W 5 529
Rodite 8 315
Rodna Mountains 5 118
Rodolia cardinalis 6 475
Roe 12 238
Roemer, Ole 4 583 7 325, 499, 502
Roentgen, W 4 519, 11 273, 301 14 567, 591, 589
Roentgen diffractometry 14 568
Roentgen spectrometry 14 568
Roentgen unit 11 615
Roentgenography 11 301
Roentgenoluminescence 7 610
Rogers B 14 172
Rogers, C. 11 80
Rogers, C. R 10 33
Roll bending sheet metal 12 250
Roll controls 5 307
Roll forging 5 471
Roll forming sheet metal 12 250
Roll mill 11 616
Roll-on roll-off ship 12 260
Roll sulfur 13 235
Roll tube technique culture pure 3 616
Rolled gold plate 6 252
Roller 3 473
Roller bearing 2 123 126
angular contact bearings 2 125
characteristics 2 124
fatigue 2 124
life 2 124
mountings 2 126
races 2 123
radial bearings 2 123
structure 2 123
tapered 2 126
thrust bearings 2 123
Roller bit 2 295
Roller chain 3 3
Roller pulverizers 3 560
Rolles' theorem 5 47
Rolling metal 11 616 619
cold rolling 11 618
cylindrical rolls 11 616
grooved rolls 11 616
hot rolling 11 617
powder metal forming 8 286
roll piercing 11 618
Sendzimir mill 11 617
special rolling processes 11 618
strain hardening 11 618
theory of rolling 11 616
types of mill 11 616
Rolling contact 11 619 620
Rolling motion dynamics 11 575 576
Rolling motion (ships) 12 273
Rolling stock railroad engineering 11 327
Romanche Deep 1 622 9 251
Romanche Trench 4 564
Romer A S 9 443 445
Romer skin neutralization test 1 487
Romicil *see* Oleandomycin
Rondelet, G 1 422
Röntgen, W *see* Roentgen, W
Roof construction 11 620
corrugated 11 620
gypsum plank 6 301
hipped plate 11 620
joints 11 620
precast concrete 10 568
rafters 11 620
roof stresses 11 620
shingles 11 620
structural shells 11 620
thin shell roofs 11 620
truss 14 121
Roof rock 10 63
Roof support in mines 3 237 238 8 483 484 502 505
tunnel 14 342
Roof truss 14 121
Roof ventilator 14 296 298
Roofing felt 14 550
Roofing slate 13 152
Roofing tile 3 167
Room, anechoic *see* Anechoic chamber
Room acoustics *see* Architectural acoustics
Room constant noise control 9 121
Roosevelt Dam 9 160
Root (botany) 11 620 626
adventitious 11 621
duration of roots 11 621
haustorial 11 621
herbicide 6 420
media in which roots grow 11 621
plant organs 10 368
primary 11 621
primary tissues 11 622 624
root and shoot connection 11 625 626
root cuttings 11 622
root systems 11 621 622
secondary tissues 11 624 625
taproot 11 621
Root (mathematics) 1 239 11 626*
Root (tooth) 13 674
Root cap 11 623
meristem apical 8 239
Root climbers 13 124
Root-eating beetle 3 278
Root hairs 11 623
Root knot nematode abaca 1 1
alfalfa 1 235
pea 9 600 603
Root mean square 11 626 627
ac circuit 1 271
Root mean square shear stress 8 269
Root nodules 11 548
Root pressure transpiration 10 292

River—*cont*
character terminology 11 581
degrading 11 584
dendritic drainage pattern 11 581-583
drainage area 11 581-582
estuarine circulation 5 80
flood plain features 5 311
flow patterns 11 581
high water occurrence 11 582
low water occurrence 11 582
major rivers (table) 11 582
management of 11 582 583
regime 11 581
in regimen 11 581
salts in 1 630, 634
seasonal fluctuations 11 582
stream patterns 11 583
water qualities 11 582
River bank erosion protection 11 539 540
river engineering 11 583-586
undercutting 5 311, 359
River barge 7 114 116
River birch 2 247, 248
River channel capacity 13 320
contraction works 11 585
improvements 11 585
meandering 11 584
shape 13 320 321
slope 13 321
straight 11 584
River development areas 11 583
River engineering 11 583 586*, 14 64 65
braided 11 584
canals 2 434 11 586
contraction works 11 585
dam 4 3-11
flood plains 5 310
inland waterways transportation 7 114-117
jetty 7 311
locks 2 434
locks and dams 11 585
revetment 11 539 540
river channel improvements 11 585
river characteristics 11 584
transportation 11 583
waste disposal 11 583
water power 11 583
River forecast center 14 455
River management 11 582 583
River prawn 4 29
River terrapin 3 25
River tides 11 586
Riverboat 7 116
Rivet 11 586 587
Rivet (Fastener) 13 201, 206
Rivet wheat 14 480
Riveted joint 11 587 588
butted 11 587
lapped 11 587
strength 11 588
stresses 11 588
structural connections 13 199 203
RL circuit 1 374, 4 225
ac circuit 1 273
RL time constant 13 644
RLC circuit 1 271
RLC peaking circuit 14 90
rms particle velocity *see* Effective particle velocity
rms sound pressure *see* Effective sound pressure
rms value (nonsinusoidal wave) 14 437
RNA see Ribonucleic acid
Road 14 13-15
Road-making machines 2 369 370
Road pavement *see* Pavement
Road runner 5 612, 11 588 589
Road stone 15 152
Road tar 3 236
Roanoke River 9 146
Roanoke Valley 9 146
Roaring forties 9 483
Roasting pyrometallurgy 11 118
sulfides 11 119 121
Robber fly 4 212, 5 362
Roberts, R 13 166
Roberts, W W 8 605
Roberts Mountain 1 523
Roberts radio current meter 9 252-253
Robertson, H P 14 619
Robin 11 589
Robinia 12 79
Robinia pseudoacacia 7 575, 8 243
Robins, B 2 83
Robinson, I 11 437
Robinson, R 8 598
Robinson, R A 12 102
Roblin, R O 13 244
Robulus navarroensis 5 433
Robust click beetle 5 277
Roc 1 82
Rocella tavatilis 2 108
de Rochas Beau 7 196 9 450
Roche, E 12 39
Roche, J 13 626
Roche's limit 12 39
binary stars 2 190
Rochelle electrics *see* Ferroelectrics
Rochelle salt 11 589
ferroelectrics 5 224 227
piezoelectric crystal 10 216
velocity of sound in 12 516
Rochester, G D 2 90
Rochon 10 449
Rochon prism 10 450
Rocinela simplex 5 291
Rock, G D 12 514
Rock 11 589 591
average composition 4 327
cleavage 3 169
compressive strength 4 613
engineering properties 4 612-614
exfoliation 5 143
fabric analysis 13 204
facies 5 175-177
fracture in 5 191-195
genetic classification 11 589
heat generation in 4, 332 , 333
igneous 7 10-18*, 11 590
melting 7 552
metamorphic 8 296-302*, 11 590 591
penetration in drilling 2 295-298
permeability 6 276 277
physical properties and behavior 11 591
porosity 6 276 277
pyroclastic 11 116
recrystallization 7 552
rock cycle 11 591
sedimentary 11 590, 12 129 135*
stone, commercial 13 151-153
tectonics 13 205
types in oceanic crust 13 220 221
see also Petrography, Petrology specific names of rocks
Rock (age determination) 11 591 594
geologic time scale 6 135 137
methods of (table) 11 592
potassium argon method 11 593
rubidium strontium method 11 593
theory 11 591
uranium lead method 11 594
Rock bit 9 295
Rock bolts 8 483 484
Rock crab 4 34
Rock creep 8 167
Rock deformation fold and fold systems 5 367 369
mechanics of *see* Rock mechanics
orogeny 9 409 411
petrofabric analysis 10 48 49
Rock dove 3 302 4 270
Rock drill (animal) 5 417
Rock drill diamond drill 5 418
jackhammer 5 417
percussion drill 5 417
Rock drill—*cont*
rotary drill 5 417
shot drill 5 418
Rock dusting in mines 8 500 501
Rock failure 13 418 420
Rock flour 12 136
Rock forming organisms 2 356
Rock gypsum 6 301
Rock magnetism 11 594 597
chemical magnetization 11 595
depositional magnetization 11 595
geomagnetic dipole 11 596 597
geomagnetic reversals 11 596
geomagnetic secular variation 11 595 596
polar wandering 11 596 597
primary magnetization 11 595
remanent magnetization 11 595
secondary magnetization 11 595
thermoremanent magnetization 11 595
viscous magnetization 11 595
Rock mechanics 11 597 599
analogy with metals 11 599
annealing recrystallization 11 598
brittle fracture 11 598
cataclastic flow 11 598
continental drift 11 596 597
deformational behavior 11 598
fault and fault structures 5 191 195
fold and fold systems 5 368
intracrystalline glide 11 598
recrystallization 11 598
shear fracture 11 598
strength 11 598
tectonic deformation 13 417 418
tectonic history of rocks 11 598
Rock salt 3 72, 8 278, 11 599 600* 12 409
evaporite (saline) 5 127
halogen minerals 6 324 325
intrusive bodies 12 38
optical materials 9 353
Permian deposits 10 25 27
in redbeds 11 597 599
Rock saws 8 489
Rock schistosity 12 63
Rock shell 11 600
Rock slider 4 31

Rubber—cont
polysulfide resins 10 491
polyurethane rubbers 11 642 643
processing 11 635 637
protective agents 11 636-637
radiation damage 11 223
SBR 11 639
silicone resins 12 324 325
silicone rubbers 11 641 642
testing 11 637-638
Thiokol polysulfide rubber 11 641
types 11 638 644
vulcanization 11 636
see also Polymer
Rubber base paint 9 493-494
Rubber products 11 644 646
building operations 11 645
compounding 11 644 645
forming 11 645
mixing 11 645
vulcanization 11 645 646
Rubber snake 2 272
Rubber tree 6 174, 11 638 639, 646 647*, 12 129
Rubel, A. C. 8 448
Rubel, J. W. 10 605, 615
Rubella *see* German measles
Rubellite 11 647* 13 693
gem 6 99
Ruberythric acid 6 224
Rubey, W. W. 1 630, 13 416
Rubia tinctoria 1 456, 6 224
Rubiaceae 3 122 11 647
Rubiales 10 546 11 647*
cinchona 3 122
ipecac 7 257
Rubidium 11 647-648
analytical methods 11 648
atomic clock 1 630
availability 11 648
electron configuration 4 504
extractive metallurgy 8 278
ionization potential 4 504
isotopes in nature 11 593
metallurgical extraction 11 647 648
occurrence 11 647
principal compounds 11 648
properties 11 648
uses 11 647
Rubidium strontium method 11 593
Rubidium vapor magnetometer 8 65
Rubner, M. 13 591
Rubus 2 254, 4 293
Ruby 11 648 649
corundum 3 496
rutile crystals in 11 656
Ruby crowned kinglet 7 361
Ruby spinel 12 618
Ruby throated hummingbird 6 316
Rudder, aircraft 1 215, 11 649*, 13 596
Rudder, ship 12 282
cavitation 2 574
Ruddy duck 4 291
Rudite 11 590, 12 130, 135
Rudolf, Lake 1 107, 109
Ruedemann, R. 9 515
Ruffed grouse 6 285
Ruffini end organ of 12 180
Ruffini cylinder 3 633 13 490
Rugae 4 159
Rugosa 3 261 11 649 650*
Rugose corals 12 77
Rum 4 255
Rumen 4 158
Rumex acetosa 12 229 231
Rumex hastatulus 12 228
Ruminant 2 561
Ruminantia 1 568
Run of press ink 7 115
Runge, F. 2 388
Runner 13 124
Running fit 11 650
allowance mechanical 1 258
Runoff 13 317 319
in Baltic Sea Basin 2 87
extreme flows 13 318
infiltration relations 6 277
and soil erosion 12 432
surface water 13 317 319
water 14 393
Runway airport 11 650 652
airfield lighting 11 652
air-traffic density forecasts 11 650
asphalt surfaces 1 591
FAA standards 11 651
length 1 216
length and loading 11 651
markings 11 651
maximum wind coverage 11 651
obstruction free approach zones 11 651
runway orientation 11 651
wind rose 11 651
Runway visual range 1 93
Rupicapra rupicapra 3 7
Rupture (hernia) 6 425
Rupture (rock) *see* Failure (rock)
Rupture, modulus of (materials) 13 183
Rural development 7 392
Rural electrification 11 652 653
dairy farm applications 11 653
development 11 652
market garden applications 11 653
poultry farm applications 11 653
uses 11 652
Rural sanitation 11 653-654
sewage disposal 11 653 654
water 11 653
Rusnak, G. A. 12 502
Russell, B. 7 582
Russell, H. N. 5 507 4 546
Russell, John Scott 13 166
Russell's paradox 8 177
Russell-Saunders coupling 1 655 657
nuclear structure 9 205
selection rules 12 160
Russian Arctic 1 522
Russian olive 5 39
Russian peasant method of multiplying 9 222
Russian spring summer encephalitis 1 425
Ixodides 7 299
Rust (metal) *see* Corrosion
Rust (microbiology) 11 654 655
barley 2 99
bean 2 117
coffee 3 265
control 11 655
corn 3 485
flax 5 298
life cycle 11 654
oats 9 239
peach 9 602
specificity 11 654
sunflower 13 292
taxonomy 6 427 14 217
vetch 14 310
wheat 14 481
see also Plant disease
Rust fly 4 212
Rust fungus 14 73
Rustellacea 9 497
Rustler dolostone 10 24
Rusty blackbird 2 254
Rut estrus 5 79
reproductive system 11 475
Rutabaga 11 655*, 14 164
disease 14 164
Rutaceae 3 189, 5 545
Ruthenate 11 655
Ruthenium 11 655
compounds 11 655
electron configuration 4 501
extractive metallurgy 8 278
ionization potential 4 504
metallurgical extraction 10 411 412, 11 655
properties 11 655
uses 11 655
Rutherford, Lord 1 652 653, 698, 3 47 516, 10 625, 11 275, 325, 12 57, 74
Rutherford lettering machine 3 548
Rutherford scattering experiments 1 653
nuclear reactions 9 200
plasma physics 10 394
Rutherstat photocopying processes 10 144
Rutilated quartz 11 656
Rutile 8 278, 11 656*
in black sands 12 22
in corundum 3 496
gem manufactured 6 101
ionic crystals 7 248
lattice 7 248
in sapphire 12 26
titanium ore 13 652
Rutin 5 296
Rutile Madelung constant 8 15
Ruwenzori Range 1 107
Runicka, L. 6 255
RV R 1 95
RW Aurigae variable stars 14 229
Ryanodine 7 142
Rydberg, P. A. 10 377
Rydberg constant 11 656
atomic structure and spectra 1 654
Rye 10 574, 11 656 657*
cultural practices 11 657
food 5 373
origin 11 656
processing 11 657
varieties 11 656
Ryukyu Trench 4 326

Root rot 2 99 117, 13 292
alfalfa 1 234
pea 9 600
soybean 12 535
wheat 14 481
Rooter skunk 12 374
Roozeboom, B 5 57, 579, 12 474
Rope manila 11 627
wire 11 627
Rope drive 11 627-628
continuous drive 11 628
multiple drive 11 628
pulley 11 91-93
sheaves 11 92
wire rope 11 628
Ropronnidae 6 574
Rosa alba 11 629
Rosa carolina 11 629
Rosa damascena 11 629
Rosa pendulina 11 629
Rosa rugosa 11 629
Rosacea skin disorders 12 369
Rosaceae 3 190, 10 488, 11 628
Rosales 3 218, 10 546, 11 628*
cherry, wild black 3 56
derrris 4 69
legume 7 449
licorice 7 495
raspberry 11 544
Rosaniline 1 465
Roscoelite 8 546
Rose 11 628 629
Rose, wind *see* Wind rose
Rose breasted grosbeak 6 275
Rose chafer 3 287
Rose curve 11 629
Rose quartz 11 182, 12 321
Rosellinia 3 265, 11 334
Rosemary 12 615
Rosen, N 11 457
Rosenauer, N 8 196
Rosenberger direct current generator 4 225
Rosenblith, W A 9 128
Rosenblueth, A 3 657
Rosenbusch, H 8 298
Rosenmund systhesis 1 231
Rosenzweig, S 1 112, 5 549
Roseola infantum *see* Exanthem subitum
Roseola typhosa 14 173
Rosette fruit (tree) diseases 5 546-548
Rosette gage strain measurement 13 168
Rosette Nebula 7 221
Rosewood 3 187
Roshko, A 7 332
Rosin 11 629
flux 12 472
tall oil 13 387
Rosin oil 11 629 630
Ross, J C 1 622
Ross P. A 3 559
Ross's goose 6 237
Ross lens objective 1 613
Ross Sea 1 440
Rossby, C G 9 247
Rossella 7 638
Rossini, F. D 13 559
Rostellum 3 641-642
Rostratulidae 3 10
Rostrospiracea 13 485
Rot (mathematics) 10 541
Rotaliidea 5 431
Rotameter 5 316
flow measurement 5 318-319
Rotaprint machine 10 616
Rotaria 2 115
Rotaria elongata 2 114
Rotaria neptunia 2 113
Rotary drilling 2 295, 8 473, 9 291
petroleum engineering 10 57-58
rock drill 3 417
Rotary kiln 7 345-346
Rotary motion conversion to reciprocating 12 579
Rotary presses 10 620
relief printing 10 598-599
Rotary pump 4 246
marine machinery 8 122
Rotary tool drill 11 630 631
drilling fluid 11 630
oil and gas well drilling 9 290
power 11 630
rotation speeds 11 630
Rotary vacuum filters 5 272
Rotating amplifiers Amplidyne 4 229-230
Regulex 4 230
Rototrol 4 230
Rotating body acceleration measurement 1 27
Rotating disk extractor 12 499
Rotating flask still 4 253
Rotating frame of reference 5 492
Rotating machines beamings 2 118-126
belt drive 2 161 162
brake 2 317 318
chain drive 3 3 5
clutch 3 223 226
electric *see* Electric rotating machinery
fluid coupling 5 334 336
gears 6 81 86
lateral vibration 8 192
longitudinal vibration 8 192
mechanical coupling 3 525-526
prime movers 10 590 592
rolling contact 11 619 620
shaft balancing 12 239 240
shafting 12 240 241
torsional vibration 8 191 192
unbalance 8 192
Rotation coordinate transformation 3 456
earth motion 4 329, 334 335*, 6 124-125
of molecules 8 549 555
stroboscopic measurement and observation 13 186
see also Rotational motion
Rotation of crops soil management 12 428
Rotation spectra (molecules) 8 551-552
Rotational harmonic motion *see* Harmonic motion
Rotational motion 11 631 632
angular acceleration 1 25
banking of curves 11 631-632
nonuniform circular motion 11 631
and rectilinear motion 8 601
uniform circular motion 11 631
work and power relations 11 632
seismology 12 151
Rotational wave physics 14 419
Rotatory dispersion 11 632 633
optical activity 9 346
optically active materials 11 632-633
polarimetric analysis 10 447
reasons for variation 11 633
Rotatory tidal current 13 636
Rotenone 1 122, 4 69, 7 142, 11 108
Rotifera 1 573, 11 633-635*, 12 255
Bdelloidea 2 113, 11 633
distribution 11 634
Monogononta 8 574 575, 11 633
morphology 11 633-634
reproduction 11 634
Seisonacea 11 633, 12 157
Rotogravure 10 603 617
Rotogravure ink 7 114
Rotogravure presses 10 622
Rotogravure screen 10 618
cylindrical 1 282
salient pole 1 283
windings 14 504
Rotor (electric machinery) 4 448
squirrel cage 7 75
wound 7 77
Rotor (helicopter) 6 384
Rotorua Lake 1 672
Rototrol 4 230
Rotten neck disease 11 564
Rough air 8 554
Rough green snake 6 268
Roughing plane 14 543
Roulette probabilities in infinite spaces 10 626
Round carrion beetle 3 276
Round off errors 7 217
Round robin network radio 11 251
television 13 467 468
Roundheaded apple tree borer 3 287
Roundworm 13 195
Rous sarcoma 11 655
fluorescent antibody method 8 585
Route surveys 13 327
circular curve 13 328
highway 6 450
horizontal curve 13 328
tunnels 14 142
vertical curves 13 328
Roux, W 4 569
Rovamycin 1 466
Rove beetle 2 150, 3 276
Roving textile 13 534
Row-crop planters 1 128
Rowan, W 11 478
Rowland ballistic method 13 332
Rowland circle 4 141
Rowland ghosts 4 140
Rowland mounting 4 141
Rowland ring 8 32, 50 10 23
Royal Gorge 9 156
Royal jelly 2 128, 12 405
Royster stove 6 373
RPF 14 231
RQ *see* Respiratory quotient
RR Lyrae stars 14 278
Ruapehu Mountain 1 671
Ruapehu Volcano 1 673
Rubber 11 655 644
adduct rubbers 11 643 644
1,3 butadiene 2 376
butadiene styrene rubbers 11 639
butyl 11 640
carbon black 2 465
chicle 3 59
curatives 11 636
diene 4 117 118
GR S 11 639
Guayule 6 286
hypalon 11 642
insulation, electric 7 157
mercaptan 8 224
natural rubber 11 634 639
neoprene 11 639
nitrile rubber 11 640 641
paint 9 493
pigment 11 636
plant metabolism 10 560
polyacrylonitrile resin 10 460
cis 1,4 polybutadiene 11 643
cis 1 4 polyisoprene 11 643
polystyrene resin 10 491

S

S 816 alloy 7 266
S radar band 11 201
S seismic waves 12 151 152
earth interior 4 339
S1 mode 9 139
Saanens goat 6 227
Sabadilla 7 142
Sabalmo incongruella 7 461
Sabella 10 492 11 427
Sabellaria 1 429 10 461, 465
Sabellariidae 10 462
Sabellidae 10 462
Saber saw 14 543
Sabin 1 18
Sabine H J 3 18
Sabine stimulea 7 468
Sable 12 1
Sac, yolk *see* Yolk sac
Sacramm ra sphaerica 5 430
Saccharase 4 172
Saccharimeter 10 446
Saccharin 12 1*, 13 239
Saccharomyces 12 2 14 601
Saccharomyces carlsbergensis 2 624
bioassay 2 194
malt beverage 8 80
Saccharomyces cerevisiae
baker's yeast 14 603
bioassay 1 341, 2 194, 9 236
cell surface ionization in yeast 2 624
distilled spirits 4 254
giant colony 14 606
industrial fermentation of steroid 13 138
malt beverage 8 80
wine 14 508
Saccharomyces ellipsoideus 4 254
Saccharomyces fragilis 14 604
Saccharomyces kefir 8 435
Saccharomyces rouxii 14 600, 602
Saccharomycetaceae 12 1
Saccharomycetales 12 1 2*, 14 601
Saccharomycetoideae 12 1
Saccharomycodes 12 2 14 601
Saccharomycopsis 12 2 14 602
Saccharomycopsis guttulata 14 602
Saccharose *see* Sucrose
Saccharum Barberi 13 241
Saccharum officinarum 13 241
Saccharum sinense 13 241
Saccharum spontaneum 13 241
Saccoglossus 3 3
Saccopharyngiformes 9 442 12 2*
Saccorhiza 12 29
Saccule 10 124
Sacculina 1 562 2 102 9 555
Sacculina carcini 3 567
Sacculus (ear) 4 321
Saccus vasculosus 9 58
Sachs, R 11 438
Sachsse process (acetylene) 9 465
Sacral rib 12 365
Sacral vertebra 12 365
Sacramento Range 9 160
Sacramento River 9 162
Sacrum 9 616
SAE number (steel) 13 92 313
Safe 12 2
Safelight 10 165
Safety factor 12 2
Safety film 10 156
Safety fuse 5 579
Safety glass 6 207 12 2 3
Safety lamp 12 3
Safety match 8 170
Safety regulations (ships) 12 275 276
Safety valve 12 3 14 260 261*
Safflorite 3 246
Safflower 12 4
Saffron 7 514 12 4*
glucoside 6 209
spice and flavoring 12 615
Safranine T 4 303
Sagartiidae 1 52 54
Sage 12 4* 12 613
SAGE (semiautomatic ground environment) system 4 17
Sage willow 14 493
Sagebrush 5 49 14 288
Sagenites giebeli zone 14 82
Sagenocrinida 4 360
Sagenopteris phillipsi 2 578
Sagger refractory chamber 7 246
Sagitta 3 412 413
Sagitta enflata 3 1
Sagitta macrocephala 4 40
Sagittal astigmatism 1 6
Sagittariidae 5 179
Sagittarius 3 412 414* 12 4
Sago 13 50
Sago palm 3 638
Saguaro 2 586 9 569
Saguaro cactus 3 100
Saha, M N 1 501
Sahara Desert 1 106
Saharan Atlas 1 107
Sahul Shelf 4 355 358
Sailfish 10 10
Sailplane 12 5 6
Saimaa, Lake 5 116
St Anthony's fire *see* Erysipelas
St Clair, Lake 1 672
St Cuthbert's beads 3 547 550
St Elias Range 9 159
St Elmo's fire 12 6
St Francis Mountains 9 155
St Helena Island 1 104
St Joe process (zinc metallurgy) 14 614 615
St John's bread 8 92
St Lawrence Island 1 523
St Lawrence Seaway 7 116 9 154
ship clearance 12 257 258
St Lawrence Valley 9 145 147 148
St Louis encephalitis 1 425 429
St Paul's Rocks 8 532
St Peter sandstone 9 376
Saithe 8 115
Sakaguchi reaction 1 529
Sakel, Manfred 7 164
Sakhalin Island 1 521 523
Sakmarian stage 10 23
Sakurajima 14 355
Sakurajima Volcano 14 355
Salad dressing 5 187
Salado formation 11 389
Salamander 12 6
behavior development 2 135 138
Salamandra 7 376 632
Salamandra atra 12 7
Salamandra salamandra 12 7
Salamandroidea 2 568 12 6 7*
Ambystomatidae 12 6
Amphiumidae 12 7
Plethodontidae 12 7
Salamandridae 12 7
Salammoniac 6 525
Saldidae 6 401
Salemidae 6 399
Salentine Peninsula 5 116
Salep 9 573
Salep mannan 8 92
Salerno, Gulf of 5 115
Salicaceae 10 488 12 8
Salicales 10 346, 12 8
Salicin 12 8
glucoside 6 219, 224
Salicinase 5 203
Salicornia 3 191, 8 127
Salicylaldehyde 3 579
Salicylaldehyde chelate 3 20
Salicylate 1 356, 5 74, 12 8*
Salicylic acid 1 520, 2 55, 475 10 112
Salient pole field winding 14 504
Salientia 12 8* 361
Amphibia 1 535 594
Amphibia fossils 1 551 556
Amphicoela 1 539*, 12 8
Anomocoela 1 433* 12 8
Diplasiocoela 4 208 209*, 12 8
ecology 12 10
economics 12 10
frog 5 537 538
morphology 12 8
nutrition 12 10
Opisthocoela 9 543*, 12 8
Procoela 10 638 639* 12 8
reproduction 12 9
taxonomy 12 8
toad 13 661
Salina 10 415
Saline *see* Evaporite
Saline soils *see* Salted soils
Saline water reclamation 12 10 14
electrodialysis 12 12 13
flash distillation 12 11 12
freezing methods 12 15
ion permeable membrane 7 235 237
multiple effect distillation 12 11
solar distillation 12 12
vapor compression 12 12
Salinella 8 254
Salinity estuarine waters 5 80
fresh water 6 568
salt lakes 7 387
sea water 6 567* 12 110 111
Saliva 1 365 4 164 165*
Salivary gland 4 164 9 570
Salivary gland virus disease 12 14
Salix 3 190 4 234 10 489 14 492
Salix alba 12 8
Salix alba var vitellina 14 493
Salix andersoniana 12 229
Salix babylonia 14 493
Salix candida 14 493
Salix cordata 4 293 14 493
Salix fragilis 14 493

Sandstone—cont.
structure 12 24
texture 12 24
uses 12 23
Sandström, J W 9 245
Sandwich panel 1 69
Sangamon (interglacial) 6 195
Sanger, E. 4 255
Sanger F 7 164, 11 38
Sanidine 5 209
Sanidinite 12 25
Sanitary engineering 3 149, 12 25*
definition 12 25
practice 12 25
sewage disposal 12 218
water purification 14 401
...itary standards, water 4 390-391
...itary ware (clay products) 1 167
...itation (food engineering) 5 385
...itation rural 11 653 654
...manoides exitiosa 7 466
...nta Cruz formation 9 271
...ntalaceae 12 25, 25
...ntalales 10 346 12 25*
mistletoe 8 517
...ntalol 13 497
...ntalum album 12 25, 25, 14 527
...ntonian subetage 3 543
...antorin 5 120
...antorini s duct 9 529
...as Francisco River 12 529 530
...ao hirruta 14 104
...ao Paulo exanthematic typhus see Spotted fever, Rocky Mountain
...ao Tomé Island 1 107
...ap feeding beetle 3 278
...ap flow beetle 3 276
...apamine 13 538
...aperda candida 3 287
...apindaceae 7 625
...apindales 10 346 12 25 26*
buckeye 2 359
mango 8 90
poison ivy 10 438
poison sumac 10 438 439
quebracho 11 189
Saponification fat and oil, nonedible 5 389 389
glycerol 6 221
wax 14 444
Saponin 6 224
Saponite 5 165
Sapotaceae 3 59, 4 358
Sapper, K. 13 436
Sapphire 11 648 12 26*
corundum 5 496
Saprodinium 9 276
Saprolegnia 10 199 200
Saprolegnia ferax 9 256
Saprolegniales 10 200
Sapromyces 10 200
Sapropel 6 186, 12 26*
coal 3 228
deposits 12 140
Saprophyte 1 256
Saprospira 13 4
Saprozoic nutrition 5 99
Sapsucker 1 26 27, 14 541
Sapygidae 6 574
Saran 3 75, 5 244
Sarcina 2 6, 8 350
Sarcina maxima 2 42
Sarcina morrhuae 2 340
Sarcobatus 3 191
Sarcochore 10 499
Sarcocystis lindemanni 12 30
Sarcocystis muscheriana 12 30
Sarcocystis tenella 12 30
Sarcodina 11 52, 548, 12 27 29*
Actinopodea 1 57, 11 52 12 27
alternation of generations 12 29
Amoebida 1 329 331
arenaceous test 12 28
axoneme 12 27
axopodia 12 27
cycloid test 12 28
dimorphism 12 27
foramina 12 28
Foraminifera fossils 5 429
Foraminiferida 12 28
Heliozoida 6 590* 12 27
megalospheric test 12 28
microspheric test 12 28
Mycetozoida 8 677
myxopodia 12 28
nodosaroid test 12 28
pseudopodia 12 27
Radiolarida 11 515* 12 28
Rhizopodea 11 52, 548, 12 27
spiral test 12 28
test 12 28
Testacida 13 524
textularid test 12 28
Sarcoidosis liver disorders 7 563
metabolic disorders 8 256
Sarcolemma 8 636
Sarcoma 10 100 12 369
oncology 9 320
Sarcomere 8 655
Sarcophaga carnaria 8 680
Sarcophaga haemorrhoidalis 8 680
Sarcophagidae 4 212, 8 679
myiasis 8 680
Sarcophyton 1 226
Sarcophyton acutangulum 1 227
Sarcophyton crassocaule 1 227
Sarcoplasm 8 637
Sarcopterygii 9 442 443, 12 29*
Crossopterygii 3 555*, 9 442
Dipnoi 4 210 211*, 9 442 12 29
Osteichthyes 9 442*, 12 29
Sarcoptes scabei 1 496, 8 517, 12 29
Sarcoptiformes 12 29 30
Acari 12 29
Acaridiae 12 29
development 12 29
hypopus 12 29
Oribatei 12 29
tapeworm vector 12 30
Sarcosporidia 1 47 11 55, 12 30 31* 13 12
life cycle 12 30
Sarcosporidiosis 12 30
Sard 5 6, 6 99
Sardinas, J. 3 643
Sardine 3 223 5 416, 419
Sardinia 5 117 8 207
Sargasso Sea 12 31
Sargassum 10 90, 12 31
Sargent B W 11 284
Sargent S S 5 549
Sargent diagrams (beta decay) 11 284 285
Sargo nuclear reactor 11 363
Sarin 3 45, 9 405
Sarmatian Sea 2 255
Saroban see Abacus
Saros 4 380
Saros, Gulf of 5 115
Sarothrilidae see Jacobsonidae
Sarracenia purpurea 10 244
Sarraceniaceae 10 244, 12 31
Sarraceniales 10 346, 12 31*
insectivorous plants 7 144
pitcher plant 10 244 245
sundew 13 290
Sars, G O 9 266, 523
Sars, M 9 266
Sarsaparilla 7 514, 12 31-32*
Sartorya 5 125
Sartorya fumigata 5 125
Sasik Lake 5 116
Saskatchewan Plateau 9 155
Sassafras 12 32
Sassafras albidum 12 32
Sassolite 2 293
Sastrugi 6 201
Sateen weave 13 536
Satellite (astronomy) 12 32
artificial see Satellite artificial
Jupiter 7 524 525
Mars 8 152 154
Neptune 9 41
origin of 5 508-509
perturbation of orbits 10 38-39
Saturn 12 40
Uranus 14 214
Satellite (diffraction gratings) 4 140
Satellite, artificial 4 329 12 32 36*
earth tide observations 4 349
escape velocity 5 68
life 4 329 12 34
meteorological uses 8 322 323
navigation uses 9 16
optical tracking instruments 9 358 362
orbital energy 12 32 33
orbital velocity 12 34
orbits 12 345
radio astronomy 11 247
rocket engines 12 34
space station 12 343
structure 12 347
television camera 8 322
tracking 1 447, 613 614, 8 303 304, 12 35 36
use in aeronomy 1 99
see also Planet, artificial
Satellitosis 9 68
Satin spar 2 397; 6 301
Satin weave 13 536
Sato, M 8 197
Saturable core magnetometer 8 65 66
Saturable reactor 12 37, 203
core material 8 27
magnetic amplifier 8 27-29
in servomechanisms 12 203
Saturated cadmium cell 14 360
Saturation 4 256 12 37
Saturation adiabatic lapse rate 1 632
Saturation current 12 37
Saturation magnetization 5 229 230 8 49
Saturation of solutions 12 37 38
crystallization 3 600 601
precipitation 10 575
Saturn 12 38 40
albedo 1 223
atmosphere 12 38
escape velocity 5 68
oblateness 6 264
orbit 12 38
origin of rings 5 509
phases 12 38
ring system 12 38-40
satellites 1 40
telescopic appearance 12 38
Saturniidae 7 464 8 600
Saturnioia 7 143
Saucers, flying see Flying saucers
Sauces 5 413
Sauconite 5 164
Sauerkraut 5 423
Sauger 14 383

Salix humilis 14 493
Salix purpurea 14 493
Salix sericea 14 493
Salmincola salmonea 7 477
Salmincola thymali 7 477
Salmo agua-bonita 14 119
Salmo clarkii 14 119
Salmo gairdneri 14 118
Salmo salar 12 14
Salmo trutta 14 118-119
Salmon, A 10 616
Salmon, V 7 592
Salmon 5 416, 419, 8 113, 12 14*, 396
Salmon River Mountains 9 158
Salmonella 5 1, 12 14 16*
  antibiotic 1 466-467, 13 528
  antigenic structure 12 14
  bacterial food poisoning 5 425
  bacterial motility 2 63
  carriers 12 15
  clinical pathology 3 200
  Enterobacteriaceae 5 1-2
  gastroenteritis 7 95
  H antigens 12 14
  immunization 12 16
  IMViC test 7 49
  infection 12 15
  O antigens 12 14
  paratyphoid gastroenteritis 9 562
  pneumonia 10 428
  serotypes 12 14
  specific diagnosis 12 16
  typhoid fever 14 173
  Vi antigen 12 14
  Widal's reaction 12 16
Salmonella abortus bovis 12 15
Salmonella anatum 12 15
Salmonella cholerae suis 9 561, 12 15
Salmonella enteritidis 12 15
Salmonella gallinarum 12 15-16
Salmonella montevideo 12 15
Salmonella newport 12 15
Salmonella oranienburg 12 15
Salmonella paratyphi A 9 561, 12 15
Salmonella paratyphi B 9 561, 12 15
Salmonella paratyphi C 9 561
Salmonella typhi 12 15, 14 173
Salmonella typhimurium 9 561 562 12 15
Salmonella typhosa biomassy 2 197
  fluorescent antibody method 8 583
  ice cream 7 5
  tetracycline 13 528
  water borne disease 14 411
Salmonellaeae 5 2
Salmonellosis 12 14
Salmonidae 3 223, 12 14 14 118
Salmonoidei 3 223
Salmopercae *see* Percopsiformes
Salomiki, Gulf of 5 115
Salp 14 140
Salpa 13 543
Salpa (Thalia) democratica 4 40
Salpeter, E E. 4 553, 11 47
Salpida 13 543
Salpingidae 3 276
Salpingitis 6 236, 11 480
Salpingoeca infusionum 9 562
Salt (chemical) 12 16-17
  classification 12 16
  hydrolysis 12 16 17
  modern theories 12 17
Salt (food) 12 17 18
  Alberger process 12 17
  buttermilk 8 434
  food preservation 5 426
  grainer salt 12 17
  method of manufacture 12 17
  salt additives 12 18
  use in food industry 12 17
  vacuum pan salt 12 17
Salt bridge 12 18
Salt deposits Devonian 4 89
  evaporite (saline) 5 127-129
  Permian 10 26
  rock salt 11 599 560
Salt dome 12 18 19*, 409
  diapiric structures 4 102
  economic importance 12 19
  formation 12 18
  geographic distribution 12 19
  gravity anomalies 12 18
  Gulf of Mexico 6 293
  oil fields 12 19
  petroleum traps 10 64
  salt from 12 19
  sulfur production 12 19
  underground storage of hydrocarbon liquids 9 289
Salt Flat graben 10 25
Salt gland 12 19
  excretion 5 137 143
  osmoregulatory mechanisms 9 434
Salt glaze 6 212
Salt Lake 7 587
Salt nuclei in atmosphere 1 634
  cloud physics 3 214 215
  in marine air 12 103 105
Salt River 9 160
Salt spray climax community 3 182 186
Salt spray test 5 18
Salt water conversion *see* Saline water reclamation
Salt water intrusion 14 404
Salt-water lake 6 568 7 587*
  Caspian Sea 5 109
Salt water lake—*cont*
  sedimentary deposits in 5 127-129
Salt water pearls 9 606
Salt-wedge estuary 5 80
Saltation 12 136
Salted soils 12 427
  contributions from atmosphere 1 634
  control of salinity 12 429-430
Salticidae 1 498
Salting agents, chemical 9 189
Salting-out effect 12 19
Salton Trough 9 160
Saltoposuchus 13 545-546
Salvador 9 164
Salvage, ship *see* Ship salvage
Salvarsan 1 550, 9 401
Salve bug 12 533
Salvelinus 8 14
Salvelinus arcturus 14 119
Salvelinus fontinalis 3 223, 14 118
Salvelinus malma 14 119
Salvia officinalis 12 4
Salween River 1 580
Salzburg Alps 5 117
Samar, island of 9 482
Samara 5 542, 8 99
Samarium 12 19 20
  electron configuration 4 504
  extractive metallurgy 8 278
  ionization potential 4 504
  paramagnetism 9 549
Samaropsis 3 478
Samarskite 11 342 14 210
Sambucus canadensis 13 112
Samia cynthia 7 469
Sample 2 223
Sample preparation (analytical chemistry) 12 484 485
Sample space (probability) 10 625
Sampled data control system 12 20 21
Sampling analytical chemistry 1 392 12 21
  assaying 1 593
  biometrics 2 225
  pulse modulation 11 96 97
  quality control 11 140
  statistics 13 66 75
  survey work 8 587
Sampling techniques 12 21
  aliquot portion 12 21
  liquids 12 21
  solids 12 21
Sampling thief 12 21
San Andreas Fault 4 537 552, 9 412 13 411
San Jose River 14 399
San Jose scale 6 476
Sanatron delay circuit 13 643
Sand 12 21-22
  bentonite bonded 3 161-162
  casting 2 542
  clastic sediments 12 138
  fireclay bonded 3 161 162
  industrial grades 12 22
  migration on beaches 12 302
  mineral constituents 12 22
  monazite 13 610
  movement along shore 12 304
  natural occurrences 12 22
  size on beaches 12 303
  source on beaches 12 303
  thorianite in 13 609
  transport by wind 4 296, 12 136
  uses 12 22
Sand by passing plants 12 305
Sand casting 2 542
Sand deltas 12 305
Sand dollar 12 22 23
Sand exclusion, oil well 9 300
Sand filter 3 155, 10 407 408
Sand flea 1 563, 12 345
Sand Hills 6 277
Sand hopper 3 563, 6 35
Sand Mountain 9 150
Sand plain climax community 3 182 186
Sand roller 10 10
Sand storm 4 296
Sand tables (ore dressing) 9 390
Sand worm 10 461
Sandage, A R 13 42
Sandalidae 3 277
Sandalwood 12 23*, 25
Sandalwood oil 13 497
Sander, B 10 202, 12 63
Sanderia 12 165
Sanderson R T 4 520
Sandfly 14 124
Sandhill crane 3 535
Sanding (wood finishing) 14 531
Sandmeyer process 11 111
Sandmeyer reaction 4 106
  nitrile 9 106
Sandpiper 12 23
Sandstone 11 590 591, 12 23 25*, 139
  abrasive 1 9, 13 152
  arenaceous rocks 1 529
  arkose 1 532
  asphalt in 1 590
  classification 12 24 25
  composition 12 24
  compressive strength 4 615
  diagenesis in 4 94
  dimension stone 13 151
  ornamental stone 13 152
  particle size 12 23
  redbed 11 547

Schenck C A 5 461
Scherbius induction motor drive constant horsepower 1 296
constant torque 1 296
Schering bridge capacitance measurement 2 442
dielectric constant measurement 4 111
Schiaparelli G V 8 154, 507 14 300
Schick test 1 473 487
antigen antibody reaction 1 473
diphtheria 4 207
neutralization reaction (antibody) 9 82
skin test 12 372
Schiebold Sauter technique 14 569
Schiemann reaction 4 106
Schiff base 1 311 12 62*
aldehyde 1 229
Schiffer J 11 458
Schilbeodes 2 552
Schimper, W 5 31, 9 308, 12 523
Schindleria 10 243
Schmopsis lorentzi 11 187
Schist 12 62 63
composition 12 63
compressive strength 4 613
crystallization cleavage in 12 63
flow cleavage in 12 63
fracture cleavage in 12 63
rotational strain in 12 63
laminar gliding in 12 63
schistosity in 12 63
shearing stress in 12 63
Schistes lustres 10 202, 13 408
Schistocerca 9 417
Schistosity rock 12 63
metamorphic rocks 8 299
rock fabric studies 13 205
in schists 12 63
slates 12 574
Schistosoma 12 389 14 411
Schistosoma douthitti 12 229
Schistosoma haematobium 12 63
Schistosoma japonicum 12 63
Schistosoma mansoni 12 63
Schistosomiasis 12 63 64* 389
biology 12 64
diagnosis 12 64
dimensions of human blood fluke 12 64
distribution 12 63
epidemiology 12 64
liver disorders 7 563
oncology 9 323
pathogenesis 12 64
treatment 12 64
see also Schistosoma
Schizaeales 1 425, 12 64-65*
Schizogony 11 448, 13 12
Coccidia 3 249
Microsporidia 8 405
Schizogregarinida 6 269 11 52, 12 65*
Schizomycetes 2 5 8 678, 12 65-66*
Actinomycetales 1 56, 12 66
bacteria 2 5, 10
Beggiatoales 2 131, 12 66
Caryophanales 2 536 12 66
Chlamydobacteriales 3 64, 12 66
Eubacteriales 5 95 12 66
Hyphomicrobiales 6 593 12 66
metabolism 12 65
modes of reproduction 12 65
morphology 12 65
motility 12 65
Mycoplasmatales 8 679 12 66
Myxobacterales 8 685 12 66
photosynthetic pigments 12 65
pseudomonadales 11 64 65 12 66
spirochaetales 12 66, 13 2 4
taxonomy 12 65
Schizomycophyta 10 320 346 13 545
Schizopathidae 1 481
Schizophalis 7 49
Schizophora 4 212
Schizophrenia 4 51 8 227 12 66*
insulin shock 7 164
manic depressive psychosis 8 91
paranoia 9 553
subtypes 12 66
treatment 12 66
Schizophrenia paranoid *see* Paranoid schizophrenia
Schizophrenic psychosis 7 164
Schizophyceae 12 67
[illegible]
Schizotrypanum cruzi see Trypanosoma cruzi
Schizura concinna 7 470
Schlafkrankheit see Sleeping sickness, African
Schläfli symbols 10 491
Schlegel, H 13 249
Schleiden T 2 590
Schlesinger H I 2 291
Schlieren (rock) igneous rocks 7 15
petrology 10 84
in syenite 13 361
Schlieren optical system 12 67
Schlieren photography 12 67 68*, 298
water tunnel 14 410
wind tunnel 14 498
Schlumberger Photoclinometer 10 138 139
Schmid Meissner process 9 104
Schmidt C 6 16
Schmidt K 14 620 624
Schmidt camera 12 68* 13 449 452
astronomical photography 1 613
astronomical spectroscopy 1 615
Schmidt Cassegrain system 12 68
Schmidt net 10 49
Schmidt Nielsen K 4 159 9 439
Schmidt rearrangement, molecular 13 127
Schmidt telescope *see* Schmidt camera
Schmidt vertical field balance 8 65
Schmitt comparator circuit 3 330 331
Schmitz' bacillus 12 254
Schneiderhohn H 9 382
Schoeffer P 10 609
Schoenflies A M 3 596
Schoenherr K E 12 279
Schoenherr Hessberger process 9 115
Schoetensack O 6 385
Schooping gun 8 291
Schott G 8 139 142, 9 266 352
Schotten Baumann reaction
acid amide 1 303
acid halide 1 44
acylation 1 62
amine 1 305 306
Schottky W 3 593 4 519
Schottky defect 3 583* 12 479
Schottky effect 12 68 69
Schrödinger E 3 355, 7 503 8 194 9 363 11 145 12 60 69 14 258 424
Schrödinger's wave equation 12 69
band theory of solids 2 92 93
perturbation (quantum mechanics) 10 41
quantum chemistry 11 145
Schrödinger's wave equation—*cont*
quantum mechanics 11 160 161
quantum theory, nonrelativistic 11 172 174
resemblance to Hamilton Jacobi equation 6 331 332
Schuler, M 7 91, 12 69
Schuler pendulum 7 91, 12 69 71*
Schuler tuning gyrocompass 6 306
inertial guidance system 7 91
Schüller, A 13 249
Schultz Dale reaction 1 395
Schulze, F 6 398
Schumann Runge bands of oxygen 8 555
Schumm, S A 12 305
Schurz, C 5 461
Schwann M 2 590
Schwann cell 3 655 8 196, 9 53
Schwanniomyces 12 2 14 601
Schwartzkopff J 10 127
Schwarzschild Crettien telescope 8 510
Schwarzschild's radius 11 437
Schwarzschild's telescope 13 451
Schweinfurt green 1 30
Schwerdt C E 14 331
Schwers F 12 576
Schwinger J 4 462 11 148
Schwyz Alps 5 117
Sciaenidae 3 550 10 10 12 249
Sciama D 3 505
Sciatic artery 2 495
Sciatica 12 71
Science 12 72
and art 1 552
descriptive 12 72
exact 12 72
logic 7 578-582
scientific methods 12 72-74
Science (animal) agricultural *see* Agricultural science (animal)
Science (plant) agricultural *see* Agricultural science (plant)
Science earth *see* Earth sciences
Science physical *see* Physical science
Scientific methods 12 72 74
cause and effect 12 73 74
classification 12 72 73
consensus 12 73
experiment 5 143 12 73
logic 7 578 582
measurement 10 205 207 12 74
repetition 12 73
Scillaren A 11 107

Saunders, H E 14 382
Sauria 13 22-24
  classification 13 24
  courtship activity 13 24
  defense mechanisms 13 23
  physiology 13 22 23
  reproduction 13 24
  rhythmic activity 13 24
  territorially 13 24
  venomous species 13 24
Saurichna 4 198-200*, 11 484
  Archosauria 1 521
  Jurassic 7 327
  Sauropoda 11 484
  Theropoda 11 484
Sauripterus 12 357
Sauromalus obesus 3 119
Sauropod 11 484
Sauropoda 4 198, 11 484
Sauropterygia 5 124, 11 484, 12 40 41*
  Nothosauria 11 484, 12 40-41
  Placodontia 11 481, 12 41
  Plesiosauria 11 484, 12 41
Sauruaceae 10 241
Saury 2 161
Saussurite 5 214
Saussuritization 5 39
Sauterne 14 507
Sava River 5 122
Savage beetle 3 276
Savanna 3 189
  climax community 3 182 186
  climax plant formations 3 186 192
  grassland of Asia 1 587
Sat annah 8 120, 11 362 365
Savannah River 13 320
Savart F 2 247
Savory 12 613
Savos Alps 5 117
Savu Sea 9 271
Saw metal 8 7
  wood 14 542 543
  see also Sawing
Saw-tooth wave 12 42 46
  current 12 45 46
  voltage 12 43 45
Saw tooth-wave generator
  bidirectional clamp 12 44
  bootstrap circuit 2 290 12 44
  constant-current 12 44
  current feedback 12 45 46
  current saw tooth 12 45 46
  keyed clamp 12 43
  Miller integrator 12 45 46
  RC circuit 12 43
  thyratron 12 43
  time-delay circuits 13 644
  trapezoidal voltage generator 12 45-46
  voltage saw tooth 12 43 45
Sawfish 11 531, 549
Sawfly 6 574
Sawing 12 41-42
  contour 12 41
  cutoff 12 41
  diamond 4 100
  machining operations 8 6
  stone quarrying 11 181
  woodworking 14 542-543
Savaul (shrub) 1 587
Saxifraga 5 39
Saxophone 8 665 666
Say stink bug 6 405
Sayan Mountains 1 585
Sayornis phoebe 10 119
Saytzeff rule 13 132
SBR rubber 11 639
Scab mite *see Psoroptes ovis*
Scabies 12 370
Scabiosa succisa 6 219
Scala tympani 4 323
Scala vestibule 4 323
Scalar 12 46 47
Scalar integral 2 414
Scalar matrix 8 183
Scalar product 2 412
Scald 2 99, 13 245
Scale (map) *see* Map scale
Scale (music) 8 662 664, 12 47*
Scale (weighing) 14 462-463
  hydraulic 14 462 463
  mechanical 14 462
  pendulum 14 462
  pneumatic 14 463
  spring 14 462
  see also Balance (weighing instrument)
  Weight measurement
Scale (zoology) 3 22 21 12 47 48
Scale factor 12 181
Scale insect 6 475, 8 187 12 48*
  chromosome number 3 107
Scale of *n* counter circuit 12 48
Scalene triangle 14 81
Scalibregmidae 10 462
Scalid 7 362
Scaling circuit 12 48 49
  frequency counter 5 502
  Geiger Muller counter 6 92
Scallop 1 427 12 49*
Scallop (squash) 13 28
Scalopus aquaticus 8 537
Scalpellidae 7 456
Scalpellum 4 41
Scalpellum vulgare 12 236
Scaly anteater 1 442 10 119
Scaly bud 2 360
Scaly leg 12 50
Scambus 6 580
Scandinavian Peninsula 5 116
Scandium 12 49 50
  analysis 12 50
  compounds 12 49 50
  distribution 12 49
Scandium—*cont*
  electron configuration 4 504
  extractive metallurgy 8 278
  ionization potential 4 504
  occurrences 12 49
  purification 12 50
  separation 12 50
Scandium acetylacetonate 3 18
Scanning color printing 10 607
  facsimile 5 177
  radar 11 205
  radioisotopes 14 8
  television 13 475-476
Scanning electron microscope 8 373
Scantlings 12 274
Scape 13 111
Scaphidiidae 3 276
Scaphopus couchii 12 8
Scaphopus holbrooki 1 455
Scaphoides luteolus 14 76
Scaphopoda 8 559, 12 50* tooth shell 13 676
Scapolite 12 50
Scapula 5 289, 12 306
Scar tissue 7 176
Scarab 1 513 2 131
Scarab bracelets 6 99
Scarabaeoidea 3 276
Scarabeiform larva 2 131
Scarfing, oxygen 9 472
Scarlet fever 1 466 467 12 50 51*, 372, 13 178
  complications 12 51
  Dick skin test 12 51
  symptoms 12 50
  treatment 12 51
Scarlet fever toxin 13 178
Scarlet oak 9 237 *13 115*
Scarlet tanager 13 388
Scarp *see* Escarpment
Scatchard G 9 436
Scatopsidae 4 212
Scatter communications
  FM radio 5 521
  overseas telephone service 13 439
  radio wave propagation 11 321
Scattering (electromagnetic radiation) 12 51 53
  in atmosphere 8 320 321
  colloidal particles 12 53
  contrasted to absorption 1 13
  large molecules in solution 12 52
  measurement 10 478
  meteorological optics 8 320 321
  molecular weight determination 8 558
  radio wave propagation 11 319 322
Scattering (electromagnetic radiation)—*cont*
  Raman effect 11 332 334
  Rayleigh scattering 12 51
  x rays 1 633
Scattering (physics) of alpha particles 1 633
  atomic and molecular 12 53 57
  coherent 12 57
  Compton effect 5 533 539
  elastic 12 54 57
  electromagnetic radiation 12 51 53
  electron diffraction 4 506 509
  incoherent 12 57
  inelastic 12 54 57
  light 12 51 53
  neutrons 9 88 91
  nuclear 12 57-60
  Raman effect 11 332 334
  Rayleigh 12 51
  x rays 1 633, 9 88
Scattering cross section, electron 5 531 537
Scattering experiments atomic and molecular 1 633, 12 53 57*
Scattering experiments, nuclear 9 200 203, 12 57-60*
Scattering layer 12 60 61
  detection 12 60
  scattering organisms 12 60
  vertical migration 12 60
Scaup 4 291
Sceliolosaurus 4 201
Scelionid wasp 6 574
Scelionidae 6 574
Scelisphron caementarium 6 582, 14 386
Sceloporus undulatus 7 564
Scenedesmus 1 255, 2 601
Scenedesmus obliquus 10 254
Scent gland 12 61
  Hemiptera 6 400 410
Sceptre 10 251
Schackoina molinienus 5 458
Schackoinidae 5 455
Schafer H E 6 444
Schaffer, F I 14 551
Scharlinger dextrins 4 93
Schatzman E 9 175
Schaudinn F 13 11
Scheat 9 610
Scheele C W 3 67, 6 221
Scheele K W 2 95, 8 562
Scheele's green 1 550 551
Scheelite 12 61* 14 154
Scheffer stroke function 7 569
Scheffertite 11 127
Scheibel York extractor 12 499
Scheidegger, A F 15 417 427
Schelkunoff S A 1 449
Schelorabates laevigatus 12 30
Schematic drawing 4 612 12 61-62*

yphistoma 7 304 305
yphomedusa 4 39, 12 90
yphopolyp 12 90 165
yphozoa 3 255 261, 12 90 91*
Coronatae 3 255 498*, 12 90
Cubomedusae 3 255 612*, 12 90
ecology 12 91
embryology 12 90
jellyfish 7 304-305
morphology 12 90
physiology 12 91
Rhizostomeae 3 255, 11 549*, 12 90
Scyphomedusae 12 90
Semaeostomeae 3 255, 12 90 165*
Stauromedusae 3 255, 12 90, 13 75-76*
Stromatoporoidea 12 90, 13 191 192*
Scyphomantha 4 41
Scythian stage 14 82
Scyphonema 3 636
Sea 12 91
science of *see* Oceanography
subdivisions *see* Oceans and seas
water in *see* Hydrosphere, geochemistry of, Sea water
see also Sea state; Sea surface
Sea anemone 1 455
Sea arrow 13 30
Sea bass 10 10
Sea breeze 8 332, 14 495
Sea butterfly 9 345
Sea clam 3 152
Sea cliff 12 303
Sea cow 12 346
Sea cucumber 4 539 12 91*
Sea dragon 9 610
Sea echoes radar 11 210
Sea fan 1 455, 6 238 12 92*
Sea feather 1 455 12 92
Sea fisheries *see* Marine fisheries
Sea floor *see* Marine sediments, Oceanic islands Submarine topography
Sea Goat (Constellation) *see* Capricornus
Sea gravimeters 13 514 515
Sea hare 9 345 13 406
Sea horse 12 92
Sea ice 12 92 94
Antarctic Ocean 1 438
Arctic Ocean 1 525
Arctic and subarctic islands 1 524
Atlantic Ocean 1 624
Baltic Sea 2 89
Bering Sea 2 166 167
Sea ice—*cont*
growth of 12 93
Newfoundland 1 524
Pacific Ocean 9 486
polar navigation 10 444
properties of 12 92 93
types 12 94
see also Iceberg Ice island
Sea lamprey 7 588
Sea lettuce 3 80
Sea level (ancient) atolls as evidence 1 647
in Baltic Sea basin 2 89
flat topped seamounts 12 122 123
strand line 13 168
submerged beaches 13 218
uplifted beaches 12 527
wave cut terraces 12 303
Sea level (datum planes) 12 94 95
half tide level 12 95
mean high water 12 95
mean higher high water 12 95
mean low water 12 95
mean lower low water 12 95
mean sea level 12 94 95
Sea level fluctuations 12 95 98
atmospheric pressure effect 12 96
Coriolis effect 12 95
density differences 12 96
epeirogenic movements 9 520
eustatic movements 9 520
glacial control 12 98
guyots as evidence 12 123
hydrological factors 12 97
meteorological disturbances 12 96
Pleistocene 6 192 193
seasonal variations 12 96
in space 12 95
storm surge 13 165
in time 12 96
Sea lily 3 547, 4 359
Sea lion 12 98
Sea mat 2 354
Sea moth 9 610
Sea mouse 10 461
Sea of Azov 2 251
Sea of Marmara 2 251 8 207
Sea of Okhotsk 9 486
Sea pansy 12 92
Sea pen 1 455 9 621 12 92
Sea slug 5 139 9 345 12 583
Sea spider 1 557 11 105
Sea squirt 12 98 14 140
Sea star 4 359 12 235
Sea state 12 98 100
breaking waves 12 100 303 304
cross sea 12 100
dead sea 9 255
forecasting 9 8, 259
Sea state—*cont*
interference wave patterns 12 100
landing conditions 9 8
sea or wind waves 9 255, 12 99
surf 12 100 303
swell 9 255 12 99
whitecaps 12 100
see also Ocean waves
Sea surface currents 9 247 249
datum planes 12 94 95
energy absorbed 8 116
fluctuations in height 12 95 98
irradiation 12 105
ripples 14 417
slope 9 245, 12 95
stirring processes 12 112
waves *see* Ocean waves Sea state Tsunami
wind stress 9 245
see also Ocean meteorological relations
Sea trials 12 283 284
Sea urchin 4 359 373, 7 233 12 100 101* 235 609
Sea valley 13 215 216
Sea wall 12 101
erosion by waves 12 300
Sea water 12 101 118
absorption of light 12 105
acoustic energy 12 105
analyses 12 116 117
anion exchange 12 108
authigenic mineral formation 12 108 109
biochemical circulation 12 109
biochemical cycle 12 109
boiling point 12 102
buffer mechanism 12 110
cation exchange 12 108
chlorinity of 6 567
colligative properties 12 102
compensation depth 12 106
compensation intensity 12 106
composition 12 107 110
biological regulation 12 109
changes with time 12 109
inorganic regulation 12 107 109
physical processes affecting 12 109
compressibility 12 102
conversion of 12 10 14
demineralization of 12 10
density 12 101 111
dissolved oxygen 12 111
distribution of properties 12 110 114
Sea water—*cont*
electrical conductivity 12 102
electromagnetic energy 12 105
electromagnetic fields 12 106 107
element abundances 12 108
evaporation of 9 264
freezing point 12 102
halocline 6 523
interaction between sea and atmosphere *see* Ocean meteorological relations
irradiance 12 105
light 12 105
magnesium occurrence 8 19
osmotic pressure 12 102
physical properties 12 101
residence times of elements 6 565
salinity of 6 567* 12 101, 110 111
serial observations 12 115 116
SOFAR signaling in 12 413
sorption 12 109
sound absorption 12 107, 14 196
sound intensity 12 107
sound producing organisms 12 107
sound reflection 12 107, 14 197 198
sound refraction 12 107, 14 196 197
sound scattering 12 107, 14 198-199
sound velocity 12 102, 107, 14 195 196
specific heat 12 102
specific volume 12 101
stirring and mixing processes 12 111 112
temperature 12 110 111
temperature measuring devices 12 114 115
bathythermograph 2 110-111*, 12 114
electrical thermometers 12 115
radiation thermometers 12 115
reversing thermometers 12 114 115
Spilhaus Miller sea sampler 2 111
temperature salinity relationships 12 112
thermal saline factors 12 102
thermocline in 13 561

Scina 6 586
Scincidae 4 39, 12 373, 15 24
Scintillation fluorescence
5 547
meteorological optics
8 320
radar 11 210
Scintillation counter 12 74 76
coincidence counting 12 75
crystalline 12 74-75
liquid 12 75-76
multiplier phototube
10 196
organic 12 75
plastic 12 75
Scintillation detector, liquid
12 75-76
gamma rays 6 35
low level counting
7 595-596
neutrons 9 84-85
Scintillation spectrometer
12 75
Scintillator 12 74-76
Sciomyzidae 4 212
Scion 2 361, 6 245
Scirrhia acicola 14 71
Scirtothrips citri 13 628
Scission (nuclear fission)
5 287
Scissor tailed flycatcher 5 362
Scitaminales 10 346, 12 76*
cardamon 2 480
turmeric 14 163
Sciuridae 3 63, 11 615, 15 31, 14 541
Sciuromorpha 11 614
Sciurus carolinensis 15 31
Sciurus niger 15 31
Sclareol 15 498
Sclater, P 14 620
Sclera 5 169
anatomy 5 169
embryology 5 166
Scleractinia 3 255, 261, 474, 12 76 77*
Scleractinia fossils 12 77 78
evolutionary lines 12 77
geographic occurrence
12 78
geologic record 12 77 78
Scleraxonia 6 238
Sclereid 5 37
Sclerenchyma 3 495, 12 78 79*
astrosclereid 12 78
bone cell 12 78
brachysclereid 12 78
macrosclereid 12 78
osteosclereid 12 78
plant tissue systems 10 578
sclereid 12 78
trichosclereid 12 79
Sclerite 1 555
Coleoptera 3 275 288
Porifera 10 516
Sclerioblast 2 594, 4 56
Scleroblast Porifera 10 513
Sclerochore 10 499
Scleroderma 6 581, 7 623, 12 405
Sclerogibbidae 6 574
Sclerosclerosome hardness test 8 274
Sclerosis, coronary 6 360 361
Sclerosis, multiple *see* Multiple sclerosis
Sclerospora 3 484
Sclerotinia 1 234, 3 222, 10 314, 316, 534
see also Monilinia
Sclerotinia camelliae 9 408
Sclerotinia cinerea 9 28
Sclerotinia sclerotiorum 5 547
lettuce diseases 7 478
nystatin assay 9 236
soybean diseases 12 535
sunflower diseases 13 292
Sclerotium 9 603
Mycelia Sterilia 8 677
Mycetozoida 8 677
Sclerotium bataticola 13 292
Sclerotium rolfsii, cowpea diseases 3 529
diseases of jute 7 328
pea diseases 9 600
peanut diseases 9 603
soybean diseases 12 535
Sclerotome 12 354
Scolecida 9 30
Scolecodonts 1 431
Scolecosporae 5 563
Scolex 2 658, 3 641 642, 11 43
Scolicide 6 574
Scolithus tubes 1 431
Scolopacidae 3 10, 625, 12 23, 14 541
Scolopendridae 3 60
Scolopendromorpha 3 60
Scolophore 10 128
Scolopocryptops 1 564
Scolopophorous organ 7 128
Scolops 7 127
Scolothrips sexmaculatus 13 629
Scolytidae 5 278
Scolytus multistriatus 14 75 76
Scomber scombrus 8 9
Scombridae 8 9 10 10
Scoop 2 369
Scopalamine 9 547
Scopeumatidae 4 212
Scopoletin 10 343
Scoteby W 9 265
Scotia 2 106 11 590 14 549
Scotification 1 593
Scorpaenidae 10 10
Scorpioid cyme 7 99
Scorpion 12 79
Arachnida 1 496
Arthropoda 1 558
Scorpionida 12 80
tailed whip 14 255
Scorpion, The *see* Scorpius *(constellation)*
Scorplonfly 8 206
Scorpionida 1 496, 558, 12 79 80*
Scorpius (constellation)
3 412 413, 12 79
Scotch boiler 5 282, 8 119 120
Scotch yoke 5 486, 7 527
coordinate system converters 1 383
sine cosine generation 1 376 377
Scotchlite screen 13 189
Scoter 4 291
Scotoma 11 537
Scotopic vision 5 170, 14 535-536
Scott, R L 12 486
Scott Tensile Tester 11 637
Scourfield, D J 7 555
Scouring bleaching 2 258
textile chemistry 15 538
Scouring rush 5 62
Scram system (nuclear reactor) 11 356
Scrambling *see* Privacy systems *(scrambling)*
Scrap (flake) mica 8 347
Scraper 3 417, 4 551
Scraptiidae *see* Melandryidae
Scratch hardness scale 6 337
Screamer 1 436
Scree 2 326 13 387
Screech owl 9 460
Screen, printing plate 10 618
color printing 10 606 607
halftone 10 611
Screen grid 13 551, 14 244
Screen grid modulation 1 356
Screen grid tube *see* Tetrode, vacuum
Screen liner 9 300
Screen printing 10 605 13 542
Screening 3 561 12 80 81* 186
ore dressing 9 389
shaking screens 3 561
vibrating screens 3 561
Screening smoke 12 81 82* 347
condensation smokes 12 82
signaling smokes 12 82
Screw 12 82 83
efficiency 12 83
friction 12 83
lead angle 12 83
threads 12 84 88
torque 12 83
Screw axes (crystal structure) 3 595 596
Screw conveyor *see* Conveyor
Screw dislocation 5 583 585
Screw fastener 12 83 84
bolt 2 277 12 86
cap screw 12 86
machine screw 12 86 88
self tapping screw 12 84
set screw 12 84
stud 12 86
threads 12 84 86
uses 12 86 88
Screw jack 12 84
Screw propeller marine 11 12 15
Screw thread gage 6 4
Screw threads 12 84 88*
13 612
acme thread 12 85
allowance 12 86
American National 12
American Standard 12
breech block thread 12
British 12 85
Brown and Sharp worm thread 12 85
buttress thread 12 85
Dardelet thread 12 85
modified square thread 12 85
nomenclature 12 84
standards 12 85
tolerance 12 86
types 12 84
unified form 12 85
Whitworth 12 85
Screw worm see Callitroga hominivorax
Scribner rule forestry 5 460
Scroll saw 14 542
Scrophulariaceae 3 190 4 1
Scrotum 13 524
histology 11 475
reproductive system 11
Scrub forest 5 547, 5 467 468
Scrub typhus 14 175 175
Scrubber (dust collection) 4 295
Scrubbing (gas operations) 6 44
SCUBA 12 89* 320
see also Skin diving
Scud 6 35
Scudderia furcata 7 554
Sculpin 12 89
Sculptor 3 413 414
Sculptor galaxy 6 12
Scurvy 1 574 4 236 8 258
12 89 90*
Scutari (Skhodet) Lake 5 1
Scutechiniscidae 6 451, 15 3
Scutellum 3 280 12 143
Scutigera coleoptrata 3 60
Scutigera forceps see Cermatia forceps
Scutigerella immaculata 1 56
13 565
Scutigeromorpha 3 60
Scutum (constellation) 3 41
414*
Scutum (Ixodidae) 7 298 29
Scyllaridae 4 30
Scyllarides aequinoctialis 4 3
Scyllaridiidae 12 157
Scyllium 3 102
Scyllium canicula 11 514
Scymaenidae 3 276
Scypha 13 10
Scyphidia 11 59

Sedimentation (geology)—*cont*
estuarine deposits 5 83 84
evaporite (saline) 5 127 129
ferruginous sediments 12 140
flocculation 5 84 12 137
flysch 12 142
geosynclinal cycle 12 142
lagoon deposits 8 132 133
lithification 12 140
littoral deposits 8 132
loess deposits 7 574
manganese sediments 12 140
mineralogical maturity 12 141
molasse 12 142
neritic deposits 8 133 135
pelagic sedimentation 12 142
pelagic deposits 8 135 137
petrologic provinces 12 142
phosphatic sediments 12 140
provenance 12 140
saltation 12 136
sedimentary facies 12 142
sedimentary sulfur 12 140
sediments of chemical deposition 12 139
sediments of physical deposition 12 138
settling velocities 12 137
siliceous sediments 12 139
source of material 12 135
stream transport and deposition 13 173
transportation and deposition 12 136
by ice 12 136
in the sea 12 137
by water 12 136
by wind 12 136
valley floor deposits 5 310 311
see also Marine sediments
Sedimentation (industrial) 12 143 144
batch sedimentation 12 144
clarification 5 134
particle size measurement 12 149
sedimentation rates 12 144
separation (mechanical) 12 186 187
settling of spheres through fluids 12 143
solid liquid filters 5 271
Stokes law 12 144
thickening 13 601-602
water treatment 10 407
Sedimentation (marine) *see* Marine sediments
Sedimentation potential (Dorn effect) 4 479
Sediments on ocean floor *see* Marine sediments
Sedoheptulose 8 578
Sedoheptulose 7 phosphate 2 17
Sedum 5 37 7 436, 10 354
Seebeck, T J 15 577 581
Seebeck effect 15 577 580
Seed (botany) 12 144 146
dispersal 12 145
economic importance 12 146
fossil *see* Fossil seeds and fruits
plant organs 10 368 369
structure 12 144
Seed coat 12 144
Seed development 11 454
Seed flax 5 297
Seed gum 6 297
Seed snipe 3 10
Seedling blight (wheat) 14 481
Seepage petroleum 10 60
soil mechanics 12 455 455
spring (water) 13 18
study by flow nets 12 454 455
Segas process 5 555
Segmental reflex 11 401 402
flexion 11 401
lengthening 11 401
stepping 11 401
stretch 11 401
Segmentation *see* Metamerism
Segovevo Lake 5 116
Segrè E 1 481 595 13 405 14 66
Segregation (alloy) 6 579
Segregation law of (mendelism) 8 225
Segregation coefficient 12 169
Seiche 12 146 147
binodal 12 146
Coriolis effect 12 147
earthquake effects 4 353
fresh water ecosystem 5 521 554
internal 12 147
mononodal 12 146
Seidel coefficient 1 5
Seidel coma 1 5
Seignette *electrics see* Ferroelectrics
Seignette salt *see* Rochelle salt
Seine River 5 122
Seismic prospecting *apparatus* 12 148
Seismic sea wave 14 355
Seismic surveys in geophysical exploration 6 168 170
in mineral *prospecting* 11 23
in petroleum prospecting 11 27
Seismic travel time curves 12 153
Seismic waves 12 150 151
continental velocities 8 533
detection of nuclear explosions 9 185
earth interior 4 539
earthquake 12 147
frequencies 12 148
oceanic velocities 8 533
reflection 12 151
refraction 11 408, 12 151
sial 13 412
sima 13 412
source of 12 149
surface velocity 12 149
tectonophysics 13 414 416
transmission 12 151
wave motion in fluids 14 432
Seismic zones 4 354
Seismogram 12 154
Seismograph 4 353 12 147 148
diverse seismograph systems 12 147
pendulum seismographs 12 147
seismic prospecting apparatus 12 148
signal to noise ratio 12 148
strain seismographs 12 148
Seismology 6 170 12 149 157*
composite wave types 12 151 152
earthquake 4 352 354 12 149 150
elastic rebound theory 12 149
internal constitution of the earth 12 154
microseisms 12 156
oceanic crust 13 220 225
seismic prospecting 12 156
seismic wave transmissions 12 151 152
seismic waves 12 150 151
site of earthquakes 12 150
soil site investigations 12 455
tectonic seismic gravity associations 12 149
travel time curves 12 152
types of earthquakes 12 150
velocity depth variations 12 152 154
Seismometer 6 168 14 472
see also Seismograph
Seison 11 633 12 157
Seisonacea 11 633 12 157*
Seisonidea 12 236
Seitz F 14 490
Seiurus aurocapillus 9 455
Selachii 4 419, 13 20 21
Selachii fossils 12 157
Selaginella 12 158 13 116
Selaginella lepidophylla 12 157
Selaginellales 7 625 10 346, 12 157 160*
Selaginellales—*cont*
alternation of generations 12 158
structure 12 158
Selas crucible 6 262
Selberg, A 9 226
Selecting circuits 13 346 347
Selection pressure and equilibrium (evolution) 10 309
Selection rules (physics) 12 160 163
atomic 1 655 661, 12 160 161*
beta decay 12 162
molecular 12 161
multipole radiation 8 626 627
nuclear 12 161
quantum theory, non relativistic 11 178
relation to conservation laws 13 364
Selective absorption *see* Absorption (electromagnetic radiation)
Selective herbicide 6 420
Selective medium (microbiology) 3 615
Selective reagents (chemical) 13 571
Selective reflection *see* Reflection (electromagnetic radiation)
Selectively permeable membranes (biology) 9 441
Selectivity 12 163
qualitative analysis 11 136 137
radio receiver 11 256 12 163
Selenastrum 1 235
Selenite 6 301
Selenium 12 163 165
allotropes 12 163
electron configuration 4 504
extractive metallurgy 8 278
ionization potential 4 504
natural occurrence 12 163
organometallic compound 9 403
preparation 12 163
principal compounds 12 164 165
properties 12 163
see also Tellurium
Selenium rectifier 14 291
characteristics 12 173
construction 12 173
ratings 12 173
stack assembly 12 173
Selenomonas 11 64 65 13 2
Self charge conjugate system 13 363

Sea water—*cont*
thermometric depth 12 116
transmission of energy 12 105
transparency 12 117-118
vapor pressure 12 102
visibility 12 106
water color 12 117 118
water masses *see* Ocean water masses
water samplers 2 111, *12 115*
water samples (analysis) 12 116
see also Hydrosphere, geochemistry of
Sea water fertility 12 118 122
cosmopolitan species 12 121
geographical variations 12 119 120
indicator organisms 12 121
life cycle in sea 8 114
photosynthetic activity 6 566 567*, 12 119
population fluctuations 12 121
productivity measurement 12 119 120
role of plants 8 114
size of populations 12 121
Sea waves *see* Ocean waves
Sea whip 1 455 12 92
Seaborg, G T 1 301 2 168 416 3 624 8 222 10 422 13 522 14 66
Seacoast 3 242 244
Seadragon 11 363
Seafood and fish products *see Fish and seafood products*
Seafood world catch 5 416
Seahorse 6 71
Seal (*zoology*) 12 98 122*
Seal pressure 12 122
cartridge 12 122
gasket 6 68
O ring 12 122
packing 9 489
V ring 12 122
Sealed beam headlights 7 29
Sealer paint 9 493 10 592 593
Sealing (*wood finishing*) 14 552
Seam welding 11 495 14 465 469
Seamount and guyot 12 122 123* 13 219 220
echo sounder record of 4 329
guyots in Pacific 9 262
Seams (*coal*) 3 240
Seaplane 12 123
Search coil 5 361 *12 123**
Searchlight 11 4
arc lamp 1 503
Seashore life 4 212
Seasonal breeders 2 274
Seasonal thermocline 13 561
Seasons 6 125-126
Seat (*stone setting*) 6 103-104
Seatworm 10 238
Seaulf 11 363
Sebaceous gland 12 123-124*, 14 546
Sebacic acid 2 475
Sebecus 3 553
Sebesulut Mountains 5 118
Seborrheic dermatitis 4 68, *12 369, 14 602*
Sebum 12 123
Secale cereale 11 636
Secant 14 93
Secchi disk 12 117-118
Secernentea 9 30, 32
Secernentes *see* Phasmidia
Seconal 6 595
Second (*time unit*) 8 188, 12 124*
Second order focusing (*particle accelerators*) 9 572
Second order reaction 7 555
Second order transition 12 126 127
ferromagnetism 12 127
helium liquid 12 127
order disorder in crystals 12 127
Second sound 6 595* 15 301
Secondary amine 1 505
Secondary atmosphere 1 651
Secondary battery *see* Storage battery
Secondary cosmic ray particles *see Cosmic rays*
Secondary creep *see* Creep of materials
Secondary emission 12 124 126
cathodoluminescence 2 561
field enhanced 5 256 12 126
secondary yield 12 124 125
see also Tetrode
Vacuum tube
Secondary magma 8 18
Secondary mains (*electric distribution*) 4 423
Secondary rainbow 11 531
Secondary recovery *see* Petroleum secondary recovery
Secondary screw worm 8 690
Secondary standards (*electrical*) 4 459 459
Secondary valence 5 458
Secondary (*seismic*) wave 12 151 152
Secondary winding (*transformer*) 14 24
Secondary x rays 3 653
Secretary bird 5 329
Secretin 5 296, 6 479 7 531
digestive system 4 171
Secretin—*cont*
endocrine mechanisms 4 592
pancreas 9 532
Secretions, salivary gland 4 164
Secretory structures, plant 12 127-129
cortex, plant 5 495-496
digestive glands 12 128
glandular hairs 12 127
gum duct 12 128
hydathodes 12 127
laticifers 12 128
nectaries 12 127
oil duct *12 128*
Sectionalization of mine power 8 490
Sectorial spherical harmonic 12 610
Secular parallax 9 546
Secular perturbation 10 37
Secular variation (*Earth rotation*) 4 18
Sedation 12 129
barbiturate 12 129
bromide 12 129
chloral hydrate 12 129
definition 12 129
mechanism 12 129
tranquilizer 12 129
Sedentaria 10 461
Sedgwick A 2 421 4 85 9 575
Sedimentary basin diastrophism and sedimentation 12 142
petroleum 10 56 57
Tethys geosyncline 13 409
Sedimentary breccias 2 326
Sedimentary cycle cyclothem *5 645*
Mediterranean Pliocene 10 419
petrology 10 85
redbed 11 588
Sedimentary rocks 6 158 10 84 85 11 590 12 129 135*
authigenesis 1 674
chemical composition 7 548 12 131 132
chemical minerals 12 132 133
chemical structures 12 134
chemical types 11 590
chemical weathering 12 132
classification 12 135
clastic types 11 590
clay size grade material 5 160
compressional velocity 12 151
compressive strength 4 613
conversions in 5 575
detrital minerals 12 132
diagenesis 4 93 95
elements in 4 550 551
Sedimentary rocks—*cont*
fabric analysis 12 131
facies 5 175 177, 12 142
geopic structures 6 119
heavy minerals 12 132
importance 12 130
mechanical structures 12 134
mechanical weathering 12 132
mineralogical composition 12 132 134
nomenclature 12 135
oolite structures 9 532
organic structures 12 134 135
organic types 11 590
origin 12 130
pisolite structures 9 532
quartz feldspar ratio 12 132
sedimentary structures 12 134 135
source area terrain 12 132
stable minerals 12 132
textural characteristics 12 130 131
packing 12 131
roundness 12 131
shape 12 131
size distribution (*kurtosis*) 12 131
size distribution (*mean*) 12 131
size distribution (*skewness*) 12 131
size distribution (*spread*) 12 131
surface configuration 12 131
unstable minerals 12 132
Sedimentation (*geology*) 6 149 7 552 12 133 142*
authigenic processes in 1 674, 12 108 109
bay deposits 8 232 235
beach sediments 12 205
carbonaceous sediments 12 140
carbonate sediments 12 139
clay (*size grade*) 5 159
coal deposits 5 229 229 240
cyclothem 5 644 645
deflocculation 12 132
deltaic deposits 4 50 51
deposits and resulting rock types 10 87
diagenetic processes 4 93 95, 7 552 12 140
diastrophic movement 12 142
dispersal 12 140
dune deposits 4 202
environments of deposition 12 137

Separately excited dc generator 4 225
Separately excited dc motor 4 228 229
Separation (chemical and physical) 12 185 186
chromatography 3 91 99
countercurrent mass-transfer operation 3 518 519
distillation 4 247
dust and mist collection 4 296
extraction 3 156 158
ion exchange 7 241 243
magnetic separation methods 8 46-47
precipitation (chemistry) 10 573
sublimation 13 210
Separation (electric) 4 467
Separation (electromagnetic) *see* Electromagnetic separation
Separation (mechanical) 3 271 273 7 422 424, 12 186 187*
centrifugation 2 634-636
clarification 3 154-155
classification 3 155 156
dust and mist collection 4 296
magnetic separation methods 8 46 47
methods based on fluid mechanics 12 186 187
methods using septums 12 186
screening 12 80 81
sedimentation 12 143 144
thickening 13 602
Separation energy *nuclear* 2 192
Separation negatives 10 606
Separatory funnel 5 157
Sepia 2 644, 4 34 107, 5 162 5 561 12 187, 13 30
Sepia negative 10 146
Sepia officinalis 13 30
Sepioidea 2 645 3 275, 12 187*
Sepiola 12 187
Sepiolite 1 569, 3 165, 12 187*
Sepiidae 4 212
Septal defects heart 2 510
Septaria 12 154
Septibranchia 8 559, 12 187*
Septic sore throat 1 466 467 10 100; 13 178
Septic tank 12 187 188
home disposal units 12 187
institutional units 12 188
municipal units 12 188
rural sanitation 11 653
tank efficiency 12 188
Septic zone (ecosystem) 3 521 534
Septicemia 1 457, 6 236, 412, 12 188*, 13 36 38
circulation disorders 3 141 144
erythromycin 5 67
Septoria 10 313 12 604
Septoria acicola 10 313
Septoria apii 12 604
Septoria blotch 9 600
Septoria glycines 12 535
Septoria leaf blotch 2 99
Septoria lycopersici 12 604
Septoria passerinii 2 99
Septoria pisi 9 600
Septoria rubi 11 344
Septum membranaceum 2 512
Septum primum 2 489
Septum secundum 2 489-490
Septum transversum 4 154
Sepula 1 431
Sequence (mathematics) 3 358, 10 646
Sequential circuit 13 345 346*, 358
Sequestering agent 3 459; 5 94
Sequestrant (food) 5 578
Sequestrene *see* Ethylenediaminetetraacetic acid
Sequoia 3 187, 9 501, 12 188 189
Sequoia gigantea 3 401, 12 188
Sequoia sempervirens 3 188, 11 389
Sere 13 231 232
Sergeant missile 1 540
Sergestidae 4 29 40
Serial observations (ocean) 12 115 116
Seriatopora 12 76
Sericea lespedeza 10 374
Sericite 8 346 643
Sericitization 8 346
Series 12 189 196
alternating 12 191
analytic functions 12 192
binomial theorem 2 193
Cesaro summability 12 193
convergence 12 189-191
divergence 12 189 191
Fejér theorem 12 193
finite 12 189
Fourier series and integrals 5 487 490 12 193
infinite product for the sine 12 194
integral test 12 190
positive 12 190
power 12 191 192
progression 10 647
ratio test 12 190
Stirling's formula 12 194
Taylor 12 191-192
uniform convergence 12 192
see also Differentiation
Series circuit 12 196
Series generator 4 224
Series motor ac 1 284 285, 14 206
dc 4 223, 14 206
universal 14 206
Series resonance 11 501
Series tube voltage regulator 14 363
Serin, B 13 299
Serine 2 195, 7 164, 12 196*
amino acids 1 308 319
bacterial metabolism 2 45
cysteine 3 649
gene action 6 106
glycine 6 221
in histone 9 217
lipid metabolism 7 534
plant metabolism 10 357
polymyxin 10 483
in protamines 9 217
Protozoa 11 51-60
Sermus canarius 2 435, 11 527
Serioscopy 11 303
Serjania subdentata 13 122
Seroallantoic membrane 11 482
Seroallantoic placenta 13 24
Serolidae 3 291
Serology 3 201, 10 576, 12 196
agglutination reaction 1 111 112
botulism 2 307
complement fixation test 3 333
conglutination 3 599
hemophilic bacteria 6 412
heterophile antigen 6 429
Lancefield differentiation scheme 7 390
lytic reaction 7 638
neutralization reaction (antibody) 9 82
precipitin test 10 577
serum 12 198
syphilis 13 575
toxin antitoxin reaction 14 7
Seromycin *see* Cycloserine
Seronine AT 13 539
Serosa *see* Chorion
Serosa (digestive system) 4 152
Serotonin 7 63, 11 71 81 12 196 197*, 14 125
cardiovascular system 2 503
distribution 12 196
endocrine mechanisms 4 592
function in brain 12 197
metabolism 12 196
pharmacological action 12 197
Serotypes *Escherichia* 5 69
Serotypes—*cont.*
Salmonella 12 14
see also Pneumococcus, Streptococcus
Serous cystadenoma 11 480
Serous gland 6 204
Serous plethora 3 141-144
Serpasil 6 595
Serpens (constellation) 3 412 413
Serpent star 13 53
Serpentes 12 389 13 24 27*
courtship 13 26
defense mechanisms 13 26
ecology 13 26
morphology 13 24
nutrition 13 26 27
physiology 13 25
venomous snakes 13 27
Serpentine 10 12, 12 197
asbestos 1 569 570 12 197
composition of mantle 8 532
magnesium occurrence 8 19
serpentinite 12 197
Serpentine leaf miner 7 464
Serpentinite 12 197 198
Serpentinization 12 197
Serpula 10 461, 463, 11 512
Serpulidae 10 462
Serpulitenkalk (serpulite chalk) 1 451
Serra do Mar 12 527
Serrania de Baudo 12 526
Serranidae 2 107-108, 10 10
Serratia 5 1 2
Serratia marcescens 2 378
RNA nucleotide composition 9 210
Serratieae 5 2
Serropalpidae *see* Melandryidae
Sertoli cells 13 525
Sertularia 3 255 6 555
Serttürner, F W A 10 93
Serum 12 198
atopic allergy 1 257
Serum, immune *see* Immune serum
Serum albumin 1 224
Serum bilirubin 3 199
Serum esterase 2 265
Serum jaundice homologous 6 418, 7 562
Serum sickness 2 218
Servoamplifier 12 202 204
ac 12 202
chopper stabilization 12 202
compensation 12 203
dc 12 202
hydraulic 12 202 205
magnetic 12 202
pneumatic 12 202-205
relay 12 202
servovalve 12 202 203

Self-contained navigation systems 9 19-20
  astro equipment 9 19
  Doppler equipment 9 19
  inertial equipment 9 20
  pressure equipment 9 19
Self-contained underwater-breathing-apparatus *see* SCUBA
Self-correction (automation) 1 679
Self-diffusion 4 146 148
Self-inductance 7 65 66
  coupled circuit 3 522
  measurement 7 68 69
  in parallel 1 271
  in series 1 271
Self-lubricating bearings 10 551
Self-noise, sonar 12 504
Self-oscillation 7 145-146
Self-potential mineral surveys 11 25
Self propelled gun 1 539
Self sustaining fusion reaction 5 591-595
  hydrogen bomb 6 548
Self synchronous repeater *see* Synchro
Self-tapping screw fastener 12 88
Selivanoff's test 2 453
Selkirk Range 9 157
Sella turcica 10 247
Sellite 9 101
Selma chalk 3 7
Selwyn Mountains 9 158
Selye 11 6 468, 10 36
Semaeostomeae 3 255, 12 165*
Semen 11 473
Semet Solvay process 5 555
Semianthracite 3 230 231
Semiarid grasslands 13 125
Semiarid regions 4 342
Semiautomatic rifle 1 537 538
Semicarbazide 1 229 6 530
Semicarbazone 1 229
Semichemical wood pulping 9 539 14 530
Semicircular canals 4 320 321
  phonoreception 10 124
Semicircular spectrometer 2 182
Semiconductor 12 165 172
  barrier layer 12 169
  Brillouin zone theory 2 334 339
  conduction 12 166 168
  contact barrier 12 170
  controlled rectifier 3 438 439
  cryosar 3 575 576
  cyclotron resonance experiments 3 645 646
  diode 4 203
  electron distribution 12 166
Semiconductor—*cont*
  elemental semiconductors 12 167
  Esaki tunnel diode 5 67
  exciton 5 135 136
  extrinsic 12 167-169
  gallium 6 19
  germanium 6 177
  Hall effect 6 321, 12 167-168
  hole conduction 6 464
  impurity semiconductors 12 167
  indium 7 61
  intrinsic semiconductors 12 167
  junction diode 7 317-319
  junction rectification 7 318
  junction transistor 7 319 321
  mobility of carriers 12 167
  n-type 12 167
  negative 12 171
  noise 9 117
  Ohm's law 9 277
  p-n junction 7 318
  p type 12 167
  parametric amplifier 9 551-552
  photodiode 10 148 149
  photoemission 10 153
  point contact diode 10 433
  point-contact transistor 10 433 434
  positive 12 171
  preparation of materials 12 168 169
  rectification 12 169 172
  resistivity 11 496
  secondary emission 12 124 125
  semiconducting compounds 12 168
  solar battery 12 465 466
  solid state physics 12 480
  surface barrier 12 169 170
  thermistor 13 555
  thermionic emission 13 554
  transistor 14 25 28
  work function 12 170
Semiconductor diode *see* Diode, semiconductor
Semiconductor rectifier 11 585 12 172 175
  barrier layer 12 173
  copper oxide 12 173
  germanium 12 174
  monocrystalline 12 172
  p-n junction 12 173
  point-contact diode 10 433
  polycrystalline 12 172
  selenium 12 173
  silicon 12 174
Semidiurnal tide 13 654
Semifusain 3 229
Semigloss finish (enamel) 4 587
Semikilled steel 13 97 99
Semikraft process 9 539
Semilunar ganglion 9 65
Semimetal 3 389 390*, 8 267, 9 4
Semimicroanalysis 11 143
Semimineral wax 14 445
Seminal fluid 5 541; 11 472
Seminal vesicle 5 234, 11 472
Seminiferous tubule 11 473, 13 524
Seminoma 11 481
Semionotiformes 1 58, 9 442, 12 175
  Clupeiformes 3 222
  gar 3 222, 6 39*
Semipalmated goose 1 436
Semipermeable membrane 9 441
Semipolar double bond 5 26
Semisilica refractories 11 409
Semitone count (music) 8 663
Semisweet china 10 546
Semliki Forest virus 1 499
Semnopithecus nestor 8 572
Semotilus atromaculatus 4 1
Semper's larva 14 619
Senarmontite 1 477
Sendust 8 35
Sendzimir line 8 280
Sendzimir mill 11 617
Senecan Chautauquan series 4 88
Senecio 3 190
Senefelder, A 7 113 114, 10 600 605 615
Senegal River 1 109
Senescence 6 182 12 175 177*
  aging process 12 175
  changes in the colloidal systems 12 176
  nonspecific changes 12 177
  physiological changes 12 175
  scope of senescence 12 176
  secondary alterations 12 176
  tissue changes 12 176
Senile dementia 12 177
  nervous system disorders 9 68
  symptoms 12 177
  treatment 12 177
Senile eczema 4 409
Senile vaginitis 14 256
Senja (Senva) 5 117
Senn T 9 78
Senonian stage 5 543
Sensation 1 595 6 346, 12 177-179*
  anesthetic 1 403
  compensation for sensory deficiencies 12 179
  exteroceptors 12 177
  interoceptors 12 177
Sensation—*cont*
  mechanoreceptors 8 196 206
  opiates 9 345
  properties common to
  senses 12 178
  proprioceptors 12 177
  psychophysical methods 11 77
  sense, chemical 12 179
  sense receptors 12 177
  spatial localization 12
  specific irritability 12
  strength of response 12 177
  temperature senses 13
  see also Sense organ
Sense, chemical 12 179
  classification 12 179
  components 12 179
  sensory learning 12 182
  smell 12 384
  taste 13 399
Sense organ 3 282, 12 179 18
  chemoreception 3 49 51
  cutaneous receptors 12
  electric organ (biology) 4 452
  eye 5 162 171
  ganglion 6 33
  gustatoreceptors 12 180
  olfactoreceptors 12 180
  phonoreceptors 12 180
  photoreceptors 12 180
  statoreceptors 12 180
Sense organ embryology 9 48 51
Sense pore 5 282
Sensible heat 11 84
Sensible temperature 12 180
Sensilla basiconica 12 180
Sensilla campaniformia 3
Sensilla coeloconica 12 180
Sensilla placodea 3 282 12
Sensilla scolopophora 3 282
Sensitive fern 5 202
Sensitivity 12 181
  analytical balance 2 72
  noise limitation 12 181
  qualitative analysis 11 136 137
  see also Sensation
Sensitization 1 595 601
Sensitized luminescence 7 615 616
Sensitometry 10 163 164
Sensory learning 12 181 185
  auditory learning 12 184
  neural mechanisms 12
  in normal animals 12
  olfactory learning 12
  somesthetic learning 12 184
  studies 12 181
  visual learning 12 185
Sepal 5 329

Shaded pole induction motor 3 78
Shadow 12 238
broken specter 2 342
eclipses 4 580 585
penumbra 9 627
photography 10 160
Shadow electron microscope 8 573
Shadow mask color kinescope 7 349
Shadow zone (sound) 12 515*, 14 196 197
Shadowgraph of fluid flow 12 238 239*, 298
ballistic range 2 76
wind tunnel 14 498 499
Shadscale 3 191
Shaffer, B 1 50
Shaft (blast furnace) 7 260
Shaft (mechanical) *see* Shafting
Shaft mine 8 482-485
Shaft balancing 12 239 240
Shaft drilling 2 297
Shaft kiln 7 545, 515
Shafting 12 240 241
bearings 2 118
clutches 3 225 226
couplings 9 525 526
diameter measurement 6 4
flexible 12 240
hollow 12 240
retaining rings 13 15
rigid 12 240
solid 12 240
splines 13 9
taper pin connectors 13 392
Shagbark hickory 6 441
Shagreen 12 245
Shah, G A 9 24
Shake culture (microbiology) 3 616
Shake table 14 329
Shale 11 590 12 239, 241*
argillaceous rocks 1 529
chemical composition 12 241
classification 12 241
diagenesis in 4 94
properties 12 241
redbed 11 387
Shale oil 8 447 448, *12 482*
see also Oil shale
Shaler Mountains 1 529
Shalfot 9 525
Shallow earthquakes 12 549
Shamolagus 7 585
Shan plateau 1 580
Shanks system 7 423 424
Shannon, C E 3 519, 5 11, 7 99
Shaped card potentiometer-arbitrary functions 1 579 581
Shaped card potentiometer—*cont*
in coordinate system converters 1 583
sine cosine 1 577
Shaped charge 12 241 242
Shaper 8 7, 12 242*
Shaping 8 6
gear cutting 6 87
sheet metal 12 249 253
Shapley, Harlow 13 49, 14 278
Shapley, L S 6 30
Shapley, M B 2 189
Shari River 1 108
Shark 5 416, 12 242 253, 13 20
economic importance 12 243
fossil forms 12 157
reproduction 12 243
varieties 12 242 243
Shark liver oil 5 189 12 243
Sharksucker 4 358
Sharp-cutoff pentode 9 627
Sharp-shinned hawk 6 545
Sharpless, S 9 24
Sharpness (photographic images) 10 157
Shasta Dam 9 162
Shattering 12 350
Shaula 13 41
Shaving gear cutting 6 88
sheet metal 12 253
Shaw, N 1 93, 633
Shaw, W C 2 301
Shawn, T 1 552
Shear 4 419 12 243 244*
jet stream 7 310
in metals 8 269
photoelasticity 10 150
in rocks 5 192
shear diagram 7 566
in soils 12 452 453
transverse loading 7 565 566
wind stress 14 497
Shear center 12 244
beam 7 569
Shear connectors 3 343
Shear flow 13 688 14 162
Shear modulus 4 419 12 244
Shear resistance (soil) 12 457-458
Shear wave 14 419
earthquake 4 552
seismology 12 151
Sheared boundary (transference number) 14 21
Sheath of Schwann 11 425
Sheathbill 5 10
Sheathed cables 14 49, 521
Sheave 6 460
Shecenia 1 601
Shedding (textile) 13 535
Shedlovsky, T 4 485 486 14 22
Sheep 1 567 12 244 249*
Sheep—*cont*
flock management 12 246
genetic improvement by selection 12 245
judging 12 248
mountain 1 568
number and value of sheep and lambs (U S) 12 245
nutrition 12 246
parasite control 12 247
physiology of reproduction 12 244
prominent breeds (U S) 12 246
Sheep bot *see Oestrus ovis*
Sheep botfly 8 680
Sheep ked 8 404 12 247
Sheep lice *see Bovicula ovis*
Sheep liver fluke 12 585
Sheep-scab 12 30
Sheep shearing 14 546
Sheep tick 13 629
Sheepshead 12 249
Sheepskin 7 446
Sheet (punch) mica 8 346 347
Sheet cavitation 2 574
Sheet erosion 12 430 444 445
Sheet fed gravure 10 603
Sheet forming (plastics) 10 406 407
Sheet inclusion compounds 3 157
Sheet iron process 8 285
Sheet metal forming 12 249 253
bending 12 249 250
blanking 12 253
coining 12 252 253
cupping 12 251 252
deep drawing 12 251 252
embossing 12 252 253
explosive forming 12 251
flexible die method 12 251 252
Guerin process 12 250
ironing 12 251
jig, fixture and die design 7 311 314
notching 12 253
perforating 12 253
piercing 12 253
press forming 12 250
punching 12 253
redrawing 12 251
roll bending 12 250
rolling 11 616 619* 12 250
shaving 12 253
shearing 12 253
sizing 12 252 253
slitting 12 253
spinning 12 252 618
squeezing 12 252
stamping 12 250
stretch forming 12 250 251
swaging 12 252 253
trimming 12 253
Sheet metal forming—*cont*
Wheelon process 12 250
wiper bending 12 250
wrap forming 12 250
Sheet metal work 4 611
Sheet piling 10 229 229
Sheet polarizers 10 449 450
Sheeted taiwans 2 589
Sheffer, H M 2 289
Sheffield plate 12 331
Shelby tube 12 456
Sheldon, W H 1 460, 10 31, 53
Shelf, continental 3 425
Shelf fungus 14 74
Shelf ice 1 459
ice island 7 4
iceberg 7 6
Shelford, V 5 15
Shell cameo 2 428
Shell drawing *see* Deep drawing
Shell model of nucleus 9 205
Shell type boiler *see* Fire tube boiler
Shellac 9 493 12 253*, 14 281, 546
Shellfish (food microbiology) 5 424
Shelter radiation *see* Radiation shelter
Shenandoah National Park 9 146
Shenandoah Valley 9 145
Shenandoah ZR 1 1 218
Sheng, P 10 597
Shepard, F P 12 301
Shepherdia 5 39
Sheppard, S E 10 162
Sherardizing 8 280, 14 612
Sherghottite 8 515
Sherrington, C S 10 527
Sherry 14 507
Shield areas 13 413
age of 4 330
Precambrian regions 10 566
Shielded wire and cable 12 254
see also Coaxial cable
Shielding, electrical 12 253 254
electromagnetic 12 253 254
electrostatic 12 253 254
grounding, electronic equipment 6 280
magnetostatic 12 253 254
shield factor 12 253 254
Shift register 13 349
Shiga ambigua 12 254
Shigella 12 254
antibiotics action against 1 466 467
antimicrobial activity of tetracycline 13 528
bacillary dysentery 2 2
Enterobacteriaceae 5 1-2
fluorescent antibody method 8 383
IMViC test 7 49

Servomechanism 12 198 205
chemical process control 3 31-32
compensation 12 202
coordinate system converters 1 383
derivative compensation 12 203
dynamic lag 12 199
error detector 12 200
feedback 5 200
hydraulic actuator 6 525
integral compensation 12 203
integrator 1 375
magnetic amplifier 8 27 29
motor systems 8 616
performance 12 199
proportional control 12 203
servomultiplier 1 371
steady-state accuracy 12 199
see also Control systems
Servomechanism components 12 200 205
controllers 12 202-204
electromagnetic 12 201
mechanical 12 201
servoamplifiers 12 202 204
servomotors (actuators) 12 204
synchro 13 368
tachometer 13 385
variable capacitance *12 201*
variable inductance 12 201
variable resistance 12 200 201
Servomechanism systems 12 199 200
acceleration 12 199
electromechanical 12 199
hydraulic 12 199-200
pneumatic 12 200
position 12 199
velocity 12 199
Servomotor 12 204
electric 12 204
flight controls 5 509
hydraulic 12 204
pneumatic 12 204
Servomultiplier 1 370
Servosalve 12 202
Sesame (food) 12 613
Sesin 6 423
Sesone 6 423
Sesoxane 7 142
Sesquiterpene 13 495 498
Sessoblast 10 201, 13 75
Set (motivation) 8 606
Set screw 12 88
Set theory 12 205 206
Boolean algebra 2 288 290, 12 206
cardinality of sets *12 205*
formation of sets 12 206
Set theory—*cont*
geometry, noneuclidean 6 156
infinity 7 96
lattice (mathematics) 7 409 412
notation 8 172
operations with sets 12 206
ordering 12 205
topology 12 206, 13 679 683
transformations 12 206
well ordering 12 205-206
Setae 4 214
Setaria italica 8 440
Setophaga picta 11 389
Setophaga ruticilla 11 389
Settlement analysis (soil mechanics) 12 457
Settling velocities (sediment tation) 12 137
Setubal, Gulf of 5 115
Seven bridges of Königsberg (graph theory) 6 253
75% rule (taxonomy) 12 572
Severance (ore dressing) 9 388-389
Severn River 5 122 14 399
Severnaya Zemlya 1 523, 581
Severny Island 1 523
Sevin 7 142
Sewage 12 207 209
bacteriology 12 209
collection systems 12 209 *214*
definition 12 207
design periods 12 208
disposal 12 214
estimated water use 12 207
examination 12 209
pumping 12 208
rates of flow 12 207
relation to water consumption 12 207
solids 12 218
storm 12 208
treatment 12 220 226
Sewage collection systems 12 209 214
construction 12 *214*
critical depth 12 211
design 12 213
maintenance 12 214
pipe 12 209
sewage flow 12 211
sewer appurtenances 12 212
transitions 12 211
velocity 12 211
Sewage disposal 12 214 218
coliform organisms 12 215
land disposal 12 218
oxidation ponds 12 218
oxygen relationship 12 215
polluted stream deoxygenation 12 216
Sewage disposal—*cont.*
pollution in lakes and estuaries 12 218
regulation of water pollution 12 214
reoxygenation 12 216
rural sanitation 11 653
stream pollution 12 215
stream pollution allowable pollutional load 12 217
stream pollution oxygen balance 12 217
Sewage gas 5 552
Sewage outfalls 12 213
Sewage sludge (fertilizer) 5 236
Sewage solids 12 218 220
burial 12 220
digestion 12 218
disposal 12 220
drying 12 220
incineration 12 220
land disposal 12 220
screening treatment 12 218
sludge drying beds 12 220
sludge gas 12 219
sludge treatment 12 218, 220
supernatant liquor treatment 12 219
treatment 12 218
Sewage treatment 12 220 226
aeration 12 224 226
coarse solids removal 12 221
fine solids removal 12 221-224
Imhoff tank 7 31
sedimentation basin design 12 222
septic tank 12 187
thickening 13 601-602
Sewer construction 14 141
Sewer pipe 12 209 211
Sewing machine 12 226
Sex determination 12 227 231
cytoplasmic inheritance 5 661
definition of sexuality *12* 227
estrogen 5 77
females diploid, males haploid 12 231
genic balance concept 12 229
heterogametic female homogametic male 12 229
heterogametic male, homogametic female 12 228
human genetics 6 499
mechanics 12 228
sex chromosomes *morphologically* similar 12 229
Sex determination—*cont*
sex in microorganisms 12 231
sex linked inheritance 12 234
sexual bipotentiality 12 227
Sex gland *see* Gonad
Sex-influenced inheritance 12 232 233
Sex-linked inheritance 12 233 234
complete linkage 12 233
linkage genetic 7 527
partial linkage 12 233
Sex mosaic *see* Gynandromorph
Sex reversal 11 465
Sextans (constellation) 3 412, 414
Sextant 12 234 235
air 234 235
altitude of celestial bod 2 585
automatic 9 16
marine 12 234
Sextant theory (organic chemistry) 1 547
Sexual behavior 2 155, 273, 11 455 458
behavior and heredity 2 155
body rhythm 2 273
courtship and pair formation 11 455 456
egg *fertilization* 11 456
physiological regulation 11 456 458
reproductive territory 11 455
Sexual differentiation 4 596 597
Sexual dimorphism 1 462 12 235 238*
in animals 12 235
in arthropods 12 236
dimorphism and protandry 12 235
physiology 12 237
in plants 12 236
reproductive system 11 4
significance 12 238
Sexual reproduction animal 11 449 450
Sexual reproduction plant 11 452 454
Sexual selection 12 236
Seybolt A U 14 269
Seymouria 12 234 362
Seymouriamorpha 1 351 3 515 7 373, 12 238*
SF 6 522
SFC *see* Specific fuel consumption
SH waves 12 151
Shad 12 234
Shade tree diseases 14 74 76

Short grassland 3 190
Short nosed sturgeon 13 207
Short range order 1 264
Short run three color system 10 607-608
Short tailed albatross 1 222
Short tailed shrew 12 307
Short ton 8 188
Short waves amateur use 1 299
broadcasting 1 363 364, 11 250
Shortt clock 3 205
Shot core barrel 2 296 297
Shot drilling (rock) 2 296, 3 418
Shot holes (mining) 8 485 486
Shot manufacture 7 426
Shot noise 9 119
Poisson law 9 119
radar 11 208
Schottky formula 9 120
vacuum tube amplifier 1 347
Shot peening *see* Peening
Shotcrete *see* Gunite
Shotgun 1 537 538
Shoulder 12 306
Shovel, power 2 568, 12 306
Shoveler 4 290
Shower, cosmic ray 3 500
Shower clouds 3 215
Showstring sands 10 63
Shrew 7 142, 12 307
Shrike 12 307
Shrimp 12 307-308
Arthropoda 1 560
common 12 308
Crustacea 3 563
Decapoda (Crustacea) 4 24
fairy 1 435, 3 563
food manufacturing 3 419
fresh water 12 307
mud 4 30
mapping 4 29
white 12 308
Shrink fit 3 258, 12 308*
Shrink resistance (textile) 13 539
Shrinking (sheet metal) 12 249 250
Shrock, R. R. 2 207, 4 261
Shrouded propeller *see* Ducted fan
Shrub (ornamental plant) 9 407 408
Shubik, M. 6 29
Shull, A. F. 2 601
Shull, C. 3 645, 6 430
Shunt dc generator 4 224
Shunt dc motor 4 227
Shunt-excited antenna *see* Antenna (aerial)
Shunting 12 308
Shutter cameras 2 431
Shutter—*cont*
motion-picture cameras 3 123
motion picture projectors 3 125
Shuttle 13 534
Siacci method (trajectories) 2 81
Sial 4 328, 13 412
Sialia currucoides 2 271
Sialia mexicana 2 271
Sialia sialis 2 271
Siam ruby 11 649
Siamese fighting fish 12 397
Siberian elm 4 564
Siberian plateau 1 577
Siberian taiga 1 584
Siberian tiger 13 640
Sibillini, Mountains 5 118
Siboglinidae 1 622
Siboglinum caulleryi 2 313
Siboglinum ueberi 1 622
Sicilian method (sulfur) 13 255
Sicily 5 117, 8 207
Sickle cell anemia 13 9 494
gene action 6 106
human genetics 6 508
metabolic disorders 8 257
Sicula 6 258
SID 13 285
Side-chain substitution 6 325 330
Side chain theory (chemotherapy) 3 53
Side launching 12 289 290
Side lobe (directivity) 4 233
Side reactions (chemical kinetics) 7 358
Side sewing (book manufacture) 2 288
Side-wall coring tool 9 294
Side-wall sample gun 9 293
Sideband 1 351, 12 308
Sidereal clock 13 642
Sidereal day 4 18, 8 189
Sidereal hour angle *see* Hour angle
Sidereal month 6 126
Sidereal time 13 642
Sidereal year 14 599
Siderite 12 308 309
carbonate minerals 2 467
iron ore 7 258
Siderobacter 12 309
Siderocapsa 12 309
Siderocapsaceae 12 309
bacteria taxonomy of 2 11
Pseudomonadaceae 11 65
Siderococcus 11 65, 12 309
Sideromonas 12 309
Sideronema 12 309
Siderophacus 2 570, 11 65
Siderophacus corneolus 2 570
Siderophile elements 4 546
Siderophyllite 2 246
Sidorosphaera 12 309
Sideswimmer 10 1
Sidetone (telephone) 13 431
Sidewinder missile 1 542
Sidgwick, N. V. 1 42
Siedentopf, H. 14 181
Siegbahn, M. 14 590
Siemens, Frederick 13 95
Siemens, Karl 13 95
Siemens, W. 14 559
Siemen's electrodynamometer 4 476
Sienna 10 224
Sierolomorphidae 6 574
Sierra de Guadarrama 8 617
Sierra del Sur 9 163
Sierra Madre Occidental 9 161
Sierra Madre Oriental 9 161
Sierra Nevada 8 617 618*, 9 161-162
tectonic patterns 13 410
Sieve 12 349
Sieve cell 10 115
Sieve tray 5 492
Sieve tube 10 115
Siewing, R. 9 528, 10 2
Sigalionidae 10 461
Sigatoka 2 90
Sight 12 309
see also Vision
Sight reduction (celestial navigation) 2 585
Sigillaria 7 457, 9 504
Sigillaria boblayi 7 458
Sigillariostrobus 7 458
Sigma hyperon *see* Hyperon
Sigmodon 11 345
Sigmoopsidae 9 510
Sigmoopsis 9 510
Sigmoopsis platyceras 9 511
Signal chopper 14 329
Signal generator 12 309
Signal oil 10 72
Signal to noise ratio 9 119 12 310*
radar 11 209
seismograph 12 148
Signal tracer 12 309 310
Signaling alarm systems 1 222
bell 2 159
railroad 11 327 328
smoke 12 82
Signature (book manufacture) 2 286 288
Significance (statistics) 11 141 142
F test 11 142
t test 11 141
Significant figures 12 310
Silazane 12 319
Silberhorn Mountain 1 671
Sigsbee Deep 6 292
Sikkeland, T. 14 67
Sikorsky, Igor 14 309
Silal 2 540
Silane 6 532, 546, 12 319
Silencer 12 310
Silent chain 3 4
Silent electric discharge (ozone) 9 478
Silexite 3 56
Silica 2 617
abrasive 1 9
biogenic deposits 3 57
ceramic technology 2 647
in chert 3 56 57
glass 6 206
petrifactions 10 42
in shale 12 241
Silica gel (desiccant) 4 77
Silica glass 9 350 352*, 12 318, 321
Silica reaction vessels 13 247
Silica refractories 11 409
Silica sands 12 22
Silicate 12 311, 476
glass 6 206, 8 265
Silicate minerals 12 311 312
classification 12 311
important minerals 12 312
inosilicates 12 311
lava 7 421
nesosilicates 12 311
phyllosilicates 12 311
in quartzite 11 183
sorosilicates 12 311
structure 12 311 312
tectosilicates 12 311
Silicate phase equilibria 12 312 317
applications 12 316
binary systems 12 313
diagrammatic representation 12 313
dynamic and static methods 12 313
establishment of equilibrium 12 313
incompatible mineral assemblages 12 316
isothermal sections 12 314
phase diagrams 12 316
pseudobinary system 12 314
ternary systems 12 314
Silicate rock weathering 14 459
Siliceous oozes 8 135 136
Siliceous petrifactions 10 42
Siliceous sediments 12 139-140
silicoflagellates in 12 317
Siliceous sinter 12 317
mineral formation 8 442
opal deposits 9 532
Silicic acid esters 12 322
silicate 12 311
Silicic lava 14 349
Silicide calcium 2 399
cerium 2 655
Silicification 10 42
Silicle 5 542, 9 538

Shigella—cont.
serological differentiation *12 254*
taxonomy 5 1
water-borne disease 14 411
Shigella alkalescens 12 254
Shigella boydii 12 254
Shigella dispar 12 254
Shigella dysenteriae 6 180, 12 254
Shigella flexneri 12 254
Shigella lutea 6 180
Shigella sonnei 12 254
Shigellosis *see* Bacillary dysentery
Shikimic acid: phenylalanine biosynthesis 2 57; 10 114
tyrosine biosynthesis 14 176
tryptophan biosynthesis 14 125
Shillaber's type 3 illumination 8 394
Shimwell, J L 1 39, 11 64
Shiner 12 254-255
common 12 255
golden 12 255
Shingle, roof 11 620
Shingles and chickenpox *see* Chickenpox and shingles, *Herpesvirus*
Shining flower beetle 3 278
Shining fungus beetle 3 276
Ship autopilot 1 689
cargo 12 258 262
chronometer 3 116
design 12 268-276
drydocking 4 279 282
freighter 12 258-259
launching 12 289 290
magnetic field of 4 43-44
magnetization 4 43-44
merchant 12 255-262
naval 12 262 268
noise 12 503-504
passenger 12 258
propulsion 12 256-257, 276 284
resistance 12 269 270, 276-279
salvage 12 284 286
shipbuilding 12 286-290
stability *12 256*
submarine 13 210-215
tanker 12 260-261
trials 12 283-284
vibrations 12 280 281
see also Ship, merchant, Ship, naval
Ship, merchant 12 255-262
bulk dry-cargo vessels 12 261-262
bulk-liquid cargo vessels (tankers) 12 260-261
bulkheads 12 256
cargo handling *12 257-262*
Ship, merchant—*cont.*
containerized cargo vessels *12 259 260*
design considerations 12 255 258
dimensions 12 255-256
general-cargo freighters 12 258-259
launching 12 289
passenger vessels 12 258
propulsion 12 256
routing forecasts 9 8
size restrictions 12 257 258
size speed relationship 12 257
speed factors 12 256
stability 12 256
Ship, naval 12 262-268
aircraft carriers 12 262-263
antisubmarine warfare 1 484 487
armament 1 541-544
cruisers 12 263-264
design 12 276
destroyer types 12 264 266
guided-missile ships 12 263 266
landing ships and craft 7 395 396
mine sweepers 12 266
motor torpedo boats 12 266 267
naval auxiliaries 12 267 268
nuclear reactors 11 361-363
submarines 13 210-215
Ship design 12 268-276
design procedure 12 268-269
freeboard 12 274
hull form 12 269-270
load lines 12 274
longitudinal stability 12 269-272
marine machinery 8 120
owner's requirements 12 268
propellers 11 12
safety of life at sea 12 275-276
ship motion 12 273
stability of ships 12 269 273
structural design 12 273 274
tonnage 12 274 275
by towing tank 14 2 4
trim 12 271-273
warship design 12 276
Ship noise 12 503 504
Ship propulsion 12 276 284
backing power of ships 12 282-283
hydrofoil craft 6 541-542
maneuverability 12 281-283
marine engine 8 109
Ship propulsion—*cont*
marine machinery 8 116
marine propeller 11 12-15
merchant ships 12 256 257
model testing 12 279-280
origin of ship waves 12 278
powering of ships 12 280
propellers 11 12-15
resistance of ships 12 276-279
rudders 12 282
ship trials 12 283 284
ship vibrations 12 280-281
steering 12 281-283
towing tanks 12 279 280
Ship routing forecasts 9 8
Ship salvage 12 284 286
Ship-timber beetles 3 277
Ship-to-shore communication 1 564, 11 241
Ship trials 12 283-284
Shipbuilding 12 286 290
launching 12 289 290
outfitting 12 290
ship design 12 268-276
ship steel 12 286
shipyard layout and facilities 12 286
Shipworm 12 235, 291
Shipyard 12 286
Shire River 1 107, 109
Shire stallion 6 489
Shishaldin Volcano 1 523
SHM *see* Harmonic motion
Shoat 6 460
Shock absorber 12 291-294*, 13 15
automotive suspension 1 680, 686, 14 316-317
Shock-absorber cord 12 291
Shock isolation 12 291-294*, 13 15
Shock mount 12 291-294
Shock syndrome 12 294
Shock tube 4 491
Shock wave 12 294 298*, 14 429 430
aerodynamic 14 61 62
aerodynamic wave drag 1 87-88
aerothermodynamics *1 103*
airplane 1 210
explosion 5 146-148
fluid-flow properties 5 345
gas dynamics 6 55
Mach number 8 1
magnetohydrodynamics 8 62
normal 12 295 296
nuclear explosion 9 181-184
oblique 12 296 297
Rankine-Hugoniot *equations 12 295*
Shock wave—*cont*
schlieren photography 12 294
shadowgraph 12 294
shock isolation 12 291 294
sonic barrier 12 505
sonic boom 12 505 506
streamlining 13 176
supersonic flight 13 308
wind tunnel 14 499
Shock-wave diffraction 6 526
Shock wave display 12 298-299
absorption methods 12 298 299
glow methods 12 299
interferometry 12 298 299
Mach Zehnder interferometer 7 193 194
refraction methods 12 298
schlieren photograph *12 68, 298 299**
shadowgraph 12 298 299*
Shockley, W 5 233
Shoenberg, D 7 558
Shogoin (turnip) 14 164
Shonkinite 10 86
Shope's rabbit papilloma virus 9 541; 14 551
Shor, G 8 532
Shoran 1 94, 9 15, 19
Shore bug 6 401
Shore crab 5 531
Shore fly 4 212
Shore processes 12 299-306
beach cycles 12 302
beach types 12 301
biological effects 12 305
currents in surf zone *12 301*
longshore movement of sand 12 304
mechanics of beach formation 12 303
sediment characteristics 8 132 133
source of beach sediments 12 305
waves 12 100, 300-301
Shore Scleroscope hardness scale 6 338
Shorea 1 587
Shoreline 3 242
ancient 8 557
limestone 7 555
Shoring 5 483
Shortlite 13 693
Shorr, E. 9 437
Short circuit 12 306
location 5 156
Short circuit protection
circuit breaker 5 155
electric power substation 4 441-442
fuses 5 577-579
Short-grass steppes 10 565

Short grassland 3 190
Short nosed sturgeon 13 207
Short range order 1 264
Short run three color system 10 607 608
Short tailed albatross 1 222
Short tailed shrew 12 307
Short ton 8 188
Short waves amateur use 1 299
broadcasting 1 363 364, 11 250
Shortt clock 5 205
Shot core barrel 2 296-297
Shot drilling (rock) 2 296, 3 418
Shot holes (mining) 8 485 486
Shot manufacture 7 426
Shot noise 9 119
Poisson law 9 119
radar 11 208
Schottky formula 9 120
vacuum tube amplifier 1 547
Shot peening *see* Peening
Shotcrete *see* Gunite
Shotgun 1 537 538
Shoulder 12 306
Shovel, power 2 368, 12 306
Shoveller 4 290
Shower, cosmic ray 3 500
Shower clouds 3 215
Showstring sands 10 63
Shrew 7 142, 12 307
Shrike 12 307
Shrimp 12 307 309
Arthropoda 1 560
common 12 308
Crustacea 3 563
Decapoda (Crustacea) 4 24
fairy 1 455, 3 563
food manufacturing 5 419
fresh water 12 307
mud 4 30
snapping 4 29
white 12 308
Shrink fit 1 258, 12 308*
Shrink resistance (textile) 13 539
Shrinking (sheet metal) 12 249 250
Shrock, R. R. 2 207 4 261
Shrouded propeller *see* Ducted fan
Shrub (ornamental plant) 9 407-408
Shubik, M. 6 29
Shull, A. F. 2 601
Shull, C. G. 5 643 6 450
Shunt de generator 4 224
Shunt de motor 4 227
Shunt-excited antenna *see* Antenna (aerial)
Shunting 12 308
Shutter cameras 2 431
Shutter—*cont*
motion picture cameras 3 123
motion picture projectors 3 125
Shuttle 13 534
Siacci method (trajectories) 2 81
Sial 4 329, 13 412
Sialia currucoides 2 271
Sialia mexicana 2 271
Sialia sialis 2 271
Siam ruby 11 648
Siamese fighting fish 12 397
Siberian elm 4 564
Siberian plateau 1 577
Siberian taiga 1 584
Siberian tiger 13 640
Sibillini, Mountains 5 118
Siboglinidae 1 622
Siboglinum caulleryi 2 513
Siboglinum ucberi 1 622
Sicilian method (sulfur) 13 255
Sicily 5 117, 8 207
Sickle-cell anemia 13 9, 494
gene action 6 106
human genetics 6 508
metabolic disorders 8 257
Sicula 6 258
SID 13 285
Side chain substitution 6 325 330
Side chain theory (chemotherapy) 3 55
Side launching 12 289 290
Side lobe (directivity) 4 233
Side reactions (chemical kinetics) 7 358
Side sewing (book manufacture) 2 288
Side wall coring tool 9 294
Side wall sample gun 9 293
Sideband 1 351, 12 308
Sidereal clock 13 642
Sidereal day 4 18 8 189
Sidereal hour angle *see* Hour angle
Sidereal month 6 126
Sidereal time 13 642
Sidereal year 14 599
Siderite 12 308 309
carbonate minerals 2 467
iron ore 7 258
Siderobacter 12 309
Siderocapsa 12 309
Siderocapsaceae 12 309
bacteria, taxonomy of 2 11
Pseudomonadaceae 11 65
Sideroccoccus 11 65, 12 309
Sideromonas 12 309
Sideronema 12 309
Siderophacus 2 570, 11 65
Siderophacus corneolus 2 570
Siderophile elements 4 546
Siderophyllite 2 246
Sidcrosphaera 12 309
Sideswimmer 10 1
Sidetone (telephone) 13 431
Sidewinder missile 1 542
Sidgwick, N. V. 1 42
Siedentopf, H. 14 181
Siegbahn, M. 14 590
Siemens, Frederick 13 95
Siemens, Karl 13 95
Siemens, W. 14 559
Siemen's electrodynamometer 4 476
Sienna 10 224
Sierolomorphidae 6 574
Sierra de Guadarrama 8 617
Sierra del Sur 9 165
Sierra Madre Occidental 9 161
Sierra Madre Oriental 9 161
Sierra Nevada 8 617-618*, 9 161 162
tectonic patterns 13 410
Sieve 12 349
Sieve cell 10 115
Sieve tray 5 492
Sieve tube 10 115
Siewing, R. 9 528 10 2
Sigalionidae 10 461
Sigatoka 2 90
Sight 12 309
see also Vision
Sight reduction (celestial navigation) 2 585
Sigillaria 7 457, 9 504
Sigillaria boblayi 7 458
Sigillariostrobus 7 458
Sigma hyperon *see* Hyperon
Sigmodon 11 345
Sigmoopsidae 9 510
Sigmoopsis 9 510
Sigmoopsis platyceras 9 511
Signal chopper 14 323
Signal generator 12 309
Signal oil 10 72
Signal to-noise ratio 9 119 12 310*
radar 11 209
seismograph 12 148
Signal tracer 12 309 310
Signaling alarm systems 1 222
bell 2 159
railroad 11 327-328
smoke 12 82
Signature (book manufacture) 2 286 288
Significance (statistics) 11 141-142
F test 11 142
t test 11 141
Significant figures 12 310
Silazane 12 519
Silberhorn Mountain 1 671
Sigsbee Deep 6 292
Sikkeland, T. 14 67
Sikorsky, Igor 14 509
Silal 2 540
Silane 6 532, 546, 12 319
Silencer 12 310
Silent chain 3 4
Silent electric discharge (ozone) 9 478
Silexite 3 56
Silica 2 617
abrasive 1 9
biogenic deposits 3 57
ceramic technology 2 647
in chert 3 56 57
glass 6 206
petrifactions 10 42
in shale 12 241
Silica gel (desiccant) 4 77
Silica glass 9 350 352*, 12 318, 321
Silica reaction vessels 13 247
Silica refractories 11 409
Silica sands 12 22
Silicate 12 311, 476
glass 6 206, 8 265
Silicate minerals 12 311 312
classification 12 311
important minerals 12 312
inosilicates 12 311
lava 7 421
nesosilicates 12 311
phyllosilicates 12 311
in quartzite 11 183
sorosilicates 12 311
structure 12 311-312
tectosilicates 12 311
Silicate phase equilibria 12 312 317
applications 12 316
binary systems 12 313
diagrammatic representation 12 313
dynamic and static methods 12 313
establishment of equilibrium 12 313
incompatible mineral assemblages 12 316
isothermal sections 12 314
phase diagrams 12 316
pseudobinary system 12 314
ternary systems 12 314
Silicate rock weathering 14 459
Siliceous oozes 8 135 136
Siliceous petrifactions 10 42
Siliceous sediments 12 139 140
silicoflagellates in 12 517
Siliceous sinter 12 317
mineral formation 8 442
opal deposits 9 332
Silicic acid esters 12 322
silicate 12 311
Silicic lava 14 349
Silicide calcium 2 399
cerium 2 655
Silicification 10 42
Silicle 5 542, 9 538

Silicoflagellata 3 117, 8 128; 12 317*
Silicomanganese 8 86
Silicon 12 317-324
  electron configuration 4 504
  extractive metallurgy 8 278
  heats of formation of compounds 12 319
  ionization potential 4 504
  natural occurrence *12 319*
  organic compounds 12 322-324
  organometallic compounds 9 402-403
  preparation 12 319
  principal compounds 12 319-324
  properties 12 318-319
  silicate 12 311
  silicone resins 12 324-325
  uses 12 317-318
  see also Germanic technology Semiconductor; Silicate minerals
Silicon bronze 3 469
Silicon carbide *12 320*
  abrasive 1 9 12 320
  refractory 11 410
Silicon diode 12 324
  junction diode 7 317 319
  parametric amplifier 9 551
Silicon iron alloy *see* Iron-silicon alloy
Silicon rectifier construction 12 174
  crystal growth 12 174
  doping 12 174
  heat dissipation 12 174
  in parallel 12 174
  ratings 12 174
  sealing 12 174
  in series 12 174
Silicon steel 13 206
Silicon tetrachloride 12 320
Silicone 12 323, 13 540
Silicone resins 12 324-325
  see also Polymer
Silicone rubbers 7 157, 11 641 642
Siliconizing 8 280
Silicothermic process 8 19 20
Silicothermic reactions
  ferroalloy 5 224
  ferrochromium 3 104
Silicotungstic acid 14 140
Silique 5 541, 9 558
Silk 5 5, 252 253, 12 325 326*
  filature operations 12 326
  insect physiology 7 124
  life cycle of the silkworm 12 325
  wild silk 12 326
Silk cotton tree 12 146
Silk-screen printing 7 114, 10 605, 619
Silk tassel bush 12 145
Silken fungus beetle 3 278
Silkie 3 58
Silkworm 5 5, 7 464; 12 325
Silky willow 14 493
Sill (geology) 10 84, 421
Sill depth (marginal seas) 9 249 250
  Caribbean Sea 2 521
  Mediterranean Sea 8 207 208
Sillimanite 12 326 327
  refractory 11 409
Sillimanite gneiss 11 591
Siloxane 3 41, 12 319, 324
Silpha 3 286
Silphidae 3 276
Silsbee effect 13 296
Siltstone 1 529, 11 590, 12 135, 139, 374
Silurian 6 136, 142, 12 327-329*
  animal life 9 521, 12 329
  climate 12 328
  facies 12 328
  plant life 9 504, 12 329
Siluriformes *see* Cypriniformes
Siluroidei 3 647-648
Silurus glanis 2 552
Silvanidae *see* Cucujidae
Silver 12 329 333
  alloys 12 331-332
  analytical methods 12 331
  assay for 1 593
  chemical properties 12 330
  crystal structure 3 599
  electron configuration 4 504
  extractive metallurgy 8 278
  ionization potential 4 504
  metallurgy 12 332-333
  noble metal alloys 12 331
  occurrence 12 329
  pyrargyrite 11 108
  resistivity 11 497
  secondary emission 12 125
  silver compounds 12 330
  silver metal 12 330
  technical alloys 12 331 332
  tetrahedrite 13 529
  uses 12 329
  see also Photographic materials
Silver alloys 12 331-332
Silver-base bearing alloys 1 258
Silver chloride (optics) 9 353
Silver chloride electrode 12 332
Silver compounds 1 475
Silver coulometer 5 516
Silver fir 5 277
Silver fish 12 333*, 13 629
Silver-halide photocopying 10 144-145
Silver halides 10 141, 156-157
Silver iodide 5 217
Silver maple 8 99, 13 119
Silver metallurgy 6 232 233, 12 332 333*
  amalgamation 12 333
  cyanidation 12 332
  electrolytic slimes, refining of 12 332-333
  Parkes process 12 333
Silver oxide 11 183
Silver oxide-zinc alkaline battery 13 158
Silver picrate 1 483
Silver plating 4 530-531
Silver salmon 12 14
Silver Springs (Florida) 13 18
Silverfish 12 333
Silvex 6 423
Silviculture 12 333 339
  accessory practices 12 336
  cutting cycles 12 338
  forest management 12 338
  reproduction cutting 12 334
  silvicultural systems 12 338
Silvretta group 5 117
Sima 4 328, 13 412
Simazin 6 423
Simha, R 2 639
Similarity transformation (matrix) 8 184
Similax herbacea 10 11
Similitude 12 339
  fluid mechanics 5 537
  law of 14 2-3
  model theory 8 525
  structural analysis 13 199
Simmonds' disease 10 252
Simon A W 3 355
Simons electrochemical process 6 550
Simple coiled gland 5 43
Simple games (game theory) 6 29-30
Simple gland 5 43
Simple goiter 13 627
Simple harmonic motion *see* Harmonic motion
Simple machine 12 339 340
  block and tackle 2 262
  friction 5 535-536
  inclined plane 7 55
  lever 7 494
  mechanical advantage 8 189
  screw 12 82-83
  wedge 14 460
  wheel and axle 14 487
Simple salt 12 16
Simplex aerator 12 225
Simplex polytope 10 492
Simpson, G G 3 174
Simpson, G G 1 425, 8 14
Simpson, J 3 501
Simpson's rule (integration) 7 172
Simulation of industrial processes 12 340
Simulator 12 340
  flight simulator 1 691
Simulidae 4 212
Simulium 5 258, 362
Simulium simile 4 216
Simultaneous contrast (vision) 14 338
Simultaneous message transmission 14 60
Sinanthropus I 417
Sinanthropus pekinensis 5 478; 9 612
Sindbis virus 1 499, 4 218
Sine 14 95
Sine function generator 1 376 378
Sine galvanometer 8 64
Sine wave 12 340 341
Sinemurian stage 7 325
Sines, law of 14 96, 100 101
Singer, F H 438
Singer, R H 549
Singing propellers 11 14
Single bond shift (isomerization) 7 281
Single-carrier theory of rectification 12 170-171
Single-cell isolation 3 617
Single crystal 3 580, 12 341*
  anisotropy 12 341
  growth techniques 12 341
  physical properties 12 341
Single lens reflex camera 2 429
Single-path navigation systems 9 18-19
Single-phase alternating-current circuits *see* Alternating-current circuit theory
Single phase generators *see* Alternating-current generator
Single phase induction motor 7 77-79
  capacitor motor 7 78
  production of rotating field 7 77
  rotor 7 77
  shaded pole motor 7 79
  split-phase motor 7 78
Single-phase motors 1 285
  commutator motor 14 206
  induction motor 7 77 78
  repulsion motor 11 484 485
  series motor 14 206
  universal motor 14 206
Single selection (human genetics) 6 502
Single sense conception 13 490
Single sideband radio AFC 1 551, 675
  amateur contributions 1 299

le-sideband radio—*cont*
compatible with double sideband systems 11 265
delay 1 351
low frequency limitation 1 351
modulation 1 351 352
overseas telephone service 13 438
principles 1 351
radiotelegraphy 13 423
radiotelephony 1 364
receiver 11 258 259
reduction of power 1 351
spectrum conservation 1 351
transmitters 11 265
plet spin state 12 58
k (geology) 7 333
k float separation (ore dressing) 9 390
k flow 12 341
khole 7 332 333
natrial node 2 483 3 138
opa grangeri 2 525
tering 12 341 342
ceramic technology 2 650
induction heating 7 73
nonferrous pyrometallurgy 11 121
powder metallurgy 10 550
ius 12 342 343
ius (circulation) 3 137-141
ius gland 3 566
chromatophore 3 98 105
ius venosus 2 482, 3 138
usitis 12 343
usoid 4 453
usoidal oscillator *see* Harmonic oscillator
usoidal test object 9 368 369
usoidal wave *see* Sine wave
phinodentalinidae 12 50
phogenerina 5 435
phogenerina reedi 5 435
phonaptera 7 134, 12 343 345*
control 12 345
flea 5 299
life history 12 343
medical importance 12 343
phonaxanthin 2 528
phonein 2 530
phonophora 3 255 12 345-346*
phonostele 13 116
Lycopsida 7 626
stele 13 105 106
lipunculida 1 428
lipunculoidea 1 413 420 12 346*
lredon mexicanum 12 7
iren 2 568 8 187
iren (acoustics) 12 346
iren lacertina 2 569, 11 517
Sirenia 8 82 12 346 347
fossils 12 347
manatee 8 85
Sirenia fossils 12 347
Sirenites argonautae zone 14 82
Sirenidae 6 574
Sirius 12 347, 13 41
binary stars 2 190
Einstein shift 4 417
Sirocco 12 347 348*, 14 493
Sisal 12 79 348*
Sistrurus catenatus 11 347
Sistrurus miliarius 11 347
Sitophilus oryzae 3 287
Sitotroga cerealella 7 467
Sitta carolinensis 9 234
Sitter, Willem de 3 509, 4 535
Sittidae 3 58 9 234
Situs inversus digestive system 4 154
heart 2 515
Sivapithecus 10 590
Sivathere 1 568
Six lined lizard 7 564
Six spotted thrips 13 628
Siyeh shale 9 522
Size reduction 12 349 351
applications 12 348
energy requirements 12 350
ore dressing 9 388 389
particle size measurement 12 349 350
processes and devices 12 350
Size reduction (food) 5 389 390
Sizing, paper 9 540
sheet metal 12 252 253
textiles 13 538
Sjaelland (Zealand) 5 117
Skaergaard 1 524
Skagerrak 5 115
Skalnate Pleso charts 9 24
Skarn 12 351
aureole contact 1 668
pneumatolysis 10 425
Skate 7 91, 11 363
Skate extinct 2 111
Skatole 2 35 7 62
Skeletal histogenesis 12 351 367
Skeletal morphogenesis 12 354
Skeletal muscle 8 636 9 80
Skeletal system 12 351 367
anatomy 12 358 364
blood calcium regulation 12 366
bone as a mineral reservoir 12 366
bone growth 12 365
bone remodeling 12 365
bone repair 12 367
calcification 12 366
chondrocranium 12 355
collarbone 3 289
embryology 12 352 354
Skeletal system—*cont*
Haversian system 12 365
hip 6 455
histogenesis 12 352
hormones and bone 12 366
internal radiation 12 367
ion transfer between blood and bone 12 366
isotopes as tracers 12 367
joints 7 315
leg 7 449
morphogenesis 12 354 358
ossification centers 12 353
pectoral girdle 12 357 363
pelvic girdle 12 358 363
pelvis 9 616
physiology 12 364 367
radioactive isotopes and bone 12 367
rib 12 355 363
shoulder 12 306
skull 12 355
splanchnocranium 12 356
sternum 12 355 363
tail 12 354
vertebra 14 307 309
vitamin D and bone 12 366
wrist 14 559
Skeletal system disorders 12 367 369
characteristics of bone 12 367
congenital defects 12 369
fracture 12 368
healing 12 368
hereditary defects 12 369
infection 12 368
metabolic disease 12 368
nearthrosis 12 368
tumors 12 369
Skeleton appendicular 12 357
anatomy 12 363
morphogenesis 12 357
Skeleton axial 12 354
anatomy 12 358
morphogenesis 12 354
Skeleton frame construction (buildings) 2 564
Skeleton shrimp 1 340 5 363
Skerman, V. B. D. 2 11
Skew conformation 3 397
Skew errors (geometrical optics) 9 368
Skew lines (geometry, euclidean) 6 153
Skew polygon 10 471
Skew quadrilateral 11 135
Skids 7 87
Skim milk 8 436
concentrated 8 436
instant dried 8 438
sweetened condensed 8 436
Skimmer 13 495
Skin 12 369
carcinomas 2 200
integument 7 174 175
Skin—*cont*
leather and fur processing 7 443
radiation injury (biology) 11 227
Skin, regeneration 7 176
Skin, ultrastructure 7 176
Skin beetle 3 277
Skin decontamination 4 38
Skin disinfectants 1 475
Skin disorders 12 369 370
eczema 4 408
impetigo 7 47
infectious etiology 12 369
noninfectious etiology 12 370
psoriasis 11 71
Skin diving 12 370 371
Skin effect 12 371
induction heating 7 75
Skin friction 12 372
boundary layer flow 2 310
drag 5 344
resistance 12 276 279
Skin metabolism 12 367
Skin reaction (antigen antibody reaction) 1 473
Skin sensitivity (temperature senses) 13 489
Skin test 12 372 373
streptococcus 13 178
Skin transplant 6 115
Skink 7 564, 12 373, 13 23
Skink, blue tailed 12 373
Skinner, B. F. 7 442, 8 604, 11 399
Skip bucket 3 239
Skip hoist 2 367
Skip trajectory 6 592
Skip zones (sound) 1 632
Skipjack 11 363 14 136
Skipper 2 381, 7 459, 464
Skipper fly 4 212
Skraup synthesis (quinoline) 11 192
Skrjabinema ovis 9 476
Skull 6 345 12 358 373*
branchiocranium 12 358
chondrocranium 12 355
chondroneurocranium 12 355
cranium 3 538
Cro Magnon man 3 554
neurocranium 12 355
Rhodesian man 11 549
Sinanthropus 9 612
splanchnocranium 12 355-356
Steinheim man 13 104
Swanscombe man 13 333
viscerocranium 12 358
Skull, morphogenesis 12 355
Skull melting 14 240
Skunk 12 373 374
Skunk cabbage 1 497
Skutterudite 3 246 12 374*
Sky car see Air-cushion vehicle

Sky-hook balloon 5 363
Sky-wave propagation (radio waves) 1 363, 11 248, 319*
Skylark 7 404 405
Skyline Drive 9 146
Skysweeper 1 540
Slab, concrete *see* Concrete slab
Slab avalanche 1 693
Slack wax (petroleum) 14 444 445
Slag 11 123
  fertilizer 5 237
  in fusion piercing 2 297
  iron blast furnace 7 260
  steel manufacture 13 93-102
Slag cement 2 627
Slag refining (pyrometallurgy) 11 125
Slag sand 12 21
Slaked lime 7 515
Slaking 2 399, 7 515
Slant height (cone) 3 395
Slashing *see* Sizing
Slate 11 591; 12 374-375*
  cleavage in 3 169
  compressive strength 4 613
  development of slaty cleavage 12 374
  flagging stone 13 152
  milled products 13 152
  mineral constituents 12 375
  roofing stone 13 152
  uses 12 375
  velocity of sound in 12 516
Slater, J C 4 97
Slater 9 527
Slater sum (kinetic theory) 7 552
Slaty cleavage 8 298
Slave-making ant 6 582
Sleep 12 375-377
  depth of 12 376
  duration of 12 376
  evolutionary theory 12 377
  hypersomnia 12 375
  insomnia 12 375
  neural mechanism 12 377
  physiological changes 12 376
Sleep wakefulness rhythm 2 274
Sleeping sickness, African 12 376, 377-378*, 14 124
  entomology, economic 5 5-7
  epidemiology 4 218, 12 377
  Protomastigida 11 46
  Protozoa 11 60
  symptoms 12 377
  treatment 12 378
Sleet 10 573
Sleeve bearing 2 122
Sletteback, A 13 44
Slick (capillary wave) 14 417
Slickensides 5 191
Slide-back voltmeter 14 254
Slide rule 12 378
Slide valve 14 261
Slide-wire potentiometer 10 542
Slider crank mechanism 5 485, 7 527, 12 379 380*
  connecting rod 3 402
  internal combustion engine 12 379 380
  radial aircraft engine 12 380
  steam engine 12 380
  toggle mechanism 12 380
Sliderock 13 388
Slides, lantern *see* Lantern slides
Sliding motion (rigid bodies) 11 577
Sliding pair 5 485, 12 380
Sliding slot linkage 5 486
Slime disease 13 663
Slime envelope 11 552
Slime mold labyrinthulales 7 375
  myxomycetes 8 687
  protoplasm 11 48
Slime tables (ore dressing) 9 390
Sling psychrometer 11 82
Slip 12 380-381
  induction motors 7 76
  marine propellers 11 12
Slip casting (ceramics) 2 649
Slip flow fluid dynamics 5 536
  propeller 14 380
  superaerodynamics 13 293, 294-295
Slip fold (geology) 5 369
Slip line (metallography) 8 295
Slip plane (crystal defects) 5 583
Slip rings 12 381-382
  assemblies 12 381
  rotating machines 12 381
Slipper shell 12 235
Slippery elm 4 564
Slitting (sheet metal) 12 253
Sliver (textile) 13 533
Slivovitz 4 255
Slope (continental) *see* Continental shelf and slope
Slope (geology) contour representation 5 425
  runoff and erosion 12 431-432
  terrain classes 13 500
Slope (mathematics) 12 382
Slope angle (line) 1 388
Slope soaring 6 213
Sloss, L L 12 241
Slot antenna *see* Antenna (aerial)
Slot harmonics 1 283
Sloth 1 382*, 12 382
Sloth, three-toed 12 383, 382
Sloth, two-toed 12 383, 382
Slotta, K. H 6 235
Slotted line 7 44
Slotted nut 9 231
Slotted section 7 44
Slotter *see* Shaper
Slovakian Ore Mountains 5 118
Slow motion linkage 5 485
Slow neutron 5 287-290
Slow-neutron induced fission 5 287-290
Slubber (textile) 13 534
Slug (unit) 12 383
Slug (zoology) 12 383
Slug, field-gray 12 383
Slug moth 7 464
Slump (geology) 7 397
Slump (landslide) 7 397
Slump structures in sedimentary rocks 12 134
Small, J K 10 577
Small arms 1 537-538
Small carrion beetle 3 276
Small circle 12 607
Small-game mammals 14 490
Small intestine 4 155, 169
Small-mouth black bass 2 108
Smaller Charriot 14 235
Smallpox 1 425, 696, 2 218, 5 35, 12 370, 383-384*, 14 328
  culture, embryonated egg 3 615
  epidemiology 12 385
  immunization 12 384
  infectious agent 12 383
  laboratory diagnosis 12 383
  pathogenesis 12 385
Smaltite 5 246 12 374
SMDG (herbicide) 6 421
Smeaton John 5 148
Smegma 12 61
Smekal, A 5 359
Smell 12 384-386
  adaptation 12 386
  anatomy 12 384
  behavioral effects 12 386
  differential sensitivity 12 385
  factors influencing sensitivity 12 385
  odor interactions 12 386
  odor qualities 12 385
  sensitivity 12 385
  stimuli 12 385
  taste 13 401
  theories 12 386
Smelt 5 416, 12 386
Smelting copper 5 465
  lead 7 432-433
  tin 13 650
  zinc 14 614-615
Smilax 6 596, 7 514
Smilax aristolochiaefolia 12 32
Smilax medica 12 31
Smilax officinalis 12 31
Smilax ornata 12 31
Smilax papyracea 12 31
Sminthuridae 5 290
Sminthurus minutus 13 18
Smith, Erwin I 476
Smith, F G 9 386
Smith, G F 13 554
Smith, H M 7 502
Smith, James E (Sir) 14 172
Smith, P H 8 424
Smith, T. 6 315
Smith, W. 5 475, 13 168, 170
Smith-Baker microscope 8 586
Smith Chart 8 424
Smith forging *see* Hammer forging
Smith number 10 alloy 7 265
Smithsonian Institution 13 256
Smithsonite 2 467, 12 386 387*, 14 612
Smittina 2 354
Smog 12 387
  aerosol 1 99 101
  fog 5 367
  high-moisture type 2 201
  low-humidity type 2 201
  ozone production 2 201
  temperature inversion 13 488
Smog induced injuries 2 201
Smoke 12 387
  dust and mist collection 4 296
  screening smoke 12 81 82
  smog 12 387
  see also Aerosol
Smoke detectors 5 278
Smoke plume 1 644
Smoke rockets 1 540
Smoke screen 12 81 82
Smoke shells 1 538
Smoked sheet rubber 11 635
Smokeprinting 10 146-147
Smoluchowski, M 12 52
Smooth green snake 6 268
Smooth headed meadow nematode 9 604
Smooth muscle 8 635
Smooth vetch 14 310
Smoothing filter 5 271, 10 561
Smoothing plane 14 543
Smudge (onion) 9 327
Smut (microbiology) 12 387-388
  heterobasidiomycetidae 6 427
Smut disease 14 235
Smut fungi 14 235
Smuttia 1 442
Smythe sewing (book manufacture) 2 286 288
S_N 1 process 13 129, 229
$S_{N}i$ process 13 129
$S_{N}i'$ process 13 129
S_N2 process 13 129, 229
$S_{N}2'$ process 13 129

ail 5 183, 12 388 389*
characteristics 12 389
economic importance 12 388
feeding habits 12 389
reproduction 12 389
ake 12 389 390*, 13 21
distribution 12 390
feeding habits 12 390
rat 2 255
reproduction 12 390
size 12 390
see also Reptilia and entries on specific snakes
nake bite treatment 14 6
nake River 7 116 9 160
nap-dragon rust 14 217
nap gage 6 4
nap ring 12 390
napping bug 2 151
napping shrimp 4 29
napping turtle 3 22 23, 14 167
neeze gas 3 45
nell, W 9 362
nell's law (refraction) 11 405-408
nell's law (seismology) 12 151 152
nipe 12 390
nipe fly 4 272
nipefish 6 71
nook, J L 3 253
norkel 13 215
nout beetle 3 278
nout butterfly 7 464
nout moth 7 464
now 10 573, 12 391
formation of snowflakes 12 391
geographical distribution 12 391
sample measurement 12 391 392
specific gravity 12 391
thermal effects 12 391
now bunting 2 371
now course 12 392
now crystals 10 574
now field 12 391
now gage 12 391 392
now goose 6 257
now line 12 391 392
now pellets 10 574 575
now surveying 12 392 393
nowbird 7 317
nowfall Antarctica 1 441
measurement 10 576
Newfoundland 1 524
nowflake 10 573 574
nowdrift 1 695
nowy egret 6 426
nowy owl 9 460
nowy tree cricket 9 416
nyder, D 10 35
oaking 6 579, 7 346
oap 12 393
emulsifying agent 4 586

Soap—*cont*
sterate 13 89
surface active agent 13 521 522
see also Soap and detergent
Soap and detergent 12 393 394
detergent action 12 394
micelle 8 347
synthetic detergents 12 393 394
Soap base grease 7 605
Soapstone 12 395*, 13 152, 387
Soaring flight 6 213
sailplane 12 5 6
slope soaring 6 213
thermal soaring 6 213
Soboliphyme 4 202
Social animals 12 395 404
agonistic behavior 12 395
allelomimetic behavior 12 395
animal community 1 408 411
birds 12 397-399
breeding grounds relations 12 402 403
cat family 12 402
display behavior 12 398
ecological interactions 4 386
et-epimeletic behavior 12 398
fish 12 395
general classification 12 395
mammals 12 399 404
organization 12 395
seals 12 402
social behavior of primates 12 403
social behavior of rodents 12 403
social behavior of wolves 12 402
social organization, development of 12 403
socialization, process of 12 403
society, mammalian 12 403
territoriality 13 522 523
territory 12 397
Social ants 12 405
Social bee 12 405
Social behavior 2 153 155
American elk 12 400
behavior and heredity 2 153-155
birds 12 397
cat family 12 402
fish 12 395
mammals 12 399
primates 12 403
rodents 12 403
seal 12 402
ungulates 12 401
wolves 12 402
Social hierarchy 12 404 405
dominance hierarchy 12 405
dominance organization 12 404
dominance subordination relationships 12 404
hereditary influences 12 405
range of dominance 12 405
Social insects 1 436 2 128, 12 405 407*
caste determination 12 405
colony foundation 12 406
fecundity 12 406
food 12 407
insect physiology 7 153
nest 12 407
reproduction 12 406
Social life 3 285
Social parasite Hymenoptera 6 573 583
Social wasp 12 405
Society human 4 401-402
Sociocultural regulation 8 607
Sockeye salmon 12 14
Soda 12 409
Soda ash (water softening) 14 402
Soda glass 6 206
Soda lamprophyre 10 86
Soda lime process 12 412
Soda niter 12 407 408
caliche 2 416
niter with 9 102
Soda process cellulose 2 625
wood pulping 14 529 530
Sodalite 12 408* 476
feldspathoid 5 214
Sodar 6 421
Soddy, F 11 50
Soddy's displacement law (radioactivity) 11 273
Soderberg electrode 4 498
aluminum extraction 1 294
Söderman, M 14 590
Sodioacetoacetate reaction 5 87 88
Sodiomalonate ion 5 92
Sodium 12 408 412
analytical methods 12 412
blood chemistry 3 197
chemical properties 12 409
electron configuration 4 504
extraction and refining 11 120, 12 410 411
extractive metallurgy 8 278
ionization potential 4 504
line spectrum 7 521
occurrence 12 409
organometallic compounds 9 402
physical properties 12 409
principal compounds 12 412

Sodium—*cont*
production 4 466
resistivity 11 497
spectrum and term diagram 1 658 660
uses 12 408
Sodium 24 14 8
Sodium arsenite 6 421
Sodium benzoate 1 475
Sodium benzoylacetone 3 19
Sodium bicarbonate 12 412
baking powder 2 72
fire extinguisher 5 279
Sodium chlorate 3 72
herbicide 6 421
soil sterilization 12 465
Sodium chloride 3 72 12 412
crystal structure 3 599 600
ionic crystals 7 247
lattice 7 247
Madelung constant 8 15
optical materials 9 353
rock salt 11 599 560
salt (food) 12 17
Sodium deoxycholate 1 499
Sodium 2 4-dichlorophenoxyethyl sulfate 6 423
Sodium 2 2 dichloropropionate 6 423
Sodium dichromate 3 106
Sodium *p*-dimethylaminoazobenzenesulfonate 7 60
Sodium *p* diphenylaminoazobenzenesulfonphthalein 7 60
Sodium fluoride 1 122, 7 140
Sodium fluoroacetate 11 615
Sodium graphite reactor 11 355
Sodium hydroxide 12 412
Sodium hypochlorite 1 475, 529
hydrazine manufacture 6 530
Sodium iodide 1 482
gamma-ray absorption 6 35
Sodium metaborate 6 421
Sodium *N* methyldithiocarbamate 5 561
Sodium *N*-methyldithiocarbamate dihydrate 6 421
Sodium montmorillonite 3 162
Sodium *N*-1 naphthyl phthalamate 6 422
Sodium nitrate 9 108, 114, 12 407-408*
Sodium *p* nitrobenzeneazosalicylate 7 60
Sodium pentaborate 6 421
Sodium pentachlorophenate 1 495, 6 422
Sodium peroxide 10 28
Sodium potassium alloys 10 530
Sodium potassium tartrate tetrahydrate *see* Rochelle salt
Sodium propionate 5 565

Sodium tetrasulfide, polysulfide resins 10 491
Thiokol rubber 11 611
Sodium trichloroacetate 6 421, 12 465
Sodium 2,4,5 trichlorophenoxyethyl sulfate 6 423
Sodium tungstate 14 140
Sodium vapor lamp 12 412-413
SOFAR 12 413*, 14 429
Soft bodied plant beetle 3 278
Soft chancre 2 352, 12 413*
Soft drinks 5 421
Soft mud forming process (ceramics) 2 648
Soft palate 8 619
Soft pine 10 235
Soft red winter wheat 14 480
Soft shelled clam 3 152
Soft shelled crab 3 530
Soft-shelled turtle 3 22, 14 167
Soft tick 7 298, 13 629
Soft-winged flower beetle 3 277
Soft x-rays (radiography) 11 502
Softening, water 14 408-409
Softrot (wood) 14 528
Softwood (plant anatomy) 14 524
xylem 14 595
Sohngen, N L 8 340
Soil 12 413-433
abiotic environment 5 14
acidity 12 426-427, 429
aeration 12 422
anion exchange 12 426
bulk density 12 420
calcareous soils 12 427
cation exchange 12 424
chemistry of 12 422 427
classification 12 416 418, 433
engineering 12 452
forest soils 5 465
color 12 422
compactibility 12 422
conditioners 12 429
consistency 12 422
control of pH 12 429
control of salinity 12 429
cropping system 12 428
electrochemical property of 13 506
elemental composition 12 422
engineering 4 614, 12 449-458*
erosion *see* Soil erosion
fertility 12 429
fertilizer 5 236 239
formation 12 462 463
great soil groups 12 416, 433 441*
horizons in 12 415
Soil—*cont*
ion exchange 12 424 426
clay minerals 3 166, 14 459
potash 3 166
land capability classes 12 428, 447-449
management 12 427 430
maps of soils 12 417
mechanical properties *see* Soil mechanics
microbial utilization 12 462-463
minerals 12 423 424
moisture equilibrium points 12 421
nutrient supplies 12 430
organic matter and ion exchange 12 425
organic matter and physical properties 12 419
organic matter and tilth 12 428 429
origin 12 413-415
particle density 12 419
physical properties 12 418-422
porosity 12 420
regolith 11 424 425
residual soils 4 614
salted soils 12 427
stabilizers 12 429
structure 12 419
surveys 12 417
temperature 12 422
testing 12 429
texture 12 418 419
water movement 12 421 422
water retention 12 421
see also Agricultural soil and crop practices For est soil Soil conservation, Soil erosion
Soil (great soil groups) 12 416 433-441*
Alluvial soils 12 434
Ando soils 12 434
azonal soils 12 433, 441
Bog soils 12 434
Brown soils 12 434
Brunizems 12 434
Calcisols 12 435
Chernozems 12 435
classification 12 433
Desert soils 12 435
Gray Brown Podzolic soils 12 436
Ground Water Laterite soils 12 438
Ground Water Podzols 12 439
Grumusols 12 437
intrazonal soils 12 433, 441
Latosols 12 438
Soil (great soil groups)—*cont*
Lithosols 12 438
Noncalcic Brown soils 12 438
Planasols 12 439
Podzols 12 439
Red Yellow Podzolic soils 12 439
Reddish Brown Lateritic soils 12 440
Regosols 12 440
Solonchak 12 440
Solonetz soils 12 441
Soloth soils 12 441
Subarctic Brown Forest soils 12 441
Tundra soils 12 441
world wide distribution 12 441-443
Yellowish Brown Lateritic soils 12 440
zonal soils 12 433, 441
Soil, zonal distribution 12 441-443
Asia 1 583 584
Chernozemic soils 12 442
Desertic soils 12 442
Latosolic soils 12 442
Podzolic soils 12 442
Tundra soils 12 442
Soil balance, microbial 12 443
antagonisms between soil microbes 12 443
associative action 12 443
Soil conservation 1 116, 3 411, 12 443-449*
causes of soil mismanagement 12 445
conservation agencies and programs 12 449
conservation measures and technology 12 447
economic and social consequences 12 446
effects on other resources 12 446
farm range and forest 12 447
geographic extent and intensity 12 443
land capability classes 12 428, 447 449*
terracing (agricultural) 13 499
types of soil deterioration 12 444
Soil erosion 5 65 66, 12 430-435*, 443 446
control 12 432 433
dust storm 4 296
factors affecting 12 431 432
types 12 430 431 444 445
wind erosion 12 136, 432*, 445 446
see also Runoff
Soil mechanics 4 614, 12 449 458*
bearing power 12 458
capillary water 12 452
conduits 12 458
consistence limits 12 453
consolidation theory 12 457
depositional types 4 614, 12 450 451
electrochemical properties 13 506
electroosmotic dewatering 4 526
engineering classification 12 452
field tests 12 456
flow nets 12 451
foundation stability 5 480-483*; 12 458
frost action 5 540 541*, 12 455
gravitational water 12 452
hygroscopic water 12 452
landslides 7 397 398*, 12 458
loading tests 12 456 457
mechanical analysis 12 451
mineral composition 12 450
particle size 12 451
permeability, measurement of 12 454
pile foundation 10 227
plasticity 12 453
pressure bulb 12 456
retaining walls 11 534-535*, 12 458
sampling 12 455
sedimentation analysis 12 451
seepage 12 453-455
settlement analysis 12 457
shear 12 452-453
site investigations 12 455
soil water relationships 12 452
stability analysis 12 458
stress distribution 12 456 457
structure 12 451
voids ratio 12 452
weight 12 451
Soil microbiology 12 458 460
bacteria 2 5
humus 6 516
manure 8 94
microbiological soil analysis 12 459
nitrogen cycle 9 110
pathogen (soil) 9 503 504
rhizosphere *11 548*
soil balance, microbial 12 443
soil microorganisms 12 460
soil mineral (microbial utilization) 12 462

Soil microbiology—cont
soil phosphorus (microbial cycle) 12 464
soil sulfur (microbial cycle) 12 465
Soil microorganisms 12 460 462
actinomycetes 12 461
algae 12 462
autotrophic 12 460
bacteria 12 460
fungi 12 461
heterotrophic 12 460
myxomycetes 12 462
phages 12 462
protozoa 12 462
viruses 12 462
yeasts 12 462
Soil mineral (microbial utilization) 12 462 464
soil formation 12 462
utilization of minerals in formed soils 12 463
Soil phosphorus (microbial cycle) 12 464
Soil physics (defined) 12 418
Soil profile 12 414
Soil science *see* Pedology
Soil sterilization 12 464 465
fumigant 5 561
inorganic compounds 12 464 465
organic compounds 12 465
Soil sulfur (microbial cycle) 12 465
Soja vitrea 1 12 535
Sol isoelectric point 7 275
Solanaceae 2 100
Solanine 10 440
Solanum 5 39 7 437
Solanum alkaloid 6 224
Solanum demissum 10 518
Solanum dulcamara 10 440
Solanum melongena 4 416
Solanum nigrum 10 351, 440
Solanum tuberosum 10 518, 522 14 283
Solar activity 13 273 287
Solar battery 12 465 466
organic 4 453
solar energy 12 468
space vehicle 1 605
see also Photovoltaic cell
Solar constant 12 466*, 13 256
heat balance 8 565
heat radiation 6 270
insolation 7 144
Solar cooking 12 470
Solar corona *see* Corona, solar
Solar daily geomagnetic variation 6 143
Solar day 4 18
Solar distillation saline water 12 12
Solar eclipse *see* Eclipse, astronomical
Solar energy 12 466 468
biological utilization 12 467 468
conversion to electricity 12 465 466
insolation 7 144
photosynthesis 10 186
solar constant 12 466
utilization as heat 12 468
Solar engine 12 468-470
heat exchanger drive 12 469
ion propulsion 7 243
photon reaction 12 470
photovoltaic cell 12 469
radiation pressure 12 470
turboelectric drive 12 469
Solar furnace 12 470
Solar heating 12 468 470 471*
Solar instruments 12 581; 13 287-290*
Solar magnetograph *see* Magnetograph, solar
Solar parallax *see* Parallax (astronomy)
Solar physics 1 619 13 266-290*
Solar pigmentation 2 200
Solar probe 12 546
Solar prominences 13 274-284
Solar radiation 12 471; 13 266 267*
climatology 3 172 174
greenhouse effect 6 269
heat balance 6 565
insolation 7 144
in polar regions 10 441
radar noise 11 209
solar constant 12 466
in space 12 538
see also Solar energy
Solar spectrograph 13 289 290
Solar spectrum 7 521 13 267 290*
see also Sun
Solar stills 3 182
Solar system 12 471
angular momentum 3 508
chemical composition 5 507
dynamical stability 2 582 583
orbital motion 9 371 372
origin 3 507 509
Solar telescope 13 286 289
Solar terrestrial effects 13 285 287
Solar terrestrial relationships astrophysics 1 619
Solar tide 13 633
Solar time 13 642
Solar tower telescope 13 288
Solar wind cosmic rays 3 502
Solasteridae 12 619
Solberg, H 14 447
Solder glass 6 208
Soldering 12 471-472*, 14 466
application 12 472
Soldering—cont
flux 12 472
induction heating 7 73
lead alloys 7 427
tin alloys 13 649
see also Brazing
Soldier beetle 3 277
Soldier fly 4 212 8 680
Sole 5 416
flounder 5 315
Solemyidae 11 45
Solenhofen limestone 1 510, 7 327*
brittle-to-ductile transition in 11 598
Solenichthyes *see* Gasterosteiformes
Solenobia 10 488
Solenodontidae 7 143
Solenogastres *see* Aplacophora
Solenoglyphodont fang 13 27
Solenoid (electrical) 12 472 473
electromagnet 4 480
magnetic field 8 51 52
permeability magnetic 10 22
refrigerated 3 372
as servomotor 12 204
Solenoid (meteorology) 12 473
baroclinic field 2 102
Solenopora 9 504 12 473*
Solenoporaceae 1 237
Solenopsis saevissima var richteri 1 437, 6 581
Solenostele 13 105 116
Solid (geometric) 12 473
see also Polyhedron
Solid (physical) 5 500 501
absorption 1 14
anelasticity 1 400-401
band structure 12 480
band theory 2 91 93
Brillouin zone theory 2 338 339
classification 12 480
cohesion 3 268 269
creep 3 540 541
crystalline 3 580
defects 3 581 585
diffusion 4 146 148
elasticity 4 419 422
electron diffraction 4 506 507
electron emission 4 509 510
ferroelectrics 5 224 229
heat capacity 6 364
infrared radiation 7 105
insulators 7 163
melting point 8 215
noncrystalline (amorphous) 1 331
radiation damage 11 224-225
rigid body 11 570
specific heat 12 574-577
Solid (physical)—cont
thermal conductivity 5 384 391
thermal expansion 13 549 550
velocity of sound (*table*) 12 516
see also Solid state chemistry Solid state physics
Solid borne sound in buildings 9 129 130
Solid casting ceramic 2 649
Solid dielectric capacitor 2 446
Solid electrolyte primary battery 10 588
Solid helium 6 392
Solid liquid filters 5 271 272
Solid liquid phase equilibria 5 57 58
Solid lubricants 7 604 605
Solid mixing 8 524
Solid of revolution 13 510 511
cylinder 3 646
sphere 12 607
Solid organic scintillator *see* Scintillation counter
Solid propellant 11 8-10
burning rate 11 8 9
catalysts 11 8
cellulose 11 8
composite 11 8
composition 11 8
double base 11 8
end burning grain 11 8
hydrocarbons 11 8
metal base fuel 8 291
oxidizer 11 8
radial burning charges 11 8
rocket engine 11 602, 608
specific impulse 11 9
suppressors 11 8
synthetic resins 11 8
synthetic rubber 11 8
Solid propellant rocket engine 11 606
engine components 11 606
grain shape and burning 11 607
jet propulsion 7 309
operation 11 608
propellants 11 602, 608
Solid solid phase equilibria 5 58-59
Solid solution 12 473 474
alloy structures 1 260 261
series in magma 8 16 17
solid-state chemistry 12 477
Solid spherical harmonic 12 609
Solid state chemistry 12 474 479
alloy 12 477 478
chemical structures 3 35

Sodium tetrasulfide polysulfide resins 10 491
Thiokol rubber 11 641
Sodium trichloroacetate 6 421, 12 465
Sodium 2,4,5 trichlorophenoxyethyl sulfate 6 423
Sodium tungstate 14 140
Sodium-vapor lamp 12 412-413
SOFAR 12 413*, 14 429
Soft bodied plant beetle 3 278
Soft chancre 2 352, 12 413*
Soft drinks 5 421
Soft mud forming process (ceramics) 2 648
Soft palate 8 619
Soft pine 10 235
Soft red winter wheat 14 480
Soft shelled clam 3 152
Soft shelled crab 3 530
Soft-shelled turtle 3 22, 14 167
Soft tick 7 298, 13 629
Soft-winged flower beetle 3 277
Soft x-rays (radiography) 11 302
Softening, water 14 408-409
Softrot (wood) 14 528
Softwood (plant anatomy) 14 524
xylem 14 595
Sohngen, N. L. 8 340
Soil 12 413-433
abiotic environment 5 14
acidity 12 426 427, 429
aeration 12 422
anion exchange 12 426
bulk density 12 420
calcareous soils 12 427
cation exchange 12 424
chemistry of 12 422 427
classification 12 416 418, 433
engineering 12 452
forest soils 5 465
color 12 422
compactibility 12 422
conditioners 12 429
consistency 12 422
control of *pH* 12 429
control of salinity 12 429
cropping system 12 428
electrochemical property of 13 506
elemental composition 12 422
engineering 4 614, 12 449-458*
erosion *see* Soil erosion
fertility 12 429
fertilizer 5 236 239
formation 12 462-463
great soil groups 12 416, 433 441*
horizons in 12 415
Soil—*cont*
ion exchange 12 424-426
clay minerals 3 166, *14 459*
potash 3 166
land capability classes 12 428, 447-449
management 12 427-430
maps of soils 12 417
mechanical properties *see* Soil mechanics
microbial utilization 12 462 463
minerals 12 423 424
moisture equilibrium points 12 421
nutrient supplies 12 430
organic matter and ion exchange *12* 425
organic matter and physical properties 12 419
organic matter and tilth 12 428-429
origin 12 415 415
particle density 12 419
physical properties 12 418-422
porosity 12 420
regolith 11 424 425
residual soils 4 614
salted soils 12 427
stabilizers 12 429
structure 12 419
surveys 12 417
temperature 12 422
testing 12 429
texture 12 418 419
water movement 12 421 422
water retention 12 421
see also Agricultural soil and crop practices. Forest soil. Soil conservation, Soil erosion
Soil (great soil groups) 12 416 433 441*
Alluvial soils 12 434
Ando soils 12 434
azonal soils 12 433, 441
Bog soils 12 434
Brown soils 12 434
Brunizems 12 434
Calcisols 12 435
Chernozems 12 435
classification 12 433
Desert soils 12 435
Gray Brown Podzolic soils 12 436
Ground Water Laterite soils 12 438
Ground Water Podzols 12 439
Grumusols 12 437
intrazonal soils 12 433, 441
Latosols 12 438
Soil (great soil groups)—*cont*
Lithosols 12 438
Noncalcic Brown soils *12 438*
Planasols 12 439
Podzols 12 439
Red-Yellow Podzolic soils 12 439
Reddish Brown Lateritic soils 12 440
Regosols 12 440
Solonchak 12 440
Solonetz soils 12 441
Soloth soils 12 441
Subarctic Brown Forest soils 12 441
Tundra soils 12 441
world wide distribution 12 441-445
Yellowish Brown Lateritic soils 12 440
zonal soils 12 433, 441
Soil, zonal distribution 12 441-445
Asia 1 583 584
Chernozemic soils 12 442
Desertic soils 12 442
Latosolic soils 12 442
Podzolic soils 12 442
Tundra soils 12 442
Soil balance microbial 12 445
antagonisms between soil microbes 12 445
associative action 12 445
Soil conservation 1 116, 5 411, 12 445 449*
causes of soil mismanagement 12 445
conservation agencies and programs 12 449
conservation measures and technology 12 447
economic and social consequences 12 446
effects on other resources 12 446
farm, range and forest 12 447
geographic extent and intensity 12 445
land capability classes 12 428, 447 449*
terracing (agricultural) 13 499
types of soil deterioration 12 444
Soil erosion 5 65 66 12 430-435*, 445 446
control 12 432 433
dust storm 4 296
factors affecting 12 431 432
types 12 430 431, 444 445
wind erosion 12 136 432*, 445 446
see also Runoff
Soil mechanics 4 614; 12 449 458*
bearing power 12 458
capillary water 12 452
conduits 12 458
consistency limits 12 453
consolidation theory 12 457
depositional types 4 614
12 450-451
electrochemical properties 13 506
electroosmotic dewatering 4 626
engineering classification 12 452
field tests 12 456
flow nets 12 451
foundation stability 5 480-485*, 12 458
frost action 5 540 541*, 12 455
gravitational water 12 452
hygroscopic water 12 452
landslides 7 397 398*, 12 458
loading tests 12 456 457
mechanical analysis 12 451
mineral composition 12 450
particle size 12 451
permeability, measurement of 12 454
pile foundation 10 227
plasticity 12 453
pressure bulb 12 456
retaining walls 11 534 535*, 12 458
sampling 12 455
sedimentation analysis *12 451*
seepage 12 453-455
settlement analysis 12 457
shear 12 452 455
site investigations 12 455
soil-water relationships 12 452
stability analysis 12 458
stress distribution 12 456 457
structure 12 451
voids ratio 12 452
weight 12 451
Soil microbiology 12 458 460
bacteria 2 5
humus 6 516
manure 8 94
microbiological soil analysis *12 459*
nitrogen cycle 9 110
pathogen (soil) 9 595 596
rhizosphere 11 548
soil balance, microbial *12 445*
soil microorganisms 12 460
soil mineral (microbial utilization) 12 462

Soil microbiology—*cont*
soil phosphorus (microbial cycle) 12 464
soil sulfur (microbial cycle) 12 465
soil microorganisms 12 460 462
actinomycetes 12 461
algae 12 462
autotrophic 12 460
bacteria 12 460
fungi 12 461
heterotrophic 12 460
myxomycetes 12 462
phages 12 462
protozoa 12 462
viruses 12 462
yeasts 12 462
soil mineral (*microbial utilization*) 12 462 464
soil formation 12 462
utilization of minerals in formed soils 12 463
soil phosphorus (microbial cycle) 12 464
soil physics (*defined*) *12 418*
soil profile 12 414
soil science *see* Pedology
soil sterilization 12 464 *465*
fumigant 5 561
inorganic compounds 12 464-465
organic compounds 12 465
soil sulfur (microbial cycle) 12 465
soja virus 1 12 355
sol, isoelectric point 7 2*5
solanaceae 2 160
solanine 10 440
solanum 3 39* 7 437
solanum alkaloid 6 224
solanum demissum 10 318
solanum dulcamara 10 440
solanum melongena 4 416
solanum nigrum 10 331, 440
solanum tuberosum 10 318 332, 14 255
solar activity 13 273 287
solar battery 12 465 466
organic 8 465
solar energy 12 468
space vehicle 1 605
see also Photovoltaic cell
solar constant 12 466*, 13 286
heat balance 6 363
heat radiation 6 370
insolation 7 144
solar cooking 12 470
solar corona *see* Corona, solar
solar daily geomagnetic variation 6 145
solar day 9 18
solar distillation, saline water 12 12
solar eclipse *see* Eclipse astronomical
solar energy 12 466 468
biological utilization 12 467-468
conversion to electricity 12 465 466
insolation 7 144
photosynthesis 10 186
solar constant 12 466
utilization as heat 12 468
solar engine 12 468 470
heat exchanger drive 12 469
ion propulsion 7 243
photon reaction 12 470
photovoltaic cell 12 469
radiation pressure 12 470
turboelectric drive 12 469
solar furnace 12 470
solar heating 12 468 470-471*
*solar instruments 12 581, 13 287 290**
solar magnetograph see Magnetograph, solar
solar parallax *see* Parallax (astronomy)
solar physics 1 619, 13 266 290*
solar pigmentation 2 200
solar probe 12 546
solar prominences 13 274 284
solar radiation 12 471, 13 266 267*
climatology 3 172 174
greenhouse effect 6 269
heat balance 6 363
insolation 7 144
in polar regions 10 441
radar noise 11 209
solar constant 12 466
in space 12 538
see also Solar energy
solar spectrograph 13 289-290
solar spectrum 7 521, 13 267 290*
see also Sun
solar stills 3 *182*
solar system 12 471
angular momentum 3 509
chemical composition 3 509
dynamical stability 2 582 583
orbital motion 9 371-372
origin 3 507 509
solar telescope 13 286 289
solar terrestrial effects 13 285 287
solar terrestrial relationships astrophysics 1 619
solar tide 13 633
solar time 13 642
solar tower telescope 13 288
solar wind cosmic rays 3 502
Solasteridae 12 619
Solberg H 14 447
Solder glass 6 208
Soldering 12 471 472* 14 466
application 12 472
Soldering—*cont*
flux 12 472
induction heating 7 75
lead alloys 7 427
tin alloys 13 649
see also Brazing
Soldier beetle 3 277
Soldier fly 4 212, 8 680
Sole 5 416
flounder 5 315
Solemyidae 11 45
Solenhofen limestone 1 510, 7 327*
brittle-to-ductile transition in 11 598
Solenichthyes *see* Gasterosteiformes
Solenobia 10 498
Solenodontidae 7 143
Solenogastres *see* Aplacophora
Solenoglyphodont fang 13 27
Solenoid (electrical) 12 472 473
electromagnet 4 489
magnetic field 8 31 32
permeability, magnetic 10 22
refrigerated 3 572
as servomotor 12 204
Solenoid (*meteorology*) *12 475*
baroclinic field 2 102
Solenopora 9 504, 12 475*
Solenoporaceae 1 237
Solenopsis saevissima var richteri 1 437, 6 581
Solenostele 13 105 116
Solid (geometric) 12 473
see also Polyhedron
Solid (*physical*) *5 500 501*
absorption 1 14
anelasticity 1 400-401
band structure 12 480
band theory 2 91 93
Brillouin zone theory 2 338 339
classification 12 480
cohesion 5 268 269
creep 5 540-541
crystalline 3 580
defects 3 581 585
diffusion 4 146 148
elasticity 4 419 422
electron diffraction 4 506 507
electron emission 4 509 510
ferroelectrics 5 224 229
heat capacity 6 364
infrared radiation 7 105
insulators 7 165
melting point 8 215
noncrystalline (amorphous) 1 331
radiation damage 11 224 225
rigid body 11 570
specific heat 12 574 577
Solid (physical)—*cont*
thermal conductivity 5 384 391
thermal expansion 13 549 550
velocity of sound (table) 12 516
see also Solid-state chemistry, Solid state physics
Solid borne sound in buildings 9 129 130
Solid casting ceramic 2 649
Solid dielectric capacitor 2 446
Solid electrolyte primary battery 10 598
Solid helium 6 392
Solid liquid filters 5 271 272
Solid liquid phase equilibria 5 57-58
Solid lubricants 7 604 605
Solid mixing 8 524
Solid of revolution 13 310-311
cylinder 5 646
sphere 12 607
Solid organic scintillator see Scintillation counter
Solid propellant 11 8-10
burning rate 11 8 9
catalysis 11 8
cellulose 11 8
composite 11 8
composition 11 8
double base 11 8
end burning grain 11 8
hydrocarbons 11 8
metal base fuel 8 291
oxidizer 11 8
radial burning charges 11 8
rocket engine 11 602, 608
specific impulse 11 9
suppressors 11 8
synthetic resins 11 8
synthetic rubber 11 8
Solid propellant rocket engine 11 606
engine components 11 606
grain shape and burning 11 607
jet propulsion 7 309
operation 11 608
propellants 11 602, 608
Solid solid phase equilibria 5 58 59
Solid solution 12 473 474
alloy structures 1 260-261
series in magma 8 16-17
solid-state chemistry 12 477
Solid spherical harmonic 12 609
Solid state chemistry 12 474 479
alloy 12 477 478

Solid state chemistry—*cont.*
coordination chemistry
3 457-461
covalently bonded
structures 12 475
crystal structure 3 592 600
defect solid state 12 479
electron compounds 12 478
Hume-Rothery
compounds 12 478
infinitely extended
complex ions 12 476
inorganic chemistry 7 119
intermetallic compounds
7 194-195, 12 477-478
interstitial compounds
12 478-479
metallic state 12 476-477
nonstoichiometric
compounds 9 138
simple ionic solids 12 474
Van der Waals structures
12 474-475
Solid-state microcircuits
8 349, 470
Solid state physics 12 479-481
alloy structures 1 260-265
band structure 12 480
band theory of solids
2 91 93
classification of solids
12 480
cohesion 3 268 269
color centers 5 294-297
creep of materials
3 540-541
crystal defects 3 581-585
crystal growth 3 585-587
crystal optics 3 587 592
crystal structure 3 592-600
crystallography 3 601 608
diffusion in solids
4 146-148
elasticity 4 415-422
electroluminescence
4 482-483
electron diffraction
4 506-507
electron emission
4 509 510
electron paramagnetic
resonance spectroscopy
4 515
excitons 5 136-137
ferroelectrics 5 224-229
historical development
12 479 480
holes in solids 6 463 464
imperfections in crystals
3 581 585 12 480-481
insulators 7 163
ionic crystals 7 247-251
lattice vibrations
7 412 415
luminescence 7 610 617
magnetism 8 69-72
metal 8 266-267
Solid state physics—*cont.*
molecular electronics
8 545-546
neutron diffraction
9 88 91
photoconductivity
11 140-142
piezoelectricity 11 217-223
pyroelectricity 11 116 117
resistivity 11 496-497
semiconductors 12 165-172
single crystals 12 341
specific heat of solids
12 574 577
superconductivity
13 295-301
thermal conductivity of
solids 3 589-591
thermoelectricity
13 577 585
use of infrared
spectroscopy 7 110
Solidago 3 190
Solidification point: fat and
oil 5 188
Solids level measurement
7 493-494
beam scale 7 495
capacitance 7 493
continuous detectors 7 495
diaphragm operated 7 494
fixed-point detectors 7 494
gamma ray detector 7 495
grid element 7 493
movable-probe 7 494
pendant-cone 7 494
rotating paddlewheel
7 494
Solids pump 12 481 482
Solidus curve 1 261
Solifluction 12 482
permafrost 10 22
Solifugae *see* Solpugida
Solion 12 482 483
Solitary bee 2 127
Solitary waves liquids 14 454
Sollner, K. 9 440
Solo man 5 478, 12 458*
Solonchak soils 12 440
Solonetz soils 12 441
Soloth soils 12 441
Solpugida 1 496, 558, 12 485*
Solstice 6 125 12 483-484*
Antarctic Circle 1 457
Arctic Circle 1 525
Solubility 10 572, 12 492
Solubility parameter solution
12 489
Solubility product constant
10 572 12 484*
Solubilized flavanthrone 4 305
Solubilized vat yellow 1 4 305
Solubilizing of samples
12 484 485
dissolution of metals and
alloys 12 485
fusion 12 485
Solubilizing of samples—*cont*
gravimetric analysis 6 262
solvents 12 484
Solution 12 485-494
absorption 1 12-13
azeotropic mixtures 1 702,
12 492
boiling point 2 276
concentration scales 3 361
dipole interaction 12 486
distillation 4 247
of electrolytes 12 494
electron donor-acceptor
interaction 12 486
ideal 12 487
intermolecular forces
12 485-487
ion-dipole interaction
12 487
ion-ion interaction
12 486-487
ionic equilibrium 5 52 54
liquid-liquid miscibility
12 490
London forces 12 485-486
molecular weight
measurements
12 487-488
nonideal 12 488
osmosis 9 441
osmotic pressure 12 488
partition of a solute 12 491
regular 12 488-490
salting out effect 12 19
saturation 12 38
scattering by 12 52
solubility of a crystalline
solid 12 487
solubility of gases 12 492
solvation 12 494
supersaturated 13 305 306
thermochemistry 13 561
vapor pressures of binary
solutions 12 491
in water 12 493, 14 588
Solution channel (under-
ground water) 13 18
Solution chromatography 5 93
Solution gas drive recovery
10 78
Solution-made topography
7 333
Solution subsidence 7 333
Solvation 6 524, 12 494*
Solvay process 12 412
calcium chloride 2 399
carbonate 2 467
Solvent 12 494 497
acid and base 1 42
chromatography 3 95
ester 5 75
ether 5 85
extraction 5 156 158
in industry 12 495-497
liquid ammonia 1 325 326
naphtha 9 2
paint 9 493
Solvent—*cont*
petroleum products 10 72
printing ink vehicles
7 113
in scientific research
12 497
thinner 13 603
Solvent cleaning of metals
4 532
Solvent dewaxing 4 91
petroleum processing 10 71
petroleum wax 14 445
Solvent dyes 4 308
Solvent extraction 12 497-500
applications 12 497 498
equipment 12 498 500
food 5 388
hydrometallurgy
6 559-560
nuclear fuels 9 188 190
petroleum processing 10 71
plutonium *10 423 424*
salting-out effect 12 19
separation (chemical and
physical) 12 186
see also Extraction
Solvent thinned paints 9 493
Solvent treatment (petroleum
products) 10 71
Solvolysis hydrolysis 6 557
steric effect (chemical
reaction) 13 129
Somali Current 9 247
Soman 3 45, 9 405
Somasteroidea 4 360, 372,
12 500*
Asterozoa 12 500
Somastotonia 10 54
Somateria mollissima 1 456
Somatic muscle *see* Skeletal
muscle
Somatization 12 500 501
Somatotropin *see* Growth
hormone
Somatotyping 1 460 461, 462
Somesthesis 12 501 502
cutaneous sensation 5 632
kinesthetic sensation 7 549
pain, cutaneous 9 489
pain, deep 9 491
pharynx disorders 10 100
sensory learning *12 192*
touch 13 690
Somite *see* Metamerism
Sommelet process thiophene
aldehydes 13 606
Sommerfeld, A. 1 654, 4 139,
5 499
Sommerfeld gamma 12 577
Sommerfeld integral Fermi-
Dirac statistics 5 216
Sommerfeld proposal 8 25
Somnifacient 6 595
Somogyi Shaffer-Hartmann
method 2 453
Sonar 12 502 504
active 12 502 504

Sonar—*cont*
dipping 1 486-487
display systems 12 503 504
Doppler effect 12 504
echo sounder 4 378 379
naval meteorology 9 8
navigation uses 9 13 16
passive 12 502 504
self noise 12 504
sound pulsing 12 503
towed 12 503
underwater sound 14 199
use 7 587 10 120, 12 504 505*
ng sparrow 12 562
nic barrier 12 505
nic boom 12 505 506
nic drilling methods 2 298
nic pump 9 293, 296
nic velocity flow meter 5 319
nic well logging 14 472
onics 2 207 12 506*
onnar lens 7 451
onne see Consol
onnet bacillus 12 254
onneratia 8 91
onobuoy 1 495 12 506*
onora Desert 9 360
onopassus *sechellensis* 1 435
ophonic 6 505
orangiaceae 8 687
orbarium 1 235
orbaldehyde 1 29
orbent chromatography 5 95-96
dehumidifier 4 44
orbic acid 5 426
orbitol 1 33
industrial production of Ascorbic acid 1 375
polyhydroxy alcohol 10 473
sugar alcohol 8 582
D Sorbitol *see* Sorbitol
Sorbose see L Sorbose
L Sorbose 1 33 375
Acetobacter suboxydans fermentation 1 33
production 1 33
Sorediom 1 495
Sorel, E. 4 231
Sorell, Lake 1 672
Sorensen, S. P. L. 1 40, 6 551
Soret, J. L. 4 143, 6 465
Sorghum 10 374, 12 506 509*, 13 50
diseases 12 508
grain 12 506
sweet 12 508
syrup 12 508
Sorghum vulgare 12 506
Sorghum vulgare var sudanense 8 261
Sorocidae 7 142 143
Sorites dominicensis 5 452
Sorocarpi 1 49
Sorosilicates 12 311
Sorption 1 79
particle size measurement 12 349
in sea water 12 108
Sorptography *see* Chromatography
Sorrel tree 12 524
Sorting operation 5 155
Sorus 5 263
Souma 14 124
Sound 12 509 518
abiotic environment 5 15
absorption 1 17-19
architectural acoustics 1 517-520
atmospheric acoustics 1 631-632; 12 515 517*
attenuation by mufflers 8 623-624
binaural 2 191
biological effects of 2 207
definitions and formulas 12 510 511
detection 12 509 510
diffusion 1 518
filtering of 5 265-266
harmonics 6 339
minimum detectable 14 431
molecular weight determination of velocity 8 558
noise 9 116 117
pressure 12 518
propagation in atmosphere 12 515 517
propagation in gases 12 513 514
propagation in liquids 12 514 515
propagation in solids 12 515, 575 577
radiation 12 511 513
reflection of 11 395 396
refraction 11 408
reverberation 11 537 539
shadows 12 258
sonics 12 506
spectrum 12 509
speed (velocity) of 12 513 516
stereophonic 13 127 128
threshold of feeling 14 431
thunder 13 616
ultrasonics 14 186
underwater see Underwater sound
underwater transducers 14 18
velocity 12 513-516
velocity in atmosphere 2 80 81
velocity in biological *tissues 2 209*
velocity in solids 12 577
wave motion in fluids 14 431
Sound—*cont*
see also Sound Wave
Sound (embayment) 9 150
bar-built estuary 3 82
Sound-amplification systems 1 520
see also Sound reproduction systems, electrical
Sound analyzer 9 132 133
Sound and vibration analyzer 6 540
Sound barrier *see* Sonic barrier
Sound discrimination 6 550
Sound energy 12 518
in the sea 12 105
Sound field in enclosures 1 517 518
free field 5 496
SOund Fixing And Ranging *see* SOFAR
Sound head, optical *see* Optical sound head
Sound insulation *see* Insulation, sound
Sound intensity 12 511, 518*
bel 2 159
decibel 4 35
music 12 518 519
speech 12 518 519
Sound level 9 131
Sound level meter 9 131-132
Sound power *see* Acoustic power
Sound pressure 12 518
acoustic impedance 7 35 36
effective (rms) 12 510, 518
instantaneous 12 510 518
microbar 8 347
peak 12 518
static 12 510
Sound pressure level 12 518
noise control 9 121
Sound producing organisms in the sea 12 107, 14 199
Sound pulsing (sonar) 12 503
Sound recording 12 518
disk 4 236 244
magnetic 8 36 41
optical 9 353-358
wire 14 518
Sound reproduction 4 236 244
Sound reproduction systems, electrical 12 518 522
binaural 2 191, 12 521
component matching 12 519
crossover network 3 555
disk recording 4 236 244
distortion 12 519
equalization 5 45 12 520
high fidelity 6 441 12 520
input sources 12 519
intermodulation 12 519
loudness equalization 12 520
loudspeaker 7 587-593
Sound reproduction systems, *electrical—cont*
loudspeaker placement 7 592 593
low level equalization 12 520
magnetic recording 8 36 41
microphones 8 557-564
nonlinearity 12 519
optical recording 9 353 358
power 12 521
preamplifier 10 565
presence 12 520
public address systems 11 88 90
resonances 12 519
stereophonic 4 243 244, 12 521, 13 127 128
tone compensating circuits 12 520
transients 12 519
two channel system 12 521
wire recording 14 518
Sound-scattering organisms 12 60 61*, 14 198-199
Sound track 3 124-129, 9 353 358*, 12 522
Sound wave 12 509 518
in atmosphere 12 515 517
detection of nuclear explosions 9 183 184
Doppler effect 4 264
earthquake induced 12 152
echo 4 377-378
group velocity 6 285
intensity 12 518
interference 7 185
loudness 7 586
reflection of 11 395 396
in sea water 12 107
see also Sound
Sounding balloons 2 84
Sounding board 8 665*, 667
Soundings (meteorological) rockets 8 321 322
upper air instruments 8 318-320*, 14 452
Soundings (oceanographic) *13 216*
echo sounder 4 378-379 13 216
positioning 13 216
slope corrections 13 216
velocity corrections 12 107, 13 216
Soundproofing 12 522
Soup manufacturing 5 414
Sour gas 9 5
Sour gum 14 144
Source flow 12 522 523
Rankine body 12 523
three dimensional source 12 522
two dimensional flow 12 522

Solid state chemistry—*cont*
coordination chemistry 5 457-461
covalently bonded structures 12 475
crystal structure 3 592 600
defect solid state 12 479
electron compounds 12 478
Hume-Rothery compounds 12 478
infinitely extended complex ions 12 476
inorganic chemistry 7 119
intermetallic compounds 7 194-195, 12 477-478
interstitial compounds 12 478 479
metallic state 12 476-477
nonstoichiometric compounds 9 138
simple ionic solids 12 474
Van der Waals structures 12 474 475
Solid-state microcircuits 8 349, 470
Solid state physics 12 479-481
alloy structures 1 260-265
band structure 12 480
band theory of solids 2 91-93
classification of solids 12 480
cohesion 3 268-269
color centers 3 294 297
creep of materials 3 540 541
crystal defects 3 581-585
crystal growth 3 585-587
crystal optics 3 587 592
crystal structure 3 592 600
crystallography 3 601-608
diffusion in solids 4 146-148
elasticity 4 415 422
electroluminescence 4 482-483
electron diffraction 4 506-507
electron emission 4 509 510
electron paramagnetic resonance spectroscopy 4 515
excitons 5 136-137
ferroelectrics 5 224-229
historical development 12 479 480
holes in solids 6 463-464
imperfections in crystals 3 581 585, 12 480-481
insulators 7 163
ionic crystals 7 247-251
lattice vibrations 7 412-415
luminescence 7 610 617
magnetism 8 69-72
metal 8 266-267
Solid-state physics—*cont.*
molecular electronics 8 545-546
neutron diffraction 9 88-91
photoconductivity 11 140-142
piezoelectricity 11 217 223
pyroelectricity 11 116-117
resistivity 11 496-497
semiconductors 12 165 172
single crystals 12 341
specific heat of solids 12 574-577
superconductivity 13 295 301
thermal conductivity of solids 3 589-591
thermoelectricity 13 577 585
use of infrared spectroscopy 7 110
Solidago 3 190
Solidification point fat and oil 5 188
Solids level measurement 7 493 494
beam scale 7 493
capacitance 7 493
continuous detectors 7 493
diaphragm-operated 7 494
fixed-point detectors 7 494
gamma-ray detector 7 493
grid element 7 493
movable-probe 7 494
pendant-cone 7 494
rotating paddlewheel 7 494
Solids pump 12 481 482
Solidus curve 1 261
Solifluction 12 482
permafrost 10 22
Solifugae *see* Solpugida
Solion 12 482-483
Solitary bee 2 127
Solitary waves liquids 14 434
Sollner, K 9 440
Solo man 5 478, 12 438*
Solonchak soils 12 440
Solonetz soils 12 441
Soloth soils 12 441
Solpugida 1 496, 558, 12 483*
Solstice 6 125, 12 483 484*
Antarctic Circle 1 437
Arctic Circle 1 525
Solubility 10 572, 12 492
Solubility parameter solution 12 489
Solubility product constant 10 572, 12 484*
Solubilized flavanthrone 4 505
Solubilized vat yellow 1 4 505
Solubilizing of samples 12 484-485
dissolution of metals and alloys 12 485
fusion 12 485
Solubilizing of samples—*cont*
gravimetric analysis 6 262
solvents 12 484
Solution 12 485 494
absorption 1 12 13
azeotropic mixtures 1 702, 12 492
boiling point 2 276
concentration scales 3 361
dipole interaction 12 486
distillation 4 247
of electrolytes 12 494
electron donor-acceptor interaction 12 486
ideal 12 487
intermolecular forces 12 485-487
ion dipole interaction 12 487
ion-ion interaction 12 486-487
ionic equilibrium 5 55 54
liquid-liquid miscibility 12 490
London forces 12 485-486
molecular weight measurements 12 487-488
nonideal 12 488
osmosis 9 441
osmotic pressure 12 488
partition of a solute 12 491
regular 12 488 490
salting-out effect 12 19
saturation 12 38
scattering by 12 52
solubility of a crystalline solid 12 487
solubility of gases 12 492
solvation 12 494
supersaturated 13 305 306
thermochemistry 13 561
vapor pressures of binary solutions 12 491
in water 12 493, 14 388
Solution channel (underground water) 15 18
Solution chromatography 5 93
Solution gas-drive recovery 10 78
Solution-made topography 7 535
Solution subsidence 7 533
Solvation 6 524, 12 494*
Solvay process 12 412
calcium chloride 2 399
carbonate 2 467
Solvent 12 494 497
acid and base 1 42
chromatography 3 95
ester 5 75
ether 5 85
extraction 5 156 158
in industry 12 495-497
liquid ammonia 1 325 326
naphtha 9 2
paint 9 493
Solvent—*cont*
petroleum products 10
printing ink vehicles 7 115
in scientific research 12 497
thinner 13 605
Solvent cleaning of metals 4 532
Solvent dewaxing 4 91
petroleum processing 1
petroleum wax 14 445
Solvent dyes 4 508
Solvent extraction 12 497-50
applications 12 497 498
equipment 12 498 500
food 5 388
hydrometallurgy 6 559 560
nuclear fuels 9 188 190
petroleum processing 10
plutonium 10 423 424
salting-out effect 12 19
separation (chemical an physical) 12 186
see also Extraction
Solvent thinned paints 9 493
Solvent treatment (petroleu products) 10 71
Solvolysis hydrolysis 6 557
steric effect (chemical reaction) 13 129
Somali Current 9 247
Soman 3 45, 9 405
Somasteroidea 4 360, 372, 12 500*
Asteroza 12 500
Somastotonia 10 54
Somateria mollissima 1 456
Somatic muscle *see* Skeletal muscle
Somatization 12 500 501
Somatotropin *see* Growth hormone
Somatotyping 1 460 461, 462
Somesthesis 12 501-502
cutaneous sensation 3 632
kinesthetic sensation 7 34
pain, cutaneous 9 489
pain, deep 9 491
pharynx disorders 10 100
sensory learning 12 182
touch 13 690
Somite *see* Metamerism
Sommelet process thiophene aldehydes 13 606
Sommerfeld, A 1 654 4 139 5 499
Sommerfeld gamma 12 577
Sommerfeld integral Fermi-Dirac statistics 5 216
Sommerfeld proposal 8 25
Somnifacient 6 595
Somogyi Shaffer Hartmann method 2 453
Sonar 12 502 504
active 12 502 504

Space vehicle—cont
structural materials 12 547
structural mechanics 12 546
structures 12 546 547
thin shell analysis 12 546
tracking 8 503 504
vibration 12 547
Spacecraft structure 12 547 548
ablation 12 552
acceleration load 12 550
astronautical engineering 1 604
ballistic zero lift reentry 12 551
boost phase 12 548
booster system 12 550
cooling and transpiration 12 554
crew environment 12 550
glide space vehicles 12 554
handling 12 547
heat dissipation 12 554
heat transfer 12 549
heating during reentry 12 551
high temperature materials 12 556
interstages 12 549
launching 12 550
lifting reentry 12 554
materials 12 549
meteoric particles 12 550
multiple staging 12 549
payload configuration 12 549
pressure tightness 12 550
pressure vessels 12 549
radiation shielding 12 551
reentry paths 12 551
reentry shapes 12 551
reliability 1 604
sloshing 12 548
stowage 12 547
structural design 12 546
surface coatings 12 550
tanks 12 549
temperature extremes 12 550
thermal stress 12 554 556
thin shell analysis 12 546
transportation 12 547
Spaces of Fontana 6 210 211
Spaces of Nuel 4 523
Spacistor 14 38
Spade rudder 12 292
Spadefoot toad 3 453 12 47 13 661
Spadix 7 94
Spalacotheriid 13 562
Spallanzani L 7 496 12 418
Spallation (rock) 5 145
Spallation reaction 9 198, 12 559*
fission 5 290
in nature 13 522
Spalling refractories 11 411
rock 5 145
Span 8 188
Spanish fly 3 275 288
Spanish lobster 4 30
Spanish moss 5 39
Spanish red 10 224
Spar varnish 14 282
Sparganosis 11 67, 12 559
Sparganum 12 559
Spark, electric 12 559 561
breakdown potential 2 324
mechanisms 12 559 561
spark gap 12 561
spark photography 13 187-190
spectrochemical analysis 12 578 579
use in spectroscopy 12 588
Spark advance 7 199
Spark counter 12 561
Spark gap 12 561
Spark ignition engine 7 197 209
bore stroke ratio 7 201
breathing and exhaust 7 201
combustion chamber 3 507
combustion knock 3 508
compression ratio 3 349, 7 201
cylinders 7 201
effect of compression ratio 7 197-198
engine balance 7 203
firing order 7 204
four stroke cycle 7 197
fuel air ratio 7 199
fuel injection 5 556
icing 7 205
ideal and actual combustion 7 197
ignition timing 7 199
intake manifold 7 204
manifold heat 7 204
octane rating 7 198
Otto combustion cycle 7 197 9 450 451
part load fuel economy 7 206
piston motion 7 203
spark advance 7 199
specific fuel consumption 7 207
supercharging 7 208
torsion dampers 7 204
typical American automobile engine 7 206
V 8 engine 7 201
vibration 7 203
Spark jamming, electronic countermeasures 4 521
Spark photographs 13 187 190
Spark plug 12 561-562
Sparking potential *see* Breakdown potential
Sparkling Burgundy 14 507
Sparkling wine 14 507
Sparrow 4 108 12 562*
chipping sparrow 12 562
English sparrow 12 562
European tree sparrow 12 562
field sparrow 12 562
grasshopper sparrow 12 562
Harris's sparrow 12 562
Old World sparrow 12 562
song sparrow 12 562
Sparrow missile 1 542
Spartina 8 127
Spartina marsh 8 127
Spasticity 10 528
cerebral palsy 2 652
diplegia 9 69
Spatangoida 4 560, 571, 12 562 563*
Spathius 6 580
Spatial localization of sensation 12 179
Spatial perception 1 494
Spatter cone 10 84
Speaker *see* Loudspeaker
Speaking tube 6 356
Spearfish formation 14 85
Spearman C 7 178
Spearmint 12 563
Special chromosome 3 111
Specialized erect stems *see* Stem (botany)
Specialized tissue 12 565 566
blood 12 565 566
bone metabolism 12 565
connective 12 564
eye metabolism 12 566
iron metabolism 7 267
liver metabolism 12 566
muscle 12 563
nerve 12 563 564
phosphate metabolism 10 131 132
radiation injury (biology) 11 228
rickets 11 566
skin metabolism 12 567
tooth metabolism 12 565
Speciation 12 567 571
biological specificity 2 217
ecotypes 12 571
geographic 12 568
hybridization and speciation 12 569
introgressive hybridization 12 570
isolating mechanisms 12 569
Speciation—cont
polyploid series in plants 12 570
species concept 12 568
types 12 568
Species 12 571, 13 404
allochronic 12 572
bacteria, taxonomy of 2 10
synchronic 12 572
Species concept 12 571-572
historical aspects 12 571
population aspects 12 572
speciation 12 568
Species plantarum 10 377
Species population 12 572 573
age distribution and sex ratio 12 573
birth rate 12 573
death rate 12 573
dispersion 12 572
emigration rate 12 573
genetic constitution 12 573
immigration rate 12 573
population density 12 572
Specific acoustic impedance 7 36
in biological tissues 2 209
Specific charge 12 573
canal rays 2 434 435
Specific conductance 4 484
Specific fuel consumption 1 177, 12 573 574*
aircraft engines 1 209
aircraft propulsion 1 185
propulsion 11 18
ramjet engine 1 176, 11 535
reciprocating aircraft engine 1 171
spark-ignition engine 7 207
turbojet engine 1 174 175 14 157
Specific gravity 4 62 12 574*
Archimedes' principle 1 517
measurement 4 62, 6 562 563
of soil particles 12 451
wood 14 534
Specific heat 12 574, 13 298
free-electron theory of metals 5 500
kinetic theory 7 353
lattice vibrations 7 413 415
of superconductors 13 298
thermodynamic principles 13 566
see also Specific heat of solids
Specific heat of solids 12 574 577
Debye theory 12 575 577
Dulong Petit law 12 574-575

Sourwood 12 523-524
South African jade 7 301
South African tick bite fever 13 630
South America 12 524 531
  Amazon River system 12 528
  coal fields (location) 8 448-449
  coal resources (table) 8 454
  coastal zone character 12 526-527
  deserts 12 530
  gapways between continental barriers 12 527
  islands 12 530
  Magdalena Cauca River 12 530
  mountains 12 527 528
  oil and gas field (locations) 8 447
  Orinoco River system 12 529
  Paraguay-Paraná-La Plata system 12 529
  physical map 12 525
  plains 12 524-526
  regional characteristics 12 524 527
  resources of 4 345
  rivers and river systems 12 528-530
  Sao Francisco River 12 529
South American blastomycosis *see* Blastomycosis
South China Sea 9 271
South Equatorial Current 9 247-249
  Atlantic Ocean 1 626
  Indian Ocean 7 56-58
South Esk River 1 671
South Island 1 672
South magnetic pole 6 144, 12 531
South Polar Seas *see* Antarctic Ocean
South Pole 1 440, 12 531
  equinox 5 62
South Sandwich Trench 4 326
Southampton 1 523
Southeast Asian waters 12 531-532
  monsoon 8 584 585
  monsoon current 12 531
  ocean floor 12 531
  salinity 12 532
  subsurface circulation 12 532
  surface circulation 12 531
  temperature 12 532
  tides 12 532
Southern Alps 1 672
Southern Carpathians 5 118
Southern corn rootworm 9 603
Southern Cross *see* Crux
Southern Fish *see* Pisces Austrinus
Southern green stink bug 6 405
Southern hemisphere: constellations 3 412-414
Southern Ocean *see* Antarctic Ocean
Southern Pointers 2 628
Southerns, L. 11 435
Southwood, T. 6 400
Sow (hog) 6 460
Sow bug 1 560, 3 565, 7 285, 9 327, 12 532 535
  Isopoda 12 532
  Peracarida 10 1
Soxhlet extractor 5 157
Soy flour 12 536
Soybean 10 374, 12 533 537*
  bacterial disease 12 534 535
  characteristics 12 534
  continuous screw press 12 536
  diseases 12 534
  economic importance 12 533
  flour 12 536 537
  fungual diseases 12 534 535
  lecithin (soy) 12 537
  nematode diseases 12 534 535
  oil processing 4 290 5 189, 12 537
  processing 12 535 537
  solvent extraction 12 535 536
  virus diseases 12 534 535
Space 12 537-538
  cislunar 7 222
  cosmology 3 509-510
  defined 1 603
  density 6 9
  detection of nuclear explosions in 9 183-184
  intergalactic 3 505
  interplanetary 7 222
  interstellar 7 222
  mathematics 8 179 180
  n-dimensional 1 392
  Riemannian *see* Riemannian space
  three dimensional 1 390 391
  wave impedance 9 276 277
Space biology 1 696, 12 538 539*
  atmospheric pressure problem 12 538
  cosmic radiation problem 12 539
  food and water problem 12 540
  gravity tolerance 12 539
  oxygen problem 12 538
Space biology—*cont*
  temperature problem 12 538
  weightlessness 14 464
Space centrode 2 641
Space charge 12 540
  diode, vacuum 4 204
  electron motion in vacuum 4 513
  Langmuir-Child law 7 398-399
  semiconductors 12 169
Space charge polarization 10 447
Space curve 2 404, 6 151
Space diversity reception 11 259
  overseas radiotelephony 13 439
  radiotelegraphy 13 423
Space exploration 12 544 545
Space flight 12 540-545
  astronautical engineering 1 603
  astronautics 1 606
  biomedical factors 12 538-540, 545
  body heat 12 540
  cabin atmosphere 12 541
  cabin design 12 540-545
  cabin pressure 12 542
  cabin puncture 12 543
  clock paradox 3 207
  escape 12 540
  feeding 12 542
  interplanetary propulsion 7 210-216
  isolation-confinement reactions 12 540 541
  metabolic requirements 12 542
  neuromuscular coordination 12 542
  nourishment 12 542
  orientation 12 542
  oxygen 12 541 542
  radiation 12 542
  reentry 12 540
  rocket engines 11 610
  spacecraft structure 12 556
  tolerable accelerations 12 540
  ventilation 12 540
  water recycling 12 542
  weightlessness 12 542 14 464
  work rest cycle 12 540 541
Space groups crystal structure 3 596 597* 6 282
Space heating 11 213
Space inversion elementary particles 4 545
Space lattice see Lattice, crystal
Space navigation 1 603, 9 10
Space perception 14 377-378
Space probe 12 545
Space propulsion *see* Interplanetary propulsors
Space radiations: galactic 12 542
  local planetary 12 542
  solar 12 542
Space station 12 543 544
  see also Space vehicle, Spacecraft structure
Space suit 12 540
Space symmetry (theoretical physics) 13 362 363
Space technology 12 544 545
  flight science 5 309-310
  interplanetary propulsion 7 210-216
  telemetering 13 426
Space time 12 556 559
  curved 12 559
  improper Lorentz transformations 7 586, 12 557-559
  Minkowski universe 12 557-559
  relativity 11 434 435
Space time pattern theory hearing 6 354-355
Space-time symmetries 13 362-364
Space vehicle 1 605, 12 545 547*
  artificial planet 10 271
  artificial satellite 12 32 36*, 545
  astronautical engineering 1 604
  astronautics 1 606
  attitude control 1 605
  autopilot 1 691
  auxiliary power 1 605
  earth satellite 12 32 36*, 545
  electromagnetic propulsion 4 490 492
  environment 1 606
  escape velocity 1 604, 12 545
  flight science 5 309 310
  ground communication and support 1 605
  guidance and control 1 605 6 286
  high altitude sounding rocket 12 545
  interplanetary propulsion 7 210 216
  lunar probe 12 546
  nose cone 9 167 168
  planetary probe 12 546
  reentry 11 389 391
  rocket engine 11 601 611
  rocket staging 11 611 612
  solar probe 12 546
  space probes 12 545
  structural design 12 546

Spermatogenesis—cont
abnormal 12 603
meiosis 3 209
spermiogenesis 12 603
Spermatogonia 12 602, 13 525
Spermatophore 5 234
Spermatozoa 7 225 13 525
Spermiogenesis *see* Spermatogenesis
Spermophilus 9 45
Spery E. A. 1 649-4 274, 6 305
Sperrylite 10 411, 12 603*
Spessartite 6 40, 7 589
Spharella 8 213
Sphaeloma fawcettii 8 213
Sphaeloma rosarum 8 213
Sphaeliotheca reiliana 5 484
Sphaeractinoidea 12 603-604
Sphaerella 1 235
Sphaerella linorum 5 298
Sphaeridae 3 276, 8 670
Sphaeriodaceae 5 563, 12 604-606*
Aureochyta 12 604
Coniothyrium 12 604
Cytospora 12 604
Diplodia 12 604
Hendersonia 12 604
hyalodidymae 12 604
hyalosculecosporae 12 604
hyalosporae 12 604
Macrophomina 12 604
phaeodidymae 12 604
phaeophragmiae 12 604
phaesporae 12 604
Phoma 12 604
Phomopsis 12 604
Phyllosticta 12 604
Pyrenochaete 12 604
Septoria 12 604
Sphaeropsis 12 604
Sphaeriidae 3 276
Sphaerium flaminneum 3 152
Sphaeroceridae 4 212
Sphaerocobaltite 3 246
Sphaerodoridae 10 461
Sphaeroeca volvox 9 562
Sphaeroma 3 291
Sphaeromicola 9 447
Sphaeromidae 3 291 7 293
Sphaerophorus fundutiformis *see* *Sphaerophorus necrophorus*
Sphaerophorus necrophorus 2 71
Sphaeropsidaceae *see* Sphaeriodaceae
Sphaeropsidales 5 563 12 606*
Discellaceae 4 234
Leptostromataceae 7 476
Sphaeriodaceae 12 604
Zythiaceae 14 650
Sphaeropsis 12 604
Sphaeropsis malorum 12 604
Sphaeropora polymorpha 13 11
Sphaerotheca humuli 5 66, 11 345
Sphaerotheca macularis 13 172
Sphaerotheca morsuvae 5 625
Sphaerotheca pannosa 9 602
Sphaerotheca pannosa var *rosae* 5 66
Sphaeratilus 2 28 3 64 65
Sphaeratilus dichotomus 3 64
Sphaeratilus discophorus 3 65
Sphaeratilus natans 3 64 65
Sphagnopsida 8 633
Sphagnum 8 633
Sphalerite 3 277, 278, 12 606*, 14 612
Sphecidae 6 574, 14 587
Sphecius speciosus 6 582
Sphecoid wasp 12 405
Sphecophile 3 275-288
Sphenacodontia 9 616
Sphendan 8 653
Sphene 12 606 607
Spheniscidae 12 607
Sphenisciformes 1 694, 9 618 12 607
Spheniscus mendiculus 12 607
Sphenobaiera 9 505
Sphenodon 7 473 11 472, 12 362
Sphenodon punctatus 11 557
Sphenodontidae 11 557
Sphenoid bone 6 596, 9 167, 12 375
Sphenoid sinus 12 342
Sphenophyllales 10 346, 12 607*
Sphenophyllum 5 63, 9 504, 10 245, 12 607
Sphenophyllum cuneifolium 12 607
Sphenopsida 10 321, 346 12 607
Equisetineae 5 63 10 346
fossil plants 9 502
Sphenopteris 9 504
Sphenostrobus 9 116
Sphere 12 607 608
area 1 528
celestial *see* Celestial sphere
manifold 8 91
Sphere of reflection x ray crystallography 14 569
Spherical aberration *see* Aberration optical
Spherical acoustic radiator 12 513
Spherical albedo *see* Albedo (optics)
Spherical and aspheric surfaces optical 12 608-609
Spherical astronomy 1 607
Spherical capacitor 2 440
Spherical coordinates astronomy 1 606 607
graphical 3 435
Spherical excess surveying 13 327
Spherical harmonics 12 609 611
applications 12 610
degree *n* 12 610
explicit forms 12 610
properties 12 610
Spherical mirrors optics 8 509
Spherical pendulum 9 618
Spherical segment 12 608
Spherical surfaces, optical *see* Spherical and aspheric surfaces, optical
Spherical triangle 12 608, 14 98-100
area 1 528
oblique, solution 14 100 102
polar triangle 10 445
right 14 99
Spherical trigonometry *see* Trigonometry spherical
Spherical wave 14 428
electromagnetic 4 494
wave equation 14 420
Spherochromatically corrected system 1 5
Spherocytosis, hereditary 3 195
Spheroid 4 560 561* 12 611, 13 310 311
quadric surface 11 135
surface and solid of revolution 13 310 311
Spheroidal coordinates 12 610
Spheroidal graphite iron 2 541
Spheroidization 6 381
Spherulitic structure (rock) 7 14 15
Sphincter of Oddi 4 161 6 14
Sphindidae 3 278
Sphingidae 7 464, 8 600
Sphingolipid 12 611
glycolipid 6 223
lipid 7 529
Sphingomyelin 7 529, 10 152
metabolic disorders 8 261
Sphingophosphatides 10 152
Sphingosine 12 611
Sphinx moth 7 464
Sphyraena barracuda 2 103
Sphyraenidae 2 103
Sphyrapicus 14 541
Sphyrapicus varius varius 12 26
Sphyrapus anomalus 13 388
Sphyrnidae 7 476
Spica 12 611* 13 41 14 328
Spicaria 8 570
Spicaria elegans 8 570
Spice and flavoring 12 612 614
allspice (*Pimenta*) 12 612
anise 12 612
basil 12 612
bay 12 612
caraway 12 612
cardamon 12 612
cayenne 12 612
celery 12 612
chicory 3 59
cinnamon 3 129 12 612
clove 3 218, 12 612
coriander 3 480, 12 612
cumin 3 622, 12 612
curry 3 629
dill 12 612
fennel 12 613
flavoring 12 613
garlic 12 613
ginger 6 187, 12 613
mace 12 613
marjoram 12 613
mint 12 613
mustard 12 613
nutmeg 12 613
oregano 12 613
paprika 12 613
pepper 9 628, 12 613
peppermint 9 628
poppy seed 12 613
rosemary 12 613
saffron 12 613
sage 12 613
savory 12 613
sesame 12 613
spices 12 612
thyme 12 613
turmeric 12 613
vanilla extract 14 270
Spicule 4 56
formation 2 394
Porifera 10 516
Spicule (sun) 5 116 13 264
Spider 1 496, 497, 12 612*
see also Arachnida
Spider beetle 3 277
Spider crab 1 498 4 24, 33, 34
Spider mite 8 518, 14 115
Spider wasp 6 574
Spike 7 98
Spike-tooth harrow 1 127
Spiked-wheel harvester 1 130
Spikelet 5 534
Spilhaus-Miller sea sampler 2 111
Spilite 10 86 12 614 615*
petrographic province 10 51-52
Spillway 4 9
Spilogale 12 574
Spin (quantum mechanics) 12 613
electron 4 516 518
elementary particle 4 543
exclusion principle 5 137
meson 8 247
multipole radiation 8 626 627
nuclear 9 190 195*, 202 208
quantum theory, nonrelativistic 11 164

Specific heat of solids—*cont*
Einstein theory 12 575
free electron theory of metals 5 500
Specific impulse 12 577-578
exhaust velocities 11 601
liquid propellant 11 7
nuclear rocket 9 201
propulsion 11 18
solid propellant 11 9
Specific inductive capacity *see* Dielectric constant
Specific irritability sensation 12 177
Specific rate constant 6 318-319
Specific reagents 11 371
Specific rotation optical activity 9 346
Specific thrust *see* Specific impulse
Specificity, biological *see* Biological specificity
Spectacle (turtle eyelid) 5 168
Specter, Brocken *see* Brocken specter
Spectral emissivity 4 583, 6 371
Spectral lines broadening 1 662
hyperfine structure 6 586
width 1 661-662
Spectral phonocardiogram 10 122
Spectral term 1 654
Spectrochemical analysis 12 578 581*, 587
elements (cosmic abundance) 4 546
excitation 12 578 579
flame photometry 5 294
observation of spectra 12 578
qualitative analysis 12 580
quantitative analysis 12 580
resolution 12 579
vaporization 12 578
x-ray *see* X-ray fluorescence analysis
see also Spectrophotometric analysis
Spectrogram 12 590
solar 13 289
Spectrograph 10 177, 12 589-590*
assaying 1 593
bent quartz crystal 3 358
Cassegrain 1 615
Coudé 1 615-616
Fabry-Perot interferometer 7 193
grating 4 140
multicrystal 3 357-358
Newtonian 1 615
prism 12 590
quartz 12 590
stellar 1 615-618
x-ray 14 579
Spectrograph, solar 13 289 290
Spectrography 12 578-581
Spectroheliogram 12 581; 13 271, 290*
Spectroheliscope 12 581
Spectrometer 12 589 590
beta ray 2 182 183
crystal diffraction 6 35
double focusing 2 182 183
gamma-ray 6 35
grating 4 140
infrared 7 107-108
orange 2 182-183
scintillation 12 75
semicircular 2 182
x ray fluorescent 14 582
Spectrophotometer 7 25, 10 172, 12 591*
infrared spectroscopy 7 108
Spectrophotometric analysis 12 581 586
absorption spectra 12 585
auxochrome 12 583
Beer's law 12 581
Bouguer Lambert-Beer law 12 581
chromogen 12 583
chromophore 12 583
colorimetry 3 302
filter photometry 12 585
infrared spectrophotometry 12 585
near-infrared spectrophotometry 12 584
reflectance spectra 12 583
ultraviolet spectrophotometry 12 585
visible spectrophotometry 12 584
see also Spectrochemical analysis Spectroscopy
Spectroscope 12 589-590
constant-deviation 12 590
direct vision 12 589
grating 4 140
interference 7 192
mass *see* Mass spectroscope
microwave 8 420
prism 12 589
Spectroscopic binaries *see* Binary stars
Spectroscopic observations meteor 8 309
Spectroscopic splitting factor 6 307
ferromagnetism 5 230
paramagnetism 9 549
Spectroscopic units 12 586
angstrom 1 406
Spectroscopy 12 586 591*, 13 590
astronomical 1 615 618, 12 587
atomic beams 8 538 542
beta ray 2 182 183
Spectroscopy—*cont*
classification 12 586-587
electron paramagnetic resonance spectroscopy 4 514-516
identification of spectrum lines 12 591
infrared 7 107, 12 587
instrumentation 12 589 591
interpretation of spectra 12 587
isoelectronic sequence 7 276
Laporte rule 9 565
light sources 12 588-589
line spectrum 7 520-521
measurement of nuclear moments 9 193
microwave 8 419 422*, 12 587
molecular beams 8 538-542
Paschen-Back effect 9 588
radio frequency 11 301, 12 587
Raman 12 587-588
Ritz's combination principle 11 580-581
spectrochemical analysis 12 578-581 587
spectrography 12 578
spectroscopic units 12 586
ultraviolet 12 586
visual 12 586 587
wavelength standards 14 441
x ray 12 586
Spectroscopy of combustion 12 591 592
interferometer 12 591
Spectrum 12 592 593
absorption 12 593
atomic 1 652-662
band 2 90
broadening of lines 1 662
of comets 5 312-313
continuous 12 593
electromagnetic 4 493
emission 12 592
of galaxies 6 6 7
of gaseous nebulae 9 25 26
infrared 7 105
line 7 520 521
mass 12 592
of meteors 8 310
of molecules 8 551 555
of novae 9 173
of planets 1 615 616
of sound 12 509
of stars 1 615 617*, 13 40
of sun 13 267-290
width of lines 1 661 662
Spectrum allocations, radio *see* Radio spectrum allocations
Spectrum analyzer 12 593
Speculum tin alloys 13 650
Speech 12 593 600
acoustical analysis 12 596
air pressure 12 594 595
articulation 12 595 596
development 12 597 598
disorders 12 598 600
frequency 12 595
fricatives 12 595 596
harelip 6 339
larynx 7 406
lip 7 528
mechanism 12 594
neurology 12 596-597
phonation 12 594 595
phonetics 10 120 121
pitch 12 595
plosives 12 595
production 12 593 597
psychoacoustics 11 72 74
respiration 12 593 594
rhythm disorders 12 598
study methods 12 595
symbolization 12 599
vocal cords 14 346
voice disorders 12 598
voiced sound 12 595
vowels 12 595
Speech interference level noise control 9 125
Speech inversion (communications privacy) 10 624
Speed 12 600
see also Velocity
Speed control ac motors 1 285 287
dc motors 4 229
governor 6 239 245
Speed length ratio (ships) 12 277
Speed measurement 13 382
Speed of sound *see* Sound
Speed regulation 12 600
Speedometer 12 201, 600 601*
Speiss 3 246
Spelaeogriphacea 5 563, 12 601*
Spelaeogriphus lepidops 12 601
Spemann, H 4 581
Spence, K W 7 442
Spencer, H 11 479
Spencer, W K 1 598, 4 372
Spent lye 6 221
Sperm cell 4 66, 12 601 602*
Sperm oil 5 189
Sperm whale 1 300, 2 660
Spermaceti 7 529
Spermaceti (*Kogia*) 14 445
Spermaceti (*Physeter catodon*) 14 445
Spermatangium 11 555
Spermatic artery 1 457
Spermatid 12 602 13 525
Spermatium 1 574
Spermatocyte 12 602 13 525
Spermatogenesis 7 225, 12 602 603*, 13 525

Sporozoa—cont
Microsporidia 8 403
Sporophores 8 568
Dematiaceae 4 52
Sporophyll 12 157
Sporoplasm Cnidosporidia 8 226 227
Microsporidia 8 403
Sporopollenin 5 330
Sporotrichum schenckii 1 341 13 11
Sporotrichosis 5 563 13 11*
Sporotrichum 12 401
Sporozoa 11 52 13 11 12*
Acnidosporidea 11 53 13 11
Cnidosporidea 11 52 13 11
Cnidosporidia 8 226 227
distribution 13 12
Haemosporidida 8 515 517
Haplosporidia 6 534
life cycles 13 11 12
nutrition 13 11
Protozoa 13 11
Sarcosporidia 12 30 31
taxonomy 13 11
Telosporidea 11 52, 13 11, 495
sporozoite 13 11
Haemosporidida 8 515 517
sporulation 11 448
Bacillaceae 2 3
parasitology 9 555
spot (fish) 8 575
spot blotch 2 99
spot test analysis 13 13
spot welding 11 495, 13 12 13*, 14 465, 468
spotlight 11 4
spotted cucumber beetle 3 287
spotted eagle ray 8 573
spotted fever Rocky Mountain 13 13 14
agent 13 14
diagnosis 13 14
fluorescent antibody study 8 593
pathogenesis 13 13
transmission 13 14
vector 13 13
spotted fever group 13 14 15
spotted fever test 13 14
spotted gar 12 173
spotted Poland China swine 13 519
spotted sandpiper 12 25
spotted skunk 12 574
spotted turtle 5 23 14 167 168
Spranger, F 10 34
spray fish 8 111
spray (astronomy) 14 281
spray coatings (metal) 8 280
spray dryer 4 296 297
spray drying, milk 8 457
spray towers 6 45
Spreading factor, hyaluronidase 6 522
Spring (asphalt) 1 590
Spring (mechanical) 13 15-18
automotive *see* Automotive suspension
constant force 13 16
design 13 17
disk 13 16
fatigue failure 13 17
flat 13 16
harmonic motion 6 341 342
helical 13 16
leaf 13 16
natural frequency 13 17
potential energy 4 600
preloaded 12 292 293
resilience 11 487
in servomechanisms 12 202
shock absorber 12 291
shock isolation 12 292 294
spiral 13 16
surging 13 17
torsion bar 13 16 689
uses 13 15
Spring (petroleum) 10 60
Spring (water) 13 18 14 404
mineral 8 463
thermal 13 551
Spring balance *see* Spring scale
Spring cankerworm 7 472
Spring corn sheller 1 155
Spring coupling 3 526
Spring dashpot 1 374
Spring grain aphid 1 490
Spring perper 5 538
Spring salmon 12 14
Spring scale 2 73 74 13 15 14 462
Spring tide 6 126, 13 634
Spring tiphia 6 581
Spring tooth harrow 1 127
Springfield Armory 1 537
Springtail 3 289 290 13 18*
Sprinkler automatic 5 278 13 18 19*
Sprinkler irrigation 1 116, 7 271
Sprocket 3 4
Spruce 13 19 20* 113
eastern species 13 19
western species 13 19 20
Spruce budworm 7 472
Spruce canker fungus 14 74
Spruce grouse 6 285
Sprue 12 569
clinical pathology 3 192 202
intestine disorders of 7 223
Spumellina 12 27
Spur blight 11 545
Spur gear 6 83
Sputtering 13 20
glow discharge 6 216
metal vapor plating 8 281 282
microcircuitry 8 349
Sputum analysis 3 200
Spy skulls 9 22
Squalene 2 54, 3 84, 13 20*
Squaliformes 4 418 13 20 21*
leather 13 21
liver oil 13 21
Squall 13 21
Squall line 13 21
tornado 13 685
Squaloidea 12 157
Squalus 3 472
Squalus acanthias 4 260
Squamata 7 474, 11 484, 13 21 27*
fer-de-lance 5 215
Lacertilia (Sauria) 11 484
Lepidosauria 7 473 474
lizards versus snakes 13 22
Sauria 13 22
Serpentes 11 484, 13 24 27
Squamous epithelium 5 42
Square 10 471, 13 27 28*
area 1 523
rectangle 11 383
Square backed crab 4 34
Square jaw clutch 3 224
Square-law detector 1 560
Square matrix 8 182
Square numbers 9 224
Square wave 13 28
analysis 13 28
application 13 28
generation 13 28
multivibrator 8 628 632
Squash 13 28 29
characteristics 13 28
diseases 13 29
harvesting 13 29
storage 13 29
Squash bug 2 362 6 405 13 29 30*
Squatinidae 12 157
Squeaker beetle 3 276
Squealer 4 290
Squeeze cementing, oil and gas wells 9 298
Squeezing, sheet metal 12 252 253
Squelch circuit 1 675
Squid 4 34 107 5 419 13 30 31*
Squilla 3 563 8 76, 13 150
Squillidae 5 103 13 150
Squire, C. F. 1 470
Squirrel 13 31
Squirrel cage polyphase induction motor *see* Polyphase induction motor
Squirrelfish 2 170
Srednja Gora 5 118
SS loran 7 585
SSB *see* Single sideband radio
Stabilimeter 2 274
Stability (metal) complexes 3 459 460
Stability (ship) 12 269-273
Stability constant, chelation 3 20
Stability valley, nuclear structure 9 204
Stabilization 13 31
Stabilization distillation, petroleum processing 10 67
Stabilized platform *see* Gyroscope, Inertial guidance system
Stabilized shunt motor 4 228
Stabilizer, aircraft 13 31-32
aerodynamic load 13 31
arrangements 13 31
control function 13 32
function 13 31
horizontal 13 31
tail assembly 13 386
vertical 13 31
Stabilizer, soil 12 429
Stable fly 4 212, 213
Stable gravimeters 13 515
Stable isotopes 7 292
Stable mineral, definition 8 444
in sandstones 12 24
in sedimentary rocks 12 132
sedimentation (geology) 12 141
Stable platform *see* Gyroscope, Inertial guidance system
Stable relic (mineral) 8 297
Stachyose 2 452 10 380
Stacked *magnetic* heads 8 40
Stackers 4 558
Stacks, steam generating furnace 5 571
Stadia 13 32, 524
Staeble Lihotzky isoplanasis condition 1 5
Stag beetle 3 276
Stagger-tuned amplifiers 1 544
Stagger-tuned filter 5 271
Staghorn fern 5 261
Staging, rocket *see* Rocket *staging*
Stagnation points, subsonic flight 13 224
Stagnation pressure, wind tunnel 14 499
Stagnation region, heat convection 3 442 443
Stagnation temperature, gas dynamics 6 52
Stagnicola palustris elodes 12 388
Stagomantis carolina 9 417
Stahl, G. E. 1 30
Stain (microbiological) 13 32 33
acid fast 1 45
classification 13 32

Spin, isotopic see Isotopic spin
Spin dyeing 4 310
Spin free complex 3 459
Spin isomer hydrogen 6 544-545
Spin lattice relaxation 8 42
Spin-orbit coupling 1 655
Spin-paired complex 3 459
Spin quantum number 11 162
Spin spin energy 8 42
Spin spin relaxation 8 42
Spin stabilization (projectiles) 2 82
Spina bifida 9 69, 13 492
Spinach 12 615-616
Spinacia oleracea 12 615
Spinal cord 2 630 631, 9 47, 12 616*, 13 364
embryology 9 47
ganglion 6 38
meninges 8 224
neurophysiology 9 80
Spinal cord disorders 12 616-617
congenital defects 12 616
drugs 12 617
inflammation 12 616
injury 12 616
nerve tract degeneration 12 617
tumors 12 616
vascular diseases 12 617
Spinal nerves 9 47, 56
Spinasterum 7 459 473
Spindle (biology) 8 520
Spindle (shafting) 12 240
Spindler, L. 12 30
Spine 12 617
Spinel (chemical) 12 617
Spinel (mineral) 12 617 618
ferrite 5 220
gem 6 99
Spinning (textile) 5 242, 12 618*, 13 532 534
Spinning of metal 12 618
powder metal forming 8 286
sheet metal 12 252
Spinning projectile 2 82
Spinning top 10 568 569
nutation 9 232 233
Spinoblast 10 201 13 75
Spinochrome (Echinodermata) 4 562
Spinor 11 187, 12 618*
Spinose ear tick 7 298
Spinoza, G. 8 176
Spinther 10 462 464
Spintheridae 10 461
Spinulosa 1 598, 4 360 12 618-619*
Spinulosida 4 372
Spinulosin 11 195
Spinus tristis 2 435, 5 273
Spiny ant eater 11 51
Spiny-headed worm 1 19
Spiny-legged fly 4 212
Spiny lobster 4 29, 30
Spiny rock lobster 3 563
Spiny soft shelled turtle 3 23
Spionidae 10 461
Spiracle 7 122-135
Spiral 13 1
Spiral cleavage 2 604, 7 230
Spiral galaxies *see* Galaxy, external
Spiral helicine artery 9 621
Spiral jaw clutch 3 224
Spiral spring 13 16
Spiral valve digestive system 4 160
Spiramycin 1 466
Spirane 1 242
optical activity 9 548
Spirastrella 3 159
Spirifer 2 315
Spiriferacea 13 485
Spirillaceae 11 66, 13 1-2*
bacteria, taxonomy of 2 11
Desulvibrio desulfuricans 13 2
metabolism 13 1
morphology 13 1
Pseudomonadaceae 11 65
Spirillary rat bite fever 11 346
Spirillina 5 435
Spirillinidea 5 431
Spirillovanthin 2 54
Spirillum 11 65, 12 65, 13 2
Spirillum lunatum 13 3
Spirillum minus 11 345, 13 1
Spirillum serpens 2 63
Spirillum volutans 13 1, 3
Spirit varnish 14 281
Spiro [4 5] decane 6 534
Spirobrachiidae 13 545
Spirocerca lupi 13 6
Spirochaeta plicatilis 13 4
Spirochaetaceae 13 3
Spirochaetales 13 2 4
bacteria, taxonomy of 2 11
Borrelia 13 4
Cristispira 13 4
Leptospira 7 475, 13 4
Saprospira 13 4
Schizomycetes 12 65-66
Spirochaetaceae 13 3
Treponema 13 4
Treponemataceae 13 4
Spirochete 13 4
bejel 2 159
pinta 10 238
relapsing fever 11 426
syphilis 13 374
taxonomy 7 475, 13 2
Vincent's angina 14 324
yaws 14 597
Spirochona 5 86
Spirocyst 3 257
Spirogyra 1 236, 3 80, 98, 11 452, 12 227
Spiroloculina canaliculata 5 432
Spirometer 13 4
Spirometra 12 559
Spirometry 13 4-5
Spironoura affine 9 30
Spirorbis 1 431, 11 512
Spirostomum 6 432, 11 55
Spirotricha 3 120, 13 5*
Ctenostomatida 11 53
Entodinomorphida 3 120, 5 4 5, 11 53
Heterotrichida 3 120, 6 451-452, 11 53
Hypotrichida 3 120, 6 598, 11 53
Odontostomatida 3 120, 9 276
Oligotrichida 3 120, 9 317, 11 53
Tintinnida 3 120, 11 53, 13 651
Spirula 2 645, 4 107, 12 187, 13 30
Spirulidae 4 40
Spirulina 3 636, 12 67
Spiruria 9 30
Camallanida 9 30
Spirurida 9 30
Spirurida 9 30
Spiruroidea 13 5-7
general morphology 13 5
Gnathostoma spinigerum 13 6
important spirurroids 13 5-7
life cycle 13 5
Musca 13 7
Oxyspirura 13 7
Thelazia 13 7
Spirostilus festivus 14 76
Spit 12 302
Spittle insect 6 471, 13 7-8*
Spitzer, L. 10 387, 394
Spiza americana 4 108
Splanchnocranium 12 355, 356
Splanchnopleure 4 153
Splash erosion 12 444
Splash lubrication 7 607
Splay (architecture) 1 518 520
Spleen 7 629 630, 632, 13 8*
Spleen disorders 13 8 9
Splendid ear shell 1 2 3
Splenic fever *see* Anthrax
Splenomegaly 13 8
Splines 13 9
involute 13 9
machine key 8 5
square 13 9
Split field rangefinder 11 339
Split fountain (printing) 10 609
Split phase induction motor 7 78
Spodumene 8 277, 11 129, 13 9 10
gem material 6 99
lithium mineral 7 544
Spoil (mining) 8 479
Spoil bank 8 479
Spoiler (airplane) 1 213, 14 509, 517
Spondylobolus 7 49
Sponge 13 10
biological significance 13 10
economic importance 13 10
Porifera 10 513
reproduction 13 10
size and structure 13 10
Sponges, boring *see* Boring sponges
Spongia officinalis 4 109
Spongicola 4 26; 6 434
Spongiidae 4 109
Spongilla lacustris 6 554
Spongillidae 6 333
Spongin 4 56
Spongioblast 4 56
nervous system 9 43
Porifera 10 514
Spongiomorphidae 12 604
Spongiostromata 1 237
Spongocoel 2 593, 13 10
Clathrinida 3 158
Spontaneous combustion 3 30
Spontaneous fission *see* Fission, nuclear
Spontaneous generation 7 49
Spontaneous magnetization 8 49
Spontaneous polarization ferroelectrics 5 224 228
ferromagnetism 5 229 23
in sulfide ore bodies 11 2
Spontin *see* Ristocetin
Spooling (textile) 15 554
Spoonbill 3 120
Sporadin 6 269
Sporangium 5 260, 10 198, 11 452
Spore *see* Bacterial endospore Fungi, Fungi imperfecti, Palynology, Sporulation
Spore stain 13 33
Sporendonema epizoum 2 540
Sporidiobolus 13 10
Sporinite 5 232
Sporoblast 6 334
Sporobolomyces 13 10, 14 601
Sporobolomyces pararoseus 14 600
Sporobolomycetales 13 10 11
Sporobolus asper 3 190
Sporobolus cryptandrus 3 190
Sporobolus heterolepis 3 190
Sporochore 10 499
Sporocyst 4 148, 5 183, 12 64
Sporogenesis 8 299
Sporogonites 9 504
Sporogony 5 249, 13 12
Sporonema phacidioides 4 254
Sporont 5 100
Cnidosporidia 3 226 227

...ar tracker photoelectric —cont.
...ellar inertial guidance 6 299
...arth 8 458 6 217, 8 82, 13 56-58*
...ayfare 1 365
...ell inclusions, noncytoplasmic 2 603
...ell protoplast 2 614
...hemurgy 3 54
...ranochivalion 3 635
...orms of processed starch 13 51
...olecular structure 13 51
...plant metabolism 10 351 352
...pond finish 10 533
...ugar 13 259
...tarwina Plumosa 5 118
...tarch 3 598, 13 52 53*
...characteristics 13 53
...economic importance 13 52
...reproduction 13 52
...structure 13 52
...targazer 4 428
...tark, J 13 53
...tark effect 13 53 54
...intermolecular 13 53 54
...inverse 13 54
...linear 13 53
...quadratic 13 53
...tark septum 8 420
...tarlet 12 619
...tarlight 7 219 222
...tarling E 4 171, 589 9 437
...tarling 13 54
...tarling's law 5 137 141
...tarter cultures 3 12
...tarved banana 2 254
...tarzman, S E 11 399
...tasis dermatitis 4 68 408
...tassfurt salt deposits 8 304
...tate Plane Coordinate systems 13 324 327
...tatocysts 7 467
...tatic 11 321 322; 13 54
...atmospheric electricity 9 117
...from dust particles 4 297
...tatic electricity 4 462; 13 54
...early experimenters 4 453
...electrical bonding 2 282
...grounding 6 278
...see also Electrostatics
...tatic machine *see* Electrostatic generator
...tatic metamorphism 8 304
...tatic optimization process control 5 31 32
...tatic pressure 12 510
...tatically determinate structures 13 36-37
...tatically indeterminate structures 13 36-37
Statics 8 193-194, 13 54-56*
...components of a force 13 55
...equilibrium of forces 5 60 61
...force 5 436-437
...force as a vector 13 54 55
...moment of a force 13 55 56
...moment of inertia 8 565 566
...principle of superposition 13 55
...principle of transmissibility 13 55
...principle of virtual work 14 329
...resultant of forces 11 433 534
Statics, fluid *see* Fluid statics
Statics in space 13 56 57
Stationary oscillation seiche 12 146
Stationary state 13 57
...energy level 4 601
...excited state 5 135
...ground state 6 275 276
Stationary stochastic process 13 142
...queueing theory 11 188
Stationary wave 13 57-58
Statistical analogs weather forecasting and prediction 14 448 449
Statistical bioclimatology 2 202
Statistical games 6 28
Statistical mechanics 13 58 66
...Boltzmann constant 2 277-278
...Boltzmann statistics 2 278 281
...Bose Einstein statistics 2 304-305
...kinetic theory 7 350 355
...quantum statistics 11 162-163
Statistical physics *see* Statistical mechanics
Statistical techniques analysis of variance 1 386-387
...weather forcasting and prediction 14 449
...*see also* Biometrics, Statistics
Statistical thermodynamics 5 10
Statistical weather forecasting 14 449
Statistics 13 66-75
...analysis 2 223 232 5 143-145 13 66 75
...biometrics 2 223 232
...Boltzmann *see* Boltzmann statistics
...classical *see* Boltzmann statistics
...correlation 13 74
...data reduction 4 15
Statistics—*cont*
...design of experiments 13 73
...distribution 13 67
...estimation 13 70
...experiment 5 143-145
...extrasensory perception (ESP) 5 159
...Fermi Dirac 5 216
...nonparametric inference 13 74
...notation 8 174
...quantum 11 162-163
...regression 13 74
...sampling 13 68
...sampling distributions 13 69
...tests of hypotheses 13 72
...weather forecasting and prediction 14 446-454
...*see also* Analysis of variance, Biometrics
Statmaster 10 144
Statoacoustic ganglion 9 47
Statoacoustic nerve 9 47
Statoblasts 13 75
...Phylactolaemata 10 201
...reproduction, animal 11 449
Statocyst 3 565 609, 12 180
...Coelenterata 3 255 261
...equilibrium biological 5 47-49
...Platyhelminthes 10 415
Statolith 5 48, 10 365
...Ctenophora 3 608-610
Stator 1 544, 4 448
Stator windings 14 504
Statospore 3 117-119
Status thymicolymphaticus 13 619
Statute mile 8 188
Staub, A 9 534
Staub, H H 5 209
Staudinger, H 5 242 8 347
Staurolite 13 75
...penetration twin 8 465
Stauromedusae 3 255, 13 75 76*
Stauropteris 3 263
Staurosporae 5 563
Steady flow 5 337, 341
Steady-state cavitation 2 574
Steady state heat conduction 3 586-587
Steady-state wave motion 14 429
Steam 13 76-77
...application 13 77
...enthalpy 13 76
...heat energy 13 76
...latent heat of vaporization 13 77
...Mollier diagram 13 77
...properties 13 76-77
...saturated 13 76-77
...specific heat 13 77
...superheated 13 76-77
Steam—*cont*
...superheater 13 302
...surface condenser 13 312
...temperature entropy chart 13 77
...velocity of sound in 12 513
...viscosity 13 77
Steam bending wood 14 544
Steam boiler 13 77-78
...construction 13 78
...feed water 2 275
...pressure 13 78
...separator 13 84
...superheated steam 13 78
Steam condenser 5 377, 13 78
...contact 5 420-421, 13 78
...surface 13 78, 312
Steam distillation 4 248
...essential oils 5 71
...petroleum processing 10 67
Steam engine 13 78-80
...cycle of operation 13 80
...cylinder action 13 79
...indicator card 13 80
...marine 8 109
...performance criteria 10 591
...power developed 13 79
...prime mover 10 590 592
...slider crank mechanism 12 580
...types 13 79
...valves 13 79, 14 261
Steam generating unit 13 81 82
...air heater 4 403
...boiler feed water 2 275
...economizer 4 403
...feed water 5 198
...fire-tube boiler 5 282
...furnace 5 573
...raw water 11 348
...reheating 11 425
...steam boiler 13 78
...superheater 13 302
...temperature control 13 85
...water-tube boiler 14 412
Steam hammer 10 227
Steam heated evaporators 5 126
Steam heating 13 82-83
...one-pipe system 13 82
...radiator 11 241
...two-pipe system 13 82 83
Steam-hydrogen dual temperature process 6 583
Steam jet cycle refrigeration 11 415
Steam jet ejector 3 582, 13 83-84*
...application 13 83
...principle 13 83
Steam-jet refrigeration 1 147
Steam locomotive 7 571
Steam power plant *see* Power plant

Stain (microbiological)—*cont.*
complex staining procedures 13 33
differential stains 13 33
Macchiavello stain 13 33
negative stain 13 33
nuclear stains 13 33
preparation 13 32
procedures 13 32
simple stains 13 33
spore stains 13 33
stains and staining 8 405
see also Dye
Stained glass 13 33
Staining (wood) 14 532, 546
Stainless steel 13 34-35
chromium 3 104
preparation 13 34-35
properties 13 34-35
radiation damage 11 223
types 13 34 35
Stalactites and stalagmites 2 572, 13 35*
Stalin Peak 1 577
Stalk-eyed fly 4 212
Stalked barnacles *see* Thoracica
Stall (aerodynamic) 13 228, 14 509
Stall warning indicator 13 36
Stallion 6 489
Stalo (stable local oscillator) 8 620
Stamen 5 329 330
anatomy 5 329
anther 5 327
filament 5 327
flower (botany) 5 326-334
microsporangium 5 329
Staminate flower 5 326
Staminode 5 327
Stamm, A J 14 537
Stamp marking inks 7 112
Stamping dies 7 312
powder metal forming 8 286
printed circuits 10 597
sheet metal 12 250
Stand oil 4 290
Standard, physical 10 203-206, 13 36
see also specific entries such as Electrical standards Frequency standard, Wavelength standards, etc
Standard cells 14 478-479
electrical standards 4 458-459
emf 5 627, 4 500
Standard deviation 11 626, 13 67
Standard force 5 436
Standard kilogram 7 347*, 10 205
Standard loran 7 583
Standard meter 8 339 10 205
Standard parts 10 642 643
Standard pitch 8 662
Standard reference state thermochemistry 13 560
Standard screw threads 12 85
Standard sea water 6 567
Standard solutions 13 655
Standard states: chemical equilibrium 5 50
thermodynamic activity 1 60
Standard temperature 10 205, 14 111
Standard time 10 205, 13 642-643*
Standardbred horse 6 488-492
Standardization, work *see* Work standardization
Standardization trials (ships) 12 283-284
Standards, design *see* Design standards
Standards of purity chemicals 11 370
Standing crop 2 215, 13 504
fresh-water ecosystem 5 521-534
Standing wave 4 12, 13 36*
detection 13 36
microseisms, cause of 12 156
microwave transmission lines 8 423
seiche 12 146
transmission lines 14 50
wave equation 14 420
wave motion in liquids 14 433
Standing-wave detector 7 43 46*, 13 36
electric power measurement 4 439
Standing wave ratio 13 36
cavity resonator 2 577
measurement 13 36
Standpipe 13 390
Stanier, R Y 2 56
Stanley, R W 14 441
Stanley, W M 14 331
Stanley Falls 1 109
Stanley Pool 1 109
Stannane 6 532
Stannate compounds *see* Tin
Stannic compounds *see* Tin
Stannite compounds *see* Tin
Stannous compounds *see* Tin
Stanovoi Mountains 1 577
Stanton number heat convection 3 442
Stapes 10 126 12 357
ear 4 319
Staphylinidae 3 276
Staphylococci acne 1 47
arthritis 1 334
blood plate hemolysin 2 270
breast disorders 2 326
Staphylococci—*cont*
coagulase 13 37
enterotoxin 13 37
hyaluronidase 13 37
infections 13 38
leukocidin 13 37
osteomyelitis 9 446
pathogen (soil) 9 594
phagocytosis 10 91
sty 13 208
Staphylococcus 13 36 38
leukocidin 7 485, 13 37
Micrococcaceae 8 550
penicillin 9 620
toxins 13 37
Staphylococcus albus 13 37
Staphylococcus aureus antibioassay 2 197, 9 619
biotic spectrum 1 466-467
carbuncle 2 477
chlortitracycline 3 83
heart disorders 6 358 362
taxonomy 8 550
Staphylococcus citreus 13 37
Staphylococcus pyogenes 5 425
Staple man made fiber 5 242
Staple wool 14 548-549
Star 13 38 48
Albireo 3 646
Aldebaran 1 228
Algenib 9 610
Algol 7 503
Alnilam 9 407
Alpha Centauri 1 266-267
Alpha Crucis (Acrux) 3 569
Alpheratz 9 610
Antares 1 442
Arcturus 1 528
Bellatrix 9 407
Betelgeuse 2 183
binary stars 2 186-191
Canopus 2 628
carbon nitrogen cycle 2 472-473
carbon stars 2 467
chemical composition 13 38, 45
clouds 13 48-49
clusters 13 49-50
constellations 3 411-414
Deneb 3 646
Denebola 7 455
distribution 13 47 48
double stars 2 186 191
dwarf 4 297
element abundances 4 546 549
energy sources 13 108
Enif 9 610
evolution 13 42-43, 106-110
faint star photography 1 603
Fomalhaut 1 496
formation of 7 222
in galaxies 6 12
Star—*cont*
Gamma Crucis (Gacrux) 3 569
in gaseous nebulae 9 24 27
giant star 6 184
Hadar 2 628
Hamel 1 532
heat flow 13 107 108
interiors 13 107-110
luminosity 13 42*, 106
Lyra 7 637
magnetic fields 13 110
Markab 9 610
mass 13 42-43
Michelson stellar interferometer 4 156, 7 190 191*
Mira 8 506
motion 13 39, 44-47*
nomenclature 13 38
nova 9 172-173
nuclear reactions in 4 558
occultation 9 244
origin of 3 506
origin of elements in 4 552-556
parallax 9 545-546
photography 1 615 615
position determination 1 603
Procyon 10 639
radial velocity determination 1 616-617
red dwarf star 11 387
Regulus 7 455
resolution by telescopes 13 449-450
Rigel 11 570
Rigil Kent 2 628
Scheat 9 610
Sirius 12 347
spectra 1 615-617, 13 40
spectral classification 1 617, 13 40 41*
Spica 12 612
structure 13 106
subgiant 13 209
sun 13 264 290
supergiant 13 502
supernova 13 505
temperature 13 41 44
transits 14 41
twinkling 14 168
variable stars 14 276 279
Star, meson *see* Meson
Star, nuclear *see* Nuclear star
Star clouds 13 48 49
Star clusters 9 27, 13 49 50*
age 3 503
Hyades 6 522
Pleiades 10 416
Star connection (ac circuit) 1 276
Star shell ammunition 1 545
Star tracker, photoelectric 9 16

r tracker, photoelectric
—cont
stellar inertial guidance
6 239
arch 2 458, 6 217, 8 82,
13 50 52*
nuviase 1 365
ell inclusions, noncyto-
plasmic 2 603
ell protoplast 2 614
chemurgy 5 54
cyanoethylation 5 635
forms of processed starch
13 51
molecular structure 13 51
plant metabolism
18 351 352
potato, Irish 10 533
sugar 13 239
Starvina Planina 5 118
Starfish 1 509 13 52 53*
characteristics 13 53
economic importance
13 52
reproduction 13 52
structure 13 52
Stargazer 4 428
Stark, J 13 53
effect 13 53 54
intermolecular 13 53 54
inverse 13 54
linear 13 53
quadratic 13 53
rk septum 8 420
rlet 12 619
arlight 7 219 222
arling E 4 171, 389 9 437
tarling 13 54
tarling's law 3 137 141
tarter cultures 3 12
Starved basins 2 254
Starvuin S E. 11 399
Stasis dermatitis 4 68, 408
Stassfurt salt deposits 8 304
State Plane Coordinate systems
13 324 327
Statbmopoda 7 467
Static 11 321 322- 13 54
atmospheric electricity
9 117
from dust particles 4 297
Static electricity 4 462 13 54
early experimenters 4 453
electrical bonding 2 282
grounding 6 278
see also Electrostatics
Static machine see Electrostatic
generator
Static metamorphism 8 304
Static optimization process
control 5 51 52
Static pressure 12 510
Statically determinate struc
tures 13 56-57
Statically indeterminate struc
tures 13 56-57
Statics 8 193-194, 13 54 56*
components of a force
13 55
equilibrium of forces
5 60-61
force 5 436-437
force as a vector 13 54-55
moment of a force 13 55 56
moment of inertia
8 565-566
principle of superposition
13 55
principle of transmissi-
bility 13 55
principle of virtual work
14 329
resultant of forces
11 433-534
Statics, fluid see Fluid statics
Statics in space 13 56-57
Stationary oscillation seiche
12 146
Stationary state 13 57
energy level 4 601
excited state 5 135
ground state 6 275-276
Stationary stochastic process
13 142
queueing theory 11 188
Stationary wave 13 57 58
Statistical analogs weather
forecasting and prediction
14 448-449
Statistical bioclimatology 2 202
Statistical games 6 28
Statistical mechanics 13 58 66
Boltzmann constant
2 277-278
Boltzmann statistics
2 278 281
Bose Einstein statistics
2 304-305
kinetic theory 7 350-355
quantum statistics
11 162 163
Statistical physics see
Statistical mechanics
Statistical techniques analysis
of variance 1 386 387
weather forcasting and
prediction 14 449
see also Biometrics,
Statistics
Statistical thermodynamics
5 10
Statistical weather forecasting
14 449
Statistics 13 66 75
analysis 2 223 232
5 145 145 13 66 75
biometrics 2 223 232
Boltzmann see Boltzmann
statistics
classical see Boltzmann
statistics
correlation 13 74
data reduction 4 15
Statistics—cont
design of experiments
13 73
distribution 13 67
estimation 13 70
experiment 5 143-145
extrasensory perception
(ESP) 5 159
Fermi-Dirac 5 216
nonparametric inference
13 74
notation 8 174
quantum 11 162 163
regression 13 74
sampling 13 68
sampling distributions
13 69
tests of hypotheses 13 72
weather forecasting and
prediction 14 446-454
see also Analysis of vari
ance, Biometrics
Statmaster 10 144
Statoacoustic ganglion 9 47
Statoacoustic nerve 9 47
Statoblasts 13 75
Phylactolaemata 10 201
reproduction, animal
11 449
Statocyst 5 565, 609 12 180
Coelenterata 3 255-261
equilibrium, biological
5 47-49
Platyhelminthes 10 413
Statolith 5 48 10 565
Ctenophora 3 608-610
Stator 1 544, 4 448
Stator windings 14 504
Statospore 3 117 119
Status thymicolymphaticus
13 619
Statute mile 8 188
Staub, A 9 554
Staub, H H 5 209
Staudinger, H 5 242, 8 347
Staurolite 13 75
penetration twin 8 465
Stauromedusae 3 255, 13 75 76*
Stauropteris 3 263
Staurosporae 5 563
Steady flow 5 337, 341
Steady state cavitation 2 574
Steady state heat conduction
3 386-387
Steady state wave motion
14 429
Steam 13 76 77
application 13 77
enthalpy 13 76
heat energy 13 76
latent heat of vaporization
13 77
Mollier diagram 13 77
properties 13 76-77
saturated 13 76-77
specific heat 13 77
superheated 13 76-77
Steam—cont.
superheater 13 302
surface condenser 13 312
temperature entropy
chart 13 77
velocity of sound in 12 513
viscosity 13 77
Steam bending wood 14 544
Steam boiler 13 77-78
construction 13 78
feed water 2 275
pressure 13 78
separator 13 84
superheated steam 13 78
Steam condenser 3 377, 13 78
contact 3 420-421, 13 78
surface 13 78, 312
Steam distillation 4 248
essential oils 5 71
petroleum processing
10 67
Steam engine 13 78-80
cycle of operation 13 80
cylinder action 13 79
indicator card 13 80
marine 8 109
performance criteria
10 591
power developed 13 79
prime mover 10 590-592
slider crank mechanism
12 380
types 13 79
valves 13 79, 14 261
Steam generating unit
13 81-82
air heater 4 403
boiler feed water 2 275
economizer 4 403
feed water 5 198
fire-tube boiler 5 282
furnace 5 573
raw water 11 348
reheating 11 425
steam boiler 13 78
superheater 13 302
temperature control 13 85
water tube boiler 14 412
Steam hammer 10 227
Steam heated evaporators
5 126
Steam heating 13 82-83
one pipe system 13 82
radiator 11 241
two-pipe system 13 82-8
Steam-hydrogen dual tempe
ature process 6 383
Steam jet cycle refrigeratio
11 413
Steam jet ejector 3 382,
13 83-84*
application 13 83
principle 13 83
Steam-jet refrigeration 1 1
Steam locomotive 7 571
Steam power plant see Po
plant

Steam propulsion 8 119-120
Steam pump 4 245
Steam separator 15 84
  baffle arrangements 15 84
  cyclones 15 84
Steam temperature control 15 85
Steam turbine 15 85-89
  aerodynamic design of blade system 15 89
  application requirements 15 87
  blade system 15 87
  casing or shell stresses 15 88
  centrifugal stresses 15 87
  governor 6 239, 15 88
  machine requirements 15 87
  marine 8 109, 120
  materials used 15 89
  oiling system 15 89
  parts 15 85
  performance criteria 10 591
  rotor blades or buckets 15 88
  shaft sealing 15 88
  shaft vibration and alignment 15 88
  steam requirements 15 86
  types 15 86
Steamboat Springs, Nevada 15 551
Steamship 12 256
Steapsin 4 170
1-Stearamidomethylpyridinium chloride 11 184
Stearate 15 89
Stearic acid 2 474, 5 184, 10 356
  lipid metabolism 7 533
Stearin 6 553
Stearyl chloride 1 45
Stearylamide 1 303
Steatite 2 650
  talc in 15 387
Steatornis caripensis 2 448
Steatornithidae 2 448
Steatorrhea 12 369
  intestine, disorders of 7 225
  lipid metabolism 7 531
Steatosis, hepatic 9 533
Steelin *see* Tetracycline
Steel 15 89 93
  alloy steels 15 91
  annealing 6 580-581
  composition 15 89 93
  hardening 6 581, 15 89-93
  heat treatment 6 579 582
  hydrogen embrittlement 6 544
  iron carbon phases in 15 90
  manufacture 15 93 102
  normalizing 6 580-581
Steel—*cont.*
  preparation 15 89-93
  properties 15 89-93
  shipbuilding 12 286
  stainless 15 34-35
  structural *see* Structural steel
  surface hardening 15 312-314
  tempering 6 581
  velocity of sound in 12 516
Steel castings 15 205
Steel construction 15 206
Steel engraving 10 603, 617
  printing plate 10 610
Steel manufacture 15 93-102
  acid open hearth process 15 99
  basic open hearth process 15 95
  electric furnace steel-making 15 99
  ferroalloys 5 222 224
  killed steel 15 98
  manganese 8 86-87
  oxygen 9 471-472
  oxygen control 15 97
  pneumatic processes 15 94-95
  raw materials 15 93
  rimmed steel 15 98
  semikilled steel 15 99
Steel-plate engraving press 10 622
Steelyard balance 2 74
Steering (ships) 8 124-125, 12 281-283*
Steering, Ackerman *see* Ackerman steering
Steering, automotive *see* Automotive steering
Steering, power 15 102-104
  application 15 102
  hybrid system 15 104
  in-line linkage system 15 104
  integral system 15 103
  linkage system 15 103
  servo loop 15 102
Steers, J. A. 12 505
Stefan-Boltzmann constant 4 353
Stefan-Boltzmann law 6 373
Stefan's constant 2 201
Steganopus tricolor 10 92
Stegobium paniceum 5 287
Stegoceras 4 201
Stegomastodon 10 636
Stegosauria 11 484
Stegosaurus 4 201, 7 327; 11 484
Stegoselachian 15 104
Stegoselachii 15 104
Steinheil, C. A. 7 454
Steinheil triple aplanat lens system 7 454
Steinheim man 5 477, 15 104-105*
Steinmetz, C. P. 6 599
Steinmetz coefficient· hysteresis 5 479, 6 599
Stele 7 624, 15 105-106*, 116
Stelechopidae 10 461
Stelexomonas 8 169
Stella, E. 9 528
Stellar associations 15 49
Stellar *atmospheres 1 630* 631
Stellar eclipses 2 188
Stellar evolution 2 190, 15 106-110
  binary stars 2 190
  carbon-nitrogen cycle 2 472-473
  elements and nuclides (origin) 4 552-556
  external galaxies 6 6-7
  proton-proton chain 11 47
  subgiant stars 13 209
  variable star 14 279
Stellar explosions 4 553
Stellar-inertial guidance 6 289
Stellar interferometer, Michelson *see* Michelson stellar interferometer
Stellar magnetic field 15 110
Stellar magnitude *see* Magnitude, stellar
Stellarator 8 60
  plasma physics 10 387
Steller sea lion 12 98
Stelleroidea *see* Asteroroa
Stem (botany) 15 110 124
  external features 15 111 114
  general characteristics 15 110-111
  internal features 15 114
  plant organs 10 368
  primary state of stems 15 114 118
  primary vascular system 15 116
  secondary state of stems 15 118 121
  stem types 15 121 124
  underground stems 15 124
  vines 15 122
  woody 15 111
Stem, branching 15 113
Stem, columnar 15 115
Stem, deliquescent 15 115
Stem, excurrent 15 115
Stem cuttings 15 124 125
  plant growth 10 535
Stem disease *see* Plant disease, articles on specific plants
Stem nematode *see* Plant disease, articles on specific plants
Stem reptile 11 484
Stem rot *see* Plant disease; articles on specific plants
Stem rust *see* Plant disease, articles on specific plants
Stem sawfly 6 574
Stemonitaceae 8 687
Stemonitales 8 687
Stencil· marking inks 7 112
Stencil etching printed circuit 10 394
Stencil printing processes 10 605
Stenecosaurus 3 553
Stenetrorhdea 1 576
Steno, N. 5 602, 15 168, 170
Stenochisma formosa 15 495
Stenoglossa *see* Neogastropod 9 34
Stenolaemata 15 125
Stenomastertdae 6 463
Stenopodidea 4 29
Stenopus hispidus 4 29
Stenosaurus 7 327, 11 484
Stenosis digestive system 4 150 175
  gastrointestinal tract disorders 6 72 74
  heart disorders 6 358-36
Stenostomum 11 541
Stenostomum grande 11 542
Stenothoidae 6 37
Stenovithius 7 472
Stensioella 13 104
Stensioellida 13 104
Stentor 6 451, 11 55
Stenurida 4 360, 9 343, 13 125
Step-and repeat photocomposing machines 10 616
Step by-step switch 13 356 35
Step-cut facets 6 103
Step faults 5 193
Step leader· lightning 7 509
Step voltage regulator 14 365 366
Stephanian stage 2 469
Stephanidae 6 574
Stephanite 12 329, 332
Stephanitis pyrioides 6 405
Stephanitis rhododendri 6 405
Stephanoceros 11 535
Stephanofilaria stilesi 5 260
Stephanocyphus 12 90
Stephanou, S. E. 1 301
Stephanurus 13 193
Stephenson, George 12 8, 13 166
Stephenson, J. 9 315
Steppe 3 190, 13 125*
  Asia 1 585 586
  vegetation distribution 14 290 291
Stepping of lenses 1 449
Stepping reflex 11 401
Steradian 7 610
Stercobilin 2 186
Stercobilinogen 4 171
Sterculia urens 6 297
Sterculiaceae 2 384, 5 275 8 82

hemistry 13 125 127
olute configuration
3 125-126
ydic hydrocarbon
1 243 244
mmetric synthesis
1 620-621
mical structures 3 32-42
mplex compounds
1 334 336
nformational analysis
1 397 398
ordination chemistry
5 461
merism, molecular
1 277 280
tical activity 9 346 348
ermation 11 199
lative configurations
13 125-126
olution 13 126
reospecific synthesis
13 127
e also Chelation
nilia 2 621
ll-surface differentiation
2 621
gastrula 3 255 261
gastrula larva 4 54
nifera 10 517
gnomogram (crystallog
y) 5 603
gnosis 13 127
gram 1 83
graphic measurement
croradiography) 8 368
graphic projection
rystallography 5 602-607
ap reproduction 8 97
ssmer 13 125
rbohydrate 2 455 454
phonic hearing (bin
al hearing) *see* Hearing
phonic sound 13 127 128
chitectural acoustics
1 520
roadcasting 11 250
nematography
3 127 129*, 9 357 358
ak recording and repro-
duction 4 243 244
agnetic recording 8 40
ptical recording 9 357 358
eproduction systems
12 321 322
plicating 10 156 13 679
opus *see* Stereoscopy
128
radiography metals
1 304
regular polymer 10 479
merope 13 128
microradiography 8 367
radiography 10 160 11 303
nicroscopic photography
160
nicroscopic rangefinder 11 340
Stereoscopic vision *see* Stereos
copy
Stereoscopy 13 128
binoculars 2 192
vision 14 338
Stereospecific catalyst
polyethylene 10 486
polypropylene 10 486
Stereospecific synthesis 13 127
Stereospondyli 1 334, 7 375,
13 128*
Stereotype 10 614
Steric effect (chemical reac
tion) 13 129-133
addition reactions 13 131
electrophilic substitution
13 133
elimination reactions
13 132
rearrangement 13 130
saturated nucleophilic
substitution 13 129
unsaturated nucleophilic
substitution 13 131
see also Chelation Stereo-
chemistry
Steric factors (chemistry)
3 460
Sterigmata 6 427
Sterigmatocystis niger see
Aspergillus niger
Sterility 11 479, 13 133* 526
Sterilization 13 133 157
autoclave 1 674
cathode rays 13 135
chemical 13 136
chlorine 13 136
filtration 13 136
food preservation
5 425-426
gamma rays 13 135
heat 13 133
hot-air 13 135
hydrogen peroxide 13 136
hydrostatic *see* Hydrostatic
sterilization
milk 8 434
ozone 13 136
radiation sterilization
13 135
tyndallization 13 134
ultraviolet radiation
13 135
Sterling silver 12 331
Stern, O 4 479 8 542
Stern W 10 35
Stern Gerlach experiment
8 542 11 157-158
Stern laver 4 479
Stern Volmer reaction
11 220
Stern wave train 12 278
Sterna hirunda 13 493
Sterna paradisaea 3 10
Sternabra 12 355
Sternapsis 10 461
Sternarchus albifrons 4 428
Sternaspidae 10 462
Sterneck, R 13 635
Sterninae 13 494
Sternite Crustacea
3 562 569
Sternopygus elegans 4 428
Sternorrhyncha 6 472 476
Alphidae 6 474
Aphoidea 6 474
Chermidae 6 475
Coccoidea 6 475
Psyllidae 6 473
Sternotherus 14 167
Sternotherus odoratus 14 167
Sternoxia *see* Elateroidea
Sternum 11 355
anatomy 12 363
Arthropoda 1 555
Crustacea 3 562-569
morphogenesis 12 355
Sternutator 3 45
Steroid 13 137-139
adrenal cortex steroid 1 71
aldosterone 1 232
androgen 1 398
bacterial biosyntheses 2 54
bile acid 2 185
biochemistry 12 567
digitoxigenin 4 192
hormone 6 480
hypersensitivity 6 590
industrial production by
fermentation 13 138
lipid 7 529
progesterone 10 644
source 13 137
sterol 13 139
structure 13 137
Steroid hormone 2 266
aldosterone 1 232
Cortical disorders 1 74
estrogen 5 77
stress (psychological)
13 181
Sterol 4 236, 13 137, 139-140*
absorption in blood 13 139
asymmetry 13 139
bile acid 2 185
biosynthesis 13 20
cell protoplast 2 613
cholesterol 3 84
ergosterol 5 65
excretion 13 139
glycoside 7 529
isolation 13 139
pathology 13 140
transformation 13 139
transport in blood 13 139
types 13 139
Sterrha bonifata 7 469
Stethoscope 13 361
Stetsen, R 3 201
Stevens, K D 9 128
STH *see* Growth hormone
Sthenon 4 543 544
Sthenopis 7 466
Sthenopis thule 7 466
Stibine 1 478, 6 532, 546
Stibnite 1 477, 8 277, 13 140*
Stichococcus 2 340
Stichocotyle nephropi 1 592
Stichocotylidae 1 592
Stichopathes ceylonensis 1 481
Stichopodidae 1 592
Stichopus 1 592, 6 465
Stickland reaction 2 46
Stickleback 6 71, 12 396,
13 140*
Sticktight flea 12 345
Stictia carolina 6 582
Stictochironomus 5 530
Stieltjes formula 7 165
Stieltjes integral 7 173
Stiff mud process 2 648
Stiffness (elasticity) 4 421-422
forced oscillation 5 437
spring coefficient 4 600
springs 6 342
Stigma 5 99 12 180
Stigmaria 3 228, 7 457, 10 417
Stigmatomycosis 14 602
Stilb 7 610
Stilbaceae *see* Stilbellaceae
Stilbella 13 140
Stilbella vulgare 13 140
Stilbellaceae 5 563, 13 140-141*
Stilbene dibromide 3 397
Stilbene dye 4 501
Stilbestrol 5 77
Stilbite 13 141*, 14 611
Stiletto fly 4 212
Still, stripping 13 186
Still wax 10 72
Stillwater complex 10 13, 51
Stilpnomelane 3 77
Stilt bug 6 401
Stilt root 8 90
Stilton cheese 3 15
Stilwell, G R 3 207, 4 265
Stimulated photoluminescence
10 168
Stimulation deafness *see*
Acoustic trauma
Stimuli (reproductive be-
havior) auditory 11 457
chemical 11 457
tactual 11 457
visual 11 457
Stimulus and response muscle
(biophysics) 8 637
perception 10 3
reflex, conditioned
11 397 399
reflex, unconditioned
11 399 402
Sting nematodes 9 603
Stingless honeybee 6 582
Stingray 11 331
Stink bug 6 401
Stinkhorn 6 469
Stinkpot 3 22
Stipa 3 190
Stipa spartea 3 190
Stipitatic acid 14 117

Stipule 7 434
Stirling's formula: Boltzmann statistics 2 280
combinations and permutations 3 305
gamma function 6 32
series 12 194
Stirodont dentition 4 374
Stirodonta 13 141
Stirring 8 522-524
Stizostedion canadense 14 585
Stizostedion vitreum 14 583
Stobbe condensation 5 374
Stochastic process 10 628; 13 59, 141-144*
learning theories 7 442
Markov process 13 142
martingale 13 144
processes with independent increments 13 144
queueing theory 11 188
stationary process 13 142
Stock, A 2 171, 291, 12 519
Stock (geology) 10 84, 421
Rocky Mountains 13 410
Stock (plant grafting) 2 361
Stock ale 8 80
Stock quotation ticker service 13 425
Stockard, C 11 476
Stockbridge damper 14 53
Stoddard solvent 6 422
Stoddart, D A 2 424
Stodola, F H 6 184
Stoechartrum giardia 9 415
Stoermer, C 14 265
Stoichiometry 13 144-147
alloy structures 1 262 263
concentration scales 3 361
definite composition, law of 4 43
heat calculations 13 147
industrial 13 147
molarity 13 145
nonstoichiometric compounds 9 138
normality 13 146
principles 13 144
titration 13 658
weight volume calculations 13 145
weight-weight problems 13 145
Stoker 13 593
moving grate 13 147
spreader 13 147
underfeed 13 147
Stokes, G G 12 513
Stokes-Cunningham factor 9 587
Stokes' formula 7 171
Stokes' law: aerosol 1 100
Avogadro number 1 697
centrifugation (biology) 2 638
Stokes' law—cont.
fluorescence *see* Fluorescence
particle properties 9 586
sedimentation (geology) 12 137
sedimentation (industrial) 2 635; 12 144
soil mechanics 12 451
viscosity 14 353
Stokes lines 11 333-334
Stokes shift (luminescence) 5 494
Stokes stream function 13 147-148
Stoke's theorem 2 414; 13 148*
STOL airplane 1 86
Stolella indica 10 201; 13 75
Stoll, A 11 81
Stolon 13 124
Stolonifera 1 455, 3 255; 13 148-149*
Stolotheca 6 258
Stolz, F 5 41; 6 484
Stomach 13 149
birds 4 158
carnivores 4 159
digestive gland 4 150
digestive system 4 152, 158, 166
embryology 4 158
feeding mechanisms and digestion 5 204
fish *4 158*
gastrointestinal track 6 71-72
peptic ulcer 9 628
physiology 4 166
reptiles 4 158
ruminants 4 158
Stomach disorders 13 149 150
congenital 13 149
inflammations 13 149
tumors 13 150
Stomach poison 7 140
Stomata 7 436-441
mechanism 10 288-289
Stomatitis 8 619
Stomatopoda 1 563, 3 563, 13 150 151*
distribution 13 151
economic importance 13 151
fossils 13 151
habitats 13 151
morphology 13 150
physiology 13 151
reproduction 13 151
Stomatoides 3 223
Stommel, H 9 247
Stomoblastula 9 562
Stomocord 5 3, 6 399
Stomodeum 5 280, 4 151
Stomopneustes 10 202
Stomopneustidae 10 202
Stomoxys 14 124
Stomoxys calcitrans 4 215
Stomphia 3 256
Stone, M. 2 289
Stone, Richard O. 10 415
Stone (avoirdupois weight) 8 188
Stone and stone products 13 151-153
broken stone 13 152
construction material 4 614
crushed stone 13 152
dimension stone 13 151
quarrying 11 180-181
slate (roofing stone) 13 152
soapstone 13 587
talc 13 586-587
Stone cameo 2 428
Stone canal Echinoides 4 375
Stone cat 2 552
Stone cell 12 78
Stone crab 4 33, 34
Stone crusher 11 181
Stone fly 10 415, 13 153
Stonefruit 1 494
Stone lithography 10 618
Stone settings 6 104
Stonehenge 1 515
Stoneley waves 12 151
Stoner, E C 4 97
Stoneware 10 546
Stony coral *see* Coral, stony
Stony-iron meteorite 8 315
Stony meteorites 13 420 421
heat production in 4 532
Stop band, filter 5 267
Stop cylinder presses 10 603
Stop watch 14 387
Stopback 13 598
Stopes, Marie C 3 232
Stoping (mining) 8 480-482
Storage battery 7 425, 13 153-159*
stationary installations 13 155
venting 13 159
see also Lead-acid storage battery, Nickel cadmium alkaline battery, Nickel iron alkaline battery, Silver oxide zinc alkaline battery
Storage devices 13 159
cam 2 421
cryogenic engineering 3 571
digital computer 4 177-182, 185-186
electrostatic storage tubes 13 159, 160-162
ferrite cores 5 221
magnetic core matrices 4 185, 13 159
Storage devices—*cont*
magnetic drums 13 159
mercury delay lines 13 159
register circuit 13 349
relay 4 178
sequential circuits 13 346
switching circuit 13 344
Storage tube 13 160 162
Charactron gun 13 162
erasing 13 160
Graphechon 13 161
Iatron 13 161
Memotron 13 162
Radechon 13 160
reading 13 160
recording 13 160-161
Tonotron 13 161
Typotron 13 162
visual 13 161
writing 13 160
Storax 4 358
Stored-program digital computers 4 175-188
Storis 1 524
Stork: Ciconiiformes 3 120
Storm 13 162-164
anticyclones 13 163
convergence patterns 13 162
divergence patterns 13 162
dust storm 4 296
electrical processes in 1 635
extratropical cyclones 13 162-164
frontal storms and weather 13 162
geomagnetic *see* Geomagnetic storm
hurricane 6 520 521
intertropical convergence 13 164
magnetic *see* Geomagnetic storm
middle latitude highs 13 163
principal cyclone tracks 13 164
radar detection 8 520
satellite observations 8 522
squall 13 21
thunderstorm 15 616
tornado 13 685
tropical 13 164, 14 116 117*
Storm petrel 10 637
Storm surge 13 165
Storm tide *see* Storm surge
Stout ale 8 80
Stove bolt 2 277
Stovko, N 4 335
Straight line mechanism 13 165 166
epicyclic 13 166
grasshopper linkage 13 166

ht line mechanism—cont
cantilever mechanism
13 166
tobers' mechanism
13 166
tuseff's linkage 13 166
ght run asphalt 1 591
ght run gasoline 6 71, *34 51*
ght mouted weevil 3 278
ght tube boiler 14 412
.n, R. H 3 80
in (mechanics) 4 421-422
1 167, 182 185
elastic 13 182
electrostrictive 4 541
Hooke's law 6 477
inelastic 13 182
linear 13 182
plastic 13 182
shearing 12 244, 13 182
structural deflections 13 203
volumetric 13 182
see also Stress and strain
train (rock) 3 369, 12 149
train gage 13 167
bonded 13 167
as pressure transducer 13 583
in servomechanisms 13 201
train rosette 13 168
temperature effect 13 167
unbonded 13 167
weight measurement 14 463
Strain hardening 8 269 270 11 618 13 182
Strain markings 8 293
Strain rate 10 398 402
Strain rosette *13 168*
Strain seismograph 12 147
Strain seismometer 4 549
Strait of Gibraltar 1 107, 8 207
Strait of Magellan 12 527
Strait of Messina 8 207
Strait of Sicily 1 107 8 207
Straits of Dover 9 165
Straits of Florida 6 294
Stramonium 9 547
Strand K A 2 189 13 43
Strand line 13 168
Baltic basin 2 88
interglacial 6 192
Strand line pools 10 63
Strange particle 4 544 13 168
hyperon 6 587 588
K meson 8 247 251
Strangeness conservation 13 168
hyperons 6 588
mesons 8 249
Strasburger, E. 13 573
Strassmann F 3 49 34 209
Strata (archeology) 1 514
Strata, rock *see* Stratigraphy
Strategy, game of, game theory 6 24-30
Stratification (sedimentary rocks) 12 130
Stratigraphic anticline 1 469
Stratigraphic nomenclature 13 168 170
categories of subdivisions 13 168
names of subdivisions 13 169
Pleistocene time units 6 195
Stratigraphic oil fields 5 175
Stratigraphic syncline 13 373
Stratigraphic traps (petroleum) 10 63
Stratigraphy (archeology) 1 514
Stratigraphy (geology) 6 141, 13 170-171*
coal measures 3 240
facies 5 175-177, 12 142
objectives of 13 170
palynology 9 527
Stratiomyidae 4 212
myiasis 8 680
Stratiotes 10 332
Stratocumulus 3 211 212
Stratopause 1 628 8 324
Stratosphere 1 627 628 13 171*
aeronomy 1 98
freezing trap 1 630
polar regions 10 441
radioactive fallout 11 267
Stratum germinativum 12 47
Stratum granulosum 11 469, 474
Stratus 3 210 212
Straub F B 8 642
Straub, R. W 4 175
Stravinsky Igor 1 552
Strawberry 5 548 549, 13 171-172*
diseases 13 172
distribution 13 171
foliage diseases 13 172
fruit diseases 13 172
harvesting 13 172
importance 13 171
nematodes 13 172
propagation 13 172
root diseases 13 172
Stray currents terrestrial electricity 13 506
Streak plate technique 2 6 3 616
Stream 11 581
base level 5 359
branch 11 581
brook 11 581
creek 11 581
exotic 11 581
flow forecasting 12 393
flow in karst regions 7 332 333
Stream—*cont*
flow measurement 13 172
fork 11 581
genetic types 5 357
gradients 5 179
intermittent 11 581
loads 13 173
see also Stream transport and deposition
patterns 5 360
power from 14 399
profile 5 359
reach 11 581
river 11 581 583
subterranean 2 571
terraces 5 360
see also River
Stream channel braided pattern 10 259
capacity 13 320
cutoff 5 311
diversion 5 311
migration 5 311
shape 13 320 321
slope 13 321
surface water 13 516 521
Stream diversions in delta growth 4 50
on flood plains 5 311
Stream erosion abrasion 5 358
base level 5 359
cavitation 5 358
plains 10 257 258
solution 5 359
undercutting 5 359
Stream flow extreme peak flows 13 318
flow-duration curves 13 318
records 13 318
seasonal distribution 13 318
and water quality 13 319 320
water source 13 317
Stream function, Stokes *see* Stokes *stream function*
Stream gaging 13 172-173
open channels 3 9
Stream pollution allowable load 12 217
deoxygenation 12 216
oxygen balance 12 217
sewage disposal 12 215
Stream sanitation studies 13 318
Steam transport and deposition 12 136 137 13 173 174*
bottom load 12 136
debris transport 13 173 174
delta deposits 4 48 51
flood plain deposits 5 310, 10 259
meander sediment
Steam transport and deposition—*cont*
relationships 5 311 312
modified Einstein procedure 13 174
suspended load 12 136
traction load 12 136
Streaming birefringence 2 248
Streaming potential 13 174
electrokinetic phenomena 4 479
see also Electroosmosis
Streamline Bernoulli's theorem 2 169
doublet flow 4 269
Streamline flow 5 324, 13 175*
laminar flow 7 388
Streamlining 13 175 177
airplane 1 210
subsonic 13 176
supersonic 13 176
Streblidae 4 212
Street, K. 2 416, 14 67
Street lighting incandescent lamps 7 50 54
parallel system 4 423
series system 4 423
sodium-vapor lamp 12 412
Streetsia challengeri 6 586
Strength, dielectric *see* Dielectric strength
Strength of materials 13 177
hardness scales 6 337 338
loading, transverse 7 565 568
stress and strain 13 182 185
Strepsiptera 3 277
Streptidine 6 224
Streptobacillary fever 11 346
Streptobacillus 5 96
Streptobacillus monili 11 345
Streptobacillus moniliformis 2 71
Streptocara 13 7
Streptoces noursei 1 466 467
Diplococcus 7 381
Lactobacillaceae 7 381 382
Leuconostoc 7 381
Pediococcus 7 381
Peptostreptococcus 7 381
Streptococcus 7 381
Streptococci blood plate hemolysis 2 270
breast disorders 2 326
fluorescent antibody method 8 383
pathogen (soil) 9 594
pharynx disorders 10 100
rheumatic fever 11 545
Streptococcus 2 6 13 177-178*
antimicrobial action of penicillin 9 620
arthritis 1 554
bacterial enzymes 2 20
beer infections 8 81
dextran 4 91

Streptococcus—cont
epidemiology 13 178
erythromycin 5 66 67
growth in liquid media 13 178
growth media 13 178
growth on solid media 13 178
important species 13 178
lactic acid formation 2 41
Lactobacillaceae 7 381
Lancefield differentiation scheme 7 390
leukocidin 7 485
milk contamination 8 431
morphology 13 177
oxygen relationship 13 178
Streptococcus cremoris 2 380
Streptococcus diacetylactis 2 380
Streptococcus faecalis 2 461, 5 569, 7 381
bioassay 2 194
Streptococcus hemolyticus
antibiotics active against 1 466-467
mastitis (cows) 8 170
rheumatic fever 11 545
scarlet fever 12 50
skin disorders 12 569
taxonomy 13 178
Streptococcus lactis 2 380, 3 12, 8 431 433
lactic acid 7 378
Streptococcus lactis var *maltigenes* 2 380
Streptococcus pyogenes 2 19, 461, 7 35, 13 253
Streptococcus salivarius 2 49
Streptococcus thermophilus 3 14, 8 431, 433, 435
Streptococcus viridans 6 359, 10 426, 13 528
Streptodornase 2 19, 20
Streptokinase 2 19, 20
virulence 14 330
Streptomyces 1 466-467, 8 340, 12 461, 13 179
Actinomycetaceae 1 56
Streptomyces albo niger 1 466-467
Streptomyces ambofaciens 1 466 467
Streptomyces antibioticus 1 466-467
Streptomyces aureofaciens 1 466-467, 3 83, 13 527
Duggar 4 53
Streptomyces bikiniensis 1 466 467
Streptomyces erythreus 1 466 467, 5 66
Streptomyces fradiae 1 466-467, 9 35
Streptomyces garyphalus 3 643
Streptomyces griseus 1 466-467, 5 563, 8 583, 13 179
Streptomyces halstedii 1 466-467, 2 461
Streptomyces hygroscopicus 2 461
Streptomyces kanamyceticus 1 466-467, 7 329
Streptomyces lavendulae 3 643
Streptomyces mashuensis 1 466-467
Streptomyces niveus 1 466-467
novobiocin 9 173
Streptomyces nodosus 1 341-342, 466-467
Streptomyces noursei 1 466-467, 5 563, 9 230
Streptomyces orchidaceus 1 466-467, 3 643
Streptomyces orientalis 1 466-467
Streptomyces punuceus 1 466-467
viomycin 14 327
Streptomyces rimosus 1 466-467
oxytetracycline 9 474
Streptomyces spheroides 1 466-467
novobiocin 9 173
Streptomyces venezuelae 1 466-467
Streptomyces viridifaciens 13 529
Streptomycetaceae 13 178 179
Actinomycetales 1 56
bacteria taxonomy of 2 11
Streptomycin 1 464 468, 475, 7 314 *13 179 180*, 13 528*
para Aminosalicylic acid 1 320
antimicrobial spectrum 13 179
development of drug resistance 4 276
glycoside 6 224
with Isonicotinic acid hydrazine 7 283
medical mycology 8 678
pharmacology 13 180
plague 10 256
plant disease control 10 516
source of guanidine group in molecule 1 529
use in tuberculosis 13 179
Streptopelia risoria 3 302
Streptose 6 224
Streptosporangium 1 57
Stress (mechanics) 13 182 185
analysis 10 149 151
anelastic 1 400-401
breaking stress 13 183
Stress (mechanics)—*cont*
combined stresses 13 183, 552
compressive 4 419, 13 182
creep of materials 3 540-541
elastic 4 419-422
Hooke's law 6 477
impact strength 13 184
metals 8 267-269
modulus of elasticity 14 606
modulus of rupture 13 183
Mohr's circle 13 184
photoelastic analysis 10 149-151
plastic deformation of metals 10 398-402
proportional limit 13 183
resilience 11 487
shear 4 419, 12 245, 13 182
strain gage 13 187
strain rosette 13 168
stress strain diagram 8 269 270, 13 182
structures 13 195-199*, 203
tensile 4 419 420 13 182
thermal 13 552 553
ultimate strength 13 183
Stress (psychological) 13 180 182
in biology 13 180
endocrine mechanisms 4 595
in engineering 13 180
measurement 13 180
personality theory 10 36
in physics 13 180
systematization of terminology 13 181
Stress (rock) *4 613 5 192,* 12 149
Stress (soil) 12 456 457
Stress and strain 13 182 185
see also Stress (mechanics)
Stress concentration 13 185
dissipation 13 185
fatigue failure 13 185
relief by plastic yielding 13 185
Stress corrosion 8 490, 8 293
Stress elongation behavior of polymers 10 476
Stress relieving (metals and alloys) 6 579
Stressocoat technique 2 285
Stressor 13 181
Stretch forming sheet metal 12 250-251
Stretch receptor its control 10 528
posture regulation of 10 528
Stretch reflex 11 401
regulation of 10 528
Stretching sheet metal 12 249 250
Striatal body (nerve) 9 57
Striated muscle *see* Skeletal muscle
Striation (glow discharge) 13 185
Stridulation 6 400 410
Striga 10 336, 13 664
Strigidae 13 185
Strigiformes 1 694, 9 460, 13 185-186
Strigomonas 1 700
Strike (geology) 5 192
Strike-slip fault 5 192, 13 570
Stringed instruments 8 665 667
Stringocephalus burtini 4 87
Stringocephalus fauna 4 89 90
Stringocephalus zone 4 88
Strings vibration 14 513
Strip chart recorders 11 380
Strip mining *see* Mining, strip
Striped bass 2 109
Striped cucumber beetle 3 287
Striped killifish 3 648
Striped maple 8 99
Striped thrips 13 628
Striplines 8 425
Stripper (gas liquid mixtures) 13 186
Stripping petroleum engineering 10 59
Stripping (gas-liquid mixtures) 13 186
Stripping reaction nuclear reactions 9 200
StriPrinter 3 348
Strix nebulosa 9 460
Strix varia 9 460
Strobila 12 165
Strobilanthes 10 537
Strobilization animal 11 448
Strobilus Cyclophyllidea 3 641 642
Stroboscope 13 186-187
Stroboscopic photography 10 160, 13 187 190*
Strobmeyer, F 2 586
Stroke G W 4 265, 7 501
Stroke hemorrhage 6 412 413
Parkinson a disease 9 567
Stroma 7 267
Stromatetidae 10 10
Stromatolite 1 237, 13 190 191*
limestone 7 516
Stromatoporoidea 3 261, 13 191 192*
Sphaeroidaceae 12 604
Strombacea 6 76
Strombidae 5 361
Strombidium 9 317
Stromboli 5 120
Strombolian eruptions 14 554
Strombomonas 5 98 99
Strombus gigas 3 361 6 131
Strombus pugilis 3 361
Stromgren, Elis 5 312

- ...ering alteration (physics) 9 356-366 13 362 363
- ...ongylida 9 30
- ...ongylidae 13 193
- ...ongylocentrotidae 4 372
- ...ongyloidea 13 192 193
  - diagnosis 13 193
  - economic importance 13 192 193
  - life history 13 192
  - morphology 13 192
  - prevention 13 193
  - treatment 13 193
- *...ongyloides ransomi* 11 540
- *...ongyloides stercoralis* 11 540 541 13 193
- ...rongyloidiasis 13 193 194
- ...rongylus 11 511, 13 193
- ...ucturanite 13 194
- strontianite
  - carbonate minerals 2 468
  - strontium ore 13 194
- Strontium 13 194 195
  - analytical methods 13 195
  - in aragonite 1 496
  - in celestite 2 587
  - content in present day organisms 9 517 518
  - electron configuration 4 504
  - extraction of the metal 13 194
  - extractive metallurgy 8 278
  - ionization potential 4 504
  - isotopes in nature 11 595
  - limestone 7 515
  - organometallic compound 9 402
  - principal compounds 13 194
  - properties 13 194
  - uses 13 194
- Strontium 90 12 567
  - radioactive fallout 11 268
- Strontium titanate imitation of diamond 6 101
- Strophanthin 6 115 13 195
- Strophanthus 6 115 13 195
- *Strophanthus hispidus* 13 195
- *Strophanthus kombe* 13 195
- Strophiole 12 144
- Strophomena 2 315
- Strother W 10 126
- Strouhal V 1 91
- Strouhal number 1 91
  - aeroelasticity 1 91
  - aircraft noise 1 183
- Stroyer Almon B 13 358 415
- Stroyer switch *see* Step-by Step switch
- Structural adhesive *see* Adhesive structural
- Structural analysis 13 195 199
  - equilibrium 13 196
  - indeterminate trusses 13 198
- Structural analysis—*cont*
  - influence lines 13 198
  - model analysis 13 199
  - principle of superposition 13 196
  - statically determinate structures 13 196
  - statically indeterminate structures 13 196
  - structural deflections 13 203
  - wind stresses 13 196
- Structural anticline 1 469
- Structural bonding 1 67
- Structural connections 13 199 203
  - bolted joint 2 277
  - eccentrically loaded connections 13 201
  - joint (mechanical) 7 316
  - moment-resisting connections 13 202
  - pinned connections 13 202
  - riveted joint 11 587 588
  - riveted or bolted web connections 13 199 200
  - rivets in tension 13 201
  - seat connections, stiffened 13 201
  - seat connections unstiffened 13 200
  - welded joint 14 464 465
  - welded web connections 13 200
- Structural deflections 13 203
  - beam 13 203
  - Maxwell's law of reciprocal deflections 13 203
  - truss 13 203
- Structural design architectural engineering 1 520 521
  - combined axial and bending moments 2 114
  - thermal stress 13 532
- Structural drawing 4 612
- Structural engineering 12 449 458
- Structural flight tests 1 191
- Structural geology 6 140 13 203 204*
  - diapiric structures 4 102
  - experimental models 13 204
  - experimental tests 13 204
  - extrusive structures 14 353
  - fabric analysis 13 204
  - fault and fault structures 5 191 195
  - fold and fold systems 5 367
  - geosyncline 6 173
  - intrusive structures 14 353
  - laboratory experiments *see* Rock mechanics
- Structural geology—*cont*
  - suboceanic 13 220-223
  - tectonic patterns 13 263, 406 413
- Structural materials 13 204 205
  - brick 2 330
  - building stone 13 151-152 205
  - cement asbestos 2 627
  - clay products 3 167 168, 13 201
  - concrete 13 205, 362 366
  - laminated structural lumber 13 205
  - structural metals 13 205
  - structural steel 13 206
  - wood 13 205
- Structural members beam columns 2 114
  - beams 7 565 568
  - bending moment 2 162
  - cantilever 2 439
  - column 3 302 305
  - concrete beam 3 367 370
  - concrete column 3 370 371
  - concrete slab 3 371-373
  - curved bars 3 631 632
  - girder plate 6 188
  - gypsum plank 6 301
  - plates 10 407 410
  - shear center 12 244
- Structural petrology 13 205 206
  - metamorphic rocks 8 297
- Structural plate *see* Plate structural
- Structural shells barrel shaped 11 620
  - cylindrical 11 620
  - dome-shaped 11 620
  - hyperbolic paraboloid 11 620
  - spherical 11 620
- Structural steel 13 206
- Structural syncline 13 373
- Structural testing aircraft 1 188
- Structural tile 3 167
- Structure spacecraft *see* Spacecraft structure
- Structures arch 1 507 509
  - beam vibrations 8 192-193
  - bridge 2 331
  - buildings 2 363
  - chimney 3 61 62
  - cofferdam 3 267 268
  - dam 4 5 11
  - flexural members 13 203
  - groin 6 275
  - joint (mechanical) 7 316
  - loads dynamic 7 568 569
  - loads repeated 7 569
  - missile launching block house 7 417 419
  - molecular sieve 8 546
  - pile foundations 10 226 229
- Structures—*cont*
  - pressure vessel 10 584 585
  - retaining wall 11 534 535
  - sea wall 12 101
  - space vehicle 12 546-556
  - stress and strain 13 195-199
  - structural connections 13 199 203
  - *see also* Structural analysis
- Structures (engineering) 3 149, 13 206*
  - design 13 206
  - trestle 14 80-81
  - truss 14 121
  - types 13 206
- Structures, statically indeterminate cantilever
  - method for wind stresses 13 196
  - Castigliano's theorem 13 197
  - method of least work 13 197
  - moment-distribution method 13 197
  - portal method for wind stresses 13 196
  - slope deflection method 13 197
  - three-moment equation 13 197
- *Struthio* 9 449
- *Struthio camalus* 9 449, 13 206
- *Struthiominus* 4 199
- Struthionidae 13 206
- Struthioniformes 1 694, 13 206 207*
  - ostrich 9 449
- Strutt, J W 8 320
- Strychnine 7 62, 10 434 13 207*
  - Gentianales 6 115
  - rodenticide 11 615
- Strychnos 6 115 13 207*
- *Strychnos castelnaei* 13 207
- *Strychnos nux vomica* 13 207
- *Strychnos tieute* 13 207
- *Strychnos toxifera* 13 207
- *Strymon acadica* 7 463
- *Strymon liparops* 7 463
- Stuart factor 2 266
- Stubaier Alps 5 117
- Stubble-mulch farming 12 435
- Stucco 10 397
- Stud fastener 12 86
- Student *t* distribution *see t* Distribution
- Stuhlinger E 7 245
- Sturgeon 1 46, 13 207-209*
- Sturm's theorem 5 47
- *Sturnella magna* 7 404
- *Sturnella neglecta* 7 404
- Sturnidae 13 54
- *Sturnus vulgaris* 13 54
- Stuttering 12 598
- Stv 13 208
- *Styela* 2 257, 3 168 4 566

Streptococcus—cont
epidemiology 13 178
erythromycin 5 66 67
growth in liquid media 13 178
growth media 13 178
growth on solid media 13 178
important species 13 178
lactic acid formation 2 41
Lactobacillaceae 7 381
Lancefield differentiation scheme 7 390
leukocidin 7 485
milk contamination 8 451
morphology 13 177
oxygen relationship 13 178
Streptococcus cremoris 2 380
Streptococcus diacetylactis 2 380
Streptococcus faecalis 2 461, 5 369, 7 381
bioassay 2 194
Streptococcus hemolyticus
antibiotics active against 1 466-467
mastitis (cows) 8 170
rheumatic fever 11 545
scarlet fever 12 50
skin disorders 12 369
taxonomy 13 178
Streptococcus lactis 2 380, 5 12, 8 431, 433
lactic acid 7 378
Streptococcus lactis var *maltigenes* 2 380
Streptococcus pyogenes 2 19, 461, 7 35, 13 253
Streptococcus salivarius 2 49
Streptococcus thermophilus 5 14, 8 431, 433, 435
Streptococcus viridans 6 359, 10 426, 13 528
Streptodornase 2 19, 20
Streptokinase 2 19, 20
virulence 14 330
Streptomyces 1 466 467, 8 340, 12 461, 13 179
Actinomycetaceae 1 56
Streptomyces albo niger 1 466 467
Streptomyces ambofaciens 1 466 467
Streptomyces antibioticus 1 466 467
Streptomyces aureofaciens 1 466 467, 5 83, 13 527
Duggar 4 53
Streptomyces bikiniensis 1 466-467
Streptomyces erythreus 1 466 467, 5 66
Streptomyces feofaciens 13 529
Streptomyces floridae 1 466-467
Streptomyces fradiae 1 466-467, 9 35
Streptomyces garyphalus 3 643
Streptomyces griseus 1 466 467, 5 563, 8 583, 13 179
Streptomyces halstedii 1 466 467, 2 461
Streptomyces hygroscopicus 2 461
Streptomyces kanamyceticus 1 466-467, 7 329
Streptomyces lavendulae 3 643
Streptomyces mashuensis 1 466-467
Streptomyces niveus 1 466-467
novobiocin 9 175
Streptomyces nodosus 1 341 342, 466 467
Streptomyces noursei 1 466-467, 5 565, 9 230
Streptomyces orchidaceus 1 466 467, 5 643
Streptomyces orientalis 1 466 467
Streptomyces puniceus 1 466-467
viomycin 14 527
Streptomyces rimosus 1 466-467
oxytetracycline 9 474
Streptomyces spheroides 1 466-467
novobiocin 9 173
Streptomyces venezuelae 1 466-467
Streptomyces viridifaciens 13 529
Streptomycetaceae 13 178 179
Actinomycetales 1 56
bacteria taxonomy of 2 11
Streptomycin 1 464 468, 475, 7 314, 13 179 180* 13 528
para Aminosalicylic acid 1 520
antimicrobial spectrum 13 179
development of drug resistance 4 276
glycoside 6 224
with Isonicotinic acid hydrazine 7 283
medical mycology 8 678
pharmacology *13 180*
plague 10 256
plant disease control 10 316
source of guanidine group in molecule 1 529
use in tuberculosis 13 179
Streptopelia risoria 5 302
Streptose 6 224
Streptosporangium 1 57
Stress (mechanics) 13 182 185
analysis 10 149 151
anelastic 1 400-401
breaking stress 13 183
Stress (mechanics)—*cont.*
combined stresses 13 185, 552
compressive 4 419, 13 182
creep of materials 3 540 541
elastic 4 419 422
Hooke s law 6 477
impact strength 13 184
metals 8 267-269
modulus of elasticity 14 606
modulus of rupture 13 183
Mohr's circle 13 184
photoelastic analysis 10 149 151
plastic deformation of metals 10 398-402
proportional limit 13 183
resilience 11 487
shear 4 419, 12 243, 13 182
strain gage 13 167
strain rosette 13 168
stress-strain diagram 8 269-270, 13 182
structures 13 195-199*, 203
tensile 4 419 420 13 182
thermal 13 552-553
ultimate strength 13 183
Stress (psychological) 13 180-182
in biology 13 180
endocrine mechanisms 4 595
in engineering 13 180
measurement 13 180
personality theory 10 36
in physics 13 180
systematization of terminology 13 181
Stress (rock) 4 613, 5 192, 12 149
Stress (soil) 12 456-457
Stress and strain 13 182 185
see also Stress (mechanics)
Stress concentration 13 185
dissipation 13 185
fatigue failure 13 185
relief by plastic yielding 13 185
Stress corrosion 3 490, 8 293
Stress elongation behavior of polymers 10 476
Stress relieving (metals and alloys) 6 579
Stresscoat technique 2 285
Stressor 13 181
Stretch forming sheet metal 12 250 251
Stretch receptor its control 10 528
posture, regulation of 10 528
Stretch reflex 11 401
regulation of 10 528
Stretching; sheet metal 12 249 250
Striatal body (nerve) 9 57
Striated muscle *see* Skeletal muscle
Striation (glow discharge) 13 185
Stridulation 6 400 410
Strigа 10 556, 13 664
Strigidae 13 185
Strigiformes 1 694, 9 460, 13 185-186
Strigomonas 1 700
Strike (geology) 5 192
Strike slip fault 5 192, 11 570
Stringed instruments 8 665 667
Strongylocephalus burtini 4 87
Strongylocephalus fauna 4 89 90
Strongylocephalus zone 4 88
Strings' vibration 14 313
Strip chart recorders 11 380
Strip mining *see* Mining, strip
Striped bass 2 108
Striped cucumber beetle 3 297
Striped killfish 3 648
Striped maple 8 99
Striped thrips *15 628*
Striplines 8 423
Stripper (gas liquid mixtures) 13 186
Stripping petroleum engineering 10 59
Stripping (gas liquid mixtures) 13 186
Stripping reaction nuclear reactions 9 200
StriPrinter 3 518
Strix nebulosa 9 460
Strix varia 9 460
Strobila 12 165
Strobilanthes 10 337
Strobilization animal 11 448
Strobilus Cycliophyllidea 3 641 642
Stroboscope 13 186 187
Stroboscopic photography 10 160 13 187 190*
Strohmeyer, F 2 386
Stroke G W 4 205, 7 501
Stroke hemorrhage 6 412 413
Parkinson s disease 9 567
Stroma 7 267
Stromateidae 10 10
Stromateoides 1 237 13 190 191*
limestone 7 516
Stromatoporoidea 3 261, 13 191 192*
Sphaeroidaceae 12 604
Strombacea 6 76
Strombidae 3 361
Strombidium 9 317
Stromboli 5 120
Stromboltian eruptions 14 554
Strombomonas 5 95 99
Strombus gigas 3 361, 6 151
Strombus pugilis 3 361
Stromgren, Elis 3 512

Schwyz bur 13 323 325
Schwyzian water 6 276
Schwyzian watercourse 3 571
Sebilia 1 461 468, 13 230 231*
amino acids 1 305
in food processing 13 231
mode of action 13 231
production 13 230
Sebaceous 13 231
analog computer solution 1 368 370
digital computer 4 182
number systems 9 220
Sebaceous colorimeter 3 301
Sebaceous processes color photography 10 167
Subtropical Convergence 1 199
Subtropical easterlies 14 495
Subtropical oceanic high 14 448
Subsilite 9 54
Subsilva 9 475
Subsilva brumpti 9 473
Subulundae 9 457
Succavi 12 1
Succession ecological 3 325, 4 498, 5 12 15, 13 231 236*
classification of seres 13 232
climax and climate 13 234 235
climax community 3 192 186
the climax complex 13 234
convergence toward the climax 13 235
effects of changing climate 13 234 235
forest 5 450-451
importance 13 235 236
monoclimax and polyclimax concept 13 234
mosaic nature 13 235
nature of succession 13 233 234
prevalence 13 235 236
regional climax 13 234
sere 13 231 232
stages 13 232 233
subclimax 13 234
succession and zonation 13 233
succession based upon soil development 13 233 234
succession retrogression cycles 13 233
tension zones 13 235
types 13 231
uses of succession by man 13 236
Succinamide 3 303
Succinate 3 74
Succinic acid 2 55 475 3 79 3 80 14 128
Krebs cycle 7 370
Succinyl CoA 2 57
pantothenic acid 9 538
Succinyl glycine 2 57
3 Succinyl 6 hydroxypyridine 2 57
Succinylcholine 6 508
Succus entericus 4 172 5 204, 7 531
Sucker 3 648 13 236*
Sucker rod type pumps 9 284
Suckfly 6 405
Sucking lice *see* Lice, sucking
Sucrase 2 461
Sucrose 13 236*, 237
biosynthesis 13 236
carbohydrate metabolism 2 458
dextran 4 91
food manufacturing 5 409
fructose 5 541
invert sugar 13 236
plant metabolism 10 352
plant translocation (organic solutes) 10 380
uridine diphosphoglucose (UDPG) 14 219
Suctorida 6 467, 11 53, 13 236 237*
Sudden ionospheric disturbance (SID) 13 285
Sudiferous gland 14 546
Suede leather 7 447
Suess, E 2 239
Suess H F 4 552, 11 294
Suez Canal 8 207
ship clearance 12 257
Suffolk stallion 6 489
Sugar 5 541, 9 515 13 237 240*
beet residue use 13 238
beet sugar 13 238
beet sugar refining 13 238
cane juice 13 237
cane sugar manufacture 13 237
comparison with synthetic sweeteners 13 239
diseases 13 240
harvesting 1 131
honey 13 239
lactose 13 239
maple sugar 13 239
molasses 13 238 239
monosaccharide 8 578
nutritional value 13 238
other sources of 13 238
raw cane sugar 13 237
starch 13 239
sucrose 13 236
syrup 13 239
use in organic synthesis 13 238
wood chemicals 14 528
Sugar alcohols 8 582
Sugar beet 13 240 241
black root 13 241
curly top 13 240
leaf spot 13 241
Sugar beet—*cont.*
virus yellows 13 241
world beet sugar production 13 240
Sugar cane 13 241 243
chromosome number 13 241
diseases 13 243
structure 13 241
world cane sugar production 13 242
Sugar crops 13 243-244
Sugar maple 8 99
Sugar mercaptals 8 581
Sugar metabolism· insulin 7 163
see also Carbohydrate metabolism
Sugar palm 13 243
Sugar phosphates 8 582
Sugar vinegar 14 324-325
Sugarberry 6 515
Sugden, S 9 543
Suidae 1 568, 6 460
Suiformes 1 567
Suint wool 14 546
Sulaiman Range 1 577
Sulawesi 4 357
Sulcus 9 57
Sulfa drugs 13 244-245*, 625
activity 13 244
and antibiotic 1 464-468
bacterial resistance 13 245
mode of action 13 244
side effects 13 244
Sulfadiazine 2 257, 11 114, 13 244
Sulfadimetine 13 244
Sulfaguanidine 13 244
Sulfamate 13 245
saccharin 12 1
Sulfamerazine 2 257 11 114
Sulfamethazine 11 114
Sulfamethoxypridazine 13 244
Sulfamic acid 13 245
Sulfane 5 41
Sulfanilamide 5 29
Sulfanilic acid 13 245
Sulfapyridine 11 111, 13 244
Sulfate 13 245, 264
calcium 2 399
chemical oxidant 9 464
sulfonation 13 251 252
Sulfate process beryllium metallurgy 2 176 177
cellulose 2 625
wood pulp 9 539
Sulfate reducing bacteria 12 140
in Black Sea 12 140
see also Clostridium Desulfovibrio, Soil microorganisms
Sulfate turpentine 13 587
Sulfathiazole 13 244, 599 600
Sulfenamide 13 246
Sulfenic acids 13 262
Sulfenone miticide 8 518
Sulfenyl chloride 9 405, 13 245 246*
Sulfenyl thiocyanate 13 603
Sulfetrone 13 253
Sulfhydryl compounds 8 227
organosulfur compound 9 405
Sulfide 13 246
olefin *see Olefin* sulfide
organosulfur compound 9 405
silicon 12 322
see also Thioether
Sulfide minerals 13 246
Sulfide ores 9 379 383-389, 13 246
pyrometallurgy 11 119
Sulfide phase equilibria 13 246-251
experimental techniques 13 247
identification of phases 13 248
phase relations in binary systems 13 248 249
phase relations in ternary systems 13 249
quenching procedures 13 247 248
reaction rates 13 247 248
Sulfide research sample containers 13 247-248
Sulfinic acid 13 251, 262
beta-Sulfinylpyruvic acid 3 649
Sulfisoxazole 13 244
Sulfite 13 251, 260
Sulfite process cellulose 2 625
wood pulp 9 539, 14 529
o-Sulfobenzoic imide *see* Saccharin
Sulfonal hypnotic 13 263
Sulfonamide 1 302, 475, 13 244, 251*
para Aminobenzoic acid 1 319
bacillary dysentery 2 2
infusion blennorrhea 7 55
organosulfur compound 9 405
plague 10 256
Sulfonamide-formaldehyde resins 14 217
Sulfonate 13 251 252
Sulfonation 13 251 252
alkane 1 250
catalysts 13 252
equipment 13 252
industrial aspects 13 251
sulfonating and sulfating agents 13 252
sulfonic acid 13 253 254
sulfonyl chloride 13 254
uses of sulfonates and sulfates 13 252

Stylaster 3 255
Stylasterina 3 255, 13 208
Stylidium 5 37
Stylifer 1 593
Stylinodon 13 386
Stylinodontinae 13 386
Stylocheata 6 77
Stylocheiron 4 40
Stylochus ellipticus 10 466
Stylolites 7 516, 13 208*
Stylommatophora 6 77
Stylomysin *see* Puromycin
Stylomyzhia 6 598
Stylophora 12 76
Stylopidae 3 277
Stylus Coleoptera 3 275-288
Styptic 1 290
Stypticin 9 4
Styptol 9 4
Styracaceae 4 358
Styrax benzoin 4 358
Styrax officinalis 4 358
Styrene 6 535, 10 467, 13 208 209
butadiene styrene rubber 11 639
coal chemical 3 235
petrochemical 10 45
polystyrene resin 10 490
Styrene butadiene copolymer 10 491
paint latex 10 46
rubber 10 46
Styrian Alps 5 117
Styrofoam thermal insulator 6 374
2-Styrylquinoline 11 193
Subacute bacterial endocarditis 1 466-467, 7 30
Subadult 5 32
Subaerial solution of limestone 7 532
Subalpine fir 5 278
Subantarctic Intermediate Water 1 626
Subarctic Bottom Water 1 626
Subarctic Brown Forest soils 12 441
Subarctic islands 1 521-525
Subarkose 1 532
Subbituminous coal 3 230 231, 8 452
Subboundaries metallography 8 293
Subcarrier modulators telemetering 13 428
Subcellular fraction RNA nucleotide composition 9 210
Subclavian artery 1 487
anomalies 2 517
Subclimax, ecology 13 232, 234
Subclover 3 220
Subcutaneous connective tissue 1 70
Subdivision draft 12 274
Subdivision of ships 12 274
Suberic acid 2 475
Suberin 2 617, 10 277
Suberites domuncula 10 519
Suberites ficus 3 159
Subgiant star *13 40-45, 209**
Subgraywacke 12 142, 241; 13 209*
Subhedral crystals 7 11
Subimago 5 32
Subjective tones 8 160
Sublacustrine canyon 14 146
Sublepidophloios 7 457
Sublepidophloios ventricosus 7 457
Sublevel caving (mining) 8 482
Sublimation 13 209-210*; 14 346
Born-Haber cycle 7 249
energy requirements 13 210
purification of reagent chemicals 11 370
separation (chemical and physical) 12 186
triple point 13 210
vapor pressure 13 209
see also Distillation
Sublimation, heat of 4 519
Sublingual gland 4 164
Subluttoral zone 8 108
Submachine gun 1 537 538
Submandibular gland 9 370
Submarine 13 210-215
antisubmarine warfare 1 484-487
autopilot 1 689
classification 13 211
design 13 210-111
ECM systems 4 521
equipment 13 211 214
escape system 13 213
nuclear propulsion 13 215
nuclear reactors 11 361 363
periscopes 13 215
propulsion 13 214 215
rescue chamber 13 213 214
resistance 12 279
salvage 12 285
simulator 12 340
snorkeling 13 215
sonar 12 502 501
stability 12 272 273
torpedo firing 13 213
trim 12 272 273
Submarine cable breaks in 13 215
telegraph 13 424
telephone service 13 439
Submarine canyon 13 215 216
erosion of 14 146 147
Gulf of Mexico 6 293
longshore sediments 12 305
Submarine design 14 2 6
Submarine geology *see* Marine geology
Submarine periscope 10 18
Submarine simulator 12 340
Submarine telephone cable
overseas telephone service 13 439
repeaters 13 439
Submarine tender 12 267
Submarine topography 13 216-225
abyssal floor 13 218-219
Atlantic Ocean 1 623
off coast of California 8 133
continental margins 13 216 218
continental shelf and slope 3 423
deep sea trenches 13 222
deeps (table) 4 326
guyot 12 122-123
Indian Ocean 7 56-57
mid-oceanic ridge 13 220
ocean basin floor 13 218-220
ocean basin formation 13 223
ocean basin structure 13 221-222
oceanic rises 13 219
Pacific Ocean 9 483 485
physiographic provinces 13 216-220
seamounts 13 122 123, 219
sounding corrections *13 216*
soundings 13 216
structural benches 13 218
submerged benches 13 218
trenches (table) 4 362
underlying structure 13 220
see also Oceanic islands
Submarine transmission lines 14 54
Submarine trench 13 412
Submarine volcanism 9 261, 14 350
seamount 12 122
Submaxillary gland 4 164, 9 370
Submerged arc furnace 5 224
Submerged arc welding *14 467*
Submerged-combustion evaporators 5 126
Submerged culture (micro *biology*) 3 *616*
Submergent shorelines 5 243
Submersible craft bathyscaph 2 109 110
submarine 13 210 215
Subminiature camera 2 429
Submucosa digestive system 4 150 175
Suboceanic relief 13 216 220
Suboceanic structure 13 220 224
Subophitic texture 2 105
Subpallium nervous system 9 42-63
Subroc 1 485
Subsequent stream 5 357
Subsidence topography 7 333
Subsonic flight 13 224 229
aerodynamic force 13 226
circulation theory of lift 13 224
drag 13 225
effect of viscosity 13 224
finite wing effects 13 228
lift-control devices 13 227
lifting line theory 13 225
Prandtl lifting line theory 13 225
separation 13 224-225
stability and control 13 228
stagnation points 13 224
Subsonic flow 13 175
Subsonic frequency *see* Infrasonic frequency
Subsonic wind tunnels 14 499
Subsonic wing 14 508
Subspaces Riemannian geometry 6 165
Subspecies 12 572
Substance P cardiovascular system *2 503*
Substantia nigra 9 547
Substation, electric power *see* Electric power substation
Substitution in integration 7 167
Substitution reaction 13 229 230
benzene 2 165-166
coordination chemistry 3 461
diazotization 4 106
electrophilic and nucleophilic reagent 4 526
electrophilic substitution 13 229 230
esterification 5 75 77
Friedel Crafts reaction 5 536
halogenation 6 325 330
nitration 9 105 105
nucleophilic substitution 13 229 230
organic chemical synthesis 9 591
radical substitution 13 229 230
steric effect (chemical reaction) 13 129 133
sulfonation 13 251
see also Steric effect (chemical reaction)
Substitutional alloy *see* Alloy structures
Substitutional impurities crystal defects *5 582*
Substructure metallography 8 293

Superior artery 1 487
Superior conjunction planet 10 267
Superior Highland 9 142
Superior vena cava 11 291
Superlattice alloy structures 1 265
Supermalloy 8 35
magnetic alloy 7 264
Supermendur 8 35
errors 4 555 13 303*
microorganism 4 385
peroxide potassium 10 521
superphosphate 10 135
phosphorus fertilizers 5 227
superposed bud 2 360
superposed field rangefinder 11 339
Superposition forces 13 55
potential electric 10 537
Superposition principle of 13 303 304
electric fields 4 427
interference of waves 7 183 185, 188 189
wave motion 14 425 429
Superposition approximation 13 65
Superposition of forces 5 436-437
Superposition theorem (electric networks) 13 304 305
uses 9 75
Superregenerative detector 1 362
amplitude modulation detector 1 362
Superregenerative receiver amplitude modulation detector 1 362
supersaturation 13 305 306
cloud chambers 5 212 214
cloud physics 5 216 217
crystal growth 5 585 586
Liesegang rings 7 496
nucleation 9 208
see also Saturation of solutions
Superscope 235 5 129
Supersonic aerodynamics *see* also Gas dynamics
Supersonic diffuser 13 306 307
Supersonic flight 13 307 309
aerodynamic heating 1 103
aerodynamic wave drag 1 87 88
aircraft control 1 88
delta wing 13 309
induced drag 13 309
jet noise 1 185
Lift 13 308
Mach cone 13 307
planform 13 309
Supersonic flight—*cont*
range 13 309
rule of concentrated action 13 308
rule of forbidden signals 13 308
shock wave 13 308
sonic boom 12 505-506
sweptback wing 13 309
wave drag 13 308
zone of action 13 308
zone of silence 13 308
Supersonic flow hydraulic analog table 6 526
Prandtl Meyer expansion fan 10 564
schlieren photograph 12 294
shock wave 12 294 298
streamlining 13 176
Supersonic wind tunnel 14 500
Supersynchronous motor 13 372
Supplementary angle 1 404
Supported catalyst 2 548
Supported stopes (mining) 8 491-492
Supposition hypothesis 6 598
Suppression 13 309
Suppressor 13 309 310
see also Filter, electric
Suppressor genes 6 108 109
Suppressor grid 9 624, 14 244
Suppressor grid modulation 1 356
Supracardial bodies 1 488
Suprarenal body *see* Adrenal gland
Suprarenal gland *see* Adrenal gland
Suprasegmental reflex 11 402
Surf 12 100
Surf beat 12 301
Surf clam 3 152
Surf zone 12 301
Surface (geometry) 10 265
analytic geometry 1 391 392
differential geometry 6 151 152
surfaces of revolution 13 310
Surface active agent 11 184 13 321 322*
classification 13 322
detergent 4 81
foam 5 365
interface of phases 7 181
mechanism 13 321 322
phosphate 10 136
soap and detergent 12 393
surface phenomenon 13 315
surface tension 13 316
textile chemistry 13 538
Surface and solid of revolution 2 642 13 310 311*
Surface and solid of revolution—*cont*
cone 3 394-395
ellipsoid and spheroid 4 560-561
generation of surfaces 13 310
hyperboloid 6 585 586
Pappus, theorems of 13 310
paraboloid 9 542 543
quadric surface 11 135
solid (geometric) 12 473
sphere 12 608
spheroid 12 611
torus 13 690
Surface areas of revolution 2 642
Surface barrier (semiconductors) 12 169 170
Surface barrier transistor 13 322
Surface charge density 3 10
Surface coating 12 253, 13 311 312*
corrosion prevention 3 491
filler 5 264
lacquer 7 376
linseed oil 7 528
paint 9 492 494
pigment 10 225 225
primer (surface coating) 10 592 593
thinner 13 603
see also Polymer
Surface combustion process 5 555
Surface condenser 3 377, 8 121 122 13 312
Surface elasticity (liquid films) 5 365 366
Surface energy interface of phases 7 180 181
surface active agent 13 321
surface phenomenon 13 314 315
surface tension 13 315-316
Surface fire forest 5 451 455
Surface hardening of steel 13 312 314
carbonitriding 13 313 314
carburizing 13 312 313
cyaniding 13 313
flame hardening 13 314
induction hardening 13 314
nitriding 13 314
tempering 13 313
Surface hardness scales 6 337 338
Surface integral Gauss theorem 6 80
integration 7 169 171
Surface irrigation 7 270
Surface layers metallography 8 293
Surface mining *see* Mining, open-cut or pit, Mining, placer; Mining, strip
Surface of revolution 1 391, 13 310-311*
Surface phenomenon 13 314-315
adsorption 1 78 82
catalysis 2 546 549
flotation 5 312-315
surface active agent 13 321-322
Surface potential barrier field emission 5 254 255
interfacial phenomena 13 314 315
Schottky effect 12 68
Surface reverberation sonar 12 504
Surface set bit 2 296
Surface tension 13 315-316
capillarity 13 316
cohesion 3 268
contact angle 13 315-316
foam 5 365-366
hydraulics 6 530
interface of phases 7 181
parachor 9 543
soap and detergent 12 393
surface active agent 13 321-322
surface energy 13 315-316
surface phenomenon 13 314 315
Surface water 13 316 321* 14 391 392
average runoff 13 317-318
characteristics of river channels 13 320
disposition of precipitation 13 317-319
drainage areas 13 318 319
extremes of runoff 13 318
quality of water 13 319
river 11 581 583
source of water in stream 13 317
spring (water) 13 18
water supply engineering 14 405
Surface wind stress 14 496 4
Surfaces, optical *see* Optical surfaces
Surfactants petroleum secondary recovery 10 8
soap and detergent 12
Surge (astronomy) 13 281
Surge (electrical) *see* Surge electrical
Surge (liquids) 14 434
on beaches 12 302
water hammer 14 396
see also Storm surge
Surge channel 11 399
Surge hydrograph 13 165
Surgery 13 322 323
types 13 323

Sulfone (antimicrobial use) 13 255
Sulfone (chemical) 13 253*, 263
  organosulfur compound 9 405
Sulfonic acid 13 253 254*, 262
  nomenclature 9 397
  organosulfur compound 9 405
  sulfonation 13 251
Sulfonyl chloride 13 254
  organosulfur compound 9 405
  sulfonamide 13 251
Sulfonyl halide 13 263
Sulfonylhydrazide 6 530
Sulfoxide 9 405, 13 254*, 263
  Grignard reaction 6 271
Sulfoxylic acid 13 259
Sulfur 13 254 263
  allotropes 13 255-256
  in biogeochemical cycle 2 244
  chemical properties 13 256
  electron configuration 4 504
  gaseous 13 256
  ionization potential 4 504
  liquid 13 256
  metal sulfides 13 257
  monoclinic sulfur 13 256
  native element 9 4
  natural occurrence 13 254-255
  organic quantitative analysis 9 398
  organosulfur compound 9 405-406
  oxides 13 258
  oxy acids 13 259 262
  persulfate 10 37
  petrochemical 10 43, 48
  in petroleum 10 55
  plastic 13 256
  preparation 13 255
  principal compounds 13 256-263
  production from salt domes 12 19
  properties 13 255 256
  purple 13 256
  pyrite source 11 116
  rhombic 13 255 256
  sedimentary 12 140
  sulfides 13 256-258
  uses 13 256
  see also Tellurium
beta Sulfur 13 256
delta Sulfur 13 256
lambda Sulfur 13 255 256
mu Sulfur 13 255 256
Sulfur (butterfly) 7 464
Sulfur-35 as radioactive tracer 14 9
Sulfur bacteria 2 131
Sulfur black 1 4 504
Sulfur dioxide, bleaching 2 259
  mine gas 8 492
  refrigerant 11 415
  solvent 12 496
Sulfur dye 4 304, 308, 309
Sulfur halides 13 263
Sulfur oxide 13 258-259
Sulfur trioxide 12 475
Sulfuric acid 12 565, 13 260, 263-264*
  alylation catalyst 1 253
  sulfate 13 245
Sulfurous acid 13 260
  sulfite 13 251
Sulfuryl halide 13 263
Sulidae 6 38
Sullivan, H S 11 74, 80
Sulphur-bottomed whale 14 479
Sultan (chicken) 3 58
Sultone 13 254
delta Sultone 5 565
Sultriness index 12 180
Sulu Sea 9 271
Sum (algebra) 1 238
  of sequence 10 646
Sumatra 4 357
Sumiki, Y 6 184
Summer 6 125 126
  in polar regions 10 441-442
Summer load line 12 274
Summer solstice *see* Solstice
Summer squash 13 28
  Bergen 13 29
  crookneck 13 29
Summer tanager 15 388
Summergreen deciduous forest 5 188
Summing amplifier 1 369
Summing circuits 1 369 370
Sumner, Charles H 2 586
Sumner, J B 5 21
Sump (mining) 8 487
Sun 13 264-290
  atmosphere 13 264 266
  chromosphere 3 116, 13 268 270
  corona 3 486 487, 13 270 272
  density 13 265
  eclipses of 4 380 382
  ecliptic 4 383
  effects on Earth 1 607 608, 13 285 287
  element abundances 4 546 549
  energy generation 13 265
  flares 13 280 287
  magnetic field 13 110, 268
  mass lost by radiation 7 90
  midnight sun 8 427
  neutrino production 9 83
  observational instruments 13 287
  photosphere 13 268
Sun—*cont*
  physical characteristics 13 264
  plages 13 279-280
  prominences 13 274
  radiation from 13 266-267
  radio emission from 11 244
  radio spectrum 13 283
  rocket observations 11 600, 13 272
  rotation 13 264
  solar activity 13 273
  solar constant 12 466
  spectroheliogram (illustration) 12 581
  spectrum 1 615, 617 618, 13 267
  as star 13 38 48
  structure 13 264 266
  sunspots 13 276 287
  surface granulation 13 268
  temperature 13 265 269
Sun bittern 6 286
Sun exposure (biochlmatology) 2 200
Sun fly 4 212
Sun gear 10 273 274
Sun grebe 6 286
Sun lamp 8 235
Sun spider 1 496, 12 483
Sun star 12 619
Sun time 5 457
Sunburn 14 186
  biochlmatology 2 200
  ultraviolet radiation (biology) 14 188
Sunda (Java) trench 7 56
Sunda Platform 4 355-358
Sunda Shelf land bridge 9 520
Sunda Trench 4 326
Sundaland 4 355
Sundew 12 128 15 290 291*
Sundial 15 291
Sundog 5 364 13 291
Sunfish 2 107, 13 291
Sunflower 13 291-292
  control measures 13 292
  diseases 13 292
  distribution 13 291
  economic importance 13 291
Suntamp 13 292 14 186
Sunlight scattering of 12 51 52
Sunshine duration transmitter 15 292 293
Sunspot 13 276 287* 295
  climatic fluctuations 3 170
  earth current storms 15 508
  effect on cosmic ray intensity 3 501
  geomagnetic variations 6 143 144
  magnetic storms 15 508
  magnetohydrodynamics 8 56
Sunspot—*cont*
  terrestrial effects 13 285-287
Sunstone 1 397, 5 213
Supella supellectilium 3 2 9 416
Super allows spacecraft 12
Super high frequency rad band 11 260
Superaerodynamics 13 293
  flow regimes 13 293
  free molecule flow 13 293-294
  hypersonic flight 6 59(
  slip flow 12 293 294
  transition flow 13 293
Supercavitating propeller 2 575-576
  hydrofoil craft 6 542
Supercentrifuge 14 180
Supercharger 7 208, 13 295
  aftercraft engines 13 295
  diesel engines 7 208, 13 295
  spark ignition engines 7 208, 15 295
  stationary and marine engines 13 295
Superchromatic lens 5 91; 7 452
Superconductivity 13 295 301
  Bardeen Cooper Schrieffe theory 15 301
  cryotron 5 576 578
  heat conductivity 13 298
  London equations 13 300 301
  Meissner effect 8 211
  quantum theories 13 301
  two fluid model 13 299 300
  zero permeability 13 296
  zero resistivity 15 296
Superconductor 13 295 301
  thermal conductivity 5 591
Supercooled clouds 5 216 217
Superdirectivity 1 447
Superelastic collision 12 53
Superexchange coupling antiferromagnetism 1 471
Superfinishing 10 457
Superfluidity 15 301 302
  Bose Einstein statistics 2 505
  liquid helium 6 392 395
Supergene enrichment mineral deposits 9 341
Supergiant star 13 39 41 107 302
Superheated steam 15 76 77 14 275
Superheater 15 302
  marine boilers 8 103 104
Superheating (liquids) 2 558
Superheterodyne receiver 15 302
  radio 11 257

f devices 13 359 360
rolled rectifier
458 459
ar 3 575-576
ron 3 576 578
al computer 4 177 182
transistor 7 320
ron beam tube 13 359
discharge tube
360
ion diode 7 317 319
ion transistor
319 321
emperature devices
317
etron beam tube
360
ransistor 10 192
-contact diode 10 433
4 178 11 440 442
hing tubes 4 179,
359 360*
tron 13 629
of ferrites 5 221
um tubes 4 179 205
5 systems (com-
nions) 13 550 557
nunications systems
(traffic) design
3 329-332
crossbar switching system
13 352 356
crossbar tandem system
13 355
Ericsson 500 Line system
13 357
manual 13 351
No 4A toll crossbar system
13 354
No. 5 crossbar system
13 352
panel system 13 357
primary-secondary
trunking arrangement
13 352
rotary system 13 357
step by-step switching
system 13 356-357
switching circuit
13 344 349
XY system 13 357
Switching theory 13 357-359
Switching tubes 4 179
13 359 360*
Swordfish 11 363
Swordtail 3 649
Sycamore 2 361 13 360*
Sycamore lace bug 6 495
Sycamore maple 8 99 13 360
Sycetta 13 360
Syconida 2 396 10 515, 13 360*
Sycotidales 3 11
Sycon 2 395 9 562
Syconium 3 257
Syconoid sponge 2 395
Syenite 7 16 10 86, 11 590
13 360 361*
Syenite—cont
composition 13 360
laterite, aluminous 7 407
occurrence 13 361
origin 13 316
structure 13 361
texture 13 361
Syllidae 10 461
Syllogism logic 7 578 579
Sylonidae 11 347
Sylvanite, gold ore 6 230
tellurium 13 482
Sylvatic plague 10 256, 12 344
Sylvester, J J 6 253
Sylvester's determinant 10 484
Sylvicolidae 4 212
Sylviidae 7 361
Sylvilagus floridanus 11 197
Sylvite 6 324, 8 278
geologic time scale 6 135
optical materials 9 553
potassium fertilizers 5 238
potassium occurrence
10 530
Symballophone 13 361
Symbiont 1 236
Symbiosis 3 285, 4 584*
bioluminescence
2 220 222
lichens 7 494
Symbiotes 11 567
Symbol chemical 3 42
Symbolic logic 7 578
Symbranchii *see* Synbranchiformes
Symmetric game game theory
6 29
Symmetric wave function
2 304 5 157*
Symmetrical lens 7 451
Symmetrical varistor 14 281
Symmetrical wave forms
14 436
Symmecrodont *see* Symmetrodonta
Symmetrodonta 8 82,
13 361 362*
Symmetry 2 185
Symmetry, animal 1 422
Symmetry, crystal 3 593-598
602-603*
Symmetry laws (physics)
13 362 364
group theory 6 283
isotopic spin 7 296 297
parity 9 565 567
quantum field theory
11 153
quantum theory, non
relativistic 11 185
quantum theory rela
tivistic 11 179
space time 12 557 559
Symmetry selection rules *see*
Selection rules (physics)
Symmond's disease 6 597
Symmorphus canadensis 6 579
Symons cone crusher 3 557
Sympathetic nervous system
1 689, 13 364 365*
see also Nervous system
Sympathetic vibration 13 365
and resonance 11 501
Sympatheticochromaffin cell
4 588
Sympetalae 5 65, 10 346,
13 365*
Campanulales 10 346
Ebenales 10 346
Ericales 10 346
Gentianales 10 346
Plantaginales 10 346
Primulales 10 346
Rubiales 10 346
Tubiflorales 10 346
Sympetaly 5 327
Symphily 8 275-288
Symphonia 3 187
Symphoriocarpus 3 190
Symphyla 1 565, 13 365*
Insecta fossils 7 140
Myriapoda 8 682
Symphysis 12 364
Symphysurina 2 426
Symphyta 6 574
Symptesis 6 581
Sympodite 3 564
Sympodium coeruleum
1 227
Symptomatic anthrax *see*
Blackleg
Syn-anti isomerism 7 279,
9 468
Synagoga mira 1 561
Synallactidae 1 592
Synanthales 10 346; 13 365*
Synapse 3 637, 9 54
activator 13 367
inactivator 13 367
synaptic transmission
13 366
Synapsid *see* Synapsida
Synapsida 11 484 13 365 366*
Ictidosauria 7 9 11 484
Pelycosauria 9 616 11 484
Therapsida 11 484 13 549
Synapsis Gametogenesis
6 31 32
Synapta maculata 1 491
Synaptic transmission
13 366 367
drug sensitivity 13 367
transmissional activity
13 366
Synapticula 11 513
Synaptidae 1 491, 6 465
Synaptomys 7 450
Synaptosauria 11 484
Euryapsida 5 124
Synarthrosis 7 314 12 552
Synbranchiformes 9 442
13 367*
Syncarida 13 367
Anaspidacea 1 396, 3 562,
5 103, 13 367
Bathynellacea 2 109,
3 562; 5 103 13 367
Syncarpy 10 345
Synchaeta 11 634
Synchondrosis 12 352
Synchro 13 367 369
control transformer
13 368
coordinate system con-
verters 1 383-384,
13 369
differential 11 447-448,
13 368 369*
error detector system
13 368
generator 13 367
motor 13 368
repeater 11 447 448*,
13 368 369
resolver 1 383 384, 13 369
in servomechanisms 12 201
sine-cosine generator 1 378
two-speed system 13 368
Synchrocyclotron 9 573,
576 577*, 13 369
Synchronic species 12 572
Synchronization 13 369
Synchronization of generators
4 434
phasing lamps 4 434,
10 109
synchronizing meters 4 434
Synchronizer phase-angle
measurement 10 109
radar 11 200
Synchronizing clutch 14 44 45
Synchronometer 5 504
Synchronous condenser
13 369-373
Synchronous converter *see*
Converter, synchronous
Synchronous generator
1 282 284*, 13 369-373
characteristic curves 1 283
conductor-cooled 1 283
flux distribution 1 283
frequency 1 282
generated voltage 1 283
harmonics 1 285
high-speed 1 282 283
inductor alternator 1 283
power equations 13 371
salient pole 13 370 371
slot harmonics 1 285
slow-speed 1 283
smooth-rotor 13 370
synchro 13 367 369
theory 13 369 371
Synchronous motor 1 284,
13 369 373*
armature reaction 1 545
circle diagrams 13 372
excitation 13 372
hunting 13 372

Surgical maggot 8 680
Surging 13 323
  protection *see* Lightning and surge protection
Suri alpaca 1 266
Surinam toad 12 10
Surra 14 124
Surveillance radar I 159, 13 323
Survey, soil 12 417
Surveying 13 323-330
  accuracy 13 324
  aerial photograph 1 82
  aeromagnetic 1 93-94
  angular measurement 13 325
  azimuth 1 702
  barometric leveling 13 326
  base line 13 324
  construction surveys 13 328-329
  contour 3 425
  control points 6 119
  differential leveling 13 325
  distance measurement 13 324 325
  electronic trilateration 13 324
  elevation differences 13 325
  errors of closure 13 324
  geodetic surveys 13 326
  horizontal control 13 324
  latitude determination 13 326
  latitudes and departures 13 324
  meridian determination 13 326
  photogrammetry 10 155-156
  plane table 10 266, 13 678
  precision 13 324
  reciprocal leveling 13 326
  reference 13 324
  route surveys 13 327
  stadia 13 32, 324
  topographic *see* Topographic surveying and mapping
  transit survey 13 678
  traverse 13 324
  triangulation 6 120-121, 13 324
  trigonometric leveling 13 326
  types of surveys 13 326
Surveying instrument alidade 1 244
  astrolabe, prismatic 1 602
  clinometer 3 202
  compass, magnetic 3 331 332
  level 7 487
  photoclinometer 10 158
  stadia 13 32
Surveying instrument—*cont*
  theodolite 13 546
  transit 14 41
Surveyor's length measures 8 188
Surwell clinograph 10 139-140
Sus scrofa 6 460
Susceptance 13 330
Susceptibility, electric 13 330
Susceptibility, magnetic 8 49, 13 330-332*
  antiferromagnetic 1 469 470, 13 331-332
  Curie-Weiss law 3 623-624
  diamagnetic 4 96 97, 13 331
  ferromagnetic 13 330
  magnetochemistry 8 52
  measurement 13 332
  paramagnetic 13 331
Susitna Glacier, Alaska 6 454
Suspended load (geology) 5 359, 12 156*
  longshore transport 12 304
Suspension, automotive *see* Automotive suspension
Suspension, torsion bar *see* Torsion bar suspension
Suspension bridge 2 334
Suspension of solids 8 522 524
Suspension polymerization 10 481
Suspensor 12 159
Susquehanna Valley 9 148
Sustentation, aircraft 1 86
Sutcliffia 11 85
Suter, P J 6 185
Sutherland, W 12 575
Sutton, G H 8 137
Sutton, Sir Graham I 644
Sutton, W S 5 114
SV waves 12 151
Svalbard (archipelago) 1 523
Sverdrup, A S 9 266
Sverdrup, H U 9 264, 483
Swabs (petroleum engineering) 9 286
Swaging 5 471 12 252 253
Swallow 13 332 333
Swallow bug 6 405
Swallow hole 7 333
Swallowtail butterfly 2 381 7 464
Swamp marsh and bog 13 333
  flood plains 10 260
  mangrove 8 90 91
  marine marsh 8 127 128
Swamp cyrilla 7 268
Swamp ironwood 7 268
Swan J 5 243
Swan I 436, 13 333*
  goose I 436
  mute I 436
Swan *see* Cygnus 5 646
Swann bands comets 3 515
Swanscombe man 5 477, 13 333-334*
Swanson, G E 10 32
Swarming, bee 2 129
Sweat bee 6 574
Sweat gland 6 204, 13 334*
Sweating, bioclimatology 2 201
Sweating process wax, petroleum 14 444-445
Swedish alum shale 9 308
Sweep generator 13 334-336
  bootstrap circuit 2 290
  circular sweep 13 335
  hyperbolic sweep 13 335-336
  linear sweep 12 45, 13 334 335*
  oscilloscope 9 430
  rotating radial sweep 13 335
  saw tooth generator 12 45
  spiral scan 13 335
Sweep through jamming 4 522
Sweet birch 2 247
Sweet cherry 3 56
Sweet flag 1 497
Sweet gas 9 5
Sweet pea 9 407
Sweet potato starch 4 93
Sweet sorghum 12 508, 13 243
Sweetbay 8 74
Sweetclover 3 221
Sweetening petroleum processing 10 70
Sweetening agent 5 378, 12 1
Sweetgum 3 187, 13 336*
Swell (wave) 12 99
Swelling agents (dyeing process) 4 509
Swelling clay 3 162
Sweptback wing 13 309, 14 62, 509
Swietenia mahagoni 8 74
Swift, C H 11 463
Swift I 491 13 336*
Swift moth 7 464
Swim bladder 12 175 595
  13 336 339*
  in Beryciformes 2 170
  cellular transport 13 338
  Clupeiformes 3 222 223
  in the darter 4 13
  gas production 13 338
  inflation mechanisms 13 338 339
  method of gas analysis 13 338
  morphology 13 337
  physiology 13 337
  physoclistous 13 337
  physostomatous 13 337
  pulmonary veins in 2 500
  respiration 11 507
  theory of gaseous transport 13 338
Swimmer's itch 4 148 150
Swimming crab 5 531, 4 33 54
Swimming pool reactor 11 359
Swine production 13 339 342
  breed types 13 339
  breeding 13 339
  critical phase 13 341
  hog 6 460
  management 13 340
  market grades 13 342
  marketing 13 342
  noncritical phase 13 341
  number and value of hogs 13 339
  nutrition 13 340
  products 13 339
Swing bridge 2 334
Swinging choke 3 64, 10 561
Swingle, W W 6 482
Swiss Alps 9 413
Swiss cheese 3 14 15
Swiss plain 13 408
Switch, crossbar *see* Crossbar switch
Switch, electric 13 342 343
  arc extinction 13 343
  blowout coil 2 270
  butt contact switch 13 343
  contacts 3 420
  knife switch 13 342
  leaf-spring switch 13 342
  mercury switch 13 343
  sliding contact switch 13 342
  toggle mechanism 13 664
  types 13 342
Switch, electronic 13 343 344
Switch, microwave 5 221
Switch, step-by-step *see* Step-by-step switch
Switch, Strowger *see* Step by-step switch
Switchboard substation 4 441
  telephone PBX 13 432
  wiring system 14 520
Switching circuit 13 344-349
  AND circuit 4 178 181
  chopping 3 86
  combinational circuit 13 344 345, 357 358
  connecting circuits 13 347
  counting circuit 3 519 520
  lockout circuits 13 347 348
  NOT circuit 4 178 181
  OR circuit 4 178 181
  register circuit 13 349
  selecting circuits 13 346 347
  sequential circuit 13 345 346 358 359
  storage devices 13 159
  switching theory 13 357 359
  translating circuits *13 345 349*
  vacuum tube switching 4 179

switching devices 13 359 360
controlled rectifier 5 [illegible] 439
crowbar 5 575 576
crowbar 5 576 578
digital computer 4 177 182
drift transistor 7 320
electron beam tube 13 359
glow-discharge tube 13 360
junction diode 7 317 319
junction transistor 7 319 321
low temperature devices 5 571
magnetron beam tube 13 360
phototransistor 10 192
point-contact diode 10 453
relay 4 178 11 440 442
switching tubes 4 179, 13 359 360*
thyratron 13 620
use of ferrites 5 221
vacuum tubes 4 179 205
Switching systems (communications) 13 350 357
communications systems (traffic) design 3 320-322
crossbar switching system 13 352 356
crossbar tandem system 13 355
Ericsson 500 line system 13 357
manual 13 351
No 4A toll crossbar system 13 354
No. 5 crossbar system 13 352
panel system 13 357
primary secondary trunking arrangement 13 352
rotary system 13 357
step by step switching system 13 356-357
switching circuit 13 344 349
XY system 13 357
Switching theory 13 357-359
Switching tubes 4 179, 13 359 360*
Sword 4 11 363
Sycamore 2 361, 13 360*
Sycamore lace bug 6 405
Sycamore maple 8 99 13 360
Sycon 13 360
Sycotida 2 396 10 513 13 360*
Sycum sides 3 11
Sycum 2 393 8 562
Sycum 3 257
Sycum spongo 2 393
Sycum 7 18 10 86, 11 590-13 360 361*
Syenite *cont*
composition 13 360
laterite, aluminous 7 407
occurrence 13 361
origin 13 316
structure 13 361
texture 13 361
Syllidae 10 461
Syllogism* logic 7 578 579
Sylonidae 11 547
Sylvanite gold ore 6 230
tellurium 13 482
Sylvatic plague 10 256, 12 344
Sylvester, J J 6 253
Sylvester's determinant 10 484
Sylvicolidae 4 212
Sylvidae 7 361
Sylvilagus floridanus 11 197
Sylvite 6 324, 8 278
geologic time scale 6 135
optical materials 9 353
potassium fertilizers 5 238
potassium occurrence 10 530
Symballophone 13 361
Symbiont 1 236
Symbiosis 3 285, 4 384*
bioluminescence 2 220 222
lichens 7 494
Symbiotes 11 567
Symbol, chemical 3 42
Symbolic logic 7 578
Symbranchii *see* Synbranchiformes
Symmetric game game theory 6 29
Symmetric wave function 2 304 3 137*
Symmetrical lens 7 451
Symmetrical varistor 14 281
Symmetrical wave forms 14 436
Symmetrodont *see* Symmetrodonta
Symmetrodonta 8 82, 13 361 362*
Symmetry 2 185
Symmetry, animal 1 422
Symmetry, crystal 3 593 598, 602-603*
Symmetry laws (physics) 13 362 364
group theory 6 283
isotopic spin 7 296 297
parity 9 565 567
quantum field theory 11 153
quantum theory, nonrelativistic 11 183
quantum theory, relativistic 11 179
space time 12 557 559
Symmetry selection rules *see* Selection rules (physics)
Symmonds disease 6 597
Symmorphus canadensis 6 579
Symons cone crusher 5 557
Sympathetic nervous system 1 689, 13 364 365*
see also Nervous system
Sympathetic vibration 13 365
and resonance 11 501
Sympathetichromaffin cell 4 588
Sympetalae 5 65, 10 346, 13 365*
Campanulales 10 346
Ebenales 10 346
Ericales 10 346
Gentianales 10 346
Plantaginales 10 346
Primulales 10 346
Rubiales 10 346
Tubiflorales 10 346
Sympetaly 5 527
Symphily 3 275-288
Symphonia 3 187
Symphoricarpus 3 190
Symphyla 1 565 13 365*
Insecta fossils 7 140
Myriapoda 8 682
Symphysis 12 364
Symphysurina 2 426
Symphyta 6 574
Sympiesis 6 581
Sympodite 3 564
Sympodium coeruleum 1 227
Symptomatic anthrax *see* Blackleg
Syn anti isomerism 7 279, 9 468
Synagoga mira 1 561
Synallactidae 1 592
Synanthales 10 346 13 365*
Synapse 3 637 9 54
activator 13 367
inactivator 13 367
synaptic transmission 13 366
Synapsid *see* Synapsida
Synapsida 11 484, 13 365 366*
Ictidosauria 7 9 11 484
Pelycosauria 9 616, 11 484
Therapsida 11 484, 13 549
Synapsis Gametogenesis 6 31-32
Synapta maculata 1 491
Synaptic transmission 13 366 367
drug sensitivity 13 367
transmissional activity 13 366
Synapticula 11 513
Synaptidae 1 491, 6 465
Synaptomys 7 450
Synaptosauria 11 484
Eurvapsida 5 124
Synarthrosis 7 314 12 352
Synbranchiformes 9 442 13 367*
Syncarida 13 367
Anaspidacea 1 396, 3 562, 5 103 13 367
Bathynellacea 2 109, 3 562, 5 103, 13 367
Syncarpy 10 345
Synchaeta 11 634
Synchondrosis 12 352
Synchro 13 367 369
control transformer 13 368
coordinate system converters 1 383-384, 13 369
differential 11 447-448, 13 368 369*
error detector system 13 368
generator 13 367
motor 13 368
repeater 11 447 448*, 13 368 369
resolver 1 383-384, 13 369
in servomechanisms 12 201
sine cosine generator 1 378
two-speed system 13 368
Synchrocyclotron 9 573, 576-577*, 13 369
Synchronic species 12 572
Synchronization 13 369
Synchronization of generators 4 434
phasing lamps 4 434, 10 109
synchronizing meters 4 434
Synchronizer phase-angle measurement 10 109
radar 11 200
Synchronizing clutch 14 44 45
Synchronometer 5 504
Synchronous condenser 13 369 373
Synchronous converter *see* Converter, synchronous
Synchronous generator 1 282 284*, 13 369-373
characteristic curves 1 285
conductor cooled 1 283
flux distribution 1 283
frequency 1 282
generated voltage 1 283
harmonics 1 283
high speed 1 282 283
inductor alternator 1 283
power equations 13 371
salient pole 13 370 371
slot harmonics 1 283
slow-speed 1 283
smooth rotor 13 370
synchro 13 367 369
theory 13 369-371
Synchronous motor 1 284, 13 369 373*
armature reaction 1 545
circle diagrams 13 372
excitation 13 372
hunting 13 372

Synchronous motor—*cont*
hysteresis motor 6 600
losses and efficiency 13 372
mechanical oscillations 13 372
power equations 13 371
reluctance motor 11 446
salient-pole 13 370 371
slip rings 12 381
smooth rotor 13 370
starting 13 372-373
synchro 13 367 369
synchronous condenser 13 369
theory 13 369-371
V curves 13 371
Synchronous speed 13 373
Synchronous vibrator 14 322
Synchrophasotron *see* Synchrocyclotron
Synchroscope 13 373
cathode ray oscilloscope 13 375
phase-angle measurement 10 109
synchronization of generators 4 434
see also Phase meter
Synchrotron 13 373
alternating gradient 9 573, 579-580*
relativistic electrodynamics 11 430
Synchrotron radiation 11 431
Crab Nebula 3 532, 9 24
in Milky Way 6 11
particle accelerators 9 578
radio astronomy 11 244
Synchytrium 10 200
Syncline 13 373
fold systems 5 368
Synclinorium 6 173
Syndactyly 13 402
Syndesmochorial placenta 10 254
Syndesmosis 12 352
Syndiotactic (alternating) polymer 10 479
Synechthran 3 275 288
Synecology 4 388
Synentognathi *see* Beloniformes
Synergid 5 326-334
Synergist 7 142
Synerocrinus 5 300
Syngamidae 13 193
Syngamus 13 193
Syngamy 5 234, 333; 11 450, 13 373 374*
meiosis 8 209-211
phycomycetes 10 198
Protozoa 11 58
in sex determination 12 227
in Testacida 13 524
Syngnathiformes 6 71
Synnemata 13 140
Synnematin 1 464-468
Synnematin *B see* D-4-Amino-4-carboxy n-butylpenicillin
Synodic month 6 126
Synodic period planet 10 268, 269
tides 13 639
Synoekete 3 275-288
Synoicum 1 574
Synonym zoological nomenclature 14 626
Synoptic meteorology *see* Meteorology (synoptic)
Synostosis 12 352
Synstemony 5 329
stamen 5 329 330
Syntelidae 3 276
Syntevidae 6 574
Syntexis (petrology) 10 84
Synthesis, organic chemical *see* Organic chemical synthesis
Synthesis gas 3 236
Fischer-Tropsch process 5 285
fuel gas 5 552
Synthesizer (electronic music) 8 667
Synthetase 2 17
Synthetic detergents 12 393-394
Synthetic diamond 4 101
Synthetic fiber 5 242
Synthetic gem 6 99
Synthetic graphite 6 257
Synthetic inorganic chemistry 7 118 120
Synthetic oils 7 604
Synthetic resin 11 8
Synthetic rubber insulation, electric 7 157
solid propellant 11 8
Synthetic ruby 6 100-101
Synthetic rutile 6 101
Synthetic spinel 6 100
Synthetic training 6 495
Syntrophism 12 443
Syntype 14 172
Synura uvella 3 117
Synxiphosaurina 8 244
Synxiphosura 8 244
Synxiphosurida 14 565
Syonite 10 86
Syphacia obvelata 9 476
Syphilis 13 374 375
antibiotics *1* 466-467
causative organism 13 374
as a cause of aneurysms 1 403
as a cause of splenomegaly 13 8
delayed hypersensitivity in 6 589
jaundice 7 302 303
in man 13 374
osteomyelitis 9 446
paresis, general 9 564
Parkinson's disease 9 567
prevention 13 375
spirochete 13 4
taxonomy 13 2
venereal disease 14 296
Syphilitic meningoencephalitis *see* Paresis, general
Syphilitis salvulitis 6 360
Syphilophobia 10 119
Syr Darya River 1 580
Syringobulbia 9 69
Syringomyelia 9 69
Syringopora 13 381
Syrphidae 4 212 8 680
Syrton 5 521 534
Syrup 5 409, 13 243
lactic acid 7 378
sugar 13 259
Sysphincta pergandei 12 407
Systellommatophora 6 77
System engineering definition 13 375
thermodynamic definition 13 572
Systema Naturae 14 626
Systematics, animal 1 422 423
Systemic arterial circulation 1 487
Systemic circulation 1 552
Systemic insecticide 7 140
Systemic trunk 2 498
Systems engineering 13 375 380
communications systems 5 320 322
component design 13 378 380
control systems 3 429 438
dynamics 13 377-378
environmental design 13 379
environmental test 5 17-19
examples of complex systems 13 378
instrumentation 7 154
linear system 13 376
maintainability of equipment 8 75, 13 379
miniaturization of equipment 8 468-471*, 13 379
nonlinear system 13 376
optimization of performance 13 378
packaging of equipment 9 488-489*, 13 379
prototype (equipment) 11 51
qualification test 11 136
reliability of equipment 11 443 445*, 13 379
selection of a model 13 377-378
simulator 12 340
subsystem test 13 380
system performance or behavior 13 375 376
system test 13 380
systems design 13 377 378
types of inputs 13 376
use of computing aids 13 377 378
Syttole 3 133
Szent Györgyi A 5 296, 8 642
Szilard Chalmers process 9 179

T

ams 3 368 369
ribution 8 227
tatistics 13 70
ssion 14 425
se, heart 3 138
3 T see 2, 4, 5 Tri
zosphen
acetic acid
ed 13 206
acteriophage 14 331
cteriophage 14 331
ke Island) 7 4
rctic Ocean 1 525
ium (electric networks)
5
ors variable stars 14 279
ical significance 11 141
ver earthquake 4 353
ch Mountains 1 577
adae 4 212
ua 16 124
ua funcifer 4 216
lena 4 406
i dorsalis 9 564
Mountain Cape Town
ng
Queen 13 28
Lands 10 263 264
rrent 12 122
ng (ore dressing) 9 390
ar interpolation 7 216

ata 13 351
anthosia 1 455
ural 13 341
n 9 405
ene gas 3 45
s 9 13 19 13 381 382*
na fly 4 212
rometer 1 374 13 382 395*
c generator 13 385
apacitor charging-current
13 345
entrifugal 13 385
hronometric 13 393
ic generator 13 345
frag type 13 394
dy currents 13 384
lectric generator 13 385
lectronic 13 344 345
mpulse 13 385
nd actual 13 343
nterrupted de 13 344
nvolution counter 13 342
343
n wavemeter 13 201
wave meter 13 (47)

Tachometer—*cont*
velocity head 13 384
vibrating reed 13 383
Tachyauxesis 1 419
Tachycineta bicolor 13 333
Tachyglossus 8 584, 11 51
Tachylite 14 347
Tachyniscidae 4 212
Tachypleus gigas 14 565
Tachypleus tridentatus 14 564, 565
Tachysterol 5 65
Tachytelic rate (macroevolution) 8 14
Tacke, I 11 543
Taconic Mountains 9 145
Taconic orogeny 13 411
Taconite 13 386
drilling in 2 297
iron ore 7 258
mining 9 471
Tactic movements (plants) 10 366 367
Tactic responses (bacterial motility) 2 64
Tactile agnosia 1 595
Tactoid 2 611
Tadpole larva 1 414
Tadpole shrimp 9 170
Taenia 2 660
Taenia saginata 3 200, 642, 13 393
Taenia solium 3 642, 649, 13 393
Taeniae coli 4 162
Taeniases 13 394
Taenidia 7 122-123
Taeniodonta 8 82 11 586 13 386*
Taenioidea *see* Cyclophyllidea
Taeniolabidae 8 628
Taeniolabis 8 628
Taeniolite 8 346
Taeniopteris 7 327
Taeniothrips inconsequens 13 628
Taeniothrips simplex 13 628
Taenite 8 313
Taenioglossate radula 8 561
Tafel plot 9 457
Taft, J 11 80
Tagging (radioisotopes) 14 7 9
Taghanican Stage 4 87
Tagmata 1 555
Crustacea 3 562 569
Taieri River 1 671
Taiga 4 342, 8 245
Arctic and subarctic islands 1 523
Asia 1 584
Tail (skeleton) 12 554
Tail assembly, aircraft 13 386
aerodynamic center 1 84
Tail shaft (ships) 12 289
Tailbone 14 308
Tailed whip scorpion 1 496, 14 235
Tailing 9 388
Tailless whip scorpion 1 500, 496
Tait, J F 1 232
Tait, P G 11 187
Takahashi, N 6 184
Takamine, J 5 41 6 484
Takeuchi, H 4 340 349
Taking up (textiles) 13 535
Takla Makan desert 1 587
Taku Glacier (Alaska) 6 203
Talc 10 12 12 476 13 386 387*
lubricant 7 604
soapstone 12 395
Talchir tillite 10 26
Taliaferro, W H 1 7
Talitridae 6 35
Tall grass prairie 10 562
Tall grassland 3 190
Tall oil 13 387
Tallow (bovine) 5 189
Talorchestia longicornis 1 563
Talos missile 1 543
D(+) Talose 2 455
Talpidae 7 143 8 537
Talus 1 428 13 387 388*
Talus breccia 2 526
Tamar River 1 671
Tamarack 7 404
Tamarind 6 298
Tamarindus indica 6 298
Tamias striatus 3 63
Tamiasciurus 13 31
Tamm, I 2 653
Tammann temperature 12 542
Tamworth swine 13 339
Tan rot 13 172
Tanager 13 398
Tanaidacea 1 563, 3 563 12 601 13 389 389*
Tanais cavolini 13 388
Tanana River 9 158
Tanaostigmatidae 6 674
Tanganyika, Lake 1 107
Tangent 12 542 13 389* 14 93
Tangent vector 2 494
Tangential acceleration *see* Acceleration
Tangential stress *see* Shear stress
Tangential velocity 14 293
stars 13 47
Tangents, law of 14 97
Tangerine 13 389
Tangoreceptor 12 180
Platyhelminthes 10 413
Tank 13 389 390
electrolytic *see* Electrolytic tank
elevated 13 390
glass 6 206 207
pressure vessel 10 584 585
prestressed concrete 13 390
ripple *see* Ripple tank
septic *see* Septic tank
steel 13 390
towing *see* Towing tank
vehicle 1 540
water 14 406
water storage 13 390
Tank artillery 1 538 539
Tank circuit 13 390
Tank gun 1 540
Tank periscope 10 17 18
Tank recovery vehicles 1 540
Tankage (fertilizer) 5 236
Tanker *see* Ship, merchant
Tannehill, I R 4 275
Tannery, P 6 154
Tannic acid 13 390 391
Tannin 5 376 13 390 391*
ink 7 112
lichens 7 495
plant metabolism 10 360
wood chemicals 14 527
Tanning, leather and fur processing 7 445 447
tannin 13 390 391
Tannu Ola Range 1 577
Tansley, A G 4 404
Tantalite 3 302 8 278
tantalum 13 391
Tantalum 13 391 392
analysis 13 392
electrolytic capacitor 2 447
electron configuration 4 504
emitter 14 246
extractive metallurgy 8 278
ionization potential 4 504
metallurgical extraction 13 391

Tantalum—*cont*
principal compounds 13 392
properties 13 391
spectral emissivity 4 583
tantalite 13 391
Tanyderidae 4 212
Tanyperidae 4 212
Tanystropleus 11 50
Tanystropheus lonaobardicus 11 51
Tanystarsus 5 530
TAO 1 464-468
Tap, transformer 14 26-27
Tape, magnetic *see* Magnetic tape
Tape, surveyor's 13 324
Tape recorders 8 37 38
Tape recording 8 36-41
Taper 8 424
Taper pin 13 392
Taper pipe thread gage 6 4
Tapered transmission line 14 50
Tapetum 5 169
eye 5 162 171
flower (botany) 5 326 334
Tapeworm 13 392 393
beef 5 642
reproduction 13 395
structure 13 392
taxonomy 10 415
Tapeworm disease 13 393-394
beef tapeworm 13 393
echinococcosis 13 394
fish tapeworm 13 394
hymenolepiasis 13 393
pork tapeworm 13 394
Taphius 12 64
Taphrina deformans 5 546
Taping (surveying) 13 324
Tapinoma sessile 6 581
Tapioca 4 93, 13 50
cassava 2 558
Tapir 10 19 13 394-395
Tapiridae 13 395
Tapirus indicus 13 394
Tapped delay line filter 5 271
Tapping 8 6
Tapti River 1 580
Tar acids 3 236
Tar bases 3 236
Tar sand *see* Oil sand
Taractogenos kurzii 1 475
Taranto, Gulf of 5 115
Tarantula 1 498
Tarantula hawk 6 582
Tararoxanthin 2 530
Tarchanoff, J 11 75
Tardigrada 13 395 398
anatomy 13 395
cleavage 13 395
ecology 13 398
embryology 13 395 397
Eutardigrada 5 124 125; 13 393
gastrulation 13 395
Tardigrada—*cont*
Heterotardigrada 6 451; 13 395
molting 13 397
physiology 13 397
Target hit theory (radiation) 11 216
Target pattern (diffraction gratings) 4 140
Target theory (mutation) 8 673 674
Tarticha 12 7
Tarim River 1 580
Tarn (lake) 7 386
Tarnished plant bug 6 405, 13 398*
Taro 1 497, 4 15
Tarpon 3 223; 13 398*
Tarpon atlanticus 13 398
Tarsal bones 1 428
Tarsal formula Coleoptera 3 275 288
Tarsal gland 12 125
Tarski, A 2 289, 7 411
Tarsonemidae 14 115
Tartar emetic 1 477
Tartar missile 1 545
Tartaric acid 10 354, 13 398-399*
Tartrate 5 74, 13 399*
Tashe noir 5 257
Tasman Mountain 1 671
Tasmania 1 669, 672
rivers 1 671
Tasmanites 2 253
Taste 13 399 401
anatomy 13 399
behavioral effects 13 401
blindness 13 401
digestive system 4 166
molecule spatial arrangement 13 400
qualities 13 399
sensitivity 13 400
threshold 3 49 51
Taste bud 4 165, 12 180, 13 399
chemoreception 3 49-51
embryology 9 49 50
Tatarian stage 10 23
Tatra, High 5 118
Tatra, Low 5 118
Tatum E L 2 67
Tauber test 2 453
Tauern, Hohe (high) 5 117
Tauern, Niedere (low) 5 117
Taupo Lake 1 672
Taurid meteor showers 4 587, 8 308
Taurine 12 391 13 253
cysteine 5 649
Taurocholic acid 2 185 7 533
Taurus 3 412 413 13 401*
Taurus moving cluster *see* Hyades
Taurus Range 1 577
Taussig H 2 514
Tautology 7 581
Tautomerism 13 401-403
anionotropic 13 402 403
keto enol tautomerism 13 402
lactam and lactim 7 376-377, 13 401
lactide and lactone 7 380
lacto-enoic tautomerism 13 402
oxime 9 468
ring chain tautomerism 13 402-403
Tautonomy 14 173
Tawing 7 446
Taxa 13 404
Taxidea taxus 2 72
Taxis 13 403
behavioral psychophysics 2 158
Klinotaxis 13 403
telotaxis 13 403
tropotaxis 13 403
Taxiways, airport 1 216
Taxocrinida 4 569
Taxocrinus 4 566
Taxodium 5 189
Taxodonta 8 559, 9 614, 13 403-404*
Taxon 13 404
plant classification 10 298
Taxonomic categories 13 404
Taxonomy 13 404
alpha 1 423
animal systematics 1 422
of bacteria *see* bacteria, taxonomy of
beta 1 423
Fungi 5 561
type method 14 172
see also Macroevolution, *Speciation*
Taxus 14 605
Taxus baccata 14 605
Taxus brevifolia 14 605
Taxus canadensis 14 605
Taxus cuspidata 14 605
Tay Sachs disease 8 226 9 69
Tayassu tajacu 9 608
Tayassuidae 1 568 9 608
Taylor, D W 8 120, 14 382
Taylor Frederick W 6 494
Taylor G I 4 335 5 342, 14 161
Taylor J H 11 380
Taylor W H 5 208
Taylor W P 5 15
Taylor's formula differentiation 4 151
partial differentiation 9 569
Taylor series 12 189 191 192
geometrical optics 9 564 568
partial differentiation 9 569
Taylor's theorem 5 342
Taylor's wake fraction 14 382
4-(2, 4, 5 TB) 6 422
2, 3, 6-TBA 6 421
TBP 9 189
Tchelitschew, Pavel 1 552
TDE 7 140
Te Anau, Lake 1 672
Tea 13 404 405
black tea 13 405
caffeine 2 588
green tea 13 405
instant tea 13 405
oolong teas 13 405
tea production 13 405
Teak 5 187
Teak forests 1 587
Teal, J 2 216
Teal 4 290
Tealia 1 52 54
Tear gas 1 36, 3 45
Tear gland 5 166, 7 376
Technetium 13 405 406
electron configuration 4 504
ionization potential 4 504
Technical oils 10 72
Technicolor process 10 168
Technirama 5 128
Technology 13 406
Tectibranchia 13 406
Tecticeps renoculus 5 291
Tectogene 9 411
Tectona grandis 5 187
Tectonic breccias 2 326
Tectonic patterns 13 406 413
the Alps 13 407 409
andesite line 13 412 413
the Apennines 13 409
Asiatic island arc complex 13 411
the Carpathians 13 409
Circum Pacific chain 13 410 411
Coast Ranges 13 411
East Indies arcuate complex 13 410
fault and fault structures 5 191 195
Hercynian massifs 13 408
High Calcareous Alps 13 408
Himalayan Cordillera 13 410
island arcs 9 263 13 412 413
the Juras 13 409
massif 8 167
Mediterranean chain 13 407
Mexico 13 411
Middle East Cordillera 13 409
Nevadan belt 13 410
North American Cordillera 13 410 411
older cordilleras 13 411
Pennine nappes 13 409
the Pre Alps 13 408

Terrane patterns—*cont*
Precambrian 10 566
the Pyrenees 13 409
rift valley 11 570
Rocky Mountains system 13 410
shields and stable areas 13 413
sial 13 412
sima 13 412
South American Cordillera 13 411
Swiss plain 13 408
Terrestrial seismic-gravity association 12 149
Tectonites 12 63
Tectonophysics 6 370, 13 413 420
arc junctions 13 415
continental drift 13 418
continental fracture system 13 414
contraction theory 13 419
core 13 414
crust 13 414
dynamics of faulting 13 416-417
mantle 13 414
mid-ocean fracture system 13 416
ocean floors 13 414
polar wandering 13 418
rates of tectonic deformation 13 417
rock failure 13 418
thermal convection currents 13 419
Tectorial membrane 10 124
Tectosilicates 12 511
Tedion 8 319
Teeming (steel manufacture) 13 95
Teeth 4 63
horny *see* Horny teeth
Teflon 3 244, 6 329
electric insulation 7 157
see also Polyfluoroolefin resin
Tegeticula (=Pronuba) yuccasella 7 406
Tegmen 3 275 295
Tegmentum 9 58
Tegotheuthis 2 315
Tehuantepec 9 163
Teichospirae labyrinthica 2 [illegible]
Teiidae 13 21
Tejon Pass 5 122
Telecast 13 421
Teleceptors 12 177
Telecommunications *see* Communications, electrical
Telegeusidae 3 277
Telegraph *see* Telegraphy
Telegraph codes 13 421-422
Continental code 13 421
Morse code 13 421
Telegraphy 13 421-425
AM radio 1 364
automatic switching 13 423
bandwidth requirements 2 94
cable circuit 13 424
circuits and equipment 13 422
facsimile 5 177
FM radio 5 521
message service 13 422 423
overseas 13 423
press systems 13 425
private line 13 424
radio circuits 13 423
stock quotation ticker service 13 425
submerged repeater amplifiers 13 424
teletypewriter 13 453
Telemetering 13 425 429
commutator 13 428
electrical 13 425 426
frequency modulation radio 5 521
mechanical 13 425
meteorological instrumentation 8 318 319
radio 13 425 428
rocket astronomy 11 600
telemetry equipment 13 428
Telemetry *see* Telemetering
Telencephalon 9 46
Telenomus 6 581
Teleobjective 13 447
Teleonemia scrupulosa 6 405, 409
Teleoptile 5 195
Teleostei 1 57 58 9 443
Teleostomi *see* Actinopterygii
Telephone 13 429 431
accessory devices 13 431
add-on 7 179
camp on 7 179
conference calling 7 179
electric network 13 430-431
electrical protection of user 3 323
executive access 7 180
hands free talking 7 180
hold key 7 179
intercom signaling 7 179
invention 4 454
optional features 7 179, 13 431
Telephone—*cont*
preset conference calling 7 179
privacy 7 180
receiver 13 430
sidetone balance 13 431
transmission equalization 13 431
transmitter 13 429 430
underwater *see* Underwater telephone
Telephone civil defense system 13 431-432
Telephone information service 13 440
Telephone intercommunicating system 7 179 180
Telephone leave-word systems 13 440 441
secretarial systems 13 440
telephone answering sets 13 441
Telephone lines 13 443
Telephone pole beetle 3 276
Telephone private branch exchange (PBX) 13 432-433
dial 13 433
manual 13 432
Telephone receiver bipolar 13 430
ring armature 13 430
Telephone service 13 433 442
Telephone service, interurban 13 434 437
direct distance dialing (DDD) 13 350, 436
intercity trunks 13 435
international dialing 13 437
long distance office 13 434
manual office 13 435
mechanized office 13 435
recording of billing information 13 435
Telephone service local 13 433 434
central office 13 433
interoffice trunks 13 434
message units 13 433
party line service 13 434
registration of messages 13 433
subscriber loops 13 434
switching equipment 13 434
tandem office 13 434
trunk circuits 13 434
Telephone service long-distance *see* Telephone service, interurban
Telephone service, overseas 13 438 440
high frequency radio 13 438 439
international agreements 13 446
submarine cables 13 439
Telephone service, overseas—*cont*
tropospheric scatter systems 13 439
Telephone service, private-line 12 441
Telephone set *see* Telephone
Telephone signaling, special subscriber 13 442-443
audible signals 13 442
code calling systems 13 442
loudspeaker paging systems 13 442
radio paging systems 13 443
visual signals 13 442
Telephone switching 13 350 357
Telephone systems automatic message accounting (AMA) 13 353
automatic ticketing equipment 13 357
central office codes 13 350
centralized automatic message accounting (CAMA) 13 355
civil defense 13 431-432
community dial offices (CDO) 13 356
crossbar switch 13 352
fundamental planning 13 447
2 letter, 5 numeral (2L-5N) numbering plan 13 350
manual operator 13 351
numbering plan 13 350
numbering plan area (NPA) 13 350
step-by-step switch 13 356-357
switching circuit 13 344 349
Telephone systems construction 13 443 445
aerial cable 13 443
aerial wire 13 443
cable splicing 13 444-445
cables 13 443
conduit 13 444
multiple line wire 13 443
pole lines 13 443
terminals 13 444
underground cable 13 444
underground lines 13 444
wires 13 443
Telephone tape recording 8 41
Telephone-television attachment 3 209
Telephone transmission inductive loading 13 434
intercity trunks 13 435
overseas radiotelephony 13 438 439
quality 13 441

Tantalum—*cont*
principal compounds 15 392
properties 15 391
spectral emissivity 4 583
tantalite 15 391
Tanyderidae 4 212
Tanypezidae 4 212
Tanystropheus 11 50
Tanystropheus lonaobardicus 11 51
Tanytarsus 5 530
TAO 1 464 468
Tap, transformer 14 26-27
Tape, magnetic *see* Magnetic tape
Tape, surveyor's 15 324
Tape recorders 8 37-38
Tape recording 8 36-41
Taper 8 424
Taper pin 15 392
Taper pipe thread gage 6 4
Tapered transmission line 14 50
Tapetum 5 169
eye 5 162-171
flower (botany) 5 326-334
Tapeworm 15 392 393
beef 3 642
reproduction 15 393
structure 15 392
taxonomy 10 413
Tapeworm disease 15 393-394
beef tapeworm 15 393
echinococcosis 15 394
fish tapeworm 15 394
hymenolepiasis 15 393
pork tapeworm 15 394
Taphrus 12 64
Taphrina deformans 5 546
Taping (surveying) 15 324
Tapinoma sessile 6 581
Tapioca 4 93, 15 50
cassava 2 538
Tapir 10 19 15 394 395
Tapiridae 15 395
Tapirus indicus 15 394
Tapped delay line filter 5 271
Tapping 8 6
Tapti River 1 580
Tar acids 5 256
Tar bases 5 256
Tar sand *see* Oil sand
Taraktogenos kurzii 1 475
Taranto, Gulf of 5 115
Tarantula 1 498
Tarantula hawk 6 582
Taraxanthin 2 530
Tarchanoff, J 11 75
Tardigrada 15 395-398
anatomy 15 395
cleavage 15 395
ecology 15 394
embryology 15 395-397
Futardigrada 5 124-125, 15 395
gastrulation 15 395
Tardigrada—*cont*
Heterotardigrada 6 451; 15 395
molting 15 397
physiology 15 397
Target-hit theory (radiation) 11 216
Target pattern (diffraction gratings) 4 140
Target theory (mutation) 8 675 674
Tarsicha 12 7
Tarim River 1 580
Tarn (lake) 7 386
Tarnished plant bug 6 405, 15 398*
Taro 1 497, 4 15
Tarpon 3 223 15 398*
Tarpon atlanticus 15 398
Tarsal bones 1 428
Tarsal formula Coleoptera 5 275 288
Tarsal gland 12 125
Tarski, A 2 289, 7 411
Tarsonemidae 14 115
Tartar emetic 1 477
Tartar missile 1 543
Tartaric acid 10 354, 15 398-399*
Tartrate 5 74, 15 399*
Tashe noir 5 257
Tasman Mountain 1 671
Tasmania 1 669, 672
rivers 1 671
Tasmanites 2 253
Taste 15 399-401
anatomy 15 399
behavioral effects 15 401
blindness 15 401
digestive system 4 166
molecule spatial arrangement 15 400
qualities 15 399
sensitivity 15 400
threshold 5 49-51
Taste bud 4 165, 12 180 15 399
chemoreception 3 49-51
embryology 9 49 50
Tatarian stage 10 23
Tatra High 5 118
Tatra Low 5 118
Tatum E L 2 67
Tauber test 2 453
Tauern Hohe (high) 5 117
Tauern Niedere (low) 5 117
Taupo Lake 1 672
Taurid meteor showers 4 587, 8 308
Taurine 12 301 15 255
cysteine 5 649
Taurocholic acid 2 185, 7 531
Taurus 3 412 413, 15 401*
Taurus moving cluster *see* Hyades
Taurus Range 1 577
Taussig, H 2 514
Tautology 7 581
Tautomerism 15 401 403
anionotropic 15 402 403
keto-enol tautomerism 15 402
lactam and lactim 7 576-577, 15 401
lactide and lactone 7 580
lacto enoic tautomerism 15 402
oxime 9 468
ring chain tautomerism 15 402-403
Tautonomy 14 173
Taxing 7 446
Taxa 15 404
Taxidea taxus 2 72
Taxus 15 403
behavioral psychophysics 2 158
kinotaxis 15 403
telotaxis 15 403
tropotaxis 15 403
Taxiways, airport 1 216
Taxocrinida 4 369
Taxocrinus 4 366
Taxodium 3 189
Taxodonta 8 559, 9 614, 15 403 404*
Taxon 15 404
plant classification 10 298
Taxonomic categories 15 404
Taxonomy 15 404
alpha 1 423
animal systematics 1 422
of bacteria *see* bacteria, taxonomy of
beta 1 423
Fungi 5 561
type method 14 172
see also Macroevolution, Speciation
Taxus 14 605
Taxus baccata 14 605
Taxus brevifolia 14 605
Taxus canadensis 14 605
Taxus cuspidata 14 605
Tay Sachs disease 8 226, 9 69
Tayassu tajacu 9 608
Tayassuidae 1 568, 9 608
Taylor D W 8 120 14 582
Taylor Frederick W 6 494
Taylor G I 4 355, 5 542, 14 161
Taylor, J H 11 380
Taylor, W H 5 208
Taylor W P 5 15
Taylor's formula differentiation 4 131
partial differentiation 9 569
Taylor series 12 189, 191 192
geometrical optics 9 564 568
partial differentiation 9 569
Taylor's theorem 5 342
Taylor's wake fraction 14 382
4 (2, 4, 5 TB) 6 422
2, 3, 6 TBA 6 421
TBP 9 189
Tchebitschew, Pavel I 552
TDE 7 140
Te Anau, Lake 1 672
Tea 15 404 405
black tea 15 405
caffeine 2 388
green tea 15 405
instant tea 15 405
oolong teas 15 405
tea production 15 405
Teak 5 187
Teak forests 1 587
Teal, J 2 216
Teal 4 290
Tealia 1 52 54
Tear gas 1 36, 5 45
Tear gland 5 166, 7 376
Technetium 15 405 406
electron configuration 4 504
ionization potential 4 50
Technical oils 10 72
Technicolor process 10 168
Technirama 3 128
Technology 15 406
Tectibranchia 15 406
Tectirepti venoculis 5 291
Tectogene 9 411
Tectona grandis 5 187
Tectonic breccias 2 326
Tectonic patterns 15 406 415
the Alps 15 407 409
andesite line 15 412 413
the Apennines 15 409
Atlantic Island arc complex 15 411
the Carpathians 15 409
Circum-Pacific chain 15 410-411
Coast Ranges 15 411
East Indies arcuate complex 15 410
fault and fault structures 5 191 195
Hercynian massifs 15 409
High Caucasous Alps 15 408
Himalayan Cordillera 15 410
island arcs 9 263 15 412 413
the Jurax 15 409
massif 8 167
Mediterranean chain 15 407
Mexico 15 411
Middle East Cordillera 15 409
Nevadan belt 15 410
North American Cordillera 15 410 411
older cordilleras 15 411
Pennine nappes 15 408
the Pre Alps 15 408

fracture patterns—*cont*
Precambrian 10 566
the Pyrenees 15 409
rift valley 11 570
Rocky Mountains system 15 410
shields and stable areas 15 413
sial 15 412
sima 15 412
South American Cordillera 15 411
Swiss plain 15 408
Tectonic seismic gravity associations 12 149
Tectonites 12 63
Tectonophysics 6 170; 15 413-420
arc junctions 15 415
continental drift 15 418
continental fracture systems 15 414
contraction theory 15 419
core 15 414
crust 15 414
dynamics of faulting 15 416-417
mantle 15 414
mid-ocean fracture system 15 414
ocean floors 15 414
polar wandering 15 418
rates of tectonic deformation 15 417
rock failure 15 418
thermal convection currents 15 419
Tectorial membrane 10 124
Tectosilicates 12 311
Teflon 8 518
Teeming (steel manufacture) 15 95
Teeth 4 63
horny *see* Horny teeth
Teflon 5 244 6 329
electric insulation 7 157
see also Polyfluoroolefin resin
Tegeticula (=Pronuba) yuccasella 7 466
Tegmen 3 275 288
Tegmentum 9 58
Tegulobranchia 2 515
Tehuantepec 9 165
Technomys labyrinthica 8 395
Teiidae 15 24
Tejo, Tagus 5 122
Tektite 15 420 421
composition 15 420
occurrence 15 420
origin 15 421
physical form 15 420
properties 15 420
TEL *see* Tetraethyllead
Telanthropus 5 477
Telecast 15 421
Teleceptors 12 177
Telecommunications *see* Communications, electrical
Telegeusidae 5 277
Telegraph *see* Telegraphy
Telegraph codes 15 421 422
Continental code 15 421
Morse code 15 421
Telegraphy 15 421 425
AM radio 1 364
automatic switching 15 423
bandwidth requirements 2 94
cable circuit 15 424
circuits and equipment 15 422
facsimile 5 177
FM radio 5 521
message service 15 422 423
overseas 15 429
press systems 15 425
private line 15 424
radio circuits 15 423
stock quotation ticker service 15 425
submerged repeater amplifiers 15 424
teletypewriter 15 455
Telemetering 15 425-429
commutator 15 428
electrical 15 425 426
frequency modulation radio 5 521
mechanical 15 425
meteorological instrumentation 8 518 519
radio 15 425 428
rocket astronomy 11 600
telemetry equipment 15 428
Telemetry *see* Telemetering
Telencephalon 9 46
Telenomus 6 581
Teleobjective 15 447
Teleonemia scrupulosa 6 405, 409
Teleoptile 5 195
Teleostei 1 57 58, 9 443
Teleostomi *see* Actinopterygii
Telephone 15 429-431
accessory devices 15 431
add-on 7 179
camp on 7 179
conference calling 7 179
electric network 15 430 431
electrical protection of user 5 525
executive access 7 180
hands-free talking 7 180
hold key 7 179
intercom signaling 7 179
invention 4 454
optional features 7 179, 15 431
Telephone—*cont*
preset conference calling 7 179
privacy 7 180
receiver 15 430
sidetone balance 15 431
transmission equalization 15 431
transmitter 15 429 430
underwater *see* Underwater telephone
Telephone civil defense system 15 431 432
Telephone information service 15 440
Telephone intercommunicating system 7 179 180
Telephone leave word systems 15 440 441
secretarial systems 15 440
telephone answering sets 15 441
Telephone lines 15 443
Telephone pole beetle 5 276
Telephone private branch exchange (PBX) 15 432 433
dial 15 433
manual 15 432
Telephone receiver bipolar 15 430
ring armature 15 430
Telephone service 15 433 442
Telephone service interurban 15 434 437
direct distance dialing (DDD) 15 550 436
intercity trunks 15 435
international dialing 15 437
long distance office 15 434
manual office 15 435
mechanized office 15 435
recording of billing information 15 435
Telephone service local 15 433 434
central office 15 433
interoffice trunks 15 434
message units 15 433
party line service 15 434
registration of messages 15 435
subscriber loops 15 434
switching equipment 15 434
tandem office 15 434
trunk circuits 15 434
Telephone service long distance *see* Telephone service, interurban
Telephone service, overseas 15 438 440
high frequency radio 15 438 439
international agreements 15 446
submarine cables 15 439
Telephone service, overseas—*cont*
tropospheric scatter systems 15 439
Telephone service, private line 12 411
Telephone set *see* Telephone
Telephone signaling special subscriber 15 442 443
audible signals 15 442
code calling systems 15 442
loudspeaker paging systems 15 442
radio paging systems 15 443
visual signals 15 442
Telephone switching 15 550 557
Telephone systems automatic message accounting (AMA) 15 553
automatic ticketing equipment 15 557
central office codes 15 550
centralized automatic message accounting (CAMA) 15 555
civil defense 15 431-432
community dial offices (CDO) 15 556
crossbar switch 15 552
fundamental planning 15 447
2 letter 5 numeral (2L 5N) numbering plan 15 550
manual operator 15 551
numbering plan 15 550
numbering plan area (NPA) 15 550
step by-step switch 15 556 557
switching circuit 15 544 549
Telephone systems construction 15 443 445
aerial cable 15 445
aerial wire 15 443
cable splicing 15 444 445
cables 15 445
conduit 15 444
multiple line wire 15 443
pole lines 15 443
terminals 15 446
underground cable 15 444
underground lines 15 444
wires 15 445
Telephone tape recording 8 41
Telephone television attachment 5 209
Telephone transmission inductive loading 15 454
intercity trunks 15 435
overseas radiotelephony 15 438 459
quality 15 441

Tantalum—*cont.*
principal compounds 13 392
properties 13 391
spectral emissivity 4 583
tantalite 13 391
Tanyderidae 4 212
Tanypeziae 4 212
Tanystropheus 11 50
Tanystropheus lonaobardicus 11 51
Tanytarsus 5 530
TAO 1 464 468
Tap, transformer 14 26 27
Tape, magnetic *see* Magnetic tape
Tape, surveyor's 13 324
Tape recorders 8 37-38
Tape recording 8 36-41
Taper 8 424
Taper pin 13 392
Taper pipe thread gage 6 4
Tapered transmission line 14 50
Tapetum 5 169
eye 5 162-171
flower (botany) 5 326 334
Tapeworm 13 392-393
beef 3 642
reproduction 13 393
structure 13 392
taxonomy 10 413
Tapeworm disease 13 393-394
beef tapeworm 13 393
echinococcosis 13 394
fish tapeworm 13 394
hymenolepiasis 13 393
pork tapeworm 13 394
Taphius 12 64
Taphrina deformans 5 546
Taping (surveying) 13 324
Tapinoma sessile 6 581
Tapioca 4 93, 13 50
cassava 2 558
Tapir 10 19 13 394-395
Tapiridae 13 395
Tapirus indicus 13 394
Tapped delay-line filter 5 271
Tapping 8 6
Tapti River 1 580
Tar acids 5 236
Tar bases 5 236
Tar sand *see* Oil sand
Taraktogenos kurzii 1 475
Taranto, Gulf of 5 115
Tarantula 1 498
Tarantula hawk 6 582
Taravanthin 2 530
Tarchanoff, J 11 75
Tardigrada 13 395 398
anatomy 13 395
cleavage 13 395
ecology 13 398
embryology 13 395-397
Eutardigrada 5 124 125, 13 393
gastrulation 13 395
Tardigrada—*cont*
Heterotardigrada 6 451; 13 395
molting 13 397
physiology 13 397
Target hit theory (radiation) 11 216
Target pattern (diffraction grating) 4 140
Target theory (mutation) 8 673 674
Taricha 12 7
Tarim River 1 580
Tarn (lake) 7 586
Tarnished plant bug 6 405, 13 398*
Taro 1 497, 4 13
Tarpon 5 225, 13 398*
Tarpon atlanticus 13 398
Tarsal bones 1 428
Tarsal formula Coleoptera 5 275 288
Tarsal gland 12 123
Tarski, A 2 289, 7 411
Tartronemidae 14 115
Tartar emetic 1 477
Tartar missile 1 543
Tartaric acid 10 354, 13 398-399*
Tartrate 5 74, 13 399*
Tashe noir 5 257
Tasman Mountain 1 671
Tasmania 1 669 672
rivers 1 671
Tasmanites 2 253
Taste 13 399 401
anatomy 13 399
behavioral effects 13 401
blindness 13 401
digestive system 4 166
molecule spatial arrangement 13 400
qualities 13 399
sensitivity 13 400
threshold 5 49 51
Taste bud 4 165, 12 180 13 399
chemoreception 3 49 51
embryology 9 49 50
Tatarian stage 10 23
Tatra High 5 118
Tatra Low 5 118
Tatum E L 2 67
Tauber test 2 453
Tauern, Hohe (high) 5 117
Tauern, Niedere (low) 5 117
Taupo Lake 1 672
Taurid meteor showers 4 587, 8 308
Taurine 12 394 13 253
cysteine 3 649
Taurocholic acid 2 185, 7 531
Taurus 3 412 413, 13 401*
Taurus moving cluster *see* Hyades
Taurus Range 1 577
Tausig H 2 514
Tautology 7 581
Tautomerism 13 401-403
anionotropic 13 402 403
keto enol tautomerism 13 402
lactam and lactim 7 376 377, 13 401
lactide and lactone 7 380
lacto-enoic tautomerism 13 402
oxime 9 468
ring chain tautomerism 13 402 403
Tautonomy 14 173
Tawing 7 446
Taxa 13 404
Taxidea taxus 2 72
Taxis 13 403
behavioral psychophysics 2 158
klinotaxis 13 403
telotaxis 13 403
tropotaxis 13 403
Taxiways, airport 1 216
Taxocrinida 4 369
Taxocrinus 4 366
Taxodium 3 189
Taxodonta 8 559, 9 614, 13 403 404*
Taxon 13 404
plant classification 10 298
Taxonomic categories 13 404
Taxonomy 13 404
alpha 1 423
animal systematics 1 422
of bacteria *see* bacteria, taxonomy of
beta 1 423
Fungi 5 561
type method 14 172
see also Macroevolution, Speciation
Taxus 14 605
Taxus baccata 14 605
Taxus brevifolia 14 605
Taxus canadensis 14 605
Taxus cuspidata 14 605
Tay-Sachs disease 8 226 9 69
Tayassu tajacu 9 608
Tayassuidae 1 568 9 608
Taylor D W 8 120, 14 582
Taylor Frederick W 6 494
Taylor G I 4 335 5 342, 14 161
Taylor J H 11 380
Taylor W H 5 208
Taylor W P 5 15
Taylor's formula differentiation 4 132
partial differentiation 9 569
Taylor series 12 180 191 192
geometrical optics 9 364 368
partial differentiation 9 569
Taylor's theorem 5 342
Taylor's wake fraction 14 582
4 (2, 4, 5-TB) 6 422
2, 5, 6-TBA 6 421
TBP 9 189
Tchebitschew, Pavel 1 552
TDE 7 140
Te Anau, Lake 1 672
Tea 13 404 405
black tea 13 405
caffeine 2 388
green tea 13 405
instant tea 13 405
oolong teas 13 405
tea production 13 405
Teak 3 187
Teak forests 1 587
Teal, J 2 216
Teal 4 290
Tealia 1 52 54
Tear gas 1 36, 5 45
Tear gland 5 166, 7 376
Technetium 13 405 406
electron configuration 4 504
ionization potential 4 50
Technical oils 10 72
Technicolor process 10 168
Technitrama 3 128
Technology 13 406
Tectibranchia 13 406
Tectiseps renoculis 3 291
Tectogene 9 411
Tectona grandis 3 187
Tectonic breccias 2 326
Tectonic patterns 13 406 415
the Alps 13 407 409
andesite line 13 412 413
the Apennines 13 409
Asiatic island arc complex 13 411
the Carpathians 13 409
Circum-Pacific chain 13 410-411
Coast Ranges 13 411
East Indies arcuate complex 13 410
fault and fault structure 5 191 195
Hercynian massifs 13 40
High Calcareous Alps 13 408
Himalayan Cordillera 13 410
island arcs 9 263, 13 412 413
the Juras 13 408
massif 8 167
Mediterranean chain 13 407
Mexico 13 411
Middle East Cordillera 13 409
Nevadan belt 13 410
North American Cordillera 13 410 411
older cordilleras 13 411
Pennine nappes 13 408
the Pre Alps 13 408

Tectonic patterns—*cont*
Precambrian 18 566
the Pyrenees 13 409
rift valley 11 570
Rocky Mountains system 13 410
shields and stable areas 13 413
sial 13 412
sima 13 412
South American Cordillera 13 411
Swiss plain 13 408
tectonic seismic gravity associations 12 149
tectonites 12 65
tectonophysics 6 170; 13 413
tectosphere
arc junctions 13 415
continental drift 13 415
continental fracture system 13 414
contraction theory 13 419
core 13 414
crust 13 414
evolution of faulting 13 416 417
mantle 13 414
mid-ocean fracture system 13 414
ocean floors 13 414
polar wandering 13 418
rates of tectonic deformation 13 417
rock failure 13 418
thermal convection currents 13 419
Tectorial membrane 10 124
Tectosilicates 12 511
Tefion 8 518
Teeming (steel manufacture) 13 95
Teeth 4 63
horny see Horny teeth
Teflon 5 244 6 329
electric insulation 7 157
see also Polyfluoroolefin resin
Tegeticula (=*Pronuba*) *yuccasella* 7 466
Tegmen 5 273 288
Tegmentum 9 58
Tegulobranchia 2 315
Tehuantepec 9 163
Teichoopus labyrinthica 5 89
Teindae 13 24
Tejo, Tagus 5 122
Tektite 13 420-421
composition 13 420
occurrence 13 420
origin 13 421
physical form 13 420
properties 13 420
TEL see Tetraethyllead
Telanthropus 5 477
Telecast 13 421
Telereptors 12 177
Telecommunications *see* Communications, electrical
Telegeusidae 3 277
Telegraph *see* Telegraphy
Telegraph codes 13 421-422
Continental code 13 421
Morse code 13 421
Telegraphy 13 421 425
AM radio 1 364
automatic switching 13 425
bandwidth requirements 2 94
cable circuit 13 424
circuits and equipment 13 422
facsimile 5 177
FM radio 5 321
message service 13 422 425
overseas 13 425
press systems 13 425
private line 13 424
radio circuits 13 425
stock quotation ticker service 13 425
submerged repeater amplifiers 13 424
teletypewriter 13 455
Telemetering 13 425 429
commutator 13 428
electrical 13 425-426
frequency modulation radio 5 321
mechanical 13 425
meteorological instrumentation 8 518 519
radio 13 425 429
rocket astronomy 11 600
telemetry equipment 13 428
Telemetry *see* Telemetering
Telencephalon 9 46
Telenomus 6 581
Teleobjective 13 447
Teleonemia scrupulosa 6 405 409
Teleoptile 5 195
Teleostei 1 57 58 9 443
Teleostomi see Actinopterygii
Telephone 13 429-431
accessory devices 13 431
add-on 7 179
camp-on 7 179
conference calling 7 179
electric network 13 430 431
electrical protection of user 3 323
executive access 7 180
hands free talking 7 180
hold key 7 179
intercom signaling 7 179
invention 4 454
optional features 7 179, 13 431
Telephone—*cont*
preset conference calling 7 179
privacy 7 180
receiver 13 430
sidetone balance 13 431
transmission equalization 13 431
transmitter 13 429 430
underwater *see* Underwater telephone
Telephone civil defense system 13 431 432
Telephone information service 13 440
Telephone intercommunicating system 7 179 180
Telephone leave word systems 13 440 441
secretarial systems 13 440
telephone answering sets 13 441
Telephone lines 13 443
Telephone pole beetle 5 276
Telephone private branch exchange (PBX) 13 452 455
dial 13 455
manual 13 452
Telephone receiver bipolar 13 430
ring armature 13 430
Telephone service 13 433 442
Telephone service interurban 13 434 437
direct distance dialing (DDD) 13 550 456
intercity trunks 13 435
international dialing 13 437
long-distance office 13 434
manual office 13 435
mechanized office 13 435
recording of billing information 13 435
Telephone service, local 13 433 434
central office 13 433
interoffice trunks 13 434
message units 13 433
party line service 13 434
registration of messages 13 433
subscriber loops 13 434
switching equipment 13 434
tandem office 13 434
trunk circuits 13 434
Telephone service long distance *see* Telephone service interurban
Telephone service overseas 13 438 440
high frequency radio 13 438 439
international agreements 13 446
submarine cables 13 439
Telephone service overseas—*cont*
tropospheric scatter systems 13 439
Telephone service, private line 12 441
Telephone set *see* Telephone
Telephone signaling special subscriber 13 442 443
audible signals 13 442
code calling systems 13 442
loudspeaker paging systems 13 442
radio paging systems 13 443
visual signals 13 442
Telephone switching 13 350 357
Telephone systems automatic message accounting (AMA) 13 555
automatic ticketing equipment 13 557
central office codes 13 550
centralized automatic message accounting (CAMA) 13 555
civil defense 13 431 432
community dial offices (CDO) 13 556
crossbar switch 13 552
fundamental planning 13 447
2 letter 5 numeral (2L-5N) numbering plan 13 550
manual operator 13 551
numbering plan 13 550
numbering plan area (NPA) 13 550
step by step switch 13 556 557
switching circuit 13 544 549
Telephone systems construction 13 443 445
aerial cable 13 443
aerial wire 13 443
cable splicing 13 444-445
cables 13 443
conduit 13 444
multiple line wire 13 443
pole lines 13 443
terminals 13 444
underground cable 13 444
underground lines 13 444
wires 13 443
Telephone tape recording 8 42
Telephone television attachment 5 209
Telephone transmission inductive loading 13 434
intercity trunks 13 435
overseas radiotelephony 13 438 439
quality 13 441

Tantalum—*cont*
principal compounds 15 592
properties 15 591
spectral emissivity 4 585
tantalite 15 591
Tanyderidae 4 212
Tanypezidae 4 212
Tanystropheus 11 50
Tanystropheus longobardicus 11 51
Tanystarsus 5 550
TAO 1 464,468
Tap, transformer 14 26 27
Tape, magnetic *see* Magnetic tape
Tape, surveyor's 15 324
Tape recorders 8 37-38
Tape recording 8 36 41
Taper 8 424
Taper pin 15 392
Taper pipe thread gage 6 4
Tapered transmission line 14 50
Tapetum 5 169
eye 5 162 171
flower (botany) 5 326 334
Tapeworm 15 392 393
beef 3 642
reproduction 15 393
structure 15 392
taxonomy 10 415
Tapeworm disease 15 393 394
beef tapeworm 15 393
echinococcosis 15 394
fish tapeworm 15 394
hymenolepiasis 15 393
pork tapeworm 15 394
Taphius 12 64
Taphrina deformans 5 546
Taping (surveying) 15 324
Tapinoma sessile 6 581
Tapioca 4 93, 15 50
cassava 2 535
Tapir 10 10, 15 594 595
Tapiridae 15 595
Tapirus indicus 15 594
Tapped delay line filter 5 271
Tapping 8 6
Tapti River 1 580
Tar acids 3 256
Tar bases 3 256
Tar sand *see* Oil sand
Taraktogenos kurzii 1 473
Taranto, Gulf of 5 115
Tarantula 4 494
Tarantula hawk 6 582
Tarasanthin 2 550
Tarchanoff, J. H. 7 75
Tardigrada 15 395 396
anatomy 15 395
cleavage 15 395
ecology 15 396
embryology 15 395 397
Futardigrada 5 124 125 15 395
gastrulation 15 395
Tardigrada—*cont*
Heterotardigrada 6 431, 15 395
molting 15 397
physiology 15 397
Target hit theory (radiation) 11 216
Target pattern (diffraction gratings) 4 140
Target theory (mutation) 8 673 674
Tarichа 12 7
Tarim River 1 580
Tarn (lake) 7 586
Tarnished plant bug 6 405, 15 398*
Taro 1 497 4 15
Tarpon 5 225, 15 398*
Tarpon atlanticus 15 398
Tarsal bones 1 428
Tarsal formula Coleoptera 5 275 288
Tarsal gland 12 123
Tarski, A. 2 289, 7 411
Tarsonemidae 14 115
Tartar emetic 1 477
Tartar mitule 1 543
Tartaric acid 10 354, 15 398-399*
Tartrate 5 74, 15 399*
Tashe noir 5 257
Tasman Mountain 1 671
Tasmania 1 669 672
rivers 1 671
Tasmanites 2 253
Taste 15 399 401
anatomy 15 399
behavioral effects 15 401
blindness 15 401
digestive system 4 166
molecule spatial arrangement 15 400
qualities 15 399
sensitivity 15 400
threshold 5 49 51
Taste bud 4 165, 12 140, 15 399
chemoreception 5 49 51
embryology 9 49 50
Tatarian stage 10 23
Tatra High 5 118
Tatra Low 5 118
Tatum, F. L. 2 67
Tauber test 2 453
Tauern, Hohe (high) 5 117
Tauern, Niedere (low) 5 117
Taupo, Lake 1 672
Taurid meteor showers 4 592, 8 304
Taurine 12 304, 15 253
cysteine 5 649
Taurocholic acid 2 145, 7 531
Taurus 3 412 415, 15 401*
Taurus, moving cluster *see* Hyades
Taurus Range 1 527
Tauung, H. 2 514
Tautology 7 541
Tautomerism 15 401-403
anionotropic 15 402 403
keto-enol tautomerism 15 402
lactam and lactim 2 526, 377, 15 401
lactide and lactone 7 550
lacto-enoic tautomerism 15 402
oxime 9 468
ring chain tautomerism 15 402 403
Tautonomy 14 173
Taxing 7 446
Taxa 15 404
Taxidea taxus 2 72
Taxis 15 403
behavioral psychophysics 2 158
klinotaxis 15 403
telotaxis 15 403
tropotaxis 15 403
Taxiways airport 1 216
Taxocrinida 4 569
Taxocrinus 4 566
Taxodium 5 189
Taxodonta 8 659, 9 614, 15 403 404*
Taxon 15 404
plant classification 10 294
Taxonomic categories 15 404
Taxonomy 15 404
alpha 1 423
animal systematics 1 422
of bacteria *see* bacteria taxonomy of
beta 1 423
Fungi 5 561
type method 14 172
see also Macroevolution, Speciation
Taxus 14 605
Taxus baccata 14 605
Taxus brevifolia 14 605
Taxus canadensis 14 605
Taxus cuspidata 14 605
Tay Sachs disease 8 226, 9 69
Tayassu tajacu 9 604
Tayassuidae 1 568, 9 604
Taylor, D. W. 8 120, 14 582
Taylor, Frederick W. 6 494
Taylor, G. I. 4 355, 5 542, 14 161
Taylor, J. H. 11 580
Taylor, W. H. 3 204
Taylor, W. P. 5 13
Taylor's formula differentiation 4 131
partial differentiation 9 569
Taylor series 12 193, 193 194
geometrical optics 9 564, 569
partial differentiation 9 569
Taylor's theorem 5 542
Taylor's wake fraction 16 592
4 (2, 4, 5 TB) 6 422
2, 3, 6 TB4 6 421
TBP 9 159
Tchebitschew, Pavel 1 552
TDE 7 140
Te Anau, Lake 1 672
Tea 15 404 405
black tea 15 405
caffeine 2 388
green tea 15 405
instant tea 15 405
oolong tear 15 405
tea production 15 405
Teak 5 187
Teak forests 1 547
Teal, J. 2 216
Teal 4 290
Tealia 1 52 54
Tear gas 1 36, 3 45
Tear gland 5 166, 7 326
Technetium 15 405 406
electron configuration 4 504
ionization potential 4
Technical aids 10 72
Trichinolor proteus 10 168
Technirama 5 125
Technology 15 406
Tectibranchia 15 406
Tectocepit venosulit 5 291
Tectogene 9 411
Tectona grandis 5 187
Tectonic breccias 2 525
Tectonic patterns 15 406 41
the Alps 15 407 409
andesite line 15 412 415
the Apennines 15 409
Atlantic island arc complex 15 411
the Carpathians 15 409
Circum Pacific chain 15 410 411
Coast Ranges 15 411
East Indies arcuate complex 15 410
fault and fault structure 5 191 195
Hercynian mass 15 4
High Calcareous Alps 15 409
Himalayan Cordillera 15 410
island arcs 9 295, 15 41 413
the Juras 15 409
massif 8 167
Mediterranean chain 15 407
Mexico 15 411
Middle East Coast Range 15 409
Nevadan belt 15 413
North American Cordillera 15 413 415
older geosynclines 15 411
Pennine nappes 15 4
the Pre Alps 15 4

Terrace patterns—cont
Precambrian 10 566
the Pyrenees 13 409
rift valley 13 570
Rocky Mountains system 13 410
shield and stable areas 13 413
sial 13 412
sima 13 412
South American Cordillera 13 411
stress plains 13 408
Tectonic seismic gravity associations 12 549
Tectonites 12 63
Tectonophysics 6 170; 13 413 420
arc junctions 13 415
continental drift 13 418
continental fracture system 13 414
contraction theory 13 419
core 13 414
crust 13 414
dynamics of faulting 13 416 417
mantle 13 414
mid-ocean fracture system 13 414
ocean floors 13 414
polar wandering 13 418
rates of tectonic deformation 13 417
rock failure 13 418
thermal convection currents 13 419
Tectorial membrane 10 124
Tectosilicates 12 311
Tedion 8 318
Tedning (steel manufacture) 13 95
Teeth 4 63
horny *see* Horny teeth
Teflon 5 244 6 329
electric insulation 7 157
see also Polyfluoroolefin resin
Tegeticula (=Pronuba) yuccasella 7 466
Tegmen 5 275 285
Tegmentum 9 58
Tegulorhynchia 2 315
Tehuantepec 9 163
Tenthopsis labyrinthica 5 365
Tendae 13 24
Tejo Tagus 5 122
Tektite 13 420 421
composition 13 420
occurrence 13 420
origin 13 421
physical form 13 420
properties 13 420
TEL *see* Tetraethyllead
Telanthropus 5 477
Telecast 13 421
Teleceptors 12 177
Telecommunications *see* Communications, electrical
Telegeusidae 5 277
Telegraph *see* Telegraphy
Telegraph codes 13 421 422
Continental code 13 421
Morse code 13 421
Telegraphy 13 421 425
AM radio 1 564
automatic switching 13 425
bandwidth requirements 2 94
cable circuit 13 424
circuits and equipment 13 422
facsimile 5 177
FM radio 5 521
message service 13 422 423
overseas 13 425
press systems 13 425
private line 13 424
radio circuits 13 425
stock quotation ticker service 13 425
submerged repeater amplifiers 13 424
teletypewriter 13 455
Telemetering 13 425 429
commutator 13 428
electrical 13 425 426
frequency modulation radio 5 521
mechanical 13 425
meteorological instrumentation 8 318 319
radio 13 425 428
rocket astronomy 11 600
telemetry equipment 13 428
Telemetry *see* Telemetering
Telencephalon 9 46
Telenomus 6 581
Teleobjective 13 447
Teleonemia scrupulosa 6 405, 409
Teleoptile 5 195
Teleostei 1 57 58 9 443
Teleostomi *see* Actinopterygii
Telephone 13 429-431
accessory devices 13 431
add-on 7 179
camp-on 7 179
conference calling 7 179
electric network 13 430-431
electrical protection of user 5 323
executive access 7 180
hands free talking 7 180
hold key 7 179
intercom signaling 7 179
invention 4 454
optional features 7 179 13 431
Telephone—cont
preset conference calling 7 179
privacy 7 180
receiver 13 430
sidetone balance 13 431
transmission equalization 13 431
transmitter 13 429 430
underwater *see* Underwater telephone
Telephone civil defense system 13 431 452
Telephone information service 13 440
Telephone intercommunicating system 7 179 180
Telephone leave word systems 13 440 441
secretarial systems 13 440
telephone answering sets 13 441
Telephone lines 13 443
Telephone pole beetle 5 276
Telephone private branch exchange (PBX) 13 432 433
dial 13 433
manual 13 432
Telephone receiver bipolar 13 430
ring armature 13 430
Telephone service 13 433 442
Telephone service interurban 13 434 437
direct distance dialing (DDD) 13 550 436
intercity trunks 13 435
international dialing 13 437
long-distance office 13 434
manual office 13 435
mechanized office 13 435
recording of billing information 13 435
Telephone service local 13 433 434
central office 13 433
interoffice trunks 13 434
message units 13 433
party line service 13 434
registration of messages 13 433
subscriber loops 13 434
switching equipment 13 434
tandem office 13 434
trunk circuits 13 434
Telephone service long-distance *see* Telephone service, interurban
Telephone service overseas 13 438 440
high frequency radio 13 438-439
international agreements 13 446
submarine cables 13 439
Telephone service, overseas—cont
tropospheric scatter systems 13 439
Telephone service private line 12 441
Telephone set *see* Telephone
Telephone signaling special subscriber 13 442 443
audible signals 13 442
code calling systems 13 442
loudspeaker paging systems 13 442
radio paging systems 13 443
visual signals 13 442
Telephone switching 13 550 557
Telephone systems automatic message accounting (AMA) 13 553
automatic ticketing equipment 13 557
central office codes 13 550
centralized automatic message accounting (CAMA) 13 555
civil defense 13 451 452
community dial offices (CDO) 13 556
crossbar switch 13 552
fundamental planning 13 447
2 letter, 5 numeral (2L 5N) numbering plan 13 550
manual operator 13 551
numbering plan 13 550
numbering plan area (NPA) 13 550
step-by step switch 13 556 557
switching circuit 13 544 549
Telephone systems construction 13 443 445
aerial cable 13 443
aerial wire 13 443
cable splicing 13 444-445
cables 13 443
conduit 13 444
multiple line wire 13 443
pole lines 13 443
terminals 13 444
underground cable 13 444
underground lines 13 444
wires 13 443
Telephone tape recording 8 41
Telephone television attachment 5 209
Telephone transmission inductive loading 13 454
intercity trunks 13 435
overseas radiotelephony 13 438 439
quality 13 441

Telephone transmission—*cont.*
rating 15 441
repeaters 15 454
Telephone transmitter 15 429 430
Telephony 15 445-447
bandwidth requirements 2 94
central switching office 15 445
compandor 3 556
crosstalk 3 555 556
elementary circuit 15 445
international 15 446
interoffice trunks 15 446
manufacture of equipment 15 447
privacy of radio circuits *10* 624
single sideband carrier system 1 352
switching systems 15 357
United States 15 447
Telephoto lens 7 453, 15 447
motion picture cameras 3 123
Telephotography 15 447 448
information content 15 448
speeds 15 447
transmission 15 448
see also Facsimile
Teleprinter *see* Teletypewriter
Telescope 15 448 452
astronomical *see* Telescope, astronomical
catadioptric 15 448 452
dioptic 15 449 452
elbow 6 299
Galilean 15 448
gun sights 6 298 299
Keplerian 15 449
lens systems 7 452 454
magnification 15 449
Newtonian 15 448 451
opera glasses 9 356
optical tracking instruments 9 360 362
periscopes 10 17
reflecting (catoptric) 15 448 452
refracting (dioptric) 15 448 452
refracting reflecting 15 451 452
resolving power 11 500, 15 449 450
terrestrial 15 448 449
Telescope, astronomical 15 448 452
aberrations 15 450 452
Brachy 15 451
Cassegrainian 15 451
Chrétien 15 451
coronagraph 5 [illegible], 15 450
Gregorian 15 451
Telescope, astronomical—*cont.*
Herschelian 15 451
limitations 15 452
Maksutov 15 452
mirror optics 8 509 510
in observatories 9 242 245
Schmidt 12 64, 15 449, 452
Schwarzschild 15 451
Schwarzschild Cretien 8 510
solar 15 286 289
use in spectroscopy 1 615-616
zenith 1 610 611
Telescope, radio *see* Radio telescope
Telescopium 3 413 414
Telestacea 3 255, 15 452 455*
anthozoa 1 455
Telesto 1 226, 3 255, 15 452
Teletranscriptions 15 458
Teletypesetter 3 345, 15 453
operating unit 15 453
tape perforator 15 453
Teletypewriter 15 453 455
Baudot code 15 453
operation 15 454
Teletypewriter exchange (TWX) service 15 455 456
comparison with other services 15 455
operating procedure 15 455
teletypewriter 15 455
see also Telex
Teleutospore 11 654, 14 217
Urediniales 14 256
Television 1 365, 15 456 459*
antennas *see* Antenna (aerial)
aspect ratio 15 477
bandwidth requirements 2 91, 15 457
basic principles and operation 15 456 457
blanking signals 15 459
camera tubes 15 461 467
cameras 15 459 461
closed circuit *see* Closed circuit television
color *see* Color television
frequencies 15 457
ghost image 15 459
grades of service 15 459
harmonic distortion 15 458
intercarrier sound system (ICS) 15 473
kinescope 7 347 349
networks 15 467 469
noise 15 459
picture transmission 15 459
program recording 8 41, 15 458
receivers 15 469 475
Television—*cont.*
reflections 15 458
resolution 15 476
scanning 15 457, 475 476*
scrambling of television signals 15 459
snow 15 458
sound transmission 15 457
standards 15 476 477
static 15 51
studios 15 478 479
transmission theory and methods 14 54 61
transmitters 15 479 482
uhf 15 457
underwater see Underwater television
vhf 15 457
Television camera 15 459 461
camera control unit 15 460
color camera 5 297, 15 460
colorplexer (encoder) 15 460
field equipment 15 461
film reproduction 15 460 461
meteorological use in satellites 8 322
monochrome cameras 15 459 460
studio cameras 15 459 461
Television camera tube 15 461 467
cathode potential stabilized emitron 15 465
iconoscope 15 464
image dissector 15 466
image iconoscope 15 464 465
image orthicon 7 51, 15 462 464
nonstorage 15 462
range of sensitivity 15 462
storage 15 462
use in industrial nondestructive testing 15 462
use in microscopes 15 462
use in military surveillance 15 462
vidicon 15 465
Television networks 15 467 469
closed circuit networks 15 469
coaxial cable system 15 469
11 carrier system 15 469
13 carrier system 15 469
local channels 15 469
microwave radio relay 15 469
monitoring 15 468
operation 15 467 468
round robin 15 467 468
switching 15 467
TD 2 radio system 15 469
testing 15 468
transmission 15 467
Television networks—*cont.*
transmission facilities 15 469
Television picture tube *see* Kinescope
Television receiver 15 469
antenna 15 470
automatic gain c (AGC) 15 [illegible] 15
automatic frequency control (AFC) 15 [illegible]
cascode amplifier 2 [illegible]
color 5 298 299, 15
controls 15 472
high voltage supply
horizontal deflection 15 472
intermediate frequency amplifier 15 470
kinescope 7 347 349, 15 472
monochrome receiver 15 470
separation of video and audio 15 471
sweep systems 15 471
sync separator circuit 15 471
transmission line 15
tuner 15 470
vertical deflection 15
video amplifier 14 32
Television scanning 15 475 476*
frequency 15 475
interlaced scanning 15
lines 15 475
raster 15 475
raster scan generator 15 334
sequential scanning
standards 15 476
Television standards 15 477
allocation standards
channel standards 15
equipment standards 15 477
modulation standards 15 477
scanning standards 15
transmission standards 15 476
Television studios 15 478
acceptable noise levels 9 129
control room 15 [illegible]
signal transmission 15
studio lighting 15 479
Television transmitter 15 482
antennas 15 [illegible]
aural signal 15 [illegible]
effective radiated power (ERP) 15 479
operation 15 [illegible]
polarization 15 [illegible]

Television transmitter—cont
requirements for color 13 480
signal characteristics 13 479
standards in other countries 13 481
transmitter power 13 479
visual signal 13 479
Telex 13 492
teletypewriter 13 435
see also Teletypewriter exchange (TWX) service
Telicate 5 252
Tellegen B D H 4 519 6 302
Teller E 1 81 4 552 12 162
Tellina lenses 5 202
Telluric currents 6 168
Telluride 13 482 484
gold ore 6 250
Tellurium 13 482-485
acids 13 484 485
allotropes 13 482 483
electron configuration 4 504
extractive metallurgy 8 278
halides 13 485
hydride 13 485
ionization potential 4 504
natural occurrence 13 482
organic compounds *13 484* 485
organometallic compound 9 405
oxides 13 483 484
preparation 13 482
principal compounds 13 483
properties 13 482 485
uses 13 483
see also Selenium Sulfur
Tellurium ocher 13 482
Telobranchial body *see* Ultimobranchial bodies
Telolecithal ovum 9 459
Telophase meiosis 8 211
mitosis 8 521
Telosporidea 11 52, 13 11, 485*
Coccidia 3 249, *11* 52, 13 485
Gregarinidia 6 263, 11 52, 13 485
Haemosporidida 6 313 317 11 52 13 485
Telotaxis 13 493
Telotremata 1 566 13 485*
Articulata (Brachiopoda) 1 566
Telson 5 562 569
Temnocephala 11 542
Temnocephalidae 3 277
Temnopleuridae 13 485
Temnopleuroida 4 360, 371, 13 485*
Temnospondyli 1 354, 7 375, 496
Temperament (music) 8 664
Temperature 13 486 487
absolute zero 1 10 11
air 1 138 139
air conditioning 1 145
color temperature 3 299
earth interior 4 527
earth surface 4 527
and heat conduction 5 585 591
and heat convection 5 439 444
heat radiation 6 369 373
inversion temperature 7 538
relation to heat transfer 13 486
scales 13 486 487
sensible temperature 12 180
standard 10 205, 13 487
thermodynamics (chemical) 13 575
upper atmosphere 1 95
Temperature anomaly map 7 271
Temperature-composition diagram 5 55
distillation 4 247
Temperature control, automatic 13 487 488
comfort control 5 316 317, 6 375 377
process control 10 637
resistance heating 11 490
steam 13 85
thermostat 13 502
Temperature cylinder 13 489
Temperature-depth trace *thermocline* 13 562
Temperature distribution in *the earth* 4 551 554
Temperature-entropy diagram *13 570*
Temperature gradient 5 439 444
in ocean 13 562
Temperature humidity index 13 491
Temperature indicators 13 489
pyrometric cones 11 127 129, *13 489*
temperature-sensitive crayons pellets and paint 13 489
thermography 13 489
see also Temperature measurement
Temperature inversion 13 488
polar atmospheres 10 440
Temperature measurement 13 488 489
calibration of instrument 13 488
dry bulb 11 82
instruments *13 489*
kata thermometer 13 491
low temperatures 7 598 601
meteorology 1 158 159
pyrometers 11 125 127*, 13 489
sea water 2 110 111, 12 114 115
sources of error 13 488
thermistor 13 556
thermocouple 13 489, 564
thermometer 13 489 586
wet bulb 11 82
Temperate rainforest 3 187
Temperature regulator (animal) 13 594
see also Hypothalamus
Temperature salinity diagram (oceanography) 12 112
Temperature scales 13 486 487
Temperature senses 13 489 491
paradoxical cold 13 490
temperature receptors 13 490
temperature "spots" 13 489
thermal adaptation 13 490
Temperature sensitive crayons, pellets and paint 13 489
Tempering 13 491
glass 6 207
steel 6 581
surface hardening of steel 13 515
Temporal bone 12 373
Temporal lobe 9 57
Ten spot dragonfly 4 271
Tender 12 267
Tenderometer (pea) 9 599
Tendipedidae 4 212
Tendon 13 491
Tendons (prestressed concrete) *10* 586
Tendril 13 111
Tendril climbers 13 124
Tenebrio molitor 3 287, 12 65
Tenebrionidae 3 276 277
Tenebroides mauritanicus 3 287
Tennantite 13 529
Tennessee Bluegrass region 9 153
Tennessee River 9 150
Tennessee River Basin 14 595
Tennessee Valley 9 148
Tenorite 3 464
Tenosynovitis 7 515
Tentec 7 142
Tentreciidae 7 143
Tensile strength 8 271
Tensile test of metals 10 598
Tension 4 419 420
in metals 8 268 272
see also Stress (mechanics)
Tensor—*cont*
see also Calculus of tensors
Tensor bundle 5 254
Tensor field 5 254
Tensor force 7 414
Tent caterpillar 2 552, 7 464 472
Tentaculata 3 609, 13 491*
Cestida 3 609
Cydippidea 3 609
Lobata 3 608, 7 570
Platyctenea 3 608 10 412
Tentaculites 3 400 4 87
Tentaculites gyracanthus 3 400
Tentaculites scalariformis 3 400
Tentelelf process 13 261
Tenthredinidae 6 574
Tenuipalpidae 14 115
Tephigram (meteorology) 1 655
Tephrite 2 105 7 16
Tephritidae 4 212
Tephroite 9 517
Tequila 4 255
Teratocarcinoma 9 520
reproductive system disorders 11 492
Teratogenesis 13 491 494
abnormality 13 491 492
causal agents 13 492
causation 13 492
degenerative changes 13 493
differentiation 13 493
form changes 13 493
genesis of anomalies 13 493
genetic factors 13 492
growth processes 13 493
nongenetic factors 13 492
premorphological events 13 493 494
production of effects 13 493
selectivity of agent 13 493
sequential anomalies *13 493*
tissue interactions 13 493
Teratogenic agent 13 494
Teratoma 9 520
Teratornis 1 694
Teratornis incredibilis 5 178
Terbia 5 64, 13 494
Terbium 13 494
electron configuration 4 504
extractive metallurgy 8 278
Terebella 11 511
Terebellidae 10 462
Terebra 8 561 9 54 11 19
Terebrantia 13 628
Terebratalia 2 315
Terebratulacea 13 485
Terebratulina 2 315
Teredidae 12 291
Teredinidae 5 100 9 613

Teredo navalis 5 101; 12 291
Terephthalate 5 74, 10 475
  polyester resins 10 467
Terephthalic acid 10 197
Terlerlaceae 5 124
Tergite 3 562 569
Tergum 1 555, 3 562 569
Terminal bar: cell surface differentiation 2 622
Terminal bud 2 360
Terminalia 3 187
Termitaphididae 6 401
Termitaria 7 287
Termite 7 281, 12 405, 13 494*; 14 559
Termite bug 6 401
Termitelike beetle 5 277
Termitidae 7 284
Termitophile 3 273 288
Tern 13 491-495
Ternary alloys 1 260
Ternary system 5 59
Terneplate 8 279
Ternifine man 5 477, 13 495*
Terpene 13 495-498
  camphor 2 432 433
  citrus flavoring 5 147
  classification 13 495
  diterpenes 13 498
  essential oils 5 71 72
  hydrocarbons 6 535 536
  isoprene 7 294
  menthol 8 227
  monoterpenes 13 496
  pinene 10 258
  polyallene 10 460 461
  polysterpenes 13 498
  sesquiterpenes 13 497
  squalene 13 20
  tetraterpenes 13 498
  triterpenes 13 498
  see also Polymer
Terphenyl 12 75 76
Terpineol 13 497
alpha Terpineol 10 236, 13 496
Terpinolene 13 496
Terra alba 6 301
Terra cotta 3 167, 10 346, 13 205 498
Terra rosa 7 333
Terra rosa bauxite 2 113
Terrace mining 8 472
Terraces, continental shelf 13 218
Terracing (agricultural) 13 498 500
  land farming 13 499
  outlet construction 13 499
  types 13 499
Terrain areas, world wide 13 500 501
Terrain clearance indicator 1 290, 13 502*
Terrain features, see Landforms
Terrain recognition system 6 290
Terramycin *see* Oxytetracycline
Terrapene 14 166
Terrapene carolina 3 23, 14 166
Terrapin 13 502
Terrazzo 13 155
Terrestrial biocycle 3 325 326
Terrestrial ecosystem 4 404, 13 502 506*
  adaptations to the habitat 13 502 503
  catastrophic agents 13 504
  comparison of ecosystems 13 502 503
  energy 13 504
  energy transfer 13 503 506
  extent 13 503
  habitat distribution of organisms 13 503
  productivity 13 504 505
  seasonal effects 13 504
  structural adaptations 13 503
  temperature 13 503 504
  trophic levels 13 504
  trophic structure 13 505
Terrestrial electricity 6 171, 13 506 511*
  discovery of earth currents 13 507
  earth current measurement 13 507
  earth current storms 13 508
  effect on antenna radiation 1 453
  electrode potentials 13 508
  electrodes 13 507
  large scale patterns 13 510
  local geoelectric phenomena 13 506
  lunar diurnal variation 13 509
  natural geoelectric currents 13 507
  periodic variations 13 508
  potential gradient 13 507
  solar diurnal variation 13 508
  vertical earth currents 13 506
Terrestrial equator 5 47
Terrestrial field guidance systems 6 289
Terrestrial force fields 13 511
Terrestrial frozen water 13 511 513
  glaciers 13 511 512
  massive ice constants 13 512 515
  properties of 13 512
Terrestrial gravitation 6 265, 266, 13 513 521*
  absolute measurements 13 515
  Aivo Heiskanen isostatic system 12 519 520
Terrestrial gravitation—*cont*
  Bouguer reduction 13 517
  free air reduction 13 517
  general root theory 13 520
  geoid of Europe 13 518 519
  gravity observations at sea 13 514
  isostasy 13 519 521
  isostatic readjustments in nature 13 520
  isostatic reduction 13 518
  measurements 13 513 515
  pendulum method 13 513 514
  physical applications of anomalies 13 519
  Pratt Hayford isostatic system 13 519
  reduction of observations 13 517
  relative observations 13 515
  sea gravimeters 13 514
  underwater gravimeters 13 514
  Vening Meinesz isostatic system 13 519
Terrestrial heat flow *see* Earth (heat flow)
Terrestrial lead 7 428
Terrestrial magnetism 13 521 *see also* Geomagnetism
Terrestrial nuclear reactions 13 521 522
  induced reactions 13 521
  spontaneous reactions 13 521
Terrestrial radiation *see* Radiation terrestrial
Terrestrial telescope 7 452, 13 448 449*
  Keplerian 13 448
Terrestrial vegetation composition 2 241
Terrier missile 1 543
Terrigenous sediments 8 155, 156, 12 187
Territorial behavior *see* Territoriality
Territorialism 4 396
Territoriality 2 245, 13 522 523*
Tertiary 6 136, 142, 13 523 524*
  fauna 13 524
  flora 9 506 507
  limits and subdivisions 13 525
  lithology 13 525
  stratigraphic nomenclature 13 523
  Taeniodonta in 13 396
Tertiary amine 1 505
Tertiary creep *see* Creep of materials
Tertylene 4 510
Tertylene polyester fiber 8 244, 2, 4, 5-TES 6 423
Teschenite 10 66, 13 549
Tesla, N. 4 434, 7 72
Tesla coil 7 72
Tessar lens system 7 453
Test of hypothesis 2 226
Testacea *see* Testacida
Testacida 11 52, 12 27 28, 13 524*
  life cycle 13 524
Testicle 11 475, 13 524
Testimony, experiment (in ory) 8 218
Testing *see* Inspection Testing; *see also* entries der specific types of such as Aircraft testing ironmental test, Skin te
Testes *see* Testis
Testis 4 296, 13 524 527*
  castration 13 526
  comparative anatomy 11 470 471
  cryptorchism 13 526
  gonad 6 235
  gonad organogenesis 11 464
  hermaphroditism 6 42
  histology 11 473, 13 525
  hypophysectomy 13 52
  normal pubertal development 13 527
  physiology 13 526
  sperm formation 13 526
Testosterone 13 526, 4 296, 5 77
  androgen 1 398
  endocrine mechanisms 4 592
  gonad 6 235
  ovary 9 454
  reproductive system 11 470 477
Tests (foraminiferal) 5 49, 12 25
Tettrow 8 578
Tetradimidae 8 575
Tetradonata *see* Ebelonia
Tetradontidae 8 22
Tetrahedrite 13 527
Tetrahymena 13 527
Tetanus 1 466 467 472 497, 13 527*
  Bacillaceae 2 2
  biologicals 2 216
  motor systems 8 631
  muscle (body types) 8 6
  neutralization reaction (
  nitrate) 9 52
Tetany 4 255
Tetbinolite 4 212
Tethys 10 537
Tethys 12 497, 13 4
  Cretaceous 5 519
  Jurassic 7 325

Tetra grossychine 3 109
Tetrahexylsilane 12 322
Tetraborane 2 290
Tetrabranchia 2 645 9 6
Tetrabromo-m cresolsulfonphthalein 7 60
Tetrabromosilane (silicon tetrabromide) 12 321
Tetrabutylsilane 12 322
Tetracaine 1 403
Tetrachloroauric acid 4 hydrate 8 251
Tetrachloro p benzoquinone 5 364
Tetrachlorodiammineplatinum (IV) 5 334
2,4,4,5 Tetrachlorodiphenyl sulfone 8 518
Tetrachloroethane 3 74
Tetrachloroethylene 6 430, 478
Tetrachloropalladate 9 523
Tetrachlorophene 1 483
Tetrachlorosilane (silicon tetrachloride) 12 321
1,2,3,4-Tetrachloro 1,2,3,4-tetrahydronaphthalene 12
Tetraclaenodon 3 394
Tetracontane 1 249
Tetracorallia *see* Rugosa
Tetracosane 1 249
Tetractinomorpha 4 55 10 513
Chorisida 3 88 89, 10 513
Clavamelida 3 158-159, 10 513
Demospongiae 4 54 57
Homosclerophorida 6 476, 10 513
Tetracrdin triterpene 14 111
Tetracycline 1 464-468, 475, 491 10 856 13 527 529*
absorption 13 528
antimicrobial activity 13 528
chemical formula 13 528
commercial production 13 528
distribution 13 528
excretion 13 529
fermentation 13 529
oxytetracycline 9 474
pharmacology 13 529
therapeutic effect 13 529
Tetracyn *see* tetracycline
Tetrad analysis (genetics) 11 578
Tetradecane 1 249
Tetradonematidae 8 243
Tetradymite 13 442
Tetraedron 1 255
Tetraethylammonium chloride 11 194
Tetraethyllead 1 474, 7 426 13 529*
aircraft fuel 1 178
combustion knock 3 309
Tetraethylpyrophosphate 7 541
Tetraethylsilane 12 322
Tetrafluoroethylene 6 529
polyfluoroolefin resin 10 470
Tetrafluorosilane (silicon tetrafluoride) 12 321
Tetragonal crystal system 3 604 605
Tetragonal lattice 3 594 595
Tetragraptus 6 259
Tetrahedrite 13 529
Tetrahedron 10 472, 13 529 530*
chemical structures 5 35
polytopes regular 10 492
Tetrahydrocannabinol 11 108
Tetrahydrofolic acid (THFA) 1 318, 2 13 14 6 221
Tetrahydrofuran 5 565
Tetrahydroimidazole 7 32
1,2,3,4 Tetrahydroisoquinoline 7 289
Tetrahydronaphthalene 1 243
1,2,3,4 Tetrahydronaphthalene 6 535 9 2
5,8,9,10 Tetrahydro-1,4 naphthoquinone 11 195
Tetrahydro-1, 4-oxazine 8 598
Tetrahydrooxazole 9 461
Tetrahydropyran 11 107
Tetrahydropyridine 11 113
Tetrahydropyrrole 11 130
1,2,3,4 Tetrahydroquinoline 11 191
Tetrahydrothiazoles 13 599 601
Tetrahymena 5 121 122, 6 585 11 511
Tetrahymena pyriformis 3 700, 11 57
2,3,4,5-Tetraiodopyrrole 11 151
Tetraiodosilane (silicon tetraiodide) 12 321
3,5,3',5' tetraiodo-L-thyronine 13 625
Tetrakentron 6 451 13 598
Tetralin 9 2
Tetralogy of Fallot 2 515
Tetralophodon 10 636
Tetrameres americana 13 6
Tetramethylammonium hydroxide 1 506
2,2,3,3-Tetramethylbutane 9 273
Tetramethyldimethane 9 822
Tetramethylsilane 12 322
Tetramethylthiuram disulfide 1 475
Tetramminepalladium chloride 9 523
Tetramorium caespitum 6 581
Tetranotidae 6 18
Tetranychidae 14 115
Mesostigmata 8 255
Tetranychus telarius 8 518
Tetraodontiformes 9 442, 13 530*
Tetraonidae 6 285, 10 563, 11 84
Tetraphenylsilane 12 322
Tetraphyllidea 10 414, 13 530*
Cestoidea 2 659
Tetraplatia 3 255
Tetraploid 10 488
Tetrapod 12 258
Tetrapoda 1 420 13 530 531*
Amphibia 1 533
Tetrapropylene 11 18
Tetrapropylsilane 12 322
Tetrapygus 1 499
Tetrarhynchoidea *see* Trypanorhyncha
Tetrasacculus 9 510
Tetrasacculus mirabilis 9 511
Tetrasulane 12 320
Tetraspora 10 213
Tetrastemma 6 479, 11 560
Tetrastichus 6 581
Tetraterpene *see* Terpene
Tetrathionate 13 262
Tetrazole 1 703
Tetrigidae 9 417
Tetrode vacuum 13 531
beam power tube 2 114 115
characteristics 13 531
negative resistance 13 531
Tetrogonia expansa 12 615
Tetrology 6 539
Tetryl 5 151 9 104
Tettigidae 6 281
Tettigoniidae 6 281 7 534, 9 417
Teuthoidea 3 275 13 531*
Cephalopoda 2 645
Texas fever 13 629
Texas Towers 13 531 532
Textile 13 532 537
auxiliary 13 537 540
battening 13 535
carding 13 532 533
chemistry *see* Textile chemistry
classification of weaves 13 536
combing 13 533
cotton 13 532
drawing out 13 533 534
fiber man made 5 242 246
fiber natural 5 246-253
finishing 13 536-537
flameproofing 5 274
letting off 13 535
microbiology *see* Textile microbiology
picking 13 535
plain weave 13 536
preparation for weaving 13 534 535
printing *see* Textile printing
roving 13 534
satin weave 13 536
shedding 13 535
softeners 13 539
spinning 12 618, 13 532 534
taking up 13 535
thread count 13 534 535
twill weave 13 536
twist 13 534
weaving 13 535 536
yarn 13 533 534
Textile chemistry 13 537 541
bleaching 2 258 259, 13 538
cyanoethylation 5 634 636
detergent 13 538
dyeing 4 511
end use finishes 13 539
felting 13 540 541
finishing agents 13 539 539
flame resistance 13 540
flock 13 541
nonwoven fabrics 13 540 541
scouring agents 13 538
sizing agents 13 538
surface active agents 13 538
textile auxiliary 13 537 540
textile printing 13 542 543
textile softeners 13 539
water repellents 13 540
see also Dye
Textile microbiology 13 541 542
cotton 13 541
retting 13 542
wool 13 541 542
Textile printing 13 542 543
azoic printing 13 543
discharge printing 13 542
etch printing 13 543
flash aging 13 542
flock printing 13 543
leuco vat esters 13 543
naphthol printing 13 543
pigment printing 13 543
pliss printing 13 543
resist printing 13 542
vat colors 13 542
see also Dye
Textularia 3 7 12 28
Textularia gramen 5 432
Textulariid 5 431
Textural soil classification 12 452
Texturizing agent (food) 5 578
TGA *see* Thermogravimetry
Thais 9 477 11 19
Thaididae 14 438
Thalamic theory 4 584
Thalamus 2 516 12 502, 507
Thalamus (botany) 5 329
Thalarctos maritimus 2 118
Thalassemia 2 195
Thalassiosira 12 27
Thalassina 4 28

Thalassinidea 4 31
Thalassiothrix frauenfeldii 8 128
Thalassiothrix nitzschioides 8 128
Thales 4 462
Thalia democratica 13 545
Thaliacea 4 40, 13 543 544* 14 140
Thalictrum 10 488
Thallium 13 544 545
  analysis 13 545
  electron configuration 4 504
  extractive metallurgy 8 278
  ionization potential 4 504
  principal compounds 13 544 545
  properties 13 544
Thallium sulfate 11 615
Thallophyta 1 235, 5 562, 10 516, 11 47, 13 545*
  algae 1 255
  Chlorophyta 3 80 10 346
  Chrysophyta 10 346
  Cyanophyta 10 346
  Euglenophyta 5 100, *10 346*
  Eumycophyta 10 346
  fossil plants 9 502
  Myxomycophyta 10 346
  Phaeophyta 10 91 346
  Pyrrophyta 10 346 11 132
  Rhodophyta 10 346 11 555
  Schizomycophyta 10 346
Thallospores 8 520
Thames 5 122
Thamnophis ordinatus 12 599
Thamnophis sirtalis 6 41
Thaumsleidae 4 212
Thaumastowendae 6 401
Thaumatoderma 8 10
Thaumatomastix 5 77
Thaumatowendae 4 212
Thea unenmi 13 401
Theater acceptable noise levels 9 129
  sound amplification systems 1 520
  television *see* Closed-circuit television
Theca cell tumor 11 480
Theca folliculi 11 474
Theca interna 9 453
Thecamoeba verrucosa 1 329 350
Thecanephria 2 513 13 545*
  Brachiata 2 513 514
Thecoloni *see* Thecodontia
Thecodontia 11 494 13 545 546*
  Archosauria 1 521
Theileria 6 515
Theileria parva 7 299
Thelastomatidae 9 475
Thelazia californiensis 13 6
Thelazia ia callipaeda 13 6
Thelazia platyptera 13 7
Thelazia rhodesii 13 6
Thelodonti *see* Coelolepida
Thelodus 3 262
Thematic apperception test (TAT) 8 609
Thenard, L. J 2 299
Thenea wyvilli 5 89
Thenoyltrifluoroacetone chelation 3 18
  Einsteinium 4 417
  plutonium extraction 10 423
  scandium analysis 12 50
Theobaldia 6 515
Theobroma 5 187
Theobroma cacao 2 584, 13 546
Theobromine 13 546* 14 218
Theodolite 9 358 362, 13 546
Theodorsen, T 1 204
Theophrastus 8 598 10 377
Theophylline 14 218
Theorem 13 546
Theoretical gravity formula 13 516
Theoretical inorganic chemistry 7 120
Theoretical physics 13 547 549
  content 13 547 549
  kinetic theory 7 350 353
  purposes 13 547
  quantum electrodynamics 11 149 150
  quantum field theory 11 150 153
  quantum mechanics 11 153 162
  quantum theory nonrelativistic 11 163 179
  relativistic electrodynamics 11 424 431
  relativistic mechanics 11 431 433
  relativity 11 433 439
Theory physical 13 549
Theory of errors probability 10 642
Theosodon garretlorum 7 553
Theralite 6 1 7 16 10 86 *13 549**
Therapeutic index 10 97
Therapsida 1 415 11 494 *13 549**
Therbligs 8 383
Thereinvale 4 212
Thersa 8 82 *13 549**
  Eutheria 8 82
  Metatheria 8 82
  Pantotheria 8 82
Thescidae 1 404
Thermal adaptation 13 490
Thermal ammeter 1 522 523
Thermal batteries 11 495
Thermal biochemistology 2 201
Thermal bomb 1 535
Thermal capacity 13 566
Thermal constant 3 143
Thermal conduction *see* Conduction (heat)
Thermal conductivity 3 384 391; 7 160*
  of diamond 4 98
  earth (heat flow) 4 353
  and heat convection 5 441
  of superconductors 13 298
  wood physics 14 535 536
Thermal conductivity of solids free electron theory 5 500 501
  lattice vibrations 7 413
Thermal cracking 5 532 535
Thermal cutting of metal *see* Welding and cutting of metals
Thermal decompositions 5 497
Thermal detectors infrared radiation 7 103, 106
  radiometers 11 317 318
Thermal diffusion 4 143
  aerosol 1 100
  diffusion in gases and liquids 4 143
  isotope separation 7 296
Thermal diffusivity 5 585
Thermal emf 13 565
Thermal energy 2 227
  thermodynamic cycle 13 564
Thermal etching 8 295
Thermal expansion 13 549 551
  cohesion 3 268
  gases 13 550
  iron alloys 7 262
  liquids 13 550
  low expansion alloys 1 259
  nonlinear forces 1 407
  solids 13 549 550
  thermal stresses 13 551
Thermal expansion alloys 7 266 267
Thermal explosion 5 507
Thermal fatigue 13 552
Thermal gradient quenching 5 590
Thermal hysteresis *see* Hysteresis thermal
Thermal inertia instrument error, 13 498
Thermal insulation *see* Insulation heat
Thermal metamorphism 8 306
Thermal neutrons 13 551
  fission 5 294 295
  neutron cross section 9 86
  nuclear fuels 9 145 146
Thermal noise 9 119
  antenna noise 9 119
  Nyquist formula 9 119
  radar 11 274
  vacuum tube amplifier 1 547
Thermal potential 13 498
Thermal reactions chemical 5 5 6
Thermal reflex vasodila 13 594
Thermal reforming 11 4 fuel gas supplements 5 533 535
Thermal resistivity 3 392
Thermal shock 13 555
Thermal soaring 6 215
  sailplane 12 3 6
Thermal spring 13 551 5
  geologic thermometer 6 122
  ore deposition 9 359
  volcanic relationship 14 351
Thermal stress 13 551, 55
  allowable stresses 13
  creep 13 552
  procedures at elev temperatures 13 55
  spacecraft structure 1 556
  structures subject to 13 552
  thermal fatigue 13 55
  thermal shock 13 555
Thermal thicket 14 523
  aerodynamic heating
Thermal transfer *see* transfer
Thermal turbulence 8 35
Thermal wattmeter 14 41
Thermal wind 6 173
Thermally cracked gasoli 6 71
Thermionic emission 13 554
  arc discharge 1 501
  field enhanced emissio *5 256*
  measurement 13 555
  from metals 13 555 5
  Poisson law 9 119
  Schottky effect 12 64
  from semiconductors 13 554
  shot noise 9 119
  surface phenomenon 13 555
  vacuum tube emitters 14 265 266
Thermionic tube 13 555
  gas tube 6 61 62
  vacuum tubes 14 245
Thermistor 13 555 556
  applications 13 556
  fixed 13 555
  heat meter 13 556
  characteristics 13 555
  disk 13 555
  electric power measurement 13 556
  flow measurement 13
  microwave power measurement 13 556
  radio-frequency power measurement 13 556

Thermistor—cont.
rod 13 555
temperature compensation 13 556
temperature measurement 13 556
temperature resistance characteristic 13 555
thermometer 13 589
time delay 13 556
vacuum measurement 13 556
voltage current characteristic 13 555
voltage regulator 13 556
washer 13 555
hermit chromium 5 105
hermit welding 14 468
hermite incendiary 7 54
Thermoactinomyces 12 461, 13 179
Thermoanalysis 13 556 559
chemical microscopy 5 51
differential enthalpic analysis 13 558
differential thermal analysis 13 558
equilibrium phase 5 57
thermogravimetry 13 557
see also Titration
Thermoanalytical curve 13 557
Thermobalance 13 557 558
Thermobathynella 13 567
Thermobia domestica 12 533, 13 629
Thermochemistry 13 559 561
Born Haber cycle 7 249
calorimetry 2 420
changes in physical state 13 561
effects of temperature and pressure 13 560 561
experimental results 13 559 560
fundamental concepts 13 559
Hess, law of 13 560
solution 13 561
titration 13 658
see also Thermodynamics (chemical)
Thermocline 13 561 562
Baltic Sea 2 88
fresh water biocycle 3 527
fresh water ecosystem 3 521 534
Gulf Stream 6 295
North Sea 9 165
permanent thermocline in *oceans* 13 561
seasonal thermocline in oceans 13 562
temperature depth traces 2 111
Thermocouple 13 562 564
air velocity measurement 1 221
Thermocouple—cont
alloys 1 260
ammeter 1 522 525
applications 13 563
characteristics 13 563
circuit connections 13 564
corrosion 13 563
electric power measurement 4 438
infrared detector 7 103, 106
low temperature thermometry 7 600
materials 13 565
radiometry 11 518
standing wave detector 13 36
temperature measurement 13 489
thermoelectricity 13 577 584
time constant 13 563
vacuum gage 14 240
Thermoduric bacteria 2 7
Thermodynamic cycle 13 564 565
air standard cycle 13 565
Brayton cycle 2 320 321
diesel cycle 4 118 119
gas turbine cycle 6 63
ideal 2 524
Otto cycle 9 450-451
processes 13 564
Rankine cycle 13 541
refrigeration 11 412, 415 417
steam 13 77
steam engine 13 79
vapor cycle 14 271 274
Thermodynamic equilibrium 5 10
Thermodynamic principles 13 565 568
Beattie Bridgeman equation 2 127
Dalton's law 4 3
enthalpy 13 566
equations of state 13 567
forms of energy 13 565
gas laws 13 567
law of degradation of energy 13 566
measures of energy 13 566
mixtures of gases 13 568
open systems thermodynamics of (biology) 9 332
potentials 10 543
specific heat 13 566
thermal capacity 13 566
Van der Waals equation 14 289
Thermodynamic processes 13 568 572
adiabatic 1 70
boundaries 13 568
cooling tower 5 452
Thermodynamic processes —cont
entropy 5 9 12
equilibrium 13 569
heat transfer 13 571
irreversible processes 13 572
isentropic process 7 272
isobaric process 7 274 275
isometric process 7 282
isothermal process 7 290 291
open systems, thermodynamics of (biology) 9 332
polytropic process 10 495
pressure volume temperature diagram 13 569
process path 13 569
reversible processes 13 571
state of a system 13 568
steam 13 77
systems 13 568
temperature entropy diagram 13 570
vapor process 13 572
work of a process 13 570
working medium 13 77
Thermodynamic sink 13 568
Thermodynamic state 13 568
Thermodynamics enthalpy 5 4
equilibrium, chemical 5 49 53
First Law 13 566
gas dynamics 6 49 58
heat 6 562
heat capacity 6 363 365
molecular biophysics 8 542
perpetual motion 10 30
in petroleum engineering 10 57
principles see Thermodynamic principles
processes *see* Thermodynamic processes
physical chemistry 10 203
relation to thermoelectricity 13 585
Second Law 13 567
statistical 5 10
and statistical mechanics 13 60 63
virial equation 14 328
zeroth law 13 496
see also Thermodynamics (chemical)
Thermodynamics (chemical) 13 572 577
activity (thermodynamics) 1 59 61
basic concepts 13 572
Boltzmann statistics 2 280
chemical energy 3 27 29
entropy 5 9 12, 13 574
equilibrium, *phase* 5 54 60
Thermodynamics (chemical) —cont
first law of thermodynamics 13 573
free energy 5 494 496 13 575
fugacity 5 557
internal energy 7 209
irreversible processes thermodynamics of 13 576 577
second law of thermodynamics 13 574
third law of thermodynamics 13 576
see also Thermochemistry
Thermodynamics of irreversible processes 9 335
Thermoelectric cooling 13 584 585
Thermoelectric generator 13 584
Thermoelectric heating 13 585
Thermoelectric power 13 579 584
Thermoelectric series 13 580
Thermoelectricity 13 577 587
applications 13 583 585
Peltier effect 13 580 582
relation to thermodynamics 13 585
Seebeck effect 13 577 580
semiconductors 12 369
thermocouple 13 562 564 577 584
thermoelectric materials 13 584
thermoelectric power 13 579 584
Thomson effect 13 582 58
Thermofax 10 161
Thermofor catalytic cracking unit 5 533
Thermogalvanic potentials 4 465
Thermogram 13 556 559
Thermographic process (photography) 10 166
Thermography 10 161, 610, 13 489
photocopying processes 10 145 146
temperature indicator 13 499
Thermogravimetry 13 557
Thermohaline convection oceans 9 250
Thermohydrometer 6 562
Thermoluminescence 13 586
geologic *thermometry* 6 529
Thermomagnetic effects 13
Thermomechanical effect 6
Thermometer 13 586 599
Beckmann 13 587
bimetallic 13 587

Thalassinidea 4 31
Thalassothrix frauenfeldi 8 129
Thalassothrix nitzschioides 8 129
Thales 4 462
Thalia democratica 13 543
Thaliacea 4 40, 13 543 544*, 14 140
Thalictrum 10 488
Thallium 15 544 545
analysis 15 545
electron configuration 4 504
extractive metallurgy 8 278
ionization potential 4 504
principal compounds 15 544 545
properties 15 544
Thallium sulfate 11 615
Thallophyta 1 235, 5 562, 10 346 11 47, 13 545*
algae 1 235
Chlorophyta 3 80 10 346
Chrysophyta 10 346
Cyanophyta 10 346
Euglenophyta 5 100, 10 346
Fumvcophyta 10 346
fossil plants 9 502
Myxomycophyta 10 346
Phaeophyta 10 91 346
Pyrrophyta 10 346 11 132
Rhodophyta 10 346 11 555
Schizomycophyta 10 346
Thallophytes 8 320
Thames 5 122
Thamnophis ordinatus 12 589
Thamnophis sirtalis 6 41
Thaumaleidae 4 212
Thaumastocoridae 6 401
Thaumatoderma 8 10
Thaumatomastix 5 27
Thaumatoxenidae 4 212
Thea sinensis 13 404
Theater acceptable noise levels 9 129
sound amplification systems 1 320
television *see* Closed circuit television
Theca cell tumor 11 490
Theca folliculi 11 474
Theca interna 9 451
Thecamoeba terricola 1 329 330
Thecanephria 2 513 15 545*
Brachiata 2 513 514
Thecosomata *see* Thecodontia
Thecodontia 11 494 15 545 546*
Archosauria 1 521
Thecteina 6 315
Thecteina pavo 7 290
Thelastomatidae 9 475
Thelia semiconvexa 13 6
Thelazia californensis 13 6
Thelazia callipaeda 13 6
Thelazia plangites 13 7
Thelazia rhodesi 13 6
Thelodonti *see* Coelolepida
Thelodus 5 262
Thematic apperception test (TAT) 8 609
Thenard, L. J. 2 299
Thenea wallichi 5 89
Thenoyltrifluoroacetone chelation 3 18
Finsteinium 4 417
plutonium extraction 10 423
scandium analysis 12 50
Theobaldia 6 335
Theobroma 5 187
Theobroma cacao 2 384, 13 546
Theobromine 13 546* 14 218
Theodolite 9 358 362, 13 546
Theodorsen, T. 1 294
Theophrastus 8 598 10 377
Theophylline 14 218
Theorem 13 546
Theoretical gravity formula 13 516
Theoretical inorganic chemistry 7 320
Theoretical physics 13 547 549
content 13 547 549
kinetic theory 7 350 355
purposes 13 547
quantum electrodynamics 11 148 150
quantum field theory 11 150 155
quantum mechanics 11 155 162
quantum theory nonrelativistic 11 163 170
relativistic electrodynamics 11 428 431
relativistic mechanics 11 431 435
relativity 11 435 438
Theory physical 13 549
Theory of errors probability 10 632
Theosodon garrettorum 5 353
Therafric 6 1 7 16 10 86 13 549*
Therapeutic index 10 97
Therapsida 1 415 11 494 13 549*
Therbligs 8 343
Thereviidae 4 212
Theria 8 82 13 549*
Eutheria 8 82
Metatheria 8 82
Pantotheria 8 82
Theridiidae 1 494
Thermal adaptation 13 550
Thermal ammeter 1 322 325
Thermal batteries 11 496
Thermal biochronology 2 281
Thermal bomb 1 546
Thermal capacity 13 566
Thermal comfort 1 149
Thermal conduction *see* Conduction (heat)
Thermal conductivity 5 584 591*, 7 160
of diamond 4 98
earth (heat flow) 4 353
and heat convection 3 411
of superconductors 15 298
wood physics 14 535 536
Thermal conductivity of solids free electron theory 5 500 501
lattice vibrations 7 415
Thermal cracking 5 532 533
Thermal cutting of metal *see* Welding and cutting of metals
Thermal decompositions 5 497
Thermal detectors infrared radiation 7 105 106
radiometry 11 517 518
Thermal diffusion 4 143
aerosol 1 100
diffusion in gases and liquids 4 143
isotope separation 7 296
Thermal diffusivity 5 585
Thermal emf 15 563
Thermal energy 2 277
thermodynamic cycle 13 564
Thermal etching 8 295
Thermal expansion 13 549 551
cohesion 5 268
gases 13 550
iron alloys 7 267
liquids 13 550
low expansion alloys 1 259
nonlinear forces 1 407
solids 13 549 550
thermal stresses 13 551
Thermal expansion alloys 7 266 267
Thermal explosion 5 507
Thermal fatigue 15 552
Thermal gradient quenching 5 580
Thermal hysteresis *see* Hysteresis thermal
Thermal inertia instrument error 15 498
Thermal insulation *see* Insulation heat
Thermal metamorphism 8 504
Thermal neutrons 15 551
fission 5 298 299
neutron cross section 9 86
nuclear fuels 9 144 146
Thermal noise 9 119
antenna noise 9 119
Nyquist's formula 9 119
radar 11 2 4
vacuum tube amplifier 1 337
Thermal potential 15 496
Thermal reactions chemical 5 5 6
Thermal reflex vasodilatation 15 594
Thermal reforming 11 443
fuel gas supplements 5 535 535
Thermal resistivity 5 590
Thermal shock 15 553
Thermal soaring 6 215
sailplane 12 5 6
Thermal spring 15 551 552
geologic thermometry 6 127
ore deposition 9 506
volcanic relationships 14 551
Thermal stress 14 551, 552 553
allowable stresses 15 552
creep 15 552
procedures at elevated temperatures 15 552
spacecraft structure 12 535 536
structures subject to stress 15 552
thermal fatigue 15 552
thermal shock 15 553
Thermal thicket 14 515
aeculuminate heating 1 4
Thermal transfer *see* Heat transfer
Thermal turbulence 8 354
Thermal wattmeter 14 435 436
Thermal wind 6 175
Thermally cracked gasoline 6 71
Thermionic emission 15 553 556
arc discharge 1 501
field enhanced emission 5 256
measurement 15 555
from metals 15 553 554
Poisson law 9 119
Schottky effect 12 64 65
from semiconductors 15 554
shot noise 9 119
surface phenomena 15 555
vacuum tube emitters 14 243 246
Thermionic tube 15 555
gas tube 6 61 62
vacuum tubes 14 243 254
Thermistor 15 555 556
applications 15 557
bead 15 555
bolometer 15 556
characteristics 15 555
disk 15 555
electric power measurement 15 556
flow measurement 15 556
in compact power measurement 15 556
rod 15 555
radio frequency power measurement 15 556

Thermistor—cont
rod 13 555
temperature compensation 13 556
temperature measurement 13 556
temperature resistance characteristic 13 555
thermometer 13 589
time delay 13 556
vacuum measurement 13 556
voltage current characteristic 13 555
voltage regulator 13 556
washer 13 555
Thermit chromium 5 105
Thermit welding 14 468
Thermite incendiary 7 54
Thermoactinomyces 12 461, 13 179
Thermoanalysis 13 556 559
chemical microscopy 5 51
differential enthalpic analysis 13 558
differential thermal analysis 13 558
equilibrium phase 5 57
thermogravimetry 13 557
see also Titration
Thermoanalytical curve 13 557
Thermobalance 13 557 558
Thermobathynella 13 567
Thermobia domestica 12 333 13 609
Thermochemistry 13 559 561
Born Haber cycle 7 249
calorimetry 2 420
changes in physical state 13 561
effects of temperature and pressure 13 560 561
experimental results 13 559 560
fundamental concepts 13 559
Hess law of 13 560
solution 13 561
titration 13 658
see also Thermodynamics (chemical)
Thermocline 13 561 562
Baltic Sea 2 88
fresh water biocycle 5 327
fresh water ecosystem 5 521 534
Gulf Stream 6 295
North Sea 9 165
permanent thermocline in oceans 13 561
seasonal thermocline in oceans 13 562
temperature depth traces 2 111
Thermocouple 13 562 564
air velocity measurement 1 221
Thermocouple—cont
alloys 1 260
ammeter 1 522 525
applications 13 563
characteristics 13 563
circuit connections 13 564
corrosion 13 563
electric power measurement 4 438
infrared detector 7 103, 106
low temperature thermometry 7 600
materials 13 563
radiometry 11 318
standing wave detector 13 36
temperature measurement 13 489
thermoelectricity 13 577 584
time constant 13 563
vacuum gage 14 240
Thermoduric bacteria 2 7
Thermodynamic cycle 13 564 565
air-standard cycle 13 565
Brayton cycle 2 320 321
diesel cycle 4 118 119
gas turbine cycle 6 63
ideal 2 524
Otto cycle 9 450-451
processes 13 564
Rankine cycle 11 341
refrigeration 11 412, 415 417
steam 13 77
steam engine 13 79
vapor cycle 14 271 274
Thermodynamic equilibrium 5 10
Thermodynamic principles 13 565 568
Beattie Bridgeman equation 2 127
Dalton's law 4 5
enthalpy 13 566
equations of state 13 567
forms of energy 13 565
gas laws 13 567
law of degradation of energy 13 566
measures of energy 13 566
mixtures of gases 13 568
open systems thermodynamics of (biology) 9 332
potentials 10 541
specific heat 13 566
thermal capacity 13 566
Van der Waals equation 14 268
Thermodynamic processes 13 569 572
adiabatic 1 70
boundaries 13 568
cooling tower 3 452
Thermodynamic processes —cont
entropy 5 9 12
equilibrium 13 569
heat transfer 13 571
irreversible processes 13 572
isentropic process 7 272
isobaric process 7 274 275
isometric process 7 282
isothermal process 7 290 291
open systems, thermodynamics of (biology) 9 332
polytropic process 10 495
pressure volume temperature diagram 13 569
process path 13 569
reversible processes 13 571
state of a system 13 568
steam 13 77
systems 13 568
temperature-entropy diagram 13 570
vapor process 13 572
work of a process 13 570
working medium 13 77
Thermodynamic sink 13 564
Thermodynamic state 13 569
Thermodynamics enthalpy 5 4
equilibrium chemical 5 49 53
First Law 13 566
gas dynamics 6 49 58
heat 6 362
heat capacity 6 363 365
molecular biophysics 8 542
perpetual motion 10 30
in petroleum engineering 10 57
principles *see* Thermodynamic principles
processes *see* Thermodynamic processes
physical chemistry 10 203
relation to thermoelectricity 13 583
Second Law 13 567
statistical 5 10
and statistical mechanics 13 60 63
virial equation 14 328
zeroth law 13 486
see also Thermodynamics (chemical)
Thermodynamics (chemical) 13 572 577
activity (thermodynamics) 1 59 61
basic concepts 13 572
Boltzmann statistics 2 280
chemical energy 3 22 28
entropy 5 9 12 13 574
equilibrium, phase 5 54 60
Thermodynamics (chemical) —cont
first law of thermodynamics 13 573
free energy 5 494 496 13 575
fugacity 5 559
internal energy 7 269
irreversible processes, thermodynamics of 13 576 577
second law of thermodynamics 13 574
third law of thermodynamics 13 576
see also Thermochemistry
Thermodynamics of irreversible processes 9 333
Thermoelectric cooling 13 581 585
Thermoelectric generator 13 584
Thermoelectric heating 13 585
Thermoelectric power 13 579 584
Thermoelectric series 13 580
Thermoelectricity 13 577 587
applications 13 583 585
Peltier effect 13 580 582
relation to thermodynamics 13 583
Seebeck effect 13 577 580
semiconductors 12 168
thermocouple 13 562 564, 577 584
thermoelectric materials 13 584
thermoelectric power 13 579 584
Thomson effect 13 582 583
Thermofax 10 161
Thermofor catalytic cracking unit 5 533
Thermogalvanic potentials 4 463
Thermogram 13 556 559
Thermographic process (photography) 10 166
Thermography 10 161, 610, 13 489
photocopying processes 10 145 146
temperature indicator 13 489
Thermogravimetry 13 557
Thermohaline convection in oceans 9 250
Thermohydrometer 6 562
Thermoluminescence 13 585-586
geologic thermometry 6 129
Thermomagnetic effects 13 586
Thermomechanical effect 6 393
Thermometer 13 586 589
Beckmann 13 587
bimetallic 13 587

Thermometer—*cont*
calorimetry 2 420
dry bulb 11 82
filled system 13 587
gas 7 599
liquid expansion 13 486
liquid in glass 13 586
low temperature thermometry 7 598 601
magnetic 7 601
maximum registration 13 587
mercury and glass 13 587
meteorological 1 158
minimum registration 13 587
resistance 7 600 13 588
temperature measurement 13 480
thermal conductivity 3 598 599
thermistor 13 589
vapor pressure thermal system 7 600 13 588
wet bulb 11 82
Thermometric depth (oceanography) 12 116
Thermometric titrations 13 658
Thermometry *see* Thermometer
Thermomonospora 13 179
Thermonuclear energy *see* Thermonuclear reaction
Thermonuclear fusion *see* Thermonuclear reaction
Thermonuclear reaction 13 589 590
carbon nitrogen cycle 2 472 473
hydrogen bomb 6 548
nuclear fusion 5 503
in stars 13 107 109
Thermonuclear reactor *see* Fusion reactor
Thermonuclear rocket 9 201
Thermoosmosis 12 453
Thermoperiodicity (plant) 10 338 339
Thermoperm 8 35
Thermopile 13 561 583 584
infrared radiation 7 106
Thermoplastic insulation 7 156
Thermoplastic resin 10 477
Thermoplyspora 13 179
Thermoreceptor (sense organ) 12 140
Thermoregulation 13 590 592
fever 5 242
heat loss 13 591
heat production 13 591
neurendocrine control 13 592
scope and limits of temperature regulation 13 590 591
species differences 13 591 592
Thermorneasurement magnetization 11 595
Thermos bottle 4 91
Thermosbaena mirabilis 9 527-528
Thermosbaenacea 3 563, 13 592*
Peracarida 10 1
Thermosbaenidae 13 592
Thermosetting insulation 7 157
Thermosetting resin 10 477
Thermosol method 4 310
Thermosphere 1 630, 8 324
Thermostat 13 592 593
Thermotherapy 7 107 13 593 596*
biological effects of sound waves 2 208 212
clinical methods of heat application 13 594
conductive heating devices 13 595
convective heating 13 595
hyperthermy 13 596
indications for thermotherapy 13 596
local application of heat 13 595
local changes in tissue 13 593
use of low temperatures 13 596
Thermovoltmeter 14 573
Thermozodium esakii 5 125
Theromyzon 6 457 11 536
Theropoda 4 198 11 484
Thesaurus literaturae botanicae 10 377
Thesocyte 10 514
Theta functions 4 563
Theta rhythms (electroencephalography) 4 478
Thévenin's theorem (electric networks) 9 76 13 596 598*
Thia 6 429
Thiactin 1 476
Thiamin chloride 2 195
Thiamine 2 194 4 256 11 116
12 561 13 598 599* 14 560
beriberi 2 166
endocrine mechanisms 4 593
food 5 471
manufacture 13 599
muscle 13 599
nerve 13 599
thiazole 13 600
Thiamine pyrophosphate 2 13 14 13 599
Thianaphthalene 9 2
Thiaridae 9 669
Thiazine dye 4 504
Thiazole 1 702 13 599 601*
preparation 13 599 601
properties 13 597
see also Thiophene
1 2 Thiazole 1 702
Thiazole dye 4 505
Thiazolidines 13 599 601
Thiazolines 13 599 601
2 Thiazolylsulfamic acids 13 245
Thick walled pressure vessel 10 585
Thickening 13 601 602
sedimentation (industrial) 12 143 144
separation (mechanical) 12 187
Thickening agent food 5 478
grease 7 605
sedimentation 13 601
Thickness measurement by radioactivity 11 290 290
ultrasonic 8 290
14 185
see also Level measurement
Thickness ratio (aerodynamics) 14 63
Thielavia 5 294
Thielaviopsis baticola 9 408
13 663
Thienemann, A 3 529
Thiessen Reinhardt 5 251, 252
Thigh 6 455, 13 602*
Thigmotaxis 13 403
Thigmotrichida 6 467 11 53 13 602*
Thigmotropisms 10 365 366
Thiirane 9 312
Thimann, K V 10 340
Thimerosal NF 1 465 8 227
Thimet 7 141
Thin films 11 592 594
Thin section (tock) 10 53
coal microscopy 5 252
petrofabric analysis 10 49
volume mode determination 10 54
Thin walled pressure vessel 10 585
Thingullatn Lake 5 116
Thinner 13 603
naphtha 9 2
paint 9 403
Thinnfeldia 9 505
Thinocoridae 3 10
Thio alcohol 8 227
Thio compounds 13 603
Thio phenol 8 227
Thioacid 9 405
Thioaldehyde and thioketone 9 405 13 603 604
Thioamide 13 603
Thiobacillus 2 54 8 329
Thiobacillus denitrificans 2 56 13 604
Thiobacillus ferrooxidans 2 64 12 309
Thiobacillus novellus 2 29 13 604
Thiobacillus thioparus and *thiooxidans* 13 604
Thiobacillus thiooxidans 2 2 64
Thiobacillus thioparus 2 29 13 604
Thiobacteriaceae 2 11, 11 66 13 604*
Macromonas 13 604
Pseudomonadales 11 65
Thiobacillus 13 604
Thiobacterium 13 604
Thioglwa 13 604
Thiospira 1 604
Thioxulum 13 604
Thiobacterium 11 65
Thiobacteriaceae 13 604
Thiobarbituric 13 603
Thiobarbituric acid 13 607
Thiocarbonate 13 603
Thiocarbanilide 1 408
Thiocarbonyl compound 13 603 604
Thiocyanate 13 603, 605*
Thiocyanogen 13 603
Thiocystis 11 552
Thiodan 7 141
Thiodictyon 11 552
Thiodiethylene glycol 6 223
Thiodiglycol process 3 44
Thioether 13 603
disulfide 4 259
Thioglwa 13 604
Thioglycollate medium 5 616
Thioindigo 7 65
Thioindigo red B 4 506
Thioindigoid dye 4 506
Thioketone 9 405, 13 603 604
Thiokinase 7 552
Thiokol polysulfide rubber 11 641
Thiol 13 603
mercaptan 8 227
nomenclature 9 397
organosulfur compound 9 405
Thiol ester 9 405
Thiolase 7 552
Thiomolybdate 8 564
Thionine 13 603 604
Thionic acids 13 272
Thionyl chloride 3 30
Thiopedia 11 552
Thiophene 13 603 606
benzene impurity 2 184
coal chemical 5 253
preparation 13 605
properties 13 604
Thiophenol 9 405
thio compounds 13 603
Thiorhodaceae 11 552
Thiorhodaceae 11 552
Amoebobacter 11 552
Chromatium 11 552
Lamprocystis 11 552
Rhodomonas 11 552
Thiocystis 11 552

Thiothodaceae—cont
Thiodictyon 11 552
Thiopedia 11 552
Thiopolycoccus 11 552
Thiosarcina 11 551
Thiospirillum 11 552
Thiosarcina 11 552
Thiosemicarbazide 6 530
Thiosemicarbazone 13 606
Thiospira 11 65 13 604
Thiospirillum 11 552
Thiospirillum jenense 11 552
Thiospirillum sanguineum 11 552
Thiosulfate 13 606
see also Sulfur
Thiosulfonic acid 13 262
Thiosulfuric acid 13 262
Thiosulfurous acid 13 260
Thio urea 2 29 132
Thiouracil 13 625
2 Thiouracil 11 114
Thiourea 13 606 607*, 625
ferroelectrics 5 225
Thiouronium salt 13 607
Thiovulum 2 29 11 65, 13 604
Thiram 1 475 5 564
Third-degree burn 2 373
Third-order reactions 7 356
Third rail 7 751
Thirst 13 607 608
body rhythm 2 273
local sign theory 13 607
physiological mechanism 13 607
water balance concept 13 607
Thiuram disulfide 13 605
Thixotropy 6 93
in bentonite 3 162
Thode, H G 13 522
Tholeiitic basalt 2 106, 10 86
petrographic province 10 50
Thoma, D 2 573
Thoma K. 7 556
Thomas, J L. 11 493
Thomas cyclotron 9 581
Thomas process 13 101
see also Bessemer process
Thomas resistor 4 459
Thomsen J S 1 651
Thomsen W 1 622
Thompson, G I 6 26 29
Thompson, J 2 355
Thompson, J C 7 83 84
Thompson S G 2 168 416 8 222 14 66
Thompson T G 12 102
Thompson W 9 266
Thompson Lampard capacitor 2 445
Thompson Type Caster 3 344, 346
Thomson, James 1 375
Thomson, Joseph John Sir 1 501, 650, 2 84, 434 435, 533 3 353 354, 4 462, 501, 519 14 567
Thomson, Thomas 3 47
Thomson, William *see* Kelvin, William Thomson first bar on (Lord)
Thomson cross section 3 354
Thomson effect 13 582 583
Thompsonia 1 562
Thomsonite 12 476 14 611
Thor missile 9 562
Thoracic aneurysms 1 403
Thoracic duct 7 551 628
circulation 3 137 141
Thoracic gland 4 596
Thoracic vertebra 12 363
Thoracica 3 145 562, 13 604 609*
Balanomorpha 2 74 13 608
Lepadomorpha 7 455, 13 608
Verrucomorpha 13 608 14 306
Thoracoabdominal breathing 11 328 329
Thoracolumbar system *see* Sympathetic nervous system
Thoracophelia mucronata 12 305
Thoracostei 6 71 9 442
Thorax 1 397, 7 134
Insecta 7 134
legs 7 134
radiograph of 11 304
trunk 14 120
wings 7 134
Thorazine 6 595
Thoria heat radiation 6 370
refractory 11 410
Thorianite 13 609*, 610
Thoriated tungsten 14 246
Thoricthidae 3 277
Thorite 9 186 11 269, 13 609 610*
Thorium 13 610 612
analytical methods 13 611 612
electron configuration 4 504
extractive metallurgy 8 278
fission 5 287
heat generation in earth 4 332
metallurgical extraction 13 610 611
minerals 11 268 269
in monazite 8 566
natural occurrence 13 610
nuclear fuels 9 184 187
ore reserves 9 186 187
principal compounds 13 611
prospecting for 11 23 24
radioactivity 11 276 279
Thorium deuteride 9 89
Thorium hydride 9 89
Thorium lead ratio 7 427
Thorn 13 111 124
Thorn forest 3 180 190
Thorn headed worm 1 516
Thorogummite 11 269
Thoron 11 325
decay products in atmosphere 1 630
radioactivity 11 278
Thorotrast 11 315
microscope x ray 8 403
Thoroughbred horse 6 488 492
Thorp, J 12 618
Thorpe reaction 9 106
Thortveitite 8 278
scandium ore 12 49
Thorybes pylades 7 463
Thousand Springs in Idaho 13 18
Thrasher 13 612
Thraupidae 2 480 13 598
Thraustotheca 10 198
Thread count 13 554
Thread lace scoria 11 103
Threading 8 6 13 612
lathe 7 407 409
Threads screw *see* Screw threads
Three halves power law *see* Langmuir Child law
Three phase ac circuits *see* Alternating current circuit theory
Three phase induction motor 7 74 77
Three spined stickleback 12 396, 13 140
Three toed sloth 12 363, 382
vertebra 14 307
Threonine 1 589 2 45, 195 7 164, 10 483, 13 612 613*
amino acids 1 308 319
in histone 9 217
plant metabolism 10 357
in protamines 9 217
Protozoa 11 51 60
L Threonine 11 41
D Threose 1 31
D(−) Threose 2 455
L Threose 1 31
Threshold, fission *see* Fission threshold
Threshold energy, nuclear reactions 9 199
Threshold of hearing 9 126
Threskiornithidae 7 1
Thrip 13 613
Thripidae 13 629
Thrips tabaci 13 628
Throacosaurus 5 554
Throat 13 613
Thrombin 5 195 13 614
Thromboangiitis obliterans *see* Buerger's disease
Thrombocytopenia 6 412
circulation disorders 3 141 144
hematologic disorders 6 395 396
Thrombocytosis 13 615
Thrombophlebitis 2 266, 10 115 13 614
circulation disorders 3 141 144
Thromboplastin 2 266, 3 195, 13 614
Thromboplastinogen 13 613
Thrombosis 3 143 13 613 615*
blood clotting 13 614
clotting after death 13 614
fate of thrombi 13 614 615
hemorrhoids 6 413
location of thrombi 13 614
phlebothrombosis 13 614
thrombophlebitis 13 614
thrombus formation 13 613
Thrombus 10 115
circulation disorders 3 141 144
embolism 4 565
embolus 4 565
infarction 7 93 94
Throscidae 5 277
Throttle (automotive) 2 477 480
Throttled flow 13 615
Through truss 14 121
Throw (fault structures) 5 192
Throwing (ceramics) 2 648
Throwing power (electroplating) 4 529
Thrush 2 254, 3 578, 11 602, 13 615*
Thrust 13 615
aerodynamic force 1 84 87
aircraft engine performance 1 171
aircraft propulsion 1 184 188
defined 13 615
electromagnetic propulsion 4 490
engine propeller combination 1 208
ion propulsion 7 243
liquid propellant 11 7
nuclear rocket 9 201
propulsion 11 17
propulsive systems 1 208 209
pulse jet 11 95
ramjet 1 175, 209, 11 535
specific *see* Specific impulse
turbojet 1 172, 208 14 149, 155-157
turboram jet 14 158 159
Thrust bearings 2 122
Thrust fault 5 192, 13 417
Thrust sheets (geology) 9 413

Thermodynamics
  cycles, engine 2 627
  first law 15 82
  fluid expansion 15 547
  gas 2 630
  liquid expansion 15 545
  liquid-in-glass 15 545
  low temperature thermometry 2 634, 635
  magnet 2 661
  mass-mass ratio relation 15 547
  pressure and gas 15 547
  pressure, liquid 15 550
  pressure-mass ratio relation 15 547
  resistance 2 641, 15 548
  temperature measurement 15 551
  thermal conductivity 5 444, 445
  thermistor 2 643, 15 553
  vapor pressure, thermal expansion 2 646, 15 544
  work 2 626, 15 82
Thermodynamic depth, fuzzy measures 12 114
Thermodynamic first law 15 674
Thermodynamics, see Thermodynamic
Thermodynamic second law 15 675
Thermodynamic, solar energy, see Thermodynamic analysis, irradiation
Thermodynamic, Tsallis, see Thermodynamic analysis, irradiation
Thermodynamic analysis, irradiation 15 553, 570
  exergy 2 672, 673
  Hydrogen 16, 16 569
  nuclear fusion 15 557
  solar 15 177, 570
Thermodynamic analysis, see Exergy analysis
Thermodynamic analysis, wind 9 251
Thermodynamic cycle 15 673
Thermodynamic cycle, gas 10 554, 555
Thermodynamic cycle, see Cycle, thermodynamic
Thermodynamic equilibrium 10 677
Thermodynamic law 15 675
Thermodynamic law, see Thermodynamic first law, Thermodynamic second law
Thermodynamic property, see Property, thermodynamic
Thermodynamic relation 12 118
Thermodynamic system 15 554, 557
  boiler 9 242
  heat 5 444, 15 551
  heat production 15 551
  heat production, see thermal energy 15 557
  heat, fuel, mode of heat generation 15 551
  thermal energy, see heat production 15 551
  thermal, 2-dimensional 15 551, 552
Thermodynamic, engineering 15 554, 15 556
Thermodynamic, fuzzy 6 91
Thermodynamic, irradiation 15 553, 570
Thermodynamic, solar 15 553, 570
Thermodynamics, chemical 15 557
Thermodynamics, engineering 2 627, 629
Thermodynamics, equilibrium 15 675
Thermodynamics, first law 15 82
Thermodynamics, fuzzy 6 91
Thermodynamics, irradiation 15 553, 570
Thermodynamics, second law 15 675
Thermodynamics, solar 15 553, 570
Thermodynamics, statistical 15 675
Thermodynamics, thermal 15 551
Thermodynamics, zeroth law 15 674
Thermoelectric effect 2 661
Thermoelectric generator 2 661
Thermoelectric, cooling 2 661
Thermoelectricity 2 661
Thermoelectricity, see Thermoelectric effect
Thermoelectricity, see Thermoelectric generator
Thermoelectricity, see Thermoelectric, cooling
Thermoelectricity, see Thermoelectricity
Thermoelectricity, see Thermoelectricity, see Thermoelectric effect
Thermoelectricity, see Thermoelectricity, see Thermoelectric generator
Thermoelectricity, see Thermoelectricity, see Thermoelectric, cooling
Thermoelectricity, see Thermoelectricity, see Thermoelectricity
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric effect
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric generator
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric, cooling
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric effect
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric generator
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric, cooling
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric effect
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric generator
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric, cooling
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric effect
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric generator
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric, cooling
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric effect
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric generator
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric, cooling
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric effect
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric generator
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric, cooling
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric effect
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric generator
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric, cooling
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric effect
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric generator
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric, cooling
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric effect
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric generator
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric, cooling
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric effect
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric generator
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric, cooling
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric effect
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric generator
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectric, cooling
Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity, see Thermoelectricity
Thermoelectricity, see

Thiothrix—cont
Thiodictyon 11 552
Thiopedia 11 552
Thiopolycoccus 11 552
Thiosarcina 11 551
Thiospirillum 11 552
Thiosarcina 11 552
Thiosemicarbazide 6 550
Thiosemicarbazone 13 606
Thiospira 11 65 13 604
Thiospirillum 11 552
Thiospirillum jenense 11 552
Thiospirillum sanguineum 11 552
Thiosulfate 13 606
see also Sulfur
Thiosulfonic acid 13 262
Thiosulfuric acid 13 262
Thiosulfurous acid 13 260
Thiothrix 2 29 132
Thiouracil 13 625
2 Thiouracil 11 114
Thiourea 13 606 607*, 625
ferroelectrics 5 225
Thiouronium salt 13 607
thiovulum 2 29 11 65
3 604
Third 3 473 5 564
third-degree burn 2 373
third-order reactions 7 356
third rail 7 751
Thirst 13 607 608
body rhythm 2 273
local sign theory 13 607
physiological mechanism 13 607
water balance concept 13 607
Thiuram disulfide 13 605
Thixotropy 8 93
in bentonite 3 162
Thode H G 13 622
tholeiitic basalt 2 106, 10 86
petrographic province 10 50
Thoma, D 2 573
Thoma, K 7 556
Thomas, J L 11 493
Thomas cyclotron 9 581
Thomas process 13 101
see also Bessemer process
Thomas resistor 4 459
Thomsen J S 1 651
Thomsen W 1 622
Thompson G L 6 26 29
Thompson J 2 355
Thompson, J C 7 83 84
Thompson S G 2 168, 416 3 222 14 66
Thompson, T G 12 102
Thompson W 9 266
Thompson Lampard capacitor 2 445
Thompson Type Caster 3 344 346
Thomson James 1 575
Thomson Joseph John Sir 1 301, 650, 2 84, 434 435, 555, 3 353 354, 4 462, 501, 519, 14 567
Thomson, Thomas 3 47
Thomson, William see Kelvin, William Thomson first baron (Lord)
Thomson cross section 3 554
Thomson effect 13 582 583
Thompsonia 1 562
Thomsonite 12 476 14 611
Thor missile 9 362
Thoracic aneurysms 1 403
Thoracic duct 7 531, 628
circulation 3 137 141
Thoracic gland 4 596
Thoracic vertebra 12 363
Thoracica 3 145 562 13 608 609*
Balanomorpha 2 74 13 608
Lepadomorpha 7 455, 13 608
Verrucomorpha 13 608, 14 506
Thoracoabdominal breathing 11 528 529
Thoracolumbar system see Sympathetic nervous system
Thoracophelia mucronata 12 505
Thoracostei 6 71, 9 442
Thorax 1 397, 7 134
Insecta 7 134
legs 7 134
radiograph of 11 504
trunk 14 120
wings 7 134
Thoramine 6 595
Thoria heat radiation 6 570
refractory 11 410
Thorianite 13 609*, 610
Thoriated tungsten 14 246
Thoractidae 3 277
Thorite 9 186, 11 269, 13 609 610*
Thorium 13 610 612
analytical methods 13 611 612
electron configuration 4 504
extractive metallurgy 8 278
fission 5 287
heat generation in earth 4 332
metallurgical extraction 13 610 611
minerals 11 268 269
in monazite 8 566
natural occurrence 13 610
nuclear fuels 9 184 187
ore reserves 9 186 187
principal compounds 13 611
prospecting for 11 23 24
radioactivity 11 276 279
Thorium deuteride 9 89
Thorium hydride 9 89
Thorium lead ratio 7 427
Thorn 13 111, 124
Thorn forest 3 189 190
Thorn headed worm 1 516
Thorogummite 11 269
Thoron 11 525
decay products in atmosphere 1 630
radioactivity 11 278
Thorotrast 11 515
microscope x ray 8 405
Thoroughbred horse 6 488 492
Thorp, J 12 618
Thorpe reaction 9 106
Thortveitite 8 278
scandium ore 12 49
Thorybes pylades 7 463
Thousand Springs in Idaho 13 18
Thrasher 13 612
Thraupidae 2 490 13 588
Thraustotheca 10 198
Thread count 13 534
Thread lace scoria 11 103
Threading 8 6, 13 612
lathe 7 407-409
Threads, screw see Screw threads
Three halves power law see Langmuir Child law
Three phase ac circuits see Alternating current circuit theory
Three phase induction motor 7 74 77
Three spined stickleback 12 396, 13 140
Three toed sloth 12 363, 382
vertebra 14 307
Threonine 1 589 2 45, 195, 7 164, 10 483, 13 612 613*
amino acids 1 308 319
in histone 9 217
plant metabolism 10 357
in protamines 9 217
Protozoa 11 51 60
L Threonine 11 41
D Threose 1 31
D(−) Threose 2 455
L Threose 1 31
Threshold fission see Fission threshold
Threshold energy, nuclear reactions 9 199
Threshold of hearing 9 126
Threskiornithidae 7 1
Thrip 13 615
Thripidae 13 629
Thrips tabaci 13 628
Thrinacosaurus 5 554
Throat 13 615
Thrombin 3 195 13 614
Thromboangiitis obliterans see Buerger's disease
Thrombocytopenia 6 412
circulation disorders 5 141 144
hematologic disorders 6 595 596
Thrombocytosis 13 615
Thrombophlebitis 2 266, 10 115 13 614
circulation disorders 5 141-144
Thromboplastin 2 266 3 195, 13 614
Thromboplastinogen 13 615
Thrombosis 5 145 13 615 615*
blood clotting 13 614
clotting after death 13 614
fate of thrombi 13 614 615
hemorrhoids 6 415
location of thrombi 13 614
phlebothrombosis 13 614
thrombophlebitis 13 614
thrombus formation 13 615
Thrombus 10 115
circulation disorders 5 141 144
embolism 4 565
embolus 4 565
infarction 7 93 94
Throscidae 5 277
Throttle (automotive) 2 477 480
Throttled flow 13 615
Through truss 14 121
Throw (fault structures) 5 192
Throwing (ceramics) 2 648
Throwing power (electroplating) 4 529
Thrush 2 254, 5 578, 11 602, 13 615*
Thrust 13 615
aerodynamic force 1 84 87
aircraft engine performance 1 171
aircraft propulsion 1 184 188
defined 13 615
electromagnetic propulsion 4 490
engine propeller combination 1 208
ion propulsion 7 245
liquid propellant 11 7
nuclear rocket 9 201
propulsion 11 17
propulsive systems 1 208 209
pulse jet 11 95
ramjet 1 175, 209, 11 335
specific see Specific impulse
turbojet 1 172, 208, 14 149, 155 157
turboram jet 14 158-159
Thrust bearings 2 122
Thrust fault 5 192, 13 417
Thrust sheets (geology) 9 413

Thorlindaceae—cont
Thodictyon 11 552
Thopeda 11 552
Thopohoreus 11 552
Thouarea 11 551
Thouparillum 11 552
Thouarea 11 552
Thowenitrobenzole 6 530
Thowenitrobenzone 13 606
Thoxtea 11 65 13 604
Thouparillum 11 552
Thouparillum jenense 11 552
Thouparillum sanguineo 11 552
Thiosulfate 13 606
see also Sulfur
Thiosulfonic acid 13 262
Thiosulfuric acid 13 262
Thiosulfurous acid 13 260
Thrasher 2 29, 152
Thiouracil 13 625
2 Thiouracil 11 134
Thiourea 13 606 607*, 625
ferroelectrics 5 225
Thiouranium salt 13 607
Thiovalum 2 29 11 65, 13 604
Thiram 1 475, 5 564
Third-degree burn 2 373
Third-order reactions 7 356
Third rail 7 751
Thirst 13 607-608
body rhythm 2 275
local sign theory 13 607
physiological mechanism 13 607
water balance concept 13 607
Thiuram disulfide 13 603
Thixotropy 6 99
in bentonite 5 162
Thode, H G 13 522
Tholeiite basalt 2 106 10 86
petrographic province 10 30
Thoma, D 2 373
Thoma K 7 356
Thomas J L 11 493
Thomas cyclotron 9 581
Thomas process 13 101
see also Bessemer process
Thomas resistor 4 459
Thomsen J 5 1 651
Thomsen, W 1 622
Thompson C L 6 26 29
Thompson, J 2 355
Thompson J C 7 83 84
Thompson S C 2 368 416 8 222 14 66
Thompson T G 12 102
Thompson W 9 266
Thompson Lampard capacitor 2 445
Thompson Type Caster 5 344 346
Thomson James 1 375
Thomson, Joseph John Sir 1 501, 650 2 84, 434 435, 555, 5 553 554, 4 462, 501, 519 14 567
Thomson, Thomas 5 47
Thomson, William *see* Kelvin, William Thomson first baron (Lord)
Thomson cross section 5 554
Thomson effect 13 582 583
Thompsonia 1 562
Thomsonite 12 476, 14 611
Thor missile 9 362
Thoracic aneurysms 1 403
Thoracic duct 7 531 628
circulation 5 137 141
Thoracic gland 4 506
Thoracic vertebra 12 563
Thoracica 5 145, 562 13 608 609*
Balanomorpha 2 74 13 608
Lepadomorpha 7 455 13 608
Verrucomorpha 13 608 14 306
Thoracoabdominal breathing 11 528 529
Thoracolumbar system *see* Sympathetic nervous system
Thoracophelia mucronata 12 305
Thoracostei 6 71, 9 442
Thorax 1 397, 7 134
Insecta 7 134
legs 7 134
radiograph of 11 504
trunk 14 120
wings 7 134
Thorazine 6 595
Thoria heat radiation 6 370
refractory 11 410
Thorianite 13 609*, 610
Thoriated tungsten 14 246
Thoricidae 5 277
Thorite 9 186, 11 969, 13 609 610*
Thorium 13 610 612
analytical methods 13 611-612
electron configuration 4 504
extractive metallurgy 8 278
fission 5 287
heat generation in earth 4 332
metallurgical extraction 13 610 611
minerals 11 268 269
in monazite 8 566
natural occurrence 13 610
nuclear fuels 9 184 187
ore reserves 9 186 187
principal compounds 13 611
prospecting for 11 23 24
radioactivity 11 276 279
Thorium deuteride 9 89
Thorium hydride 9 89
Thorium lead ratio 7 427
Thorn 15 111, 124
Thorn forest 5 189 190
Thorn headed worm 1 516
Thorogummite 11 269
Thoron 11 325
decay products in atmosphere 1 610
radioactivity 11 278
Thorotrast 11 325
microscope, x ray 8 405
Thoroughbred horse 6 488 492
Thorp J 12 618
Thorpe reaction 9 106
Thortveitite 8 278
scandium ore 12 49
Thorybes pylades 7 463
Thousand Springs in Idaho 15 18
Thrasher 13 612
Thraupidae 2 480, 13 388
Thraustotheca 10 198
Thread count 13 554
Thread lace scotia 11 103
Threading 8 6 13 612
lathe 7 407 409
Threads screw *see* Screw threads
Three halves power law *see* Langmuir Child law
Three phase ac circuits *see* Alternating current circuit theory
Three phase induction motor 7 74 77
Three-spined stickleback 12 396, 15 140
Three toed sloth 12 363, 382
vertebra 14 307
Threonine 1 389 2 45, 195 7 164, 10 485, 13 612 613*
amino acids 1 308 319
in histone 9 217
plant metabolism 10 357
in protamines 9 217
Protozoa 11 51 60
L-Threonine 11 41
D Threose 1 31
D(−) Threose 2 455
L *Threose* 1 31
Threshold fission *see* Fission threshold
Threshold energy nuclear reactions 9 193
Threshold of hearing 9 126
Threskiornithidae 7 1
Thrip 13 613
Thripidae 13 629
Thrips tabaci 13 628
Throacosaurus 3 554
Throat 13 613
Thrombin 3 195, 13 614
Thromboangiitis obliterans *see* Buerger's disease
Thrombocytopenia 6 412
circulation disorders 3 141 144
hematologic disorders 6 395 396
Thrombocytosis 13 613
Thrombophlebitis 2 266 10 115 13 614
circulation disorders 3 141 144
Thromboplastin 2 266 3 195, 13 614
Thromboplastinogen 13 613
Thrombosis 3 144, 13 613 615*
blood clotting 13 614
clotting after death 13 614
fate of thrombi 13 614 615
hemorrhoids 6 413
location of thrombi 13 614
phlebothrombosis 13 614
thrombophlebitis 13 614
thrombus formation 13 615
Thrombus 10 115
circulation disorders 3 141 144
embolism 4 565
embolus 4 565
infarction 7 93 94
Throsciidae 5 277
Throttle (automotive) 2 477 480
Throttled flow 13 615
Through truss 14 121
Throw (*fault structures*) 5 192
Throwing (ceramics) 2 648
Throwing power (electroplating) 4 529
Thrush 2 254, 3 578, 11 602, 15 615*
Thrust 13 615
aerodynamic force 1 84-87
aircraft engine performance 1 171
aircraft propulsion 1 184-185
defined 13 615
electromagnetic propulsion 4 490
engine propeller combination 1 208
ion propulsion 7 243
liquid propellant 13 7
nuclear rocket 9 201
propulsion 11 17
propulsive systems 1 208-209
pulse jet 11 95
ramjet 1 175, 209 11 535
specific *see* Specific impulse
turbojet 1 172, 208, 14 149, 155 157
turboram jet 14 158 159
Thrust bearings 2 122
Thrust fault 5 192, 13 417
Thrust sheets (geology)

Thermometer—*cont*
calorimetry 2 420
dry bulb 11 82
filled system 13 587
gas 7 599
liquid expansion 13 486
liquid in glass 13 586
low temperature thermometry 7 598 601
magnetic 7 601
maximum-registration 13 587
mercury and glass 13 587
meteorological 1 158
minimum registration 13 587
resistance 7 600, 13 588
temperature measurement 13 489
thermal conductivity 3 388 389
thermistor 13 589
vapor pressure thermal system 7 600, 13 588
wet-bulb 11 82
Thermometric depth (oceanography) 12 116
Thermometric titrations 13 658
Thermometry *see* Thermometer
Thermomonospora 13 179
Thermonuclear energy *see* Thermonuclear reaction
Thermonuclear fusion *see* Thermonuclear reaction
Thermonuclear reaction 13 589-590
carbon nitrogen cycle 2 472 473
hydrogen bomb 6 548
nuclear fusion 5 593
in stars 13 107-109
Thermonuclear reactor *see* Fusion reactor
Thermonuclear rocket 9 201
Thermoosmosis 12 455
Thermoperiodicity (plant) 10 338 339
Thermoperm 8 35
Thermopile 13 564, 585 584
infrared radiation 7 106
Thermoplastic insulation 7 156
Thermoplastic resin 10 477
Thermopolyspora 13 179
Thermoreceptor (sense organ) 12 180
Thermoregulation 13 590 592
fever 5 242
heat loss 13 591
heat production 13 591
neuroendocrine control 13 592
scope and limits of temperature regulation 13 590 591
species differences 13 591-592
Thermoremanent magnetization 11 595
Thermos bottle 4 91
Thermosbaena mirabilis 9 527-528
Thermosbaenacea 3 563, 13 592*
Peracarida 10 1
Thermosbaenidae 13 592
Thermosetting insulation 7 157
Thermosetting resin 10 477
Thermosol method 4 310
Thermosphere 1 630, 8 524
Thermostat 13 592 593
Thermotherapy 7 107, 13 593 596*
biological effects of sound waves 2 208 212
clinical methods of heat application 13 594
conductive heating devices 13 595
convective heating 13 595
hyperthermy 13 596
indications for thermotherapy 13 596
local application of heat 13 593
local changes in tissue 13 593
use of low temperatures 13 596
Thermovoltmeter 14 573
Thermovsodium esakii 5 125
Theromyzon 6 457, 11 556
Theropoda 4 198, 11 484
Thesaurus literaturae botanicae 10 377
Thesocyte 10 514
Theta functions 4 563
Theta rhythms (electroencephalography) 4 478
Thévenin's theorem (electric networks) 9 76 13 596 598*
Thia 6 428
Thiactin 1 476
Thiamin chloride 2 195
Thiamine 2 194 4 256 11 114
12 561 13 598 599* 14 540
beriberi 2 166
endocrine mechanisms 4 593
food 5 371
manufacture 13 599
muscle 13 598
nerve 13 598
thiazole 13 600
Thiamine pyrophosphate 2 13 14 13 598
Thianaphthalene 9 2
Thiaridae 9 609
Thiazine dye 4 304
Thiazole 1 702 13 599 601*
preparation 13 599 601
properties 13 599
see also Thiophene
1, 2 Thiazole 1 702
Thiazole dye 4 303
Thiazolidines 13 599 601
Thiazolines 13 599 601
2-Thiazolylsulfamic acids 13 245
Thick-walled pressure vessel 10 585
Thickening 13 601 602
sedimentation (industrial) 12 143 144
separation (mechanical) 12 187
Thickening agent food 5 378
grease 7 605
sedimentation 13 601
Thickness measurement by radioactivity 11 289 290
ultrasonic 8 290, 14 183
see also Level measurement
Thickness ratio (aerodynamics) 14 63
Thielavia 5 298
Thielaviopsis basicola 9 408, 13 663
Thienemann, A 5 529
Thiessen, Reinhardt 5 231, 232
Thigh 6 455, 13 602*
Thigmotaxis 13 403
Thigmotrichida 6 467, 11 53, 13 602*
Thigmotropisms 10 365 366
Thiirane 9 312
Thimann, K V 10 340
Thimerosal NF 1 483, 8 227
Thimet 7 141
Thin films 11 392 394
Thin section (rock) 10 55
coal microscopy 5 232
petrofabric analysis 10 49
volume mode determination 10 54
Thin walled pressure vessel 10 585
Thingvallatn Lake 5 116
Thinner 13 603
naphtha 9 2
paint 9 405
Thinnfeldia 9 505
Thinocoridae 3 10
Thio alcohol 8 227
Thio compounds 13 603
Thio phenol 8 227
Thioacid 9 405
Thioaldehyde and thioketone 9 405 13 603 604
Thioamide 13 603
Thiobacillus 2 54, 8 129
Thiobacillus denitrificans 2 56 13 604
Thiobacillus ferrooxidans 2 64 12 509
Thiobacillus novellus 2 29 13 604
Thiobacillus thiocyanoxidans 13 604
Thiobacillus thiooxidans 2 29, 64
Thiobacillus thioparus 2 29 13 604
Thiobacteriaceae 2 11 11 66, 13 604*
Macromonas 13 604
Pseudomonadales 11 65
Thiobacillus 13 604
Thiobacterium 13 604
Thioglora 13 604
Thiospira 1 604
Thiovulum 13 604
Thiobacterium 11 65
Thiobacteriaceae 13 604
Thiobarbiturate 13 603
Thiobarbituric acid 13 602
Thiocarbonate 13 603
Thiocarbamide 1 409
Thiocarbonyl compound 13 603 604
Thiocyanate 13 603, 605*
Thiocyanogen 13 603
Thiocystis 11 552
Thiodan 7 141
Thiodictyon 11 552
Thiodiethylene glycol 6 223
Thiodiglycol process 3 44
Thioether 13 603
disulfide 4 259
Thioglora 13 604
Thioglycollate medium 5 616
Thioindigo 7 63
Thioindigo red B 4 306
Thioindigoid dye 4 306
Thioketone 9 405, 13 603 604
Thiokinase 7 532
Thiokol polysulfide rubber 11 641
Thiol 13 603
mercaptan 8 227
nomenclature 9 397
organosulfur compound 9 405
Thiol ester 9 405
Thiolase 7 532
Thiomolybdate 8 364
Thionine 13 603 604
Thionic acids 13 262
Thionyl chloride 1 30
Thiopedia 11 552
Thiophene 13 605 606
benzene impurity 2 164
coal chemical 3 295
preparation 13 605
properties 13 605
Thiophenol 9 405
thio compounds 13 603
Thiopolycoccus 11 552
Thiorhodaceae 2 55 12 65
Amoebobacter 11 552
Chromatium 11 552
Lamprocystis 11 552
Rhabdomonas 11 552
Thiocystis 11 552

Titanium
Tiger-cat 6 99
Tiger moth 7 464
Tiger salamander 12 6
Tiger swallowtail butterfly 8 391
Tiglic acid (trans) 2 475
Tigloyl CoA 7 277
Tigris-Euphrates River 1 580
Tilapia 6 429
Tilaea tilbeae 12 75
Tile 13 640
  clay products, architectural 5 167
Tile drainage system 3 139
Tilia 9 188, 13 117
Tilia americana 2 108
Tilia europea 2 108
Tilia heterophylla 2 108
Tiliaceae 2 108, 8 82
Till 13 641
Till plains 10 262
Tillage 1 128
Tillandsia 5 39
Tillera 14 481
Tillotia cornes 12 388
Tillotia foetida 12 388
Tillotiaceae 14 235 236
Tilletiopsis 13 10
Tiller, C. E. 8 300
Tillina 11 57
Tilsit 5 398, 11 590
  Dwyka 10 26
  Talchir 10 26
Tillodon 13 641
Tillodont *see* Tillodontia
Tillodontia 8 82, 13 641*
Tilt up construction for precast concrete 10 568
Tilted fault blocks 5 194
Tilth 12 418, 428 429
Timber 13 205
  see also Forests and forestry
Timber management 5 441-444
Timber wolf 14 522
Time 13 641-643
  calendar 2 416
  clock 3 203 205
  coordinate systems terrestrial 5 457
  day 4 18
  daylight saving 13 643
  ephemeris time 4 335, 13 643
  fourth dimension 5 490
  geologic scale 6 141 142
  horology 6 487 488
  International Date Line 7 209 210
  measurement 13 641
  measures 8 189
  polar regions 10 443
  second 12 124
  sidereal 13 642
  solar 13 642
Time—*cont*
  space time 12 556 559
  standards of 4 460, 5 504, 10 205, 13 642 643*
  units 13 641 642
  zone 13 642
Time assignment speech interpolation (TASI) 13 440
Time base generator 12 43
Time constant 13 643 644
Time delay circuits 13 644 645
  coincidence amplifier 3 269 270
  comparator circuit 3 330
  delay line 4 48
  linear sweep 13 644
  multivibrator 13 644
  phantastron 13 645
  sanatron 13 645
Time delay fuse 5 578
Time-delay relay 3 205
Time-dependent functions 1 382
Time dilatation (relativity) 11 434-435
Time-division multiplexing 14 60 61
  amplitude modulation 1 352
  pulse modulation 11 97
Time-division multiplier 1 371-372
Time exposures 2 428, 431
Time fuze 1 536, 540
Time-interval measurement 13 641, 646*
  cathode ray oscilloscope 9 430
  chronograph 3 116
  chronoscope 3 116
  electrical oscillations 13 646
  [illegible] 13 646
  velocity of light 13 646
  vibration of atoms 13 646
Time perception 14 539
Time reversal 12 557
Time sight method (celestial navigation) 2 586
Time signals 13 643
Time stratigraphic units 13 169
Time study 7 82
  human engineering 6 495
  work measurement 14 554 557
Time symmetry (theoretical physics) 13 362 363
Time zones 13 642 643
Timekeeping chronometer 3 116
  clock 3 203 205
Timekeeping—*cont*
  sundial 13 291
Timerellacea 1 663
Timing devices interval timer 3 205
  time cycle controller 3 206
  time delay relay 3 205
  time schedule controller 3 206
  time switch 3 205
Timiskaming graywacke 10 566
Timor 4 357
Timor Sea 9 271
Timothy 13 646 647
Timpani 8 665 666
Tin 13 647 650
  allotropes 13 647
  alloys 13 649 650
  analysis 13 649
  bronze 2 349
  cassiterite 2 559
  electron configuration 4 504
  extraction and refining 11 120
  extractive metallurgy 8 278
  gray 12 167
  ionization potential 4 504
  metallurgy 13 650
  mining and concentration 13 647
  natural occurrence 13 647
  organometallic compound 9 405
  physical properties at low temperature 13 298
  principal compounds (inorganic) 13 648 649
  principal compounds (organic) 13 649
  properties 13 647 648
  uses and applications
  [illegible]
Tin metallurgy 13 650
Tin roof dog whelk 14 488
Tinamidae 13 650
Tinamiformes 1 694 13 650-651*
Tinamous 13 650
Tincal 2 301
Tindale N B 7 473
Tinea 6 274
Tinea capitis 4 68 8 678
Tinea corporis 4 68, 8 678
Tinea pedis 4 68
Tinea pellionella 7 467
Tineidae 7 464
Tineola bisselliella 7 467
Tingia 9 116
Tingidae 6 401
Tingiostachya 9 116
Tinkertoy 8 470
Tinnitus 4 22
Tinplate 8 279, 13 648
Tinplating 4 531
Tinsley Gall ac potentiometer 10 545
Tintinnida 11 55, 13 5, 651*
Tintinnina 13 651
Tintinnopsis 13 651
Tintinnus 13 651
Tioughniogan Stage 4 87
Tiphia vernalis 6 581
Tiphiid wasp 6 574
Tiphiidae 6 574
Tipple, mine 8 497
Tipula infuscata 4 216
Tipulidae 4 212
Tire 13 651
  automobile 11 644 646
  noise control 9 125
Tirolites cassianus zone 14 82
Tirrill burner 6 263
Tisbe furcata 5 463
Tischenko reaction aldehyde 1 229
  ester 5 75
  ether 5 87
Tischner, M 10 129
Tiselius A 4 527, 11 57
Tiselius electrophoresis cell 4 527
Tissue 13 651
  DNA purine and pyrimidine contents 9 212
  RNA nucleotide composition 9 210
  see also Plant tissue systems
Tissue culture *see* Culture, tissue
Tisza River 5 122
Titan 12 40
  [illegible] 113
  [illegible] ration
  extraction and refining 11 120
  extractive metallurgy 8 278
  ilmenite 7 29
  ionization potential 4 5
  metallurgy 11 124 13
  natural occurrence 12 6 13 652
  organometallic compo 9 404
  polymerization catalys 13 653
  principal compounds 13 652
  titanate 13 651 652

Thue-Siegel Roth theorem 9 227
Thuja 3 188, 10 117
Thuja occidentalis 1 500
Thuja orientalis 1 500
Thuja plicata 1 500
Thuja standishii 1 500
Thujaplicin 14 117
Thule asteroids 1 596
Thulium 13 616
  electron configuration 4 504
  extractive metallurgy 8 278
Thunburg technique 2 26
Thunder 13 616
Thunderbolt fighter 1 534
Thundersquall 13 21
Thunderstorm 13 616 617
  atmospheric electricity 1 635 636
  cloud physics 3 215-216
  clouds 13 616
  electrical phenomena 13 617
  formation 13 616
  lightning in 7 509 510
  radar detection 8 320
  squall 13 21
  tornadoes with 13 685
Thunnidae 14 136
Thunnus thynnus 14 136
Thurstone L. L. 7 178
Thylacinus 2 432
Thyanta 6 410
Thylacinus 8 155
Thylacoleo 8 155
Thylacoleo carnifex 8 155
Thylacosmilus 8 155
Thymatrol 4 230
Thyme 12 613
Thymelaeace 3 189
Thymidine 5' phosphate 2 59
Thymidinetriphosphate 9 213
Thymidylic acid 9 213
Thymine 2 36, 4 66, 10 550 11 115
  metabolic disorders 8 258
Thymocyte 13 618
Thymol 10 112
Thymol blue 7 60
Thymolphthalein 7 60
Thymolsulfonphthalein 7 60
Thymus gland *13 617 619*
  amphibians 13 618
  birds 13 618
  comparative anatomy 13 617 618
  comparative embryology 13 617 618
  endocrine gland 4 589
  fishes 13 617
  hematopoiesis 6 396 598
  histogeneus 13 618-619
  histology 13 618
  mammals 13 618
  physiology 13 619
  reptiles 13 618
Thymus gland—cont
  response to adrenal hormones 13 619
  response to sex hormones 13 619
  response to thyroid hormone 13 619
  surgical removal 13 619
  thymic extracts 13 619
  thymus and cancer 13 619
  thymus and myasthenia gravis 13 619
Thyone 11 511
Thyone briareus 12 91
Thyratron 13 619 621
  argon 13 619
  control 13 620
  deionization time 13 620
  hydrogen 13 620
  ionization time 13 620
  mercury vapor 8 236, 13 619
  negative grid 13 619
  noise 6 62
  oscillations 6 62
  ratings 13 621
  shield grid 13 620
  surges 6 62
  xenon 13 619
Thyratron inverter 7 235
Thyrididae 7 464
Thyridopteryx ephemeraeformis 7 467
Thyrite 14 281
Thyroglobulin 13 626
Thyroid gland 4 235, 9 27, 13 621 627*
  ammiotes 13 624
  amphibians 13 624
  biochemistry 13 626 627
  cartilage 14 346
  comparative anatomy 13 623 624
  embryonic origin 13 621
  endocrine gland 4 588
  experimental methods 13 624
  fishes 13 624
  goiter 13 625 626
  goitrogenic agents 13 626
  hormone adenohypophyseal 6 480
  hormonal control of thyroid 13 623
  hyperthyroidism 13 625
  metamorphosis 13 622
  phylogeny 13 624
  physiology 13 624
  radioactive tracers 14 8
  radioiodine 13 625
  removal of pituitary 13 625
  retardation of growth 13 621
  thyroid and growth 13 621
  thyroid and morphogenesis 13 622 623
Thyroid gland—*cont*
  thyroid inhibitors 13 623
  thyroid metabolism 13 624-625
  thyroid physiology 13 625
  thyroidectomy 13 622
  tissue response 13 622 623
Thyroid gland disorders 6 229 13 627
Thyroid stimulating hormone (TSH) 6 596
Thyrotoxicosis 4 102
  see also hyperthyroidism
Thyrotropic hormone see Thyrotropin
Thyrotropin 13 625
  endocrine mechanisms 4 593
  pituitary gland 10 250
  ultimobranchial bodies 14 179
Thyroxin 3 547, 4 235, 6 479 7 240 13 625
  endocrine mechanisms 4 595
  goiter 6 229
  tyrosine 14 176
Thysanidae 6 574
Thysanietta giardi 12 90
Thysanoessa longipes 12 121
Thysanopoda 4 40
Thysanoptera 7 134 13 628 629*
  thrip 13 615
Thysanosoma actinoides 12 247
Thysanura 1 495 565 7 134 13 629*
  silverfish 12 333
Thysanus 6 581
Tiber Tevere 5 122
Tibetan plateau 1 577
Tibia 1 428
  leg 7 418
Tibione *see para* Acetamino benzaldehyde thiosemicarbazone
Tick L. J. 9 257
Tick 1 24 496 499 5 257, 13 15 629 630*
  miticide 8 518
  reproduction 13 629
  structure 13 629
Tick bite fever South African 13 630
Tick borne infection 1 425
Tick fever Colorado 13 630
Tick paralysis 13 630 631
Tick typhus North Queensland 13 631
Tick typhus Siberian 13 631
Tick typhuses 13 15
Tickle 13 631 632
Ticonal 1 266
Ticonium 2 175
Tidal bore 13 632
  Amazon River 12 329
Tidal currents alternating 9 251
  and coastal deposition 8 132 135
  ebb stream 9 251
  in estuaries 5 79 84
  flood 9 251
  in the ocean 9 251
  in rivers 11 586
  rotary 9 251
  and shore processes 12 2
  slack water 9 251
  speeds of 9 251
Tidal datum planes see S level (datum planes)
Tidal flats 5 83 84
Tide 13 632 640
  amphidrome points 13 6
  Atlantic Ocean 1 626
  atmospheric tides 13 639
  binary stars 2 188
  bodily tide 13 638
  corange charts 13 633
  cotidal charts 13 633
  Darwin's constituents 13 634
  datum planes 12 94
  diurnal inequality 13 63
  diurnal tide 13 634
  dynamics of ocean tide 13 637 639
  in earth's crust 4 316 35
  effect on Earth rotation 4 333
  equilibrium tide 13 633
  harmonic development 13 633
  long period tide 13 633 6
  luntidal interval 13 633
  neap tide 13 634
  ocean 13 635 636
  power from 14 399
  prediction 13 639
  semidiurnal tide 13 634
  spring tide 13 634
  tidal analysis 13 639
  tidal currents 13 636 637
  tidal friction 13 640
  tidal streams of the sea 9 251
  tide generating forces 13 632
Tidewater 9 150 151
Tidewater navigation 9 147
Tie bar *see* Tie rod
Tie line 5 56
Tie member *see* Ring
Tie rod 15 640
Tiemannite 12 163
T'ien Shan 1 577
Tierra caliente 12 527
Tierra fria 12 527
Tierra templada 12 527
TIG welding 14 467
Tiger 13 640
Tiger beetle 3 276
Tiger butterfly 2 343

Topographic surveying and mapping—*cont*
plane table survey 10 266, 15 678
plotting 15 679
scale 15 677
survey method 15 677 678
symbols 15 677
transit survey 15 678
tunnels 14 142
Topography 15 677
see also Relief features on maps
Topology 15 679 685
biophysics, mathematical 2 235
construction of topological spaces 15 680 682
continuous map 15 680
electric networks 9 72 73
fiber bundle 5 253
graph theory 6 253
group theory 6 282 283
homotopy theory 15 682
manifold 8 91, 15 682 683
metric 15 680
notation 8 172, 174
set theory 12 206, 15 679-681
topological space 15 679-680
torus 15 690
see also Boolean algebra
Topotype 14 172
Topping of crude oil 10 65-66
Topworking 6 245
Torbanite 5 229, 15 685*
Torbernite 11 269, 14 210
Torch 15 684 685
brazing 2 322
cutting torch 15 684
welding torch 15 684
Tornado 15 685
radar detection 8 320
squall line conditions 13 21
warnings 14 453
Tornaria larva 4 361, 5 5
Toroid 10 22
Toroidal coil 7 81 8 51
Toroidal lenses 12 608
Toroidal Stabilized Pinch Machine 10 234
Torpedo 2 111 4 428 10 209, 11 351
Torpedo naval acoustic 1 48
bangalore *see* Bangalore torpedo
design 14 2 4
firing from submarines 13 215
guidance 1 689
Torpedo nobiliana 4 428
Torpedo ray 11 548
Torpex 1 484 5 152
Torque 15 686
dynamometer measurement 4 314
Torque—*cont*
foot pound 5 429
foot poundal 5 429
rotational motion 11 632
statics in space 13 56 57
work 24 532
Torque converter 13 686 687*, 14 45 47
characteristics 13 686
fluid coupling 5 535
hydraulic action 13 686
Torque motor 12 204
Torque transmission 12 240 241
Torrens, Lake 1 672
Torricelli, Evangelista 9 588 13 687
Torricelli's theorem 13 687
Torridonian conglomerate and sandstone 10 567
Torsion 13 687 689
cylindrical bars 13 687
elastic shear stress 13 687
elasticity 4 420
inelastic behavior 13 688
membrane analogy 13 689
metal 8 268
solid noncircular sections 15 688
thin walled tubes 13 688
Torsion balance 2 73 6 264*
Torsion bar 13 689 690
Torsion-bar spring 13 17, 689-690
Torsion bar suspension 13 690
Torsional harmonic oscillator 9 618
Torsional pendulum 6 542 9 618
gyromagnetic effect 6 507
Torsional vibration 8 191-192
Torticollis 8 658
Tortoise 15 690
Tortricid 7 464
Tortricidae 7 464
Tortrix 7 472
Torula 8 224
Torula herbarum 4 52
Torula lignaperda 4 52
Torula utilis 3 578
Torulopsidales *see* Cryptococcales
Torulopsis 3 578 14 602
Torulopsis glabrata 14 602
Torulopsis histolytica 14 602
Torulopsis hyalofera 3 188
Torulopsis utilis 14 604
Torulosis 14 602
Torus 1 391, 15 690*
manifold 8 91
surface and solid of revolution 15 310 311
topology 15 681
Torymidae 6 574
Torymids 6 574
Torynurus 15 193
Toscano Emilian Apennines 5 118
Total eclipse 4 380
Totalizing meter 14 414
Totes Gebirge Mountains 5 117
Touch 15 690 691
perception of vibration 15 692
pressure adaptation 15 691
pressure thresholds 15 691
spatial discrimination 15 691
stereognosis 15 127
Tough bumelia 7 268
Tough pitch copper 3 466
Toupin, R 14 201
Tourmaline 15 692 693
authigenic tourmaline 1 674
boron ores 2 301
gem 6 99
pleochroism 10 417
rubellite 11 647
Tournaisian series 2 469
Tournament (graph theory) 6 254
Tousey R 15 272
Tovomita 3 187
Towboat 7 114 816
marine propellers 11 12
Towed sonar *see* Sonar
Tower 14 1
cooling *see* Cooling tower
on ocean floor 15 551
solar *see* Solar tower
Texas Towers 15 531 552
Tower packings 6 45
Tower telescope 15 298
Towhee 14 1
Towing basin *see* Towing tank
Towing tank 5 545, 12 279 280*, 14 1 4
dynamometer 14 2
law of similitude 14 2
lines of flow 14 3-4
measurements 14 5
model testing 14 2-4
nonsteady state experiments 14 4
towing methods 14 1 2
water tunnel 14 409
wave experiments 14 4
Townes, C H 1 650
Townsend, J S 12 559, 561 14 4
Townsend coefficients 4 452, 12 561
Townsend discharge 4 452, 14 4*
Townsend equation 4 452, 12 561
Townsend Mountain 1 671
Toxaphene 8 518, 15 398
insecticide 7 141
rodenticide 11 615
Toxascaris leonina 1 572
Toxasteridae 12 565
Toxemia 14 4 5
jaundice 7 502 503
of pregnancy 14 4 5
Toxic adenoma 15 626
Toxic goiter *see* Hyperthyroidism, Thyroid gland
Toxic hepatitis 7 563, 10 433
Toxicological analysis 5 440
Toxicology 14 5 6
bioassay 2 198
lead poisoning 7 424
lethal dose 50 7 478
nicotine 9 100
pharmacology 10 97
poison 10 434
Toxicyst 11 51 60
Toxiglossate radula 8 561
Toxin, bacterial 1 457, 469 487, 15 527, 14 6 7*
biologicals 2 218
botulism 2 307
diphtheria 4 207
gangrene gas 6 38
neutralization reaction (antibody) 9 82
Toxin, erythrogenic *see* Scarlet fever toxin
Toxin antitoxin reaction 14 7
Toxocara canis 1 572
Toxocara cati 1 572
Toxoids 2 218 219
biologicals 2 218 219
toxin, bacterial 14 6
Toxoplasma 6 315
Toxoplasma gondii 8 383 14 7
Toxoplasmosis 9 357 14 7
Toxopneustidae 15 485
Toxoptera graminum 1 490
Toxosloma rutum 13 612
Toxothrix 3 64
2, 4, 5 TP 6 423
TPN *see* Triphosphopyridine nucleotide (TPN)
TR box 2 577
TR tube 11 212
Trabeculae 2 285
Trace (mathematics) 13 66
Trace analysis 11 136, 14 7*
see also Analytical Chemistry
Trace elements plant in biogeochemical surveys 6 117 118
biosphere, geochemistry of 2 242
fertilizer 5 239
in mineral soils 12 424
in sea water 12 108
Tracer (ammunition) 1 539
Tracer, radioactive 14 7-9
atmosphere 11 270
atmospheric chemistry 1 635
in biology 11 306 310

Titanium—cont.
uses of important compounds 13 653
welding 14 467
Titanium base alloys 13 654-655
Titanium dioxide 13 653
white pigment 10 223
Titanium metallurgy 13 653-655
Titanoides 9 557
Tithonian stage 7 325
Titicaca, Lake 12 524
Titius, J. D. 10 207
Titmouse 13 655
Titrant 13 655
Titration 13 655 661
acid base reaction 13 656
amperometric 13 658 659
buret 2 372
classification by chemical reaction 13 656
classification by end points 13 656 658
complex formation reactions 13 656
concentration scales 3 561
conductimetric 13 659 660
coulometric analysis 5 517
indicator, acid base 7 59 61, 13 657
neutralization reactions 9 82, 13 656
oxidation reduction reactions 13 656
photometric titration 13 657
pipet 10 241 242
potentiometric 13 660 661
precipitation reaction 13 656
solvents 13 656
stoichiometry 13 146 147
thermometric titrations 13 658
Titration, amperometric 13 658 659
see also Polarographic analysis
Titration, conductimetric 13 659 660
Titration, potentiometric 13 660 661
Titrilog I 155
Titrimetric analysis 14 374
Titrimetry see Titration
Titusville oil well 9 290
Tiza, L. & 393
Tjalfiella 10 412
Tmesipteris 11 69
TNT 13 665
Toad 13 661
giant 12 10
spadefoot 12 47
Toad bug 6 401
Toadfish 2 111, 12 396, 13 537
Toarcian stage 7 325
Tobacco 13 661 664
budworm 7 472
characteristics 13 662
chlorosis 13 663
cultivation 13 662
curing 13 662
disease control 13 664
diseases 13 663
economic importance 13 662
frenching 13 663
harvester 1 131
harvesting 13 662
hornworm 7 472
oncology 9 325
tobacco mosaic disease 13 664
types 13 662
Tobacco mosaic virus 10 305, 584, 11 229, 14 551
assay 8 578
RNA nucleotide composition 9 210
Tobacco ring (spot virus) 12 535
Tobacco thrip 9 603
Tobago 14 476
Tobia fever *see* Spotted fever, Rocky Mountain
Tobin's acid 9 3
Tocopherol *see* Vitamin E
α Tocopherol 11 108
Todd, R. 8 142
Todd AO 5 128
Toddiae 3 475
Toed winged beetle 3 278
Toggenburg goat 6 227
Toggle 12 380, 13 664
Toggle switch *see* Switch, electric
Tokay 14 507
Tolerance 13 661 665
gage 6 5
Tollens naphthoresorcinol test 2 453
Tollens' reagent 1 230
Tollmien Schlichting stability theory 2 309
Tollmien Schlichting waves 2 309
Tolman, Edward C. 7 443, 8 603, 10 52
Talmiea menziesii 9 563
m Toluamide 1 503
o Toluamide 1 503
p Toluamide 1 503
Toluate 5 74
Toluene 10 48, 13 665*
aircraft fuel 1 178
coal chemical 3 235
solvent 12 496
Toluene diisocyanate 10 493
m Toluic acid 2 475
o Toluic acid 2 475
p Toluic acid 2 475
Toluidine 10 224, 13 665*
Toluidine blue 4 204
Tolumol 3 235
Tolypothrix 3 636
Tomato 13 665 666
biological uses 13 666
classification 13 665
culinary 13 666
distribution 13 666
economic importance 13 666
food manufacturing 13 666
hornworm 7 472
leaf mold 4 52
pests 13 666
structure 13 665
vegetable growing 13 666
Tomato bushy stunt virus 14 551
RNA nucleotide composition 9 210
Tomato fruitworm 7 472
Tombaugh, C. W. 10 420
Tombolo 12 502
Tomistoma 3 552, 554
Tomography 11 305
Tomopteridae 10 461
Ton 8 188
Ton of refrigeration 13 666
Tonalite 4 206, 10 86, 13 666*
Tone (music and acoustics) 13 666
Fletcher Munson contours 5 299 300
octave 9 275
partial tone 9 571
Tone compensating circuits 12 520
Tone line process 10 611
Tone reproduction (photography) 10 165
Toner 4 306
pigment 10 224
Tonga Kermadec Trench 4 320
Tonga Trench 13 223
Tongariro Mountain 1 671
Tongariro volcano 1 675
Tongue 13 666 668
chemoreception 5 49 50
development 13 668
digestive system 4 165
function 13 668
lingual glands 13 667 668
mammalian 13 667
muscle 13 668
taste buds 13 667
Tongue tie 4 165
Tongue worm 5 5
Tonicella 10 487
Toning (photography) 10 163
Tonnage (ships) 12 274 275
Tonometer 6 210 211
Tonotron storage tube 13 161
Tonsil 7 632, 13 668 669*
development 13 669
function 13 669
lingual tonsil 13 669
palatine 4 165, 13 668 669
pharyngeal tonsil 13 669
Tonsillitis 1 466-467, 10 13 669*
Tool steel: martensite 13 9
vanadium 14 269
Tooling 13 670 673
auxiliary tooling 13 67
clamping 13 671
dies 7 311-314, 13 670
fixtures 7 311-314, 13
functional uses 13 670
gage 13 670
guiding 13 672
jigs 7 311 314, 13 670
locating 13 670 671
multiple tool functions 13 672
nomenclature 13 670
positioning 13 671
production methods 10
Tooling devices 13 670
Tooth 13 673 675
biochemistry 2 199
dentition 4 65 66 13 6 674
digestive system 4 165
disorders 13 675 676
life cycle 13 674
structure 13 674 675
Tooth disorders 13 675 676
dental caries 13 676
dentoalveolar abscesses 13 676
developmental defects 13 676
diseases of the jaws 13 6
mouth disorders 8 619
periodontal disease 13 6
prosthesis 11 107
rickets 13 676
tetany 13 676
toothache 13 676
Tooth neck fungus beetle 3 27
Tooth shell 13 676
Toothed whale 2 660
Top, spinning 10 568 569
nutation 9 232 233
Top shell 1 591, 6 75
Top slicing (mining) 8 482
Topaz 13 676 677
gem 6 99
Tophet C. 7 295
Tophus 8 258, 13 677*
gout 6 239
origin 13 677
Topogon lens 7 455
Topographic anatomy 1 396
Topographic climax 3 186
Topographic maps 2 338 13 677 679
Topographic surveying and mapping 13 677 679
aerial surveys 13 678 679
alidade 3 256
contour 3 425, 13 677
control 13 677
ground surveying 13 678
map drafting 13 679

Topographic surveying and mapping—cont
plane table survey 10 266, 13 678
plotting 13 679
scale 13 677
survey method 13 677 678
symbols 13 677
transit survey 13 678
tunnels 14 142
ography 13 677
see also Relief features on maps
pology 13 679 683
biophysics, mathematical 2 255
construction of topological spaces 13 680 682
continuous map 13 680
electric networks 9 72 73
fiber bundle 5 253
graph theory 6 253
group theory 6 282 283
homotopy theory 13 682
manifold 8 91, 13 682 683
metric 13 680
notation 8 172, 174
set theory 12 206, 13 679-683
topological space 13 679 680
torus 13 690
see also Boolean algebra
Toporype 14 172
Topping of crude oil 10 65-66
Topworking 6 245
Torbanite 3 229 13 685*
Torbernite 11 269, 14 210
Torch 13 684 685
brazing 2 522
cutting torch 13 684
welding torch 13 684
Tornado 13 685
radar detection 8 320
squall line conditions 13 21
warnings 14 453
Tornaria larva 4 363, 5 3
Toroid 10 22
Toroidal coil 7 81, 8 31
Toroidal lenses 12 608
Toroidal Stabilized Pinch Machine 10 234
Torpedo 2 111 4 428, 10 209 11 331
Torpedo naval acoustic 1 48
bangalore *see* Bangalore torpedo
design 14 2 4
firing from submarines 13 213
guidance 1 689
Torpedo nobiliana 4 428
Torpedo ray 11 348
Torpex 1 484 5 152
Torque 13 686
dynamometer measurement 4 314
Torque—cont
foot pound 5 429
foot poundal 5 429
rotational motion 11 632
statics in space 13 56 57
work 14 552
Torque converter 13 686 687*, 14 45 47
characteristics 13 686
fluid coupling 5 335
hydraulic action 13 686
Torque motor 12 204
Torque transmission 12 240 241
Torrens, Lake 1 672
Torricelli, Evangelista 9 588, 13 687
Torricelli's theorem 13 687
Torridonian conglomerate and sandstone 10 567
Torsion 13 687 689
cylindrical bars 13 687
elastic shear stress 13 687
elasticity 4 420
inelastic behavior 13 688
membrane analogy 13 689
metal 8 268
solid noncircular sections 13 688
thin walled tubes 13 688
Torsion balance 2 73 6 264*
Torsion bar 13 689 690
Torsion bar spring 13 17 689-690
Torsion bar suspension 13 690
Torsional harmonic oscillator 9 618
Torsional pendulum 6 542, 9 618
gyromagnetic effect 6 307
Torsional vibration 8 191 192
Torticollis 8 658
Tortoise 13 690
Tortricid 7 464
Tortricidae 7 464
Tortrix 7 472
Torula 8 224
Torula herbarum 4 52
Torula lignaperda 4 52
Torula utilis 3 578
Torulopsidales *see* Cryptococcales
Torulopsis 3 578, 14 602
Torulopsis glabrata 14 602
Torulopsis histolytica 14 602
Torulopsis lipofera 5 188
Torulopsis utilis 14 604
Torulosis 14 602
Torus 1 391, 13 690*
manifold 8 91
surface and solid of revolution 13 310 311
topology 13 681
Torymidae 6 574
Torymids 6 574
Torynurus 13 193
Toscano Emilian Apennines 5 118
Total eclipse 4 580
Totalizing meter 14 414
Totes Gebirge Mountains 5 117
Touch 13 690 691
perception of vibration 13 692
pressure adaptation 13 691
pressure thresholds 13 691
spatial discrimination 13 691
stereognosis 13 127
Tough bumelia 7 268
Tough-pitch copper 5 466
Toupin, R 14 201
Tourmaline 13 692 693
authigenic tourmaline 1 674
boron ores 2 301
gem 6 99
pleochroism 10 417
rubellite 11 647
Tournaisian series 2 469
Tournament (graph theory) 6 254
Tousey R 13 272
Tovomita 3 187
Towboat 7 114 116
marine propellers 11 12
Towed sonar *see* Sonar
Tower 14 1
cooling *see* Cooling tower
on ocean floor 13 531
solar *see* Solar tower
Texas Towers 13 531 532
Tower packings 6 45
Tower telescope 13 288
Towhee 14 1
Towing basin *see* Towing tank
Towing tank 5 343, 12 279-280* 14 1 4
dynamometer 14 2
law of similitude 14 2
lines of flow 14 3 4
measurements 14 3
model testing 14 2-4
nonsteady state experiments 14 4
towing methods 14 1 2
water tunnel 14 409
wave experiments 14 4
Townes, C H 1 650
Townsend J S 12 559 561 14 4
Townsend coefficients 4 452, 12 561
Townsend discharge 4 452 14 4*
Townsend equation 4 452 12 561
Townsend Mountain 1 671
Toxaphene 8 518, 13 398
insecticide 7 141
rodenticide 11 615
Toxascaris leonina 1 572
Toxasteridae 12 563
Toxemia 14 4 5
jaundice 7 302 303
of pregnancy 14 4 5
Toxic adenoma 13 626
Toxic goiter *see* Hyperthyroidism; Thyroid gland
Toxic hepatitis 7 563, 10 435
Toxicological analysis 5 440
Toxicology 14 5 6
bioassay 2 198
lead poisoning 7 424
lethal dose 50 7 478
nicotine 9 100
pharmacology 10 97
poison 10 434
Toxicyst 11 51 60
Toxiglossate radula 8 561
Toxin, bacterial 1 457, 469 487 13 527 14 6 7*
biologicals 2 218
botulism 2 307
diphtheria 4 207
gangrene, gas 6 38
neutralization reaction (antibody) 9 82
Toxin, erythrogenic *see* Scarlet fever toxin
Toxin antitoxin reaction 14 7
Toxocara canis 1 572
Toxocara cati 1 572
Toxoids 2 218 219
biologicals 2 218 219
toxin, bacterial 14 6
Toxoplasma 6 315
Toxoplasma gondii 8 583, 14 7
Toxoplasmosis 9 557, 14 7
Toxopneustidae 13 485
Toxoptera graminum 1 490
Toxostoma rufum 13 612
Toxothrix 3 64
2 4, 5 TP 6 423
TPN *see* Triphosphopyridine nucleotide (TPN)
TR box 2 577
TR tube 11 212
Trabeculae 2 285
Trace (mathematics) 13 66
Trace analysis 11 136, 14 7*
see also Analytical Chemistry
Trace elements, plant in
geochemical surveys 6 118
biosphere, geochemistry 2 242
fertilizer 5 239
in mineral soils 12 42
in sea water 12 108
Tracer (ammunition) 1 5
Tracer, radioactive 14 7-9
atmosphere 11 270
atmospheric chemistry 1 635
in biology 11 306 31 14 7-8

Tracer, radioactive—*cont*
industrial plant control 14 9
in industry 14 8 9
in medicine 14 7-8
oceanic circulation and mixing 9 254-255
piston ring wear studies 14 8-9
radiochemistry 11 301
radioisotope (assay) 11 306
radiometric assay 11 317
sea water 11 270
sea water fertility 12 119
surface water 11 270
see also Radiochemistry
Trachea 2 349, 9 27
insect physiology 7 123-133
Tracheid 2 615, 618
wood 14 524
xylem 14 591
Trachelomonas reticulata 5 99
Trachelomonas volvocina 5 98
Tracheole: insect physiology 7 122 133
Tracheophyta 10 321, 346, 13 121, 14 9*
Bryophyta 2 353-354
economic importance 14 9
Lycopsida 7 626, 10 346, 14 9
musci 8 635
origin 14 9
Psilopsida 10 346, 11 69, 14 9
Pteropsida 14 9
reproduction 14 9
Sphenopsida 12 607, 14 9
Trachodon 4 201
Trachoma 1 466 467, 4 219, 14 9*
Trachybasalt 10 86
Trachyceras aon zone 14 82
Trachyceras aonoides zone 14 82
Trachylina 5 255, 14 9 10*
Trachymedusae 5 255, 4 59; 14 10
Trachyphyllia amarantum 12 77
Trachyte 7 16, 10 86, 11 590; 14 10 11*, 347
composition 14 10
occurrence 14 10
origin 14 10
petrographic province 10 50
structure 14 10
texture 14 10
Trachyte porphyry 11 590
Trachytic tuff 14 134
Track-while-scan radar systems 11 205
Tracking antenna *see* Antenna (aerial)
Tracking distortion (phonograph records) 4 242-243
Tracking error (optical tracking) 9 360
Tracking error (phonograph records) 4 242
Tracking telescope 9 360 362
Traction load (geology) 12 136
Traction magnet 4 489
Tractor 14 11-12
crawler 14 12
engines 14 11
farm 14 11-12
hydraulic systems 14 12
industrial 14 12
and plow 1 117
power steering 15 102
power take-off 14 11
transmission 14 11
see also Automotive vehicle
Tractrix 14 12
tractrix of revolution 13 310
see also Catenary
Trade winds 14 495
Tradescantia 3 110, 8 672
Traffic control air *see* Air traffic control
airport 1 163
highways and streets *see* Traffic engineering
queueing theory 11 188
Traffic control systems 14 12-13
Traffic engineering 14 13 15*, 64
access control 14 14-15
capacity calculations 14 13-14
communications 3 320 322
interchanges 14 14 15
movement study 14 13
origin-destination studies 14 13
parking 14 15
safety 14 15
traffic recorders 14 13
Tragacanth 6 297
Tragulid 1 567
Tragulina 1 568
Tragulus 1 568
Training equipment 12 340
Trajectory 14 16
elliptical 2 82
exterior ballistics 2 78-82
kinematics 7 347
parabolic 2 79-80
projectile 2 78
Tramimer 14 507
Tranquilizer 14 16-17
animal feed composition 1 427
effect on patient 14 16
mechanism 14 16
rauwolfia 11 347
sedation 12 129
serotonin 12 197
Tranquilizer—*cont*
types 14 16-17
use in diseases 14 17
Transacetylation 10 152
Transaminase 5 21; 14 17
amino acid 1 311
blood chemistry 3 197
enzyme 5 20, 24
nitrogen excretion 9 111
Transaminase B 6 106
Transamination 12 567, 14 17*
amino acid 1 311
vitamin B_6 14 342
Transauroral lines gaseous nebulae 9 25-26
Transcendental equation 12 189-196
Transcendental function 4 129
Transcendental numbers 9 224
Transconductance *see* Mutual conductance
Transcription, electrical *see* Electrical transcription
Transcurrent faults 13 417
Transducer 14 18
electroacoustic *see* Transducer, electroacoustic
electrokinetic *see* Electrokinetic transducer
electromechanical 12 509-510
pressure *see* Pressure transducer
resonant 14 18
rotary 15 367
in servomechanisms 12 200 202
temperature 15 487
underwater *see* Transducer, underwater
Transducer, electroacoustic 7 587-595
carbon 8 358 359
dynamic 8 357-358
electrostatic (condenser) 8 358
electrostrictive (ceramic) 8 358
magnetic 8 358
microphone transducers 8 357-359
piezoelectric (crystal) 8 358, 10 217
telephone receiver 13 430
telephone transmitter 13 429 430
underwater *see* Transducer, underwater
Transducer, electrokinetic *see* Electrokinetic transducer
Transducer electromechanical 12 509 510
Transducer, underwater 14 18
hydrophone 6 563
pressure transducer 10 584
sonar 12 503-504
underwater sound 14 199
Transduction bacterial genetics 2 21
Transductor 12 203
Transesterification *14 18 19*
alcoholysis 1 225
catalysis 14 19
reaction equilibria 14 19
reaction kinetics 14 19
reaction mechanism 14 19
Transfer characteristic control systems 3 429
open loop 3 430
Transfer collisions charge transfer 12 56-57
excitation transfer 12 56 57
Transfer effect (Verbal learning) 14 303
Transfer impedance 7 37
Transfer instruments 1 521; 4 477
Transfer molding plastics 10 405
Transfer operations gas absorption 6 44 45
Transfer processes photocopying 10 145
Transferase 5 24
Transference number 14 19-22
Hittorf method 14 19 22
moving boundary method 14 19 22
Transform, integral *see* Integral transform
Transformation (bacterial) 2 21, 9 427
Transformation (data) 2 231 232
Transformation (set theory) 12 206
Transformation diagrams (steel) 6 380
Transformation formulas (integral transforms) 7 165
Transformation of coordinates 1 592
conformal mapping 3 595
contravariant vector 2 405
coordinate systems, graphical 3 456
Hamilton-Jacobi theory 6 332
Transformation ratio (transformers) 14 24
Transformation series, radioactive 11 277-283
Transformation theory, mathematical elliptic function and integral 4 563
geometry, Riemannian 6 162-165
Transformation theory, quantum 14 22 25
Transformations, canonical *see* Canonical transformations
Galilean *see* Galilean transformations

formations canonical
ent
Lorentz see Lorentz transformations
Y-delta see Y-delta transformations
sformer 14 23 29
radio frequency 14 27 28
autotransformer 1 692 693
characteristics 14 26
construction 14 24 25
cooling 14 25 26
copper loss 3 472
distortion 14 28
distribution 4 424 425
double delta connections (six phase) 1 281
double Y connections (six-phase) 1 281
equivalent circuit 3 524
impedance matching 7 37
instrument see Instrument transformer
insulation 7 158 160
intermediate frequency 14 28
invention 4 454
overloads 14 27
parallel operation 14 27
as phase inverter 10 101
phase transformation 14 27
power 14 24 27
radio-frequency 14 27 28
resonance see Resonance transformer
single phase 14 25
substation 4 440
taps 14 26 27
three phase 14 25
use of ferrites 5 221
use with antennas 1 450 451
variable 13 367 369
video 14 27 28
sformer coupled amplifier 1 343 14 357 358
audio frequency 14 357 358
radio frequency 14 358
nsformer ratio bridge 2 443
nsfusion 1 468, 14 29 30*
ns Himalaya 1 577
nsient electric 5 132
14 30 35*
alternating current 14 33 35
damping 4 11 13
direct current 14 31 33
nature of 14 30
RC RL and RLC circuits 14 32 35
surges 13 525
time constant 13 644
types 14 31
Transient cavitation 2 574
Transient flow 8 62
Transient heat conduction 3 388 389
Transistor 14 35 38
action 14 36 38
alloy junction 7 319
in amplifiers 1 348
biasing 1 348
classification 14 35 36
controlled rectifier 3 438-439
current gain 14 36
current multiplication 14 37
diffused base 7 320
double base diode 14 38
equivalent circuit 5 64
field-effect 14 38
grown junction 7 319
high frequency 7 320, 13 322, 14 37
injection 14 36
junction see Junction transistor
manufacture 13 522, 14 38
noise 14 38
n p n 7 321
phototransistor 10 192
p-n-i-p 7 321
p n p n 3 438 439
point contact see Point contact transistor
power transistor 7 321
rate grown 7 320
remelt junction 7 320
spacistor 14 38
surface barrier see Surface-barrier transistor
temperature effect 14 38
testing 14 128
tetrode 7 321
Transistor amplifier 1 348-350
bias considerations 1 348
cascade 1 350
common base connection 1 349
common-collector connection 1 350
common-emitter connection 1 350
configurations 1 349
junction potential barriers 1 348
linear 1 348
power amplifier 1 350
principles 1 348
signal insertion 1 349
Transistor [illegible]
common [illegible]
common [illegible]
14 39 40
common emitter 1 350, 14 38 39
selection 14 39 40
Transit (astronomy) 14 40 41
instrument 1 609 612
of Jupiter's satellites 14 41
of Mercury 8 233, 14 41
Transit (astronomy)—cont
of stars 14 41
of Venus 14 40, 301
Transit (engineering) 14 41
angular measurement 13 525
precision 13 525
stadia 13 524
Transit circle 1 610 611
Transit declinometer 4 36
Transit survey 13 678
Transiting 13 525
Transition elements 3 106 14 41-42*
chemical properties 14 42
cobalt 3 246 248
compounds 8 53
copper 3 469 472
hafnium 6 517
hydride, metal 6 532
ion 14 42
iron 7 258 268
manganese 8 86 89
mercury (element) 8 229 230
metalloacid elements 8 292
molybdenum 8 565
organometallic compound 9 403-404
rare-earth elements 11 344
thenium 11 543 544
scandium 12 50
tantalum 13 392
technetium 13 405 406
titanium 13 651 655
Transition flow superaerodynamics 13 293, 295
Transition point 14 42
equilibrium, phase 5 59
first-order transition 5 285
second-order transition 12 126
see also Thermoanalysis
Transition probability 13 143 144
Transition temperature alloy phases 1 265
antiferromagnetism see Neel temperature
brittle temperature 8 268
ferroelectrics 5 225-228
superconductivity 13 295 301
Transitional epithelium 5 42
Transketolase 2 17
Translating circuit [illegible] 349 [illegible] 456
[illegible]
Translucent medium 14 42 43
Transmethylation 7 534
Transmissibility forces 13 55
Transmission automotive 1 688 14 43 47*
automatic 14 43 47
automobile 1 680
fluid coupling 14 45
Transmission
automotive—cont
manual shift 14 44 45
nonshifting 14 46 47
overdrive 9 455 456
semi automatic 14 120
torque converter 13 686, 14 45 47
tractor 14 11
truck 14 120
types 14 43 44
Transmission, electrical impedance matching 7 37 38
maximum power transfer 7 37
Transmission light 7 24
diffuse 7 25
spatial characteristics 7 24
spectral characteristics 7 25
specular 7 25
see also Filter, optical, Optical materials
Transmission mechanical belt drive 2 161
chain drive 3 3 5
clutch 3 223 226
coupling 3 525 526
fluid coupling 5 334 336
gear drive 6 88
gear train 6 89 91
gears 6 81 86
linkage mechanical 7 527 528
rope drive 11 627 628
Transmission, simultaneous 14 60 61
Transmission coefficient 11 396-397
Transmission coupling factor 4 231
Transmission electron radiography 11 305
Transmission equalization (telephone) 13 431
Transmission gate 6 80
switch, electronic 13 343
Transmission grating 4 139 141
Transmission lines 4 445, 14 47-54*
aerial 14 52 54
characteristic impedance 1 451, 14 49
circuit analysis 14 59 60
circuit elements 14 50
coaxial 3 245 14 51
constants 14 51
copper loss 3 472
delay line 4 47
distortionless 14 49
equations 14 49 50
equivalent circuit 14 51-52
impedance 14 49
loading 7 565
microwave see Microwave transmission lines
noise 14 59

Transmission lines--*cont*
open-wire 14 51
oscillating wind forces 7 332
power 14 51-54
principal mode 14 49
problems 14 419
pulse-forming networks 11 94
pulse transients 14 50
reflection coefficient 11 397*; 14 50
requirements 14 51
sheathed cables 14 51
standing wave detector 13 36
standing waves 14 50
submarine 14 54
tapered 14 50
television receiver 13 470
theory 14 48-50
towers 14 1, 52
transmission coefficient 11 397
traveling waves 14 51
two conductor 14 58-60
underground 14 54
wave guide 14 421-424
wavelength measurement 14 439
wind-induced vibration 1 92
Transmission loss (acoustics) 1 519
Transmission modes 14 421
Transmission substation *see* Electric power substation
Transmission theory and methods 14 54-61
antennas 1 443 453
coaxial cable 14 58-59
communications, electrical 3 518
electromagnetic waves 14 54 61
multiplexing 8 626
radiation from antenna 14 55 56
two conductor transmission line 14 58 60
wave guide 14 57-58, 421-424
wavelength measurement 14 439
Transmission of torque 12 240-241
Transmission tower· radio 14 1
television 14 1
Transmissometer 10 172, *14 458**
Transmittance 12 582
optical materials 9 353
of sea water 12 117
Transmitter· radio *see* Radio transmitter
telemetering 13 428
telephone 13 429-430
Transmitter--*cont*.
television *see* Television transmitter
Transmitting antennas *see* Antenna (aerial)
Transmitting tubes 14 245
Transmutation 14 61
Transmutation (genetic) *see* gene conversion
Transmutation, nuclear nuclear reactions 9 198-201
terrestrial nuclear reactions 13 522
Transonic flight 14 61-64
area rule 14 63-64
characteristics 14 62
design 14 62 64
shock waves 14 61-62
sonic barrier 12 505
Transonic wind tunnels 14 499-500
Transosonde 8 318
naval meteorology 9 8
weather station 14 458
Transovarian passage 1 425, *499*
tick fever, Colorado 13 630
Transparent medium 14 64
Transparent pigments 10 224
Transphosphorylation 2 49
Transpiration daily periodicity 10 290
dynamics of stomatal transpiration 10 289
effects of environment on transpiration 10 289
evapotranspiration 5 130
hydrometeorology 6 561-562
plant, water relations of *10 289*
significance 10 291
Transplantation embryology, experimental 4 572
Transplanters 1 128
Transponder meteorological 8 319
navigation 9 14
Transport equation, Boltzmann *see* Boltzmann transport equation
Transport number 14 19 22
Transportation air *see* Air transportation
automobile 1 680
automotive vehicle 1 686
mining, open-cut or pit 8 474 475
mining excavation 8 487
truck 14 119
Transportation engineering 3 149, 14 64 65*
air 14 65
coastal 14 64
highway engineering 6 450-452*, 14 64
Transportation engineering --*cont*.
inland waterways transportation 7 114-117
pipelines 10 241*; 14 65
railroad engineering 11 *527-551*
railroads 14 65
river engineering 11 585-586, 14 64-65
traffic engineering 14 13 15
Transreplication (genetic) *see* Gene conversion
Transuranium elements 1 301-302; 14 65 67*
berkelium 2 168
californium 2 417
curium 3 624-625
einsteinium 4 417-418
fermium 5 217
mendelevium 8 222
neptunium 9 41-42
nobelium 9 115 116
plutonium 10 422-425
see also Actinide elements
Transvaal jade 7 301
Transversality conditions 2 410
Transverse electric mode 14 421
Transverse electromagnetic mode 14 49
Transverse loading *see* Loading, transverse
Transverse magnetic mode 14 421
Transverse mass 11 432
Transverse Mercator projection 8 97
Transverse stability 12 269 272
Transverse vibrations 14 312
Trantschelis discolor 9 602
Trap (petroleum) 10 63 64
Trap-door spider 1 498
Trapezium 9 407
Trapezoid 10 471, 14 67-68*
area 1 528
Trapezoidal rule 7 171
Trapping printing 10 608
Traps in solids 14 68
color centers 3 295-297
thermoluminescence 13 585-586
Trastmene, Lake 5 116
Traube, I 10 211
Traum's disease 13 340
Trauma 14 68
Traumatotropism 10 366
Traveling-wave cathode ray 2 560
Traveling wave tube 2 560, 14 68 71*
beam confining methods 14 70
electron gun 14 68-69
electrostatic focusing 14 70
focusing methods 14 69 70
Traveling-wave tube--*cont*
periodic magnetic focusing 14 70
radar transmitter 11 211
slow-wave circuit 14 70
see also Backward wave tube
Traveling waves 14 425
transmission lines 8 42
14 48 49
Travers, M W 7 372, 7 36, 14 562
Traverse 13 324
Travertine 2 397; 11 590, 14 71*
dripstone 13 35
flowstone 13 35
lime pan playa 10 415
mineral formation 8 442
ornamental stone 13 152
stalactites and stalagmite 13 35
Travisia 11 511
Treated gem 6 99 100
Treating processes 10 69-71
Treatment, sewage 12 220 226
Trebidae 2 418
Trebius 2 418
Tree 14 71-76
caliper 5 457
petrified 10 42-43
see also entries under specific names such as Elm Oak, etc
Tree, respiratory 12 91
Tree ring ages 11 295
Tree-ring hydrology 14 77
Tree ring dating *see* Dendrochronology
Tree duck 4 290
Tree fern 5 261
Tree frog 5 538
Tree kangaroo 7 *550*
Tree sloth 4 411
Tree swallow 13 333
Tree swift 1 491
Treehopper 6 471, 14 76*
Tréfouël, J 1 476
Trehalose 7 124
Trehalose 6, 6' dimycolate 6 225
Trei Scaune (Haromszek) Mountains 5 118
Treibs synthesis 5 565 566
Trellis drainage 11 583
Trematoda 10 414, 14 77 80*
Aspidogastrea 1 592, 10 414
Digenea 4 148, 10 414
ecology 14 79
life history 14 79
Monogenea 8 572, 10 414
morphology 14 77-79
physiology 14 79
Platyhelminthes 10 414
taxonomy 14 77

Tremiode 5 183
Trematops 12 364
Trematosaurus 1 334 7 575, 16 80*
Trembley, A. 11 418
Tremellales 6 427
Trenex columba 6 580
Trenite 3 365
Trenoctopus 2 645
Tremolite 1 336 14 80*
asbestos 1 569
fibrous talc 13 387
Trempealeauan age 2 425 427
Trench digging 3 416, 5 134
Trench fever 3 7, 14 80*
M crotatobiotes 8 404
Trench mouth *see* Vincent's angina
Trenches, ocean *see* Submarine topography
Trentonia 3 78
Trentonia flagellata 8 170
Trentonian series 9 374
Trepang 6 465-467
Treponemas 8 169
Treponemas rotans 8 170
Treponema 1 466 467, 7 475, 8 620
fluorescent antibody method 8 583
Treponema carateum 13 4
Treponema pallidum 6 360, 9 364 10 238 13 4, 374, 16 296 597
Treponema pertenue 13 4, 14 597
Treponemal immobilization test 13 375
Treponemataceae 13 3
Treponematosis 13 374
Treponemes 2 359
syphilis 13 374
Treponomata 2 356, 14 80*
Permian 10 27
Sientolaemata 13 125
Trestle 14 80 81
Tretothoracidae 9 276
Treuter Mountains 1 523
TRF receivers 11 257
Tri oil 9 104
Triacetate fiber 5 243
Triacetyloleandomycin 1 464 468
Triamantane 1 245 249
Triactinomyxon legeri 1 57
Trialeurodes vaporarum 6 474
Triallylarsine 9 401
Triallylarsinoxide 9 401
Triallylphosphorus 9 404
Triallylphosphorus oxide 9 404
Triamcinolone 13 138
Triamino triarylmethane dye 4 301
Triangle 10 471 14 81*
area 1 389 528
Triangle—*cont*
astronomical *see* Astronomical triangle
polar *see* Polar triangle
Pythagorean theorem 11 132
spherical *see* Spherical triangle
Triangle (music) 8 665 666
Triangulation geodesy 6 120-121
optical tracking instruments 9 359 360
surveying 13 324
Triangulomonas 5 98
Triangulum 3 412-413
Triangulum Australe 3 412, 414*
Triangulum Nebula 1 400, 9 27
Triarylmethane dye 4 301
Triassic 6 136, 14 81 85*
animal life 9 521
division 14 82
life 14 83
of North America 14 85
paleogeography 14 82
plant life 9 505
Triassic Lowland 9 148
Triatoma 3 3, 6 404 405
Trypanosomatidae 14 124
Triatoma infestans 6 409
Triatoma pallidipennis 6 400
Triatoma protracta 6 407
Triazine 8 674
soil sterilization 12 465
s Triazine optical bleaches 13 538
1, 2, 4 Triazole 1 703
Tribasic acid 1 40
Triboelectrification 4 462
Tribolium confusum 3 287
Tribonema 3 117
Tribrachion schmidti 3 89
Tribromosilane 12 320
Tributary streams 11 581
Tributyl phosphate fuel reprocessing 9 189
plutonium extraction 10 423
solvent 12 496
Tri n butyl phosphate 10 423
Tricarboxylic acid cycle *see* Krebs cycle
Triceratops 4 201, 11 484
Trichechidae 8 85
Trichechus 12 346 347, 363
Trichechus manatus 8 85
Trichiales 8 687
Trichina worm 9 557
Trichinella 9 557
Trichinella spiralis 7 636, 14 85, 88
Trichinella test 12 372
Trichinosis 10 428, 12 372 14 85 86*, 89
Trichite 6 300
1, 1, 2 Trichloro 1, 2, 2 trifluoroethane 5 501
1, 1, 2 Trichloro 1, 2, 2 trifluoroethane polymonochloro trifluoroethylene 10 471
Trichloroacetic acid 3 76, 14 86*
2, 3, 6 Trichlorobenzoic acid 6 421, 10 342
Trichloroethylene 3 74
solvent 12 496
Trichlorofluoromethane 5 501
1, 3 bis (2, 2, 2 Trichloro 1 hydroxyethyl) urea 6 423
Trichloromethane 3 77
Trichloromethanesulfenyl chloride 13 243
N (Trichloromethylthio)-4 cyclohexene-1, 2-dicarboximide 5 564
2, 4, 5-Trichlorophenoxyacetic acid 6 422, 12 465
4-(2, 4, 5 Trichlorophenoxy) butyric acid 6 422
2 (2, 4, 5 Trichlorophenoxy)-ethyl 2, 2 dichloropropionate 6 423
2, 4 5 Trichlorophenoxyacetic acid 1 124
2, 4, 5 Trichlorophenoxypropionic acid 6 423 10 342
1, 2 3 Trichloropropane 3 75
Trichlorosilane 12 320
N Trichlorothiotetrahydrophthalimide 1 475
Trichlorotriammineplatinum (IV) chloride 3 334
Trichobranchiate gill 4 26
Trichobranchidae 10 462
Trichocomaceae 5 123
Trichocyst 11 55 56
Trichoderma 10 316
Trichodesmium erythraea see Oscillatoria erythraea
Trichodina 10 20
Trichogramma minutum 6 581
Trichogrammatidae 6 574
Trichogyne 11 555
Trichome 13 115
leaf anatomy 7 436 441
Trichomonadida 11 52, 14 86*
Trichomonadidae 14 86
Trichomonas 5 560 14 86
Trichomonas buccalis 10 474
Trichomonas foetus 10 474
Trichomonas hominis 10 474, 14 86
Trichomonas tenax 14 86
Trichomonas vaginalis 9 557, 10 474 14 86
Trichomoniasis 14 86*, 256
Trichomycin 1 476
Trichonympha 10 473
Trichophaga tapetzella 7 467
Trichophilopteridae 8 78
Trichophyton 8 568
Trichophyton interdigitale 6 275
Trichophyton mentagrophytes 4 68, 6 274, 9 236
Trichophyton rubrum 4 69, 5 563, 6 275
Trichophyton schoenleini 6 275
Trichophyton sulphureum 6 275
Trichophyton tonsurans 4 68
Trichophyton verrucosum 4 68, 6 274, 275, 8 678
Trichoptera 14 86 87
caddis fly 2 586
Trichopterygidae *see* Ptilidae
Trichosomoides 14 89
Trichosporon 5 579, 14 599
Trichosporon pullulans 5 188
Trichostomatida 6 467, 11 53, 14 87*
Trichostrongylidae 13 193
Trichostrongylus 13 193
Trichostrongylus axei 12 247
Trichothecium 8 568
Trichothecium roseum 8 568
Trichroism 14 87 88
Trichuris trichiura 14 88, 411, 488
Trichuroidea 14 88 89
Trichuris trichiura 14 88
Trieladida 10 414, 14 89*, 144
Triclinic crystal system 3 604 605
Triclinic lattice 3 594 595
Trico field 9 6
Tricolorimeter 3 301
Triconodonta 14 89
Tricosane 1 249
Tricosanoic acid 2 474
Trictenotomidae 3 277
Tricyclene 13 497
Tricyclo (5 1, 0 0, 3, 5)-1, 5 octadiene 3 640
Tridacna 3 152
Tridacna gigas 5 101
Tridacnidae 5 101
Tridactylidae 9 418
Tridecane 1 249
Tridecylic acid 2 474
Tridentate ligand 3 17
Tridione 5 41
Tridymite 11 185 12 321
in meteorites 8 313
refractory 11 409
Trieste (bathyscaph) 2 110
Trieste Gulf of 5 115
Trietazine 6 423
Triethanolamine 1 251
Triethylchlorosilane 12 322 323
Triethylene glycol 10 470
Triethylsilanol 12 319
Triethylvinylsilane 12 322
Trifid Nebula 9 25
Trifluoroacetate 14 90
Trifluorochloroethylene 6 329
Trifolium 3 218
Trifolium alexandrinum 3 220

Trifolium campestre 3 219
Trifolium dubium 3 220
Trifolium fragiferum 3 219
Trifolium gymnocarpum 3 218
Trifolium hirtum 3 220
Trifolium hybridum 3 219
Trifolium incarnatum 3 219
Trifolium lappaceum 3 220
Trifolium lupinus 3 221
Trifolium michelianum 3 220, 527
Trifolium nigrescens 3 220, 527
Trifolium pratense 3 219
Trifolium procumbens 3 219
Trifolium repens 3 219
Trifolium resupinatum 3 219
Trifolium subterraneum 3 219
Trifolium variegatum 3 221
Trifolium willdenovii 3 221
Trig-traverse 13 325
Trigeminal ganglion 9 47
Trigeminal nerve 3 537
  embryology 9 47
Trigermane 6 177
Trigger circuit 14 90-91
  peaking differentiating ringing 14 91
  see also Pulse generator
Triggerfish 13 530
Trigly 10 423
Triglyceride 5 188, 7 531, 14 91-92*
  lipid 7 529
Triglycol dichloride 10 423
Trigona 6 582
Trigonal bipyramid 3 55
Trigonal crystal system 3 604-605
Trigonal lattice 3 594 595
Trigonalidae 6 574
Trigonia 7 327, 9 614
Trigonometric curve 14 92-93
Trigonometric function generators analog computer 1 376
  gear mechanism 1 376
  linear potentiometer circuit 1 376
  Scotch yoke 1 376
  shaped card potentiometer 1 376
  synchro resolver 1 376
Trigonometric functions 4 561, *12 189*, *14 93* 94
  differentiation 4 129
  evaluation 12 195
  hyperbolic function 6 584
  radian measure 11 213
  values 14 92 94, 97-98
Trigonometric integrals 5 489
Trigonometric parallax 9 545
Trigonometry, plane 14 93 98
  angles 14 93
  conversion formulas 14 96
  double angle and half angle formulas 14 95-96
  functions 14 93 94
Trigonometry, plane—*cont*
  generalization 14 98
  inverse trigonometric functions 14 96
  reduction formulas 14 95
  solutions of rectilinear figures 14 96 97
  uses 14 93
  values of trigonometric functions 14 97-98
Trigonometry, spherical 14 98-102
  Cosines, law of 14 100
  half-angle formulas 14 101
  Napier's analogies 14 101-102
  Napier's rules 14 99-100
  oblique spherical triangle solutions 14 100 102
  polar triangle 10 445, 14 100
  sines, law of 14 100 101
  spherical triangle 14 98 100
Trigonopsis 3 579
Trigonosemus palissa 13 485
Trigonostylopidae 1 601
Trigonostylops 1 601
Trigynaspida 8 252
Trihaloketone 6 323
Trihedron 14 102
3, 4, 5-Trihydroxybenzoic acid *see* Gallic acid
2, 6, 8 Trihydroxypurine 11 115; 14 218
2, 3, 5-Triiodobenzoic acid 1 693
Triiodomethane 7 240
Triodosilane 12 320
Triiodothyronine 6 479
  endocrine mechanisms 4 593
  tyrosine 14 176
L-Triiodothyronine 13 626
3, 5 3'-Triiodo L-thyronine 13 626
Triisobutylene 10 46
Trilateration, electronic 13 324
Trillium 3 109
Trillium erectum 10 368
Trilobita 1 555, 14 102 106*
  Arthropoda 1 555-566
  development 14 104
  distribution 14 106
  evolution 14 106
  molting 14 104
  morphology 14 104
  reconstruction 14 106
  taxonomy 14 106
  variation 14 106
Trilobite *see* Trilobita
Trilobite zones 2 426
Trilobus 6 436-441
Trilon 9 405
Trilophosaurus 11 50
Trim (nautical) 12 271 273
  submarines 13 212
Trimenoponidae 8 78
Trimerella 7 49
Trimetal plate 10 602, 616
Trimetaphosphate 10 134
Trimethyl phosphite 10 135
Trimethylamine oxide 14 229
Trimethylbenzylammonium hydroxide 11 183
1, 7, 7-Trimethylbicyclo [2 2 1]-heptane 1 242
2, 6, 6-Trimethylbicyclo [3 1 1]-2-heptene 6 534
Trimethylchlorosilane 12 322-323
Trimethylenetrinitramine 6 435
Trimethylethylsilane 12 322
Trimethylhydroquinone 14 344
Trimethyl *beta* hydroxyethylammonium hydroxide 3 85
Trimethylolethane 10 473
Trimethylolmelamine 14 216
Trimethylolpropane 10 473
2, 2, 4-Trimethylpentane 9 273
2, 4, 4-Trimethyl-1 pentene 1 252
2, 4, 6-Trimethylpyridine 11 110
1, 3, 7-Trimethylxanthine 14 218
Trimetric drawing 10 214-216
Trimmer capacitors 2 445
Trimmer potentiometer 10 543
Trimming forging 5 470
  sheet metal 12 253
Trinidad 8 134
  West Indies 14 476
Trinidad Asphalt Lake 1 590
Trinil fauna 5 477
Trinitrobenzene 7 111
2 4, 6 Trinitrophenol 10 213-214
Trinitrophenylmethylnitramine 5 151
Trinitrotoluene 5 151, 9 104
2, 4, 6 Trinitrotoluene 13 665
Trinity division 9 6
Trinity River 7 116
Trinity sands 9 538
Trinomial perfect square 1 240
Triode, gas cold cathode 3 274
  hot cathode *see* Thyratron
Triode, vacuum 14 106-110
  applications 14 109
  characteristics 14 108
  control grid 14 106-107
  disk seal 8 426
  electrostatic field 14 107-108
  grid current 14 108 109
  high frequency 8 426
  twin 14 110
Triodopsis albolabris 12 388
L-Triodothyronine 13 626
Trionychidae 3 22
Trionyx spiniferus 3 23
Triops 9 171
Triose 8 578
Triosephosphate dehydrogenase 10 370
Trioxalatorhodiate(III) ion 5 335
sym-Trioxane 5 473
Tripedalia 3 255
Triphenylchlorosilane 12 32 323
Triphenylmethane 1 463, 14 110*
  dyes 15 32
  hexaphenylethane 6 435
Triphosphopyridine nucleotide (TPN) 2 15 14, 3 264, 4 20 5 23, 7 371, 535, 14 110*
  biological oxidation 2 21
  niacin 9 92
Triplasia goodlandenus 5 41
Triple-beam balance 2 74
Triple bond chemical 3 25
Triple mirrors 8 507
Triple plate silver 4 530
Triple point 7 6 14 111*
  melting point 8 215-216
Triple superphosphate 10 13
Triplet Zeeman effect 14 60
Triplet spin state 12 58
Triploblastica 5 138
Triploid 10 488
Tripneustes ventricosus 4 373
Tripod, camera 2 431
Tripolyphosphate 10 136
Tripropylene 11 18
Tripsacum 3 481
Triptane aircraft fuel 1 178
Tripyloidea 4 616
Tristazo dye 4 299
Tristiane 12 319, 320
Tristeza 5 546 548
Tritanopia 3 300
Tri ten steel 15 206
Tritepene 14 111
  polyalkene 10 460-461
  squalene 15 20
Tritiane 13 604
Trithiocarbonate 13 603
Trithion 7 141
Tritiites 5 453, 595
Tritium 14 479
Triticum aegilopoides 14 480
Triticum aestivum 10 480, 11 621
Triticum compactum 14 480
Triticum dicoccoides 14 480
Triticum dicoccum 14 480
Triticum durum 14 480
Triticum macha 14 480
Triticum monococcum 14 480
Triticum persicum 14 480
Triticum polonicum 14 480
Triticum spelta 14 480
Triticum sphaerococcum 14 480
Triticum timopheevi 14 480
Triticum turgidum 14 480
Triticum vulgare 14 480

...um 1 692 9 195 14 112
115*
compounds 14 115
content of natural waters 11 270
cytogenic properties 3 572
hydrogen isotope 6 544
nuclear fusion 3 592 594
properties 14 112 115
prospecting 14 112 115
radioisotope (biology) 11 309
as tracer 14 8
see also Deuterium
Tritium hydride 9 176
Tritium thymidine 1 692
Triton 4 55 11 422, 14 115*
Triton 8 11 185
Triton (nuclear reactor) 11 363
Triton (satellite) 9 41
Triton cristatus 11 478
Triton lacustris 13 618
Tritonicornane 1 240
Triturus 13 7
Triturus cristatus 11 466
Trivandrum sandstone 12 6
Trivelodont 7 9
Trivalent antimony 12 64
Trivers, R P H 10 162
Trochaea 6 75
Trochammina inflata 5 432
Trochamminidae 3 431
Trochela 1 592
Trochidae 4 501
Trochilidae 1 491, 6 516
Trochlea 3 21
Trochlear nerve 3 537
embryology 9 47
Trochodendron 12 28
Trochophore 1 559 439, 7 232, 14 113 115*
Trochophore larva 2 545, 5 4 6 12 546
coelom 3 262 263
Trochus 3 575, 14 114
Trochus 11 19
Trochus militaris 6 75
Trogamite 6 1
Trogan 3 548
Trogon 11 71
Troglodytella 5 5
Troglodytes aedon 14 558
Troglodytidae 9 589
wren 14 558
Trogon formosus 1 604 14 114*
Trogon 13 641
Troilite 8 515
lead in 7 428
Trojan planets 14 114
Trombe and L T 3 806
Trombone 1 122
insecticide 7 142
Trombone 1 235
Trombicula akamushi 14 174
Trombicula alfreddugesi 1 496
Trombicula delicata 14 174
Trombicula irritans 3 59
Trombiculid mite 14 174
Trombiculidae 14 115
Trombidiform mite 14 115
Trombidiformes 14 114 115
Trombone 8 666
Trommel screen 12 81
Trona 12 409
Trona process boron 2 302
Trondheim Fiord 5 115
Tropacaine 9 4
Tropeoline 00 7 60
Trophallaxis 12 405 406, 407
Trophic level 2 215, 223, 239
community 5 324 325
ecological systems energy in 4 389
ecosystem 4 407
food chain 5 379 380
Trophogenic zone fresh water ecosystem 5 521 534
Trophotrite 5 100, 13 12
Cnidosporidia 5 226 227
Microsporidia 8 405
Trophus cardate 11 634
forcipate 11 634
fulcrate 11 634
incudate 11 634
malleate 11 634
ramate 11 634
Rotifera 11 635
uncinate 11 634
virgate 11 634
Tropic acid 6 106
Tropic hormone 6 480
Tropic levels ecosystem 4 406 407
Tropic of Cancer 2 436 6 125, 14 115*
Tropic of Capricorn 2 448 6 125, 14 116
Tropical bedbug 6 405
Tropical cyclone *see* Atmospheric low
Tropical deciduous (monsoon) forest 3 187 188
Tropical log beetle 3 278
Tropical low 1 642, 13 164
Tropical meteorology 14 116 117
Tropical rainforest 2 205 3 186 187, 5 468
Africa 1 106
Asia 1 586 587
South America 5 468
Tropical rat flea 12 345
Tropical rat mite 8 253
Tropical region 2 204
Tropical savanna 1 587 13 125
Tropical scrub forests 5 468
Tropical storm 13 164, 14 116 117
Tropical weather *systems* 8 532 534
Tropical year 4 329, 14 509
orbital motion of Earth 4 336
Tropical zone 8 245
Tropidoscyphus 5 98
Tropine 6 106
Tropiometridae 3 549
Tropites subbullatus zone 14 82
Tropolone 14 117 118
Tropone 1 548
Tropopause 8 421 14 118*
aeronautical meteorology 1 96
atmospheric high 1 641
beryllium fallout 11 270
ICAO standard 1 97
polar stratospheres 10 441
turbine engine performance 1 97
United States standard 1 97
Troposphere 1 627, 14 118*
barotropic field 2 103
beryllium 7 in 11 271
chemical composition of 1 634
jet stream 7 310
monsoon circulation in 8 584 585
radioactive fallout 11 267
storm 13 162
Tropospheric attenuation 11 201
see also Terpene
Tropospheric scatter communications *see* Scatter communications FM Radio
Tropotaxis 13 405
Tropsch H 5 284
Trout 3 223 5 416 12 14 506 14 118 119*
Trout stream beetle 3 276
Trouton's Rule 7 541
vaporization 5 125
Troy weight 8 188
Trucherognathidae 3 406
Truck 14 119 120
air brake 1 142 2 318
crane 5 536
earthmover 4 551
electric 7 87
industrial *see* Industrial trucks
power steering 13 102
refrigerated *see* Refrigerated truck
see also Automobile Automotive vehicle
Truck tractor 14 120
True air speed aircraft 1 220
True anomaly (astronomy) 2 581
True clovers 3 218
True coral 12 76
True crab 4 24
True lobster 4 29
True mosses 8 633
True owl 13 185
True porcelain *see* Porcelain
True weevil 3 278
Truffle 1 574, 5 561
Trumpet 8 666
Trumpetfish 6 71
Trumpler, R J 13 49
Truncate selection 6 402
Truncus arteriosus 2 482, 488
Trunk (astronomy) 1 596
Trunk lines air transportation 1 160
Trunk lines telephone 13 434, 435
Trunkfish 13 580
Trusina Planina 5 118
Truss 14 121 122
bridge 2 331
buildings 2 365
cantilever 2 439
deflection 13 204
indeterminate 13 108
Truth function 7 578
logic 7 580
Troglodytes troglodytes 14 559
Tryon R C 2 149
Tryon study 2 149 151
Trypanorhyncha 10 414 14 122*
Cestoidea 2 659
Trypanosoma 1 700 11 45
developmental stages 14 123 125
life history 14 124
morphology 14 123
nonpathogenic species 14 123 124
pathogenic species 14 124
reproduction 14 123
Trypanosoma brucei 14 124
Trypanosoma cruzi 3 5 14 123 124 125
Hemiptera 6 400 410
Trypanosoma danilewskyi 14 124
Trypanosoma duttoni 14 124
Trypanosoma equinum 14 124
Trypanosoma equiperdum 14 123
Trypanosoma evansi 14 124
Trypanosoma gambiense 12 377 14 123
Trypanosoma granulosum 14 124
Trypanosoma hippicum 14 124
Trypanosoma lewisi 1 7 14 123
Trypanosoma paddae 14 124
Trypanosoma rangeli 5 5 14 125
Trypanosoma rhodesiense 12 377 14 123
Trypanosoma rotatorium 14 124
Trypanosoma vivax 14 124
Trypanosomatidae 11 45 46 14 122* 124
Crithidia 14 125
Herpetomonas 14 123

Trypanosomatidae—*cont.*
Leishmania 14 123
Leptomonas 14 123
morphology 14 122
Phytomonas 14 123
reproduction 14 123
taxonomy 14 123
Trypanosoma 14 123
Trypanosomiases 14 628
Trypanosphaera transformata 11 52
Tryparsamide 9 401
sleeping sickness, African 12 378
Trypeteta lampas 1 51-52
Trypeteta lateralis 1 51-52
Trypoxylon politum 6 582
Trypsin 5 20 21, 203, 204
digestive system 4 170
epithelium 5 41 43
protein metabolism 11 42
Trypsinogen 5 204
digestive system 4 170
Tryptamine 7 63, 10 341, 14 126
Tryptophan 2 35, 46, 195, 6 106, 7 62, 63, 164, 9 92, 10 340, 12 196, 14 125-126*, 342
amino acids 1 308-319
in histone 9 217
in protamines 9 217
plant metabolism 10 357
Protozoa 11 51 60
synthetase 6 106
tryothricin 14 177
L Tryptophan 11 41
Tryptula 6 436-441
Tsai, B 1 470
Tschermakite *1 336*
Tschugaeff synthesis 14 207
Tsetse fly 4 212, 5 362, 12 377
TSH *see* Thyrotropin
Tsuga 3 188
Tsuga canadensis 3 188, 6 410
Tsuga caroliniana 6 410
Tsuga heterophylla 6 410, 14 289
Tsuga mertensiana 6 410
Tsunami 14 126 127, 355
earthquake effects 4 353
Tsutsugamushi disease 14 173-175
Tweett, M 3 93
TTA 10 423
Tuamotu Islands 9 261
Tuareg 1 460
Tuatara 11 557, 13 22
Tuba 8 666
Tubal bladder 14 219
Tube drawing of metal 4 272
gas *see* Gas tube
parameters, evaluation 14 128
storage 13 160 162
switching 13 359 360
Tube—*cont*
television camera 13 461-467
traveling wave *see* Traveling wave tube
vacuum 14 245 254
x ray 14 587-590
Tube, electron 14 127
Tube and-shell heat exchanger 6 375
Tube mill 3 560
Tube snout 6 71
Tube-still heater 14 131-132
box type 14 131
cylindrical type 14 132
furnace construction 5 574
Tube tester 14 127-128
Tuber 13 111, 124
Tubercle bacilli 14 129
Tubercularia 14 128
Tubercularia vulgaris 14 128
Tuberculariaceae 5 563, 14 128-129*
Tuberculin 14 130
Tuberculin skin test 12 372
Tuberculosis 1 466 467, 554, 2 218 564, 6 589, 7 619, 10 91, 12 372 13 8, 179 14 129-131*
para Aminosalicylic acid *1 320*
diagnostic procedures 14 131
epidemiology 14 130-131
immunology 14 130
isonicotinic acid hydrazide 7 282
osteomyelitis 9 446
pathogenesis 14 129 130
prostate disorders *11 27*
sulfone (antimicrobial use) *13 253*
thiosemicarbazone 13 606
viomycin, in treatment of 14 327
Tuberculum 12 355
Tubificid annelid 1 57
Tubiflorales 10 346, 532
*15 665, 14 132 135**
belladonna 2 161
digitalis 4 191
peppermint 9 628
sage 12 4
spearmint 12 563
Tubipora 1 226, 3 255 474 13 148
Tubipora musica 13 148
Tubocurarine chloride *11 184*
Tubulanidae 9 496
Tubulanus 9 496 11 559
Tubulanus capistratus 11 557
Tubular-acinous gland 5 43
Tubular gland 5 43
Tubular press 10 508
Tubularia 3 255 11 419
Tubuli seminiferi recti 11 473
Tubulidentata *8 82*
Tubulidentata fossils 14 153
Tubulifera 13 628
Tubuliflorae 2 432
Tucana 3 412, 414*
Tufa 14 155
mineral formation 8 442
Tuff 11 500, 14 135 154*, 349
compressive strength 4 613
welded 14 349
Tufted puffin 11 91
Tufted titmouse 13 655
Tugboat 7 115-116
Tukey, J W 9 257
Tularemia 1 466 467, 2 550, 4 218, 10 91, 12 344, 13 179, 629, 14 134 135*
Brucellaceae 2 351
Exodistes 7 299
Tularosa Basin 9 160
Tulip 9 407
Tulip tree 2 361, 14 135*
Tuma phase meter 10 102
Tumblebug 2 151
Tumbling flower beetle 3 277
Tumbling mill 14 135
pebble mill 9 607
Tumbling pulverizers 3 558
Tumbu fly 8 680
Tumor 9 518 526 14 135-136*
adenocarcinoma 9 521
anaplasia *9 519*
basal cell sarcoma 9 521
bladder 14 221
carcinoma 9 520
characteristics 9 518 520
invasion 9 519
classification 9 520 521
diagnosis 9 525 524
Ewing's 12 369
giant cell *12 369*
lymphoma leukemia 9 521
metastasis 9 519 520
mixed 9 520
neoplasia 9 37
pseudotumor 9 520
sarcoma 9 520 521
treatment 9 523 524
Tumor viruses 14 136
avian leukosis 1 695
mouse viral leukemias 8 619
myxomatosis, infectious (rabbits) 8 687
papillomatosis infectious (rabbit) 9 541
Rous sarcoma 11 635
Tumuli 14 349
Tumulitermes tirodiae 12 407
Tuna 5 416 419 14 136*
marine fisheries 8 113
Tundra 3 191 4 342 8 245 14 136*
Arctic islands 1 522
Asia 1 584
soils 12 441 442
vegetation distribution *14 291*
Tuned amplifier 1 345
intermediate-frequency amplifier 7 194
Tuned circuits resonance 11 502
wavelength measurement 14 439 441
Tuned plate oscillator 9 421
Tuned plate–tuned grid oscillator 9 422
Tuned radio frequency receiver 11 257
Tuner 14 137
television receiver 13 47
use of ferrites 5 221
Tung 9 232
Tung tree 14 137
oil 4 290, 5 189
taxonomy 6 174
Tunga penetrans 12 345
Tungar gas tube 6 61
Tungstate 14 157
Tungsten 14 138 140
acids 14 139
alloys 14 138
crystal structure 5 599
electron configuration 4 504
emitter 14 245
extraction 14 138-139
extractive metallurgy 8 2
fabrication 14 138-139
halides 14 140
heat radiation 6 369 370
heteropoly acids 14 140
ionization potential 4 5
mechanical properties 14 139
occurrence 14 138
ore (scheelite) *12 61*
oxides 14 139 140
oxyhalides 14 140
physical properties 14 1
principal compounds 14 139 140
properties 14 139
resistivity 11 497
salts 14 140
spectral emissivity *4 593*
thermionic emission 12 6
uses 14 138
velocity of sound in 12 51
wolframite 14 523
Tungsten carbide 14 138 140
Tungsten hexacarbonyl 14 14
Tungsten hexachloride 14 14
Tungsten inert gas welding 14 467
Tungsten silicide 14 140
Tungstic acid 14 139
Tunic 12 98
Tunica albuginea 9 453 13 52
Tunica media 1 553
Tunica vasculosa lentis 3 162 171
Tunicata 1 420 14 140 141*
Ascidiacea 1 574, 14 140

Tunicata—cont
Larvacea 7 405 14 140
Thaliacea 13 543 14 140
see also Acarina
Tunicate 1 414
Tunicate development 7 234 235
cleavage 7 234
fertilization 7 234
gastrulation 7 234
metamorphosis 7 234 235
tadpole stage 7 234
Tuning 8 662, 664 14 141
Tuning (electric circuit) 14 141
Tuning fork 14 141
electrical standards 4 459 460
Tunnel 14 143 144
arch supports 14 142 143
blasting 2 256 14 142 143
boring machines 14 143
drilling 14 142
driving methods 14 143
excavation 14 142
grouting 14 142
lagging 14 142
lining 14 143 144
mine drainage 8 435
pressurization 14 143
roof supports 14 142 143
route selection 14 142
survey 13 329 14 142
water supply engineering 14 405
Tunnel, wind *see* Wind tunnel
Tunnel diode *see* Esaki tunnel diode
Tunnel effect, quantum *see* chemical 5 255
Tunnel kiln 7 346
Tupaioidea 7 143
Tupelo 14 144
Turaco 3 612
Turacoue 2 462
Turbanella 8 10
Turbaria green 2 601
Turbellaria 10 414, 14 144 145*
Acoela 10 414 14 144
Allaeocoela 1 257, 10 414 14 144
digestive system 14 145
ecology 14 144
excretion 14 145
morphology 14 144 145
nervous system 14 145
physiology 14 144 145
Rhynchelminthes 10 414
Polycladida 10 414 465, 14 144
reproductive system 14 145
Rhabdocoela 10 414, 14 144
Tricladida 10 414, 14 89, 144
Turbid meter 14 146
particle size measurement 12 349
Turbidimetric analysis 14 146
Turbidity 12 52
Turbidity (scattering media) 1 13
Turbidity current 14 146 147
graywacke 6 267
in sandstone formation 12 24
sedimentation (geology) 12 137
in submarine canyons 13 215
submarine topography 13 218
Turbidostat 2 24
Turbine 8 525, 14 147 148
aircraft 1 97, 14 149 152
Brayton cycle 2 320 321
carbon deposition 1 188
fuel injection 5 556
gas *see* Gas turbine
hydraulic *see* Hydraulic turbine
impulse turbine 14 148
prime mover 10 590 592
reaction turbine 11 549 14 148
rotor unbalance 12 240
steam 13 85 89
see also Prime mover, Turbine propulsion
Turbine generator 13 78 14 399-400
Turbine locomotive 7 572
gas turbine 7 573
steam turbine 7 572
Turbine propulsion 14 148 154
advantages 14 148
aircraft applications 14 148 152
automotive 14 152 154
free piston engine 14 152 154
gas turbine 14 148-154
helicopter 6 386
nuclear 14 152
operation 14 148 149-152
turbocompound engine 14 152
turbofan 14 154 155
turbojet engine 14 149
turboprop 14 157-158
turboprop engine 14 149 152
turboram jet 14 158 160
see also Propulsion
Turbinidae 1 591
Turbinolia 3 261
Turbo milling 2 652
Turbocompound engine 14 152
aircraft 13 295
Turbodrill 2 298, 14 154*
oil and gas well drilling 9 200
Turboelectric drive 8 111
Turbofan 14 154 155
configurations 14 155
design characteristics 14 155
ducted fan 4 292
engine 14 149
operating principle 14 154 155
Turbogenerators 6 114
Turbojet 1 173, 7 307, 14 149, 155 157*
afterburner 1 109 110, 174, 186, 14 158
compressor 14 155 156
compressor stall 14 156
diffuser 14 155
engine control 14 156
jet velocity 7 311
noise 1 183 184 187
operating principle 14 155
performance 1 172 174, 14 156 157
pressure volume diagram 7 307
specific fuel consumption 12 574
thrust 14 149
turboram jet 14 158
Turboprop 14 149 152, 157 158* 174 175
control problems 14 157 158
design considerations 14 157 158
performance 1 174 175 14 157
regenerators 14 158
specific fuel consumption 12 574
Turboram jet 14 158 160
afterburning 14 158
dual cycle engine 14 159
Turboshaft engine 14 149 151
Turbot 5 315
Turbulence 14 160
atmospheric 1 96 635, 643
mixing 8 522
noise 9 123
Turbulent diffusion 14 162
in estuaries 5 82
Turbulent flow 5 324, 336, 14 160 163*
aerothermodynamics 1 102 104
body contour and roughness 2 311
compressible fluid flow 14 162
electrically conducting fluid flow 14 162 163
fluid flow properties 5 341
heat convection 3 440 442
local isotropy 14 162
logarithmic velocity profile 14 160 161
pipe flow 10 239 241
Turbulent flow—cont
random nature 14 160
semiempirical theories 14 160
shear flow 14 162
statistical theory 14 161 162
stresses 14 160
turbulent diffusion 14 162
turbulent jet mixing 14 161
wake flow 14 382
Turbulent jet mixing 14 161
Turbulent viscosity (wind) 14 497
Turdidae 2 271 9 589 13 615
Turdus merula 2 254
Turdus migratorius 11 589
Turesson G 12 571
Turfan depression 1 590
Turgor movements 10 367
Turing A M 3 360
Turing machine 3 360
Turkey 6 18 14 163*
Turkey oak 9 238
Turkey red 6 224
Turkey Red Oil 5 190
Turks Islands 14 473
Turmeric 12 76 14 163*
spice and flavoring 12 615
Turn and bank indicator 14 163 164
Turnbuckle 14 164
Turnbull's blue 5 218 7 259
Turner F J 11 598
Turner's syndrome 11 465
Turnicidae 6 286
Turning machining operations 8 6
Turning (woodworking) 14 164* 542 546
Turning pair 12 380
Turning radius vehicles 1 47
Turnip 2 181 14 164 165*
Turnip yellow mosaic virus 9 210
Turnstone 14 165
Turntable phonograph 4 237
Turonian stage 3 543
Turpentine 14 165
pinene 10 238
solvent 12 496
tall oil 13 587
thinner 13 603
see also Terpene
Turquois 14 165 166
gem 6 99
Turret lathe 7 407
horizontal 7 407
ram 7 408
saddle 7 408
vertical 7 408
Tursiops truncatus 4 262
Turtle 14 166 168
Tuscarora Depth 4 326
Tuscaroridae 4 39
Tushinsky, J 3 128

Trypanosomatidae—*cont.*
Leishmania 14 123
Leptomonas 14 123
morphology 14 122
Phytomonas 14 123
reproduction 14 123
taxonomy 14 123
Trypanosoma 14 123
Trypanosomiases 14 628
Trypanosphaera transformata 11 52
Trypansamide 9 401
sleeping sickness, African 12 378
Trypetesa lampas 1 51 52
Trypetesa lateralis 1 51-52
Trypoxylon politum 6 582
Trypsin 5 20 21, 203, 204
digestive system 4 170
epithelium 5 41 43
protein metabolism 11 42
Trypsinogen 5 204
digestive system 4 170
Tryptamine 7 63, 10 341, 14 126
Tryptophan 2 35, 46, 195, 6 106, 7 62, 63, 164, 9 92, 10 340, 12 196, 14 125-126*, 342
amino acids 1 308 319
in histone 9 217
in protamines 9 217
plant metabolism 10 357
Protozoa 11 51-60
synthetase 6 106
tryothricin 14 177
L-Tryptophan 11 41
Trypula 6 436 441
Tsai B 1 470
Tschermakite 1 336
Tschugaeff synthesis 14 207
Tsetse fly 4 212, 5 362, 12 377
TSH *see* Thyrotropin
Tsuga 3 188
Tsuga canadensis 3 188, 6 410
Tsuga caroliniana 6 410
Tsuga heterophylla 6 410, 14 289
Tsuga mertensiana 6 410
Tsunami 14 126 127, 355
earthquake effects 4 353
Tsutsugamushi disease 14 173-175
Tswett, M 5 93
TTA 10 423
Tsumotu Islands 9 261
Tuareg 1 460
Tuatara 11 557, 13 22
Tuba 8 666
Tubal bladder 14 219
Tube drawing of metal 4 272
gas *see* Gas tube
parameters, evaluation 14 123
storage 13 160-162
switching 13 359 360
Tube—*cont*
television camera 13 461-467
traveling wave *see* Traveling wave tube
vacuum 14 243-254
x-ray 14 587 590
Tube, electron 14 127
Tube-and shell heat exchanger 6 375
Tube mill 3 560
Tube snout 6 71
Tube still heater 14 131-132
box type 14 131
cylindrical type 14 132
furnace construction 5 574
Tube tester 14 127 128
Tuber 13 111, 124
Tubercle bacilli 14 129
Tubercularia 14 128
Tubercularia vulgaris 14 128
Tuberculariaceae 5 563, 14 128-129*
Tuberculin 14 130
Tuberculin skin test 12 372
Tuberculosis 1 466-467 554, 2 218 564, 6 589 7 619, 10 91 12 372, 13 8, 179, 14 129 131*
para Aminosalicylic acid 1 320
diagnostic procedures 14 131
epidemiology *14 130 131*
immunology 14 130
isonicotinic acid hydrazide 7 282
osteomyelitis 9 446
pathogenesis 14 129 130
prostate disorders 11 27
sulfone (antimicrobial use) 13 253
thiosemicarbazone 13 606
viomycin, in treatment of 14 327
Tuberculum 12 355
Tubificid annelid 1 57
Tubiflorales 10 346, 532
13 665 14 132 133*
belladonna 2 161
digitalis 4 191
peppermint 9 628
sage 12 4
spearmint 12 563
Tubipora 1 226 3 255 474 13 148
Tubipora musica 13 148
Tubocurarine chloride 11 184
Tubulanidae 9 496
Tubulanus 9 496, 11 559
Tubulanus capistratus 11 557
Tubular acinous gland 5 43
Tubular gland 5 43
Tubular press 10 508
Tubularia 3 255, 11 419
Tubuli seminiferi recti 11 473
Tubulidentata 8 82
Tubulidentata fossils 14 135
Tubulifera 13 628
Tubuliflorae 2 432
Tucana 3 412, 414*
Tufa 14 133
mineral formation 8 442
Tuff 11 590, 14 133 134*, 349
compressive strength 4 613
welded 14 349
Tufted puffin 11 91
Tufted titmouse 13 655
Tugboat 7 115 116
Tukey, J W 9 257
Tularemia 1 466-467, 2 350, 4 218, 10 91, 12 344, 13 179, 629, 14 134-135*
Brucellaceae 2 351
Ixodides 7 299
Tularosa Basin 9 160
Tulip 9 407
Tulip tree 2 361, 14 135*
Tuma phase meter 10 102
Tumblebug 2 131
Tumbling flower beetle 3 277
Tumbling mill 14 155
pebble mill 9 607
Tumbling pulverizers 3 558
Tumbu fly 8 680
Tumor 9 318 326, 14 135 136*
adenocarcinoma 9 321
anaplasia 9 319
basal cell sarcoma 9 321
bladder 14 221
carcinoma 9 320
characteristics 9 318-320
invasion 9 319
classification 9 320 321
diagnosis 9 323 324
Ewing's 12 369
giant cell 12 369
lymphoma leukemia 9 321
metastasis 9 319 320
mixed 9 320
neoplasia 9 37
pseudotumor 9 320
sarcoma 9 320 321
treatment 9 323 324
Tumor viruses 14 136
avian leukosis 1 695
mouse viral leukemias 8 619
myxomatosis infectious (rabbits) 8 687
papillomatous, infectious (rabbit) 9 541
Rous sarcoma 11 635
Tumuli 14 349
Tumulitermes tricolae 12 407
Tuna 5 416 419 14 136*
marine fisheries 8 113
Tundra 5 191 4 342 8 245 14 136*
Arctic islands 1 522
Asia 1 581
soils 12 441 442
vegetation distribution 14 291
Tuned amplifier 1 343
intermediate-frequency amplifier 7 194
Tuned circuits resonance 11 502
wavelength measurement 14 439-441
Tuned plate oscillator 9 421
Tuned plate–tuned grid oscillator 9 422
Tuned radio-frequency receiver 11 257
Tuner 14 137
television receiver 13 470
use of ferrites 5 221
Tung 9 232
Tung tree 14 137
oil 4 290, 5 189
taxonomy 6 174
Tunga penetrans 12 345
Tungar gas tube 6 61
Tungstate 14 137
Tungsten 14 138-140
acids 14 139
alloys 14 138
crystal structure 3 599
electron configuration 4 504
emitter 14 245
extraction 14 138 139
extractive metallurgy 8 27
fabrication 14 138 139
halides 14 140
heat radiation 6 *369 370*
heteropoly acids 14 140
ionization potential 4 50
mechanical properties 14 139
occurrence 14 138
ore (scheelite) 12 61
oxides 14 139 140
oxyhalides 14 140
physical properties 14 139
principal compounds 14 139 140
properties 14 139
resistivity 11 497
salts 14 140
spectral emissivity 4 383
thermionic emission 12 69
uses 14 138
velocity of sound in 13 516
wolframite 14 523
Tungsten carbide 14 138, 140
Tungsten hexacarbonyl 14 140
Tungsten hexachloride 14 140
Tungsten inert gas welding 14 467
Tungsten silicide 14 140
Tungstic acid 14 139
Tunic 12 08
Tunica albuginea 9 453, 13 524
Tunica media 1 557
Tunica vasculosa lentis 5 162 171
Tunicata 1 420 14 140 141*
Ascidiacea 1 574 14 140

U

...ace 13 293
...ers 3 295
...ceti norum stars 14 279
...ube manometer 5 518 8 93
...ure River 1 109
...s03 4 31 9 454
...uvacr 3 551
...gigrator 4 53
...ter 300 7 266 9 96
...ov'a 14 78
...rotoides 14 77
...PG see Uridine diphospho-glucose (UDPG)
...en R. J 4 341
...O see Flying saucers
...-rest tortricid 7 472
...F see Ultrahigh frequency
...ries of articles
...lenbeck G E. 1 655, 4 516, 6 25
...ria Basin 6 186 9 305
...ria formation 1 500
...thermal sortalis 9 513
...ariferes 4 196
...ariidae 4 196
...atherium 4 192
...ata 5 7 411 8 586
...bricht sphere 10 172
...ce 14 179
...ierature colors 4 102 14 179
...ilaminite 9 94
...ilaneae 14 255
...ilon 14 179
...ilus americana 4 563 564 13 113
...ilus glabra 4 564
...ilus procera 4 564
...ilus pumilio 4 564
...ilus rubra 4 564
...ilus thomasi 4 564
...ina 1 353
...ivers 1 256 3 82
...ivia 9 310
...ivius affinis 9 511
...lerian series 4 89
...limate analysis 11 143
...limate strength 13 183
function and fate 14 179
structure 14 179
...mbrachial bodies 14 179
...ion
...lrabasic rock *in* mantle 15 914
peridotite 10 12
...petrographic province 10 52

Ultracentrifuge 2 636, 14 180*
biochemistry 2 190
molecular weight determination 8 558
molecular weight of polymers 10 478
particle size measurement 12 349
protein isolation 11 57
Ultrafiltration 14 180 181
Ultrahigh frequency band allocations 11 260
antennas 1 443 453
Ultrahigh frequency television 13 457
Ultramafite 10 12
Ultramarine 7 422, 10 224 12 476
Ultramicroanalysis 11 143
Ultramicroscopy 14 181
Ultrasonic absorption coefficient (biological tissue) 2 210
Ultrasonic generator 14 182
Ultrasonic metal inspection *see* Metal inspection ultrasonic
Ultrasonic waves in fluids 14 429
Ultrasonic welding 14 468
Ultrasonics 14 182 186
acoustic interferometer 7 189 190
alloying 14 185
analytical uses 14 183 186
biological effects of sound waves 2 207, 211
cavitation 14 183
cleaning 14 183
delay lines 14 182
detectors 14 182
echo techniques 4 577-578
effects in solids 14 184 185
engineering applications 14 182 183
generator 14 182
helium liquid 14 185
high amplitude applications 14 183
high power devices 14 182
inspectoscope 14 182 183
low amplitude applications *14 182*
low temperature data 14 185 186
mechanical filters 14 182 *183*
medical therapy 14 183
Ultrasonics—*cont*
metal inspection ultrasonic 8 288 290
projectors 14 182
pulse system 14 182
shear waves in liquids 14 182
sound attenuation in fluids 14 184
thermal effects 14 184 185
thermotherapy 13 596
thickness gage 14 182 183
Ultrasound *see* Ultrasonics
Ultraspherical polynomials 9 415
Ultraviolet catastrophe 6 372
Ultraviolet detector 10 192 195
Ultraviolet lamp 14 186
mercury vapor lamp 8 234 235
sunlamp 13 292
Ultraviolet photography 10 159 160
Ultraviolet radiation 4 66 14 186 187*
absorption 1 11 17
in sea water 12 105
from sun 13 283 285
sunlamp 13 292
temperature dependence 6 369
Ultraviolet radiation (biology) 14 187 189
action spectra 10 209 14 188
bacteriophage 2 9
bioclimatology 2 200
clinical use 14 188
effects on skin 14 189
mechanism 14 188
microscope fluorescence 8 383
mutation 8 678
photobiological effects 14 187 188
photoreversal 14 188
radiation biology 11 219
sterilization 13 135
water purification 14 401
Ultraviolet spectrophotometry spectrophotometric analysis 12 585
Ultraviolet spectroscopy 12 586
Ultravulcanian explosions 14 454
Ulva 3 80 8 107
Ulva lactuca 1 699

Umbel 7 98
Umbellales 2 579 10 516, 14 189*
anise 1 427
caraway 2 449
coriander 3 480
cumin 3 622
Dicotyledoneae 14 189
dill 4 192
fennel 5 214 215
Ginseng 6 188
parsley 9 568
parsnip 9 568
Umbelliferae 3 190 10 488 12 128 14 189
Umbellula 4 41
Umbellula encrinus 9 622
Umbilical hernia 6 425
Umbilical point 6 152
Umbilical vein 2 500
changes during development 2 485
Umbilicus 1 256
Umbra 14 189
shadow 12 238
Umbradrie 8 403
Umbrella magnolia 8 74
Umbrian Apennines 5 118
Umbriel 14 214
Umezawa Hamao 7 329
Umklapp process 14 189
Umnak Island 1 525
Unaka Range 9 147
Unalaska Island 1 525
Unavailable energy entropy 5 11
Unbalance rotational 12 240
Uncertainty principle 14 189 190
applied to stars 13 110
and Compton effect 3 553
energy measurement 14 190
position measurement 14 190
quantum mechanics 11 154
quantum theory nonrelativistic 11 172
Uncinaria 13 193
Uncinula necator 5 66 6 252
Unconformity 9 520, 14 190 191*
importance in geologic record 14 191
Uncus 11 634
Undecylenic acid 5 563

Tussock moth 2 551, 7 464
Tuttle, J E 10 160
Tuttletype pressure vessels 13 218
Tuve, M A 7 254
Tuxer Alps 5 117
Tuxtlas volcanoes 9 151, 161
Tuyere 11 124
  Bessemer converter 13 94
  iron blast furnace 7 260
Twaddle hydrometer scale 6 562
Tweeter loudspeaker 7 591
Twilight 14 168
Twilight glow 1 148
Twill weave 13 536
Twin carbon arc brazing 2 322
Twin laws 5 207-208
Twin lens reflex camera 2 429
Twin paradox *see* Clock paradox
Twin studies 6 506 509
Twin-T filter 5 269
Twin triode 14 110
  vacuum tube 14 252
Twiners 13 124
Twinkling stars 14 168
Twinned crystal 14 168
Twinning (crystallography) 14 168 169
  in cassiterite 2 539
  in chrysoberyl 3 116
  in diamond 4 98
  in feldspars 5 207 208
  in fluorite 5 355
  in marcasite 8 101
  mineralogy 8 464 465
  in rutile 11 676
Twist, textile 13 534
Twisted product 5 253
Twisting, structural member 12 244
Twisting deformation 13 687
Twitch muscle 8 637
Twitchell's reagent 5 73, 188
Two carrier theory of rectification 12 171-172
Two conductor transmission lines 14 58 60
Two-drum type marine boiler 8 103
Two fluid model (liquid helium) 6 393
Two-plate halftones printing in color 10 608
Two-toed sloth 12 363, 382
Two way paper chromatography 3 96
Tworf d'Herelle phenomenon 2 69
TWX 13 455
Tycho's nova 13 303
Tygon 5 75
Tylenchida 9 30
Tylenchoidea 1 490, 14 169*
Tylenchus 6 436 441
Tylopoda 1 568
Tylosaurus 7 474, 11 484
Tylose 14 592
Tympanic cavity 4 319 320
Tympanic membrane 4 319 320
Tympanuchus cupido 10 563
Tympanuchus pallidicinctus 10 563
Tyndall, J 7 496 12 51
Tyndall effect 14 149
Tyndallization 13 134
Typaudae 7 143
Type (archeology) 1 514
Type (printing) 14 169 172
  case 14 171
  classification 14 160, 170
  families 14 171
  font 14 171
  measurements 14 171
  setting of see Composition (type)
  special designs 14 171 172
  styles 14 170
Type I error biometrics 2 227
Type II error biometrics 2 227
Type metals lead alloys 7 427
  tin alloys 13 650
Type method 14 172-173
  designations 14 172
  taxonomic method 14 172
Type size 14 171
Type specimen (taxonomy) 6 419
Typesetting *see* Composition (type)
Typewriter 14 173
  justifying 3 348
Typhlomolge rathbuni 2 569
Typhlonectes 6 300
Typhlopidae 13 27
Typhloplanidae 11 542
Typhloscolecidae 10 461
Typhlotriton spelaeus 12 7
Typhoid fever 1 466 467, 4 102, 5 1, 424, 9 591, 10 91, 13 8 14 173*
  biologicals 2 218
  Salmonella 12 14
Typhoid vaccine 15 596
Typhoon 6 520 521
  Asia 1 582
  atmospheric low 1 642
Typhula graminum 9 236
Typhus 1 696, 5 7 13 14
  endemic *see* Typhus fever, endemic (flea borne)
  entomology, economic 5 5-7
  louse 7 503
  murine *see* Typhus fever, endemic (flea borne)
Typhus, scrub 14 115 173 175
Typhus fever endemic (flea borne) 1 467, 13 528 14 175
  fluorescent antibody method 8 583
Typhus fever epidemic (louse borne) 1 467 13 528, 14 175 176
  Brill's disease 14 176
  clinical picture 14 175
Typhus fever, epidemic (louse borne)—*cont*
  diagnosis 14 176
  etiologic agent 14 176
  fluorescent antibody method 8 583
  insect vector 14 176
Typing blood 14 29
Typographical point 3 544
Typotron storage tube 13 165
Tyrannidae 5 562 7 561, 9 589, 10 88
Tyrannosaurus 4 199, 11 494
Tyrannus tyrannus 7 561
Tyrén, F 14 590
Tyrian purple 4 298, 7 64 13 406
Tyrocidine hydrochloride 14 177
  tyrothricin 14 177
Tyroglyphus farinae 12 29
Tyrophagus castellani 12 29
Tyrosinase 12 567
*Tyrosine 1 76, 2 35, 46, 195, 5 41 6 106 508 7 164, 10 114, 13 624, 626, 14 176 177**
  amino acids 1 308-319
  in histone 9 217
  plant metabolism 10 357
  in protamines 9 217
  tyrothricin 14 177
  see also Adrenal gland
Tyrosinosis 4 236
L-Tyrosyl-D valylglycyl L-alanine 9 629
Tyrothricin 14 177
  antibiotic 1 464 468
  United States production of 14 177
Tyrrell, Lake 1 672
Tyrrhenian Sea 5 115 8 207
Tyson's gland 12 61
Tyto alba 9 460 15 185
Tytonidae 9 460 15 185
Tyuyamunite 11 269 14 210

Upper limb man 1 397
Upper Sonoran zone 8 245
Upwelling 5 470-471
Upwelling 11 495
Upupidae 3 453
Upwelling (oceanography) 9 96
exchange of gases 12 105
Pacific Ocean 9 495
sea water fertility 12 120
Uracil 2 56 195, 9 209, 10 359 11 115
metabolic disorders 8 258
Ural Mountains 5 118
Ural River 5 122
Ural station 5 39
Uraniidae 7 284
Uranid 7 464
Uranidae 7 464
Uraninite 11 269 14 209*, 210
anomalous lead 7 430
Uranium 14 209 212
carnotite 2 527
chemical reactions 14 211
compounds 9 42
Earth (age of) 4 331
electron configuration 4 504
extractive metallurgy 8 278
fission 5 282 290
halides 14 212
heat generation in earth 4 312
hydride 14 211
ionization potential 4 504
ions in solution 14 211
isotopes 14 209
metal 14 210 211
natural occurrence 14 209-210
in nonaqueous solvents 14 212
nuclear fuels 9 184 188* 11 598
ore reserves 9 186 187
oxides 14 211 212
physical properties 14 210 211
prospecting for 11 25
radioactivity 11 273 281
in silicates 13 421
thermal properties 14 210
uranyl nitrate 14 209
uranyl salts 14 212
Uranium 235 1 649
Uranium 238 11 273 281
Uranium lead method 11 594
Uranium lead rocks 7 427
Uranium metallurgy 14 213
Uranium minerals 11 268* 269
Uranium oxide 11 410
Uranophane 14 210
Uranothorite 13 610
Uranus 14 213 214
albedo 1 223 14 214
atmosphere 14 214
escape velocity 5 68
Uranus—*cont*
orbit 14 213 214
satellites 14 214
Uranyl minerals 11 269
Urbain G 5 125, 7 623, 13 491 14 606
Urban development 7 392
Urceolus sabulosus 8 169
Urea 9 110, 593 14 214 215*
component of chemical nitrogen fertilizers 5 237
in hydrazine formation 6 530
resin molding 10 405
in water soluble nematocides 9 29
see also Thiourea, Urea (biochemistry)
Urea (biochemistry) 14 215
blood chemistry 5 197
constituent of blood plasma 2 266
cycle 1 529, 9 112 115
excretion 5 137 143
Urea formaldehyde type resins 14 215 217
see also Polymer
Urease 2 20 5 20 22
Urechinidae 6 463
Uredinales 14 217
rust (microbiology) 11 654
Uredosorus 11 654
Ureid 14 217 218
5 Ureidohydantoin 7 33
Ureidosuccinic acid 2 59
Ureilite 8 314
Uremia 2 266 7 344 9 40
kidney disorders 7 342 344
sulfa drugs 13 244
Ureotelic 5 137 143
Urethane 8 674 14 218*
isocyanate 7 275
polyurethane resins 10 494
Urethritis 11 482 14 86
Urethrovaginal duct 11 466
Urey H C 4 84 340 4 340 547 552 6 131 7 497 12 471
Urgonian limestone 3 545
Uric acid 1 554 2 56 266 9 110 11 115 14 218*
blood chemistry 5 197
gout 6 259
Uricase 14 218
Uricotelic 5 137 143
Uridine diphosphateglucose 3 264
Uridine diphosphoglucose (UDPG) 3 261 14 218 219*
Uridine monophosphate 2 59
Uridinediphosphate (UDP) 10 352
nucleic acid 9 214
Uridinediphosphogalactose 8 262
Uridinediphosphoglucose 10 352
metabolic disorders 8 262
Uridylic acid 9 209
Urinalysis 5 192 194*, 14 219*
Addis count 5 193
amylase 5 194
bacteriologic studies 5 194
Bence Jones protein 5 194
calcium 5 194
calculus analysis 5 194
clearance tests 5 193
concentration dilution test 5 193
hormone assays 5 194
melanin 5 193
occult blood 5 193
Phenolsulfonphthalein test 5 193
poisons 5 194
pregnancy tests 5 194
Urinary bile jaundice 5 199
Urinary bladder 14 219 221*, 225 226
allantoic 14 220
cloacal 14 219 220
embryology 14 225
tubal 14 219
see also Urinary system
Urinary bladder disorders 14 220 221
anomalies 14 220
calculi 14 220
cystitis 5 650
fistulae 14 220
inflammation 14 220
obstruction 14 220
tumors 14 221
Urinary system 14 221 233
amniote kidneys 14 228
amphibians 14 225 227 228
anamniote kidneys 14 226
antidiuretic hormone 14 232
archinephros 14 226
birds 14 225, 228
chorion 14 225
comparative anatomy 14 226
comparative embryology 14 221
comparative vertebrate physiology 14 229 233
cyclostomes 14 227
diuresis 14 232
fishes 14 227
GFR 14 231
glomerular activity 14 230
glomerular filtration rate 14 231
holonephros 14 226
hypertension of renal origin 14 232 233
kidney 14 221 231
mammals 14 225 228 229
metanephros 14 224
micturition 14 233
nephros 14 221 225
opisthonephros 14 226 227
Urinary system—*cont*
physiology 14 229 233
pronephros 14 226
radiation injury (biology) 11 228
renal clearance tests 14 231
renal function theories 14 229 232
renal plasma flow 14 231
renin 14 233
reproductive system, embryology 11 462
reptiles 14 225, 228
RPF 14 231
tubular excretion 14 231
tubular reabsorption 14 230 231
urinary bladder *see* Urinary bladder
urine production 14 229
Wolffian body 14 223
Wolffian duct 14 222
Urinary urobilinogen 5 199
Urination 14 233 234
body rhythm 2 273
nervous system in 14 233
reproductive system disorders 11 482
Urine 14 229 234*
chemical properties 14 229
physical properties 14 229
urinalysis 14 219
Urn 12 346
Urn model 10 628
Urnatella 5 8
Urnatella gracilis 5 9
Urobilin 2 186
Urobilinogen 7 302 303
Urochordata *see* Tunicata
Urochrome 2 186
Urocordylus 9 28
Urocyon cinereoargenteus 5 490
Urocystis cepulae 9 327
Urodasys 8 10
Urodela 7 474
Amphibia 1 333
Amphibia fossils 1 336
see also Caudata
Urogenital sinus 11 466
Urogenital system 14 234
mesonephros 14 234
metanephros 14 234
pronephros 14 234
reproductive system *see* Reproductive system
urinary system *see* Urinary system
Uroglena 5 117
Uromastix 13 23
Uronic acid 2 453 8 621, 9 609
Uroporphyrin 10 520
Uropygi 1 496 14 235*
Uropygial gland 12 61 14 235*
Uropygium 14 235
Urosalpinx 9 34 11 19

Undecylic acid 2 474
Underclay 3 163, 228
Undercoater 9 493, 10 592
Underfrequency protection. *electric* 4 447
Underground mining *see* Mining, underground
Underground nuclear explosion 9 182 184
Underground river 7 333
Underground solution of limestone 7 332
Underground surveys 13 329
Underground transmission lines 14 54
Underground water 14 391
Underlon 12 301
Undervoltage protection 4 447
Underwater acoustics *see* Underwater sound
Underwater camera 2 430
Underwater construction 13 329
Underwater demolition 14 191-192
  applications 14 191
  equipment 14 191
Underwater drone *see* Drone
Underwater gravimeters 13 514-515
Underwater nuclear explosion 9 182 184
Underwater photography *14 192* 194
  bottom photography 14 193 194
  camera housing 14 193
  deep-sea 14 193-194
  light source 14 193
  photography 10 158
  Romanche Trench 4 364
  shallow water photography 14 192 193
Underwater projector (sound) 14 18
Underwater sound 1 49, 12 107, 14 195 199*
  absorption 14 196
  acoustics 14 195
  bottom reflection 14 198
  generation 14 18
  hydroacoustic detection of nuclear explosions 9 183 184
  hydrophone 6 563
  isothermal surface layer 14 196
  negative surface gradients 14 196-197
  noises 14 199
  pressure effect 14 195
  propagation loss 14 197
  reception 14 18
  reflection 14 197 198
  refraction 14 196 197
  reverberation 12 504
  salinity effect 14 195
Underwater sound—*cont*
  scattering layer 12 60
  scattering of 14 198 199
  ship noise 14 199
  SOFAR 12 413
  sonar 12 502 504
  sonobuoy 12 506
  sound channels 14 197
  submarine noise 14 199
  surface reflection 14 197-198
  temperature effect 14 195 196
  transducer 14 18
  velocity 12 102, 14 195-196
Underwater telephone 14 199
  underwater sound 14 199
Underwater television 9 268, 14 199 200*
Underwater transducer 14 18
Underwater visibility 12 106
Underwing 7 464
Underwood B J 7 443
Underwriters Laboratory 4 79
Undulant fever *see* Brucellosis
Ungava Bay 9 145
Ungava Peninsula 9 141
Ungerade state 12 161
Ungulate horse 4 88
  perissodactyla fossils 10 18 20
  rhinoceros 11 545
  stomach 13 149
  tapir 13 394 395
  taxonomy 10 18
Uniaxial crystal 3 588-591
Unicapsula 8 689
Unicellular gland 5 43
Unicorn beetle 2 130
Unidentified flying objects *see* Flying saucers
Unified field theories 14 200 201
  historical development 14 200
  light 7 506 507
  theoretical physics 13 548
  unification proposals 14 200 201
Unified screw thread 12 85
Uniform convergence series 12 192
Uniform corrosion 3 490
Uniform flow 5 324
Unijunction transistor *see* Double base diode
Unilocular adipose tissue 1 70
Unimak Island 1 523
Unimolecular reaction 7 357
Unio 5 100 9 607
Union set theory 12 206
Unionidae 8 670, 9 613
  Eulamellibranchia 5 100 101
Unipolar transistor *see* Field effect transistor
Unique factorization theory 7 411
Unisol process 10 70
Unit cell Brillouin zone 2 338
Unit cell crystal structure 3 593 600
  lattice constant 7 412
Unit chemical changes 14 202-203
Unit coal 3 229
Unit operations 14 201-202
  centrifugation 2 634 636
  classification, mechanical 3 155 156
  crystallization 3 600 601
  drying 4 282 290
  dust and mist collection 4 296
  flotation 5 312-315
  fluid mechanics 14 201
  fluidization of solids 5 345-347
  heat transfer 14 201
  humidification 6 515
  mass transfer operation 8 167-168, 14 201
  mechanical principles 14 201
  mixing 8 521 524
  separation (mechanical) 12 187
  size reduction 12 348 350
  solvent extraction 12 500
  thickening *13 601-602*
Unit processes 14 202 203
  amination 1 304 305
  esterification 5 75-77
  halogenation 6 525-530
  high-pressure 6 450
  hydrogenation 6 552-553
  hydrolytic processes 6 558 559
  nitration 9 103 105
  oxidation process 9 462 464
  pyrolysis 11 118
Unitary transformation Hamilton Jacobi theory 6 332
  matrix theory 8 184
United States (ship) 12 256
United States (towboat) 7 115
United States Air Force aircraft designations 1 161
United States Coast and Geodetic Survey (USCGS) surveying coordinate systems 13 324
United States Naval Observatory 13 643
United States Range 1 523
Units, electrical *see* Electrical units
Units systems of 14 203 204
  absolute systems 14 203 204
  dimensional analysis 4 192 196
  electrical 4 460 461
Units, systems of—*cont*
  force 5 436 437
  gravitational systems 14 204
  magnetic units 4 460 461
Universal joint 3 526, 5 487, 14 204 205*
Universal motor 3 528 14 206*
  alternating current motor 1 285
  commutator 3 528
  series motor 14 206
Universal stage microscope 10 53
Universal time constant curve 13 643
Universe 14 206
  age of 3 503 504
  cosmochemistry 3 503
  expanding universe 3 510
  Minkowski *see* Minkowski universe
  origin of 4 552
  possible motions of 3 509
  structure of 3 509 510
Universe (biometrics) *see* Population
Unloader 14 207
Unperturbed problem 10 39
Unsaturated cadmium cell 14 360
Unsaturated halides 6 326 327
Unsaturated hydrocarbon *14 207* 209
  addition reaction 1 62 64
  alkene 1 252
  alkyne 1 255
  chemical properties 14 207 209
  diene 4 117-118
  occurrence 14 207
  ozonization 9 479-480
  physical properties 14 207
  preparation 14 207
Unsaturated polyester 10 466 467
Unsaturation aromatic hydrocarbon 1 546
Unstable gravimeters 13 515 516
Unstable minerals 12 141
  in arkoses 1 533
Unstable relicts (petrology) 8 17
Unsteady flow 5 341
Unsteady state convection 4 145
Unsteady state diffusion 4 145
Unsteady state process heat *transfer* 6 575
Untuned amplifiers 1 344
Updike D B 10 603
Updraft carburetor 2 477
Updraft kiln 7 346
Updrafts *in thunderstorm* 13 616
Upland game birds 14 490
Upper inversion *13 488*

Upper limb, man 1 597
Upper Silurian zone 8 245
Upset forging 5 470 471
Upset welding 11 495
Upupidae 5 473
Upwelling (oceanography) 9 245
exchange of gases 12 105
Pacific Ocean 9 485
sea water fertility 12 120
Uracil 2 36, 105 9 209, 10 539, 11 115
metabolic disorders 8 258
Ural Mountains 5 118
Ural River 5 122
Uralization 5 39
Uraloceratidae 7 284
Uramid 7 464
Uramidae 7 464
Uranium 11 268 14 209*, 210
anomalous lead 7 430
Uranium 14 209 212
ammonite 2 527
chemical reactions 14 211
compounds 9 42
Earth age of) 4 551
electron configuration 4 504
extractive metallurgy 8 278
fission 5 297 299
halides 14 212
heat generation in earth 4 552
hydride 14 213
ionization potential 4 504
ions in solution 14 211
isotopes 14 209
metal 14 210 213
natural occurrence 14 209 210
in nonaqueous solvents 14 212
nuclear fuels 9 184 188* 11 359
ore reserves 9 186 187
oxides 14 211 212
physical properties 14 210 211
prospecting for 11 23
radioactivity 11 273 281
in tektites 13 421
thermal properties 14 210
uraninite 14 209
uranyl salts 14 212
Uranium 235 3 619
Uranium 238 11 273 281
Uranium lead method 11 504
Uranium lead ratio 7 427
Uranium metallurgy 14 213
Uranium minerals 11 268 269
Uranium oxide 11 410
Uranophane 14 210
Uranothorite 13 610
Uranus 14 213 214
albedo 3 225 14 214
atmosphere 14 214
escape velocity 3 68
Uranus—*cont*
orbit 14 213 214
satellites 14 214
Uranyl minerals 11 269
Urban G 5 123, 7 623, 13 491, 14 606
Urban development 7 392
Urceolus sabulosus 8 169
Urea 9 110, 393 14 214 215*
component of chemical nitrogen fertilizers 5 237
in hydrazine formation 6 530
resin molding 10 405
in water soluble nematocides 9 29
see also Thiourea, Urea (biochemistry)
Urea (biochemistry) 14 215
blood chemistry 3 197
constituent of blood plasma 2 266
cycle 3 529 9 112 113
excretion 5 137 143
Urea formaldehyde type resins 14 215 217
see also Polymer
Urease 2 20 5 20 22
Urechinidae 6 463
Uredinales 14 217
rust (microbiology) 11 654
Uredosorus 11 654
Ureid 14 217 218
5 Ureidohydantoin 7 33
Ureidosuccinic acid 2 59
Urethite 8 314
Uremia 2 266 7 344 9 40
kidney disorders 7 342 344
sulfa drugs 13 244
Ureotely 5 137-143
Urethane 8 674 14 218*
isocyanate 7 275
polyurethane resins 10 494
Urethritis 11 482 14 86
Urethrovaginal duct 11 466
Urey H C 4 84 340 4 340 547 552 6 131 7 497 12 471
Urgonian limestone 5 543
Uric acid 1 554 2 56 266, 9 110 11 115 14 218*
blood chemistry 3 197
gout 6 239
Uricase 14 218
Uricotely 5 137 143
Uridine diphosphateglucose 3 264
Uridine diphosphoglucose (UDPG) 3 264 14 218 219*
Uridine monophosphate 2 59
Uridinediphosphate (UDP) 10 552
nucleic acid 9 214
Uridinediphosphogalactose 8 262
Uridinediphosphoglucose 10 552
metabolic disorders 8 262
Uridylic acid 9 208
Urinalysis 3 192 194* 14 219*
Addis count 3 193
amylase 3 194
bacteriologic studies 3 194
Bence Jones protein 3 194
calcium 3 194
calculus analysis 3 194
clearance tests 3 195
concentration dilution test 3 193
hormone assays 3 194
melanin 3 193
occult blood 3 193
Phenolsulfonphthalein test 3 193
poisons 3 194
pregnancy tests 3 194
Urinary bile jaundice 3 199
Urinary bladder 14 219 221*, 225 226
allantoic 14 220
cloacal 14 219 220
embryology 14 225
tubal 14 219
see also Urinary system
Urinary bladder disorders 14 220 221
anomalies 14 220
calculi 14 220
cystitis 3 630
fistulae 14 220
inflammation 14 220
obstruction 14 220
tumors 14 221
Urinary system 14 221 233
amniote kidneys 14 228
amphibians 14 225, 227 228
anamniote kidneys 14 226
antidiuretic hormone 14 232
archinephros 14 226
birds 14 225 228
chorion 14 225
comparative anatomy *14 226*
comparative embryology 14 221
comparative vertebrate physiology 14 229 233
cyclostomes 14 227
diuresis 14 232
fishes 14 227
GFR 14 231
glomerular activity 14 230
glomerular filtration *rate* 14 231
holonephros 14 226
hypertension of renal origin 14 232 233
kidney 14 221 231
mammals 14 225, 228 229
metanephros 14 224
micturition 14 233
nephros 14 221 225
Urinary system—*cont*
physiology 14 229 233
pronephros 14 226
radiation injury (biology) 11 228
renal clearance tests 14 231
renal function theories 14 229 232
renal plasma flow 14 231
renin 14 233
reproductive system embryology 11 462
reptiles 14 225 228
RPF 14 231
tubular excretion 14 231
tubular reabsorption 14 230 231
urinary bladder *see* Urinary bladder
urine production 14 229
Wolffian body 14 223
Wolffian duct 14 222
Urinary urobilinogen 3 199
Urination 14 233 234
body rhythm 2 275
nervous system in 14 233
reproductive system disorders 11 482
Urine 14 229, 231*
chemical properties 14 229
physical properties 14 229
urinalysis 14 219
Urn 12 346
Urn model 10 628
Urnatella 5 8
Urnatella gracilis 5 9
Urobilin 2 186
Urobilinogen 7 302-303
Urochordata *see* Tunicata
Urochrome 2 186
Urocordylus 9 28
Uroeyon cinereoargenteus 5 490
Urocystis cepulae 9 327
Urodasys 8 10
Urodela 7 474
Amphibia 1 333
Amphibia fossils 1 336
see also Caudata
Urogenital sinus 11 466
Urogenital system 14 234
mesonephros 14 234
metanephros 14 234
pronephros 14 234
reproductive system *see* Reproductive system
urinary system see Urinary system
Uroglena 3 117
Uromastix 13 23
Uromic acid 2 453 8 621, 9 609
Uroporphyrin 10 520
Uropygi 1 496, 14 235*
Uropygial gland 12 61, *14 235**
Uropygium 14 235
Urosalpinx 9 34, 11 19

Urosome 3 462-463
Urosporidium fuliginosum 6 334
Urostylidae 6 401
Urox 6 423
Ursa Major 14 235
Ursa Minor 3 412-414, 14 235*
Ursidae 2 118, 523
Ursus americanus 2 118
Ursus horribilis 2 118
Ursus middendorfii 2 118
Urticaceae 14 235
Urticales 10 346, 14 235*
  breadfruit 2 324
  hop 6 478-479
  marijuana 8 102
Usanovich, M 1 42
Usanovich theory 1 42
Uschakov, P. 10 431
Use-dilution method 2 197
Usnea barbata 7 495
Using, H 9 437
Ust Urt Plateau 1 577
Ustilaginaceae 14 235
Ustilaginales 14 235-236
  smut (microbiology) 12 387
Ustilago avenae 12 388
Ustilago hordei 2 99, 12 388
Ustilago kolleri 12 388
Ustilago maydis 3 484, 485, 12 388
Ustilago nuda 2 99 14 482
Ustilago scabiosae 14 236
Ustilago tritici 10 312
Usu Volcano 14 354
Uterine disorders 14 236
  congenital 14 236
  functional 14 236
  inflammatory 14 236
  neoplastic 14 236
Uterine milk 6 300
Uterus 5 179, 11 469, 474, 14 234, 236 237*
  benign tumors 11 481
  bicornis 11 466
  bicornuate 14 234
  bipartite 14 234
  duplex 11 466, 14 234
Uterus—*cont*
  effector system 4 414
  histology 11 474
  malignant tumors 11 481
  menstruation 8 225
  pelvic endometriosis 11 48
  simplex 11 466, 14 234
  vagina 14 256
Utricle 5 542
Utricularia 14 152
Utriculus 4 320
Uvales 7 333
Uvarovite 6 40
Uvigerina gallowayi 5 433
Uvula 4 166
  palate 9 497

V

V-8 engine (automotive) 1 685, 7 201 205
V band color centers 3 295 297
V belt 14 244 245
V centers color 3 295 297
V factor (hemophilic bacteria) 6 412
V-g diagram 14 511
V particle 6 587 588, 14 376 377*
Vaal R *see* I 109
Vacancy impurity crystal defects 3 582 585
Vaccination 14 239
brucellosis 2 353
immunity 7 34
Vaccine 1 468
antigen 1 472
biologicals 1 472 2 218
foot and *mouth disease* 5 429
poliomyelitis 10 456
preparation 2 218
types 2 218
typhoid fever 14 175
Vaccine preparation 2 218
Vaccinia virus 14 331
DNA purine and pyrimidine contents 9 212
fluorescent antibody method 8 385
Vaccinium 5 189 5 437, 10 499
Vaccinium ashei 2 271
Vaccinium australe 2 270
Vaccinium corymbosum 2 270
Vaccinium lamarckii 2 271
Vaccinium macrocarpon 5 535
Vaccinium myrtillus 2 271
Vaccinoform 5 79
Vacuole cell inclusions 2 604
Vacuum bottle 4 90 91
Vacuum brake 1 142
Vacuum cleaner 14 239
Vacuum deposition printed circuits 10 506
Vacuum dielectric capacitor 3 446
Vacuum diode *see* Diode vacuum
Vacuum distillation 14 241
petroleum processing 10 67
Vacuum energy level field emission 5 255
Vacuum *filter* 5 347
Vacuum flask 4 90 91
Vacuum fluctuations quantum electrodynamics 11 149 150
Vacuum forming (plastic sheets) 10 406
Vacuum freeze dryer 4 298
Vacuum fusion 14 239 240
Vacuum induction melting 14 240
Vacuum measurement 14 240
absolute standard of pressure 8 9
ionization gage 7 253 254
McLeod gage 8 9 10
Pirani gage 10 242
pressure 10 581
thermistor 13 556
see also Pressure measurement
Vacuum melting 1 502, 14 240
Vacuum metallurgy 14 240 241
beryllium metallurgy 2 176 178
Kroll process 13 654
thorium 13 611
Vacuum microbalance apparatus 3 492
Vacuum pan salt (food) 12 17
Vacuum phototube 10 192 195
Vacuum process 13 101
Vacuum puffing unit 5 399
Vacuum pump 4 246, 14 241 243*
condenser, vapor 5 382
cryopump 5 571
steam jet ejector 13 83 84
Vacuum retort process 11 119 122
Vacuum rotary *dryer* 4 298
Vacuum rotary filter 5 272
Vacuum tube 14 243 254
amplification factor 14 217
amplitude distortion 4 256
basic operation 14 243 248
causes of failure 14 251
circuit reactance 14 250
classification 14 213
coefficients 14 216 248
cold cathode 3 274 275
degassing 14 244
diode 4 203 205
dynamic plate resistance 14 248
early developments 4 434
electron transit time 14 250
emitters 14 245 246
equivalent circuit 5 64
Vacuum tube—*cont*
evacuation of the envelope 14 244
failure statistics 14 251
field-emission tube 3 274 275
frequency limitations 14 250
getter 14 244 245
heptode 6 418
hexode 6 436
interelectrode capacitance 14 249 250
life vs filament voltage 14 248
lighthouse tube 7 508 509
load line 7 561 563
mechanical structure 14 244
microphonic 8 564
mutual conductance 14 217 248
noise 14 250 251
octode 9 273
pentagrid converter 9 623
pentode vacuum 9 624 627
plate dissipation 14 248 249
plate resistance 14 248
quiescent point 7 564
relation between tube coefficients 14 249
reliability 14 251
selection 14 248
shot noise 9 119
sockets 14 251 252
special 14 252 254
switching 4 179 13 359
tetrode vacuum 13 531
transconductance 14 248
triode vacuum 14 106 110
tube *reactance* 14 250
tube tester 14 327 329
use as detectors 8 364
variation of *characteristics* 14 248
see also Beam power tube Electron tube
Vacuum tube amplifier 1 342 349
amplification 1 345
audio frequency 1 345
bandwidth 1 345
basic principles 1 342 343
beam power tube 1 345
broad band amplifier 1 344
cascade 1 345
Vacuum tube amplifier—*cont*
cathode bypassing 1 347
Class A operation 1 344
Class AB operation 1 344
Class B operation 1 344
Class C operation 1 344
classifications 1 343 345
degeneration 1 347
direct coupled 1 345
distortion 1 347
fidelity 1 346
frequency response 1 345 346
gain 1 343 345
grid current flow 1 344
high frequency compensation 1 346
hum 1 347
impedance coupled 1 345
intermediate frequency 1 345
linear (Class A) 1 344
low frequency compensation 1 346
motorboating 1 348
multiple stage 1 345
narrow band amplifier 1 344
negative feedback 1 347
noise 1 347
nonlinearities 1 347
oscillation 1 347 349
output power 1 345
pentode amplifier 1 345
phase response 1 345
positive feedback 1 347
quiescent operation 1 342
radio frequency 1 345
regeneration 1 347 348
RC coupled 1 345
signal response 1 346
small signals 1 345
stagger tuning 1 344
tetrode amplifier 1 345
transformer coupled 1 345
triode amplifier 1 344
tuned 1 345 344
undesirable conditions 1 346
untuned 1 344
Vacuum tube voltage regulator 14 362 364
Vacuum tube voltmeter 14 254 256
low voltage *limits* 14 256
types 14 254 256
waveform error 14 256

Vacuum vessel 4 90 91
Vadose water 6 276
Vadose zone cave 2 571
Vagabond currents terrestrial 13 506
Vagina 11 474, 14 256*
  disorders 14 256
  fibrosa 13 491
  histology 11 474
  reproductive system 11 466
Vaginal disorders 14 256
Vaginal plug 11 473
Vaginismus 14 256
Vaginitis 10 256, 14 86
Vaginulina cretacea 5 433
Vagotomine 9 534
Vagus ganglion 9 47
Vagus nerve 9 557, 13 399
  cranial 3 538
  embryology 9 47
Vaigach 5 117
Vaisala radiosonde 8 318
Valanginian substage 3 543
Valders stage 10 525
Valence 9 465, 14 256-259*
  alloy structures 1 262 263
  bond types 14 257 258
  chemical binding 3 24 26
  chemical structures 3 38 39
  criterion of maximum overlapping 14 259
  electronic structure of atoms 14 257
  oxidation number 14 258
  periodic table 10 14
  quantum theory 14 258 259
  rule of eight 14 257
Valence band 14 259
  band theory of solids 2 92
  semiconductors 12 166
Valence bond resonance *see* Resonance (molecular structure)
Valence bond theory 3 38 39
  coordinate bond 3 458
Valence compounds 12 480
Valence crystals 12 480
Valence electron 2 91 93
  chemical structures 3 33
  free electron theory 5 499
Valence forces intermolecular 7 195
Valencia, Gulf of 5 115
Valenciannite 5 210
Valency compounds 12 477 478
Valeramide 1 303
n-Valeramide 1 303
Valeriana 11 617
Valeric acid 2 474
Valeryl chloride 1 45
Valine 14 259 260
  amino acids 1 308 319
  bioassay 2 195
  in histone 9 217
  insulin structure 7 164
  plant metabolism 10 557
  in protamines 9 217
Valine—*cont*
  Protozoa 11 57
  tyrothricin 14 177
L Valine 11 41
Vallacerta 12 317
Valley change in shape 6 161
  chinook effect 1 524
  deposits 5 358
  Finger Lakes 5 273
  fiord 5 277
  foehn effect 1 524
  glaciated 6 453
  Greenland 1 524
  pattern on plains 10 258
  widening 5 358
  winds 14 495
Valley and ridge province 9 145
Valley of Ten Thousand Smokes 9 158
Valley wind 8 332
Vallisia 8 572
Vallisneria 6 391
Valonia 2 235
Valsata 4 360, 14 260*
Valsatacea 6 76
Valsatida 4 372
Valve 14 260-262
  compressor 14 262
  hydraulic turbine 14 261
  pipe 14 260
  pressure regulating 10 580
  pump 14 262
  steam engine 14 261
  throttled flow 13 615
Valve (vein) 2 500
Valve electric *see* Electron tube
Valve, relief *see* Relief valve
Valve, safety *see* Safety valve
Valve action 14 262
Valve follower 14 263
Valve lifter 14 263
Valve lifter hydraulic *see* Hydraulic valve lifter
Valve train 14 262 264
  cam action 14 263
  hydraulic valve lifter 6 529
  timing 14 264
  valve action 14 262 263
Valvifer 5 280
Valvifera 14 264 265
Valvula foraminis ovalis 2 509
Valvular disease (circulation disorders) 3 141 144
Valvular insufficiency (heart disorders) 6 558 562
Valvular stenosis 2 514
Valvulineria californica 5 434
Valvulinid 5 431
Vampire bat 2 109
Vampyrella 11 44
Vampyrellidae 11 44
Vampyromorpha 2 645, 3 275
  14 265*
Vampyroteuthis 4 40
Vampyroteuthis infernalis 4 107, 14 265
Van Allen, J 3 502
Van Allen radiation 14 265-266
Van Allen radiation belts 14 265 266
  astronaut protection 12 542
  astronomical geophysics 1 608
  geomagnetic storms 6 143
  plasma physics 10 388
Van Alphen, P 7 508
Van Arkel de Boer process
  chromium 3 104
  pyrometallurgy, nonferrous 11 125
  zirconium 14 616
Van Biesbroeck, G 13 271
Van de Graaff generator 9 573*, 13 135, 14 266 268*
  operating voltage 14 267
  operation 14 266
Van de Kamp, P 2 189, 13 39
Van den Bergh reaction jaundice 3 199
Van der Hoven, J 8 354
Van der Pol oscillator 11 439
Van der Waals, J D 6 41, 13 567, 14 268
Van der Waals covolume 14 334
Van der Waals equation 14 268
  intermolecular forces 7 195
  thermal expansion 13 550
Van der Waals equation of state for gases 13 568
Van der Waals forces 3 26 7 195 196
  cohesion 3 269
  intermolecular 7 195 196
Van der Waals structures 12 474 475
Van Dyke, H B 6 485
Van Laar equations 1 60
Van Leeuwen, J H 4 97
Van Leeuwenhoek, Antony 2 66 8 348
Van Niel, C B 2 11
Van Slyke method 1 310
Van't Hoff, J H 1 213 10 210
Van't Hoff law osmotic pressure 12 488
Van Vleck, J H 8 53 9 548
Van Vleck paramagnetism *see* Paramagnetism
Van Wijhe, J 9 551
Van Woerkom, A J J 3 315
Vanadate 14 268
Vanadinite 11 129
Vanadium 14 268 270
  alloys 14 269
  calcium reduction 14 269
  carnotite ore 2 527, 14 268
  electron configuration 4 504
Vanadium—*cont*
  extraction from ores 14 268
  extractive metallurgy 8 278
  ferrovanadium reduction 14 268
  in imposonite 7 47
  ionization potential 4 504
  magnesium reduction 14 269
  natural occurrence 14 268
  principal compounds 14 269 270
  properties of 14 269
  tool steels 14 269
Vanadium permendur 7 261, 8 35
Vancoein 1 466 468
Vancomycin antibiotic 1 464 468
Vancouver Mountains 9 162
Vanderhoofia 4 80
Vandyke 10 146
Vane 5 195
Vane anemometer 1 402
  air velocity measurement 1 221
Vanern Lake 5 116
Vanessa 7 471
Vang 12 259
Vanguard satellite 12 34 36
Vanhornidae 6 574
Vanilla 14 270
Vanilla extract 14 270 271
Vanilla fragrans 9 373, 14 270
Vanilla planifolia 9 372, 14 270
Vanillin 6 219 224, 14 271
Vapam 6 421
Vapor *see* Gas Vapor pressure
Vapor coatings metal 8 290
Vapor compression saline water reclamation 12 12
Vapor compression cycle refrigeration 11 412
Vapor condenser *see* Condenser vapor
Vapor cycle 14 271 274
  binary vapor cycle 14 273 274
  power plant 14 271
  regenerative heat cycle 14 272
  refrigeration plant 14 271 272
  vapor steam plant 14 271 272
Vapor drying wood 14 539
Vapor lamp 14 274
  fluorescent lamp 5 317 319
  mercury vapor lamp 8 234 235
  neon glow lamp 9 36 37
  sodium vapor lamp 12 412
  ultraviolet 14 186
Vapor lock 14 274
  automobile 5 558
Vapor phase nitration 9 104 105

Vapor phase treatment petroleum 10 71
Vapor pressure 14 275 276
binary solutions 12 491
boiling point 2 276
and cavitation 2 572 575
deliquescence 4 48
dew point 4 90
distillation 4 247
efflorescence 4 414
evaporation 5 125 126
frost point 4 90
humidity 6 516
liquid 7 540
liquid vapor equilibrium 14 275
measurement 14 276
quantitative relations 14 275 276
saturation of solutions 12 38
sublimation 13 209
sulfide systems 13 246
see also Drying
Vapor pressure thermometer 7 600
Vaporization 13 209 210, 14 346
Vaporizer cryogenic 3 571
Vaquelin, L. 9 100
Var hour measurement 4 426
Var measurement *14 368 369*
Varactor 14 276
see also Parametric amplifier
Varanger Fiord 5 115
Varangerhalvöen Peninsula 5 116
Varanidae 13 22 24
Varanus komodoensis 13 22
Vardar River 5 122
Variable (parameter) 9 551
Variable area sound track 9 354 357
Variable bandwidth filter 9 133
Variable brightness nebula 9 24
Variable capacitance diode *see* Varactor
Variable density sound track 9 354 357
Variable (discrete and continuous) 14 276
Variable discriminator transducers 12 149
Variable head flow meters 5 315 318
Variable pitch recording 4 237
Variable reactance amplifier *see* Parametric amplifier
Variable real *see* Real variable
Variable resistance *see* Potentiometer (variable resistor)
Variable speed changer 1 375
Variable star 14 276 279
Argelander system 14 277
classification 14 277
cont
determination of distance 14 277
dimension of galaxy 14 277
importance 14 277
irregular variables 14 279
long period variables 14 279
mira 8 506
nomenclature 14 277
nova 9 172-173
short period variables 14 278 279
supernova 13 303
types 14 277
Varian, R. 4 519
Varian, S. 4 519
Variance 10 629
analysis of *see* Analysis of variance
biometrics 2 224
definition 13 67
Variation (algebra) 1 241
Variation (analytical chemistry) 1 394
Variation, magnetic *see* Magnetic declination
Variation method (quantum chemistry) 11 145 146
Varicella 10 428
fluorescent antibody study 8 383
Varied bunting 2 371
Varied thrush 13 615
Variegated mud loving beetle 3 278
Variety (taxonomy) 12 572
Variola 10 428
Variola major *see* Smallpox
Variolitic structure basalt 2 106
Variometer 14 279 281
declination 14 279 280
horizontal intensity 14 280
vertical intensity 14 280
Varistor 14 281
Vari-Typer Corporation's Headliner 3 348
Varley loop test 3 156
Varnish 14 281 282
japanning 7 302
stain 14 282
surface coating (protective) 13 311-312
thinner 13 603
wood 14 546
Varnish tree 12 26, 14 282*
Varnished cambric insulation 7 158
Vars *see* Volt amperes
Varve 8 139, 14 282*
Vascular bundles 14 282 284
Vascular cambium 8 242
Vascular disturbances 3 141-143
Vascular rays wood 14 524
Vascular system flower 5 328
leaf 7 440 441
Vasculogenesis 7 628
Vasoconstriction cardiovascular system 2 502, 6 484
Vasodilatation cardiovascular system 2 503, 6 484
Vasopressin 4 235, 6 479, 9 629
amino acids 1 308
endocrine mechanisms 4 593
hormone, neurohypophyseal 6 485
pituitary gland 10 251
reproductive system 11 479
Vast Fiord 5 115
Vat blue 1 4 306
Vat blue 4 4 305
Vat colors 13 542
Vat dyes 4 308 310
Vat-ester dyeing 4 310
Vat red 41 4 306
Vater, papilla of 4 161
Vaterite 2 397
Vättern, Lake 5 116
Vaucheria 1 236 3 80, 117
Vauquelin, L. N. 2 171 3 103
Veal 2 563
Vectograph 10 450 14 285*
Vectograph print 10 160
Vectolite 7 263
Vector (mathematics) 14 285
Vector (spinor) 12 618
Vector analysis quaternions 11 185
see also Calculus of tensors, Calculus of vectors
Vector diagram ac circuits 1 272
Vector field force 5 437
Vector momentum conservation 3 408
Vector *n* space 2 403 404
Vector potential magnetic *see* Magnetic vector potential
Vector product of two vectors 2 412
Vector space 9 539
Vectorcardiography 14 285 286
electrophysiology 4 528 529
Vedalia beetle 7 122
Veering wind 14 286
Vega 7 657 13 41 14 286*
Vegadex 6 421
Vegard's law 12 477
Vegetable 4 416
Vegetable fiber 5 246 250
Vegetable growing 14 286
asparagus 1 588
beet 2 130
broccoli 2 541
brussels sprouts 2 553
carrot 2 533
cauliflower 2 569
celery 2 579
collard 5 289
commercial 14 288
cucumber 5 612
eggplant 4 416
garlic 6 59
home gardening 14 286
kohlrabi 7 569
lettuce 7 478 479
okra 9 311
onion 9 326
paprika 9 541
parsley 9 568
parsnip 9 568
pea 9 600
pepper 9 627
pimento 10 232
potato, Irish 10 532 534
potato, sweet 10 534
pumpkin 11 104
turnip 14 164
Vegetable ivory 14 287
Vegetable oil 5 187
Vegetable oils (hydrogenation) 6 552
Vegetable products (food engineering) 5 407
Vegetable seed production 14 286
Vegetable tanning 7 446
Vegetable wax 14 443 444
Vegetation dew moisture 4 90
on dunes 4 293
energy sources 4 602
fog moisture 4 90
frost 5 540
plant geography 10 525
prairie 10 562-563
steppe 13 125
see also Paleobotany Postglacial vegetation and climate, Palynology entries on specific plants
Vegetation cover 12 452
Vegetation zones 2 204, 5 14, 14 287 289*
Vegetation zones (world) 14 289 291
Asia 1 584 588
coniferous forest and tundra 14 291
desert 14 289
low-latitude 14 289-290
mediterranean 14 290
mid latitude 14 290
Vegetative reproduction 11 452
Vehicle (paint) 9 493
Vehicle, automotive *see* Automotive vehicle
Vehicular telephony 5 520
Veil nebula 13 303
Veillonella 6 247, 9 28
Veillonella alcalescens 9 28, 11 15
Veillonella gazogenes 11 15
Vein (anatomy) 8 441, 14 291
blood vessels 2 269
hemorrhoids 6 414

Vacuum vessel 4 90 91
Vadose water 6 276
Vadose zone cave 2 571
Vagabond currents terrestrial 13 506
Vagina 11 474, 14 256*
  disorders 14 256
  fibrosa 13 491
  histology 11 474
  reproductive system 11 466
Vaginal disorders 14 256
Vaginal plug 11 473
Vaginismus 14 256
Vaginitis 10 256, 14 86
Vaginulina cretacea 5 433
Vagotonine 9 531
Vagus ganglion 9 47
Vagus nerve 9 557, 13 399
  cranial 3 538
  embryology 9 47
Vaigach 5 117
Vaisala radiosonde 8 318
Valanguinan substage 3 543
Valders stage 10 525
Valence 9 465, 14 256 259*
  alloy structures 1 262 263
  bond types 14 257 258
  chemical binding 3 24 26
  chemical structures 3 38 39
  criterion of maximum overlapping 14 259
  electronic structure of atoms 14 257
  oxidation number 14 258
  periodic table 10 14
  quantum theory 14 258 259
  rule of eight 14 257
Valence band 14 259
  band theory of solids 2 92
  semiconductors 12 166
Valence bond resonance *see* Resonance (molecular structure)
Valence-bond theory 3 38 39
  coordinate bond 3 458
Valence compounds 12 480
Valence crystals 12 480
Valence electron 2 91-93
  chemical structures 3 33
  free electron theory 5 499
Valence forces intermolecular 7 195
Valencia, Gulf of 5 115
Valenciantite 5 210
Valency compounds 12 477 478
Valeramide 1 303
δ-Valeramide 1 303
Valerianaceae 11 647
Valeric acid 2 474
Valeryl chloride 1 45
Valine 14 259 260
  amino acids 1 308 319
  bioassay 2 105
  in histone 9 217
  insulin structure 7 164
  plant metabolism 10 357
  in protamines 9 217
Valine—*cont*
  Protozoa 11 57
  tyrothricin 14 177
L-Valine 11 41
Vallacria 12 317
Valley change in shape 6 161
  chinook effect 1 524
  deposits 5 358
  Finger Lakes 5 273
  fiord 5 277
  foehn effect 1 524
  glaciated 6 453
  Greenland 1 521
  pattern on plains 10 258
  widening 5 358
  winds 14 495
Valley and ridge province 9 145
Valley of Ten Thousand Smokes 9 158
Valley wind 8 332
Vallisia 8 572
Vallisneria 6 393
Valonia 2 235
Valvata 4 360, 14 260*
Valvatacea 6 76
Valvatida 4 372
Valve 14 260 262
  compressor 14 262
  hydraulic turbine 14 261
  pipe 14 260
  pressure regulating 10 580
  pump 14 262
  steam engine 14 261
  throttled flow 13 615
Valve (vein) 2 500
Valve, electric *see* Electron tube
Valve relief *see* Relief valve
Valve safety *see* Safety valve
Valve action 14 262
Valve follower 14 263
Valve lifter 14 263
Valve lifter, hydraulic *see* Hydraulic valve lifter
Valve train 14 262 263
  cam action 14 263
  hydraulic valve lifter 6 529
  timing 14 264
  valve action 14 262 263
Valvifer 3 280
Valvifera 14 261 265
Valvula foraminis ovalis 2 509
Valvular disease (circulation disorders) 3 141 144
Valvular insufficiency (heart disorders) 6 358 362
Valvular stenosis 2 514
Valvulinera californica 5 431
Valvulinid 5 431
Vampire bat 2 109
Vampyrella 11 44
Vampyrellidae 11 44
*Vampyromorpha 2 645, 3 275, 14 265**
Vampyroteuthis 4 40
Vampyroteuthis infernalis 4 107, 14 265
Van Allen, J 3 502
Van Allen radiation 14 265 266
Van Allen radiation belts 14 265-266
  astronaut protection 12 542
  astronomical geophysics 1 608
  geomagnetic storms 6 143
  plasma physics 10 388
Van Alphen, P 7 508
Van Arkel de Boer process chromium 3 101
  pyrometallurgy, nonferrous 11 125
  zirconium 14 616
Van Biesbroeck, G 13 271
Van de Graaff generator 9 573*, 13 135, 14 266 268*
  operating voltage 14 267
  operation 14 266
Van de Kamp, P 2 189, 13 39
Van den Bergh reaction jaundice 3 199
Van der Hoven, J 8 354
Van der Pol oscillator 11 139
Van der Waals, J D 6 41, 13 667 14 268
Van der Waals covolume 14 334
Van der Waals equation 14 268
  intermolecular forces 7 195
  thermal expansion 13 550
Van der Waals equation of state for gases 13 568
Van der Waals forces 3 26 7 195 196
  cohesion 3 269
  intermolecular 7 195 196
Van der Waals structures 12 474 475
Van Dyke, H B 6 485
Van Laar equations 1 60
Van Leeuwen, J H 4 97
Van Leeuwenhoek, Antony 2 66, 8 348
Van Niel, C B 2 11
Van Slyke method 1 310
Van't Hoff, J H 1 243, 10 210
Van't Hoff law osmotic pressure 12 488
Van Vleck, J H 8 53 9 548
Van Vleck paramagnetism *see* Paramagnetism
Van Wijhe, J 9 531
Van Woerkom, A J J 3 315
Vanadate 14 268
Vanadinite 11 128
Vanadium 14 268 270
  alloys 14 269
  calcium reduction 14 269
  carnotite ore 2 527, 14 268
  electron configuration 4 504
Vanadium—*cont*
  extraction from ores 14 268
  extractive metallurgy 8 278
  ferrovanadium reduction 14 268
  in impsonite 7 47
  ionization potential 4 504
  magnesium reduction 14 269
  natural occurrence 14 26
  principal compounds 14 269 270
  properties of 14 269
  tool steels 14 269
Vanadium permendur 7 291 8 35
Vancocin 1 466 468
Vancomycin antibiotic 1 4 468
Vancouver Mountains 9 162
Vanderhoofia 4 80
Vandyke 10 146
Vane 3 195
Vane anemometer 1 402
  air-velocity measurement 1 221
Vanern, Lake 5 116
Vanessa 7 471
Vang 12 239
Vanguard satellite 12 34 36
Vanhornidae 6 574
Vanilla 14 270
Vanilla extract 14 270 271
Vanilla fragrans 9 373, 14 270
Vanilla planifolia 9 372, 14 27
Vanillin 6 219, 221, 14 271
Vapam 6 421
Vapor *see* Gas, Vapor pressure
Vapor coatings metal 8 280
Vapor compression saline water reclamation 12 12
Vapor compression cycle refrigeration 11 412
Vapor condenser *see* Condenser, vapor
Vapor cycle 14 271 274
  binary-vapor cycle 14 273 274
  power plant 14 271
  regenerative heat cycle 14 272
  refrigeration plant 14 271 272
  vapor steam plant 14 273 274
Vapor drying wood 14 530
Vapor lamp 14 274
  fluorescent lamp 5 347 348
  mercury vapor lamp 8 234 235
  neon glow lamp 9 36 37
  sodium vapor lamp 12 412
  ultraviolet 14 186
Vapor lock 14 274
  automobile 5 558
Vapor phase nitration 9 101 105

Vapor phase treatment petroleum 10 71
Vapor pressure 14 275 276
binary solutions 12 491
boiling point 2 276
and cavitation 2 572 575
deliquescence 4 45
dew point 4 90
distillation 4 247
efflorescence 4 414
evaporation 5 125-126
frost point 4 90
humidity 6 516
liquid 3 340
liquid vapor equilibrium 14 275
measurement 14 276
quantitative relations 14 275-276
saturation of solutions 12 58
sublimation 13 209
sulfide systems 13 246
see also Drying
Vapor pressure thermometer 7 600
Vaporization 13 209-210, 14 346
Vaporizer cryogenic 5 571
Vapsi n L 9 100
Var hour measurement 4 426
Var measurement 14 368 369
Varactor 14 276
see also Parametric amplifier
Varanger fiord 5 115
Varangerhalvöen Peninsula 5 115
Varanidae 13 22, 24
Varanus komodoensis 13 22
Vardar River 5 122
Variable (parameter) 9 551
Variable area sound track 9 354 357
Variable bandwidth filter 9 133
Variable brightness nebula 9 24
Variable-capacitance diode *see* Varactor
Variable-density sound track 9 354-357
Variable (discrete and continuum) 14 276
Variable discriminator transducers 12 148
Variable head flow meters 5 513-518
Variable pitch recording 4 257
Variable reactance amplifier *see* Parametric amplifier
Variable, real *see* Real variable
Variable resistance *see* Potentiometer (variable resistor)
Variable speed changer 1 375
Variable star 14 276 279
Argelander
Variable star—*cont*
determination of distance 14 277
dimension of galaxy 14 277
importance 14 277
irregular variables 14 279
long period variables *14 279*
mira 8 506
nomenclature 14 277
nova 9 172 173
short period variables 14 278 279
supernova 13 303
types 14 277
Varian R 4 519
Varian, S 4 519
Variance 10 629
analysis of see Analysis of variance
biometrics 2 224
definition 13 67
Variation (algebra) 1 241
Variation (analytical chemistry) 1 394
Variation, magnetic *see* Magnetic declination
Variation method (quantum chemistry) 11 145 146
Varicella 10 428
fluorescent antibody study 8 393
Varied bunting 2 371
Varied thrush 13 615
Variegated mud loving beetle 3 278
Variety (taxonomy) 12 572
Variola 10 428
Variola major *see* Smallpox
Variolitic *structure basalt* 2 106
Variometer 14 279 281
declination 14 279 280
horizontal intensity 14 280
vertical intensity 14 280
Varistor 14 281
Vari Typer Corporation's Headliner 3 348
Varley loop test 3 136
Varnish 14 281 282
japanning 7 302
stain 14 282
surface coating (protective) 13 511-512
thinner 13 603
wood 14 546
Varnish tree 12 26 14 282*
Varnished cambric insulation 7 158
Vars *see* Volt amperes
Varve 8 139 14 282*
Vascular bundles 14 282 284
Vascular cambium 8 242
Vascular disturbances 5 141-
Vascular system flower 5 525
leaf 7 440 441
Vasculogenesis 7 629
Vasoconstriction cardiovascular system 2 502, 6 484
Vasodilatation cardiovascular system 2 503, 6 484
Vasopressin 4 235 6 479, 9 629
amino acids 1 509
endocrine mechanisms *4 393*
hormone neurohypophyseal 8 485
pituitary gland 10 251
reproductive system 11 479
Vast Fiord 5 115
Vat blue 1 4 506
Vat blue 4 4 505
Vat colors 13 542
Vat dyes 4 508 510
Vat-ester dyeing 4 510
Vat red 41 4 506
Vater papilla of 4 161
Vaterite 2 597
Vattern Lake 5 116
Vaucheria 1 256 5 80 117
Vauquelin L N 2 171 5 103
Veal 2 563
Vectograph 10 450 14 295*
Vectograph print 10 160
Vectolite 7 263
Vector (mathematics) 14 295
Vector (spinor) 12 618
Vector analysis quarternions 11 185
see also Calculus of tensors Calculus of vectors
Vector diagram ac circuits 1 272
Vector field force 5 437
Vector momentum conservation 5 408
Vector n space 2 405 404
Vector potential magnetic *see* Magnetic vector potential
Vector product of two vectors 2 412
Vector space 9 339
Vectorcardiography 14 295 296
electrophysiology 4 528 529
Vedalia beetle 7 122
Veering wind 14 286
Vega 7 637 13 41 14 296*
Vegadex 6 421
Vegard's law 12 477
Vegetable 4 416
Vegetable fiber 5 246 250
Vegetable growing 14 286
asparagus 1 589
beet 2 130
broccoli 2 541
brussels sprouts 2 553
carrot 2 553
cauliflower 2 569
Vegetable growing—*cont*
cucumber 5 612
eggplant 4 416
garlic 8 59
home gardening 14 246
kohlrabi 7 569
lettuce 7 478 479
okra 9 311
onion 9 526
paprika 9 541
parsley 9 568
parsnip 9 569
pea 9 600
pepper 9 627
pimento 10 232
potato *Irish 10 532 534*
potato *sweet 10 534*
pumpkin 11 104
turnip 14 364
Vegetable ivory 14 297
Vegetable oil 5 187
Vegetable oils (hydrogenation) 8 552
Vegetable products (food engineering) 5 407
Vegetable seed production 14 296
Vegetable tanning 7 446
Vegetable wax 14 443 444
Vegetation *dew moisture* 4 90
on dunes 4 293
energy sources 4 602
fog moisture 4 90
frost 5 540
plant geography 10 525
prairie 10 562 563
steppe 13 125
see also Paleobotany Postglacial vegetation and climate Palynology entries on specific plants
Vegetation cover 12 432
Vegetation zones 2 204 3 14 14 287 289*
Vegetation zones (world) 14 289 291
Asia 1 594 588
coniferous forest and tundra 14 291
desert 14 289
low latitude 14 289 290
mediterranean 14 290
mid latitude 14 290
Vegetative reproduction 11 452
Vehicle (paint) 9 495
Vehicle automotive *see* Automotive vehicle
Vehicular telephony 5 520
Veil nebula 13 303
Veillonella 6 247 9 28
Veillonella alcalescens 9 28, 11 15
Veillonella gazogenes 11 15

Veining (metallography) 8 293, 295
Veinite 1 668
Vejovis spinigerus 1 496
Vela 3 412
Velamen 2 657
  plant epidermis 5 37
Velar phonetics 10 121
Velella 3 255, 12 346
Veliger larva 2 615, 7 232, 12 291
Veliidae 6 401
Velocity 14 292 293
  angular 14 292 293
  areal 1 528
  combined 14 293
  differentiation 4 130-131
  escape 5 68
  group 6 285
  linear 14 292
  rectilinear motion 8 601-602
  relative 11 427
  rigid body dynamics 11 572-573
  tangential 14 293
Velocity, orbital *see* Orbital velocity
Velocity, phase *see* Phase velocity
Velocity analysis 14 293 296
  instant centers 14 294 295
  relative velocity 14 293
  velocity polygon 14 293-295
Velocity diagrams turbine 14 147
Velocity of light 7 499 501
  time interval measurement 13 646
Velocity microphone 8 362
Velocity modulation principle 7 365 368
Velocity pickup vibration 14 321
Velocity potential electrolytic tank 4 188
Velocity servomechanism 12 199
Velocity of sound *see* Sound
Velocity well logging 14 472
Velon 3 75 5 244
Velvet ant 6 574
Velvet water bug 6 401
Velvety shore bug 6 401
Ven blood group 2 269
Venae cavae (circulation) 3 137-141
Vena cava inferior, anomalies 2 520
Vena contracta Borda mouthpiece 2 294
Veneer 13 119, 14 296*
  plywood 10 425
Venereal disease 14 296
  gonorrhea 6 235
  lymphogranuloma venereum 7 636
Venereal wart 11 482
Venericardia 9 614
Venetian Alps 5 117
Venetian red 10 224
Venezuelan equine encephalitis (VEE) 1 499, 4 587
Venice, Gulf of 5 115
Vening Meinesz, F A 9 411
Vening Meinesz's regional isostatic-floating theory 13 520
Venom 13 27
  oral gland 9 369
Venom apparatus 13 27
Venom gland 6 185
Venous system, comparative anatomy 2 499 500
  abdominal veins 2 500
  cardinal veins 2 499
  portal system 2 500
  sinus venosus 2 499
Ventilation 14 296-298
  air distribution 14 298
  alternating current generator 1 282
  comfort control 3 316
  convection 14 296 297
  electric rotating machinery 4 448
  equipment 14 142
  exhaust system 14 298
  marine machinery 8 123
  mechanical 14 297 298
  natural 14 296 297
Ventricle 2 516, 482, 3 137, 6 357
Ventriculus 3 280
Ventro medial nucleus 6 519
Ventura, E 8 460
Venturi tube 14 298-299
  air velocity measurement 1 221
  flow measurement 5 315-317
Venturia inaequalis 5 546, 10 308
Venturia pyrina 5 546
Venule 2 269, 14 291
Venus 14 299 301
  albedo 1 223, 14 299
  atmosphere 14 300
  echo time of radar signals 4 336
  escape velocity 5 68
  internal constitution 14 301
  phases 10 100 14 299
  spectroscopic observations 14 300
  telescopic appearance 14 299 300
  temperature 14 300-301
  transits 14 40, 301
Venus' flytrap 12 31, 128 14 301*
Venus mercenaria 3 139
Vepor Mountains 5 118
Ver du cayor 8 680
Vercors, Mountains of 5 117
Verant lens system 7 454
Verbal learning 14 301-305
  affectivity of verbal units 14 303
  basic theoretical problems 14 305
  factors in rate of 14 302 305
  individual differences 14 305
  intralist similarity 14 303
  massed vs distributed practice 14 304 305
  meaningfulness and rate of learning 14 302 303
  meaningfulness of a verbal unit 14 302
  problem solving (psychology) 10 634
  transfer 14 303 304
  types of verbal units 14 302
Verbascose 2 452, 10 380
Verdet constant 5 181
Verel 4 370, 5 244
Veretillum cynomorium 9 621
Verhoogen, J 4 341
Verifax 10 145 161
Verlandung 13 232
Vermes 14 558
Vermes Oligomera 1 429, 9 515
Vermes Polymera 1 428 429, 10 478
Vermiculite 3 165, 14 305 306*
  alteration of biotite 2 246
  clay mineral 3 165
  nonstructural properties 14 306
  structural properties 14 305 306
Vermiform appendix 1 492
Vermilingua 4 411
Vernadsky, V I 2 239
Vernal equinox 5 62, 9 372, 10 571
Verneuil, A V L 6 100
Verneuil process 5 496 6 100 101
Vernier, Pierre 14 306
Vernier 14 306
Vernier discriminations vision 14 358
Vernier scale 14 306
Vernon, J 10 127
Vernon, M D 10 7
Vernonia method 12 169
Verona, I 11 114 14 217
Verruca (wart) 14 386
Verruca 4 41
Verruca stroemia 14 306
Verrucomorpha 13 608, 14 306 307*
Verruga peruana 2 532
Versene *see* Ethylenediamine tetraacetic acid
Versor 11 186
Vertebra 14 307 308
Vertebra—*cont.*
  acelous 12 354
  amphicoelous 12 354
  articular process 12 363
  atlas 12 363
  axis 12 363
  bird 14 308
  caudal 12 363
  centrum 12 363
  cervical 12 363
  chevron 12 363
  exopophysis 12 363
  in fish 14 307
  hemal arch 12 363
  heterocoelous 12 354
  human 14 307
  intercentrum 12 363
  lumbar 12 363
  mammal 14 308
  neural arch 12 363
  number in animals 14 307
  opisthocoelous 12 354
  other forms 14 307 309
  procoelous 12 354
  reptile 14 307
  sacral 12 363
  spinal process 12 363
  thoracic 12 363
  transverse process 12 363
  vertebral column 14 308
  zygopophysis 12 363
Vertebrae morphogenesis of tail 12 354
Vertebral column 12 358
Vertebral column, morphogenesis 12 354
Vertebrata 14 308
  Agnatha 1 112 115, 14 309
  coelom 5 265
  Gnathostomata 6 226*, 14 308
  Pisces (zoology) 10 212 213
  Tetrapoda 13 510 551
Vertebrates regeneration 11 421 424
Vertex angle 1 404
Vertical circle (celestial navigation) 2 581
Vertical conveyors 3 450
Vertical disk recording 4 258
Vertical flow tank 12 223
Vertical gyro 6 309
Vertical illumination microscope 8 495
Vertical intensity variometer 14 280
Vertical leaf pressure filter 5 397
Vertical lift bridge 2 334
Vertical retort process (zinc) 11 119 14 614
Vertical speed indicator 11 316 317
Vertical stabilizer aircraft 13 51
Vertical step and repeat microfilming camera 10 147

Vertical tail assembly 13 546
Vertical take-off and landing (VTOL) 14 508 510
convertiplane 3 415
helicopter 6 583 589
Vertical turbine pump 2 653
Verticillium 8 570 10 534, 13 172
Verticillium albo atrum 3 513 9 408 11 341 13 292
Verticillium wilt 3 514
Vertumn VI 10 210
Very high frequency radio waves 11 260
aviation radiotelephony 1 364
oscillators 9 422
radio spectrum allocations 11 260
television 13 457
Very low frequency radio waves 11 260
Vesicant 3 44
Vesicular structure basalt 2 106
igneous rock 7 12 13
Vespa crabro germana 6 582
Vespa maculata 6 496 12 407
Vespa vulgaris 12 407
Vespidae hornet 6 496
Hymenoptera 6 574
social insects 12 405
wasp 14 387
Vespula 12 406
Vespula (Dolichovespula) maculata 6 582
Vespula (Vespula) 6 582
Vessel pressure *see* Pressure vessel
Vest Spitsbergen 1 525
Vesta 1 596 597
Vestigial sideband radio transmission 1 352
compared to SSB 1 352
principle 1 352
spectrum occupancy 1 352
television picture transmission 13 458
Vesuvius 5 120 14 353
Vetch 14 310-311
crown vetch 14 310
diseases 14 310
insect pests 14 310
Vevers, H 9 344
VFR 1 163 164
vhf antenna 1 443 453
see also Antenna (aerial)
vhf omnidirectional radio range 11 256
Viaduct 14 80 81
Vianaidae 6 401
Vibrio 6 586
Vibraculum 2 356
Vibrating conveyor 2 868
Vibration 14 311 316
aeroelastic 1 92
Vibration—*cont*
analogy between vibrating system and electric circuit 4 315
atomic 1 407 6 542 565*
beats 2 126
contrasted with oscillation 9 419
degree of freedom 14 311 312
diaphragm 14 314
of elastic bodies 14 313
energy considerations 14 312
external driving force 14 312
harmonics 6 559
lattice 7 412 415
of marine propellers 11 14
measuring equipment 14 315 316
mechanical 14 311
membranes 14 313 314
mode 8 523
of molecules 8 548 556
musical instruments 8 665 667
nonlinear systems 14 312
periodic motion 10 13
plate 14 314
resonant vibrators 14 316
rods 14 313 315
rotating body 12 259
several degrees of freedom 14 312 313
of ships 12 280 281
solid body 14 311
of strings 8 661* 14 313
stroboscopic measurement and observation 13 186
sympathetic 13 365
transverse 14 312
two degrees of freedom 14 312
wave motion 14 425 429
Vibration bridge *see* Bridge vibration
Vibration curve 4 132 139
Vibration damping 14 316 318
friction 14 317
inherent 14 317
magnetic 14 317
numerical values 14 317 318
Vibration forced *see* Forced oscillation
Vibration frequency indicator 14 315
Vibration isolation 14 318 320
center-of gravity system 14 319
location of isolators 14 319 320
natural frequency 14 318 319
passive isolation 14 318
Vibration isolation—*cont*
radius of gyration system 14 319 320
resilient medium 14 319
resonance 14 318 319
source isolation 14 318
underneath mounting system 14 319
Vibration machine 14 320 321
direct drive 14 320
electrodynamic 14 321
reaction type 14 321
Vibration measurement aircraft testing 1 189
Vibration meter 14 315 316
Vibration pickup 14 316 321*
musical instruments 8 667
seismic 12 493
sound 12 510
Vibration rotation spectra (molecules) 8 552 554
Vibrato musical acoustics 8 661 662
Vibrator 9 419 14 321 325*
chopper 5 80
interrupter 14 322
inverter 7 235
power 14 321 323
signal chopper 14 323
synchronous 14 322 323
Vibratory motion *see* vibration
Vibrio antibiotics action against 1 466 467
bacterial metabolism 2 33
Pseudomonadales 11 65
Spirillaceae 13 1
Vibrio cumma bacterial motility 2 63
Pseudomonadineae 11 66
Spirillaceae 13 2
water borne disease 14 411
Vibrio fetus 3 81 11 66
Vibrio metschnikovi 3 84
Vibrion septique see Clostridium septicum
Vibrissa 6 517 518
Vibrograph 14 315 316
Vibrometer 14 315 316
Viburnum 4 293
Vicallow 8 55
Viceroy butterfly 2 381
Vicia angustifolia 14 310
Vicia articulata 14 310
Vicia bengalensis 14 310
Vicia cracca 14 310
Vicia dasycarpa 14 310
Vicia ervilia 14 310
Vicia faba 6 511 8 672 14 310
Vicia monantha 14 310
Vicia pannonica 14 310
Vicia sativa 14 310
Vicia villosa 14 310
Vickers hardness scale 6 337
Vickers penetration hardness testing method 8 275
Victorella 6 439
Victoria Lake 1 107
Victoria blue B 4 302
Victoria Falls 1 107
Victoria Island 1 529
Victoria Land 1 460
Victoria Strait 9 160
Victorio Peak limestone 10 21
Vicuna 14 525
Video amplifier 14 325 321
Video recording 13 458
Video tape recording 13 458
Video transformer 14 27 28
Vidicon 13 465
closed circuit television 13 465
film cameras 13 461
television camera tube 13 465
ultraviolet sensitive 13 466
x ray sensitive 13 466
Vierwaldstatter Lake 5 116
View camera 2 430
View finder optical 2 431
Vigna unguiculata 2 115
Vignetting geometrical optics 9 366
optical lenses 7 452
Villefranchian fauna 5 477
Villikinine 4 172
Villus 4 152 160 5 295
Vinactane *see* viomycin
Vinca 13 122
Vincent's angina 13 4 14 324
Vincente R 4 350
Vinegar 14 324 326
Achromobacteraceae 1 59
bacteria 1 51
fermentation 5 215
processes 14 325
types 14 324
Vinegar eel 2 601
Vinegar fly 4 212
Vinegaroon 14 235
Vinogradov density gradient method 14 180
Vinogradov A P 2 259
Vinogradov I M 9 225
Vinyl 10 407
Vinyl acetate 10 495
Vinyl acetal resin varnishes 8 27
Vinyl carbazole 10 495
Vinyl chloride 3 75 10 496
Vinyl ethers 5 85
Vinyl 2-ethylhexoate 10 497
Vinyl films 10 405
Vinyl fluoride 10 496
Vinyl halides 6 526
Vinyl methyl ether 10 496
Vinyl oleate 10 497
Vinyl polymerization inhibitor (chemical) 7 110 111
Vinyl resin 14 326
paint 9 493
see also Polyvinyl resin
Vinyl silicon trichloride 12 325
Vinyl stearate 10 497
Vinylacetic acid 5 80

Vinylacetylene 1 245
Vinylbenzene 6 535
see also Styrene
9-Vinylcarbazole 2 450
Vinylidene chloride 3 75, 10 496
Vinylidene fluoride 10 471
Vinylite 3 75
Vinylite records 4 239 243
Vinylogy 15 326 327
2 Vinylpyridine 11 110
N-Vinylpyrrolidone 7 377
Vinyltrichlorosilane 12 322 323
Vinyon HH 5 244
Viocin *see* viomycin
Vioform 11 193
Viola 3 188
Viola (musical instrument) 8 666
Violacein 11 546
Violanin 1 454
Violaxanthin 2 530
Violet pigments 10 224
Violin 8 667
Viomycin 1 464-468, 7 314, 14 327*
Viper 5 215, 13 27
Viperidae 13 27
Viral hepatitis 7 302-303, 562
Viral leukemias, mouse *see* Mouse viral leukemias
Virales 14 327-328
Virchow, R 9 595
Vireo 14 328
Vireo griseus 14 328
Vireo olivaceus 14 328
Vireonidae 14 328
Virgin Islands 14 475
Virgin wool 14 551
Virginia deer 4 42
Virginia snakeroot 1 532
Virginids 8 308
Virgo 3 412-413, 14 328
Virgo cluster 6 8
Virgularia 3 255, 9 622
Virial coefficients 13 63-64
Virial equation 14 328
Beattie-Bridgeman equation 2 127
Virial theorem 2 305
Viridin 10 316
Virology 14 331
Virtual image 7 29 30
Virtual work, principle of 14 328-329
Virulence 1 472, 14 329-330*
bacteriology, medical 2 68
contributions of host 14 330
endotoxins 14 330
exotoxins 14 329
extracellular enzymes and activators 14 330
microbial contributions to 14 329
microbial factors 14 330
pathogen 9 593
Virulence—*cont*
phagocytosis 10 91
streptokinase 14 330
surface components and phagocytosis 14 330
Virus 1 125, 8 348, 14 330-332*
actinophage 1 57
animal 1 423
arbor group B 4 62
bacteriophage 2 69
biochemistry 2 199
in cancer 14 332
chemical composition 14 331
culture, tissue 5 620
ECHO *see* ECHO virus
fluorescent-antibody technique 8 383
Microtatobiotes 8 403
milk 8 432
mutation 14 331
pathogen 9 593
plant virus 10 382-385
reproduction 14 331
ribonucleic acid 11 562
shape 14 330-331
size 14 330 331
soil microorganisms 12 462
structure 14 331
wart 14 386
see also Animal virus, Plant virus
Virus disease, salivary gland 12 14
Virus interference immunity 7 34
Virus yellows sugar beet 13 241
Viruses, tumor *see* Tumor viruses
Vis viva integral 6 265
Visayan Islands 9 482 483
Visceral arch 4 152, 11 513, 12 356
Visceral leishmaniasis 7 449
Visceral lymphomatosis *see* Lymphosarcoma
Visceral muscle 8 635
Visceral pouch 4 151
Visceral reflex arc 13 364
Viscerocranium 12 358
Viscometer 14 333
capillary 14 333
falling sphere 14 333
Ostwald 14 333
Viscose 2 620-626
Viscose process 5 243, 14 526
Viscose rayon 10 403
Viscosity 8 558
absolute 5 522
Avogadro number 1 697
flow of fluids 5 521
of gases *see* Viscosity of gases
and heat convection 3 441
at high pressures 6 447
hydraulics 6 530
Viscosity—*cont*
kinematic 14 332 334
of liquids *see* Viscosity of liquids
measurement 14 333
metal 8 269 270
molecular weight determination 8 558
molecular weight of polymers 10 478
Reynolds number 11 540
and rheology 11 544
rubber 11 637
steam 13 77
units of measurement 5 522
Viscosity-index improver (lubricant) 7 603
Viscosity of gases 7 554-555, 14 332
Viscosity of liquids 8 558, 14 332-334
kinematic viscosity 14 333
pressure 14 334
temperature-dependence 14 334
Viscous damping 14 316 317
control systems 5 437
vibration damping 14 316-317
see also Damping
Viscous flow 5 522, 6 541, 14 332-334*
Bernoulli's equation 5 524
boundary layer 2 307 311
in solids (creep) 12 479
see also Streamline flow
Viscous force 14 332
Viscous friction *see* Friction
Viscous magnetization 11 595
Viscous shear 14 333
Viscum album 8 517 12 25
Visean series 2 469
Vishnuites decipiens zone 14 82
Visibility airport 1 95
fog 5 366
under water 12 106
weather station 14 458
Visibility meter 10 172 175
Visible horizon 6 479
Visible radiation *see* Light
Visible spectrophotometry 12 584
Visible spectrum 12 586 587
see Light
Visible speech 10 121
Vision 7 125, 12 309, 14 334 359*
after-image 14 339
anatomical basis 14 335
atypical stimuli 14 334 335
behavior, ontogeny of 2 143
binocular 13 128
blindness 2 261
color 3 292, 299
eye glasses 5 172
Vision—*cont*
foveal 14 336
human 14 334
peripheral 14 336 338
photopic 5 170, 14 335 338
scotopic 5 170, 14 335-336
sensory learning 12 182
space perception 14 337 338
stereoscopic 13 128
time perception 14 337 338
visual acuity 14 337-338
visual stimuli 14 334 335
white 14 489
Vision and action patterns 2 145
VistaVision 3 127-128
Vistula River 5 122
Visual acuity 14 337-338
Visual binaries 2 186 187
see also Binary stars
Visual colorimetry 3 301-302
Visual comparators 3 329 330
Visual cortex 14 335
Visual flight rules (VFR) 1 163 164
Visual learning 12 183
Visual perception *see* Vision
Visual photometer 10 170
Visual purple 5 162 171, 14 336, 341
Visual spectroscopy 12 586
Vitaceae 11 543
Vital capacity 11 528
Vital staining 5 191
Vitallium 1 259, 3 247
Vitamin 14 339 340
alpha carotene 14 340
para-Aminobenzoic acid 1 319
ascorbic acid 1 574
bacterial coenzyme 2 13
bacterial nutrition 2 65
beta carotene 14 340
bioassay 2 193
biochemistry 2 199
biotin 2 245
choline 3 85
daily allowances 14 341
deficiency 4 102
fat soluble 14 339
folic acid 5 369
food 5 371
inositol 7 121
niacin 9 92
nutrition 9 235
pantothenic acid 9 537
production by yeast 14 604
pyorrhea 11 107
quantitation in clinical pathology 3 192 202
riboflavin 11 561
supplements, animal feed composition 1 426
swine production 15 541
thiamine 15 508
vitamin A 14 340
vitamin Bd 14 341

Vitamin—cont
vitamin B_{12} 14 342
vitamin D 14 345
vitamin K 14 344
water soluble 14 339
Vitamin A 14 340 341
blood plasma constituents 2 266
carotenoid 2 528
deficiency effects 4 236
food 5 371
production 14 341
shark liver oil 12 243
value in nutrition 14 340
Vitamin B_6 5 369
Vitamin B_1 *see* Thiamine
Vitamin B_2 see Riboflavin
Vitamin B_3 *see* Pantothenic acid
Vitamin B_6 14 340, 341 342*
bioassay 2 194
cycloserine 5 644
daily requirement 14 342
deficiency 14 341
food 5 371
pyridoxine 4 236
Vitamin B_{12} 4 236, 14 340, 342 343*
bioassay 2 194
daily requirement 14 342
deficiency 14 342
food 5 371
production 13 179 14 342 343
Propionibacteriaceae 11 16
synthesis 14 342
Vitamin B complex deficiency 14 924
see also Adenylic acid Biotin Folic acid, *Inositol* Niacin, PABA, Pantothenic acid Riboflavin Thiamine, Vitamin B_6, Vitamin B_{12}
Vitamin C *see* Ascorbic acid
Vitamin D 4 236 14 340 343 344*
biochemistic aspects 2 200
daily dietary allowance 14 345
deficiency 10 545
industrial production 14 345 344
milk 8 430 431
rickets 11 566
Vitamin D_2 14 343
Vitamin D_3 *see* 7 Dehydrocholesterol activated
Vitamin E 5 371 14 340 344*
deficiency 4 256 14 344
food 5 371
production 14 344
pyran 11 109
requirements 14 344
Vitamin G see Riboflavin
Vitamin H *see* Biotin
Vitamin K 14 340 344 345*
Vitamin K—cont
blood coagulation 2 266
deficiency disease 4 256
food 5 371
production 14 345
vitamin K_1 11 195, 14 344 345
vitamin K_2 11 195, 14 344 345
vitamin K_3 14 344 345
Vitamin M 5 369
Vitelline arteries 2 484
Vitelline membrane (invertebrate embryology) 7 226
Vitelline membrane (ovum) 9 460
Vitelline veins changes during development 2 485
Viticulture *see* Grape culture
Vitiligo pigmentation 10 225
Vitis 5 189, 6 251 7 436 12 79
Vitis labruscana 6 251
Vitis labrusca 6 251
Vitis rotundifolia 6 251
Vitis vinifera 6 251 14 506
Vitrain 5 229 232 235
Vitreledonella 4 40
Vitreoscilla filiformis 2 132
Vitreoscillacea 2 132
Vitreous body (eye) 5 166
Vitreous chamber (eye) 5 166
Vitreous enamels 8 285
Vitric tuff 14 154
Vitrification temperatures 2 163
Vitrified zircon 10 512 513
Vitrinite 5 232
Vitriolic acid *see* Sulfuric acid
Vitrophyres 7 11 10 521, 11 560
Viverridae 2 523 5 149
Vivianite 14 345 346
annabergite 14 345 346
erythrite 14 345
odontolite 14 345
Viviparidae 9 609
Viviparus 12 603
Vocal cords 14 546
Vocoder 14 516
capacity 7 101
Vodka 4 253 255
Voges Proskauer test 12 14
Vogesite 7 389
Vogt W 4 581 5 191
Voice box *see* Larynx
Voice coil 12 204
Voice operated antiregeneration (radiotelephony) 5 364
Voice operated carrier (radiotelephony) 5 364
Voids ratio of soils 12 452
Voigt W 8 67
Voigt *effect magnetooptics* 8 67 68
Volan 5 412 414*
Volatilization 14 346 347
Volatilization processes nonferrous pyrometallurgy 11 123
Volcanic ash 11 116, 14 135 154
alteration to bentonite 5 162
Andosols 12 454
origin of bentonites 2 165
in shale 12 241
siliceous sediments 12 140
Volcanic breccia 2 526, 14 555
Volcanic caldera 14 550
Volcanic dome 14 550
Volcanic earthquakes 12 130
Volcanic eruptions 14 548 555
earthquakes 14 555
submarine 14 550
surface deformations 14 554
tsunamis 14 555
types 14 554
volcanology 14 554
see also Volcano Volcanology
Volcanic fumaroles 6 525
Volcanic gases 14 543
Volcanic glass 14 547 548
alteration to montmorillonite 2 163
alteration in sediments 12 140
composition 14 549
devitrification 14 548
formation 14 549
obsidian 9 244
perlite 10 21
pitchstone 10 215
rhyolite 11 560
structure 14 547
texture 14 547
water content 14 547 549
Volcanic landforms 14 550
Volcanic mudflows 14 550
Volcanic rocks 7 15
Volcanic vents 10 421 14 548
types 14 548
Volcano 5 120 14 548 551*
andesitic 13 413
atmospheric gases origin of 1 631
basaltic 13 413
composite 14 550
Europe 5 120
fault occurrence 12 149
oceanic islands 9 261
products 14 548 550
pyroclastic *materials* 11 116, 14 135 154 549
seamount 12 122
shield 14 550
structure types 10 84
submarine 9 261, 14 550
tumuli 14 549
types 14 548
see also Igneous rocks, Lava, Magma, Volcanology, specific names of *volcanoes*
Volcanology 14 551 555
composition of *magma* 14 553
earth vibrations 14 555
energy sources 4 602
physical properties of magma 14 553 554
surface deformations 14 554
types of eruptions 14 554
Volchovo Volhovbis 9 542
Volet, C 13 515
Volga River 5 122
Volgian stage 7 325
Volhard titration 13 605
Volmer M 5 586
Volt 14 559
absolute 4 458 459
reactive 4 456 14 568
Volt ampere hour measurement 4 426
Volt amperes 1 274, 14 568 569*
measurement 14 568 569
Volt-ohm milliammeter 14 574
Volta, A 2 232 4 455 462
Volta effect 13 581
Volta River 1 109
Voltage Ohm's law 9 277
Kirchhoff's law 7 565
see also Potential electric Potential difference
Voltage addition (analog) 1 569 570
Voltage amplifier 14 555 560
audio amplifier 14 557 558
cascode amplifier 2 557
cathode follower stages 14 558 559
differential 14 560
direct coupled 14 555 559 560
grounded grid 14 559
impedance-coupled 14 557
impedance matching 7 37 38
preamplifier 10 565
rc coupled 14 555 557
transformer coupled 14 557 558
tuned 14 555
video 14 555
Voltage *divider* networks 4 192
potentiometer 10 542
Voltage doubler 14 568 567
Voltage drop 4 222
Kirchhoff's law 7 565
transient, electric 14 51
wiring (electric) 14 522
Voltage measurement 14 560 561

Vinylacetylene 1 245
Vinylbenzene 6 535
  see also Styrene
9-Vinylcarbazole 2 450
Vinylidene chloride 3 75, 10 496
Vinylidene fluoride 10 471
Vinylite 3 75
Vinylite records 4 259 263
Vinylogy 13 326 327
2 Vinylpyridine 11 110
N-Vinylpyrrolidone 7 377
Vinyltrichlorosilane 12 322 323
Vinyon HH 5 244
Viocin *see* viomycin
Vioform 11 193
Viola 3 188
Viola (musical instrument) 8 666
Violacein 11 546
Violanin 1 454
Violaxanthin 2 530
Violet pigments 10 224
Violin 8 667
Viomycin 1 464-468, 7 314, 14 527*
Viper 5 215, 13 27
Viperidae 13 27
Viral hepatitis 7 302 303, 562
Viral leukemias, mouse see Mouse viral leukemias
Virales 14 327-328
Virchow, R 9 593
Vireo 14 328
Vireo griseus 14 328
Vireo olivaceus 14 328
Vireonidae 14 328
Virgin Islands 14 475
Virgin wool 14 551
Virginia deer 4 42
Virginia snakeroot 1 552
Virginids 8 308
Virgo 3 412 413, 14 328
Virgo cluster 6 8
Virgularia 3 255, 9 622
Virial coefficients 13 63 64
Virial equation 14 328
  Beattie Bridgeman equation 2 127
Virial theorem 2 505
Viridin 10 516
Virology 14 331
Virtual image 7 29 30
Virtual work, principle of 14 328-329
Virulence 1 472, 14 329-330*
  bacteriology, medical 2 68
  contributions of host 14 330
  endotoxins 14 330
  exotoxins 14 329
  extracellular enzymes and activators 14 330
  microbial contributions to 14 329
  microbial factors 14 330
  pathogen 9 593
Virulence—*cont*
  phagocytosis 10 91
  streptokinase 14 330
  surface components and phagocytosis 14 330
Virus *1* 125, 8 548, 14 330 332*
  actinophage 1 57
  animal 1 423
  arbor group B 4 62
  bacteriophage 2 69
  biochemistry 2 199
  in cancer 14 332
  chemical composition 14 331
  culture, tissue 5 620
  ECHO *see* ECHO virus
  fluorescent-antibody technique 8 383
  Microtatobiotes 8 403
  milk 8 452
  mutation 14 331
  pathogen 9 593
  plant virus 10 382-385
  reproduction 14 331
  ribonucleic acid 11 562
  shape 14 330 331
  size 14 330 331
  soil microorganisms 12 462
  structure 14 331
  wart 14 386
    see also Animal virus, Plant virus
Virus disease, salivary gland 12 14
Virus interference, immunity 7 34
Virus yellows, sugar beet 13 241
Viruses, tumor *see* Tumor viruses
Vis viva integral 6 265
Visayan Islands 9 482 483
Visceral arch 4 152, 11 513, 12 336
Visceral leishmaniasis 7 449
Visceral lymphomatosis *see* Lymphosarcoma
Visceral muscle 8 635
Visceral pouch 4 151
Visceral reflex arc 13 564
Viscerocranium 12 358
Viscometer 14 333
  capillary 14 333
  falling sphere 14 333
  Ostwald 14 333
Viscose 2 620 626
Viscose process 5 243, 14 526
Viscose rayon 10 403
Viscosity 8 558
  absolute 5 322
  Avogadro number 1 697
  flow of fluids 5 321
  of gases *see* Viscosity of gases
  and heat conduction 3 441
  at high pressures 6 447
  hydraulics 6 550
Viscosity—*cont*
  kinematic 14 332 334
  of liquids *see* Viscosity of liquids
  measurement 14 333
  metal 8 269 270
  molecular weight determination 8 558
  molecular weight of polymers 10 478
  Reynolds number 11 540
  and rheology 11 544
  rubber 11 637
  steam 13 77
  units of measurement 5 322
Viscosity index improver (lubricant) 7 603
Viscosity of gases 7 354-355, 14 332
Viscosity of liquids 8 558, 14 332-334
  kinematic viscosity 14 333
  pressure 14 334
  temperature dependence 14 334
Viscous damping 14 316 317
  control systems 5 437
  vibration damping 14 316 *317*
  see also Damping
Viscous flow 5 322, 6 541
  14 332 334*
  Bernoulli's equation 5 324
  boundary layer 2 307 311
  in solids (creep) 12 479
  see also Streamline flow
Viscous force 14 332
Viscous friction *see* Friction
Viscous magnetization 11 595
Viscous shear 14 333
Viscum album 8 517, 12 25
Viscan series 2 469
Vishnuites decipiens zone 14 82
Visibility, airport 1 95
  fog 5 366
  under water 12 106
  weather station 14 458
Visibility meter 10 172 175
Visible horizon 6 479
Visible radiation *see* Light
Visible spectrophotometry 12 584
Visible spectrum 12 586 587
  see Light
Visible speech 10 121
Vision 7 125, 12 309, 14 334 339*
  after image 14 339
  anatomical basis 14 335
  atypical stimuli 14 334-335
  behavior, ontogeny of 2 145
  binocular 13 128
  blindness 2 261
  color 3 292, 299
  eye glasses 5 172
Vision—*cont*
  foveal 14 336
  human 14 334
  peripheral 14 336 338
  photopic 5 170, 14 335-3
  scotopic 5 170, 14 335-336
  sensory learning 12 182
  space perception 14 337-3
  stereoscopic 13 128
  time perception 14 337 3
  visual acuity 14 337 339
  visual stimuli 14 334 33
  white 14 489
Vision and action patterns 2 145
VistaVision 5 127-128
Vistula River 5 122
Visual acuity 14 337-338
Visual binaries 2 186 187
  see also Binary stars
Visual colorimetry 5 301 302
Visual comparators 5 329 33
Visual cortex 14 335
Visual flight rules (VFR) 1 16 164
Visual learning 12 183
Visual perception *see* Vision
Visual photometer 10 170
Visual purple 5 162 171, 14 33 341
Visual spectroscopy 12 586
Vitaceae 11 543
Vital capacity 11 528
Vital staining 5 191
Vitallium 1 259, 3 247
Vitamin 14 339 340
  alpha carotene 14 340
  para-Aminobenzoic acid *1 319*
  ascorbic acid 1 574
  bacterial coenzyme 2 15
  bacterial nutrition 2 65
  beta carotene 14 340
  bioassay 2 193
  biochemistry 2 199
  biotin 2 245
  choline 3 85
  daily allowances *14 343*
  deficiency 4 102
  fat soluble 14 339
  folic acid 5 369
  food 5 371
  inositol 7 121
  niacin 9 92
  nutrition 9 233
  pantothenic acid 9 557
  production by yeast 14 604
  pyorrhea 11 107
  quantitation in clinical pathology 5 192 202
  riboflavin 11 561
  supplements, animal feed composition 1 426
  swine production 13 541
  thiamine 13 508
  vitamin A 14 340
  vitamin B_{12} 14 341

Vitamin—cont
vitamin B_{12} 14 342
vitamin D 14 343
vitamin K 14 344
water soluble 14 339
Vitamin A 14 340 341
blood plasma constituents 2 266
carotenoid 2 328
deficiency effects 4 236
food 5 371
production 14 341
shark liver oil 12 245
value in nutrition 14 340
Vitamin B_6 5 369
Vitamin B_1 *see* Thiamine
Vitamin B_2 *see* Riboflavin
Vitamin B_3 *see* Pantothenic acid
Vitamin B_4 14 340, 341 342*
bioassay 2 194
cytosterine 3 644
daily requirement 14 342
deficiency 14 341
food 5 371
pyridoxine 4 236
Vitamin B_{12} 4 236, 14 340, 342-343*
bioassay 2 194
daily requirement 14 342
deficiency 14 342
food 5 371
production 13 179 14 342 343
Propionibacteriaceae 11 16
synthesis 14 342
Vitamin B complex deficiency 14 324
see also Adenylic acid, Biotin Folic acid, Inositol, Niacin, PABA Pantothenic acid, Riboflavin, Thiamine Vitamin B_6 Vitamin B_{12}
Vitamin C *see* Ascorbic acid
Vitamin D 4 236 14 340 343 344*
bioclimatic aspects 2 200
daily dietary allowance 14 343
deficiency 10 343
industrial production 14 343 344
milk 8 430 431
rickets 11 566
Vitamin D_2 14 343
Vitamin D_3 *see* 7 Dehydrocholesterol activated
Vitamin E 5 371 14 340, 344*
deficiency 4 236 14 344
food 5 371
production 14 344
pyran 11 108
requirements 14 344
Vitamin G *see* Riboflavin
Vitamin H *see* Biotin
Vitamin K 14 340 344 345*
Vitamin K—*cont*
blood coagulation 2 266
deficiency disease 4 236
food 5 371
production 14 345
vitamin K_1 11 195, 14 344 345
vitamin K_2 11 195, 14 344 345
vitamin K_3 14 344 345
Vitamin M 5 369
Vitelline arteries 2 484
Vitelline membrane (invertebrate embryology) 7 226
Vitelline membrane (ovum) 9 460
Vitelline veins changes during development 2 495
Viticulture *see* Grape culture
Vitiligo pigmentation 10 225
Vitis 3 184 6 251 7 436 12 79
Vitis labruscana 6 251
Vitis labrusca 6 251
Vitis rotundifolia 6 251
Vitis vinifera 6 251, 14 506
Vitrain 3 229 232 233
Vitreledonella 4 40
Vitreoscilla filiformis 2 132
Vitreoscillacea 2 132
Vitreous body (eye) 5 166
Vitreous chamber (eye) 5 166
Vitreous enamels 8 285
Vitric tuff 14 134
Vitrification temperatures 5 165
Vitrified zircon 10 512 513
Vitrinite 3 232
Vitriolic acid *see* Sulfuric acid
Vitrophyres 7 11 10 521 11 560
Viverridae 2 525 5 148
Vivianite 14 345 346
annabergite 14 345 346
erythrite 14 345
odontolite 14 345
Viviparidae 9 609
Viviparus 12 603
Vocal cords 14 346
Vocoder 14 346
capacity 7 101
Vodka 4 255 255
Voges Proskauer test 12 14
Vogesite 7 389
Vogt W 4 581 5 191
Voice box *see* Larynx
Voice coil 12 204
Voice operated antiregeneration (radiotelephony) 1 364
Voice operated carrier (radiotelephony) 1 364
Voids ratio of soils 12 452
Voigt W 8 67
Voigt effect magnetooptics 8 67 68
Volan 3 412 414*
Volatilization 14 346 347
Volatilization processes nonferrous pyrometallurgy 11 123
Volcanic ash 11 116, 14 133 134
alteration to bentonite 5 162
Ando soils 12 434
origin of bentonites 2 163
in shale 12 241
siliceous sediments 12 140
Volcanic breccia 2 526 14 133
Volcanic caldera 14 350
Volcanic dome 14 350
Volcanic earthquakes 12 150
Volcanic eruptions 14 348 355
earthquakes 14 355
submarine 14 350
surface deformations 14 354
tsunamis 14 355
types 14 354
volcanology 14 354
see also Volcano, Volcanology
Volcanic fumaroles 6 325
Volcanic gases 14 353
Volcanic glass 14 347 349
alteration to montmorillonite 2 165
alteration in sediments 12 140
composition 14 349
devitrification 14 348
formation 14 348
obsidian 9 244
perlite 10 21
pitchstone 10 215
rhyolite 11 560
structure 14 347
texture 14 347
water content 14 347 349
Volcanic landforms 14 350
Volcanic mudflows 14 350
Volcanic rocks 7 16
Volcanic vents 10 421 14 348
types 14 348
Volcano 5 120, 14 348 351*
andesitic 13 413
atmospheric gases origin of 1 631
basaltic 13 413
composite 14 350
Europe 5 120
fault occurrence 12 149
oceanic islands 9 261
products 14 348 350
pyroclastic materials 11 116 14 133 134 349
seamount 12 122
shield 14 350
structure types 10 84
submarine 9 261 14 350
tumuli 14 349
types 14 348
see also Igneous rocks Lava Magma, Volcanology, specific names of volcanoes
Volcanology 14 351 355
composition of magma 14 355
earth vibrations 14 355
energy sources 4 602
physical properties of magma 14 353 354
surface deformations 14 354
types of eruptions 14 354
Volchkia volborthi 9 342
Volet, C. 13 515
Volga River 5 122
Volgian stage 7 325
Volhard titration 13 605
Volmer, M 5 586
Volt 14 355
absolute 4 458 459
reactive 4 456 14 368
Volt ampere hour measurement 4 426
Volt amperes 1 274 14 368 369*
measurement 14 368 369
Volt-ohm milliammeter 14 374
Volta A 2 292 4 455 462
Volta effect 13 581
Volta River 1 109
Voltage Ohm's law 9 277
Kirchhoff's law 7 363
see also Potential electric, Potential difference
Voltage addition (analog) 1 369 370
Voltage amplifier 14 355 360
audio amplifier 14 357 35
cascode amplifier 2 537
cathode follower stages 14 358 359
differential 14 360
direct coupled 14 355, 35 360
grounded grid 14 359
impedance coupled 14 3
impedance matching 7 5 58
preamplifier 10 565
rc coupled 14 355 357
transformer coupled 14 357 358
tuned 14 355
video 14 355
Voltage divider networks 4 192
potentiometer 10 542
Voltage doubler 14 366 367
Voltage drop 4 222
Kirchhoff's law 7 363
transient, electric 14 3
wiring (electric) 14 5
Voltage measurement 14 361
electrometer 4 498

Vinylacetylene 1 245
Vinylbenzene 6 535
  see also Styrene
9 Vinylcarbazole 2 450
Vinylidene chloride 3 75, 10 496
Vinylidene fluoride 10 471
Vinylite 3 75
Vinylite records 4 239 243
Vinylogy 13 526-527
2-Vinylpyridine 11 110
N-Vinylpyrrolidone 7 577
Vinyltrichlorosilane 12 322-323
Vinyon HH 5 244
Viocin *see* viomycin
Vioform 11 193
Viola 3 188
Viola (musical instrument) 8 666
Violacein 11 546
Violanin 1 454
Violaxanthin 2 530
Violet pigments 10 224
Violin 8 667
Viomycin 1 464-468, 7 514, 14 527*
Viper 5 215, 13 27
Viperidae 13 27
Viral hepatitis 7 302 303, 562
Viral leukemias, mouse *see* Mouse viral leukemias
Virales 14 527-528
Virchow, R 9 595
Vireo 14 528
Vireo griseus 14 528
Vireo olivaceus 14 528
Vireontidae 14 528
Virgin Islands 14 475
Virgin wool 14 551
Virginia deer 4 42
Virginia snakeroot 1 532
Virginids 8 308
Virgo 3 412-413, 14 528
Virgo cluster 6 8
Virgularia 3 255 9 622
Virial coefficients 13 63 64
Virial equation 14 528
  Beattie Bridgeman equation 2 127
Virial theorem 2 305
Viridin 10 316
Virology 14 531
Virtual image 7 29 30
Virtual work, principle of 14 528-529
Virulence 1 472, 14 529-530*
  bacteriology, medical 2 68
  contributions of host 14 530
  endotoxins 14 530
  exotoxins 14 529
  extracellular enzymes and activators 14 530
  microbial contributions to 14 529
  microbial factors 14 530
  pathogen 9 593
Virulence—*cont.*
  phagocytosis 10 91
  streptokinase 14 530
  surface components and phagocytosis 14 530
Virus 1 125; 8 548, 14 530-532*
  actinophage 1 57
  animal 1 425
  arbor group B 4 62
  bacteriophage 2 69
  biochemistry 2 199
  in cancer 14 532
  chemical composition 14 531
  culture, tissue 3 620
  ECHO *see* ECHO virus
  fluorescent antibody technique 8 383
  Microtatobiotes 8 403
  milk 8 432
  mutation 14 531
  pathogen 9 593
  plant virus 10 382 385
  reproduction 14 531
  ribonucleic acid 11 562
  shape 14 530 531
  size 14 530-531
  soil microorganisms 12 462
  structure 14 531
  wart 14 586
  see also Animal virus, Plant virus
Virus disease, salivary gland 12 14
Virus interference immunity 7 34
Virus yellows sugar beet 13 241
Viruses, tumor *see* Tumor viruses
Vis viva integral 6 265
Visayan Islands 9 482 485
Visceral arch 4 152, 11 513, 12 356
Visceral leishmaniasis 7 449
Visceral lymphomatosis *see* Lymphosarcoma
Visceral muscle 8 635
Visceral pouch 4 151
Visceral reflex arc 13 364
Viscerocranium 12 358
Viscometer 14 533
  capillary 14 535
  falling sphere 14 535
  Ostwald 14 535
Viscose 2 620 626
Viscose process 5 245 14 526
Viscose rayon 10 403
Viscosity 8 558
  absolute 5 322
  Avogadro number 1 697
  flow of fluids 5 321
  of gases *see* Viscosity of gases
  and heat convection 3 441
  at high pressures 6 447
  hydraulics 6 530
Viscosity—*cont.*
  kinematic 14 532 534
  of liquids *see* Viscosity of liquids
  measurement 14 535
  metal 8 269 270
  molecular weight determination 8 558
  molecular weight of polymers 10 478
  Reynolds number 11 540
  and rheology 11 544
  rubber 11 637
  steam 13 77
  units of measurement 5 322
Viscosity-index improver (lubricant) 7 603
Viscosity of gases 7 554-555, 14 532
Viscosity of liquids 8 558, 14 532 534
  kinematic viscosity 14 535
  pressure 14 534
  temperature-dependence 14 534
Viscous damping 14 516 517
  control systems 3 437
  vibration damping 14 516 517
  see also Damping
Viscous flow 5 322, *6* 541, 14 532 534*
  Bernoulli's equation 5 324
  boundary-layer 2 307 311
  in solids (creep) 12 479
  see also Streamline flow
Viscous force 14 532
Viscous friction *see* Friction
Viscous magnetization 11 595
Viscous shear 14 535
Viscum album 8 517 12 25
Visean series 2 469
Vishnuites decipiens zone 14 82
Visibility airport 1 95
  fog 5 366
  under water 12 106
  weather station 14 458
Visibility meter 10 172 175
Visible horizon 6 479
Visible radiation *see* Light
Visible spectrophotometry 12 584
Visible spectrum 12 586 587
  see Light
Visible speech 10 121
Vision 7 125 12 309, 14 534 539*
  after image 14 539
  anatomical basis 14 535
  atypical stimuli 14 534 535
  behavior, ontogeny of 2 143
  binocular 15 128
  blindness 2 261
  color 5 292, 299
  eye glasses 5 172
Vision—*cont*
  foveal 14 536
  human 14 534
  peripheral 14 536 538
  photopic 5 170, 14 535 538
  scotopic 5 170, 14 535 536
  sensory learning 12 182
  space perception 14 537 538
  stereoscopic 15 128
  time perception 14 537 538
  visual acuity 14 537 538
  visual stimuli 14 534 535
  white 14 489
Vision and action patterns 2 145
VistaVision 3 127-128
Vistula River 5 122
Visual acuity 14 537 538
Visual binaries 2 186-187
  see also Binary stars
Visual colorimetry 3 301 302
Visual comparators 3 329 330
Visual cortex 14 535
Visual flight rules (VFR) 1 163 164
Visual learning 12 183
Visual perception *see* Vision
Visual photometer 10 170
Visual purple 5 162 171, 14 536, 541
Visual spectroscopy 12 586
Vitaceae 11 543
Vital capacity 11 528
Vital staining 5 191
Vitallium 1 259, 3 247
Vitamin 14 539-540
  alpha carotene 14 540
  para Aminobenzoic acid 1 319
  ascorbic acid 1 574
  bacterial coenzyme 2 15
  bacterial nutrition 2 65
  beta carotene 14 540
  bioassay 2 193
  biochemistry 2 199
  biotin 2 245
  choline 3 85
  daily allowances 14 541
  deficiency 4 102
  fat soluble 14 559
  folic acid 5 369
  food 5 371
  inositol 7 121
  niacin 9 92
  nutrition 9 235
  pantothenic acid 9 537
  production by yeast 14 604
  pyorrhea 11 107
  quantitation in clinical pathology 3 192 202
  riboflavin 11 561
  supplements, animal feed composition 1 426
  swine production 13 541
  thiamine 13 598
  vitamin A 14 540
  vitamin B_6 14 541

W

W Virginus start 14 278
Wage P 5 51
Wackenroder's liquid 13 262
Wadsworth mounting 4 141
Wage incentives 14 379 390
  methods engineering 8 541-542
  work measurement 7 82
Wagener, S 13 553
Wagener's larva 4 111
Wagner branch 2 442
  capacitance measurement 2 442
Wagner Meerwein rearrangement 13 127
  steric effect 13 130
  tautomerism 13 402
Wahl A C 10 422 14 66
Wahl A M 13 17
Waikaremoana Lake 1 672
Waikato River 1 671
Wairarapa, Lake 1 672
Waitaki River 1 671
Wakatipu, Lake 1 672
Wake (seagoing vessels) 14 380 382
  frictional 14 380
  measurement 14 382
  persistence 14 382
  potential 14 380
  propeller 14 382
  wake flow 14 382
  wave 14 382
Wake flow 5 321 14 382
Waksman S A 1 464 476 9 52
Waksmania (*Microbispora*) 13 179
Walchia 9 504
Walcott C D 1 431
Wald A 6 29
Walden inversion 13 125 127 129
  organic reaction mechanism 9 400
  racemization 11 198
Walden's rule (viscosity) 14 333
Waldever's ring 7 632
Walker A 14 229
Walker J L 5 587
Walker W H 5 28
Walking stick 9 416 14 382 389*
  [illegible]
  [illegible]
  [illegible]
Wall construction 14 585
Wall rock alteration 9 579
Walla Walla Plateau 9 160
Wallaby 7 550
Wallace, Alfred Russel 1 425, 5 132 7 496 12 567 14 620
Wallace's Line 14 623
Wallacea 4 355
Waller, F 5 125
Waller J 5 550
Wallerian degeneration 9 68
Walleye 14 383
Wallis's product 12 191
Walnut 14 383 384
Walrus 14 394
Walsh Lieutenant Don 2 110
Walton, J R 14 67
Wamoscope 2 560
Wanaka Lake 1 672
Wanganui River 1 671
Wapiti 4 560
Warble fly 4 212, 5 362 8 680
Warbler 14 384
Warburg O 5 21, 10 185 208
Warburg respirometer 2 26
Ward Marshall 1 464
Ward Leonard speed control system 4 229
  direct current motor 4 220
  direct-current generator 4 225
  servomotor control 12 204
Warfare aerial see Aerial warfare
  amphibious see Amphibious warfare
  antisubmarine *see* Antisubmarine warfare
  naval *see* Naval warfare
Warfarin 10 256 11 615
Warhead nuclear *see* Nuclear warhead
Waring E 9 225
Waring's theorem 9 226
Warm air heating system 13 384 385
  components 14 385
  ratings 14 385
  register, air 11 424
Warm front 5 559 8 310
Warm Springs in Georgia 13 551
Warner, L 7 559
  see Alarm
  g
Warping earth crust 14 585 586
  diatrophism 4 103
  Glacial Epoch 6 192
Warren truss 14 121
  bridge 2 552
Warrior the *see* Orion
Warrior coal field 9 150
Warrior Tombigbee Waterway 7 116
Warship *see* Ship, naval
Wart 14 586
Warta River 5 122
Warwick B L 12 252
Wasatch formation 11 588
Wasatch group 9 477
Wasatch Mountains 9 157
Wasatch Range 9 160
Wash boring 2 209
Wash coal 10 592 595
Wash oil 3 235
Washer 14 396
Washington H S 4 546
Washken, F 11 598
Wasp 14 586
  bethylid 12 405
  potter 12 405
  spheroid 12 405
Wasp fly 4 212
Waspaloy 7 266
  nickel alloy 9 96
Wasserman test 13 373
  lytic reaction 7 639
Waste control production methods 10 644
Waste disposal (food) 5 584
Waste disposal radioactive 8 131 132
Watch 14 587
  chronometer 3 116
  escapement 5 68 69
Water 6 546, 14 387 389*
  artesian 6 277 278
  atmospheric *see* Cloud physics Hydrometeorology Precipitation (meteorology)
  cavitation in 2 572 576
  chemical properties 14 388 389
  dew 4 98
  estuarine *see* Estuarine oceanography
  fire extinguisher 5 278 279
  fresh supply at sea 3 182
  gaseous state 13 76 77 14 387
Water—*cont*
  ground *see* Ground water
  heavy *see* Heavy water
  hydrology 6 556 557
  hydrolysis 6 557
  hydrometeorology 6 560 562
  liquid 14 386
  management 14 393
  mine 8 491 495
  mineral 8 463
  normal vibration modes 8 552
  oasis 9 239
  oil field 9 510 511
  oxygen 9 475
  properties 14 389
  radiation damage 11 223
  raw 11 548
  refrigerant 11 415
  rural sanitation 11 653
  sea 12 101 118
  soil 12 421
  solid 14 387
  solutions in 14 389
  as a solvent 12 405
  speed of sound in 14 451
  supercooled 5 216
  thermal expansion 13 350
  world supply 13 517
Water soil 12 421 422
Water activated batteries 11 495
Water analysis 14 390 391
  completed test 14 390
  confirmed test 14 390
  membrane filters 14 390
  most probable number (MPN) 14 390
  presumptive test 14 389 390
  quantitative testing 14 389
  sanitary standards 14 390 391
Water balance 4 595
Water based paints 10 495
Water Bearer *see* Aquarius
Water boatman 6 401 14 391*
Water body *see* Hydrology-Hydrosphere
Water borne disease 10 411
  infectious disease transmission 7 94
Water bug 3 251 14 391*
Water cell 4 159
Water cement ratio law 3 563
Water chevrotain 3 550

Voltage measurement—*cont*
galvanometer 6 21-24
high-frequency 14 361
methods 14 360-361
nonsinusoidal 14 361
oscilloscope, cathode ray 9 452
oscilloscope methods 14 361
potentiometer methods 10 543 545
small voltages 14 361
spark gap method 14 360
vacuum-tube voltmeter 14 254 256
voltmeter 14 360, 369-374*
Voltage-multiplier circuit 14 366 367
high-voltage power supplies 10 561
Voltage regulation 4 434, 14 361 362
electric power generation 4 434
Voltage regulator 3 274, 14 362-366*
ballast resistor 2 75
electric distribution systems 4 425
electric power generation 4 434
electronic 14 362-364
gas-tube regulator circuit 14 362
induction 14 365 366
power supply, electronic 10 560
power system 14 364-366
step 14 365 366
thermistor 13 556
vacuum tube regulator circuit 14 362 364
voltage regulator tube 14 368
Voltage regulator, automotive 14 366
Voltage-regulator tube 6 60 61, 215, 14 367 368
Voltage standing-wave ratio (VSWR) measurement 7 43 46
Voltage surge 13 323
substation protection 4 443
Voltage tripler circuit 14 367
Voltaic cell 4 453
storage battery 13 153
Voltaic pile electricity 4 462
Voltameter 3 516
Voltmeter 14 369-374
average-reading 14 360
calibration 14 360
classifications 14 369
digital *see* Digital voltmeter
electrodynamic ac 14 371 372
electronic ac 14 374
electrostatic 4 536, 14 370-371
indicating 14 360
moving-coil 14 369 370
moving-iron 14 372 373
moving magnet 14 370
recording 14 360
rectifier-type 14 360, 373 374
thermovoltmeter 14 373
vacuum tube *see* Vacuum tube voltmeter
Volvaria palmeri 4 107, 12 187
Volume moment of inertia 8 566
Volume expansion, coefficient of 13 550
Volume force (lattice vibrations) 7 414
Volume integral Gauss' theorem 6 80
integration 7 169-171
Volume measures 8 188
Volume per cent 3 361
Volume perturbation 10 39
Volume reverberation (sonar) 12 504
Volume of revolution 2 642
Volume unit (VU) 14 374
Volumetric analysis 14 374-375
buret 2 372
pipet 10 241-242
titration 13 655 661
Volumetric efficiency 14 375
Volumetric flask 14 375
Volumetric method gas analysis 6 46
Volumetric titration 14 374
Voluntary muscle *see* Skeletal muscle
Volutidae 9 34, 11 19
Volutin 8 169
Volvocales 2 601
Volvocidae 11 54
Volvox 1 235, 2 601, 3 80, 8 169 10 275, 11 59
Volvox aureus 10 212
Volvox globator 10 212
Volvulus 6 72 74
Vomer 12 373
Vomeronasal organ 13 22
Vomiting gas 3 45
Von Alberti, F 14 81
Von Baer, K E 6 174
Von Baeyer, J F A 1 242
Von Brand, T 4 202
Von Ebner glands of *see* Glands of Von Ebner 13 668
Von Eotvos, R 8 162
Von Euler, U S 6 484
Von Frey Max 13 490
Von Frisch, K 10 125
Von Gierke's disease 8 262
Von Jaureg, J W 9 564
Von Laue, M 3 592
Von Liebig, J 5 215
Von Mehring, J 7 163, 9 532
Von Meyer, H 1 511
Von Mises function 8 269
Von Muralt, A 8 642
Von Neumann, John 3 618
Von Neumann-Morgenstern cooperative solution 6 29
Von Recklinghausen's disease 12 369
Von Weizsaecker, C F 3 504
VOR 9 20, 14 375
VOR *see also* VHF omnidirectional radio range
VOR/DME 9 15
Vorce cell chlorine manufacture 5 70
Vortac 9 15, 14 375*
Vortex 14 375 376
arrays 14 376
free 14 375
noise 1 182-183
sheet 14 376
tube 14 375 376
Vortex cavitation 2 574
Vortex street, Karman *see* Karman vortex street
Vorticella 10 20 11 54
Vosges Proskauer test 7 48
Vostok, Antarctica 4 527
Vran Planina 5 118
VTOL *see* Vertical take off and landing
VTOL airplane 1 86
aerodynamic force 1 86
VTVM *see* Vacuum tube voltmeter
Vuillemin, P 1 464
Vulcamicina *see* Novobiocin
Vulcan cannon 1 534
Vulcanian eruptions 14 354
Vulcanization rubber 11 646
rubber products 11 649 6
Vulpecula 3 412 414*
Vulpes fulva 5 490
Vultur gryphus 5 178
Vulture 6 415 14 377*
Vulval gland 12 61
Vulvovaginitis 2 3
Vycor glass 6 209
Vycron 5 241

Wave ocean *see* Ocean waves
Wave *acoustics* 1 319
Wave analysis in towing tank 14 4
Wave analyzer 6 540
Wave celerity 14 432
Wave convergence shore processes 12 301
Wave cut terrace 3 245, 12 305
Wave cyclone (meteorology) 3 598 599
Wave divergence shore processes 12 301
Wave drag, aerodynamic *see* Aerodynamic wave drag
Wave equation 14 419 420
analog solution 1 395
conduct 14 420
with damping 1 395
electric dipole radiation 14 420
plane wave solutions 14 419 420
resonant lines 14 420
Schrödinger 12 69
spherical wave solutions 14 420
standing wave solutions 14 420
wave motion 14 425 429
Wave erosion 12 300
Wave experiments in towing tank 14 4
Wave filter electromechanical 14 183
Wave forecasting naval meteorology 9 8
ocean waves 9 259
Wave function *atomic structure and spectra* 1 658 660
exclusion principle 5 157
free electron theory of metals 5 499
parity 9 565 567
quantum mechanics 11 159 160
quantum theory nonrelativistic 11 163 164
transformation theory 14 23
Wave guide 8 413 14 420 424
antennas 1 448
attenuation of hollow wave guides 14 424
band designation for rectangular type 14 422
bends 14 423
cavity resonator 2 576 577
directional coupler 4 231
hollow 14 57 58
impedance standards 7 38
joints 14 422 423
junctions 14 423
Maxwell's equations 14 421
microwave transmission lines 8 422
Wave guide—*cont*
particle accelerators 9 582 584
phase velocity 14 422
rectangular 14 421-422
reflection coefficient 11 397
shapes 14 424
standing wave detector 13 36
transmission coefficient 11 397
transmission modes 14 421
Wave guide antenna 1 447 448
Wave impedance (electromagnetic radiation) 4 494 495
of empty space 9 276 277
reflection and transmission coefficients 11 396
Wave making machine 12 270
Wave making resistance 12 270, 276 279*
Wave measuring devices (ocean) 9 259 260
Wave mechanics 14 424
ripple tank 11 579 580
Wave microphone 8 363
Wave motion 14 425 429
acoustic waves in bars 14 428 429
acoustic waves in gases 14 426-428
acoustic waves in liquids 14 428
acoustic waves in solids 14 428-429
amplitude 1 350
in crystals 2 338
Doppler effect 4 264 265
electromagnetic waves 14 425 426
on flexible stretched strings 14 428
frequency 5 501
fundamental relations 14 425
group velocity 6 285
light 7 502
one dimensional plane waves *14 427 428*
one dimensional spherical waves 14 428
periodic motion 10 13
plane wave propagation 14 426
in plates 14 429
refraction 11 405-408
sound 12 509 518
steady state 14 429
superposition principle 13 303 304
wave equation 14 419, 426
see also Wave (physics)
Wave motion in fluids 14 429-432
acoustic waves 14 430 431
applications 14 429-430
classification 14 430
seismic waves 14 432
Wave motion in fluids—*cont*
wave motion 14 425 429
zone of action 14 431
zone of silence 14 431
Wave motion in liquids 14 432 434
flood wave 14 434
hydraulic jump 6 526 527
oscillatory waves 14 432 433
ripple tank 11 579 580
solitary waves 14 434
standing waves 14 433
surges 14 434
wave motion 14 425 429
wave number 1 350
Wave number (spectroscopy) 1 654
Wave optics 14 434
electron wave optics 4 514
Wave packet 14 431
quantum theory nonrelativistic 11 175
Wave particle duality Compton effect 5 355 356
quantum mechanics 11 154 156
Wave plate 10 451 452
Wave propagation ripple tank study 11 580
in wave guide 14 421 422
wave motion 14 425
Wave radiation electromagnetic *see* Electromagnetic radiation
Wave refraction *see* Refraction of waves
Wave reflection (electromagnetic waves) *see* Reflection (electromagnetic radiation)
Wave reflection (seismic) 12 151
Wave shaping circuits 14 442 443
clamping circuit 5 152 154
clipping circuit 5 205
comparator circuit 5 530 531
limiter circuit 7 516 518
multivibrator 8 628 632
pulse generator 11 93 94
relaxation oscillator 11 438 440
saw tooth 12 42 46
square wave 13 28
trigger circuit 14 91
Wave train 12 500
Wave traps 1 482
Wave vector, electron 2 91 92 338, 5 499
Wave wake 14 581 582
Wave windings (armature) 14 505
Waved whelk 14 488
Waveform 14 434 435
distortion 4 256 257
saw tooth 12 42-46
sine wave 12 340 341
square wave 13 28
Waveform, nonsinusoidal 14 435 438
effect of even harmonics 14 436
effect of odd harmonics 14 436
even and odd *functions* 14 437
Fourier series representation 14 435 436
harmonic analyzer 6 539 540
power factor 14 437
RMS value 14 437
symmetry 14 436 437
Waveform determination 14 438
oscilloscope 9 426 432
Wavefront electromagnetic radiation 4 494
Huygens principle 6 521 522
refraction 11 405
Wavelength 14 438 439
angstrom unit 1 406
Wavelength measurement 14 439 441
by frequency 14 439
interferometer 14 439
Lecher wires 14 439
standing wave detector 13 36
tuned circuits 14 439 441
wavemeter 14 442
Wavelength standards 14 441 442
angstrom 1 406
improvements 14 442
other secondary standards 14 441 442
primary cadmium standard 14 441
published data 14 442
secondary iron standards 14 441
spectroscopy 12 591
Wavellite 14 442
Wavemeter 14 442
absorption type 14 440
calibration 14 442
cavity *resonator* 2 577
Lecher wire 14 439
microwave 14 440
resonant cavity microwave 14 441
Waves harmonics 14 436 437
nonsine 14 436 437
polarization 10 448
symmetry 14 346 347
Waves, electromagnetic *see* Electromagnetic wave
Waves and wave forces 5 242
Waves of larger amplitude wave motion in fluids 14 431 432
Wax, animal and vegetable 14 443-444

Water color (oceanography) 12 117
Water conservation I 116, 14 391-395*
  crop irrigation 14 392
  international agreements 14 395
  land management 14 393
  organizations 14 395
  precipitation 14 392
  runoff 14 393
  saline water reclamation 12 15
  surface water 14 391-392
  underground water 14 391
  water management 14 393
  water pollution 14 392
  water rights 14 393-394
  water use 14 392
  water waste 14 393
  watershed control 14 394-395
Water-content measurement *see* Moisture-content measurement
Water courses 11 581
Water decontamination 4 58
Water-deficient regions 4 542
Water disinfectants 1 475
Water distribution systems 14 405-407
  standpipes 15 390
Water-drive recovery 10 77-78
Water erosion 15 498
Water exclusion, oil well 9 297 299
Water flea 3 563, 6 292, 14 395*
Water-flow pyrheliometer 13 266
Water gap 9 148
Water gas 14 389
  fuel gas 5 552-553
Water-gas coke 3 271
Water gas reaction 2 463
Water-gas shift reaction 6 547
Water glass 12 311
Water hammer 14 396 398
  basic equations 14 398
  chart of pressures 14 397
Water lettuce 1 497
Water main 14 405 407
Water mass *see* Ocean water masses
Water microbiology 14 398
  sewage disposal 12 215
  water-borne disease 14 411
Water moccasin 3 515
Water molecule 14 387
Water oak 9 237
Water penny beetle 3 278
Water pig 2 448
Water pollution 14 392, 399*
  sewage disposal 12 214
Water power 13 318, 14 399 400*
  fall line source 5 179
  from streams 14 399
Water power—*cont*
  tidal barrages 9 251
  from tides 14 399 400
  water conservation 14 392
Water properties 14 388
Water purification 14 401
  thickening 13 601-602
Water quality chemical compositions of 6 568
  geographic variations *13 520*
  ground water 6 278
  lakes 7 387
  river 11 582
  seasonal variation 13 319-320
  sediment effects 13 320
  stream flow rates 13 320
  surface water 13 319 320
Water recycling space flight 12 542
Water relations of plant *see* Plant, water relations of
Water repellents textile 13 540
Water resource management *4 400-401*
  ecology 4 400-401
Water rights 14 393-394
Water scorpion 6 401
Water snake 14 401-402
Water softening 14 402-403
  hard water 14 402
  ion exchange 7 241
  phosphate *10 156*
  water treatment 14 408 409
  zeolite 14 611
Water solutions 14 388
Water storage reservoir 11 487
Water strider 6 401, 14 404*
Water supply engineering 3 149, 14 404 407*
  canal 14 405
  distribution 14 405 407
  distribution system design 14 406
  fire hydrant 14 406
  ground water 14 404
  pipeline 14 405
  pumping station 14.406
  reservoir 11 487
  salt water intrusion 14 404
  snow surveying 12 392
  sources of water supply 14 404 405
  spring 14 404
  surface water 14 405
  transmission 14 405 407
  tunnel 14 405
  water table 14 404
  water treatment 14 407-409
  well 14 404 405
Water-supply studies 13 318
Water table 6 277-278, 14 404, 407*
  in beaches 12 303
  cave 2 571
  desert 9 238
Water table—*cont.*
  flood plains 10 259
  playa surface 10 415
  and saline soils 12 429
  spring (water) 13 18
Water theory 1 39 40
Water-thinned paints 9 493
Water thrush 14 384
Water transportation 14 64 65
Water treader 6 401
Water treatment 14 407-409
  aeration 14 409
  chlorination 14 408
  coagulation 14 407
  diatomaceous earth filters 14 408
  disinfection 14 408
  filtration 14 407 408
  rapid sand filters 14 408
  saline water reclamation 12 15
  sedimentation 14 407
  slow sand filters 14 407-408
  water softening 14 408-409
Water tube boiler 14 412
  bent tube 14 412
  boiler feed water 2 275
  marine 8 102
  straight-tube 14 412
*Water tunnel 5 343, 14 409-411**
  applications 14 409 410
  cavitation studies 14 409 *410*
  construction 14 409
  hydroelasticity 14 410
  instruments 14 410
  limitations 14 410
  see also Towing tank
Water vapor 14 387, 15 76 77
  atmospheric content 3 214, 6 515 516
  biodimatology 2 200
  dehumidifier 4 44
Water vascular system 13 52
Water wells 6 276
Waterdrops 3 214
Waterfall 5 360, 6 453
  escarpment 5 69
  fall line 5 179
  fiord 5 277
Waterfowl 14 490
Waterhouse Frederikson syndrome *see* Adrenal disorders
Waterloo quartzite 11 183
Watermelon 10 574 14 411*
  melon growing 8 214
Waterproofing basements 5 482
Watershed 6 561
  control 14 394 395
Waterspora 2 554
Waterspout 14 411
Waterton Glacier International Peace Park 9 157
Waterton pool 9 5
Watkins, D A 14 69
Watkins gun 14 69
Watson, J D 2 62; 8 672
Watson, K. 9 78
Watson, K M. 6 42
Watson, S W. 7 375
Watson-Crick DNA model 9 215
Watt, C 3 69
Watt, James 8 4, 119, 9 53; 13 165
Watt 4 435; 14 413*
  absolute 4 458
  relation to horsepower 6 492
Watt-hour 4 425
  Btu relation 2 341
  relation to calorie 2 419
Watt-hour meter 4 426, 14 413 414*
  commutator 14 413
  electric energy measurement 4 426
  induction 14 413 414
  mercury 14 413
  principle of operation 14 413-414
  special 14 414
  totalizing 14 414
Wattle 7 446
Wattmeter 4 435, 14 414 417*
  electric power measurement 4 435, 14 414 417
  electrodynamic 14 414-415
  electrodynamic instrument 4 477
  electrostatic 14 416
  harmonic measurement 6 340
  polyphase 14 416 417
  thermal 14 415-416
Watts, J W 13 80
Waucoban epoch 2 425
Wave (capillary) 14 417
  ripple 4 219
Wave (internal) 14 417 418
Wave (physics) 14 418 419
  coherent waves 7 184 185
  diffraction 4 132 159
  electromagnetic wave 4 476
  gravitational 6 266 11 437*
  interference of waves 7 185 189
  sine wave 12 340 341
  standing wave 15 56
  stationary wave 15 57 58
  see also Wave motion
Wave (sea) 12 99
Wave (seismic) 12 150 151
Wave (ship) 12 278
Wave (sine) 12 340 341
Wave (standing) 12 146
Wave (swell) 12 99
Wave (wind) 12 99
Wave (worm) 7 461
Wave, atmospheric (table) 8 551
Wave, compression 12 294 295
Wave, elastic earth 4 552

Weiss P 5 229
Weiss magneton 8 67
Weiss molecular field 5 229-230
Weiss theory of ferromagnetism 5 229-230
Weissenberg technique 14 569
Weissopf, V F 11 287
Weizmann, S 1 4 516
Weizmann, C 1 54
Weizsäcker C F von 4 553
Wel 2 352
Weld (*Reseda luteola*) 5 296
Welded joint 7 316 14 464-465*
  strength 14 465
  structural connection 13 104 205
  types 14 464
Welding and cutting of metals 8 91 14 465-468
  arc *see* Arc welding
  argon 1 530 531
  automatic 14 467
  cold welding 14 468
  coted electrode 14 467
  covered electrode 14 466
  electric *see* Arc welding
  flame cutting 14 469
  forge welding 14 468
  gas welding 14 468
  induction welding 14 468
  inert gas metal arc welding 14 467
  metal inert gas 14 467
  metallurgy 14 469 469
  nonfusion welding 14 468
  oxygen 9 471-472
  oxygen cutting 14 469
  powder metal forming 8 296
  processes 14 466
  resistance upset welding 14 468
  resistance welding 11 495 496 14 467 468
  spot *see* Spot welding
  submerged arc welding 14 467
  thermal cutting 14 469
  thermit welding 14 468
  torch 13 684
  tungsten inert gas 14 467
  ultrasonic welding 14 468
  welding processes 14 466
Welding torch 14 468
Weldment 14 465
Well 14 469 470
  artesian 1 533
  casing 14 469
  drilled 14 469
  dug 14 469
  water supply engineering 14 404 405
  see also Oil and gas wells
Well drilling *see* Boring and drilling, mineral, Oil and gas well drilling
Well drilling mud 2 163
Well logging (mineral) 14 470 472
  acoustic 14 472
  caliper 14 472
  core logging 14 470
  cuttings analysis 14 470
  dip 14 472
  directional surveying 14 470 471
  driller's log 14 470
  electric 14 471
  electromagnetic 14 471
  focused current 14 471
  gamma ray 14 471 472
  geochemical 14 472
  geophone 14 472
  geothermal 14 472
  induction 14 471
  neutron 14 472
  photoelectric 14 472
  radioactivity 14 471 472
  resistivity 14 471
  sonic 14 472
  spontaneous potential 14 471
  visual wall logging 14 470
Well ordering set theory 12 205 206
Well pump 14 405
Well type manometer 8 93
Wellington formation 11 388
Wellpoint systems 14 472 473
Welsbach C F Auer von 9 34 10 561 13 610
Welsbach gas mantle 12 588
Welwitschia 6 226 8 241 13 121
Wen 9 320
Wenlockian series 12 327
Wenk F W *10 340*
Wentworth Joseph 5 486
Wentworth quick return mechanism 5 486
Wentzel Kramers Brillouin method 10 41
Werdnig Hoffman disease 8 659
Werner A 3 17 458
Werner H 10 36
Werner L B 3 624 14 66
Werner coordination compounds 3 17
Wernerite 12 50
Wernicke C 1 489
Wernicke's disease 13 598
Wertheimer M 10 33
West C A 6 185
West Australia Current 9 249
West Greenland Current 9 249
West Indies 14 473 *476*
  Bahama Islands 14 473 474
  climate 14 473
  Cuba 14 474 475
West Indies—*cont*
  fauna 14 473
  flora 14 473
  Greater Antilles 14 474 475
  Hispaniola 14 475
  Jamaica 14 475
  Lesser Antilles 14 475 476
  main volcanic arc 14 476
  outliers 14 476
  Puerto Rico 14 475
  temperature 14 473
  Tobago 14 476
  Trinidad 14 476
  Virgin Islands 14 475
West Nile fever 1 490 14 476 477*
  West Nile virus 14 477
West Sand Mountain 9 150
West Spitsbergen Current 1 626
West Wind Drift 1 438 626 9 249
Westerfield F 10 125
Westergaard H M 4 4
Westerhout G 6 11
Westerlies 14 493
Westerly jet stream 7 310
Western boundary currents 9 247
Western Carpathians 5 118
Western Caucasus 5 118
Western chicken flea 12 545
Western equine encephalitis (WEE) 1 490
Western Ghats 1 586
Western grebe 6 268
Western hemlock 6 410
Western tanager 13 598
Westinghouse Nuttall flexible coupling 5 526
Weston F 4 500
Weston cell 4 459 500 14 478 479
Weston saturated cadmium cell 14 560
Westphal balance 2 74 4 63
  density measurement 4 63
Westphalian stage 2 469
Wet acid process 10 135
Wet adiabatic lapse rate 1 632
Wet assay 1 593
Wet bulb temperature 6 515, 515 11 82
Wet cell 14 477-479
  air depolarized alkaline cell 14 477 478
  alkaline cell 14 477 478
  electrical standards 4 458 459
  Lalande cell 14 477 478
  Weston standard cell *14 478 479*
Wet classifiers 3 156
Wet corrosion 5 488
Wet gas natural 9 5
Wet haze 5 367
Wet snow avalanche 1 693
Wet spinning fiber 5 242
Wether goat 6 227 229
Wetherill, G W 14 522
Wettability 13 515 516
Wetted surface (ships) 12 277
Wettersteín Gebirge 5 117
Wetting agent 14 321
  agent 12 591 594
  fire extinguisher 5 278
  herbicide 6 420
Wettstein A 1 232 6 235
Wever F 10 127
Wexler, H 5 170
Weyl H 11 447 14 200
Whale 14 479
  gestation period 6 182
Whale lice 1 540
Whale oil 5 189
Whale shark 12 243
Whalebone whale 2 660
Whaling annual catch 8 112
  Antarctic Ocean 1 438 440
  Atlantic Ocean 1 627
  conservation 8 115
Wharf 10 216 14 479*
  bulkhead 2 370
  caisson foundation 2 349
Wharton Deep 7 56
Wheat 10 374 15 50 14 479 485*
  bran 14 485
  chromosome number 14 480
  cultural practices 14 481
  disease control measures 14 483
  diseases 12 588 14 481 483
  flour 14 481
  food 5 372
  germ 9 212
  gum 6 209
  leading producers 14 479
  market classes 14 480
  origin 14 480 481
  processing 14 485 485
  varieties 14 481
Wheat jointworm 6 581
Wheat stem sawfly 6 580
Wheat strawworm 6 581
Wheat thrips 15 628
Wheatstone Sir Charles 14 485
Wheatstone bridge 14 485 487
  accuracy 14 486 487
  adjustment 14 485 486
  bolometer 2 276
  capacitance measurement 2 442
  insulation resistance testing 7 162
  Kelvin bridge 7 334 335
  sensitivity 14 486
Wheatstone bridge circuit 4 484
Wheel and axle 14 487
Wheel base 14 487
  vehicles 1 47
Wheel bug 6 409 14 487*

Wax, animal and
vegetable—*cont*
acid value 14 443-444
cell walls in plants 2 617
epidermis, plant 5 537-539
iodine value 14 444
lipid 7 529
Reichert-Meissel value 14 444
saponification value 14 444
sources 14 443
structure 14 443 444
see also Carboxylic acid
Wax, native mineral 9 477
Wax, petroleum 14 444-445
dewaxing (petroleum) 4 91
paraffin 10 72
purification of crude wax 14 444-445
uses 14 444
Wax ester 14 443
Wax gland 13 334
Wax myrtle 8 683
Wax palm 2 522
Waxwing 14 445
Waxy electrolyte (primary battery) 10 588 589
Waxy maize 4 93, 13 50
Weak interaction (physics) 13 362-363
electron capture 4 503
nuclear scattering 12 60
parity 9 563 566
Weapon, naval *see* Armament, naval
Weapon, nuclear *see* Nuclear weapons
Weapon A 1 486
Weapon systems 1 541
Wear resistance 6 537-538
Weasel 14 445-446
Weather 14 446
see also Meteorology
Weather (forecasting and prediction) 14 446 454
adiabatic diagram 1 632-635
automatic data processing 14 456
aviation forecasting 1 95-97* 14 453
basic premises 14 449
centers and offices of forecasting 14 451 454
cloud prediction 14 451
from data to forecast 14 447
development 14 446 447
dynamic methods 14 448
evaluating forecasting 14 447
extended range numerical prediction 14 451
flood forecasting 14 455
future developments 14 447
hurricane warnings 14 453
Weather (forecasting and prediction)—*cont*
long range forecasting 14 447-448
longer-period forecasting 14 448-449
machine produced prognoses 14 448
medium range forecasts 14 448
National Meteorological Center 14 452-453
numerical calculation of climate 14 451
numerical methods 14 447
numerical weather prediction 14 450
precipitation prediction 14 451
radar storm tracking 8 320
river forecast center 14 455
semiempirical techniques 14 447
ship routing forecasts 9 8
short range forecasts 14 448
short range numerical prediction 14 450 451
statistical linear regression 14 449 450
statistical procedures 14 449
statistical weather forecasting 14 449
tornado warnings 14 453
wave forecasting 9 8 250*
see also Climatology Meteorological codes Meteorological instrumentation Soundings (meteorological) and entries under Meteorology
Weather avoidance radar 8 320
Weather balloons 13 426
Weather charts 14 446 454
isobar (meteorology) 7 274
isothermal chart 7 200
Weather disturbances 8 326
radar observation 1 164 166 8 320
see also Storm
Weather element 14 446
Weather map 14 454 456
analysis 14 454
facsimile transmission 5 177
wind rose 14 496
Weather modification 14 456 457
for agriculture 14 456 457
fog control 14 457
frost protection 14 457
inducing rainfall 14 457
Weather station 14 457 458
aeronautical meteorology 1 97
aviation 14 458
Weather station—*cont*
density of observational networks 14 458
first-order 14 457-458
frequency of observations 14 458
radiosonde data 14 458
second order 14 458
transosonde 14 458
types 14 457 458
visibility 14 458
see also Weather (forecasting and prediction)
Weathering processes 6 139-140, 7 551-552, 14 458 460*
chemical 14 458 460
in deserts 4 74
exfoliation, rock 5 143
frost action 5 541
laterite, origin 7 407
lithosphere, geochemistry of 7 551 552
mechanical 14 458-459
as ore guides 11 20
plant nutrition 14 459
products 14 459
in sedimentary rocks 12 132
in soil formation 12 414
solution, underground 7 532-533
types 14 458 459
Weaver J 10 575
Weaver finch 12 562
Weaving 13 535 536
Web spinning sawfly 6 574
Webb J H 10 162
Weber E H 10 125
Weber H H 8 642
Weber, J 11 437
relation to gauss 6 80
Weber 14 460
Weber Deep 12 551
Weber's law 12 178
Weberian apparatus 3 647
Clupeiformes 3 222 223
Weberian ossicles 10 125
Webster T 15 525
Webworm 2 552
Weddell Sea 1 440 9 251
Wedge 14 460
Wedge room *see* Anechoic chamber
Wedge shaped beetle 3 277
Wedging frost 5 540
Weed killer *see* Herbicide
Weed oil 6 422
Weeping European beech 2 130
Weevil *14 460 461*
Coleoptera 3 275 288
Weft textile 13 534
Wegelius C 2 495
Wegener A 10 415, 11 597, 15 225
Weglarska, B *15 597*
Wehnelt, A 4 519
Weidenreich, F 5 478, 9 612
Weierstrass, K 8 177
Weierstrass canonical form 4 561
Weierstrass comparison test 12 192
Weierstrass condition 2 409 41
Weierstrass formula 7 163
Weierstrass functions 4 563
Weierstrass sigma function 4 563
Weierstrass zeta function 4 56
Weigela 10 179
Weight 14 461
apothecaries' 8 188
atomic 1 662 665
avoirdupois 8 188
carat 8 188
measures 8 188
molecular 8 556 558
Troy 8 188
see also Mass, Weight measurement
Weight average molecular weight 10 478
Weight buret 2 372
Weight density 4 62
Weight measurement 14 461 464
balance 2 73-74, 14 461 462
electrical weighing system 14 463
hydraulic scale 14 462 46
mechanical type industrial scales 14 462
pendulum type mechanical scale 14 462
pneumatic scale 14 463
spring scale 15 15 14 46
volumetric load elemen 14 464
Weight per cent 5 561
Weightlessness 1 696 12 549 14 464*
space flight 12 542
space station 12 545
Weil's disease 13 2, 14 464*
jaundice 7 302 304
Leptospira 7 375
Weil Felix test 13 15
rickettsioses 11 569
spotted fever, Rocky Mountain 13 14
tick typhus 15 655
typhus, epidemic (louse borne) 14 176
Weill, R 3 257
Weinberg A M 11 566
Weinberg W 6 338
Weinberg's differential method 6 506
Weiner J S 10 232
Weinmannia 5 187
Weintraub, E 2 501
Weir canal 2 454
flow measurement 5 31* 319

Wind—cont
radar observation 8 319 320
rocket observations 8 322
sea breeze 8 332 14 495
sirocco 12 347
speed 14 493, 496
squall 13 21
thunderstorms 13 617
tornado 13 685
transport of sediment 12 136
upper air circulation 14 495
upper air measurement 1 632
valley 8 332 14 495
veering 14 496
Venturi 1 523 14 495
vertical surface wind 14 494-495
chill index 12 180
deposits dune 4 292
dust 4 296
sand 7 574
sand 4 296
erosion 12 432 440
loads 13 202
measurement 14 493 496
direction 14 496
use of sample 14 495 496
speed 14 496
wind power 14 496
Wind River Range 9 356
Wind rose 11 651 14 496
wind shift line 14 504
wind stress 14 496-497
internal horizontal stresses 14 497
on ocean surface 9 245 247, 255 256, 263 264
pressure 14 497
structural design 13 196
wind tunnel 5 343, 14 497-498
arc arc furnace 1 503
air velocity measurement 1 221
airstream 14 498
blow-down 14 500
continuous supersonic 14 500
flow visualization 14 499-498
hypersonic 14 500 501
indraft 14 500
intermittent 14 500
low speed 14 499
measurements 14 498 499
model forces 14 498
model moments 14 498
model surface pressures 14 498
nozzle 9 174
problems for 14 497
reaction of model on airstream 14 498
Wind tunnel—cont
shadowgraph 14 498 499
shock waves 14 499
supersonic 14 500
temperatures 14 498
test conditions 14 497 498
tests 1 189
transonic 14 499 500
Wind tunnel drive simulator 12 348
Wind tunnel instrumentation 14 502 504
direction probes 14 503
hot wire anemometer 1 403
humidity measurement 14 502
mass flow 14 503 504
Schlieren photography 12 67 68
shadowgraph 12 238 239
shock wave display 12 299 299
temperature probes 14 502
turbulence measurements 14 502 503
yaw sphere 14 503
Wind tunnel tests aircraft model 1 189
aircraft testing 1 189
airship 1 218
horizontal buoyancy tests 2 372
Wind turbulence (automobile) 9 123
Wind vane 14 493
Wind wake 12 99
Windage and friction loss electric rotating machinery 4 449
Windblown sediment 12 136
Windings (electric machinery) 14 504 506
armature windings 14 504 506
field windings 14 504 505
synchronous generators 1 289 293
Windmill 14 496
Window (microwave) 2 576
Window (sound transmission) 1 519
Window glass 6 207
optical materials 9 352
Window winged moth 7 464
Windward Passage 2 521
Wine 14 506 508
alcohol content 14 507
classification 14 506 507
production 14 507 508
spoilage organisms 14 508
Wine vinegar 14 324
Wing 1 198 199, 14 508 509
aerodynamic center 1 84
aerodynamic force 1 85
aeroelasticity 1 90
airfoil 1 199 199
Wing—cont
angle of attack 1 90
aspect ratio 1 589
downwash 13 228
drag 1 86, 200
landing flaps 14 509
lift 1 85
lifting line theory 13 228
loading see Wing loading
section see Airfoil profile
stall 1 86
subsonic flight 13 224
in transonic flight 14 61 61
upwash 13 228
Wing, rotating autogiro 1 674
Wing loading 14 509 509
Wing motion 5 301
Wing nut 9 231
Wing structure 1 206 14 510 518
airfoil 1 201 206
airframe 1 206
beam shear material 14 514 515
bottom of wing box 14 516
choice of material 14 513 514
design 14 510 515
flight loads 14 511
gust loads 14 511
landing flaps 14 517
landing loads 14 511 512
leading edge structure 14 516 517
maneuver loads 14 511
net wing loads 14 512 513
prime structural framework 14 514 516
structural materials 14 510
takeoff loads 14 511 512
top of wing box 14 515 516
total flight load 14 510 511
trailing edge structures 14 517
V n diagram 14 511
wing ribs 14 516
wing statistics 14 516
wing to fuselage structure 14 517 518
wing weights 14 516
Wingate sandstone 11 388
Winge O 12 229
Winged Horse see Pegasus
Winkler C A 6 176
Winkler Bach formula 3 652
Winning coalition game theory 6 29 30
Winogradsky, Sergei 2 66 67, 132 9 107 11 552
Winslow C E A 12 181
Winter 6 125 126
in polar regions 10 440 441
solstice see Solstice
Winter bud 2 361
Winter flounder 5 515
Winter wren 14 550
Winteraceae 5 329
Wiped film vertical still 4 253
Wiper bending sheet metal 12 250
Wire 14 518
conductor electric 5 392
drawing of metal 4 272
magnet see Magnet wire
materials 5 392
shielded 12 254
telephone system 13 443
Wire antenna see Antenna (aerial)
Wire line coring 2 297 298
Wire recording 14 518
magnetic recording 8 57
Wire rope 11 627
flat rope 11 627
rope drive 11 628
standard rope 11 627
Wire saw quarrying 11 181
Wire wound potentiometer 10 542 545
Wire wound resistor 11 498
Wireworm 5 287
Wiring (electric) 14 519 522
branch circuit 2 519
bus bar 2 576
circuit design 14 521 522
circuit protection 14 522
codes 4 449
conductor electric 5 392 394
conductor capacity 14 521 522
conductor sizes 14 521
copper loss 5 472 14 522
distribution switchboards 14 520
feeder 14 519 520
feeder design 14 521
flexible insulation 7 156 158
fuses 5 577 579
lighting loads 14 521
methods 14 521
motor loads 14 521
panelboards 14 520
primary service 14 519 520
printed circuit 10 593 597
purpose 14 519
secondary service 14 520
service entrance 14 519
switchboard 14 520
three phase 14 519
transformers 14 519
voltage drop 14 522
wiring systems 14 519
Wiring diagram 14 522
Wirsungs duct 9 529
Wirz H 9 438
Wisconsin (Glacial) 6 195
Wisconsin Driftless Area 9 154
Wishicenus, G F 2 574
Wishicenus J 13 125

Wheeled crane 3 536
Wheeler, Sir Mortimer 1 513
Wheeler cell 3 70
Wheelon process 12 250
Whelk 11 18, 14 487-488*
Whetstone 10 202
Whewell, W. 13 635
Whey 2 538, 3 11; 8 436
  concentrated 8 436
Whip scorpion, tailless 1 500
Whipple, F. L. 3 310, 315-316; 4 587
Whipple, G. S 523
Whipple's disease 7 223
Whippoorwill 2 448, 14 488*
Whipsnake 2 255
Whipstock, deflecting tool 9 294-295
Whipworm disease 14 488
Whirligig beetle 3 276
Whirlpool bath 13 595
Whiskers, crystal 14 488-489
Whiskey 4 255, 255
Whistle pig 14 541
Whistlers, aeronomy 1 99
  astronomical geophysics 1 608
  radio-wave propagation 11 322
Whitby, L. 13 244
White, H. J. 4 538
White, R. W. 9 81
White 14 489
White ant 13 494
White arsenic 6 421
White ash 1 576
White Band bituminous shales 8 251
White bass 2 108
White-bellied martin 8 156
White blood cell 2 263
White Carpathians 5 118
White Chianti 14 507
White clover 3 220
White crappie 3 559
White dwarf star 13 39 43, 14 489*
  Einstein shift 4 417
  evolution 13 109-110
White faced glossy ibis 7 1
White fir 5 277
White fringed beetle 14 460
White fronted goose 6 237
White ibis 7 1
White iron 2 540
White iron pyrite 8 101
White Jurassic 7 325
White key scale 12 47
White lead, white pigment 10 225
White metals, bearing 2 119
White Milan turnip 14 164
White Mountains 9 145
White nebula 9 24
White nickel ore 9 94
White Nile River 1 109
White noise 9 119, 14 489
  acoustic noise 9 117
  electronic countermeasures 4 522
  radar 11 208
White oak 9 237, 15 119
White oil 10 72
White perch 2 108
White phosphorous 10 134
  chemiluminescence 3 46
  incendiary 7 54
  pigment 10 223 224
White pine 10 235
White pine blister rust 14 73 74, 217
White pine weevil 14 461
White salmon 8 505
White Sands National Monument 9 160
White Sea 5 115, 9 271
White shrimp 12 308
White-tailed deer 4 42
White-tailed ptarmigan 11 85
White tin 13 647 650
White wheat 14 480
White wine 14 507
White-winged crossbill 3 555
Whitecaps 12 100
Whitefish 3 223, 14 489*
Whitehead, A. H. 438
Whitehead, A. N. 7 582
Whitening agents 13 538
  titanium dioxide 13 653
Whiteprint 10 146
Whites 7 464
Whiteware 3 167
Whiting, P. W. 12 251
Whiting 13 337
  marine fisheries 8 113
Whitman, P. M. 7 411
Whitney, Eli 10 643
Whitney, H. 6 254
Whittaker, R. H. 13 233
Whitworth, J. 7 528
Whitworth screw thread 12 85
Whooping cough 1 466 467, 2 218, 14 489*
  Brucellaceae 2 552
Whooping crane 3 536, 12 572
Whorl 5 274
  fingerprint 5 275-276
  integumentary patterns 7 177
Widal's reaction 12 16
Widal's test 14 173
Wide cut gas oil 10 54 55
Wide screen motion pictures
  cinematography 3 125-129
  stereophonic sound 9 357
Widman, J. 1 62, 13 231
Widmanstätten structures
  metallography 8 293, 295
  meteorite 8 515
Wiedemann Franz law 14 489
  490
  Earth (heat flow) 4 533
  thermal conductivity 3 390
Wiedlmann's law 4 525
Wiegand, C. 1 481
Wielandiella 9 505
Wien, W. 4 462
Wien bridge oscillator 9 423
Wien's displacement law 6 373
Wien effect 4 487
Wien frequency bridge 5 508
Wien's radiation law 6 373
Wiener, A. 3 201
Wiener, Norbert 1 677, 3 319, 637
Wiener process *see* Brownian motion process
Wienerwald 5 117
Wiette field 9 306
Wigglesworth, R. 6 403
Wigman, Mary 1 552
Wigner, E. P. 5 289, 11 365 366, 12 58, 14 490
Wigner effect 11 220
Wigner energy 11 225
Wigner-Seitz method 14 490
Wilbur, J. B. 1 384
Wild ballistic camera 9 361
Wild ginger 1 532
Wildcat well 11 25
Wildebeest 6 226
Wildfire 13 663
Wildlife conservation 14 490-492
  action programs 14 492
  conservation measures 14 491-492
  conservation problems 14 491
  management 14 491 492
Wildlife management 4 400
  ecology 4 400
Wilke, G. 3 639
Wilkins, J. E. II 366
Willamette Valley 9 162
Willemite 14 492* 612
Williams, C. M. 7 475
Williams, F. C. 13 160
Williams, H. J. 5 233 234
Williams, L. S. 2 655
Williams, R. C. 8 376, 14 331
Williams tube 13 160
Williamson, E. D. 15 248
Williamson synthesis 5 85
Williamsonia 9 505
Williamsoniaceae 3 639
Williwaw 1 523, 14 495
Willow 12 8, 14 492 493*
Willow fly 6 394
Willow oak 9 237
Willow thrush 15 615
Willstätter, R. 1 454, 3 640
Willstätter synthesis 14 207
Wilms tumor 7 342 344
Wilson, C. B. 7 476
Wilson, C. T. R. 3 355
Wilson, C. V. 2 171
Wilson, James 6 215
Wilson, O. C. 9 26
Wilson cloud chamber 3 212, 214
Wilson's disease 2 265
  liver disorders 7 365
  metabolic disorders 8 258
  nervous system disorders 9 71
Wilson globe 6 215
Wilson's snipe 12 590
Wilson's theorem 9 224
Wilt disease 2 118, 9 600, 13 292
  see also Plant diseases
Wilting 10 295-296
Wilting coefficient 5 14
Wimshurst machine 4 540
Winch 6 461
Wind 14 493 495
  above 100,000 feet 8 322
  all weather flying 1 96
  anemometer 1 402
  anticyclonic circulation 14 493 494
  Atlantic Ocean 1 624
  atmospheric high 1 640
  atmospheric low 1 642
  average fluctuations in 3 170
  backing 2 5
  baroclinic field 2 102
  barotropic field 2 102
  Beaufort scale 14 495
  bora 14 495
  chinook 3 63
  climatology 3 174 178
  convergent patterns 14 494
  Coriolis effect 5 480
  cyclone 3 640
  cyclonic circulation 14 493 494
  direction 14 493, 496
  divergent patterns 14 494
  dust storms 4 296 297
  effects on ocean surface 9 245 247, 263
  fetch 9 257
  foehn 5 120 14 495
  frontal zone speed 5 539
  geostrophic 6 173
  gradient 6 244
  gradients and sound 1 632, 12 515 517
  hurricane 6 520 521
  isobars and pressure gradients 7 274 14 496
  isotachs 7 290
  jet stream 7 310
  katabatic 1 440 524, 8 332
  khamsin 12 548
  land breeze 8 332, 14 495
  local 14 495
  measurement 1 402 14 493
  minor terrestrial 14 495
  mistral 14 495
  monsoon 8 544 545
  mountain 8 332, 14 495
  mountain (lee) wave 1 96

Wind—cont
radar observation 8 319 320
rocket observations 8 322
sea breeze 8 332 14 495
smoke 12 347
speed 14 493 496
squall 13 21
thunderstorms 13 617
tornado 13 685
transport of sediment 12 136
upper air circulation 14 495
upper air measurement 1 632
valley 8 332 14 495
veering 14 296
williwaw 1 523 14 495
zonal surface wind 14 494 495
Wind-chill index 12 180
Wind deposits dune 4 292
dust 4 296
loess 7 374
sand 4 296
Wind erosion 12 432, 446
Wind loads 13 202
Wind measurement 14 495 496
direction 14 496
size of sample 14 495-496
speed 14 496
Wind power 14 496
Wind River Range 9 156
Wind rose 13 621 14 496
Wind shift line 14 504
Wind stress 14 496 497
internal horizontal stresses 14 497
on ocean surface 9 245 247, 252 256 263 264
pressure 14 497
structural design 13 196
Wind tunnel 5 343, 14 497-508
air arc furnace 1 503
air velocity measurement 1 221
airstream 14 499
blow-down 14 500
continuous supersonic 14 500
flow visualization 14 498 499
hypersonic 14 500 501
indraft 14 500
intermittent 14 500
low speed 14 499
measurements 14 498 499
model forces 14 498
model moments 14 498
model surface pressures 14 498
nozzle 9 174
problems for 14 497
reaction of model on airstream 14 498
Wind tunnel—cont.
shadowgraph 14 498 499
shock waves 14 499
supersonic 14 500
temperatures 14 498
test conditions 14 497-498
tests 1 189
transonic 14 499 500
Wind tunnel drive simulator 12 349
Wind tunnel instrumentation 14 502 504
direction probes 14 503
hot wire anemometer 1 403
humidity measurement 14 502
mass flow 14 503 504
Schlieren photography 12 67 68
shadowgraph 12 238 239
shock wave display 12 299-299
temperature probes 14 502
turbulence measurements 14 502 503
yaw sphere 14 503
Wind tunnel tests aircraft model 1 189
aircraft testing 1 189
airship 1 218
horizontal buoyancy tests 2 372
Wind turbulence (automobile) 9 123
Wind vane 14 493
Wind wave 12 99
Windage and friction loss electric rotating machinery 4 449
Windblown sediment 12 136
Windings (electric machinery) 14 504 506
armature windings 14 504 506
field windings 14 504 505
synchronous generators 1 282 283
Windmill 14 496
Window (microwave) 2 576
Window (sound transmission) 1 519
Window glass 6 207
optical materials 9 352
Window winged moth 7 464
Windward Passage 2 521
Wine 14 506 508
alcohol content 14 507
classification 14 506 507
production 14 507 508
spoilage organisms 14 508
Wine vinegar 14 524
Wing 1 198 199 14 508 509
aerodynamic center 1 84
aerodynamic force 1 85
aeroelasticity 1 90
airfoil 1 198 199
Wing—cont
angle of attack 1 90
aspect ratio 1 589
downwash 13 228
drag 1 86, 200
landing flaps 14 509
lift 1 85
lifting line theory 13 228
loading *see* Wing loading
section *see* Airfoil profile
stall 1 86
subsonic flight 13 224
in transonic flight 14 61 64
upwash 13 228
Wing rotating autogiro 1 674
Wing loading 14 508 509
Wing motion 5 301
Wing nut 9 231
Wing structure 1 206 14 510 518*
airfoil 1 201 206
airframe 1 206
beam shear material 14 514 515
bottom of wing box 14 516
choice of material 14 515 514
design 14 510 513
flight loads 14 511
gust loads 14 511
landing flaps 14 517
landing loads 14 511 512
leading edge structure 14 516 517
maneuver loads 14 511
net wing loads 14 512 513
prime structural frame work 14 514 516
structural materials 14 510
takeoff loads 14 511 512
top of wing box 14 515 516
total flight load 14 510 511
trailing edge structures 14 517
V n diagram 14 511
wing ribs 14 516
wing statistics 14 516
wing to fuselage structure 14 517 518
wing weights 14 516
Wingate sandstone 11 388
Winge, O 12 229
Winged Horse *see* Pegasus
Winkler C A 6 176
Winkler Bach formula 3 632
Winning coalition game the ory 6 29 30
Winogradsky Sergei 2 66 67 132 9 107 11 552
Winslow C E A 12 181
Winter 6 125 126
in polar regions 10 440 441
solstice *see* Solstice
Winter bud 2 361
Winter flounder 5 315
Winter squash 13 28
Winter wren 14 559
Winteraceae 5 329
Wiped film vertical still 4 255
Wiper bending sheet metal 12 250
Wire 14 518
conductor, electric 3 392
drawing of metal 4 272
magnet *see* Magnet wire
materials 3 392
shielded 12 254
telephone system 13 443
Wire antenna *see* Antenna (aerial)
Wire line coring 2 297 298
Wire recording 14 518
magnetic recording 8 37
Wire rope 11 627
flat rope 11 627
rope drive 11 628
standard rope 11 627
Wire saw quarrying 11 181
Wire wound potentiometer 10 542 543
Wire wound resistor 11 499
Wireworm 3 287
Wiring (electric) 14 519 522
branch circuit 2 319
bus bar 2 376
circuit design 14 521 522
circuit protection 14 522
codes 4 449
conductor electric 3 392 394
conductor capacity 14 521 522
conductor sizes 14 521
copper loss 3 472 14 522
distribution switchboards 14 520
feeder 14 519 520
feeder design 14 521
flexible insulation 7 156 158
fuses 5 577-579
lighting loads 14 521
methods 14 521
motor loads 14 521
panelboards 14 520
primary service 14 519 520
printed circuit 10 593 597
purpose 14 519
secondary service 14 520
service entrance 14 519
switchboard 14 520
three phase 14 519
transformers 14 519
voltage drop 14 522
wiring systems 14 519
Wiring diagram 14 522
Wirsung's duct 9 529
Wirz, H 9 438
Wisconsin (Glacial) 6 195
Wisconsin Driftless Area 9 154
Wislicenus, G F 2 574
Wislicenus J 13 125
Wiswesser, W J 3 43

Wheeled crane 5 536
Wheeler, Sir Mortimer 1 515
Wheeler cell 5 70
Wheelon process 12 250
Whelk 11 18, 14 487-488*
Whetstone 10 202
Whewell, W. 15 635
Whey 2 538, 5 11, 8 436
  concentrated 8 436
Whip scorpion, tailless 1 500
Whipple, F. L. 3 310, 315-316, 4 587
Whipple, G. 5 523
Whipple's disease 7 223
Whippoorwill 2 448, 14 488*
Whipsnake 2 255
Whipstock deflecting tool 9 294-295
Whipworm disease 14 488
Whirligig beetle 3 276
Whirlpool bath 13 595
Whistlers, crystal 14 488-489
Whiskey 4 253, 255
Whistle pig 14 541
Whistlers aeronomy 1 99
  astronomical geophysics 1 608
  radio wave propagation 11 522
Whitby, L. 15 244
White, H. J. 4 538
White, R. W. 9 81
White 14 489
White ant 13 494
White arsenic 6 421
White ash 1 576
White Band bituminous shales 8 251
White bass 2 308
White-bellied martin 8 156
White blood cell 2 263
White Carpathians 5 118
White Chianti 14 507
White clover 5 220
White crappie 5 339
White dwarf star 13 59 43, 14 489*
  Einstein shift 4 417
  evolution 13 109 110
White faced glossy ibis 7 1
White fir 5 277
White fringed beetle 14 460
White fronted goose 6 237
White ibis 7 1
White iron 2 540
White iron pyrite 8 101
White Jurassic 7 525
White key scale 12 47
White lead white pigment 10 223
White metals bearing 2 119
White Milan turnip 14 164
White Mountains 9 145
White nebula 9 24
White nickel ore 9 94
White Nile River 1 109
White noise 9 119, 14 489
  acoustic noise 9 117
  electronic countermeasures 4 522
  radar 11 208
White oak 9 237, 15 119
White oil 10 72
White perch 2 108
White phosphorous 10 154
  chemiluminescence 3 46
  incendiary 7 54
  pigment 10 223-224
White pine 10 235
White pine blister rust 14 73-74, 217
White pine weevil 14 461
White salmon 8 505
White Sands National Monument 9 160
White Sea 5 115, 9 271
White shrimp 12 308
White-tailed deer 4 42
White-tailed ptarmigan 11 85
White tin 13 647 650
White wheat 14 480
White wine 14 507
White-winged crossbill 5 555
Whitecaps 12 100
Whitefish 3 225, 14 489*
Whitehead, A. 11 438
Whitehead, A. N. 7 582
Whitening agents 13 558
  titanium dioxide 13 653
Whiteprint 10 146
Whites 7 464
Whiteware 3 167
Whiting, P. W. 12 251
Whiting 13 337
  marine fisheries 8 133
Whitman, P. M. 7 411
Whitney Eli 10 643
Whitney, H. 6 254
Whittaker, R. 13 233
Whitworth, J. 7 528
Whitworth screw thread 12 85
Whooping cough 1 466-467, 2 218, 14 489*
  Brucellaceae 2 352
Whooping crane 5 536, 12 572
Whorl 5 274
  fingerprint 5 275 276
  integumentary patterns 7 177
Widal's reaction 12 16
Widal's test 14 175
Wide cut gas oil 10 54 55
Wide screen motion pictures
  cinematography 3 125 129
  stereophonic sound 9 557
Widman, J. 1 62, 13 231
Widmanstätten structures
  metallography 8 293 295
  meteorite 8 515
Wiedemann Franz law 14 489 490
  Earth (heat flow) 4 533
  thermal conductivity 3 390
Wiedlmann's law 4 525
Wiegand, C. 1 481
Wielandiella 9 505
Wien, W. 4 462
Wien bridge oscillator 9 425
Wien's displacement law 6 373
Wien effect 4 487
Wien frequency bridge 5 508
Wien's radiation law 6 373
Wiener, A. 3 201
Wiener, Norbert 1 677, 3 319, 637
Wiener process *see* Brownian motion process
Wienerwald 5 117
Wietze field 9 306
Wigglesworth, R. 6 403
Wigman, Mary 1 552
Wigner, E. P. 5 289, 11 365 366, 12 58, 14 490
Wigner effect 11 220
Wigner energy 11 225
Wigner Seitz method 14 490
Wilbur, J. B. 1 384
Wild ballistic camera 9 361
Wild ginger 1 532
Wildcat well 11 25
Wildebeest 6 226
Wildfire 13 663
Wildlife conservation 14 490 492
  action programs 14 492
  conservation measures 14 491 492
  conservation problems 14 491
  management 14 491 492
Wildlife management 4 400
  ecology 4 400
Wilke, G. 3 639
Wilkins, J. E. 11 366
Willamette Valley 9 162
Willemite 14 492*, 612
Williams C. M. 7 475
Williams, F. C. 13 160
Williams, H. J. 5 233 254
Williams, L. S. 2 655
Williams, R. C. 8 376, 14 531
Williams tube 13 160
Williamson, F. D. 13 248
Williamson synthesis 5 85
Williamsonia 9 505
Williamsoniaceae 5 639
Williwaw 1 523, 14 495
Willow 12 8, 14 492 493*
Willow fly 6 394
Willow oak 9 237
Willow thrush 13 615
Willstätter, R. 1 454, 3 640
Willstätter synthesis 14 207
Wilms tumor 7 542 544
Wilson, C. B. 7 476
Wilson, C. T. R. 3 355
Wilson, C. V. 2 171
Wilson, James 6 215
Wilson, O. C. 9 26
Wilson cloud chamber 3 214
Wilson's disease 2 265
  liver disorders 7 563
  metabolic disorders 8
  nervous system disorder 9 71
Wilson globe 6 215
Wilson's snipe 12 390
Wilson's theorem 9 224
Wilt disease 2 118, 9 600, 15 292
  see also Plant diseases
Wilting 10 295-296
Wilting coefficient 5 14
Wimshurst machine 4 540
Winch 6 461
Wind 14 493 495
  above 100 000 feet 8 32
  all-weather flying 1 96
  anemometer 1 402
  anticyclonic circulation 14 493 494
  Atlantic Ocean 1 621
  atmospheric high 1 640
  atmospheric low 1 642
  average fluctuations in 3 170
  backing 2 3
  baroclinic *field 2 102*
  barotropic field 2 102
  Beaufort scale 14 493
  bora 14 495
  chinook 3 65
  climatology 3 174 178
  convergent patterns 14 4
  Coriolis effect 5 480
  cyclone 5 640
  cyclonic circulation 14 49 494
  direction 14 493, 496
  divergent patterns 14 4
  dust storms 4 296 297
  effects on ocean surface 9 245-247, 263
  fetch 9 257
  foehn 5 120, 14 495
  frontal zone speed 5 539
  geostrophic 6 175
  gradient 6 244
  gradients and sound 1 635 12 515 517
  hurricane 6 520 521
  isobars and pressure gra dients 7 274 14 496
  isotachs 7 290
  jet stream 7 510
  katabatic 1 640, 524 8 39
  khamsin 12 548
  land breeze 8 532 14 49
  local 14 495
  measurement 1 402, 14 49
  minor terrestrial 14 495
  mistral 14 495
  monsoon 8 544 545
  mountain 8 532 14 495
  mountain *(lee)* wave 1 96

Woolsorters disease *see* Pulmonary anthrax
Wool wax 14 444
Woolypod vetch 14 510
Worden gravimeter 13 516
Work 13 573 14 551 553*
and energy 4 599 601 14 552
examples 14 551
rigid body dynamics 11 575 576
sign conventions 14 551
torque 14 552
units of 14 552
erg 5 64 65
foot pound 5 429
foot poundal 5 429
joule 7 316
variable force 14 552 553
work principle 14 552
Work, virtual 14 328 329
Work content 14 558
Work diagram 14 552 553
Work Factor system 14 555
Work function (electronic) 14 553
contact potential difference 5 429
Schottky effect 12 68 69
semiconductors 12 170
Work function (thermodynamics) 14 553
Work hardening 3 584
Work kinetic energy theorem 4 600
Work measurement 14 553 557
devices 14 554
methods engineering 8 311 342
predetermined elemental time 14 555 556
procedures 14 554
standard data 14 556 557
time formulas 14 556 557
time study 14 554 557
wage incentives 14 580
work sampling 14 556
Work principle 14 552
Work sampling 14 556
Work simplification 8 342
Work standardization 14 557 558
Worker bee 2 128
Workforce skill requirements 1 679
Workman Reynolds effect 4 468
World curves 11 435 12 557
World lines *see* World curves
World points 12 557
World resources *see* Earth resource patterns
Worm 14 559
Worm bristle 1 428
Worm horsehair 1 574
Worm gears 6 86
Worm tube 9 517
Worn out basket shell 14 488
Wort 8 80
Worthington, L V 2 521
Worthite 7 206
Wortmannia 13 586
Worzel, L 13 511
Wound infections 13 56 58
Wound rotor induction motor speed control 1 286 287
Wound rotor polyphase induction motor *see* Polyphase induction motor
Wounded tree beetle 3 277
Wow *see* Flutter and wow
WP smoke 12 81
Wra blood group 2 260
Wrangel Island 1 581
Wrap forming sheet metal 12 230
Wren 14 558 559
Wrench fault 3 192
Wright A F 9 516
Wright B 1 50
Wright C W 4 572
Wright Orville 6 213 14 509
Wright S 6 505
Wright W H 13 299
Wright Wilbur 6 213 14 509
Wright ore mining system 9 507
Wringer 2 634
Wrinkled bark beetle 3 276
Wrist 14 559
Writing inks 7 112
Wrought alloys 3 470 471
Wrought aluminum alloys 1 286
Wrought iron 7 259 14 559 560*
structural materials 13 205
Wry neck 8 658
Wu I V 9 566
Wuchereria 8 599
Wuchereria bancrofti 3 257 259
Wuchereria malayi 3 257 259
Wuchereria pacifica 3 257
Wulfenite 14 560
molybdenum ore 8 562
Wulfenberger direction finder 9 20
Würm (Glacial) 6 195
Wurtz Fittig reaction 14 560
Wurtz reaction 1 219 14 560
Wurtzilite 14 560
Wurtzite 14 560
zone crystals 7 217
lattice 7 217
Madelung constant 8 15
Wüst G 6 204 9 240 266
WWV radio signals 4 460
frequency standard 5 501
time 13 613
WWVH radio signals 4 460
Wych elm 4 561
Wyckoff R W G 8 376
Wye level (surveying) 7 487
Wymer J 13 515
Wyoming Basin 8 618 9 156

Witch weed 13 664
Witches' broom 2 385
Witches'-broom virus 1 234
Witherite 14 522
  barium ore 2 95
  carbonate minerals 2 468
Witschi, E 11 463
Witt, G 5 65
Witt, O N 4 298
Witt theory 4 298
Witting, R 12 102
Wiwaxia 1 451
WKB *method* 10 41
WMO cloud classification 3 211
WN virus 14 477
Wohler, F 2 171, 3 219, 5 215; 9 593
Wohlfahrtia magnifica 8 680
Wohlfahrtia opaca 8 680
Wohlfahrtia vigil 5 6, 8 680
Wolbachia 11 567
Wolbachia melophagi 8 404
Wold escarpment 5 69
  plains 10 258
Wolf, A 9 70
Wolf, Max 14 114
Wolf 14 522
  gestation period 6 182
Wolf Rayet star 13 44, 14 523*
Wolf spider 1 498
Wolff, C F 4 569
Wolff, E 11 465
Wolff rearrangement 13 127
Wolffia arrhiza 1 497
Wolffian duct 14 222
  reproductive system 11 465
Wolfian body 14 223
Wolfle, Dael 7 405
Wolframite 5 215, 14 138, 523*
Wolfrid, G P 13 516
Wollaston, W H 10 449
Wollaston prism 10 449
Wollastonite 14 523
Wolverine 14 525
Womb 14 236 237
Wood, A B 8 138
Wood, R W 11 332 12 52
Wood 14 524 541
  carbon 14 in 11 291
  cell walls 14 525
  compressive strength 15 205
  dyeing 4 311
  flameproofing 5 294
  hardness of 6 358
  hydrolysis 6 558
  mineralized 10 43
  preservatives 14 539 540
  tensile strength 15 205
  velocity of sound in 12 516
Wood (anatomy and identification) 14 524 526
  anatomy of hardwoods 14 524 525
  anatomy of softwoods 14 524
  properties 14 526
Wood alcohol 8 339
Wood bending methods 14 544
Wood borer 2 131
Wood boring fly 4 212
Wood chemicals 14 526 528
  acetate rayon 14 526
  acetic acid 1 30
  alkaloids 14 527
  cellulose 14 526
  charcoal 3 10, 14 527
  destructive distillation 4 80
  dyes 14 528
  essential oils 14 527
  lignin 14 527
  naval stores 9 8
  oxalic acid 14 527
  paper and paper products 9 539 541
  pine oil 10 236
  rayon 14 526
  sugars 14 528
  tall oil 13 587
  tannins 14 527
  wood pulp 14 526
Wood decay 14 528
Wood deterioration 14 537-538
  fire 14 538
  insects 14 538
  marine borers 14 538
Wood duck 4 290
Wood engravings 10 609 610
Wood fiber 12 79
Wood fiber products 14 528 531
  chemical uses 14 530 531
  constituents 14 530
  particle board 14 530
  pulping processes 14 529 530
Wood finishing 14 531 534
  application 14 533
  bleaching 14 532
  defoaming 14 532
  destaining 14 532
  evaluation 14 534
  exterior 14 532 534
  filler 6 264
  filling 14 532
  finish application 14 546
  finishing properties of wood 14 535
  interior 14 532 533
  kinds 14 532 533
  materials 14 532
  objectives 14 531
  patching up 14 531 532
  polishing 14 533
  prefinishing 14 532
  preservative treated 14 534
  priming 14 532
  processes 14 532
  rubbing 14 533
  sanding 14 531
  sealing 14 532
  shellac 12 253
  staining 14 532
Wood finishing—*cont*
  surface preparation 14 531, 545-546
  testing 14 534
  wash coating 14 531
  watering 14 531
  woodworking 14 546
Wood hoopoe 3 473
Wood ibis 7 1
Wood louse 7 283, 9 527
Wood's metal 2 387
Wood physics 14 534 537
  bound water movement 14 535
  capillary movement 14 535
  density 14 534
  differential shrinkage 14 535
  electrical properties 14 536
  heat of wetting 14 535
  hygroscopicity 14 534-535
  mechanical properties 14 536 537
  moisture movement 14 535
  shrinking 14 535
  specific heat 14 536
  strength 14 536 537
  swelling and pressure 14 535
  thermal conductivity 14 535 536
  thermal degradation 14 537
  thermal diffusivity 14 536
  thermal expansion 14 536
  thermal properties 14 535 536
  vapor movement 14 535
  velocity of sound in elm 12 516
  volumetric shrinkage 14 535
Wood preservation 5 541, 14 534 537 541*
  application of preservatives 14 540
  deterioration of wood 14 537 538
  fungi 14 537 538
  insects 14 538
  marine borers 14 538
  nonpressure applications 14 540
  oils 14 539 540
  preparation for treatment 14 539
  pressure treatments 14 540
  termites 14 538
  wood treating characteristics 14 539 541
Wood pulp 9 539 540
  paper and paper products 9 539 540
  wood chemicals 14 526
Wood rat 5 541 542
Wood technology 5 411 414
Wood thrush 13 615
Wood ticks 13 630
Wood tin 2 389
Wood treating 14 538 541
Wood turtle 3 23, 14 168
Wood warbler 14 328
Woodchuck 14 541
Woodcock 3 10, 12 23, 14 541*
Wooden tongue *see* Actinomycosis
Woodhead, A 4 202
Woodpecker 12 26, 14 541*
Woodruff lex 8 5
Woodward, A S 10 242
Woodward, R H 100 15 207
Woodwind musical instruments 8 665 666, 14 515
Woodworking 14 542 546
  finishing 14 545
  gluing 14 544 545
  handsaws 14 542
  nailing 9 1 2
  planer 10 266
  planing 14 543 544
  sawing 12 42 14 542 543
  steaming 14 544
  turning 14 161
Woodworth, R S 8 603
Woody monocotyledons 13 123
Woof textile 15 554
Wooder loudspeaker 7 391
Wool 14 546 551
  action of cold 14 550
  action of hydrogen 14 549
  action of heat 14 549
  action of steam 14 550
  action of water 14 550
  advantages of grading 14 548
  bleaching 2 259
  chemical characteristics 14 549 550
  clean wool yield 14 549
  consumption 14 546
  core test 14 549
  evaporation 3 615
  dyeing 5 250 252
  fiber structure 14 546 547
  grading systems 14 548 549
  growth 14 547
  length 14 548 549
  measuring devices 14 548
  physical properties 14 547 548
  plasticity 14 550
  production 14 546
  reprocessed wood 14 551
  reuse of wool fibers 14 550 551
  sheep 14 546
  technological advances 14 550
  textile microbiology 15 541 542
  virgin wool 14 551
Wool fat 14 443
  lanolin 7 399
Wool grease 14 444

X

X and R chart 11 140
X band radar 11 201
X cell 8 332
X chromosome 6 425
X cut plate 5 590 591
X factor 6 412
X ray(s) 14 567 568
absorption of 11 302
autoradiography 1 691
bremsstrahlung 2 330
Compton effect 3 353 359
contrasted with gamma rays 9 196
detection of nuclear explosions 9 183 184
historadiography 6 459
mesonic 9 202
microradiography 8 365-370
mutation 8 675
nuclear radiation (biology) 9 196
particle size measurement 12 349
radiation cytology 11 221
radiography 11 301 304
radiology 11 315
scattering 1 653 9 88
secondary 1 655
from sun 13 285 285
X ray(s) physical nature of 14 567 568
quantum theory 14 567 568
Röntgen's findings 14 567
X ray crystallography 8 558 14 568 570*
proteins 11 41
X ray diffraction 14 570 576
Bragg's law 14 571 572
clay mineral studies 3 164
contrasted to neutron diffraction 9 89 89
crystalline diffraction 14 573 575
by gases 14 575 576
Laue equations 14 573 572
Laue method 14 573 575
by liquids 14 576
molecular biophysics 8 543
by molten salts 14 576
noncrystalline diffraction 14 575 576
petrography 10 53
powder method 14 574 575
proteins 11 40
reciprocal lattice 14 572
X ray diffraction—*cont*
rotating crystal method 14 574
by solutions 14 576
x ray crystallography 14 568 570
X ray film 10 157
X ray flourescence analysis 14 576 581
counter tubes 14 580
crystal analyzers 14 579
diffractometry 14 580
instrumentation 14 579
Moseley's law 14 577
x ray absorption 14 578 579
x ray microscopes 8 402
x ray spectrographs 14 579
x ray tube operation 14 579 580
X ray fluorescent emission spectrometer 14 582
X ray image spectrography 8 402
X ray microscope *see* Microscope, x ray
X ray optics 14 567 568, 581-582*
X ray powder diffractometer *14 578*
X ray powder methods 14 582-587
amorphous substances 14 586
Bragg's law 14 584 585
diffractometers 14 585
lattice geometry 14 583
solid solutions 14 586 587
x ray spectra 14 583
X-ray spectra 14 577 578* 585
X ray spectrochemical analysis 14 576 581
X ray spectrograph 14 579 12 586 587*
X ray tube 14 587 590
gas 14 587 588
high vacuum 14 588
high voltage 14 588 589
radiography 11 302
x ray fluorescence analysis 14 579 580
X unit 14 590
X Y recorder 11 383
Xanthate 2 626 13 603, 14 526
cellulose 5 243
Xanthene 4 302, 11 108
Xanthidae 4 34
Xanthine 2 47 14 218
Xanthine dehydrogenase 6 106, 113
Xanthine oxidase 5 20 24
Xanthomatosis 8 260, 13 140
Xanthomonas 11 63
Xanthomonas campestris 2 385, 10 307
Xanthomonas citri 5 547
plant disease 10 314
Xanthomonas malvacearum 5 513 514
Xanthomonas phaseoli 12 535
Xanthomonas pruni 5 546 9 601 10 420
Xanthomonas stewartii 5 484
Xanthomonas vignicola 5 529
Xanthomycin A 1 476
Xanthophore 5 99
neural crest 9 78
Xanthophyceae 3 117
Heterochlorida 6 427
Xanthophyll 2 528 529 530, 3 92
Chrysophyta 3 117 119
Phaeophyta 10 89
Xanthurenic acid 11 193
vitamin B_6 14 342
Xanthusia vigilis 9 452
Xantusiidae 13 24
Xenarthra 4 411 12 363
Xenia 3 255
Xenia (reproduction plant) 11 454
Xenia Hicksoni 1 226
Xenia uniserta 1 227
Xenoblast 8 296
Xenocryst 7 14
in basalt 2 106
Xenodiscoides fallax zone 14 82
Xenolith 14 561
in granite 14 561
in granodiorite 14 561
igneous rocks 7 14 15
in magmas 8 18
Xenon 14 561 562
analytical methods 14 562
discovery 14 562
distribution 14 562
electron configuration 4 504
high pressure discharge 6 370 375
ionization potential 4 504
occurrence 14 562
Xenon—*cont*
production 1 637, 14 562
properties 14 562
uses 14 561 562
Xenon lamp 13 187 188
Xenophon 6 224
Xenoplastic transplantation 4 572
Xenopneusta 4 377
Xenopsylla cheopis 10 255 12 344 14 175
Xenopterygii *see* Gobiesocoformes
Xenopus 11 478
Xenopus mulleri 9 345
Xenopus tropicalis 12 8
Xenosauridae 13 24
Xenothrix 10 500
Xenotime 11 342
Xenungulata 11 128, 14 562 563*
Xerarch succession 13 232
Xeric environment 5 14
Xerography 10 146 160
Xerophthalmia 4 236, 14 340
Xerophyte 5 37 39, 150
Xeroradiography 11 301
Xerosere 13 232
Xerosin 1 38
Xestobium rufovillosum 3 287
Xi hyperon *see* Hyperon
Xingu River 12 529
Xiphinema americanum 4 268
Xiphisternum 12 355
Xiphophorus (Platypoecilus) maculatus 12 229
Xiphosura 8 244, 14 561 567*
Aglaspida 8 244 14 563
anatomy 14 565 566
crab 3 530 531
distribution 14 563 565
importance 14 566 567
life history 14 565
Limulida 14 563
molting 14 565
morphology 14 566
nutrition 14 565
Synxiphosurida 14 563
Xiphosurida 1 557, 8 214
Limulina 8 244
Synxiphosaurina 8 244
Xiphydriidae 6 574
Xylelidae 6 574
Xylastodorus 6 408

Y

chromosome 6 425
connection 1 276
rot place 3 591
delta transformations 14 598
598
organ 4 506
section 9 75
19 6 425
Shute T 6 184
ish antenna 1 447, 14 597*
ed's effective temperature
12 383
ak 14 597
Island Bay Alaska 6 199
ian 10 534 536
ang C N 9 83 566 12 558
angtze Plain 1 580
angtze River 1 580
angtze (Changjiang) 1 577
ankee clover 4 289 9 541
ard (unit) 5 429*, 8 189
armouth (interglacial)
6 195
arn fiber man made 5 242
textile 13 533
arn mount textile 13 534
ervetus 9 504
aw indicator 14 597
aw measurement wind tun-
nels 14 503
aw sphere wind tunnel in-
strumentation 14 503
awing (ships) 12 273
awn 1 460 467 4 219 13 374
14 597 598*
azoo River 9 152
ear 14 599
calendar 2 415 416
eclipse year 4 380
east 5 561 14 599 604*
alcoholic fermentation
2 58
amphotericin B 1 341
ascospores 14 600 603
assimilation 14 601
baker's *see* Baker's yeast
blastomycosis 2 257
candidiasis 2 430
cell surface ionization
2 621
Cryptococcales 3 579
Cryptococcosis 3 579
cytology 14 600
DNA purine and pyrimi-
dine contents 9 212

Yeast—*cont*
ecology 14 601-602
fermentation 14 601
food spoilage 14 602
histoplasmosis 6 458
imperfect 14 601
industrial *see* Yeast, indus-
trial
insects 14 602
milk 8 432
morphology 14 599-600
mycology medical 8 678
pathogen 9 503 14 602
perfect 14 601
physiological properties
14 601
respiration 14 601
Saccharomycetales 12 1
sexual reproduction 14 600-
601
soil microbiology 12 549,
462 14 601
taxonomy 1 574
trees 14 601
Yeast industrial 14 601 604
active dried yeast manu-
facture 14 603
compressed cake manufac-
ture 14 603
ergosterol 5 65
fodder 14 603
food 14 603
glycerol production 14 604
invertase 14 604
malt beverage 8 80
production process 14 604
raw materials 14 603
as a source of enzymes
14 604
strain 14 603 604
vitamin production 14 601
Yeast buds 14 599
Yeast gum 8 92
Yeast mannan 8 92
Yellow bellied sapsucker 12 26
Yellow billed cuckoo 3 612
Yellow birch 2 247 13 119
Yellow breasted chat 3 11
Yellow buckeye 2 359
Yellow dwarf (virus) 2 99
Yellow enzyme *see* Flavopro-
tein
Yellow fever 14 604 605
arbor virus 1 499
in aviation medicine 1 696

Yellow fever—*cont*
fluorescent antibody meth-
od 8 585
liver disorders 7 562
mosquito 4 218 5 6 8 599
reduction in virus viru-
lence 1 424
taxonomy 14 528
Yellow filter illustration 5 266
Yellow Globe turnip 14 164
Yellow green algae 3 117
Yellow headed blackbird 2 255
Yellow jacket 6 574 582
Yellow mealworm 3 287
Yellow mercury salve 8 228
Yellow nickel ore 9 91
Yellow ocher 7 519
Yellow pigments 10 224
Yellow Plain 1 580
Yellow poplar 14 155
Yellow River 1 580
Yellow Sea 9 271
Yellow shafted flicker 5 300
Yellow stem white willow
14 493
Yellow straightneck squash
13 28
Yellow virus disease
see Plant virus
Yellow warbler 14 584
Yellowfin 14 136
Yellowhead Pass 9 157
Yellowish Brown Lateritic soils
12 440
Yellowknife Group 10 567
Yellows virus disease 5 546 548
Yellowstone National Park
9 157
Yellowstone River 13 520
Yenesei River 1 577
Yerkes R 10 126
Yerkes Observatory 13 452
Yersin Alexander 10 255
Yew 14 605
Yield (nuclear explosions)
9 181 183
Yield point metal 8 271 272
stress strain characteristics
13 183
Yield strength metal 8 271
stress strain characteristics
13 183
YIG 5 218
Yoder H S 8 301
Yogurt 8 435

Yoldia Sea 2 87
Yolk 4 414
granules 2 604
ovum 9 458
Yolk sac 14 605
amniota 1 528
extraembryonic membrane
5 158
fetal membrane 5 241
placentation 10 253
Yonge C M 4 380
Yoredale beds 2 469
Yorkshire swine 13 339
Yosemite Valley 5 277
Yosida, K 7 412
Young J R 12 125
Young, J Z 4 363
Young P T 8 605
Young, T 7 184, 500 9 563
Young's equation 5 314
Young Helmholtz theory 5 300
Young's modulus 4 419 420*
6 477 13 184 14 606*
Young's two-slit experiment
7 184 185
Youngina 7 473, 474 11 484
Yount, J 5 533
Youtz Slick method 10 568
Yponomeutidae 7 464
Ypsilantis T 1 491
Ytterbium 8 278 9 549, 14 606*
Yttrium 14 606
electron configuration
4 504
occurrence extraction and
refining 8 278
ionization potential 4 504
in monazite 8 566
Yttrium iron garnet 5 218
Yttrofluorite 11 542
Yucatan Peninsula 9 151 152
Yucca 8 240 13 120
Yucca gloriosa 8 245
Yucca moth 7 461
Yudkin W H 4 362
Yughny Island 1 523
Yukawa, H 8 247
Yukawa interaction 4 543 544
Yukawa meson *see* pi Meson
Yukon Plateau 9 159
Yukon River 9 158
Yukon Valley 9 158
Yun nan Plateau 1 577
Yungia 9 67
Yvon J 13 65

Xylem 2 615, 13 103, 14 590-595*
fibers 14 591
kinds 14 590 591
parenchyma 14 591
plant, mineral nutrition of 10 279
Xylem—*cont*
plant translocation (organic solutes) 10 379
primary 14 591
secondary 14 591-592
tracheids 14 591
Xylem—*cont.*
vessels 14 591
Xylene 3 235, 10 48, 14 596*
Xylene type oil fraction 6 422
Xylenol 3 236
Xylocopa virginica 6 582
Xylomycidae 4 212
Xylophone 8 665 666*, 13 563
Xylose 8 578
D Xylose 6 599
D(+)-Xylose 2 455
Xylulose 8 578
D-Xylulose 5 phosphate 2 16

Z

Z Canelopardalis stars 14 279
Z-cut plate 5 590-591
Z-meter 14 280
Zacharias, J. R. I 649 11 438
Zachariasen, W. H. 1 501, 3 42
Zaglossus 8 584
Zagros Range 1 577
Zalambdalestes 7 143
Zalambdalestidae 7 143
Zeale 7 472
Zaphus californianus 12 98
Zambezi River 1 107, 108 109
Zamia 3 618
Zamia floridana 1 549
Zapodidae 13 615
Zea 4 506, 5 57, 8 239, 11 621
Zea amylacea 5 481
Zea ceratina 5 481
Zea indentata 5 481
Zea indurata 5 481
Zea mays 3 481, 10 188, 11 621, 14 283
Zea saccharata 5 481
Zeaxanthin 2 529, 3 92
Zebra 6 198, 14 607*
gestation period 6 182
Zebrina pendula 10 288
Zebu 14 607
Zeeman, P. 11 439, 14 607
Zeeman effect 14 607 610
anomalous 14 608 609
in crystals 14 609 610
electron spin 4 518
Faraday effect 5 132
inverse 14 609
magnetooptics 8 67
in molecules 14 609
normal 14 607 608
nuclear 14 610
quadratic 14 609
relation to Paschen Back effect 9 588
triplet 14 608
Zeeman energy 8 42
Zeiss 5 544
dyeing 4 310
Zeiformes 9 442, 14 610
Zeiger, H. C. 6 60
Zeia 1 417
Zeiss salt 3 460
Zenaidura macroura 4 270
Zener, C. 1 400, 13 584
Zenneria liberica 4 216
Zenith 14 610
celestial navigation 2 584
Zenith distance 1 607
celestial navigation 2 584
Zenith telescope 1 610 612
Zenith tube 1 611 612
Zenopsis ocellata 14 610
Zeoidea *see* Zeiformes
Zeolite 12 476, 14 402 403, 610 611*
analcime 1 366
base exchange 14 611
cation exchange 14 611
chabazite 3 1
crystallography 14 611
heulandite 6 432
ion exchange 7 241
molecular sieve 8 546 547
stilbite 13 241
as water softener 14 611
Zeomorphi *see* Zeiformes
Zermelo, E. 8 177
Zermelo von Neumann theorem game theory 6 26
Zernike, Frits 8 398
Zero 14 611
absolute *see* Absolute zero
see also Root (mathematics)
Zero function 5 487
Zero-order reactions 7 356
Zero point energy quantum mechanics 11 161
Zero point vibration ionic crystals 7 250
lattice vibrations 7 412
Zero sum game 6 26
Zero vector 9 339
Zerogel 6 93
Zervas, L. 9 629
Zeta 10 234
Zeta potential electrokinetic phenomena 4 479
electroosmosis 4 525
streaming potential 13 174
Zeuglodont 2 660
Zeugloptera 7 466
Zeuglothrips 13 628
Zeugogeosynclines 6 174
Zeuner, F. E. 8 14
Ziegler, K. 11 645
Ziegler catalyst 10 486 491 11 643
Ziegler process 13 655
Ziegler type catalysts 3 639 640
Ziehl Neelsen's carbol fuchsin 13 33
Zillerthal, Alps of 5 117
Zimm, B. H. 12 52
Zinc 14 611 615
alloy 14 615 614
analytical methods 14 615
brass 2 320
calamine 2 390
chemical properties 14 612
compounds 14 612 615
crystal structure 3 599
electron configuration 4 504
extraction and refining 8 278, 11 120
franklinite 5 491
ionization potential 4 504
isotopes 13 611 612
metal 14 612
metallurgy 14 614 615
occurrence 12 606, 14 612
organometallic compound 9 403
refining 14 615
Reformatsky reaction 11 402
roasting 14 614
sintering 14 614
smelting 14 614 615
uses 14 612
velocity of sound in 12 516
zincite 14 615
Zinc alloys 14 615 614
Zinc blast furnace process 11 119
Zinc blende 13 255
crystal structure 3 600
ionic crystals 7 248
lattice 7 248
madelung constant 8 15
Zinc chloride 12 472
Zinc chromate 3 106
Zinc coating 8 279
Zinc metallurgy 14 614 615
blast furnace process 14 615
commercial grades 14 615
electrolytic process 14 615
electrothermic (Saint Joe) process 14 614 615
fire concentration 14 614
horizontal (Belgian) retort process 14 614
refining 14 615
roasting 14 614
sintering 14 614
smelting methods 14 614 615
vertical retort (New Jersey) process 14 614
Zinc oxide 10 223
Zinc plating 4 531
Zinc silver cell 10 588
Zinc sulfide electroluminescence 4 482
luminescence 7 616 617
phosphors 13 585 586
Zincate 14 615
Zincite 14 612, 615*
Zineb 5 564
Zinfandel 14 507
Zingiber 12 76
Zingiber officinale 6 187
Zingiberaceae 1 76 550 6 187
Zingiberene 13 497
Zinnwaldite 8 546 10 425
Zinsser, H. 14 176
Zinziberaceae 5 186 192
Zipper 14 615
Ziram 5 561
Zircaloy tubes 9 187
Zircon 8 278, 14 615*
authigenic zircon 1 674
gem 6 99
gem material 6 99
zirconium 14 616
Zirconia 6 517
Zirconium 14 615 618
analytical 14 617 618
baddeleyite 14 616
compounds 14 617
crystal structure 3 599
electron configuration 4 504
extractive metallurgy 8 278
ionization potential 4 504
natural occurrence (baddeleyite) 2 71
occurrence 14 615 616
production of metal 14 616
properties 14 616 617
zircon 14 616
Zitterbewegung 12 60
Zoaea larva 5 105
Zoantharia 14 618
Actiniaria 1 52 54
Antipathatia 1 480
Ceriantheria 2 654
Rugosa 11 649 650
Scleractinia 12 76 77
Tabulata 13 381
Zoanthidea 14 618
Zoanthella galapagoensis 14 618
Zoanthidea 3 255 14 618*
Zoanthina tenlaculata 14 618
Zoanthus 3 255

McGRAW HILL ENCYCLOPEDIA OF SCIENCE AND TECHNOLOGY

Topical Index

Zoarcidae 4 41
Zoaria 2 357
Zodiac 14 618
  celestial navigation 2 585
  constellations 3 412-414
Zodiacal constellations 3 413-414
Zodiacal light 14 618 619
  Fraunhofer corona 14 618-619
  Gegenschein 14 619
  meteor 8 307
  Poynting-Robertson effect 14 619
Zoea larva 4 26
  Crustacea development 3 566
  Eumalacostraca 5 102
Zola, Emile 1 552
Zona pellucida 9 460, 11 469
Zonal soil 12 433
  biological climax on 13 254
Zonal soil classification 12 416, 433 434*
  geographic distribution 12 441-443
  great soil groups 12 433-441
Zonal spherical harmonic 12 610
Zonation 13 233
Zone biostratigraphic 7 56
Zone circles 3 602
Zone electrophoresis 3 97
Zone indices 3 607
Zone leveling 14 619
Zone plate 4 138
Zone refining 14 619
Zone time 13 612 613
Zoning in minerals 7 13 14
Zonite 7 362
Zoobenthos 8 107 108
  in Black Sea 2 251
Zoochlorellae 10 513
  Porifera 10 519
Zoochory 10 498
Zooecium 2 356
Zoogeographic region 14 619 624
  classification 14 620
  faunal regions, world 14 625
Zoogeography 14 624-626
  faunal 14 625 626
  objectives 14 624
  regional approach 14 624 625
  relict fauna 2 253
  subject area 14 624
  systematic approach 14 624
  see also Paleoecology
Zoogloea 11 64 65 13 604
Zoological nomenclature 14 172, 626 627*
  binomial nomenclature 14 626
  higher taxa 14 626
  international code 14 626 627
  type method 14 172 175
Zoology 14 627
Zoom lens 14 627
  motion picture cameras 3 123
  prism optical 10 623
Zoomar lens 14 627
Zoomastigina *see* Zoomastigophorea
Zoomastigophorea 11 52 14 627 628*
  Hypermastigida 6 586 587* 11 52 14 628
  Polymastigida 10 473 474* 11 52 14 628
  Protomastigida 11 45 46* 52 14 628
Zoomastigophorea—*cont*
  Rhizomastigida 11 52, 547-548*, 14 628
  Trichomonadida 11 52, 14 86*
Zoonoses 14 628 629
  bacteria 2 5
  conclusions 14 629
  control 14 629
  effect on food supply 14 628 629
  heartwater disease 6 362
  insect bite diseases 14 629
  mastitis 14 628
  parasitology, medical 9 556
  present status 14 628
  spread of 14 629
  trypanosomiases 14 628
  use as a weapon 14 629
Zoophobia 10 119
Zoophyte 2 351
Zooplankton 4 39 5 528, 8 129
  deep sea fauna 4 39
  diurnal vertical migration 12 121
  fresh water 5 528
  oceanic geography 12 121
Zoospores 5 107
  Chlorophyta 3 80 85
  Phycomycetes 10 109
Zoosterol 15 139
Zoothamnium 11 55
Zooxanthellae 1 227, 456, 700 3 579
  algal symbiont 12 78
  coral reef 5 474
Zoraptera 14 629 630
Zoregite 12 163
Zoroasteridae 5 458
Zorotypus hubbardi 14 629
Zoroptera 7 131
Zorotypidae 14 630
Zorotypus hubbardi 14 629 630
Zoster *see* Chickenpox and shingles
Zostera 8 107
Zostera marina 7 375
Zosterophyllum 9 501
ZPS triangle *see* Astronomical triangle
Zsigmondy, R 14 181
Zsigmondy gold number 6 94
Zucchini 13 28
Zuckerkandl organ of 1 488
Zygocosmoceras 9 320
Zuider See 5 116
Zuider Zee 5 115
Zürich, Lake of 5 116
Zwai, Lake 1 107
Zwarte Bergen 1 108
Zweifach, B 9 437
Zwitterion 1 342
Zygadenus 10 439
Zygaenidae 7 461
Zygomatic bone 12 573
Zygomorphic flower 5 527
Zygomorphy 10 345
Zygonema 8 209
Zygophyllales 12 561
Zygoptera 7 131 9 275
Zygopterus 3 265
Zygorhiza kochii 2 661
Zygosaccharomyces 14 602
Zygote 5 254
Zymase 10 325
Zymobacterium 11 16
Zymogen 5 20
Zymogen granule 2 387, 681
  digestive system 4 160
Zymogenous microorganisms 12 459
Zymosan 11 15
Zythia 14 630
Zythia fragariae 14 630
Zythia resinae 14 630
Zythiaceae 5 561 12 606 14 630*

Preface

The topical index that follows groups the 7,224 articles in the Encyclopedia under nearly a hundred general headings. These listings give some indication of the great fund of information to be found in the more than 9,000 pages of the Encyclopedia. They will enable the interested reader to find quickly the articles in an area of science or technology in which he is seeking knowledge. For example, he will find titles of articles dealing with astronomy listed under the heading Astronomy, of articles dealing with microbiology under Microbiology, and so on.

The listings will be found to be useful in many ways. They will assist the reader who desires a thorough grounding in any subject covered in the Encyclopedia. If he is interested in acoustics, for example, he can turn to the list under that heading. Then, by studying all the articles listed there, he can significantly increase his knowledge of the subject. The Encyclopedia offers a broader and more up to date coverage of many scientific and technological subjects than will be found in most textbooks.

The listings will help the student engaged in research by providing further information on some aspect of a subject. It will be easy for him to find the articles related to his research activities by simply selecting the pertinent titles given under the general heading.

For a considerably more detailed listing, which goes well beyond article titles, the reader should refer to the 100,000-entry comprehensive index which fills 434 pages of Volume 15. The comprehensive index *entries* are specific, rather than general as in the topical index.

Actually, there are five approaches by which the student can find information in the encyclopedia.

1. The alphabetical placement by title of articles in the Encyclopedia.
2. The comprehensive index.
3. The topical index.
4. The 40,000 cross references among articles.
5. The list of contributors in Volume 15 which shows the major articles written by each contributor.

Using the listings

The lists can be used in various ways, depending on the desired goal. A reader seeking information on a general subject, for example, might not be interested in all of the articles in a list. There are approximately 100 articles listed under Meteorology and climatology. Some of these, such as Air glow, Backing wind, and Millibar, are essentially only concise descriptions or they may cover some specific aspect of a larger subject. On the other hand, such articles as Air pressure, Meteorological instrumentation, and Weather (forecasting and prediction), deal with

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Using the listings

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fundamentals or more general aspects. Thus, the reader has various choices. If he is interested in all aspects of a subject, he can read all of the articles listed under that subject heading. He can then go to the lists under the headings cited in the cross references, and select from these lists the articles related to his basic area of interest.

As an alternative, the reader can select from the list only those articles dealing with the general aspects of the subject and pass up the short, descriptive articles or those on specific topics. For example, a large number of the several hundred articles listed under Geology (mineralogy and petrology) are concerned with specific minerals and rocks. The selective reader might pass by these to concentrate on the more general articles such as Clay minerals, Igneous rocks, Magma, Metamorphic rocks, Sedimentary rocks, and so on. Here, too, the reader should refer to the other subject headings cited at the end of the Geology (mineralogy and petrology) list in order to locate related articles that are classified for the purpose of the topical index in other areas.

Undue repetition of article titles among several lists was avoided by not placing *all* related articles under each heading. For example, the titles of the many crystal articles, listed under Solid-state physics, would have to be repeated under Geology (mineralogy and petrology) to make that list complete. To avoid this repetition, a cross reference at the end of Geology (mineralogy and petrology) states: "For additional treatment of crystalline materials *see* Solid-state physics." Most of the lists carry similar references.

Acoustics

Absorption Absorption (sound). Acoustic mine. Acoustic torpedo. Acoustics Aircraft noise Anechoic chamber Architectural acoustics Audio Audio amplifier Audiometry Beat. Bel Binaural sound Crossover network Deafness. Decibel Directivity Disk recording Doppler effect. Ear protectors Echo Echo sounder. Electroacoustics. Equalization, frequency-response Fidelity Filter, acoustic Fletcher-Munson contours. Flutter and wow Free field Hearing Hearing aid. High fidelity Hydrophone Image, acoustical Impedance, acoustic. Interference of waves Interferometer, acoustic Inverse square law. Loudness Loudspeaker. Magnetic recording Masking (sound) Megaphone. Microbar Microphone Microphonics Muffler. Musical acoustics Musical instruments. Noise, acoustic Noise control Noise control in buildings Noise measurement. Octave Optical recording Overtone (music and acoustics) Partial tone Phon Phonetics Phonograph Physiological acoustics Point source Psychoacoustics Public address system Radiometer, acoustic Recording Reflection (sound). Reflection and transmission coefficients Refraction of waves. Resonance (acoustics and mechanics) Resonator, acoustic Reverberation Scale (music). Silencer Siren (acoustics) SOFAR. Sonar Sone Sonics Sonobuoy Sound Sound intensity Sound pressure Sound recording Sound reproduction systems, electrical Sound track Soundproofing. Stereophonic sound Tone (music and acoustics) Transducer, underwater. Tuning fork Ultrasonics. Underwater sound Underwater telephone Vocoder Volume unit (VU) Wire recording

For articles on wave motion and vibration *see* CLASSICAL MECHANICS For transmission of sound by modulated carrier waves over electric circuits or radio waves *see* COMMUNICATIONS For the physiology of hearing *see* COMPARATIVE PHYSIOLOGY

Aeronautical engineering

Adhesive structural Aerodynamic center Aerodynamic force Aerodynamic wave drag Aerodynamics. Aeroelasticity Aeromechanics. Aeronautical engineering Aeronautics. Aerostat. Aerostatics Aerothermodynamics. Afterburner. Air navigation. Air pocket Air traffic control Air transportation. Aircraft. Aircraft compass system Aircraft engine. Aircraft engine, reciprocating. Aircraft engine performance. Aircraft fuel. Aircraft instrument panel Aircraft instrumentation. Aircraft low-approach system (ILS). Aircraft noise. Aircraft propulsion Aircraft testing. Air cushion vehicle Airfoil. Airfoil profile. Airframe. Airplane Airport engineering. Airport surface detection equipment Airship. Air-speed indicator. Air-velocity measurement. Altimeter, pressure. Altimeter, radio Aluminum Anemometer. Armament, air. Aspect ratio. Autogiro Automatic horizon Autopilot. Aviation Balloon Blimp. Borane. Boron fuel. Center of gravity. Ceramic technology. Chemical fuel. Compass, radio. Convertiplane Diffuser. Dirigible. Drone Dynamic similarity. Elevator, aircraft. Fire detector. Flight Flight characteristics Flight con-

[illegible]

personic flight. Instrument landing system. Jet flow Jet fuel Jet propulsion Jet velocity. Kerosine. Kite. Landing gear. Mach number Magnesium Metal-base fuel Missile Model theory. Nozzle. Nuclear aircraft propulsion Nuclear rocket. Optical tracking Ornithopter Oxidation process Parachute Pitot tube Propellant Propeller, air. Propulsion Pulse jet. Ram jet Rate of climb indicator Reentry Refractory Rocket Rocket engine Rocket-sled testing Rudder, aircraft Runway, airport Sailplane Seaplane. Similitude. Skin friction Sonic barrier Sonic boom Specific fuel consumption. Specific impulse Stability [illegible]

dicator Strai [illegible]

Subsonic flig [illegible]

Supersonic d [illegible] Supersonic flight Tail assembly. Thermal stress Throttled flow Thrust. Transonic flight Turbine propulsion Turbofan Turbojet. Turboprop Turboram jet. Turbulent flow. Turn and bank indicator. Vertical take-off and landing Wind tunnel. Wind tunnel instrumentation. Wing Wing loading. Wing structure Yaw indicator.

For theoretical aspects of air flow phenomena *see* FLUID MECHANICS For articles on propulsion methods, devices, and fuels *see* PROPULSION. For aircraft armament and further articles on missile technology *see* ARMAMENT; SPACE TECHNOLOGY

For further aspects of structural design *see* ENGINEERING MECHANICS. For information on control systems and instrumentation *see* COMMUNICATIONS; CONTROL SYSTEMS ENGINEERING; NAVIGATION.

Agriculture

Agricultural chemistry. Agricultural engineering. Agricultural machinery. Agricultural meteorology. Agricultural science (animal). Agricultural science (plant). Agricultural soil and crop practices. Agriculture. Agriculture (drainage). Agriculture (structures). Agronomy. Alfalfa. Almond Animal-feed composition. Apple Apricot. Artichoke. Asparagus. Avocado. Banana. Barley. Bean. Bee and beekeeping. Beet. Bermuda grass. Blackberry. Blueberry. Bluegrass. Bluestem grass. Brazil nut. Breeding (animal). Breeding (plant). Broccoli. Brome grass. Brussels sprouts. Buckwheat. Burlap. Butter. Cabbage. Cacao Cantaloupe. Canvas Carrot. Cashew. Cattle production, beef. Cattle production, dairy. Cauliflower. Celery. Cereal. Cheese. Cherry Citron. Coconut. Coffee. Collard. Corn. Cotton. Cover crops. Cowpea. Crabapple. Cranberry. Cress. Cucumber. Currant. Dairy machinery. Dallis grass. Date. Defoliant. Drought. Egg (fowl). Eggplant. English walnut. Fertilizing. Fescue. Fiber crops. Fig. Filbert. Flax. Floriculture. Forestry, farm. Frost. Fruit (tree) Fruit growing (small). Fumigant. Garlic. Gibberellin. Goat. Gooseberry. Grain crops. Grape culture. Grapefruit. Grass crops Growing season Hemp Herbicide. Honeydew melon. Hop Horse production. Horseradish. Horticultural crops. Insect control, biological Insecticide. Irrigation of crops Kale Kohlrabi. Kudzu Kumquat. Landscape architecture. Legume forages. Lemon. Lespedeza. Lettuce. Lime (botanical). Lupine. Mandarin. Melon growing. Milk. Millet. Miticide. Mohair. Mule production. Muskmelon Mustard. Nectarine. Nematocide. Nitration Nut crop culture. Oats Okra. Olive. Onion. Orange. Ornamental plant. Paprika. Parsley Parsnip. Pea. Peach. Peanut. Pear. Pecan Pedology. Pepper. Persian melon. Pimento. Pineapple. Pistachio. Plant disease. Plant physiology Plum. Pomegranate. Potato, Irish. Potato, sweet. Poultry production. Pumpkin. Quince. Radish. Rape Raspberry Redtop grass. Rodenticide. Rhubarb. Rice Rural electrification. Rural sanitation Rust (microbiology). Rutabaga. Rye. Sheep Silk. Smut (microbiology). Soil. Soil (great soil groups) Soil mechanics. Soil sterilization. Sorghum. Soybean Spinach. Squash. Strawberry. Sugar beet. Sugar cane. Sugar crops. Sunflower. Swine production Tangerine. Terracing (agricultural) Timothy. Tobacco. Tomato. Tractor. Turnip. Vegetable growing. Vetch. Water softening. Watermelon. Wheat. Wool

For such aspects of agriculture as wildlife management, farm fish ponds, land range management *see* CONSERVATION. For more information on the physiological processes *see* PLANT PHYSIOLOGY.

Air conditioning, heating, and ventilation

See MECHANICAL ENGINEERING.

Analytical chemistry

Activation analysis. Analytical chemistry. Analytical chemistry, errors in. Archeological chemistry. Assay. Balance (analytical). Balance (weighing instrument). Birefringence. Boiler feed water. Boiler water. Buret. Camera. Chemical microscopy. Chemical dating. Chromatography. Cinematography. Colorimetric analysis. Colorimetry. Coulometric analysis. Crystal optics Crystallography. Electrodeposition analysis. Electrooptics. Extraction Filter, color, Flame photometry. Flocculation. Fluorimetric analysis. Forensic chemistry. Gas analysis. Gas chromatography. Gravimetric analysis. Infrared spectroscopy. Interferometry. Ion exchange. Line spectrum. Mass spectroscope. Microscope. Nephelometric analysis. Nucleation. Optical methods of chemical analysis. Optics. Organic quantitative analysis. Photography. Photography, color. Photometry. Pipet. Polarimetric analysis. Polarized light. Polarographic analysis Precipitation (chemistry). Prism, optical. Projection systems, optical Qualitative chemical analysis. Quantitative chemical analysis. Radioactivity (applications). Radioisotope (assay). Radiometric assay. Raman effect. Raw water. Reagent chemicals. Refractometric analysis. Sampling techniques. Separation (chemical and physical). Solubilizing of samples. Spectrochemical analysis. Spectrography. Spectroheliscope. Spectrophotometric analysis. Spectroscopy. Spectroscopy of combustion Spot-test analysis Stoichiometry Supersaturation. Thermosnalysis Titration. Titration, amperometric. Titration, conductimetric Titration, potentiometric. Trace analysis. Turbidimetric analysis. Units, systems of Vacuum fusion. Volatilization. Volumetric analysis. Volumetric flask. Weight Weight measurement. X-ray crystallography X ray diffraction. X-ray fluorescence analysis X-ray optics X-ray powder methods. X-ray tube.

For the application of quantitative measurement and analysis in fields of science and technology *see* ATOMIC PHYSICS, CHEMICAL ENGINEERING, GEOLOGY (MINERALOGY AND PETROLOGY), INORGANIC CHEMISTRY; METALLURGICAL ENGINEERING; ORGANIC CHEMISTRY, PHYSICAL CHEMISTRY.

Anatomy

See ANIMAL ANATOMY, INVERTEBRATE ZOOLOGY; PALEOBOTANY, PALEONTOLOGY, PLANT ANATOMY, VERTEBRATE ZOOLOGY

Animal anatomy

Abdomen. Adrenal gland Anatomy, regional Ankle. Anus Aorta. Appendix Arm. Artery. Autonomic nervous system Blood vessels. Bone. Brain Breast Bronchus Bursa. Capillary (anatomical) Cardiovascular system. Central nervous

system Circulatory system. Collarbone. Colon. Copulatory organ. Cowper's gland. Cranial nerve. Cranium Dentition. Digestive system Ear. Endocrine system. Esophagus. Eye. Fallopian tube. Foot. Gallbladder. Ganglion Gastrointestinal tract. Gill (anatomy). Hand Head. Heart Hip Intestine. Joint (anatomical). Larynx. Leg Ligament. Liver. Lung Lymph node Lymphatic system. Meninges. Mouth. Muscular system. Neck. Nervous system. Neuron Nose Ovary. Pancreas. Parasympathetic nervous system. Parathyroid gland Pelvis. Penis Peritoneum Pharynx. Pineal body Pituitary gland Prostate gland. Rectum. Reproductive system. Respiratory system Reticular formation (brain). Sense organ. Shoulder Sinus Skeletal system. Skin Skull Spinal cord Spine Stomach Spleen Sympathetic nervous system. Tendon Thigh Thyroid gland Throat Tongue Tonsil Trunk. Urinary bladder Urinary system Urogenital system Uterus Vagina Vein Vertebra. Vocal cords Wrist.

See also ANIMAL PATHOLOGY; GROWTH AND MORPHOGENESIS, HISTOLOGY; INVERTEBRATE ZOOLOGY; VERTEBRATE ZOOLOGY

Animal behavior

See ANIMAL ECOLOGY; PSYCHOLOGY, PHYSIOLOGICAL AND EXPERIMENTAL.

Animal ecology

Animal community Biogeography Biological productivity. Biomass *Community classification.* Deep-sea fauna Ecologic interactions. Ecological systems, energy in. Ecology Ecology, applied. Ecology, human Ecosystem Environment. *Food chain* Freshwater ecosystem Limnology Marine ecosystem Phoresy Plant community. Population dynam-

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For ecological aspects concerned with wildlife management *see* CONSERVATION, for animal distribution in time *see* EVOLUTION, for functional and behavioral aspects *see* GENERAL PHYSIOLOGY, PSYCHOLOGY, PHYSIOLOGICAL AND EXPERIMENTAL. For invertebrate animals *see* INVERTEBRATE ZOOLOGY, for physical and biotic aspects see PHYSICAL GEOGRAPHY; for other animal groups *see* VERTEBRATE ZOOLOGY.

Animal pathology

Ablastin Achondroplasia Acne. Actinomycosis Actinophage Addison's disease. Adenovirus Adrenal disorders. Aerobacter Agamma-globulinemia Agglutination reaction Agglutinin Allergy, atopic. Amebiasis para-Aminobenzoic acid Analgesics. Anaphylaxis Anaplasia Anemia. Anesthetic. Aneurysm. Angina pectoris. Animal virus Anoxia Anthrax Antibody. Antigen. Antigen-antibody reaction Antihistamines Antitoxin. Appendicitis Arbor viral encephalitides. Arthritis. Arthus reaction. Ascariasis. Aspergillosis Asthma. Atrophy. Avian leukosis. Bacillary dysentery. Bacteria, lysogenic. Bacteriology, medical Bacteriophage. Balantidiasis. Barbiturates. Bejel Benzedrine. Beriberi Biological specificity. Biologicals. Birthmark. Blackleg Blastomycosis Blood groups. Blood-plate hemolysis. Botulism. Breast disorders. Bronchial disorders. Bronchiectasis. Brucellosis. Buerger's disease. Burn. Bursitis. Cachexia. Cancer (biology). Candidiasis. Carbuncle. Carrion's disease. Cat scratch disease. Cataract. Cathartics. Cerebral palsy. Chagas' disease. Chickenpox and shingles Cholera vibrio. Chromomycosis. Circulation disorders Cirrhosis. Clinical pathology. Clonorchiasis. Coccidioidomycosis. Coliphage. Colitis. *Complement (serum).* Complement-fixation test Concussion Conglutination Conjunctivitis Constipation. Coxsackie virus Cryptococcosis. Culture. Culture, embryonated egg. Culture, tissue. Cystitis. Death. Dengue fever. Dentistry. Dermatitis Dermatophytosis Diabetes Diarrhea. *Diphtheria.* Disease. Disease carrier. Drug resistance. Dyschondroplasia. ECHO virus. Eczema. Edema. Effective dose 50. Embolism Embolus Encephalitis, equine Endocarditis. Enteric bacilli Enterovirus Epidemic. Epidemiology. Escherichia Esophagus, disorders of Exanthem subitum. Eye disorders. Eye glasses. Fasciolíasis Fasciolopsiasis Fever. Fièvre boutonneuse Filar

Gangrene, gas Gastrointestinal tract disorders Germ. German measles. Germfree vertebrate. Gerontology Glanders Glaucoma Goiter. Gonorrhea. Gout Gram-negative diplococci. Granuloma inguinale. Guinea worm infection Harelip. Hay fever. *Heart disorders* Heartwater disease. Hemadsorption viruses Hematologic disorders. Hemophilia. *Hemophilic bacteria.* Hemorrhage. *Hemorrhagic* septic

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Heter

kin's

Hyperplasia. Hypersensitivity. Hypertension. Hypertrophy. Hypnotic. Hypoplasia. Ileitis Immun-

tious disease control Infectious disease transmission Infectious

Inflamm

orders

Jaundice

ders.

Ketosi

Lancet

ders. Leishmaniasis. Leprosy. Leptospira. Lethal dose 50. Leukemia Leukocidin Leukopenia. Listeriosis. Liver disorders Louping-ill Lung disorders Lupus erythematosus Lymph

For further aspects of structural design *see* ENGINEERING MECHANICS. For information on control systems and instrumentation *see* COMMUNICATIONS; CONTROL SYSTEMS ENGINEERING; NAVIGATION.

Agriculture

Agricultural chemistry. Agricultural engineering Agricultural machinery. Agricultural meteorology. Agricultural science (animal). Agricultural science (plant). Agricultural soil and crop practices. Agriculture. Agriculture (drainage). Agriculture (structures). Agronomy. Alfalfa. Almond. Animal-feed composition. Apple. Apricot. Artichoke. Asparagus. Avocado. Banana. Barley. Bean. Bee and beekeeping. Beet. Bermuda grass. Blackberry. Blueberry Bluegrass. Bluestem grass. Brazil nut Breeding (animal). Breeding (plant). Broccoli. Brome grass. Brussels sprouts. Buckwheat. Burlap. Butter. Cabbage. Cacao Cantaloupe Canvas Carrot. Cashew. Cattle production, beef. Cattle production, dairy. Cauliflower. Celery. Cereal Cheese. Cherry. Citron. Coconut. Coffee. Collard. Corn. Cotton. Cover crops Cowpea. Crabapple. Cranberry. Cress. Cucumber. Currant. Dairy machinery. Dallis grass. Date. Defoliant. Drought. Egg (fowl). Eggplant. English walnut Fertilizing. Fescue. Fiber crops. Fig. Filbert. Flax. Floriculture Forestry, farm. Frost Fruit (tree). Fruit growing (small) Fumigant. Garlic. Gibberellin Goat Gooseberry. Grain crops. Grape culture Grapefruit Grass crops. Growing season. Hemp Herbicide. Honeydew melon. Hop. Horse production Horseradish. Horticultural crops. Insect control, biological. Insecticide. Irrigation of crops. Kale. Kohlrabi Kudzu Kumquat. Landscape architecture. Legume forages Lemon. Lespedeza. Lettuce. Lime (botanical) Lupine. Mandarin. Melon growing. Milk. Millet. Miticide. Mohair. Mule production. Muskmelon Mustard. Nectarine. Nematocide. Nitration. Nut crop culture. Oats Okra. Olive Onion. Orange. Ornamental plant Paprika. Parsley. Parsnip. Pea. Peach. Peanut. Pear. Pecan. Pedology. Pepper Persian melon Pimento. Pineapple. Pistachio. Plant disease. Plant physiology. Plum Pomegranate. Potato, Irish. Potato, sweet. Poultry production. Pumpkin Quince. Radish. Rape. Raspberry. Redtop grass Rodenticide. Rhubarb. Rice. Rural electrification. Rural sanitation. Rust (microbiology). Rutabaga. Rye. Sheep Silk. Smut (microbiology). Soil. Soil (great soil groups). Soil mechanics. Soil sterilization. Sorghum Soybean. Spinach. Squash. Strawberry. Sugar beet. Sugar cane. Sugar crops. Sunflower. Swine production. Tangerine. Terracing (agricultural). Timothy. Tobacco. Tomato. Tractor. Turnip. Vegetable growing. Vetch. Water softening. Watermelon. Wheat. Wool.

For such aspects of agriculture as wildlife management, farm fish ponds, land range management *see* CONSERVATION. For more information on the physiological processes *see* PLANT PHYSIOLOGY.

Air conditioning, heating, and ventilation

See MECHANICAL ENGINEERING.

Analytical chemistry

Activation analysis. Analytical chemistry. Analytical chemistry, errors in. Archeological chemistry. Assay. Balance (analytical). Balance (weighing instrument). Birefringence. Boiler feed water. Boiler water. Buret. Camera. Chemical microscopy. Chemical dating. Chromatography. Cinematography. Colorimetric analysis. Colorimetry. Coulometric analysis Crystal optics. Crystallography. Electrodeposition analysis. Electrooptics. Extraction. Filter, color. Flame photometry. Flocculation. Fluorimetric analysis. Forensic chemistry. Gas analysis Gas chromatography. Gravimetric analysis. Infrared spectroscopy. Interferometry. Ion exchange. Line spectrum Mass spectroscope. Microscope. Nephelometric analysis. Nucleation. Optical methods of chemical analysis Optics. Organic quantitative analysis. Photography. Photography, color. Photometry. Pipet. Polarimetric analysis. Polarized light. Polarographic analysis. Precipitation (chemistry). Prism, optical. Projection systems, optical. Qualitative chemical analysis. Quantitative chemical analysis. Radioactivity (applications). Radioisotope (assay) Radiometric assay. Raman effect. Raw water. Reagent chemicals. Refractometric analysis. Sampling techniques. Separation (chemical and physical). Solubilizing of samples. Spectrochemical analysis. Spectrography. Spectroheliscope Spectrophotometric analysis. Spectroscopy. Spectroscopy of combustion. Spot-test analysis Stoichiometry Supersaturation. Thermoanalysis. Titration. Titration, amperometric. Titration, conductimetric. Titration, potentiometric Trace analysis. Turbidimetric analysis. Units, systems of. Vacuum fusion. Volatilization. Volumetric analysis Volumetric flask Weight. Weight measurement. X-ray crystallography. X-ray diffraction. X-ray fluorescence analysis. X-ray optics. X-ray powder methods. X-ray tube.

For the application of quantitative measurement and analysis in fields of science and technology *see* ATOMIC PHYSICS; CHEMICAL ENGINEERING; GEOLOGY (MINERALOGY AND PETROLOGY); INORGANIC CHEMISTRY; METALLURGICAL ENGINEERING; ORGANIC CHEMISTRY; PHYSICAL CHEMISTRY.

Anatomy

See ANIMAL ANATOMY; INVERTEBRATE ZOOLOGY; PALEOBOTANY; PALEONTOLOGY; PLANT ANATOMY; VERTEBRATE ZOOLOGY.

Animal anatomy

Abdomen. Adrenal gland. Anatomy, regional. Ankle. Anus. Aorta. Appendix. Arm. Artery. Autonomic nervous system. Blood vessels. Bone. Brain. Breast. Bronchus. Bursa. Capillary (anatomical). Cardiovascular system. Central nervous

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See also ANIMAL PATHOLOGY; GROWTH AND MORPHOGENESIS; HISTOLOGY; INVERTEBRATE ZOOLOGY, VERTEBRATE ZOOLOGY.

Animal behavior

See ANIMAL ECOLOGY, PSYCHOLOGY, PHYSIOLOGICAL AND EXPERIMENTAL.

Animal ecology

Animal community Biogeography. Biological productivity Biomass. *Community classification* Deep-sea fauna Ecologic interactions Ecological systems. energy in Ecology Ecology, applied Ecology, human Ecosystem Environment. *Food chain.* Freshwater ecosystem Limnology. Marine ecosystem Phoresy. Plant community *Population* dynamics Protective coloration Pyramid of numbers Social animals. Social hierarchy. *Social insects* Space biology Species *population* Succession, ecological Terrestrial ecosystem *Zoogeographic region.* Zoogeography.

For ecological aspects concerned with wildlife management *see* CONSERVATION, for animal distribution in time *see* EVOLUTION; for functional and behavioral aspects *see* GENERAL PHYSIOLOGY, PSYCHOLOGY, PHYSIOLOGICAL AND EXPERIMENTAL For invertebrate animals *see* INVERTEBRATE ZOOLOGY; for physical and biotic aspects *see* PHYSICAL GEOGRAPHY, for other animal groups *see* VERTEBRATE ZOOLOGY

Animal pathology

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Gangrene, gas. Gastrointestinal tract disorders Germ German measles. Germfree vertebrate Gerontology. Glanders Glaucoma. Goiter. Gonorrhea Gout Gram-negative diplococci. Granuloma inguinale. Guinea worm infection. Harelip. Hay fever. Heart disorders Heartwater disease. Hemadsorption viruses. Hematologic disorders. Hemophilia Hemophilic bacteria Hemorrhage. Hemorrhagic

[illegible] disease Hyaluronidase *Hyperplasia* Hypersensitivity Hypertension. Hypertrophy. Hypnotic. Hypoplasia Ileitis Immunity. Immunology. Impetigo. IMViC test *Inclusion* blennorrhea. Inclusion bodies (virus). Infant diarrhea Infarction. Infection *Infection, lytic. Infectious* disease control. Infectious disease transmission *Infectious*

Inflamm
orders o
Jaundice. Jones's disease. Joint (anatomical) disorders. Keratitis. Keratoconjunctivitis (*epidemic*). Ketosis Kidney disorders. Klebsiella pneumoniae. *Lancefield* differentiation scheme Larynx disorders. Leishmaniasis Leprosy Leptospira Lethal dose 50 Leukemia Leukocidin Leukopenia Listeriosis Liver disorders. Louping ill. Lung disor-

meningitis. Lymphogranuloma venereum. Lymphogranuloma-psittacosis group. Lysin. Lytic reaction. Malaria. Malnutrition. Mastitis (cows). Measles. Medicine. Melioidosis. Meningitis. Meningococcus. Menopause. Mental illness. Metabolic disorders. Metaplasia Mole (skin). Molluscum contagiosum. Moraxella lacunata. Mouse viral leukemias. Mouth disorders. Multiple sclerosis. Mumps. Muscular dystrophy. Muscular system disorders Mycology, medical. Myxomatosis, infectious (rabbits). Myxovirus. Narcotic. Neoplasia. Nephritis. Nervous system disorders. Neutralization reaction (antibody). Neutralizing antibody. Newcastle disease. Nitrofuran. Nocardiosis. Nose disorders. Nursing Obesity. *Oncology*. Opiates. Opsonin. *Osteomyelitis* Pancreas disorders. Papillomatosis, infectious (rabbit). Paracolon bacilli. Paragonimiasis. Parapertussis Parasitology, medical. Paratyphoid fever. *Paratyphoid gastroenteritis*. *Parkinson's disease*. Pathogen. Pathology Pellagra. Peptic ulcer. Peritonitis. Phagocytosis. Pharmaceuticals testing. Pharynx disorders. Phlebitis. Phlebotomus fever. Pigmentation. Pink eye. Pinta. Pinworm infection. Pituitary gland disorders. Plague. Pleuropneumonia-like organism (PPLO). Pneumococcus. Pneumocystosis. Pneumonia. Pneumonitis. Poison. Poliomyelitis. Precipitin. Precipitin test. Pregnancy Pregnancy, disorders of. Properdin. Prostate disorders. Proteus. Pseudomonas aeruginosa. Pseudotuberculosis Psittacosis. Psoriasis Public health. Pyorrhea. Q fever. Quelling reaction Rabies Rat-bite fever. Relapsing fever Reproductive system disorders. Respiratory system disorders Retinitis. Rheumatic fever. Rheumatism. Rickets. Rickettsialpox Rickettsioses. Rous sarcoma Salivary gland virus disease. Salmonella. Scarlet fever. Schistosomiasis Sciatica. Scurvy. Sedation. Senescence. Septicemia. Serology. Shigella. Shock syndrome. Sinusitis Skeletal system disorders. Skin disorders. *Skin test*. *Sleeping sickness*. *African Smallpox* Soft chancre Spinal cord disorders Spirochete Spleen disorders. Sporotrichosis Spotted fever Rocky Mountain. Spotted fever group. Staphylococcus. *Sterility Stomach disorders* Streptococcus Strongyloidiasis. Sty. Sulfa drugs. Sulfone (antimicrobial use). Surgery. Syphilis. Tapeworm disease. Tetanus. Thiosemicarbazone. Thrombosis. Thyroid gland disorders Tick bite fever. South African. Tick fever, Colorado Tick paralysis Tick typhus, North Queensland. Tick typhus, Siberian Tonsillitis. Tooth disorders. Tophus Toxemia Toxicology. Toxin, bacterial Toxin-antitoxin reaction Toxoplasmosis. Trachoma. Transfusion Trauma. Trench fever. Trichinosis. Trichomoniasis Tuberculosis. Tularemia Tumor. Tumor viruses Typhoid fever. Typhus, scrub. Typhus fever, endemic (flea-fever. Typhus, epidemic (louse-borne) Ulcer. Urinalysis. Urinary bladder disorders. Uterine disorders. Vaccination. Vaginal disorders Venereal disease. Vincent's angina. Virulence. Virus Wart. Weil's disease. West Nile fever. Whipworm disease. Whooping cough. Yaws. Yellow fever. Zoonoses.

Animal systematics

Animal kingdom. Animal systematics. Species concept. Taxonomic categories. Type method. Zoological nomenclature.

For specific animal groups *see* INVERTEBRATE ZOOLOGY; VERTEBRATE ZOOLOGY.

Anthropology

Animal evolution. Anthropology, physical. Anthropometry. Anthroposcopy. Archeological chemistry. Archeology. Australopithecus. Chemical dating. Cro-Magnon man. *Evolution, organic*. Fontéchevade man. Fossil man. Heidelberg man Java *man Life, origin of. Neanderthal* man. *Peking* man. Piltdown man Pleistocene. Primates (fossil). Proconsul Recent. Rhodesian man. Solo man. Speciation. Steinheim man. Swanscombe man Ternifine man.

See also PALEONTOLOGY

Archeology

See ANTHROPOLOGY

Architectural engineering

See CIVIL ENGINEERING.

Armament

Acoustic mine. Acoustic torpedo Aeronautical engineering Airborne radar Aircraft Airplane. Airship Antisubmarine warfare Armament, air. Armament, army Armament, naval. Atomic bomb Ballistic missile Ballistic range Ballistics, exterior Ballistics, interior Balloon Blimp Borane Ceramic technology Chemical fuel *Chemical warfare*. Combustion Continuous-wave radar Detonation Dirigible, Doppler radar Electronic countermeasures. Explosion and explosive Fire Fire-control systems *Fuel Fulminate*. Fuse, explosive Gas mask. Guidance systems Guided missile Hydrazine Hydrogen bomb. Incendiary Inertial guidance system Jamming Jet propulsion Launching pad *complex Missile Missile guidance systems* Monopulse radar Moving target indication Nitration. Nuclear explosion Oxidation process Passive radar Perchlorate Picric acid Primer (explosive) Propellant Propulsion Pulse jet Pyrotechnics Radar Ram jet Refractory Rocket Rocket staging Shaped charge Ship, naval Smoke Sonar Sonobuoy Submarine Supersonic flight Toluene. Trajectory Underwater demolition

For aircraft information *see* AERONAUTICAL ENGINEERING.

Astronomy

Aberration of light Albedo Aldebaran Alpha Centauri. Andromeda nebula. Antares Antarctic Circle. Aphelion Apogee Apsides. Aquarius. Arctic Circle. Arcturus Areal velocity Aries Asteroid Astrometry. Astronomical coordinate systems As-

tronomical geophysics. Astronomical instruments. Astronomical photography. Astronomical spectroscopy Astronomical unit. Astronomy. Astrophysics. Atmosphere, geochemistry of Atomic clock. Betelgeuse Binary stars Bootes. Calendar. Camera. Cancer (constellation). Capricornus Carbon star. Cardinal points Cassiopeia Celestial mechanics Celestial navigation Celestial sphere Centaurus. Center of mass Central force. Centripetal force. Ceres Chromosphere. Chronograph Chronometer Chronoscope Clock Coal sack Comet. Constellation. Corona, solar Coronograph. Cosmic electrodynamics Cosmic rays Cosmochemistry Cosmogony Cosmology Crab nebula Crux. Cygnus Day Doppler effect Dwarf star Earth (orbital motion) Earth tide Eclipse, astronomical Ecliptic Einstein shift Elements (cosmic abundance) Elements and nuclides (origin) Encke's comet. Ephemeris. Equator. Equinox. Eros. Escape velocity Flying saucers Galaxy, external. Galaxy, the Gemini Geography, mathematical. Giant star. Halley's comet Horizon. Horology. Hyades Interstellar matter Interstellar space Jupiter Latitude, astronomical Leo Libra. Light-year Longitude, astronomical. Lyra Magellanic clouds Magnitude stellar. Mars. Mercury (planet) Meridian Messier number Metagalaxy. Meteor Meteorite Midnight sun Mira Mizar Month Moon Nautical Almanac Nebula Nebulae gaseous Neptune Nova Nutation (astronomy and mechanics) Observatory, astronomical. Occulation. Orbital motion. Orion. Orion nebula Parallax (astronomy). Parsec Pegasus Perigee. Perihelion. Perseus Perturbation (astronomy). Phase (astronomy) Photosphere P[illegible]

Pleiad[illegible]

equin[illegible]

clock Radiation Radio astronomy Radio telescope Red dwarf star Red shift Retrograde motion Rigel Rocket astronomy. Sagittarius Satellite (astronomy) Saturn Schmidt camera Scorpius Second (time unit) Shadow Sirius Solar constant Solar radiation Solar system Solstice Space Spectrochemical analysis Spectrohelioscope Spica Star Star cloud Star clusters Stellar evolution Stellar magnetic field Subgiant star Sun. Sundial Sunspot Supergiant star Supernova Taurus Telescope, astronomical Tide Time Time-interval measurement Transit (astronomy) Trojan planets Tropic of Cancer Tropic of Capricorn Twilight Twinkling stars Umbra Universe. Uranus Ursa Major Ursa Minor. Van Allen radiation Variable star Vega Venus Virgo Watch White dwarf star Wolf Rayett star Year. Zenith Zodiac. Zodiacal light

For articles on space flight and vehicles *see* SPACE TECHNOLOGY For celestial navigation *see* NAVIGATION For articles on the upper atmosphere *see* GEOPHYSICS, METEOROLOGY AND CLIMATOLOGY For further articles on matter-energy relationships in cosmic applications *see* ATOMIC PHYSICS; ELECTROMAGNETIC RADIATION; NUCLEAR PHYSICS. For relativistic and other theoretical considerations regarding the nature of the universe *see* THEORETICAL PHYSICS.

Atomic physics

Absorption. Absorption (electromagnetic radiation). Acceptor atom Angstrom Antiferromagnetism Antimatter Antineutron. Antiproton. Atom Atomic beams Atomic clock Atomic constants. Atomic mass unit. Atomic number. Atomic physics. Atomic structure and spectra Atomic weight Auger effect Baryon Binding energy, nuclear. Boltzmann constant. Boltzmann statistics Boltzmann transport equation Bose-Einstein statistics. Bremsstrahlung Cascade particle. Chemical binding. Chromatography. Collision Compton effect. Conduction band. Conservation of mass Degeneracy (quantum states). Deuteron. Diamagnetism. Donor atom Eigenfunction Eigenvalue Electron. Electron capture. Electron configuration Electron paramagnetic resonance spectroscopy. Electron spin. Electron volt Elementary particle Elements (chemical). Energy level (quantum mechanics). Excited state Exclusion principle Fermi-Dirac statistics. Fine structure (spectrum lines). Ferromagnetism Flame photometry. Gravitation Ground state Harmonic oscillator Hyperfine structure Hyperon Ion Isobar (atomic physics). Isoelectric sequence. Isomerism, nuclear. Isotone Isotope. Isotope shift Isotopic spin I[illegible]

[illegible] on. Lepton.

[illegible] resonance

[illegible] Mass de-

[illegible] spectroscope Mendelevium Meson. Metastable state. Microradiography. Microwave spectroscopy. Molecular beams Multipole radiation Muonium. Neptunium. Neutrino. Neutron Neutron, delayed Neutron cross section Neutron diffraction. Nobelium Nuclear moments. Nuclear physics Nuclear structure Nucleon. Nucleus, atomic Packing fraction Paramagnetism Parity Paschen-Back effect Periodic table Perturbation (quantum theory). Planck's constant. Positron Pr[illegible] (physics). Q[illegible] mechanics. Q[illegible] Quantum theory, nonrelativistic. Radiation Radiation chemistry Radioactivity. Radio-frequency spectroscopy. Radiography Ritz's combination principle. Rydberg constant. Scattering experiments, atomic and molecular Scattering experiments, nuclear Schrodinger's wave equation Selection rules (physics). Specific charge Spin (quantum mechanics). Stark effect Stationary state Strange particle. Symmetry laws (physics) Triton. Uncertainty principle Valence band V-particle Work function (electronic) X-ray crystallography. X-ray diffraction. X-ray fluorescence analysis. X unit. Zeeman effect

For more detailed nuclear aspects *see* NUCLEAR PHYSICS.

meningitis. Lymphogranuloma venereum. Lymphogranuloma-psittacosis group. Lysin. Lytic reaction. Malaria. Malnutrition. Mastitis (cows). Measles. Medicine. Melioidosis. Meningitis. Meningococcus. Menopause. Mental illness. Metabolic disorders. Metaplasia. Mole (skin). Molluscum contagiosum. Moraxella lacunata. Mouse viral leukemias. Mouth disorders. Multiple sclerosis. Mumps. Muscular dystrophy. Muscular system disorders. Mycology, medical. Myxomatosis, infectious (rabbits). Myxovirus. Narcotic. Neoplasia. Nephritis. Nervous system disorders Neutralization reaction (antibody). Neutralizing antibody. Newcastle disease. Nitrofuran. Nocardiosis. Nose disorders. Nursing. Obesity. Oncology. Opiates. Opsonin Osteomyelitis. Pancreas disorders. Papillomatosis, infectious (rabbit). Paracolon bacilli. Paragonimiasis. Parapertussis. Parasitology, medical. Paratyphoid fever. Paratyphoid gastroenteritis. Parkinson's disease. Pathogen. Pathology. Pellagra. Peptic ulcer. Peritonitis. Phagocytosis. Pharmaceuticals testing. Pharynx disorders. Phlebitis. Phlebotomus fever. Pigmentation Pink eye Pinta. Pinworm infection. Pituitary gland disorders. Plague. Pleuropneumonia-like organism (PPLO). Pneumococcus Pneumocystosis Pneumonia. Pneumonitis. Poison Poliomyelitis. Precipitin. Precipitin test. Pregnancy. Pregnancy, disorders of. Properdin. Prostate disorders. Proteus Pseudomonas aeruginosa. Pseudotuberculosis. Psittacosis. Psoriasis Public health Pyorrhea. Q fever. Quellung reaction. Rabies. Rat-bite fever. Relapsing fever. Reproductive system disorders. Respiratory system disorders. Retinitis Rheumatic fever. Rheumatism Rickets. Rickettsialpox Rickettsioses. Rous sarcoma. Salivary gland virus disease Salmonella. Scarlet fever. Schistosomiasis. Sciatica. Scurvy. Sedation. Senescence. Septicemia. Serology. Shigella. Shock syndrome. Sinusitis. Skeletal system disorders. Skin disorders. Skin test. Sleeping sickness. African. Smallpox. Soft chancre. Spinal cord disorders Spirochete Spleen disorders Sporotrichosis Spotted fever. Rocky Mountain Spotted fever group Staphylococcus. Sterility Stomach disorders. Streptococcus Strongyloidiasis. Sty. Sulfa drugs Sulfone (antimicrobial use). Surgery. Syphilis. Tapeworm disease. Tetanus Thiosemicarbazone. Thrombosis Thyroid gland disorders Tick bite fever. South African. Tick fever. Colorado Tick paralysis Tick typhus. *North Queensland Tick typhus. Siberian* Tonsillitis. Tooth disorders Tophus Toxemia Toxicology. Toxin. bacterial Toxin-antitoxin reaction Toxoplasmosis. Trachoma. Transfusion Trauma Trench fever. Trichinosis. Trichomoniasis Tuberculosis. Tularemia. Tumor. Tumor viruses. Typhoid fever. Typhus, scrub. Typhus fever, endemic (flea-borne) Typhus fever, epidemic (louse-borne). Ulcer. *Urinalysis. Urinary bladder disorders* Uterine disorders Vaccination. Vaginal disorders. Venereal disease. Vincent's angina. Virulence. Virus Wart. Weil's disease. West Nile fever. Whipworm disease. Whooping cough. Yaws Yellow fever. Zoonoses.

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Animal evolution. Anthropology, physical. Anthropometry. Anthroposcopy. Archeological chemistry Archeology. Australopithecus. Chemical dating Cro-Magnon man Evolution, organic. Fontéchevade man. Fossil man. Heidelberg man Java man Life, origin of. Neanderthal man. Peking man. Piltdown man. Pleistocene. Primates (fossil). Proconsul Recent. Rhodesian man. Solo man. Speciation. Steinheim man. Swanscombe man. Ternifine man

See also PALEONTOLOGY

Archeology

See ANTHROPOLOGY.

Architectural engineering

See CIVIL ENGINEERING.

Armament

Acoustic mine Acoustic torpedo Aeronautical engineering. Airborne radar Aircraft Airplane. Airship Antisubmarine warfare Armament, air Armament, army Armament, naval Atomic bomb Ballistic missile. Ballistic range Ballistics, exterior. Ballistics, interior. Balloon Blimp Borane. Ceramic technology. Chemical fuel Chemical warfare Combustion. Continuous-wave radar Detonation. Dirigible. Doppler radar Electronic countermeasures Explosion and explosive Fire Fire-control systems Fuel Fulminate. Fuse, explosive Gas mask. Guidance systems Guided missile Hydrazine Hydrogen bomb. Incendiary. Inertial guidance system Jamming Jet propulsion Launching pad complex Missile Missile guidance systems Monopulse radar Moving-target indication Nitration Nuclear explosion Oxidation process Passive radar. Perchlorate Picric acid Primer (explosive) Propellant Propulsion Pulse jet Pyrotechnics Radar Ram jet Refractory. Rocket Rocket staging Shaped charge Ship, naval Smoke Sonar Sonobuoy Submarine Supersonic flight Toluene Trajectory Underwater demolition

For aircraft information *see* AERONAUTICAL ENGINEERING.

Astronomy

Aberration of light. Albedo Aldebaran. Alpha Centauri *Andromeda nebula* Antares. Antarctic Circle. Aphelion Apogee. Apsides. Aquarius Arctic Circle. Arcturus. Areal velocity. Aries. Asteroid Astrometry. Astronomical coordinate systems As-

tronomical geophysics. Astronomical instruments Astronomical photography Astronomical spectroscopy Astronomical unit Astronomy, Astrophysics. Atmosphere, geochemistry of. Atomic clock. Betelgeuse Binary stars Boötes Calendar. Camera. Cancer (constellation). Capricornus. Carbon star. Cardinal points. Cassiopeia. Celestial mechanics Celestial navigation. Celestial sphere Centaurus Center of mass Central force Centripetal force. Ceres. Chromosphere. Chronograph. Chronometer. Chronoscope Clock. Coal sack. Comet Constellation. Corona, solar Coronograph Cosmic electrodynamics Cosmic rays. Cosmochemistry. Cosmogony. Cosmology Crab nebula. Crux. Cygnus. Day Doppler effect. Dwarf star Earth (orbital motion) Earth tide Eclipse, astronomical Ecliptic. Einstein shift Elements (cosmic abundance) Elements and nuclides (origin). Encke's comet. Ephemeris Equator. Equinox Eros Escape velocity Flying saucers Galaxy, external. Galaxy, the Gemini Geography, mathematical. Giant star. Halley's comet Horizon Horology. Hyades Interstellar matter Interstellar space Jupiter Latitude, astronomical. Leo Libra. Light-year Longitude, astronomical Lyra. Magellanic clouds Magnitude, stellar Mars Mercury (planet) Meridian Messier number Metagalaxy. Meteor Meteorite Midnight sun Mira. Mizar. Month Moon Nautical Almanac Nebula Nebulae gaseous. Neptune Nova. Nutation (astronomy and mechanics). Observatory, astronomical. Occulation Orbital motion Orion Orion nebula. Parallax (astronomy) Parsec Pegasus Perigee Perihelion Perseus Perturbation (astronomy). Phase (astronomy). Photosphere Pisces (constellation) Planet Planetarium. Pleiades Pluto. Polaris Precession. Precession of equinoxes Procyon Proton-proton chain. Quartz clock. Radiation Radio astronomy Radio telescope Red dwarf star Red shift Retrograde motion Rigel Rocket astronomy Sagittarius Satellite (astronomy) Saturn Schmidt camera. Scorpius Second (time unit) Shadow. Sirius Solar constant Solar radiation. Solar system Solstice Space Spectrochemical analysis. Spectroheliograph Spica Star [illegible] evolution [illegible] Sundial [illegible] rus Telescope, astronomical Tide Time Time-interval measurement. Transit (astronomy) Trojan planets. Tropic of Cancer Tropic of Capricorn Twilight Twinkling stars Umbra Universe Uranus. Ursa Major Ursa Minor Van Allen radiation Variable star Vega Venus Virgo Watch White dwarf star Wolf Rayet star Year. Zenith. Zodiac. Zodiacal light

For articles on space flight and vehicles *see* SPACE TECHNOLOGY For celestial navigation *see* NAVIGATION For articles on the upper atmosphere *see* GEOPHYSICS; METEOROLOGY AND CLIMATOLOGY For further articles on matter-energy relationships in cosmic applications *see* ATOMIC PHYSICS, ELECTROMAGNETIC RADIATION; NUCLEAR PHYSICS For relativistic and other theoretical considerations regarding the nature of the universe *see* THEORETICAL PHYSICS

Atomic physics

Absorption Absorption (electromagnetic radiation). Acceptor atom. Angstrom Antiferromagnetism Antimatter. Antineutron Antiproton Atom. Atomic beams Atomic clock Atomic constants. Atomic mass unit. Atomic number. Atomic physics Atomic structure and spectra. Atomic weight Auger effect Baryon Binding energy, nuclear. Boltzmann constant Boltzmann statistics. Boltzmann transport equation. Bose-Einstein statistics Bremsstrahlung Cascade particle. Chemical binding. Chromatography. Collision Compton effect. Conduction band Conservation of mass Degeneracy (quantum states) Deuteron. Diamagnetism. Donor atom Eigenfunction. Eigenvalue Electron. Electron capture Electron configuration Electron paramagnetic resonance spectroscopy. Electron spin Electron volt Elementary particle. Elements (chemical) Energy level (quantum mechanics). Excited state Exclusion principle Fermi-Dirac statistics Fine structure (spectrum lines). Ferromagnetism Flame photometry. Gravitation Ground state Harmonic oscillator Hyperfine structure. Hyperon Ion Isobar (atomic physics) Isoelectric sequence Isomerism nuclear. Isotone Isotope. Isotope shift Isotope spin Larmor precession Lepton Magnetic moment, electron Magnetic resonance Magnetism Magnetization Magneton. Mass defect Mass number Mass spectroscope Mendelevium Meson Metastable state Microradiography. Microwave spectroscopy Molecular beams. Multipole radiation Muonium Neptunium. Neutrino Neutron Neutron, delayed. Neutron cross section Neutron diffraction Nobelium Nuclear moments Nuclear physics Nuclear structure. Nucleon Nucleus, atomic Packing fraction. Paramagnetism Parity Paschen-Back effect Periodic table. Perturbation (quantum theory) Planck's constant Positron Positronium Proton Quantum (physics). Quantum electrodynamics Quantum mechanics Quantum numbers. Quantum statistics. Quantum theory nonrelativistic Radiation Radiation chemistry Radioactivity. Radio-frequency spectroscopy. Radiography Ritz's combination principle Rydberg constant [illegible] specific charge Spin (quantum mechanics) Stark effect Stationary state Strange particle Symmetry laws (physics). Triton Uncertainty principle. Valence band. V particle. Work function (electronic) X-ray crystallography. X-ray diffraction. X-ray fluorescence analysis X-unit. Zeeman effect.

For more detailed nuclear aspects *see* NUCLEAR PHYSICS

meningitis. Lymphogranuloma venereum. Lymphogranuloma-psittacosis group. Lysin. Lytic reaction. Malaria. Malnutrition. Mastitis (cows). Measles. Medicine. Melioidosis. Meningitis. Meningococcus. Menopause. Mental illness. Metabolic disorders. Metaplasia. Mole (skin). Molluscum contagiosum. Moraxella lacunata. Mouse viral leukemias. Mouth disorders. Multiple sclerosis. Mumps. Muscular dystrophy. Muscular system disorders. Mycology, medical. Myxomatosis, infectious (rabbits). Myxovirus. Narcotic. Neoplasia. Nephritis. Nervous system disorders. Neutralization reaction (antibody). Neutralizing antibody. Newcastle disease. Nitrofuran. Nocardiosis. Nose disorders. Nursing. Obesity. Oncology. Opiates. Opsonin. Osteomyelitis. Pancreas disorders. Papillomatosis, infectious (rabbit). Paracolon bacilli Paragonimiasis. Parapertussis. Parasitology, medical. Paratyphoid fever. Paratyphoid gastroenteritis. Parkinson's disease. Pathogen. Pathology. Pellagra. Peptic ulcer. Peritonitis. Phagocytosis. Pharmaceuticals testing. Pharynx disorders. Phlebitis. Phlebotomus fever. Pigmentation. Pink eye. Pinta. Pinworm infection. Pituitary gland disorders. Plague. Pleuropneumonia-like organism (PPLO). Pneumococcus. Pneumocystosis. Pneumonia Pneumonitis. Poison. Poliomyelitis. Precipitin. Precipitin test. Pregnancy Pregnancy, disorders of. Properdin. Prostate disorders. Proteus. Pseudomonas aeruginosa. Pseudotuberculosis. Psittacosis. Psoriasis Public health Pyorrhea. Q fever. Quellung reaction Rabies. Rat-bite fever. Relapsing fever. Reproductive system disorders. Respiratory system disorders. Retintis. Rheumatic fever. Rheumatism. Rickets. Rickettsialpox. Rickettsioses. Rous sarcoma. Salivary gland virus disease. Salmonella. Scarlet fever. Schistosomiasis. Sciatica. Scurvy. Sedation. Senescence. Septicemia Serology. Shigella. Shock syndrome. Sinusitis. Skeletal system disorders Skin disorders. Skin test. Sleeping sickness, African. Smallpox Soft chancre. Spinal cord disorders. Spirochete. Spleen disorders. Sporotrichosis. Spotted fever. Rocky Mountain. Spotted fever group. Staphylococcus. Sterility. Stomach disorders. Streptococcus. Strongyloidiasis. Sty. Sulfa drugs. Sulfone (antimicrobial use) Surgery. Syphilis. Tapeworm disease. Tetanus Thiosemicarbazone. Thrombosis. Thyroid gland disorders Tick bite fever. South African. Tick fever, Colorado Tick paralysis. Tick typhus, North Queensland. Tick typhus, Siberian Tonsillitis. Tooth disorders. Tophus. Toxemia. Toxicology. Toxin, bacterial Toxin-antitoxin reaction Toxoplasmosis. Trachoma. Transfusion Trauma. Trench fever. Trichinosis. Trichomoniasis. Tuberculosis. Tularemia. Tumor. Tumor viruses. Typhoid fever. Typhus, scrub. Typhus fever, endemic (flea-borne). Typhus fever, epidemic (louse-borne) Ulcer. Urinalysis. Urinary bladder disorders. Uterine disorders. Vaccination Vaginal disorders. Venereal disease. Vincent's angina. Virulence Virus. Weil's disease. West Nile fever. Whipworm disease. Whooping cough Yaws. Yellow fever. Zoonoses.

Animal systematics

Animal kingdom. Animal systematics. Species concept. Taxonomic categories. Type method Zoological nomenclature.

For specific animal groups *see* INVERTEBRATE ZOOLOGY; VERTEBRATE ZOOLOGY.

Anthropology

Animal evolution. Anthropology, physical. Anthropometry. Anthroposcopy. Archeological chemistry. Archeology. Australopithecus. Chemical dating. Cro-Magnon man. Evolution, organic. Fontéchevade man Fossil man Heidelberg man Java man. Life, origin of. Neanderthal man. Peking man. Piltdown man Pleistocene. Primates (fossil). Proconsul Recent. Rhodesian man. Solo man. Speciation. Steinheim man. Swanscombe man Ternifine man

See also PALEONTOLOGY.

Archeology

See ANTHROPOLOGY.

Architectural engineering

See CIVIL ENGINEERING.

Armament

Acoustic mine. Acoustic torpedo. Aeronautical engineering. Airborne radar Aircraft Airplane. Airship Antisubmarine warfare. Armament, air. Armament, army. Armament, naval Atomic bomb. Ballistic missile. Ballistic range. Ballistics, exterior. Ballistics, interior Balloon Blimp Borane. Ceramic technology. Chemical fuel. Chemical warfare. Combustion Continuous-wave radar. Detonation Dirigible. Doppler radar Electronic countermeasures. Explosion and explosive. Fire. Fire-control systems. Fuel Fulminate. Fuse, explosive. Gas mask. Guidance systems. Guided missile. Hydrazine. Hydrogen bomb. Incendiary Inertial guidance system Jamming Jet propulsion Launching pad complex Missile. Missile guidance systems Monopulse radar Moving-target indication Nitration. Nuclear explosion Oxidation process. Passive radar Perchlorate Picric acid Primer (explosive) Propellant. Propulsion Pulse-jet Pyrotechnics. Radar Ram jet. Refractory. Rocket. Rocket staging Shaped charge Ship, naval Smoke. Sonar Sonobuoy Submarine. Supersonic flight. Toluene. Trajectory. Underwater demolition.

For aircraft information *see* AERONAUTICAL ENGINEERING.

Astronomy

Aberration of light. Albedo. Aldebaran Alpha Centauri Andromeda nebula. Antares. Antarctic Circle. Aphelion. Apogee Apsides. Aquarius. Arctic Circle. Arcturus. Areal velocity. Aries. Asteroid Astrometry Astronomical coordinate systems. As-

sion Thiamine Threonine. Thyroid gland. Transamination. Triglyceride. Triphosphopyridine nucleotide (TPN) Tryptophan Tyrosine Ultracentrifuge Urea (biochemistry). Uric acid. Uridine diphosphoglucose (UDPG). Urine. Valine. Vitamin Vitamin A Vitamin B_6. Vitamin B_{12}. Vitamin D Vitamin E. Vitamin K X-ray diffraction.

For information on the disease processes *see* ANIMAL PATHOLOGY; for articles in animal physiology *see* COMPARATIVE PHYSIOLOGY; for other articles on carbon compounds *see* ORGANIC CHEMISTRY.

Biology

See AGRICULTURE; ANIMAL ANATOMY; ANIMAL ECOLOGY, ANIMAL PATHOLOGY; ANIMAL SYSTEMATICS, ANTHROPOLOGY, BIOCHEMISTRY; BIOPHYSICS, COMPARATIVE PHYSIOLOGY; CYTOLOGY, EVOLUTION; FOOD ENGINEERING; FORESTRY; GENERAL PHYSIOLOGY; GENETICS; GROWTH AND MORPHOGENESIS; HISTOLOGY, INVERTEBRATE ZOOLOGY, MEDICAL MICROBIOLOGY; MICROBIOLOGY; PALEOBOTANY; PALEONTOLOGY; PLANT ANATOMY; PLANT ECOLOGY; PLANT PATHOLOGY; PLANT PHYSIOLOGY, PLANT TAXONOMY, PSYCHOLOGY, PHYSIOLOGICAL AND EXPERIMENTAL; VERTEBRATE ZOOLOGY. *See also* SANITARY ENGINEERING

Biophysics

Aberration, optical. Autoradiography. Aviation medicine. Behavioral psychophysics Biological effects of sound waves Biophysics Biophysics, mathematical. Biopotentials and electrophysiology Birefringence. Bone (biophysics). Cell-surface ionization Chromatic aberration Cybernetics. Cytology (molecular basis) Decompression illness Dichroism Electrocardiography Electrodiagnosis Electroencephalography Electromagnetic radiation. Electromyogram Electrophysiology (heart). Electrotherapy. Gas dynamics. Gravity Health physics Historadiography Information theory (biological applications) Infrared radiation (biology) Linear energy transfer (biology) Mechanoreceptors. Micromanipulation Microscope. Microscope, centrifuge. Microscope, electron Microscope, fluorescence Microscope, interference Microscope, optical Microscope, phase contrast Microscope, reflecting Microscope, x-ray. Molecular biophysics Muscle (biophysics). Nuclear radiation (biology). O-

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ogy. Radiation injury (biology) Radiation microbiology Radioactivity (applications) Radioisotope (biology) Radiology. Respiration, external Space biology Spirometry. Symballophone. Thermodynamic principles. Thermodynamic processes. Thermotherapy. Ultraviolet radiation Ultraviolet radiation (biology). Vectorcardiography. Weightlessness

For applications in other fields *see* ACOUSTICS; ANIMAL PATHOLOGY; FLUID MECHANICS.

Botany

See AGRICULTURE; BIOCHEMISTRY; CONSERVATION; CYTOLOGY; FORESTRY; MICROBIOLOGY; PALEOBOTANY; PLANT ANATOMY; PLANT ECOLOGY; PLANT PATHOLOGY; PLANT PHYSIOLOGY; PLANT TAXONOMY.

Chemical engineering

Abrasive. Adhesive, structural. Agricultural chemistry. Agricultural science. Amination Anemometer. Animal-feed composition Autoclave. Bergius process Bleaching Boiler feed water. Boiler water Boundary-layer flow. Boyle's law. Brick. Cement. Cement-asbestos Cetane number. Centrifugal pump. Centrifugation. Ceramic technology. Charcoal Charles' law. Chemical engineering Chemical fuel Chemical process control Chemical warfare. Chemurgy. Clarification. Classification, mechanical Clay Clay minerals. Clay products architectural Coal chemicals. Coal gasification. Coke. Combustion Combustion chamber. Combustion knock Concrete. Condenser, vapor Conservation of energy Contact condenser. Cooling tower. Crystallization Cyanoethylation. Defoliant. Dehumidifier. Dehydrogenation Desiccant. Destructive distillation Detonator Diffusion in gases and liquids. Dimensional analysis Displacement pump Drier (paint) Drying Dust and mist collection Dyeing Economizer and air heater. Electrochemical proc-

Evaporator Explosion and explosive. Explosive forming Feed water Fertilizer Fertilizing Fiber, man-made Fiber, natural. Filler. Filtration. Fire detector Fire extinguisher. Fischer-Tropsch process. Fission, nuclear. Flame. Flameproofing. Flax. Floriculture. Flow measurement Flow of fluids Fluid dynamics Fluid mechanics. Fluid statics Fluid-flow principles. Fluid-flow properties. Fluidization of solids. Food engineering. Food manufacturing Forest fire control. Fossil fuel. Frit. Fuel. Fuel gas. Fuel gas supplements Fumigant. Furnace (steam generating). Furnace construction. Fuse, explosive Gas absorption operations. Gas furnace Gas mask. Gibberellin. Glass and glass products Glazing Halogenation Heat exchanger. Herbicide. High-pressure physics High-pressure processes

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Ice manufacture. Incendiary. Imhoff tank. Impulse generator. Incompressible flow. Insecticide Isothermal process Isotope separation (stable isotopes). Japanning Jet flow. Kiln. Lacquer. Laminar flow. Leaching. Leather and fur processing. Lignite. Lime (industrial). Magnetic separation

Automotive engineering

See MECHANICAL ENGINEERING.

Bacteriology

Ablastin. Achromobacteraceae. Acid-fast stain. Actinomycetaceae Actinomycetales Actinoplanaceae. Aerobacter. Agglutination reaction. Agglutinin. Anthrax. Antibacterial agents. Antibiotic. Antibody. Antigen. Antigen-antibody reaction. Antiseptic. Antitoxin. Azotobacteraceae. Bacillaceae. Bacillary dysentery. Bacteria. Bacteria, lysogenic. Bacteria, taxonomy of. Bacterial cell chemistry. Bacterial coenzyme. Bacterial endospores. Bacterial enzyme. Bacterial genetics. Bacterial growth. Bacterial luminescence. Bacterial metabolism Bacterial motility. Bacterial nutrition. Bacterial physiology. Bacteriology. Bacteriology, medical. Bacteriophage. Bacteroidaceae Beggiatoales. Biological specificity. Biologicals. Blood-plate hemolysis. Botulism. Brevibacteriaceae. Brucellaceae. Brucellosis. Caryophanales. Caulobacteraceae. Chemotherapy. Chlamydobacteriales. Cholera vibrio. Coliphage. Complement (serum) Complement-fixation test. Conglutination. Corynebacteriaceae. Culture, elective. Culture, media components of. Culture, pure Culture technique. Cystitis Diphtheria Disease carrier. Drug resistance. Effective dose 50. Endocarditis. Enteric bacilli Enterobacteriaceae Epidemic. Epidemiology Escherichia. Fermentation. Food poisoning, bacterial. Food preservation Food spoilage. Foot and mouth disease. Gaffkya tetragena Gangrene, gas Germ. Glanders Gonorrhea Gram's stain. Gram-negative diplococci. Hemophilic bacteria. Hemorrhagic septicemia. Heterophile antigen Humus. Hyaluronidase. Hyphomicrobiales Immunity. Immunology. IMViC test. Infant diarrhea Infectious disease control. Infective dose 50 Isoantigen. Isonicotinic acid hydrazide Johne's disease. Klebsiella pneumoniae. Lactobacillaceae Lancefield differentiation scheme. Leprosy Leptospira. Lethal dose 50. Leukocidin. Lyophilization. Lysin. Lytic reaction. Mastitis (cows) Melioidosis Meningitis Meningococcus Methanomonadaceae. Micrococcaceae. Moraxella lacunata. Mycobacteriaceae Mycoplasmatales Myxobacterales. Neisseriaceae Neutralization reaction (antibody) Neutralizing antibody Nitrobacteriaceae. Nitrogen cycle. Opsonin. Paracolon bacilli. Parapertussis. Paratyphoid fever. Paratyphoid gastroenteritis. Pasteurization. Pathogen (soil). Phagocytosis. Pink eye. Pinta Plague. Pleuropneumonia-like organism (PPLO). Pneumococcus. Pneumonia. Precipitin. Precipitin test. Properdin. Propionibacteriaceae. Proteus. Pseudomonadaceae. Pseudomonadales. Pseudomonadineae Pseudomonas aeruginosa. Pseudotuberculosis. Public health Quelling reaction. Rat-bite fever. Relapsing fever. Rheumatic fever. Rhizobiaceae. Rhodobacterineae. Salmonella. Scarlet fever. Schizomycetes Septicemia Serology. Shigella Siderocapsaceae. Skin test. Soft chancre. Spirillaceae. Spirochaetales. Spirochete. Stain (microbiological). Sterilization. Streptomycetaceae. Syphilis. Thiobacteriaceae. Tuberculariaceae. Tuberculosis. Tularemia. Typhoid fever. Vaccination. Venereal disease. Vincent's angina. Virulence. Water analysis. Water-borne disease. Weil's disease. Whooping cough. Zoonoses.

For more articles on the chemistry of the physiological processes *see* BIOCHEMISTRY. For information on the role of bacteria in plant disease *see* PLANT PATHOLOGY; for information on the role of bacteria in water and sewage *see* SANITARY ENGINEERING.

See also MEDICAL MICROBIOLOGY; MICROBIOLOGY.

Biochemistry

Acetyl phosphate Acetylcholine. Adenosinediphosphate (ADP). Adenosinetriphosphate (ATP). Adenylic acid. Adrenal cortex steroid. Adsorption Alanine. Albumin. Aldosterone Amino acids para-Aminobenzoic acid. Amphoterism. Amylase. Androgen. Arginine. Ascorbic acid Asparagine. Aspartic acid. Auxin. Bile acid Bilirubin. Biochemistry. Biological oxidation Biotin. Blood Buffer solution Calcium metabolism Carbohydrate. Carbohydrate metabolism Carboxylic acid Carotenoid. Catalysis. Cetyl alcohol. Chelation. Chemical energy. Chemical warfare. Chitin. Chlorophyll. Cholesterol. Choline. Coacervation. Coenzyme. Colloid. Creatine-creatine. Cysteine. Cystine. Cytochemistry. Cytochrome. Dextrin. Dialysis. Digitoxigenin. Diphosphopyridine nucleotide (DPN). Donnan equilibrium. Electrophoresis. Enantiomorph. Enzyme. Enzyme inhibition. Epinephrine. Equilibrium, chemical Equilibrium, ionic Equilibrium, phase Ergosterol. Estrogen Fibrinogen. Flavone Folic acid Fructose Galactose. Gamma globulin. Gel. Globulin. Glucose. Glucose-1-phosphate. Glucose-6-phosphate. Glutamic acid. Glutamine Glutelin. Glycine Glycogen. Glycolipid Gonad Hemoglobin. Histidine. Hormone Hormone, adenohypophyseal. Hormone, adrenal cortex Hormone, adrenal medullary Hormone, neurohypophyseal. Human genetics. Hyaluronic acid. Hydrogen bond. Hypophysis. Inositol Insulin Interface of phases. Inulin. Ion-permeable membrane Iron metabolism. Isoelectric point Isoleucine. Krebs cycle. Lactase Lactose. Leucine Levan Lipid. Lipid metabolism Lysine Maltase Maltose. Metabolic disorders. Metabolism. Metabolism in ruminants Methionine. Monosaccharide Niacin. Nucleic acid Nucleoprotein Nutrition. Oligosaccharide Oncology Pancreas. Pantothenic acid Peptide. Phenylalanine Phosphate metabolism Phosphatide Photochemistry Plasmal. Polysaccharide. Porphyrin. Progesterone. Prolamine. Proline Protein. Protein, fibrous Protein, globular. Protein metabolism. Pyrimidine. Pyrrole. Racemization. Radiation biochemistry. Raffinose. Riboflavin. Serine. Serotonin. Serum Specialized tissue. Sphingolipid. Squalene Steroid Sterol. Sucrose Surface phoenomenon. Surface ten-

Gravitation Gravity Group velocity. Hamilton's equations of motion. Hamilton's principle Hamilton Jacobi theory Harmonic (periodic phenomena) Harmonic motion Harmonic oscillator. Horsepower. Hydrometer Hypothesis Impact (impulsive force) Impedance, mechanical. Impulse (mechanics). Inertia. Jet propulsion Kilogram Kinematics. Kinetics (classical mechanics). Lagrange's equations Lagrangian function. Least action principle of. Length Level measurement. Lissajous figures. Manometer. Mass. Matter (physics). McLeod gage Mean free path. Measure Mechanical vibration. Mechanics Mechanics, classical. Meter (units) Metric system Micron Minimal principles Missile Mode of vibration. Moment of inertia Momentum Motion Motion, rectilinear Newton Newton's laws of motion Nutation (astronomy and mechanics). Oscillation. Particle Pendulum Period (periodic phenomena). Periodic motion Perpetual motion Perturbation (quantum theory). Phase (periodic phenomena) Phase velocity Physical law Physical measurement Physical science Physics Poinsot's method Postulate Potentials (physics) Pound Poundal. Power. Precession Pressure. Pressure transducer Product of inertia Radiation. Radius of gyration Relative motion R-- sult Rol. Sine . Stat thetic vibration Theorem Theory, physical Time constant Torque Trajectory Tuning fork Units systems of. Vacuum measurement Velocity Vernier Vibration Vibration damping Virtual work principle of Wave (physics) Wave equation Wave motion Wavelength Weight Weight measurement Work

For engineering applications *see* ENGINEERING MECHANICS For statistical, relativistic, and quantum mechanics *see* ATOMIC PHYSICS; MOLECULAR PHYSICS; SOLID-STATE PHYSICS, THEORETICAL PHYSICS

Climatology

See METEOROLOGY AND CLIMATOLOGY

Communications

Airborne radar Altimeter radio Amateur radio Amplitude modulation Amplitude modulation detector Amplitude-modulation radio Amplitude modulator Angle modulation Antenna (aerial) Audio amplifier Automatic frequency control (AFC) Automatic gain control (AGC) Bandwidth requirements (communications) Carrier. Cascode amplifier Cavity resonator Choke (filter) Closed circuit television Coaxial cable. Color television Communications, electrical Communications systems protection Communications systems (traffic) design. Compass, radio Continuous-wave radar. Corner reflector antenna Counting circuit Crosstalk Data transmission. Decca. Dectra. Demodulator. Detector. Directional coupler. Direction-finding equipment. Discriminator. Distortion (electronic circuits). Doppler radar. Echo box Electronic countermeasures. Equalization, frequency-response. Facsimile. Fidelity. Filter, electric. Frequency modulation Frequency-modulation detector Frequency-modulation radio. Frequency modulator. Ground controlled-approach system (GCA). Ground-position indicator (GPI). Heterodyne principle High fidelity. Hyperbolic navigation system. Image orthicon. Impedance matching. Inertial guidance system. Information theory. Intercommunicating system. Interference, electrical Intermediate-frequency amplifier. Jamming Kinescope. Loran Loudspeaker. Microphone. Microwave Microwave optics Microwave transmission lines Mixer Modulation Modulator Monopulse radar Moving-target indication Multiplexing Navarho Navigation systems, electronic. Noise, electrical. Noise filter, radio Noise generator electrical Omega Passive radar. Phase modulation Phase-modulation detector Phase modulator Polar-coordinate navigation systems Precision approach radar (PAR). Privacy systems (scrambling) Pulse modulation Pulse modulator Radar Radio Radio broadcasting Radio broadcasting networks Radio range Radio receivers Radio spectrum allocations. Radio transmitter. Radio-wave propagation Radome Scaling circuit Selectivity Sensitivity Signal-to-noise ratio Shielding electrical Sideband Sound reproduction systems, electrical Static. Superheterodyne receiver. Suppression Suppressor. Surveillance radar Switching circuit Switching systems (communications) Switching theory. Switching tubes Systems engineering Tacan Telecast Telegraphy Telemetering Telephone Telephone civil defense system Telephone private branch exchange (PBX) Telephone service. Telephone signaling special subscriber Telephone systems construction Telephony. Telephotography Teletypesetter Teletypewriter Teletypewriter exchange (TWX) service Television. Television camera Television camera tube Television networks Television receiver Television scanning Television standards Television studio Television transmitter Telex. Terrain-clearance indicator Transmission lines Transmission theory and methods Tuner Tuning Underwater telephone Video amplifier Vortac Wave guide. Yagi antenna.

For articles on basic electron devices and circuits *see* ELECTRONIC ENGINEERING. For electrical circuit theory *see* ELECTRICAL ENGINEERING. For electromagnetic radiation phenomena *see* ELECTROMAGNETIC RADIATION For transmission of information by sound waves *see* ACOUSTICS For electronic navigation equipment *see* NAVIGATION. For aspects of human communication through printing and other visual means *see* GRAPHICS AND GRAPHIC ARTS; PHOTOGRAPHY

methods. Mass-transfer operation. Metric system. Miticide. Mixing. Mortar. Naval stores. Navier-Stokes equation. Nematocide. Newtonian fluid. Nitration. Nitrogen fixation. Nuclear engineering. Nuclear fuels. Nuclear fuels reprocessing. Oxidation process. Paint. Paper and paper products. Particle accelerator. Particle detector. Particle properties. Pesticide Photographic materials. Photography. Pigment. Pine oil. Pipe flow. Pitot tube. Plant, water relations of. Plant translocation (organic solutes). Plaster. Plaster of paris Plastics fabrication. Porcelain. Pottery. Prilling. Primer (explosive). Primer (surface coating). Propellant. Pyrolysis Pyrometric cone Pyrotechnics. Refractory. Refrigeration Refrigeration cycle. Reynolds number. Rheology. Rodenticide Roll mill. Rosin oil Rubber. Rubber products. Safety glass. Saline water reclamation Screening. Screening smoke Sea water. Sedimentation (industrial). Separation (mechanical). Septic tank. Sewage treatment. Shaped charge. Shellac. Sintering. Size reduction. Smoke. Solar energy. Solids pump. Solvent extraction Spinning (textile). Stained glass. Stripping. Sulfonation. Surface coating. Terra cotta Textile. Textile chemistry. Textile microbiology. Textile printing Thickening Thinner Tile Transesterification. Turbulent flow. Unit, systems of. Unit operations Unit processes. Varnish. Varnish tree Ventilation. Water power. Water softening Water treatment Wind power Wood chemicals. Wood fiber products Wood finishing Zipper.

For applications of agricultural chemistry *see* AGRICULTURE. For construction applications *see* CIVIL ENGINEERING For unit operation and unit processes production applications *see* INORGANIC CHEMISTRY, MICROBIOLOGY; MINING ENGINEERING; NUCLEAR ENGINEERING; NUCLEAR PHYSICS, PETROLEUM CHEMISTRY. For the theoretical aspects of this subject *see* PHYSICAL CHEMISTRY

Chemistry

See ANALYTICAL CHEMISTRY; BIOCHEMISTRY; CHEMICAL ENGINEERING, INORGANIC CHEMISTRY; ORGANIC CHEMISTRY, PETROLEUM CHEMISTRY; PHYSICAL CHEMISTRY

Civil engineering

Air-entraining portland cement. Airport engineering. Alidade. Arch. *Architectural acoustics.* Architectural engineering. Azimuth Beam. Beam column Blasting. Bolted joint Breakwater. Bridge. Bridge vibration Brittleness. Buildings. Bulkhead Bulldozer. Caisson foundations. Canal. Cantilever Cement. Cement-asbestos. Chimney. Civil engineering Clinometer. Coastal engineering. Cofferdam Column. Composite beam. Concrete. Concrete beam. Concrete column Concrete slab Construction engineering. Construction equipment. Construction methods. Contour. Crane hoist. Dam. Derrick Dredge. Earthmover Electroosmotic dewatering. Engineering and architectural contracts. Engineering geology. Excavator. Floor construction. Foundations. Furnace construction Girder, plate. Grab bucket. Groin (engineering). Grout. Gunite. Gypsum plank Harbor. Highway engineering. Imhoff tank. Industrial meteorology. Inland waterways transportation. Jetty. Joint (mechanical). Level (surveying). Loading, transverse. Loads, dynamic. Loads, repeated. Lumber manufacture. Masonry. *Noise control in buildings.* Pavement. Photogrammetry. Pier. Pile driver. Pile foundation. Pipeline. Plane table. Plate, structural. Portland cement. Precast concrete. Prestressed concrete. Railroad engineering. Reinforced concrete. Reservoir. Retaining wall. Revetment. River engineering. Riveted joint. Roof construction Runway, airport. Safety factor. Sanitary engineering. Sea wall Septic tank. Sewage. Sewage collection systems. Sewage disposal. Sewage solids Sewage treatment. Shovel, power. Soil mechanics. Stadia Structural analysis. Structural connections. Structural deflections. Structural materials. Structural steel Structures (engineering) Surveying. Tank. Theodolite. Topographic surveying and mapping Tower Traffic engineering Transit (engineering). Transportation engineering Trestle. Truss Tunnel Unloader. Wall construction. Water conservation. Water pollution. Water softening Water supply engineering. Water treatment. Welded joint. Wellpoint systems Wharf. Wood fiber products Wood finishing Wood physics Wood preservation

For mechanics and properties of materials *see* ENGINEERING MECHANICS. For hydraulics articles *see* FLUID MECHANICS For mapping articles *see* PHYSICAL GEOGRAPHY. For related articles in the fields of geology and hydrology *see* ENGINEERING GEOLOGY; GEOLOGY (SURFICIAL AND HISTORICAL); HYDROLOGY

Classical mechanics

Acceleration Acceleration measurement. Amplitude (wave motion). Angular frequency. Angular momentum. Anharmonic oscillator. Antigravity. Art, science in Balance (weighing instrument). Ballistics, exterior Ballistics, interior. Beat. Bourdon-spring pressure gage. Canonical transformations Cayley-Klein parameters Celestial mechanics. Center of gravity. Center of mass. Center of pressure. Centrifugal force Centripetal force. *Centrode Centroids of areas and lines* Collision. Conservation of energy Conservation of momentum. Constraint. Couple. D'Alembert's principle. Damping Degree of freedom (mechanics) Density Density measurement. Dimensional analysis. Dimensions (mechanics) Displacement (mechanics). Doppler effect. Dynamics. Dyne. Earth, Empirical method. Energy. *Equilibrium of forces* Erg Euler angles. Euler's equations of motion. Foot (unit). Foot-pound. Foot-poundal. Force Forced oscillations Foucault pendulum. Frame of reference. Free fall. Frequency (wave motion). Fundamental frequency. Galilean transformations. Gas Gram.

For analog and digital computers and for data processing equipment *see* COMPUTERS AND INFORMATION PROCESSING. For basic electrical circuitry and components *see* ELECTRICAL ENGINEERING. For electronic circuits and components *see* ELECTRONIC ENGINEERING For mechanical, hydraulic and pneumatic devices *see* MECHANICAL ENGINEERING

Cryogenic engineering

See CHEMICAL ENGINEERING.

Cytology

Autoradiography. Cell (biological). Cell (pressure-temperature effects). Cell constancy. Cell division. Cell inclusions, noncytoplasmic Cell lineage. Cell membranes and monolayers. Cell nucleus Cell organization Cell plastids Cell protoplast. Cell structures Cell walls in plants. Cell-surface differentiation Cell-surface ionization Centriole Centrosome Chromosome. Chromosome aberration. Chromosome theory of heredity. Cytochemistry Cytokinesis Cytology. Cytology (molecular basis) Cytoplasm Cytoplasmic inheritance Deoxyribonucleic acid. Gene. Gene action. Golgi component. Lethal gene Meiosis Microscope Microscope, electron. Microscope, fluorescence Microscope, interference. Microscope, optical. Microscope, phase contrast Microtechnique Mitochondria Mitosis Mutation. Oogenesis Polyploidy. Protoplasm Recombination, genetic Ribonucleic acid Sex determination Sperm cell Spermatogenesis

For more information on the chemistry of various physiological processes *see* BIOCHEMISTRY, for further information on cells in tissues *see* HISTOLOGY.

Ecology

See ANIMAL ECOLOGY; PLANT ECOLOGY

Electrical engineering

Admittance. Alternating current. Alternating-current circuit theory Alternating-current generator. Alternating-current motor Alternator Ammeter Amplifier. Antiresonance Arc heating Arc lamp Arc welding. Armature Armature reaction Attenuator Audio amplifier Autotransformer Backward-wave tube. Ballast resistor Battery (electric) Beam power tube. Bias (electron tube) Blocking oscillator. Blowout coil Bonding Bootstrap circuit. Brake Branch circuit Breadboarding Breakdown Bridge circuit. Bus-bar Calibration. Candle. Candlepower. Capacitance box. Capacitance measurement. Capacitor. Cascode amplifier Cathode follower. Cathode-ray tube. Cell (electric) Choke (filter). Chopper Circuit. electric Circuit, electronic Circuit breaker Circuit testing, electrical Clamping circuit. Clipping circuit. Clutch Coaxial cable Cockcroft-Walton accelerator. Coil Coincidence amplifier Communications, electrical Communications systems protection. Commutation Commutator. Comparator circuit. Conductance. Conductor, electric. Connector, electric. Contact, electric. Contact rectifier Controlled rectifier. Converter, synchronous Copper loss. Core loss. Corona discharge. Coupled circuits. Current balance. Current measurement. Crosstalk. Cryosar. Cryotron. Data transmission Delay line. Dielectric heating. Digital voltmeter. Diode, semiconductor. Diode, vacuum. Direct current. Direct-coupled amplifier. Direct-current circuit theory Direct-current generator. Direct-current motor. Distortion (electronic circuits). Dry cell. Dynamic braking. Dynamo. Dynamometer. Edison battery. Electric distribution systems Electric energy measurement Electric furnace. Electric power generation. Electric power measurement Electric power substation. Electric power systems. Electric protective devices. Electric rotating machinery Electrical codes. Electrical degree Electrical engineering Electrical measurements Electrical standards. Electroacoustics Electrodynamic instrument. Electrokinetic transducer. Electrolytic tank Electromagnet. Electromagnetic pump. Electrometallurgy Electrometer Electron lens. Electron tube. Electronic writing Electronics. Electroplating of metals. Electropolishing. Electrostatic lens. Electrostatic precipitator Energy sources Equivalent circuit. Esaki tunnel diode Excitation. Excitron. Facsimile. Feedback circuit Fidelity. Filter, electric. Flash welding. Fluorescent lamp Fluxmeter. Footcandle Foot-lambert Frequency divider. Frequency measurement Frequency multiplier. Fuel cell. Fuse, electric. Gain. Galvanometer. Gas tube. Gate circuit Generator, electric. Grounding, electrical. Grounding, electronic equipment. Harmonic analyzer Heating, electric. Heptode. Hexode. Hydroelectric generator Hysteresis motor. Ignitron. Illuminance Illumination. Impedance matching Impedance measurements, high-frequency. Impulse generator. Incandescent lamp. Inductance bridge. Inductance measurement Induction coil. Induction heating Induction motor Inductometer. Inductor. Infrared image converter tube. Infrared lamp Instability, electrical. Instrument transformer. Instrumentation Insulation, electric. Insulation resistance testing Intercommunicating system Interference, electrical. Intermediate-frequency amplifier. Inverter. Ionization gage. IR drop. Junction diode. Junction transistor. Kelvin bridge Kirchhoff's laws of electric circuits. Klystron Lambert. Lamp (electric) Light panel Light amplifier. Lighthouse tube Lightning and surge protection. Lightning arrester. Lightning rod. Limiter circuit. Linear accelerator Linearity. Lissajous figures. Load line. Loading, electrical Loudspeaker Lumen Lumenhour Luminaire. Luminance. Luminosity factor. Luminous efficiency. Luminous energy. Luminous flux Luminous intensity. Lux. Magnet wire. Magnetic amplifier Magnetic lens Magneto Magnetron Mechanical rectifier. Megger Mercury battery Mercury-vapor lamp Mercury-vapor rectifier

Comparative physiology

Acetyl phosphate. Acetylcholine. Adenosinediphosphate (ADP). Adenosinetriphosphate (ATP). Adenylic acid. Adrenal cortex steroid. Adrenal gland. Alanine. Albumin. Aldosterone. Amino acids para-Aminobenzoic acid. Amylase. Androgen. Animal growth. Arginine. Ascorbic acid. Asparagine. Aspartic acid. Autotomy. Bile acid. Bilirubin. Biochemistry. Bioelectric model. Biological oxidation. Bioluminescence. Biotin. Blood. Blood groups. Calcium metabolism. Carbohydrate. Carbohydrate metabolism. Cardiovascular system. Cell (pressure-temperature effects). Cell membranes and monolayers. Centrifugation (biology). Cetyl alcohol. Chemoreception. Chitin. Cholesterol Choline. Chromatophore. Circulation. Coenzyme. Creatine-creatinine. Cysteine. Cystine. Cytochrome. Dextrin. Digestive system. Digitoxigenin. Diphosphopyridine nucleotide (DPN). Electric organ (biology). Endocrine mechanisms Endocrinology. Enzyme. Enzyme inhibition Ephaptic transmission. Epinephrine. Equilibrium, biological. Ergosterol. Estrogen. Excretion. Feces. Feeding mechanisms and digestion. Fibrinogen. Folic acid Fructose. Galactose. Gallbladder. Gamma globulin Gestation period. Globulin. Glucose. Glucose-1-phosphate. Glucose-6-phosphate. Glutamic acid. Glutamine Glutelin. Glycine. Glycogen Glycolipid. Gonad. Heart (ganglionic pacemaker) Hemoglobin. Hibernation. Histidine. Homeostasis. Hormone Hormone, adenohypophyseal. Hormone, adrenal cortex. Hormone, adrenal medullary. Hormone, neurohypophyseal. Hyaluronic acid Hypophysis. Inositol. Insect physiology. Insulin. Inulin Iron metabolism Isoleucine Krebs cycle. Lactase Lactation Lactose. Leucine Levan Lipid. Lipid metabolism Liver. Lymphatic system. Lysine. Maltase Maltose Menstruation. Metabolism Metabolism in ruminants. Methionine. Microscope, centrifuge Monosaccharide. Muscular system. Nervous system. Nervous system (invertebrate) Niacin Nitrogen excretion. Nucleic acid. Nucleoprotein. Nutrition. Oligosaccharide Oncology Osmoregulatory mechanisms Ovary. Pancreas. Pantothenic acid. Parathyroid gland. Peptide. Periodicity in organisms. Phenylalanine Phonetics Phonoreception Phosphate metabolism. Phosphatide. Photoreception. Physiological acoustics Physiology, general. Plasmal Polysaccharide. Porphyrin Progesterone Prolamine. Proline. Protein Protein, fibrous Protein, globular Protein metabolism Raffinose. Regeneration (biology). Reproductive system Respiration Respiratory pigments. Respiratory system Riboflavin Serine. Serotonin. Serum Sight. Skeletal system Specialized tissue. Speech. Sphingolipid Steroid. Sterol. Sucrose. Synaptic transmission. Taxis. Testis. Thermoregulation. Thiamine Threonine Thyroid gland Transamination. Triglyceride Triphosphopyridine nucleotide (TPN). Tryptophan. Tyrosine. Urea (biochemistry). Uric acid. Uridine diphosphoglucose (UDPG). Urinary system Urine. Valine. Vitamin. Vitamin A. Vitamin B_6. Vitamin B_{12}. Vitamin D. Vitamin E. Vitamin K. Vocoder.

For physiological aspects of certain groups of plants *see* MICROBIOLOGY; PLANT PHYSIOLOGY; for certain behavioral aspects of vertebrates *see* PSYCHOLOGY, PHYSIOLOGICAL AND EXPERIMENTAL.

See also GENERAL PHYSIOLOGY.

Computers and information processing

Abacus. Analog computer. Analog-to-digital converter. Binary number system. Bit. Boolean algebra. Calculating machines. Cam mechanism. Computer. Counter, digital. Counting circuit. Data processing systems. Data reduction Data transmission Decimal number system. Differential analyzer. Digital computer. Digital computer programming. Digital-to-analog converter. Dynamic analogies. Electrolytic tank Gate circuit. Information theory. Magnetic recording. Microcircuitry. Number systems. Octal number system. Pulse generator. Scaling circuit. Simulator. Slide rule Storage devices. Switch, electronic. Switching circuit Switching theory. Switching tubes

For applications of computers, see the particular field of interest. For use of computers with automatic control systems *see* CONTROL SYSTEMS ENGINEERING.

Conservation

Conservation of resources. Ecology, applied Fisheries conservation. Forest conservation. Land use planning. Mineral resources conservation Range land conservation Soil conservation. Water conservation Wildlife conservation.

For economic aspects *see* AGRICULTURE; FORESTRY, for environmental aspects *see* ANIMAL ECOLOGY, PHYSICAL GEOGRAPHY.

Control systems engineering

Accelerometer. Alarm systems. Automation. Autopilot. Chemical process control Clock control systems Closed-loop control system Computer control system. Control systems. Cybernetics. Damping. Environmental test. Feedback circuit Feedback control systems Fire-control systems. Governor. Guidance systems Guided missile Humidity control. Hunting Hydraulic actuator. Magnetic amplifier Maintainability of equipment Microcircuitry. Miniaturization of equipment. Missile guidance systems Open-loop control system. Operations research Operator training Packaging of equipment Pressure control, automatic. Process control Prototype (equipment) Qualification test Regulator. Reliability of equipment. Remote-control system. Repeater, synchro. Sampled-data control system. Saturable reactor. Servomechanism. Synchro Systems engineering. Telemetering. Temperature control, automatic. Traffic control systems. Tracer, radioactive.

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Cryogenic engineering

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control [illegible]
amplifi [illegible]
circuitry Miniaturization of equipment Missile guidance systems. Open-loop control system. Operations research. Operator training. Packaging of equipment. Pressure control, automatic. Process control. Prototype (equipment). Qualification test. Regulator. Reliability of equipment. Remote-control system Repeater, synchro. Sampled-data control system Saturable reactor. Servomechanism. Synchro. Systems engineering. Telemetering Temperature control, automatic. Traffic control systems Tracer, radioactive.

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Metallic-disk rectifier. Microcircuitry. Microphone. Microphonic tube. Microwave tube. Mixer. Motor, electric. Motorboating. Motor-generator set. Multimeter. Multivibrator. Neon glow lamp. Neper. Network theory, electrical. Nuclear battery. Nuclear power. Number indicator tube Octode. Ohm's law. Ohmmeter. Open circuit. Oscillator. Oscillograph. Oscilloscope, cathode-ray. Parallel circuit. Parametric amplifier. Parasitic oscillation. Particle accelerator. Pentagrid converter. Pentode, vacuum. Phase inverter. Phase meter. Phase-angle measurement. Phot. Photoflash lamp. Photometer. Photometry. Phototube. Phototube, multiplier. Point-contact diode. Point-contact transistor. Potentiometer (variable resistor). Potentiometer (voltage measurement). Power amplifier. Power factor meter. Power plant. Power supply, electronic. Preamplifier. Pressure transducer. Printed circuit. Prony brake. Pulse generator. Push-pull amplifier. Q meter. Quadrature. Radio-frequency amplifier. Reactor, electric. Recording instruments, graphic. Rectifier. Regeneration (engineering) Regulation. Relaxation oscillator. Relay Reliability of equipment. Reluctance motor. Repulsion motor. Reserve battery. Resistance heating. Resistance measurement. Resistance welding. Resistor. Resonance (alternating-current circuits). Response. Rheostat. Ripple voltage. Rural electrification Saturable reactor. Saturation Saw-tooth wave Schematic drawing. Selectivity. Semiconductor rectifier Sensitivity *Series circuit. Shielding, electrical. Short circuit.* Shunting. Signal generator. Signal tracer Silicon diode. Slip Slip rings Sodium-vapor lamp Solar battery. Solar energy. Solenoid (electrical) Solion Speed regulation. Spot welding. Square wave. Stabilization. Storage battery Storage tube. Strain gage. Stroboscope. Sunlamp. Superposition theorem (electrical networks). Suppressor Surface-barrier transistor Surging Sweep generator. Switch, electric. Switch, electronic. Switching tubes. Synchro. Synchronization Synchronous condenser. Synchronous motor. Synchronous speed Synchroscope. Tachometer Tank circuit Telegraphy. Telemetering. Telephony. Telephotography Teletypesetter. Teletypewriter. Teletypewriter exchange (TWX) service Telex. Tetrode. vacuum Thermionic tube. Thermistor Thermocouple Thermometer. Thevenin's theorem (electrical networks). Thyratron Time constant. Time delay circuits. *Transducer Transformer.* Transient, electric. Transistor. Transistor connection. Transmission lines. Transmission theory and methods. Traveling-wave tube. Trigger circuit Triode, vacuum Tube. electron. *Tube tester. Ultraviolet lamp* Universal motor. Vacuum tube. Vacuum-tube voltmeter Van de Graff generator. Vapor lamp. Varactor Varistor. Vibration pickup. Vibrator. Video amplifier. *Vibrating-reed measurement* Voltage. *Voltage measurement* Voltage-multiplier. Volt-amperes Water power. *Watt-hour* meter. Wattmeter. Waveform. Waveform, nonsinusoidal. Waveform determination. Wave-shaping circuits. Wet cell. Wheatstone bridge Wind power. Windings (electric machinery). Wire. Wiring (electric). Wiring diagram Y-delta transformations.

For electrical and electromagnetic phenomena and laws *see* ELECTRICITY AND ELECTROMAGNETISM. For electrochemical phenomena and laws *see* PHYSICAL CHEMISTRY. For electrical conduction in solids *see* SOLID-STATE PHYSICS. For *electrical conduction in gases and vacuum see* ELECTRONIC ENGINEERING. For applications of electrical engineering in other fields *see* COMMUNICATIONS; COMPUTERS AND INFORMATION PROCESSING; CONTROL SYSTEMS ENGINEERING; NAVIGATION. For generator prime movers *see* MECHANICAL ENGINEERING.

Electricity and electromagnetism

Admittance. Alternating current. Ammeter. Ampere. Ampere's law. Ampere-turn. Arc discharge. Attenuation Attenuator. Ballast resistor. Band theory of solids. Barkhausen effect. Barretter. Biot-Savart law. Bolometer. Breakdown potential. Brush discharge. Calomel electrode. Canal rays. Capacitance. Capacitance box. Capacitance measurement. Capacitor. Cathode rays. Cathodoluminescence Cell (electric). Characteristic curve Charge, electric Chopping. Coil Condenser, electrical. Conductance Conduction (electricity) Conductivity. Coulomb. Coulomb's law. Current, electric. Current balance. Current density Current measurement Dark current. Degaussing Demagnetization. Dielectric constant. Dielectrics. Digital voltmeter. Dipole Dipole moment Direct current. Eddy current. Electret Electric energy measurement. Electric field Electric power measurement. Electrical conduction in gases. Electrical conductivity of metals Electrical measurements Electrical standards. Electrical units Electricity Electroacoustics. Electrochemical equivalent Electrochemical process. Electrochemical series Electrochemistry Electrode Electrode potential Electrodynamic instrument. Electrodynamics Electrokinetic phenomena Electroluminescence Electrolysis Electrolyte. Electrolytic conduction Electromagnetic field Electromagnetism. Electrometer Electromotive force (cells). Electromotive force (emf) Electron diffraction Electron emission Electron lens. Electron motion in gases. Electron optics Electromosis Electrophoresis Electroscope Electrostatic lens. Electrostatics Electrostriction Excitation. *Excitation potential.* Farad. Faraday's law of induction Ferroelectrics Field emission Field theory classical Field-enhanced emission Fluxmeter. Free-electron theory of metals Frequency counter. *Frequency measurement* Galvanometer. Gauss Germanium diode Gilbert Glass electrode Glow discharge. Harmonic analyzer. Helmholtz coil Henry Hydrogen electrode. Hysteresis, magnetic.

Impedance electrical Impedance matching. Impedance measurements, high frequency. Inductance Inductance bridge. Inductance measurement Induction, electromagnetic. Induction, electrostatic. Induction, magnetic. Inductometer. Inductor Instrument transformer. Insulator, electric. Ionization. Ionization potential. Joule's law Kelvin bridge Kinetic theory of matter. Langmuir Child law Lenz's law. Lines of force Magnet Magnetic circuits. Magnetic field Magnetic flux Magnetic moment. Magnetic lens. Magnetomotive force Magnetooptics Magnetostatics. Maxwell. Meissner effect. Mho Molecular electronics. Multimeter Oersted. Ohm Ohm's law. Ohmmeter. Oscillograph Oscilloscope, cathode-ray Overvoltage Permeability, magnetic. Permittivity. Phase (periodic phenomena) Phase meter. Phase-angle measurement Photoconductivity Photoelectricity. Photoemission. Photovoltaic effect Piezoelectricity Pinch effect. Plasma physics. Polar molecule Polarity (electricity) Polarization (dielectrics). Potential electric. Potential difference Potentials, physics Potentiometer (variable resistor). Potentiometer (voltage measurement) Power factor Power factor meter. Pyroelectricity. Q Q meter Reactance Reciprocity, principle of Recording instruments, graphic Reflectometer, microwave Regulation Relativistic electrodynamics. Reluctance Resistance electrical. Resistance measurement Resistivity, electrical Resistor Response. Rheostat Saint Elmo's fire Salt bridge Saturation Saturation current. Schottky effect. Search coil Secondary emission Semiconductor Skin effect Space charge Spark, electric. Spark gap. Spectrum analyzer Sputtering Standing-wave detector Static electricity Striation Superconductivity Susceptance Susceptibility, electric. Synchroscope Thermionic emission Thermistor Thermoelectricity Townsend discharge. Unified field theory Vacuum tube voltmeter. Varistor Volt. Voltage measurement Volt amperes. Voltmeter Volt-ohm-milliammeter Watt. Watt hour meter. Wattmeter. Waveform determination Wavelength measurement. Wavelength standards Wavemeter Weber Wheatstone bridge

For articles on electromagnetic radiation *see* ELECTROMAGNETIC RADIATION For fields of applied electrical physics *see* COMMUNICATIONS, COMPUTERS AND INFORMATION PROCESSING, CONTROL SYSTEMS ENGINEERING; ELECTRICAL ENGINEERING, ELECTRONIC ENGINEERING. For articles on biological electrical phenomena and applications *see* BIOPHYSICS

Electromagnetic radiation

Absorption. Absorption (electromagnetic radiation). Amplitude (wave motion) Angstrom Antenna (aerial). Band spectrum Birefringence Black body. Bremsstrahlung Cerenkov radiation Color centers Color temperature Compton effect. Conservation of mass. De Broglie wavelength. Diffraction. Dispersion (radiation). Displacement current. Doppler effect. Eigenfunction. Einstein shift. Electric field. Electromagnetic field. Electromagnetic radiation Electromagnetic wave. Electrooptics Emissivity. Energy level (quantum mechanics). Equation of continuity. Ether hypothesis Fine structure (spectrum lines). Franck Condon principle. Frequency (wave motion). Fundamental frequency. Gamma rays. Ground state Harmonic (periodic phenomena) Harmonic oscillator. Heat radiation Heat transfer Huygens' principle. Hyperfine structure. Incandescence. Inertia of energy. Infrared detector Infrared radiation Infrared spectroscopy Interference of waves. Interferometry Inverse square law. Isotope shift. Kinetic theory of matter Light Line spectrum Lines of force Magnetic resonance. Maser Maxwell's equations Micron Microwave Microwave optics. Microwave spectroscopy Oscillation Paschen Back effect Phase (periodic phenomena) Phase velocity Photon Planck's constant Planck's radiation law Point source Polarization of waves. Poynting's vector. Pyrometer Quantum (physics) Quantum electrodynamics Quantum field theory. Quantum mechanics Quantum statistics. Quantum theory, nonrelativistic Radiation Radiation pressure. Radio spectrum allocations Radio-frequency spectroscopy Radiometry Radiometrometer Radiowave propagation Reciprocity, principle of. Reflection (electromagnetic radiation). Reflection and transmission coefficients Reflectometer, microwave Refraction of waves Relativistic electrodynamics Ritz's combination principle. Roentgen unit Scattering (electromagnetic radiation). Schrodinger's wave equation Sine wave. Solar energy Spectrochemical analysis Spectrography. Spectroscopy Spectrum Spectrum analyzer. Standing wave detector Stationary state. Stationary wave Superposition, principle of Ultraviolet radiation Wave equation Wave motion Wave optics Wavelength Wavelength measurement. Wavelength standards Wavemeter. X ray(s), physical nature of X-ray diffraction. X-ray optics X-ray tube. X-unit Zeeman effect

For articles concerning the visible wavelengths *see* OPTICS For basic electrical phenomena *see* ELECTRICITY AND ELECTROMAGNETISM. For electronic phenomena and devices *see* ELECTRONIC ENGINEERING For uses of electromagnetic radiation for communications *see* COMMUNICATIONS

Electronic engineering

Acceptor atom Air traffic control Airborne radar. Aircraft low-approach systems Airport surface detection equipment Altimeter, radio Amateur radio. Ammeter Amplifier Amplitude-modulation detector Amplitude-modulation radio. Amplitude modulator Antenna (aerial) Arc discharge Arc lamp. Attenuator. Audio amplifier. Automatic frequency control (AFC) Automatic gain control (AGC). Backward-wave tube Barretter. Beam-power tube. Bias (electron tube) Blocking oscillator. Bolom-

eter. Bonding. Bootstrap circuit. Breadboarding. Breakdown potential. Bridge circuit. Brush discharge. Calibration. Canal rays. Capacitance box. Capacitance measurement. Capacitor. Cascode amplifier. Cathode follower. Cathode rays. Cathode-ray tube. Cavity resonator. Characteristic curve. Choke (filter). Chopping. Circuit, electronic. *Clamping circuit. Clipping circuit. Closed-circuit* television. Coaxial cable. Coil. Coincidence amplifier. Cold-cathode tube. Color television. Communications, electrical. Comparator circuit. Compass, radio. Conductance. Conduction band. Contact potential difference Contact rectifier. Continuous-wave radar. Controlled rectifier. Corner reflector antenna. Corona discharge. Counting circuit. Course-line computer. Crossover network. Crosstalk. Cryosar Cryotron. Current balance. Current measurement. Cyclotron resonance experiments. Dark current. Data transmission. Decca. Dectra. Delay line. Demodulator. Detector. Digital voltmeter. Diode, vacuum. Direct-coupled amplifier. Directional coupler. Direction-finding equipment. *Discriminator. Disk recording. Distortion* (electronic circuits). Donor atom Doppler radar Echo box. Electric energy measurement. Electric power measurement. Electrical conduction in gases. Electrical measurements. Electrical standards Electroacoustics. Electrodynamic instruments. Electrometer. Electron. Electron emission. Electron lens. Electron motion in vacuum. Electron optics. Electron tube. Electronic countermeasures. Electronic writing. Electronics. Electrostatic lens Equalization, frequency-response. Equivalent circuit. Esaki tunnel diode. Excitation Excitation potential. Exciton. Fascimile. Feedback circuit. Ferrite devices. Fidelity. Field emission. Field-enhanced emission. Filter, electric. Fluorescent *lamp. Frequency counter Frequency divider.* Frequency measurement Frequency modulator. Frequency multiplier. Frequency-modulation detector. Frequency-modulation radio. Gain. Galvanometer. Gas tube. *Gate circuit. Geiger-Müller counter.* Germanium diode. Glow discharge. Ground-controlled-approach system (GCA). Grounding, electronic equipment. Ground-position indicator (GPI). Gyrator. Hall effect. *Harmonic* analyzer. Hearing aid. Heptode. Heterodyne principle Hexode. High fidelity. Hyperbolic navigation system Ignitron. Image orthicon. Impedance, electrical Impedance matching. Impedance measurements, high-frequency. Inductance measurement. Inductometer. Inductor. Inertial guidance system. Infrared detector. Infrared image converter tube. Instability, electrical. Instrument landing system (ILS). Instrumentation. Intercommunicating system. Interference, electrical. Intermediate-frequency amplifier. Inverter. Ionization. Ionization chamber. Ionization potential. Jamming. Junction diode. Junction transistor. Kelvin bridge. Kinescope. Klystron. Langmuir-Child law. Lighthouse *tube. Limiter* circuit. Linearity. Lissajous figures. Load line. Loading, electrical. Loran. Magnetic lens. Magnetic recording. Magnetron. Maser. Meissner effect. Mercury-vapor lamp. Mercury-*vapor rectifier. Microcircuitry. Microphonic tube.* Microscope, electron. Microwave. Microwave optics. Microwave transmission lines. Microwave tube Miniaturization of equipment. Mixer. Modulator. Molecular electronics Monopulse radar. Motorboating. Moving-target indication. Multimeter. Multiplexing. Multivibrator. Navarho. Navigation systems, electronic. Neon glow lamp. Noise, electrical. Noise filter, radio. Noise generator, electrical. Number indicator tube. Octode Ohmmeter. Omega Oscillator. Oscillograph Oscilloscope, cathode-ray Packaging of equipment. Parametric amplifier. Parasitic oscillation. Particle detector. Passive radar. Pentagrid converter. Pentode, vacuum Phase inverter. Phase meter. Phase modulator. *Phase-angle measurement. Phase-modulation* detector Photoconductive cell Photoconductivity. Photodiode Photoelectric devices. Photoelectricity. Photoemission Phototransistor. Phototube. *Phototube, multiplier Photovoltaic cell. Photovoltaic* effect. Piezoelectric crystal. Piezoelectricity. Point-contact diode. Point-contact transistor. Polar-coordinate navigation systems. Potentiometer (variable resistor). Potentiometer (voltage measurement) Power amplifier. Power supply, electronic. Power-factor meter Preamplifier. Precision approach radar (PAR). Pressure transducer. Printed circuit. Privacy systems (scrambling). Pulse generator. Pulse modulator Push-pull amplifier Q meter. Quadrature, Quartz clock. Radar. Radio Radio astronomy. Radio broadcasting. Radio broadcasting networks. Radio range. Radio receivers Radio spectrum allocations Radio telescope Radio transmitter. Radioactivity (applica*tions) Radio-frequency amplifier Radio-wave* propagation Radome Recording. Recording instruments, graphic. Rectifier. Reflectometer, microwave. Regeneration (engineering). Regulation. Re*laxation oscillator Relay Reliability of equip*ment Resistance measurement. Resistor. Resonance (alternating-current circuits). Response. Ripple voltage. Saint Elmo's fire Saturation. Saturation current. Saw-tooth wave. Scaling circuit Schematic drawing Schottky effect Scintillation counter. Secondary emission Selectivity. Semiconductor Semiconductor rectifier Sensitivity Shielding, electrical Shunting Signal generator. Signal tracer Signal to-noise ratio Silicon diode. Sodium-vapor lamp Solar battery Sonar Sound recording Sound reproduction systems, electrical. Space charge. Spark, electric Spark gap Spectrum analyzer. Sputtering. Square wave Stabilization. Standing-wave detector. Static Storage devices. Storage tube. Striation Superconductivity. Superheterodyne receiver Suppression. Suppressor. Surface-barrier transistor. Surging. Surveillance radar. Sweep generator. Switch, electronic. Switching circuit. Switching theory Switching tubes. Synchro-

nization Synchroscope. Tacan. Tank circuit. Telecast. Telegraphy. Telemetering Telephone. Telephony. Telephotography. Teletypesetter. Teletypewriter. Teletypewriter exchange (TWX) service. Television Television camera. Television camera tube. Television receiver. Television scanning. Television transmitter Telex. Terrain clearance indicator. Tetrode, vacuum Thermionic emission. Thermionic tube. Thermistor. Thyratron. Time constant Time-delay circuits. Townsend discharge. Transducer. Transformer. Transistor. Transistor connection. Transmission theory and methods Traveling wave tube. Trigger circuit. Triode, vacuum Tube, electron Tube tester. Tuner. Tuning. Ultrasonics. Vacuum tube. Vacuum-tube voltmeter. Valence band. Varactor, Varistor, Video amplifier. Voltage amplifier. Voltage measurement Voltage regulator. Voltage-multiplier circuit. Voltage-regulator tube Voltmeter. Volt-ohm milliammeter. Vortac Wave guide. Waveform Waveform, nonsinusoidal. Waveform determination Wavelength measurement. Wavelength standards. Wavemeter. Waveshaping circuit Wheatstone bridge. Wire recording Wiring diagram Work function (electronic) X-ray tube Yagi antenna

For a complete list of articles in the field of communications *see* COMMUNICATIONS For articles on computers *see* COMPUTERS AND INFORMATION PROCESSING. For electronic controls *see* CONTROL SYSTEMS ENGINEERING.

Embryology

See GROWTH AND MORPHOGENESIS. See also specific taxonomic groups of animals and plants listed under INVERTEBRATE ZOOLOGY, PLANT KINGDOM, VERTEBRATE ZOOLOGY.

Engineering

See specific *engineering fields*, such as CHEMICAL ENGINEERING; ELECTRICAL ENGINEERING; NUCLEAR ENGINEERING.

Engineering drawing

See GRAPHICS AND GRAPHIC ARTS.

Engineering geology

Aerial photograph Airport engineering Alidade Avalanche Blasting *Boring and drilling* (mineral). Breakwater. Bridge Bulkhead Caisson foundations Canal Clay. Clay minerals Cleavage, rock Clinometer. Coastal *engineering*. Cofferdam Concrete Construction engineering. Construction equipment Construction *methods*. Dam. Delta. Dune. Earthquake Electroosmotic dewatering. Engineering *geology*. Erosion Exfoliation. Fault and fault structures. Flood plains. Foundations. Frost action Geophysical exploration Gravel. Grout (engineering) Ground water *Harbor*. Highway engineering. Hydrolaccolith Jetty Landslide Level (surveying). Loess Mass wasting Pavement Permafrost Photogrammetry Pier. Pile foundation Plane table. Railroad engineering. Regolith. Reservoir. Retaining wall. Revetment. River engineering Rock mechanics. Runway, airport. Sand Sea wall. Sedimentation (geology). Seismology. Sewage disposal. Shore processes. Snow surveying Soil mechanics. Solifluction. Stadia. Stone and stone products Structural geology. Structural petrology. Surface water. Surveying. Terrestrial frozen water. Theodolite. Till. Topographic surveying and mapping Transit (engineering). Transportation engineering Tunnel. Water supply engineering. Water table. Weathering processes. Wellpoint systems. Wharf.

For information on the composition and properties of minerals and solid rocks *see* GEOLOGY (MINERALOGY AND PETROLOGY); for articles treating loose sediments and geologic processes of importance in construction engineering *see* GEOLOGY (SURFICIAL AND HISTORICAL); for articles relating to the action of fluids on rock materials *see* HYDROLOGY. For articles on the stresses, strength, and elasticity of materials *see* ENGINEERING MECHANICS For aspects of boring, drilling, and excavation *see* MINING ENGINEERING; PETROLEUM ENGINEERING

Engineering mechanics

Acceleration Aeroelasticity Air velocity measurement Anelasticity Anemometer. Angular frequency Angular momentum Archimedes' principle. Beattie-Bridgeman equation. Bending moment. Bernoulli's theorem Borda mouthpiece. Boundary-layer flow Boyle's law Brittleness. Buoyancy. Cavitation Center of gravity Center of mass. Center of pressure. Centrifugal force Centripetal force. Centrode. Centroids of areas and lines Channel, open Charles' law Collision. Compressible flow. Conservation of energy Conservation of momentum Constraint Couple Crane hook. Creep of materials. Crocco's equation Curved bars. D'Alembert's paradox. Dalton's law Degree of freedom (mechanics) Diffuser Dimensional analysis. Dimensions (mechanics) Displacement (mechanics). Doublet flow Ducted flow Dynamic similarity. Dynamics. Efficiency Elastic limit Elasticity. Energy. Equilibrium of forces Euler's momentum theorem. Flight dynamics. Flight science Flow of fluids *Flow measurement* Fluid dynamics. Fluid mechanics Fluid statics *Fluid flow principles* Fluid flow properties. Flutter, aeronautical. Force Friction Froude number Gas dynamics. Gas kinematics. Gas kinetics Gas mechanics. Hardness scales Harmonic motion High-pressure physics Hooke's law. Horsepower. Hydraulic analog table. Hydraulic gradient. Hydraulic jump. Hydraulics. Hydrodynamics. *Hydrokinematics*. Hydrokinetics. Hydromechanics. Hydrostatics. Hypersonic flight Impact (impulsive force) Impulse (mechanics). Incompressible flow Inertia. Isentropic flow. Jet flow Karman vortex street Kelvin's circulation theorem. Kelvin's minimum energy theorem. *Kinemat-*

eter. Bonding. Bootstrap circuit. Breadboarding. Breakdown potential. Bridge circuit. Brush discharge. Calibration. Canal rays Capacitance box. Capacitance measurement. Capacitor. Cascade amplifier. Cathode follower. Cathode rays. Cathode-ray tube. Cavity resonator. Characteristic curve. Choke (filter). Chopping. Circuit, electronic. Clamping circuit. Clipping circuit. Closed-circuit television. Coaxial cable. Coil. Coincidence amplifier. Cold-cathode tube. Color television. Communications, electrical Comparator circuit. Compass, radio. Conductance. Conduction band Contact potential difference. Contact rectifier. Continuous-wave radar. Controlled rectifier. Corner reflector antenna. Corona discharge. Counting circuit. Course-line computer. Crossover network. Cross-talk. Cryosar. Cryotron. Current balance Current measurement. Cyclotron resonance experiments. Dark current. Data transmission. Decca Dectra. Delay line. Demodulator. Detector. Digital voltmeter. Diode, vacuum. Direct-coupled amplifier. Directional coupler. Direction-finding equipment Discriminator. Disk recording. Distortion (electronic circuits). Donor atom. Doppler radar. Echo box. Electric energy measurement. Electric power measurement Electrical conduction in gases Electrical measurements Electrical standards Electroacoustics. Electrodynamic instruments. Electrometer. Electron. Electron emission Electron lens. Electron motion in vacuum. Electron optics Electron tube Electronic countermeasures. Electronic writing. Electronics. Electrostatic lens Equalization, frequency-response. Equivalent circuit. Esaki tunnel diode. Excitation. Excitation potential Excitron. Fascimile. Feedback circuit. Ferrite devices Fidelity Field emission. Field-enhanced emission. Filter, electric. Fluorescent lamp. Frequency counter. Frequency divider. Frequency measurement. Frequency modulator. Frequency multiplier. Frequency-modulation detector. Frequency-modulation radio. Gain. Galvanometer. Gas tube. Gate circuit. Geiger-Müller counter. Germanium diode. Glow discharge. Ground-controlled-approach system (GCA) Grounding, electronic equipment. Ground-position indicator (GPI). Gyrator. Hall effect Harmonic analyzer. Hearing aid. Heptode. Heterodyne principle Hexode. High fidelity. Hyperbolic navigation system Ignitron Image orthicon. Impedance, electrical. Impedance matching. Impedance measurements, high-frequency. Inductance measurement. Inductometer. Inductor. Inertial guidance system Infrared detector. Infrared image converter tube. Instability, electrical. Instrument landing system (ILS). Instrumentation. Intercommunicating system. Interference, electrical. Intermediate-frequency amplifier. Inverter. Ionization. Ionization chamber. Ionization potential. Jamming. Junction diode. Junction transistor. Kelvin bridge. Kinescope. Klystron. Langmuir-Child law. Lighthouse tube. Limiter circuit. Linearity. Lissajous figures. Load line. Loading, electrical Loran. Magnetic lens. Magnetic recording. Magnetron. Maser. Meissner effect. Mercury-vapor lamp. Mercury-vapor rectifier. Microcircuitry. Microphonic tube Microscope, electron. Microwave. Microwave optics. Microwave transmission lines. Microwave tube. Miniaturization of equipment. Mixer. Modulator. Molecular electronics. Monopulse radar. Motorboating. Moving-target indication. Multimeter. Multiplexing. Multivibrator. Navarho. Navigation systems, electronic. Neon glow lamp. Noise, electrical. Noise filter, radio Noise generator, electrical. Number indicator tube. Octode. Ohmmeter. Omega. Oscillator. Oscillograph. Oscilloscope, cathode-ray. Packaging of equipment. Parametric amplifier. Parasitic oscillation. Particle detector. Passive radar. Pentagrid converter. Pentode, vacuum Phase inverter Phase meter. Phase modulator Phase-angle measurement. Phase-modulation detector Photoconductive cell. Photoconductivity. Photodiode Photoelectric devices Photoelectricity. Photoemission Phototransistor. Phototube. Phototube, multiplier. Photovoltaic cell. Photovoltaic effect. Piezoelectric crystal. Piezoelectricity. Point-contact diode Point-contact transistor. Polar-coordinate navigation systems. Potentiometer (variable resistor) Potentiometer (voltage measurement) Power amplifier. Power supply, electronic. Power-factor meter. Preamplifier. Precision approach radar (PAR). Pressure transducer. Printed circuit. Privacy systems (scrambling). Pulse generator Pulse modulator. Push-pull amplifier Q meter Quadrature. Quartz clock. Radar. Radio Radio astronomy. Radio broadcasting. Radio broadcasting networks. Radio range. Radio receivers Radio spectrum allocations. Radio telescope Radio transmitter. Radioactivity (applications) Radio-frequency amplifier. Radio-wave propagation. Radome Recording Recording instruments, graphic Rectifier Reflectometer, microwave Regeneration (engineering) Regulation. Relaxation oscillator. Relay. Reliability of equipment. Resistance measurement. Resistor. Resonance (alternating-current circuits). Response. Ripple voltage Saint Elmo's fire. Saturation. Saturation current Saw-tooth wave. Scaling circuit. Schematic drawing Schottky effect. Scintillation counter Secondary emission. Selectivity. Semiconductor. Semiconductor rectifier. Sensitivity Shielding, electrical Shunting Signal generator. Signal tracer. Signal-to-noise ratio Silicon diode. Sodium-vapor lamp Solar battery. Sonar Sound recording Sound reproduction systems, electrical Space charge. Spark, electric. Spark gap. Spectrum analyzer. Sputtering. Square wave. Stabilization Standing-wave detector. Static. Storage devices Storage tube. Striation. Superconductivity. Superheterodyne receiver. Suppression. Suppressor. Surface-barrier transistor. Surging Surveillance radar. Sweep generator. Switch, electronic. Switching circuit. Switching theory. Switching tubes. Synchro-

Sugar Tea Thickening Unit operations. Unit processes. Vanilla extract. Wheat.

For many aspects of food production *see* AGRICULTURE

Forestry

Arborvitae Ash Balsa Basswood. Beech. Birch Buckeye. Cedar. Cherry. Cherry, wild black. Chestnut. Cypress Dendrology. Dogwood. Douglas-fir Ebony Elm. Fir Forest and forestry. Forest conservation Forest ecology. Forest fire control Forest mapping Forest mensuration Forest seeding and planting Forest soil. Forest tree nursery management. Forestry, farm. Hackberry. Hemlock. Hickory Holly. Hophornbeam. Hornbeam. Ironwood Kentucky coffeetree Larch. Lignumvitae. Locust (forestry). Logging (forestry). Lumber manufacture. Magnolia. Mahogany. Maple. Mulberry Oak Osage-orange Pine Plywood. Poplar. Red alder. Redwood Sassafras Sequoia. Silviculture. Sourwood Spruce. Sweetgum. Sycamore. Tree. Tulip tree Tupelo Veneer. Walnut. Willow Wood (anatomy and identification) Wood fiber products Wood finishing Wood physics Wood preservation Woodworking Yew.

For economic aspects *see* CONSERVATION; for structure, environmental and classificatory aspects *see* PLANT ANATOMY; PLANT ECOLOGY; PLANT TAXONOMY.

General physiology

Bioelectric model. Biological effects of sound waves. Biopotentials and electrophysiology Cell (biological) Cell (pressure-temperature effects) Cell membranes and monolayers. Cell-surface ionization Cytochemistry Cytology (molecular basis). Electrophysiology (heart) Infrared radiation (biology) Mechanoreceptors. Molecular biophysics. Neurophysiology. Nuclear radiation (biology). Radiation biochemistry Radiation cytology Radiation microbiology

For many chemical and physical aspects of physiology *see* BIOCHEMISTRY, BIOPHYSICS; for those aspects pertaining to cell function *see* CYTOLOGY; for those aspects pertaining to plants *see* PLANT PHYSIOLOGY

See also COMPARATIVE PHYSIOLOGY.

Genetics

Allele Bacterial genetics Biometrics. Breeding (animal) Breeding (plant). Cell division. Chromosome Chromosome aberration. Chromosome theory of heredity. Cytokinesis. Cytoplasmic inheritance. Deoxyribonucleic acid. Dominance, recessiveness, blending Eugenics Experiment Expressivity, gene Gene Gene action Genetics Hardy-Weinberg formula. Heterosis Human genetics. Lethal gene Linkage, genetic. Maternal influence Meiosis Mendelism Mitosis Mutation Penetrance, gene Phenocopies Pleiotropism Polyploidy. Pseudoalleles Recombination, genetic Ribonucleic acid Sex determination Sex influenced inheritance Sex linked inheritance. Syngamy.

For information on the chemistry of the physiological processes *see* BIOCHEMISTRY; for information on the origin of life, animal evolution and plant evolution *see* EVOLUTION; for those aspects of genetics which apply to microorganism *see* MICROBIOLOGY.

Geochemistry

Atmosphere, geochemistry of Atmospheric chemistry [illegible] Cosmo- [illegible] abundance Elements and nuclides (origin) Fused salt phase equilibria Geochemical prospecting Geochemistry. Geochronometry Geologic thermometry Geological time scale High pressure phenomena Hydrosphere Hydrosphere, geochemistry of Isotope dilution techniques. Lead isotopes, geochemistry of Life, origin of Lithosphere. Lithosphere, geochemistry of Low level counting Marine sediments. Meteorite Ocean currents Ore deposits, geochemistry of Paleobiochemistry Paleoecology (geochemical aspects) Petroleum (origin) Radioactive fallout. Radioactive minerals Radioactive species produced by cosmic rays Radioactive waste disposal Radiocarbon dating Rock (age determination) Silicate phase equilibria Sulfide phase equilibria Tektite Terrestrial nuclear reactions. Tracer, radioactive

For techniques and methods related to Geochemistry *see* ANALYTICAL CHEMISTRY, ATOMIC PHYSICS, ELECTROMAGNETIC RADIATION, MOLECULAR PHYSICS, NUCLEAR ENGINEERING, NUCLEAR PHYSICS, PHYSICAL CHEMISTRY

Geography

See PHYSICAL GEOGRAPHY

Geology (mineralogy and petrology)

Agate Albite Allanite Alunite Amber Amblygonite Amethyst Amphibole Amphibolite Analcime. Andalusite Andesine Andesite Anglesite Anhydrite Ankerite Anorthite Anorthoclase Anorthosite Anthophyllite Apatite Aphanite Aplite Apophyllite Aragonite Arenaceous rocks Argentite Argillaceous rocks Argillite Argyrodite Arkose Arsenolite Arsenopyrite Asbestos Augite Aureole, contact Azurite Baddeleyite Barite. Basalt Bauxite Bentonite Beryl. Beryllonite. Biotite Boracite Borate minerals Bornite Bournonite. Breccia Brochantite Brucite Bytownite Calcarenite. Calcite Caliche Cameo Cancrinite Carat Carbonate minerals Carnotite. Cassiterite. Celestite Cerargyrite Cerussite Chabazite. Chalcanthite Chalcedony Chalcocite Chalcopyrite Chalk. Chert. Chlorite Chloritoid Chromite Chrysoberyl Chrysocolla Cinnabar. Clay Clay, commercial Clay minerals Coal. Cobaltite Columbite. Concretion Conglomerate Coquina Cordierite Corundum

ics. Kinetics (classical mechanics). Knudsen number. Laminar flow. Laplace's irrotational motion. Loading, transverse. Loads, dynamic. Loads, repeated. Mach number. Mechanical advantage. Mechanics. Mechanics, classical. Metal, mechanical properties of. Mode of vibration. Model theory. Moment of inertia. Momentum. Motion Motion, rectilinear. Navier-Stokes equations. Newton's laws of motion. Newtonian fluid. Nozzle. Nutation (astronomy and mechanics). Orifice. Oscillation. Pascal's law. Pendulum. Periodic motion. Pipe flow. Pitot tube. Plastic deformation of metal Plasticity. Plate, structural. Pressure vessel. Power. Prandtl-Meyer expansion fan Precession. Pressure Product of inertia Radius of gyration. Relative motion. Resilience. Resonance (acoustics and mechanics). Resultant of forces. Reynolds number. Rheology. Rigid-body dynamics. Ring. Ripple tank. Riveted joint. Rotational motion Rudder, aircraft Safety factor. Schlieren photography. Shadowgraph of fluid flow. Shear. Shear center. Shock isolation. Shock wave. Shock-wave display Similitude. Sink flow. Skin friction Sonic barrier. Sonic boom. Source flow Statics Statics in space. Stokes stream function. Strain. Strain gage. Strain rosette. Streamline flow. Streamlining. Strength of materials. Stress and strain Stress concentration. Supersonic aerodynamics. Supersonic diffuser. Supersonic flight. Sympathetic vibration Thermal stress Throttled flow. Torque. Torricelli's theorem Torsion. Towing tank. Turbulent flow Velocity Venturi tube. Vibration. Vibration damping. Vibration isolation Vibration machine. Vibration pickup Viscous flow. Vortex Wake flow Water hammer. Water tunnel. Wave motion in fluids Wave motion in liquids. Wind tunnel. Wind-tunnel instrumentation Wood physics. Work. Young's modulus.

Evolution

Animal evolution Cambrian Carboniferous Cenozoic Cretaceous Devonian. Eocene Evolution, organic Jurassic. Life, origin of Macroevolution Mesozoic Miocene. Mississippian. Mutation (ontogeny). Oligocene. Ordovician. Paleocene. Paleozoic. Pennsylvanian. Permian Plant evolution. Pleistocene. Pliocene Population genetics Quaternary. Recent. Silurian Speciation. Tertiary. Triassic.

For specific groups of invertebrate animals *see* INVERTEBRATE ZOOLOGY; for further aspects of plant evolution *see* PALEOBOTANY, for further aspects of animal evolution *see* PALEONTOLOGY, for specific groups of animals *see* VERTEBRATE ZOOLOGY. *See also* ANTHROPOLOGY.

Flight science

For aircraft design *see* AERONAUTICAL ENGINEERING. For theoretical aspects of air flow phenomena *see* FLUID MECHANICS. *See also* THERMODYNAMICS.

Fluid mechanics

Adiabatic process. Aerodynamic center. Aerodynamic force. Aerodynamic wave drag. Aerodynamics. Aeromechanics. Aeronautical engineering. Aerostatics. Aerothermodynamics Air pocket. Airfoil. Airfoil profile. Air-velocity measurement. Anemometer. Archimedes' principle. Aspect ratio. Beattie-Bridgeman equation. Bernoulli's theorem. Borda mouthpiece. Boundary-layer flow. Boyle's law. Buoyancy. Cavitation. Channel, open. Charles' law. Chemical engineering. Compressible flow. Conservation of energy. Crocco's equation. D'Alembert's paradox. Dalton's law. Diffuser. Doublet flow Ducted flow. Dynamic similarity. Electrolytic tank. Elevator, aircraft. Euler's momentum theorem. Flight. Flight dynamics. Flow of fluids Flow measurement. Fluid dynamics. Fluid mechanics. Fluid statics. Fluid-flow principles. Fluid-flow properties. Flutter, aeronautical. Froude number. Gas dynamics Gas kinematics. Gas kinetics. Gas mechanics High-pressure physics Hydraulic analog table. Hydraulic gradient Hydraulic jump. Hydraulics Hydrodynamics Hydrokinematics Hydrokinetics Hydromechanics Hydrostatics. Incompressible flow. Isentropic flow. Jet flow. Karman vortex street. Kelvin's circulation theorem. Kelvin's minimum energy theorem Knudsen number. Laminar flow. Laplace's irrotational motion Mach number Model theory. Navier-Stokes equation. Newtonian fluid Nozzle Orifice Pascal's law. Pipe flow Pitot tube Potentials (physics). Prandtl-Meyer expansion fan. Pressure. Pressure measurement. Propeller, air Reynolds number. Rheology. Ripple tank. Rudder, aircraft. Schlieren photography Shadowgraph of fluid flow Shock wave. Shock-wave display. Similitude. Sink flow. Skin friction Sonic barrier Sonic boom Source flow. Stabilizer. Stokes stream function Streamline flow. Streamlining Subsonic flight Supersonic dynamics. Supersonic flight. Supersonic diffuser. Throttled flow Torricelli's theorem Towing tank. Turbulent flow Venturi tube. Viscous flow Vortex Wake flow. Water hammer. Water tunnel. Wave motion in fluids Wave motion in liquids Wind tunnel. Wind-tunnel instrumentation Wing Work.

Food engineering

Baking powder Barley. Buckwheat Butter. Casein Charcoal Cheese Citrus flavoring Cocoa powder and chocolate. Coffee. Corn. Egg processing. Fat and oil, edible. Filtration Food. Food engineering Food manufacturing. Food microbiology. Food poisoning, bacterial. Food preservation. Food science Food spoilage Food technology Gelatin. Gum. Heat exchanger. Ice cream. Margarine. Milk Mixing Monosodium glutamate Oats Peanut. Pepsin Radioactivity (applications). Rennin. Rice. Rye. Salt (food). Sedimentation (industrial). Size reduction. Soybean. Spice and flavoring. Starch

NOGRAPHY; For the development of plants, animals, and man, the lines of descent, and the history of such relationships *see* ANTHROPOLOGY; EVOLUTION; PALEOBOTANY, PALEONTOLOGY. For an interpretative description of relief features, resources, and the graphic representation of earth features *see* PHYSICAL GEOGRAPHY.

Geophysics

Aeromagnetic surveying Aeronomy Air glow. Albedo Aphelion Apogee. Aquifer. Artesian systems. Atmospheric electricity Atmospheric evaporation. Aurora. Cloud physics. Compass, magnetic. Cosmic rays. Declinometer Earth Earth (heat flow). Earth (orbital motion). Earth deformations and vibrations Earth inductor. Earth interior. Earth sciences. Earth tides. Earthquake. Electrojet, upper air Evapotranspiration Geodesy. Geologic thermometry Geomagnetic storm. Geomagnetic variations, transient. Geomagnetism Geophysical exploration. Geophysics. Geyser. Glacier Ground water High-pressure phenomena. Hydrography. Hydrolaccolith. Hydrology. Ice field (Eisstromnetz) Inclinometer. Ionosphere. Isostasy Lightning Magnetometer Meteorological instrumentation Meteorological rockets Meteorological use of satellites Mineral spring. Moho (Mohorovičić discontinuity). Mohole Orogeny Perigee Polar wandering Polygonal ground Prospecting. Prospecting, petroleum Rock magnetism. Seismograph Seismology. Snow field Snow gage. Snow line Snow surveying Solifluction Spring (water). Stream gaging Surface water. Swamp, marsh and bog Tectonophysics. Terrestrial electricity. Terrestrial force fields Terrestrial frozen water. Terrestrial gravitation. Terrestrial magnetism. Thermal spring Tide. Tsunami Van Allen radiation. Variometer. Volcanology. Warping, earth crust. Water table. Well

For cosmic-terrestrial relationships and related geophysical and cosmological phenomena *see* ASTRONOMY; GEOCHEMISTRY, SPACE TECHNOLOGY For a treatment of absolute geochronology and of geochemical processes in the atmosphere, biosphere, hydrosphere, and lithosphere *see* GEOCHEMISTRY. For additional information on related geophysical phenomena of the atmosphere and oceans *see* METEOROLOGY AND CLIMATOLOGY; OCEANOGRAPHY

Graphics and graphic arts

Book manufacturing Composition (type). Descriptive geometry. Dimensioning Drafting Drafting machine Engineering drawing Engineering graphics Ink Layout drawing Paper and paper products Photocopying processes Pictorial drawing Printing Printing press. Sche
typewriter.

Growth and morphogenesis

Adrenal gland Allantois. Amnion. Androgenesis. Animal. Animal morphogenesis Aortic body. Blastulation. Cardiovascular system. Carotid body. Cell constancy. Cell lineage. Chorion. Cleavage, embryonic. Coelom Digestive gland Digestive system. Ear Embryogenesis. Embryology. Embryology, experimental. Embryonic differentiation Embryonic induction Embryonic organizer. Endocrine gland. Endocrine system Epidermal ridges. Esophagus. Estrus. Extraembryonic membranes. Eye Fate maps, embryonic. Feather (bird). Fertilization. Fetal membrane Fingerprint Gallbladder Gametogenesis. Gastrulation. Germ layers. Gland Gynogenesis Hair. Hematopoiesis Histogenesis. Integument Integumentary patterns. Invertebrate embryology. Kidney. Lacrimal gland. Lip Liver. Lymphatic system. Mammary gland. Merogony. Metamerism, embryonic. Muscular system. Nervous system. Neural crest. Neurulation. Oogenesis. Oral gland. Ovum. Palate. Pancreas Parathyroid gland. Pharynx. Photophore gland Placentation. Plant morphogenesis Poison gland Primitive gut. Protogyny Reproduction, animal Reproductive system Respiratory system. Salt gland. Scale (zoology) Scent gland. Sebaceous gland. Sexual dimorphism Skeletal system. Sperm cell. Spermatogenesis. Sweat gland. Swim bladder Teratogenesis Thymus gland Thyroid gland Tongue Tooth Ultimobranchial bodies Urinary system Uropygial gland Yolk sac.

For various animal groups in which certain embryological aspects may be discussed *see* INVERTEBRATE ZOOLOGY; VERTEBRATE ZOOLOGY.

Heat

Absorption (electromagnetic radiation). Black body Bolometer Boltzmann constant. Boltzmann statistics. British thermal unit (Btu) Brownian movement Calorie Calorimetry Chemical fuel. Color temperature. Combustion. Conduction (heat) Conservation of energy. Convection (heat). Dewar flask. Eigenfunction Emissivity Energy Energy sources Enthalpy Fire Flame. Fossil fuel. Fuel. Fuel gas Fuel gas supplements. Gray body. Heat. Heat balance Heat capacity Heat exchanger. Heat radiation. Heat transfer Ice point. Incandescence Insulation
matter
ics Ox
law Pc
Specific heat of solids. Statistical mechanics Temperature Temperature measurement. Thermal expansion Thermal stress Thermoanalysis Thermocouple Thermodynamic principles. Thermodynamic processes. Thermometer Turbine propulsion. Work.

See also THERMODYNAMICS

Covellite. Crocoite. Cryolite. Crystal growth. Crystal optics. Crystal structure. Crystallography. Cummingtonite. Cuprite. Dacite. Datolite. Diabase. Diamond. Diatomaceous earth. Diopside. Diorite. Dolomite. Dolomite rock. Dumortierite. Eclogite. Emerald. Emery. Enargite. Enstatite. Epidiorite. Epidosite. Epidote. Epsomite. Feldspar. Feldspathoid. Felsite. Ferberite. Flaser rock. Fluorite. Franklinite. Fuller's earth. Gabbro. Galena. Garnet *Garnierite.* Gem. Gem, manufactured Gem cutting. Gem mounting. Gemology. Geode. Glauconite Glaucophane. Gneiss. Goethite. Granite. Granitization. Granodiorite. Granulite. Gravel. Graywacke. Greenockite. Greisen. Gypsum. Halloysite. Halogen minerals. Hausmannite. Hematite. Hemimorphite. Heulandite. Hornblende. Hornfels. Huebnerite. Humite. Huntite. Idocrase. Igneous rocks. Illite. Ilmenite. Intaglio (gemology). Jade. Jadeite Jasper. Jet (gemology). Kaliophilite Kalsilite. Kaolinite. Kutnahorite. Kyanite Labradorite. Lamprophyre Larnite. Laterite. Latite. Lava. Lazurite. Lepidolite Leucite. Leucite rock. Lignite Limburgite. Limestone. Limonite Magma. Magnesite. Magnetite. Malachite Manganite. Marble. Marcasite. Marl. Melanterite. Melilite. Merwinite. Metamorphic rocks. Metamorphism. Metasomatism. Mica. Mica schist. Microcline. Migmatite Millerite. Mineral. Mineral fuel areas Mineral resource areas. Mineral resources conservation. Mineralogy. Molybdenite. Monazite. Montmorillonite. Monzonite. Moraine. Muscovite. Mylonite. Native elements. Natrolite. Nepheline syenite. Nephelinite. Niccolite. Niter. Nitrate minerals. Obsidian. Oligoclase. Olivine. Onyx Oolite and psiolite. Opal. Ore and mineral deposits. Orpiment. Orthoclase. Orthoquartzite Orthorhombic pyroxene. Pearl. Peat Pectolite. Pegmatite. Pentlandite. Peridotite. Perlite Perovskite. Perthite. Petrographic province. Petrography. Petrology. Phenocryst. Phlogopite. Phonolite. Phyllite Phyllonite. Picrite. Pigeonite. Pitchstone. Pneumatolysis. Pollucite Porphyroblast Porphyry. Precious stones. Prehnite. Proustite. Psilomelane Pumice. Pyrargyrite. Pyrite. Pyroclastic rocks. Pyrolusite. Pyromorphite Pyroxene. Pyroxenite Pyrrhotite. Quartz. Quartzite. Radioactive minerals Radiolarian earth. Rapakivi granites. Realgar. Rhodochrosite Rhodonite. Rhyolite. Rock. Rock salt. Rubellite. Ruby. Rutile. Sandstone Sanidinite Sapphire. Scapolite. Scheelite. Schist Sedimentary rocks Sepiolite. Serpentine. Serpentinite Shale Siderite. Silicate minerals. Siliceous sinter Sillimanite. Skarn. Skutterudite. Slate. Smithsonite. [illegible] bite. Stone and stone products. Strontianite. Stylolites Subgraywacke. Syenite. Taconite Talc Tantalite. Tetrahedrite. Theralite. Thorianite Thorite Tonalite. Topaz. Tourmaline. Trachyte. Travertine. Tremolite. Tufa. Tuff. Turquois. Uraninite. Vermiculite. Vivianite. Volcanic glass. Wavellite. Willemite. Witherite. Wolframite. Wollastonite. Wulfenite. Wurtzite X-ray powder method. Zenolith. Zeolite. Zincite. Zircon.

For additional treatment of ore and mineral deposits and geochemical processes *see* GEOCHEMISTRY. For additional treatment of crystalline materials *see* SOLID-STATE PHYSICS. For engineering aspects *see* ENGINEERING GEOLOGY. For surficial and historic aspects *see* GEOLOGY (SURFICIAL AND HISTORICAL).

Geology (surficial and historical)

Albertite. Amygdule. Anticline. Archeozoic. Asphalt and asphaltite. Atoll. Authigenic minerals. Avalanche. Barrier reef. Basement rock. Batholith Bioherm. Biostrome. Bitumen. Black shale. Cambrian. Carboniferous. Cave. Cenozoic. Cirque. Cleavage, rock. Coastal landforms. Coastal plain Continental shelf and slope. Coral reef. Cretaceous. Cyclothem. Dating methods Delta Desert erosion features. Devonian. Diagenesis. Diapiric structures. Diastem. Diastrophism. Dopplerite Drumlin Dune Earthquake. Elaterite. Engineering geology. Eocene. Erosion. Escarpment. Esker. Evaporite (saline). Exfoliation, rock. Facies (geology). Fall line Fault and fault structures. Finger lakes. Fiord. Flood plains Fluvial erosion cycle. Fluvial erosion landforms. Fold and fold systems. Fringing reef. Frost action. Geology. Geomorphology. Geosyncline. Gilsonite. Glacial Epoch. Glaciated terrane. Graben Hatchettite. Horst. Impsonite. Jurassic. Kame. Karst topography. Kerogen Laccolith Landslide. Loess Marine sediments Mass wasting. Massif. Matterhorn. Mesozoic Miocene. Mississippian. Mud volcano Natural gas. Oceanic islands Oil sand Oil shale. Oil-field waters. Oligocene Ordovician Ozokerite Paleocene. Paleoclimatology. Paleoecology. Paleogeography. Paleogeology. Paleozoic Pennsylvanian Permian Petrofabric analysis Petroleum. Petroleum geology. Playa Pleistocene Pliocene. Pluton Precambrian Proterozoic. Quaternary. Recent Redbed Regolith Rift valley Rock mechanics. Salt dome Sand. Sapropel. Schistosity, rock Seamount and guyot Sedimentation (geology). Shore processes. Silurian Strand line. Stratigraphic nomenclature Stratigraphy Stream transport and deposition. Stromatolite. Structural geology Structural petrology Submarine canyon. Submarine topography Syncline. Talus. Tectonic patterns Tertiary. Till Torbanite. Triassic Ulmin Unconformity Varve Volcano. Weathering processes. Wurtzilite

For the origin, distribution, and abundance of the earth's elements, their geochemical cycles, and absolute methods of geochronology *see* GEOCHEMISTRY For properties of minerals and the petrography and petrogenesis of rocks, mineral and ore deposits, *see* GEOLOGY (MINERALOGY AND PETROLOGY). For geophysical phenomena of the earth, its waters, and its atmosphere *see* GEOPHYSICS; METEOROLOGY AND CLIMATOLOGY; OCEA-

NOGRAPHY; For the development of plants, animals, and man, the lines of descent, and the history of such relationships *see* ANTHROPOLOGY; EVOLUTION; PALEOBOTANY; PALEONTOLOGY. For an interpretative description of relief features, resources, and the graphic representation of earth features *see* PHYSICAL GEOGRAPHY.

Geophysics

Aeromagnetic surveying Aeronomy. Air glow Albedo Aphelion Apogee. Aquifer, Artesian systems Atmospheric electricity. Atmospheric evaporation Aurora. Cloud physics. Compass, magnetic. Cosmic rays. Declinometer Earth Earth (heat flow) Earth (orbital motion). Earth deformations and vibrations. Earth inductor. Earth interior. Earth sciences Earth tides Earthquake Electrojet. upper air. Evapotranspiration Geodesy. Geologic thermometry Geomagnetic storm Geomagnetic variations, transient Geomagnetism Geophysical exploration Geophysics Geyser. Glacier. Ground water High-pressure phenomena Hydrography. Hydrolaccolith. Hydrology Ice field (Eisstrom-netz) Inclinometer. Ionosphere Isostasy Lightning Magnetometer Meteorological instrumentation. Meteorological rockets. Meteorological use of satellites Mineral spring Moho (Mohorovičić discontinuity). Mohole. Orogeny Perigee Polar wandering. Polygonal ground Prospecting Prospecting, petroleum Rock magnetism Seismograph Seismology. Snow field Snow gage Snow line Snow surveying Solifluction Spring (water) Stream gaging Surface water. Swamp, marsh and bog Tectonophysics Terrestrial electricity Terrestrial force fields Terrestrial frozen water. Terrestrial gravitation Terrestrial magnetism Thermal spring Tide Tsunami Van Allen radiation Variometer. Volcanology Warping, earth crust. Water table Well

For cosmic-terrestrial relationships and related geophysical and cosmological phenomena *see* ASTRONOMY, GEOCHEMISTRY; SPACE TECHNOLOGY. For a treatment of absolute geochronology and of geochemical processes in the atmosphere, biosphere, hydrosphere, and lithosphere *see* GEOCHEMISTRY. For additional information on related geophysical phenomena of the atmosphere and oceans *see* METEOROLOGY AND CLIMATOLOGY, OCEANOGRAPHY

Graphics and graphic arts

Book manufacturing Composition (type) Descriptive geometry Dimensioning Drafting Drafting machine Engineering drawing. Engineering graphics Ink Layout drawing Paper and paper products Photocopying processes Pictorial drawing

Growth and morphogenesis

Adrenal gland. Allantois. Amnion. Androgenesis. Animal Animal morphogenesis. Aortic body. Blastulation. Cardiovascular system. Carotid body. Cell constancy. Cell lineage. Chorion. Cleavage, embryonic. Coelom. Digestive gland. Digestive system. Ear. Embryogenesis Embryology. Embryology, experimental. Embryonic differentiation Embryonic induction Embryonic organizer. Endocrine gland. Endocrine system. Epidermal ridges. Esophagus. Estrus. Extraembryonic membranes. Eye. Fate maps, embryonic. Feather (bird). Fertilization. Fetal membrane. Fingerprint Gallbladder. Gametogenesis. Gastrulation. Germ layers. Gland. Gynogenesis Hair Hematopoiesis. Histogenesis. Integument Integumentary patterns. Invertebrate embryology. Kidney. Lacrimal gland. Lip. Liver. Lymphatic system. Mammary gland. Merogony. Metamerism, embryonic. Muscular system Nervous system Neural crest. Neurulation Oogenesis Oral gland. Ovum Palate. Pancreas. Parathyroid gland Pharynx Photophore gland Placentation. Plant morphogenesis. Poison gland Primitive gut. Protogyny Reproduction, animal. Reproductive system. Respiratory system Salt gland Scale (zoology) Scent gland Sebaceous gland. Sexual dimorphism. Skeletal system. Sperm cell. Spermatogenesis Sweat gland Swim bladder. Teratogenesis. Thymus gland Thyroid gland. Tongue. Tooth. Ultimobranchial bodies. Urinary system. Uropygial gland Yolk sac.

For various animal groups in which certain embryological aspects may be discussed *see* INVERTEBRATE ZOOLOGY; VERTEBRATE ZOOLOGY

Heat

Absorption (electromagnetic radiation). Black body Bolometer Boltzmann constant Boltzmann statistics. British thermal unit (Btu). Brownian movement Calorie. Calorimetry. Chemical fuel. Color temperature Combustion Conduction (heat) Conservation of energy. Convection (heat). Dewar flask Eigenfunction. Emissivity Energy. Energy sources Enthalpy. Fire Flame. Fossil fuel. Fuel Fuel gas Fuel gas supplements. Gray body. Heat Heat balance. Heat capacity. Heat exchanger. Heat radiation Heat transfer Ice point. Incandescence. Insulation, heat. Joule. Kinetic theory of matter. Lattice vibrations Low-temperature physics. Oxidation process Phonon. Planck's radiation law. Power. Pyrometer Solar energy. Specific heat. Specific heat of solids Statistical mechanics. Temperature. Temperature measurement Thermal expansion. Thermal stress. Thermoanalysis Thermocouple. Thermodynamic principles. Thermodynamic processes Thermometer. Turbine propulsion. Work.

See also THERMODYNAMICS.

Histology

Adipose tissue. Blood. Bone. Cardiovascular system. Cartilage. Connective tissue. Digestive system Epithelium. Lymphatic system. Muscle. Muscular system. Nerve. Nervous system. Reproductive system. Respiratory system. Skeletal system. Tissue. Urinary system.

For specific animal groups see INVERTEBRATE ZOOLOGY; VERTEBRATE ZOOLOGY.

Hydrology

Agriculture (drainage). Aquifer. Artesian systems Atmospheric evaporation. Basin. Canal. Cave. Channel, open. Cloud physics. Dam. Evapotranspiration. Flood plains. Fluvial erosion cycle. Fluvial erosion landforms. Frost action. Geyser. Glacier. Ground water. Hydrography. Hydrolaccolith. Hydrology. Hydrometeorology. Hydrosphere. Hydrosphere, geochemistry of. Ice field (Eisstromnetz). Irrigation of crops. Karst topography Lake Limnology. Meteorological instrumentation. Mineral spring. Oasis. Permafrost. Plant. water relations of. Playa. Polygonal ground. Precipitation Precipitation gages. Reservoir. River. River engineering. River tides. Sedimentation (geology). Sewage disposal. Snow. Snow field Snow gage Snow line. Snow surveying. Soil. Soil Conservation Soil mechanics. Solifluction. Spring (water). Stream gaging Stream transport and deposition Surface water Swamp, marsh, and bog. Terrestrial frozen water. Thermal spring. Tree-ring hydrology. Water. Water analysis. Water conservation. Water microbiology. Water pollution. Water power. Water supply engineering. Water table. Well

See also FLUID MECHANICS; METEROLOGY AND CLIMATOLOGY. OCEANOGRAPHY.

Illumination engineering

See ELECTRICAL ENGINEERING.

Immunology

Ablastin. Agglutination reaction. Agglutinin Allergy, atopic Antibody. Antigen. Antigen-antibody reaction. Antitoxin Arthus reaction Blood groups Complement (serum). Complement-fixation test. Conglutination. Germfree vertebrate Hypersensitivity. Immunity. Immunology. Lysin Lytic reaction. Neutralization reaction (antibody). Neutralizing antibody. Serology. Skin test

Industrial and production engineering

Allowance. Assembly methods. Automation. Bulk-handling machines. Caliper. Comparator. Control chart. Conveying machines. Conveyor. Crane hoist. Derrick. Design standards. Dimensioning Drafting machines. Elevating machines. Engineering. Engineering and architectural contracts. Environmental test. Escalator. Force fit. Gages. Gantt chart. Hoisting machines. Industrial control Industrial engineering. Industrial trucks Inspection and testing. Inventory management. Jig, fixture, and die design. Linear programming. Location fit. Mass production. Materials handling. Materials handling machines. Methods engineering. Methods study. Micrometer. Miniaturization of equipment. Monorail Nomograph. Operations research. Operator training Optical flat. Packaging of equipment. Patent. Pilot production. Plant facilities. Press fit. Product design. Production engineering. Production methods. Production planning. Prototype (equipment). Qualification test. Quality control. Reliability of equipment. Running fit Shrink fit. Technology. Tolerance Wage incentives. Work measurement. Work standardization.

For industrial psychology and human engineering *see* PSYCHOLOGY, PHYSIOLOGICAL AND EXPERIMENTAL For industrial and production equipment, techniques, and materials, see the various engineering lists such as CIVIL ENGINEERING; CONTROL SYSTEMS; ELECTRICAL ENGINEERING; MECHANICAL ENGINEERING.

Industrial microbiology

Acetobacter suboxydans fermentation. Acetone-butanol fermentation. Acetone-ethanol fermentation Amphotericin B. Antibiotic. Bacitracin Bacteria. Bacterial genetics Bacterial metabolism. Bacterial nutrition. Bacterial physiology. Bioassay 2,3-Butanediol Butter. Carbomycin. Cheese Chloramphenicol. Chlortetracycline. Citric acid. Culture, elective Culture, media components of Culture, pure Culture technique. Cycloserine Demethylchlortetracycline Dextran. Distilled spirits. Enzyme (industrial production). Epoxysuccinic acid. Erythromycin Food preservation Fumaric acid Gallic acid Gram's stain Griseofulvin Industrial microbiology. Itaconic acid Itatartaric acid. Kanamycin Kojic acid. Lactic acid. Lactobacillaceae. Lyophilization. Malt beverage. Microbiological methods Microbiology. Mushroom. Neomycin Novobiocin Nystatin Oxytetracycline Penicillin. Polymyxin. Saccharomycetales Sterilization. Streptomycetaceae Streptomycin Subtilin Tetracycline Textile microbiology. Viomycin Wine. Yeast, industrial.

Inorganic chemistry

Acetal. Acetate. Acetylation Acetylide Acid and base Acidolysis Actinide elements Actinium Activated carbon Aircraft fuel Air-entraining portland cement Alcoholysis Alkali Alkali metals Alkaline-earth metals. Alum Aluminate Aluminum Amalgam. Americium Amide. Amidine Amine. Ammonia Ammonium salt Antimonate Antimony Aqua regia. Argon Aromatic. Arsenate Arsenic. Arsenite (chemical) Astatine Atmospheric gases, production of Atomic bomb Azide Barium Barium titanate Base, chemical. Benzoate Berkelium. Beryllium Bismuth. Borane. Borate Boride Boron Boron fuel. Bromate. Bromide Bromine. Cadmium Calamine. Calcium. Californium

Calomel Carbide Carbon Carbon dioxide. Carbon-nitrogen cycle. Carbonate. Cement Cement asbestos Cerium. Cesium. Chemical compounds. Chemical structures. Chemical symbols and formulas. Chemical warfare. Chemistry. Chlorate. Chloride Chlorine Chloroform Chloroplatinate. Chromate. Chromium Citrate. Clathrate compounds. Clay. Clay minerals. Coagulation Cobalt. Combining volumes, law of. Complex compounds. Concrete Coordination chemistry. Coordination number Copper. Copper chemistry. Cosmochemistry. Cosmogony. Crystal Crystal growth. Crystal structure Curium Cyanamide. Cyanate Cyanide Cyanogen Definite composition law of. Detergent Deuterium Dichromate Dry ice. Dysprosium. Einsteinium Electrochemical series Electrolyte. Electronegativity Elements (chemical). Equivalent weight Erbium. Ethoxide Europium Fermium. Ferric compound Ferricyanide Ferrite Ferrocyanide Ferrous compound Fire. Fluoborate Fluoride Fluorine Fluorocarbon Fluosilicate Francium Fulminate Gadolinium. Gallium Germanium. Gold Gram-equivalent weight Gram-molecular weight Graphite Ground water Grout Gunite Hafnium Halide Halogen elements. Heavy water Helium Helium, liquid Holmium Hydrate Hydrazine Hydride Hydride, metal Hydrogen Hydrogen bomb Hydrogen fluoride Hydrogen ion Hydroxide Hypochlorite. Indium Inert gases. Inorganic chemistry Intermetallic compounds Iodate Iodide Iodine Iodoform Ion Ion propulsion Iridium. Iron Isomorphism (crystallography) Krypton Lactate. Lanthanide contraction Lanthanum Lead Lead isotopes. Liquefaction of gases Lithium Lutetium. Magnesium. Magnetochemistry Manganese Manganese compound Mendelevium. Mercury (element). Metal carbonyl. Metalloacid elements Metalloid Mixture Molybdate Molybdenum. Mordant. Multiple proportions, law of Neodymium Neon Neptunium Nickel Niobium Nitrate Nitric acid Nitride Nitrite Nitro and nitroso compounds Nitrogen Nitrogen oxides Nobelium Nonelectrolyte Nonmetal Nonstoichiometric compounds Nuclear chemistry Oleate Osmium Oxalate Oxidation-reduction Oxide Oxidizing agent Oxygen Ozone Palladium Palmitate Parachor Paraffin Perchlorate Periodate Periodic table Permanganate Peroxide. Persulfate pH Phenacetin Phosphate Phosphorus Picrate Platinum Plutonium Polonium Portland cement Potassium Praseodymium Promethium Protactinium Radiochemistry Radioisotope production Radium Radon Rare-earth elements Raw water Resin Rhenium Rhodium. Rubidium Ruthenium Salicylate Salt (chemical) Samarium Scandium Sea water Selenium Silicate Silicon Silver. Sodium Solid state chemistry Solvent Spinel (chemical) Stearate Stellar evolution Strontium. Structural materials Structural steel. Sulfamate. Sulfate Sulfide Sulfite. Sulfur Sulfuric acid Tantalum Tartrate Technetium Tellurium Terbium Thallium Thiocyanate. Thiosulfate. Thorium. Thulium. Tin Titanate. Transition elements Transmutation Transuranium elements Trifluoroacetate. Tritium Tungstate. Tungsten. Uranium Vanadate Vanadium Water. Xenon. Ytterbium. Yttrium Zinc. Zincate. Zirconium

For the application of inorganic materials of construction *see* CIVIL ENGINEERING For the earth sciences aspects of ores and minerals from which metals are won *see* GEOLOGY (MINERALOGY AND PETROLOGY). For the practical applications of metals and other inorganics *see* MECHANICAL ENGINEERING For the field of carbon silicon chemistry and organic metallic compounds *see* ORGANIC CHEMISTRY For the measurement and determination of inorganic chemical constants *see* PHYSICAL CHEMISTRY.

Invertebrate zoology

Abalone Acanthocephala Acarina Acnidosporidea Acoela. Acoelomata Acrania. Acrothoracica Actiniaria Actinomyxidia Actinopodea. Adeleida. Alcyonacea Alcyonaria. Allocoelea. Ambergris. Amlypygi Ameba. Amera. Ammonoidea Amoebida. Amphidiscophora. Amphidiscosa Amphilinidea Amphineura Amphipoda. Anaspidacea Animal Animal symmetry Anisomyaria Annelida Anopla. Anoplura Anostraca Ant Antlion Anthozoa. Anthuridea Antimere Antipatharia Aphelenchoidea. Aphid Aplacophora. Apoda (Crustacea) Apoda (Echinodermata) Aporidea Apostomatida Apterygota Arachnida Araneae Arbacioida. Archiacanthocephala. Archiannelida Argulоida. Arhynchobdellae Army worm Arthropoda Articulata (Brachiopoda) Articulata (Echinodermata) Ascaridida Ascaridina Ascaridoidea Ascaris Aschelminthes Ascidiacea Ascothoracica Asellota. Aspidobranchia Aspidochirota. Aspidogastrea Asteroidea Asterozoa Astomatida Athecanephria. Atremata Aulodonta. Autotomy Axonolaimoidea [illegible]

Cestida Cestoda Cestodaria Cestoidea Chaetog[illegible] Lerlantheria [illegible] cerata [illegible] iadida Chiro[illegible] pedia. Cladocera Cladocopa Clam [illegible]

Corallimorpharia. Coronatae. Crab. Crayfish. Cricket. Crinoid. Crinoidea. Crustacea. Cryptomonadida. Cryptostomata. Ctenophora. Ctenostomata Cubomedusae. Cumacea. Cutworm Cyclophyllidea. Cyclopoida Cyclostomata (Bryozoa). Cydippidea. Cysticercosis. Cystidea. Decapoda (Crustacea). Decapoda (Mollusca). Demospongiae. Dendroceratida. Dendrochirota. Dermaptera. Desmodoroidea. Desmoscolecoidea. Deuterostomia. Diadematacea. Diadematoida. Dibranchia. Dictyoceratida. Dicyemida. Digenea. Dinoflagellida. Dioctophymoidea Diphyllidea. Diplopoda. Diplopórita. Diplura. Diptera. Dorylaimoidea. Dracunculoidea. Dragonfly. Earthworm. Earwig. Echinacea. Echinococcosis. Echinocystitoida. Echinodermata. Echinoida. Echinoidea. Echinothurioida. Echiuroidea. Edrioasteroidea. Emeriida. Elasipoda. Eleutherozoa. Embioptera. Endopterygota. Enopla. Enoploidea. Enterocoela. Enteropneusta. Enterozoa. Entodiniomorphida. Entomology. Entomology, economic. Entoprocta. Eocanthocephala. Eocrinoidea. Ephemeroptera. Epicaridea. Eucarida. Eucestoda. Eucoelomata. Euechinoidea. Euglena. Euglenida. Eugregarinida. Eulamellibranchia. Eumalacostraca. Eumetazoa. Euphausiacea. Euryalae. Eutardigrada. Exopterygota. Filarioidea. Firefly Flabellifera. Flea. Flexibilia. Fly. Foraminiferida. Forcipulata. Gammaridea. Gastropoda. Gastrotricha. Gnathiidea. Gordioidea. Gorgonacea. Grasshopper. Gregarinidia. Gymnolaemata Gymnostomatida. Gyrocotylidea. Haemosporidiida. Hairworm Halichondrida. Haplosclerida. Haplosporidia. Harpacticoida. Helicosporidia. Heliozoida. Hellgrammite. Hemichordata Hemicidaroida Hemidiscosa. Hemimetabola. Hemiptera. Hemizonida. Heterochlorida. Heteronemertini Heterotardigrada. Heterotrichida Hexactinellida Hexactinosa. Hexapoda. Hexasterophora Hirudinea. Holasteroida Holectypoida. Holometabola Holothuroidea. Holotricha. Homoptera. Homosclerophorida. Hookworm. Hoplocarida. Haplonemertini. Hornet. Hydra. Hydroida Hydrozoa. Hymenoptera. Hymenostomatida Hyperiidea. Hypermastigida Hypotrichida. Ichneumon Inadunata Inarticulata. Insect control, biological. Insecta. Invertebrata. Invertebrate embryology. Irregularia. Isopoda. Isoptera. Ixodides Jellyfish. Katydid. Kinorhyncha Kissing bug. Lancelet. Larvacea. Leaf hopper. Lecanicephaloidea. Leech. Lepadomorpha. Lepidocentroida. Lepidoptera. Lepostracea. Lernaeopodoida. Leucettida. Leucosoleniida. Limpet Lipostraca. Lobata. Lobster Lophophore Louse Lychniscosa. Lyssacinosa. Macrodasyoidea Malacostraca. Mallophaga. Mandibulata. Mantis. Mastigophora. Mayfly. Mealybug Mecoptera Mermithoidea. Mesostigmata. Mesozoa. Metagenesis. Metamerism. Metazoa. Microsporidia. Microtechnique. Midge. Milleporina. Millipede. Mite. Mollusca. Molpadonia. Monhysteroidea. Monogenea Monogononta. Monstrilloida. Moruloidea Mosquito. Moth. Mussel. Mycetozoida. Myiasis. Myodocopa. Myriapoda. Mysidacea. Mystacocarida. Myxosporidia Nautiloidea. Nautilus. Nebaliacea. Nectonematoidea. Nematoda. Nematomorpha. Neogastropoda. Neoteny. Neotremata. Neuroptera. Nippotaeniidea. Notodelphyoida. Notomyota. Notostraca. Nucleolitoida. Nuda. Nudibranch Nudibranchia. Obelia. Octopoda. Octopus. Odonata. Odontostomatida. Oegophiurida. Oligochaeta. Oligomera. Oligotrichida. Oniscoidea. Onychopalpida Onychophora. Ophiocystioidea. Ophiurae. Ophiurida. Ophiuroidea. Opisthobranchia. Orthonectida. Orthoptera. Ostracoda. Oxyurina. Oxyuroidea. Oyster. Oyster drill. Paedogenesis. Palaeacanthocephala. Palaechinoida. Palaeoisopus. Palaeonemertini. Palaeotremata. Paleocopa. Palpigradi. Pancarida. Paracrinoidea. Paramecium. Parasitic castration. Parasitology. Parazoa. Parthenogenesis. Pauropoda Paxillosa. Pectinibranchia Pedipalpi Pelecypoda Pelmatozoa. Pennatulacea. Pentastomida. Peracarida. Perischoechinoidea. Peritrichida. Periwinkle. Phalangida. Phanerozonia. Pharetronida Phoronida. Phreaticoidea. Phylactolaemata. Phyllocarida. Phymosomatoida. Phytomastigophorea. Phytomonadida. Pinworm. Plasmodroma. Platyasterida. Platycopa. Platyctenea Platyhelminthes Plecoptera. Plectoidea Podocopa. Poecilosclerida. Poecilioidea. Pogonophora. Polychaeta Polycladida. Polymastigida Polymera Polyplacophora. Porifera. Porocephalida. Portuguese man-of-war. Priapuloidea. Prosobranchia. Protandry. Proteocephaloidea. Proteomyxida Proterostomia. Protobranchia Protomastigida. Protozoa. Protozoology. Protremata. Protura. Pseudocoelomata. Pseudophyllidea Pseudoscorpionida. Psocoptera Pterobranchia. Pterygota. Ptychodactiaria Pulmonata Pycnogonida. Pygasteroida. Radiata. Radiolarida. Regularia. Reticulosa. Rhabdiasoidea. Rhabditoidea. Rhabdocoela. Rhizocephala. Rhizomastigida. Rhizopodea. Rhizostomeae Rhombifera. Rhynchobdellae. Rhynchocoela. Ricinulei. Rock shell Rotifera. Sand dollar. Sarcodina. Sarcoptiformes. Sarcosporidia. Scale insect Scallop. Scaphopoda. Schizocoela Schizogregarinida. Scleractinia. Scorpion Scorpionida. Scyphozoa Sea cucumber Sea fan. Sea squirt. Sea urchin Seisonacea. Semaeostomeae. Sepioidea. Septibranchia. Shipworm Shrimp Silverfish. Siphonaptera Siphonophora. Sipunculoidea Slug (zoology). Snail Solpugida. Somasteroidea. Sow bug Sparganosis. Spatangoida. Spelaeogriphacea. Spider Spinulosa Spirotricha Spiruroidea Spittle insect Sponge Sporozoa. Springtail Squash bug Starfish. Statoblasts. Stauromedusae. Stenolaemata Stenurida. Strodonta Stolonifera. Stomatopoda Stone fly Strongyloidea. Stylasterina. Suctorida. Syceltida. Symphyla Syncarida Tanaidacea. Tapeworm Tardigrada Tarnished plant bug. Taxodonta Tectibranchia Telestacea Telosporidea. Telotremata. Temnopleuroida Tentaculata Termite. Testacida. Tetrabranchia Tetractinomorpha. Tetraphyllidea. Teuthoidea Thalassea. Thecanephria. Thermobaenacea. Thigmotrichida Thoracica. Thrip. Thy-

sanoptera Thysanura Tick. Tintinnida. Tooth shell Tortoise Trachylina. Treehopper. Trematoda Treptostomata. Trichomonadida Trichoptera. Trichostomatida Trichuroidea. Tricladida. Trilobita Trochophore Trombidiformes. Trypanorhyncha Trypanosomatidae. Tunicata Turbellaria. Tylenchoidea. Uropygi. Valvata. Valvifera. Vampyromorpha. Verrucomorpha. Walking stick. Wasp Water boatman. Water bug Water flea. Water strider Weevil Wheel bug. Whelk Worm Xiphosura Zoantharia Zoanthidea Zoology. Zoomastigophorea. Zoraptera

For classification *see* ANIMAL SYSTEMATICS, for fossil groups *see* PALEONTOLOGY.

Low-temperature physics

See SOLID-STATE PHYSICS.

Machine design

See MECHANICAL ENGINEERING.

Marine engineering

See MECHANICAL ENGINEERING; NAVAL ARCHITECTURE.

Mathematics

Addition Algebra. Analysis of variance Analytic geometry Angle Arc (mathematics) Area Asymptote Barycentric calculus. Bessel functions *Beta function* Binary number system. Binomial theorem Boolean algebra Calculus, differential and integral Calculus of tensors. Calculus of variations Calculus of vectors Cardioid. Catenary Centroids of areas and lines Chord Circle Combinations and permutations. Complex numbers and complex variables. Cone *Conformal mapping.* Conic section Coordinate systems, graphical. Cube Curve fitting Cycloid. Cylinder. Decimal number system. Descriptive geometry Determinant Diameter Differential equation Differentiation Dihedron Discriminant Distribution (probability) Division Dyadic. e Ellipse Ellipsoid and spheroid Elliptic function and integral Epicycloid. Equations, theory of Exponent Extrapolation Fiber bundle. Fourier series and integrals. Game theory Gamma function. Gauss' theorem Geometry, differential Geometry, euclidean Geometry, noneuclidean. Geometry, Riemannian. Gradient of a scalar Graph theory. Graphic methods Green's theorem Group theory Helix Hexagon Hyperbola Hyperbolic function Hyperboloid Infinity Information theory. Integral transform Integration Interpolation Involute Laplace's differential equation Laplace transform Laplacian. Lattice (mathematics) Least squares, method of. Lemniscate (of Bernoulli). Line Line integral. Linear programming. Linear systems of equations. Lissajous figures Logarithm. Logic. Lorentz transformations Manifold Mathematical notation, contemporary Mathematics Matrix calculus. Matrix theory Monte Carlo method Multiplication. Nomograph. Normal. Number systems. Number theory. Numerical analysis. Octagon Octahedron. Octal number system Operator theory. Orthogonal polynomials. Parabola. Paraboloid. Parallelepiped. Parallelogram. Parameter. Parametric equation Partial differentiation. Pentagon. Perturbation (mathematics). Plane. Point. Polar triangle. Polygon Polyhedron. Polynomial systems of equations. Polytopes, regular. Potentials (mathematics). Prism. Prismatoid and prismoid Probability. Progression (mathematics). Projective geometry. Protractor. Pyramid and frustum Pythagorean theorem Quadric surface. Quadrilateral. Quaternions. Queueing theory. Radian measure. Radius. Real variable Rectangle. Ring theory. Root (mathematics) Root mean-square. Rose curve. Scalar. Series Set theory. Significant figure. Slope. Solid (geometric). Sphere Spherical harmonics. Spheroid Spiral. Square. Statistics Stochastic process. Stok[illegible] rev[illegible] To[illegible] Trigonometric curve. Trigonometry, plane. Trigonometry, spherical. Trihedron Variable (discrete and continuous). Vector (mathematics). Zero.

For applications of mathematics to the various scientific and engineering fields see the particular field of interest.

Mechanical engineering

Acceleration analysis. Accelerometer. Ackerman steering Air brake. Air compressor. Air conditioning. Air conditioning, automotive. Air cooling. Air filter Allowance. Anharmonic oscillator Assembly methods Atomic energy Automobile. Automobile brake Automotive air suspension. Automotive body. Automotive chassis Automotive engine. Automotive frame Automotive steering. Automotive suspension. Automotive vehicle. Axle. Ball-bearing pulverizer. Bearings, antifrictional. Belt. Belt drive. Block and tackle Blowpipe. Boiler feed water. Boiler water. Bolt. Bolted joint. Boring. Bourdon-spring pressure gage. Brayton cycle Broaching Buffing Buhrstone mill Bulk-handling machines. Bulldozer Burning velocity measurement. Bus. Bushing. Caliper. Cam mechanism. Carburetor [illegible] chamber. Combustion knock Combustion wave measurement. Comfort control Comparator. Compression ratio Compressor Condenser, vapor. Connecting rod. Construction equipment Contact condenser. Convection (heat). Conveying machines. Conveyor. Cooling tower Cotter pin. Coupling. Crane hoist. Crane hook Crank. Crushing and pulverizing [illegible]

ice. Ducted fan. Dynamometer. Earthmover. Economizer and air heater. Efficiency. Electric furnace. Electromagnetic pump. Electroplating of metals. Electropolishing. Elevating machines. Energy sources. Engine. Engine cooling. Escalator. Escapement. Excavator. Explosive forming Extrusion. Fan Feed water. Fire-tube boiler. Fluid coupling. Flywheel. Force fit. Forging. Fossil fuel. Four-bar linkage. Friction. Fuel injection. Fuel pump. Fuel systems. Furnace (steam generating). Furnace construction. Gages. Gas furnace. Gas turbine. Gasket. Gear. Gear cutting. Gear drive. Gear loading. Gear train. Governor. Grab bucket. Grinding. Grinding mill. Gyrocompass. Gyroscope. Harmonic oscillator. Heat exchanger. Heat pump. Heat radiation Heat transfer. Heating, comfort. Hoisting machines. Honing. Hot-water heating system. Humidification Humidistat. Humidity control. Hydraulic actuator. Hydraulic press Hydraulic turbine. Hydraulic valve lifter. Hydraulics. Hygrometer. Ice manufacture. Ignition systems. Impulse turbine. Inclined plane. Industrial meteorology. *Industrial trucks Inertial guidance system.* Instrumentation. Internal combustion engine. Jig, fixture, and die design Joint, mechanical. Lapping. Lathe. Level measurement. Lever. Link. Linkage, *mechanical Loading, transverse. Loads, dynamic* Loads, repeated. Location fit. Locomotive Lubrication, engine Machine. Machine design Machine elements. Machine key. Machinery. Machining operations. Magnetic separation methods. Magneto. Manifold, engine Manometer Marine boiler. Marine engine. Marine engineering. Marine machinery. Marine refrigeration. Materials handling machines. McLeod gage Mechanical advantage. Mechanical engineering. Mechanisms. Metal forming. Micrometer. *Milling* machine. Moisture-content measurement. Monorail. Motorcycle. Nailing. Nibbling. Nuclear power. Nut Octane number. Oil furnace. Oldham's coupling. Otto cycle Overdrive. Packing Packing house. Panel heating and cooling Pantograph. Pawl. Pebble mill Peening Pelton wheel. Pendulum Pile driver. Pirani gage. Planer Plate, *structural. Planetary gear train Polishing* Power plant Press fit Pressure measurement. Pressure vessel. Prime mover. Product design. Prony brake. Psychrometer. Psychrometrics. Pulley. *Pump. Pumping* machinery Radiant heating Radiator. Rankine cycle. Ratchet. Raw water. Reactor, nuclear. Reactor, ship propulsion Reaction turbine. Reamer. Refrigerated truck Refrigeration Refrigeration cycle. Refrigerator Refrigerator car Register, air. Reheating Reliability of equipment Ring. Rivet. Riveted joint. Roll mill Rolling, metal Rolling contact. Rope. Rope drive. Running fit Safe. Safety factor Safety valve. Sawing. Screening. Screw. Screw fastener Screw jack. Screw threads. Seal, pressure. Separation (mechanical) Sewing machine. Shaft balancing. Shafting. Shaper. Sheet metal forming. Shock absorber. Shock isolation. Shock-absorber cord. Shovel, power. Shrink fit. Simple machine. Size reduction. Slider crank mechanism. *Sliding pair. Snap ring. Solar energy.* Solar heating. Solids pump. Spark plug. Spectrocopy of combustion. Speedometer. Sprinkler, automatic Spinning of metal. Splines. Spring (mechanical). Steam. Steam boiler. Steam condenser. Steam engine. Steam generating unit. Steam heating. Steam jet ejector. Steam separator. Steam temperature control. Steam turbine. Steering, power. Stoker. Straight line mechanism. Stroboscope. Structural connections. Superheater. Surface condenser. Tachometer. Tank. Taper pin. Temperature-humidity index. Thermal expansion. Thermodynamic cycle. Thermostat. Threading. Tie rod. Tire. Toggle. Tolerance. Ton of refrigeration. Tooling. Torque. Torque converter. Torsion bar. Torsion bar suspension. Tracer, radioactive. Tractor. Transducer. Transmission, automotive. Truck Tube-still heater. Tumbling mill Tuning fork. Turbine. Turnbuckle. Turning (woodworking). Typewriter. Universal joint. Unloader. Vacuum cleaner. Vacuum pump. Valve. Valve train. Vapor cycle. *Vapor lock. V-belt.* Velocity analysis. *Ventilation.* Vibration damping. Vibration isolation. Vibration machine. Vibration pickup. Voltage regulator, automotive. Volumetric efficiency. Warm air heating system. *Washer Water power. Water-tube boiler.* Wedge. Welded joint Water hammer Wheel and axle. Wheel base. Wind power. Wire Woodworking.

For articles on rigid and fluid mechanics, strength of materials and related topics *see* ENGINEERING MECHANICS. For basic thermodynamic laws, principles and processes *see* THERMODYNAMICS. For articles on materials *see* INORGANIC CHEMISTRY; METALLURGICAL ENGINEERING; ORGANIC CHEMISTRY. For articles on lubricants *see* PETROLEUM CHEMISTRY For articles on machinability, plating, welding and other metallurgical topics *see* METALLURGICAL ENGINEERING For articles on structures *see* CIVIL ENGINEERING For aeronautical structures *see* AERONAUTICAL ENGINEERING.

See also CONTROL SYSTEMS ENGINEERING; NUCLEAR ENGINEERING

Mechanics

For engineering applications *see* ENGINEERING MECHANICS. For classical theoretical concepts *see* CLASSICAL MECHANICS. For statistical, quantum and relativistic mechanics *see* ATOMIC PHYSICS, MOLECULAR PHYSICS; SOLID-STATE PHYSICS, THEORETICAL PHYSICS

Medical microbiology

Ablastin Acidosporidea Actinomycetaceae Actinomycosis Actinomyxidia Actinophage Adelaida *Adenovirus. Aerobacter Agglutination reaction* Agglutinin Allergy, atopic Ameba Amebiasis para-Aminosalicylic acid Amoebida Anaphylaxis Animal virus Anthrax Antibacterial agents Antibiotic Antibody Antigen Antigen-antibody reac-

tion Antimicrobial agents. Antiseptic. Antitoxin. Aphelenchoidea Arbor viral encephalitides. Arthus reaction Ascariasis. Ascaridida. Ascaridina. Ascaridoidea Ascaris Ascomycetes. Aspergillosis. Avian leukosis Bacillaceae. Bacillary dysentery. Bacteria Bacteria. lysogenic. Bacteriology, medical Bacteriophage Bacteroidaceae Balantidiasis. Bejel Biological specificity. Biologicals. Blackleg. Blastomycosis. Botulism. Brucellaceae Brucellosis Candidiasis. Carrion's disease. Cat scratch disease. Cercaria Cestoda. Chagas' disease. Chemotherapy. Chickenpox and shingles Cholera vibrio Chromomycosis Clonorchiasis Cnidosporidia. Coccidia Coccidioidomycosis Coenurosis Cold, common Coliphage Complement (serum). Complement fixation test Conglutination. Corynebacteriaceae Coxsackie virus Cryptococcales. Cryptococcosis Culture, elective. Culture, embryonated egg Culture, media components of. Culture, pure. Culture, tissue. Culture technique Cyclophyllidea Cysticercosis. Cystis Dengue fever Dermatophytosis. Digenea Dioctophymoidea Diphtheria Disease Disease carrier Dracunculoidea Drug resistance Echinococcosis. ECHO virus. Effective dose 50 Emerinda Encephalitis, equine. Endocarditis Enteric bacilli Enterobacteriaceae. Enterovirus Epidemic Epidemiology Escherichia Eubacteriales Exanthem subitum. Fasciolasis. Fasciolopsiasis Fever Fièvre boutonneuse. Filariasis. Filarioidea Flea Food poisoning, bacterial Foot and mouth disease Fungistat and fungicide Gaffkya tetragena. Gangrene, gas Germ German measles Germfree vertebrate Glanders Gonorrhea Granuloma inguinale Griseofulvin Guinea worm infection Haemosporidiida Heartwater disease Hemadsorption viruses. Hemophilic bacteria Hemorrhagic septicemia Herpes simplex Heterophile antigen Histo-

...ical inclusion bodies (virus). Infant diarrhea Infection Infection, lytic Infectious disease control Infectious disease transmission Infectious mononucleosis Infective dose 50 Influenza Isoantigen Isonicotinic acid hydrazide Johne's disease. Keratoconjunctivitis (epidemic) Klebsiella pneumoniae Lactobacillaceae. Lancefield differentiation scheme Leishmaniasis Leprosy. Leptospira Lethal dose 50 Leukocidin Listeriosis Louping-ill. Lymphocytic choriomeningitis Lymphogranuloma venereum Lymphogranuloma-psittacosis group. Lysin Lytic reaction Malaria Mastitis (cows) Measles Melioidosis. Meningitis Meningococcus Microbiological methods Microscope, electron Microscope, fluorescence Microscope, optical Microsporidia Molluscum contagiosum Monhysteroidea Monilaceae. Monilales Moraxella lacunata. Mouse viral leukemias Mumps Mycology, medical Myiasis. Myxomatosis, infectious (rabbits) Myxosporidia Myxovirus Nematoda Neutralization reaction (antibody). Neutralizing antibody. Newcastle disease. Nitrofuran. Nocardiosis. Nystatin Opsonin. Papillomatosis, infectious (rabbit). Paracolon bacilli. Paragonimiasis. Parapertussis. Parasitology, medical Paratyphoid fever. Paratyphoid gastroenteritis. Phagocytosis. Phlebotomus fever. Phycomycetes Pink eye. Pinta. Pinworm. Pinworm infection Plague. Pleuropneumonia like organism (PPLO). Pneumocystosis. Pneumonia. Pneumonitis. Poliomyelitis. Precipitin Precipitin test. Properdin. Proteus. Pseudomonadaceae Pseudomonas aeruginosa. Pseudophyllidea. Psittacosis Public health. Q fever. Quellung reaction Rabies. Rat bite fever. Relapsing fever. Rhabdiasoidea. Rhabditoidea. Rheumatic fever. Rickettsiales. Rickettsialpox. Rickettsioses Rous sarcoma. Salivary gland virus disease. Salmonella Sarcosporidia. Scarlet fever. Schistosomiasis. Septicemia. Serology. Shigella. Skin test Sleeping sickness, African Smallpox. Soft chancre. Sparganosis. Spirillaceae. Spirochete. Sporotrichosis. Sporozoa Spotted fever, Rocky Mountain Spotted fever group. Staphylococcus. Streptococcus Strongyloidea Strongyloidiasis. Sulfa drugs. Sulfone (antimicrobial use). Syphilis. Tapeworm Tapeworm disease Tetanus. Thiosemicarbazone Tick Tick bite fever, South African. Tick fever, Colorado Tick paralysis. Tick typhus, North Queensland Tick typhus. Siberian Toxin, bacterial Toxin-antitoxin reaction Toxoplasmosis. Trachoma Trench fever Trichinosis. Trichomoniasis Trichuroidea. Trypanosomatidae. Tuberculosis. Tularemia Tumor viruses Tylenchoidea. Typhoid fever. Typhus, scrub. Typhus fever, endemic (flea-borne) Typhus fever, epidemic (louse-borne). Vaccination Venereal disease. Vincent's angina. Virulence Virus. Wart Weil's disease. West Nile fever Whipworm disease Whooping cough. Yaws. Zoonoses

For more information on oncology and other disease processes *see* ANIMAL PATHOLOGY; for the chemistry of the physiological processes *see* BIOCHEMISTRY.

See also MICROBIOLOGY.

Metallurgical engineering

Alloy Alloy structures. Arc welding Atomic bomb Beryllium alloys. Beryllium metallurgy. Brass Brazing Brittleness. Bronze Cadmium metallurgy. Cast iron Cermet. Cladding Copper alloys. Corrosion. Creep of materials Drawing of metal Elastic limit Elasticity Ma-

...platin

...trusion

Forgi...

...ys Gold metallurgy

Grain boundaries (metallurgy). Hardness scales. Heat-treatment (metals and alloys). Hooke's law. Hydrogen bomb Hydrometallurgy. Iron (extraction from ore). Iron alloys. Iron-silicon alloys Lead alloys. Lead metallurgy. Machinability (metals) Magnesium alloys. Metal. Metal, mechanical properties of. Metal and mineral ...

ice Ducted fan. Dynamometer. Earthmover. Economizer and air heater. Efficiency. Electric furnace. Electromagnetic pump. Electroplating of metals. Electropolishing. Elevating machines. Energy sources. Engine. Engine cooling. Escalator. Escapement. Excavator. Explosive forming. Extrusion. Fan. Feed water. Fire-tube boiler. Fluid coupling. Flywheel. Force fit. Forging. Fossil fuel. Four-bar linkage. Friction Fuel injection. Fuel pump. Fuel systems. Furnace (steam generating). Furnace construction. Gages. Gas furnace Gas turbine Gasket. Gear. Gear cutting Gear drive. Gear loading. Gear train. Governor. Grab bucket. Grinding. Grinding mill. Gyrocompass Gyroscope. Harmonic oscillator. Heat exchanger. Heat pump Heat radiation. Heat transfer. Heating, comfort. Hoisting machines. Honing. Hot-water heating system Humidification. Humidistat. Humidity control. Hydraulic actuator. Hydraulic press Hydraulic turbine. Hydraulic valve lifter. Hydraulics. Hygrometer. Ice manufacture Ignition systems. Impulse turbine. Inclined plane. Industrial meteorology *Industrial trucks. Inertial guidance system.* Instrumentation. Internal combustion engine. Jig, fixture, and die design. Joint, mechanical. Lapping Lathe Level measurement. Lever. Link. Linkage, mechanical. Loading, transverse. Loads, dynamic *Loads, repeated. Location fit* Locomotive Lubrication, engine Machine. Machine design Machine elements. Machine key. Machinery. Machining operations. Magnetic separation methods. Magneto Manifold, engine. Manometer. Marine boiler. Marine engine. Marine engineering Marine machinery. Marine refrigeration. Materials handling machines. McLeod gage. Mechanical advantage. Mechanical engineering. Mechanisms. Metal forming Micrometer. Milling machine Moisture-content measurement. Monorail Motorcycle Nailing. Nibbling. Nuclear power. *Nut.* Octane number *Oil* furnace. Oldham's coupling. Otto cycle Overdrive. Packing. Packing house Panel heating and cooling Pantograph. Pawl. Pebble mill. Peening Pelton wheel. Pendulum. Pile driver. Pirani gage. Planer *Plate, structural Planetary gear train.* Polishing Power plant. Press fit. Pressure measurement. Pressure vessel. Prime mover. Product design. Prony brake. Psychrometer. Psychrometrics Pulley Pump. Pumping machinery Radiant heating. Radiator Rankine cycle. Ratchet. Raw water Reactor, nuclear. Reactor, ship propulsion Reaction turbine Reamer. Refrigerated truck Refrigeration. Refrigeration cycle. Refrigerator. Refrigerator car Register, air. Reheating Reliability of equipment. Ring. Rivet. Riveted joint. Roll mill Rolling, metal Rolling contact. Rope. *Rope drive. Running fit* Safe. Safety factor. Safety valve. Sawing. Screening. Screw. Screw fastener. Screw jack Screw threads. Seal, pressure. Separation (mechanical) Sewing machine. Shaft balancing. Shafting. Shaper. *Sheet metal forming* Shock absorber. Shock isolation. Shock-absorber cord Shovel, power. Shrink fit Simple machine. Size reduction. Slider crank mechanism *Sliding pair. Snap ring. Solar energy.* Solar heating. Solids pump. Spark plug. Spectroscopy of combustion. Speedometer. Sprinkler, automatic. Spinning of metal. Splines. Spring (mechanical). Steam. Steam boiler. Steam condenser. *Steam engine. Steam generating unit. Steam heating.* Steam jet ejector. Steam separator. Steam temperature control Steam turbine. Steering, power Stoker. Straight line mechanism. Stroboscope. Structural connections Superheater. Surface condenser. Tachometer. Tank. Taper pin. Temperature-humidity index. Thermal expansion. Thermodynamic cycle. Thermostat. Threading. Tie rod. Tire. Toggle. Tolerance. Ton of refrigeration. Tooling. Torque. Torque converter. Torsion bar. Torsion bar suspension. Tracer, radioactive. Tractor. Transducer. Transmission, automotive. Truck. Tube-still heater. Tumbling mill Tuning fork Turbine Turnbuckle. Turning (woodworking). Typewriter. Universal joint. Unloader. Vacuum cleaner. Vacuum pump. Valve. Valve train. Vapor cycle. Vapor lock. V-belt. Velocity analysis. Ventilation Vibration damping. Vibration isolation. Vibration machine. Vibration pickup. Voltage regulator, automotive. Volumetric efficiency. Warm air heating system. Washer. Water power Water-tube boiler. Wedge. *Welded joint. Water hammer. Wheel and* axle. Wheel base. Wind power. Wire Woodworking

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Mechanics

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Medical microbiology

Ablastin Acridosporidea. Actinomycetaceae Actinomycosis. Actinomyxidia. Actinophage. Adelaida. Adenovirus Aerobacter. Agglutination reaction. Agglutinin Allergy, atopic Ameba. Amebiasis para Aminosalicylic acid *Amoebida.* Anaphylaxis Animal virus Anthrax Antibacterial agents Antibiotic Antibody. Antigen. Antigen antibody reac

cycline. Pasteurization. Pathogen (soil). Penicillin. *Petroleum* microbiology. Phycomycetes. Polymyxin. Propionibacteriaceae Protophyta. Pseudomonadaceae. Pseudomonadales. Pseudomonadineae. Rhizobiaceae. Rhizosphere. Rhodobacteriineae. Riboflavin Rickettsiales. Rust (microbiology). [illegible] Soil bal- [illegible] microorganisms. Soil mineral (microbial utilization) Soil phosphorus (microbial cycle). Sphaerioidaceae. Sphaeropsidales Spirillaceae. Spirochaetales Sporobolomycetales Stain (*microbiological*). Sterilization Steroid. Stilbellaceae Streptomycetaceae. Streptomycin. Subtilin Tetracycline. Textile microbiology Thiobacteriaceae Tuberculariaceae. Tyrothricin. Uredinales. Ustilaginales Vinegar Viomycin Virales. Vitamin B_{12}. Water analysis Water microbiology. Water purification. Waterborne disease. Wine. Yeast Yeast, industrial Zythiaceae.

For articles on the chemical reactions in physiology see BIOCHEMISTRY; for more information on plant diseases caused by microorganisms see PLANT PATHOLOGY

See also ANIMAL PATHOLOGY; MEDICAL MICROBIOLOGY

Microscopy

See BIOPHYSICS, ELECTROMAGNETIC RADIATION, OPTICS

Mineralogy

For articles pertaining to rocks and minerals see GEOLOGY (MINERALOGY AND PETROLOGY); for additional treatment of related geochemical processes see GEOCHEMISTRY

Mining engineering

Assaying Ball bearing pulverizer Boring and drilling, mineral Buhrstone mill Bulk-handling machines Classification mechanical Coal mining Conveying machines Conveyor Core drilling Crushing and pulverizing Drilling machine Elevating machines. Grinding mill Hoisting machines. Industrial trucks Materials handling machines Mining Mining, open-cut or pit. Mining, placer Mining, strip Mining, underground. Mining excavation Mining machinery. Mining operating facilities Mining safety Pebble mill Prospecting. Quarrying Roll mill Safety lamp. Screening Separation (*mechanical*) Size reduction. Tumbling mill Ventilation Well logging (*mineral*).

See also PETROLEUM ENGINEERING.

Molecular biology

See BIOPHYSICS, CYTOLOGY; GENERAL PHYSIOLOGY

Molecular physics

Absorption (electromagnetic radiation). Adhesion, molecular. Angstrom. Atom. Atomic clock. Atomic structure and spectra. Boltzmann statistics. Boltzmann transport equation. Bose-Einstein statistics. Brownian movement. Chemical binding Chemical compounds. Chemical structures. Chemistry. Chromatography. Cohesion (physics). Collision. Crystallization. Degeneracy (quantum states). Eigenfunction Eigenvalue. Electron. Electron configuration. Electron diffraction Electron paramagnetic resonance spectroscopy. Electron spin. Electronegativity. Energy level (quantum mechanics). Excited state. Exclusion principle. Fermi-Dirac statistics. Flame photometry. Franck-Condon principle. Ground state. Harmonic motion. Harmonic oscillator. Hydrogen bomb Inorganic chemistry. Intermolecular forces Magnetic resonance. Maser. Microwave spectroscopy. Molecular association. Molecular beams. Molecular physics. Molecular structure and spectra. Molecular weight Molecule. Neutron diffraction Nuclear moments Organic chemistry. Paramagnetism. Perturbation (quantum theory) Planck's constant. Polarimetric analysis. Quantum (physics). Quantum mechanics. Quantum numbers Quantum statistics Quantum theory, nonrelativistic Radiation chemistry. Radiofrequency spectroscopy Rheology Ritz's combination principle Schrodinger's wave equation. Selection rules (physics). Spin (quantum mechanics). Stark effect. Stationary state. Statistical mechanics Thermoanalysis. Uncertainty principle Wave physics. X-ray crystallography X-ray diffraction. Zeeman effect.

See also ATOMIC PHYSICS

Morphogenesis

See GROWTH AND MORPHOGENESIS.

Morphology

See ANIMAL ANATOMY; CYTOLOGY; GROWTH AND MORPHOGENESIS; HISTOLOGY, INVERTEBRATE ZOOLOGY, PALEOBOTANY, PALEONTOLOGY, PLANT ANATOMY, VERTEBRATE ZOOLOGY

Mycology

Actinomycetales [illegible] Eurotiales Fungi. Fungi Imperfecti. Fungistat and fungicide Griseofulvin. Heterobasidiomycetidae Histoplasmosis. Homobasidiomycetidae. Hypersensitivity. Melanconiales Meningitis. Microbiological methods Moniliaceae Moniliales. Mycelia Sterilia Myriangiales Nocardiosis Phycomycetes. Rhizosphere Rust (*microbiology*). Saccharomycetales. Smut (microbiology). Sphaerioi-

ing. Metal coatings. Metal forming. Metal inspection, magnetic. Metal inspection, ultrasonic. Metallography. Metallurgy. Nickel alloys. Nickel metallurgy. Nose cone. Ore dressing. Permalloy. Pewter. Plastic deformation of metal. Powder metallurgy. Pyrometallurgy. Pyrometallurgy, nonferrous. Radioactivity (applications). Radiography of metals. Resilience. Rheology. Rocket. Rolling, metal. Silver alloys. Silver metallurgy. Sintering. Soldering. Solid-state physics. Space technology. Spacecraft structures. Spinning of metal. Spot welding. Stainless steel. Steel. Steel manufacture. Stress and strain. Surface hardening of steel. Tempering. Thermonalysis. Tin alloys. Tin metallurgy. Titanium. Titanium metallurgy. Torch. Uranium metallurgy. Vacuum metallurgy. Welding and cutting of metals. Wrought iron. X-ray powder method. Young's modulus. Zinc alloys. Zinc metallurgy. Zone refining.

For construction applications *see* CIVIL ENGINEERING. For ore supply and location *see* GEOLOGY (MINERALOGY AND PETROLOGY) For the winning of ores and metals from the earth *see* MINING ENGINEERING. For analytical applications and control methods *see* ANALYTICAL CHEMISTRY; PHOTOGRAPHY.

Meteorology and climatology

Aerology. Aeronautical meteorology. Agricultural meteorology. Air. Air glow. Air mass. Air pressure. Air temperature. Air waves, upper synoptic. Anemometer. Atmosphere. Atmospheric acoustics. Atmospheric adiabatic change. Atmospheric chemistry. Atmospheric electricity. Atmospheric high. Atmospheric low. Atmospheric pollution. Aurora. Backing wind. Baroclinic field. Barometer. Barotropic field. Bioclimatology. Brocken specter. Chinook. Climatic change. Climatic prediction. Climatology. Clinometer. Cloud. Cloud physics. Continentality, weather and climate. Coriolis acceleration and force. Cyclone. Degree-day. Dendrochronology. Dew. Dew point. Drought. Dust storm. Environmental protection. Fog. Front. Frost. Geostrophic wind. Gradient wind. Greenhouse effect, terrestrial. Growing season. Hail. Halo. Heat balance, terrestrial atmospheric. Humidity. Hurricane. Hydrometeorology. Hygrometer. Industrial meteorology. Insolation. Isanomal. temperatures. Isentropic surfaces. Isobar (meteorology). Isopycnic. Isotach. Isothermal chart. Jet stream. Lightning. Marine influence on weather and climate. Mesosphere. Meteorological instrumentation. Meteorological optics. Meteorological rockets. Meteorological use of satellites. Meteorology. Micrometeorology. Millibar. Mirage. Moisture-content measurement. Monsoon. Naval meteorology. Oceanmeteorological relations. Polar meteorology. Precipitation (meteorology). Precipitation gages. Psychrometer. Psychrometrics. Radiation, terrestrial. Radioactive fallout. Rain shadow. Rainbow. Sensible temperature. Sirocco. Smog. Snow. Solenoid (meteorology). Squall. Storm. Stratosphere. Sundog. Sunshine-duration transmitter. Temperature inversion. Temperature-humidity index. Thedodolite. Thunder. Thunderstorm. Tornado. Treering hydrology. Tropical meteorology. Tropopause. Troposphere. Veering wind. Waterspout. Weather. Weather (forecasting and prediction). Weather map. Weather modification. Weather station. Wind. Wind measurement. Wind rose. Wind stress. Windshift line.

For related physical aspects of earth and atmosphere *see* GEOPHYSICS; for related chemical aspects, *see* GEOCHEMISTRY. For relevant aspects of the interaction of sea and atmosphere *see* OCEANOGRAPHY.

Microbiology

Acetobacter suboxydans fermentation. Acetonebutanol fermentation. Acetone-ethanol fermentation. Achromobacteraceae. Acid-fast stain. Acrasiales. Actinomycetaceae. Actinomycetales. Actinoplanaceae. Amphotericin B. Antimicrobial agents. Antibacterial agents. Antibiotic. Antiseptic. Ascomycetes. Axenic culture. Azotobacteraceae. Bacillaceae. Bacitracin. Bacteria. Bacteria, taxonomy of. Bacterial cell chemistry. Bacterial coenzyme. Bacterial endospores. Bacterial enzyme. Bacterial genetics. Bacterial growth. Bacterial luminescence. Bacterial metabolism. Bacterial motility. Bacterial nutrition. Bacterial physiology. Bacteriology. Bacteroidaceae. Basidiomycetes. Beggiatoales. Bioassay. Brevibacteriaceae. Brine, microbiology of. Brucellaceae. 2,3-Butanediol. Butter. Carbomycin. Caryophanales. Caulobacteraceae. Cheese. Chemostat. Chlamydobacterales. Chloramphenicol. Chlortetracycline. Citric acid. Corynebacteriaceae. Cryptococcales. Culture, elective. Culture, media components of. Culture, pure. Culture technique. Cycloserine. Dematiaceae. Demethylchlortetracycline. Dextran. Discellaceae. Distilled spirits. Enterobacteriaceae. Enzyme (industrial production). Epoxysuccinic acid. Erysiphales. Erythromycin. Ethyl alcohol. Eubacteriales. Eumycetes. Eurotiaceae. Eurotiales. Fermentation. Food microbiology. Food poisoning, bacterial. Food preservation. Food spoilage. Fumagillin. Fumaric acid. Fungi. Fungi Imperfecti. Gallic acid. Gluconic acid. Gram's stain. Griseofulvin. Heterobasidiomycetidae. Homobasidiomycetidae. Humus. Hyphomicrobiales. Ice cream, Industrial microbiology. Itaconic acid. Itatartaric acid. Kanamycin. Kojic acid. Labyrinthulales. Lactic acid. Lactobacillaceae. Leptostromataceae. Lyophilization. Malt beverage. Manure. Marine microbiology. Melanconiales. Methanomonadaceae. Microbiology. Microbiological methods. Micrococcaceae. Microtatobiotes. Milk. Moniliaceae. Moniales. Mushroom. Mycelia Sterilia. Mycobacteriaceae. Mycoplasmatales. Myriangiales. Myxobacterales. Myxomycetes. Neisseriaceae. Neomycin. Nitrobacteriaceae. Nitrogen cycle. *Nosobiocin*. *Nystatin*. Oxytetra-

chamber Carbon star. Carbon-nitrogen cycle. Chain reaction, nuclear. Cloud chamber. Critical mass. Crystal counter Curie. Curium Cyclotron Deuterium Deuteron Elements (chemical). Fission, nuclear Fusion, nuclear. Gamma rays Half-life. Heavy water. Hydrogen bomb Hyperfine structure. Ionization chamber. Isomerism, nuclear. Isotone. Isotope Linear accelerator Magnetic resonance Magnetogas dynamics. Magnetohydrodynamics. Magneton Mass defect. Mass number. Mean free path Multipole radiation. Neutron. Neutron, delayed Neutron cross section Neutron optics. Nuclear chemistry Nuclear explosion Nuclear moments Nuclear physics Nuclear power. Nuclear radiation. Nuclear reaction. Nuclear structure Nucleon. Nucleonics. Nucleus, atomic. Nuclide. Packing fraction. Pair production (electron positron). Parity (quantum mechanics). Particle accelerator. Particle detector. Pinch effect. Plasma physics Plutonium Positron Probability in physics. *Proton* Proton-proton chain Quantum (physics). *Quantum* field theory Radiation Radiation chemistry *Radioactive* species produced by cosmic rays. Radioactivity Radioactivity, standards. Radio-frequency spectroscopy Radioisotope. Radium Radon Reactor, nuclear Reactor physics Resonance transformer. Roentgen unit. Scattering experiments, atomic and molecular Scattering experiments *nuclear* Scintillation counter Selection rules *(physics)*. *Spallation* reaction Spin (quantum mechanics). Strange particle Symmetry laws *(physics)*. Synchrocyclotron Synchrotron Technetium Thermal neutrons Thermonuclear reaction Thorium Transmutation Transuranium. Triton. Uranium Van de Graaff generator V-particle

See also ATOMIC PHYSICS; MOLECULAR PHYSICS, NUCLEAR ENGINEERING.

Oceanography

Antarctic Ocean Antisubmarine warfare Arctic Ocean Atlantic Ocean Atoll Baltic Sea Barrier reef Bathyscaph Bathythermograph Bering Sea. Black Sea Caribbean Sea Continental shelf and slope Coral reef Coriolis acceleration and force Deep-sea fauna Delta Echo sounder. Estuarine oceanography Fringing reef Gulf of Mexico Gulf Stream Halocline Harbor. Hydrophone Hydrosphere Hydrosphere geochemistry of. Ice islands Iceberg Indian Ocean. Mangrove swamp Marine ecosystem Marine fisheries Marine marsh. Marine navigation Marine resources Marine sediments. Mediterranean Sea Naval meteorology North Sea Northwest Passage Ocean currents Ocean waves Ocean meteorological relations. Oceanic islands Oceanography Oceans and seas. Organic reef Pacific Ocean Reef River tides Sargasso Sea Scattering layer SCUBA. Sea. Sea ice. Sea level (datum planes) Sea level fluctuations. Sea state Sea water Sea water fertility. Seamount and guyot. Seiche Shore processes Skin diving SOFAR Sonar Sonobuoy Southeast Asian waters Storm surge. Submarine canyon Submarine topography. Texas Towers. Thermocline. Tidal bore. Tide. Tsunami. Turbidity current. Underwater photography. Underwater sound. Underwater television. Wave (capillary). Wave (internal).

For related geophysical phenomena *see* GEOCHEMISTRY; GEOPHYSICS; METEOROLOGY AND CLIMATOLOGY. For related aspects of marine biology *see* ANIMAL ECOLOGY; PLANT ECOLOGY.

Optics

Aberration of light. Aberration, optical. Absorption Absorption (electromagnetic radiation). Albedo. Angstrom. Aspheric surfaces, optical. Astronomical instruments. Astronomical spectroscopy. Atomic structure and spectra. Band spectrum. Binoculars Black. Brocken specter. Camera. Candle. Candlepower Cathodoluminescence. Chemical microscopy. Chemiluminescence Chromatic aberration Cinematography. Color. Color centers Color vision. Colorimetric analysis. Colorimetry Comparator Compton effect. Crystal optics. DeBroglie wavelength. Dichroism. Diffraction. Diffraction grating. Diopter. Dispersion *(radiation)*. *Doppler* effect Electroluminescence. Electrooptics. *Energy* level (quantum mechanics) Eyepiece. Faraday effect Filter, color. Fine structure (spectrum lines). Flame photometry Focal length Foot candle. Foot-lambert Franck-Condon principle. Frequency (wave motion) Fringe (optics). Ghost image, optical Gray Ground state. Gun sights. Huygens' principle Illuminance Image, optical Inertia of energy. Interference filter, optical. Interference of waves. Interferometry. Isotope shift. Kerr effect Lambert. Lantern slides. Latent image Lens, optical Light. Light amplifier Light panel. Line spectrum. Lumen. Lumen-hour Luminance. Luminescence Luminosity factor. Luminous efficiency Luminous energy. Luminous flux Luminous intensity Luminous paint. Lux Magnetooptics Magnification Meteorological optics. Micron Microscope Mirage Mirror optics. Molecular structure and spectra. Observatory, astronomical. Opaque medium. Opera glasses Optical fibers Optical flat. Optical materials Optical methods of chemical analysis. Optical recording. Optical tracking instruments. Optics. Optics, geometrical. Optics, physical Paschen-Back effect Penumbra. Periscope Phosphorescence Phot. Photon Photoelasticity Photoelectric devices. *Photoelectricity* Photography. Photography, color. Photoluminescence Photometer. Photometry. Planck's constant Pleochroism Point source. Polarimetric analysis. Polarized light. Prism, optical Projection systems, optical *Projector (light)*. Pyrometer. Quantitative chemical analysis. Quantum mechanics. Quantum

For industrial applications *see* MICROBIOLOGY; for the mycological aspects of plant disease *see* PLANT PATHOLOGY.

Naval architecture

Antisubmarine warfare. Archimedes' principle. Armament, naval. Buoyancy. Center of gravity. Drydocking. Fluid dynamics Fluid mechanics. Fluid-flow principles. Fluid-flow properties. Froude number. Glider. Hydrodynamics. Hydrofoil craft Inland waterways transportation. Laminar flow. Landing ships and craft. Model theory. Naval architecture. Propeller, marine. Reynolds number. Seaplane Ship, merchant. Ship, naval Ship design. Ship propulsion. Ship salvage. Shipbuilding. Similitude. Streamline flow. Streamlining. Submarine. Towing tank. Turbulent flow Underwater demolition. Wake (seagoing vessels). Wake flow. Water tunnel.

For theoretical aspects of fluid flow phenomena *see* FLUID MECHANICS.

Navigation

Accelerometer. Air Almanac. Air navigation Air traffic control Airborne radar. Aircraft compass system. Aircraft low-approach systems. Airport surface detection equipment. Air-speed indicator Altimeter, pressure. Altimeter, radio Astrolabe. prismatic. Azimuth Buoy Celestial navigation Compass, magnetic. Compass, radio Continuous-wave radar Coordinate systems, terrestrial. Corner reflector antenna. Course-line computer. Dead reckoning. Decca Dectra Direction-finding equipment. Doppler radar Geography, mathematical Glide-path indicator. Great circle, terrestrial. Ground-controlled approach system (GCA) Ground-position indicator (GPI). Gyrocompass. Gyroscope Hyperbolic navigation system Inertial [illegible] Landing system (ILS) [illegible] Nautical [illegible] ion instruments. Navigation systems, electronic Omega. Passive radar. Piloting. Polar navigation Polar-coordinate navigation systems. Precision approach radar (PAR). Radar Radio. Radio range Schuler pendulum Sextant SOFAR Sonar. Surveillance radar. Tacan Terrain-clearance indicator. Vortac.

For astronomical bodies *see* ASTRONOMY. For articles on the earth's magnetic field *see* GEOPHYSICS. For articles on ocean currents and waves *see* OCEANOGRAPHY. For air currents and aeronautical meteorology *see* METEOROLOGY AND CLIMATOLOGY. For communication equipment *see* COMMUNICATIONS. For automatic control systems *see* CONTROL SYSTEMS ENGINEERING. For electronic devices and circuits *see* ELECTRONIC ENGINEERING.

Nuclear engineering

Actinium. Alpha rays. Aluminum. Americium. Atomic bomb Atomic energy. Background count. Barn (unit). Beryllium. Beta rays Betatron. Boron Bubble chamber. Cadmium. Carbon. Ceramic chemistry. Cerenkov radiation. Cermet. Chain reaction, nuclear. Chemical engineering Cloud chamber. Cockcroft-Walton accelerator. Cosmic rays. Critical mass Crystal counter. Curie. Cyclotron. Decontamination (radioactive contaminants). Deuterium Dosimeter. Ducted flow. Electromagnetic pump. Energy sources. Film badge. Fission, nuclear. Flow measurement. Flow of fluids. Fluid-flow principles Fluid-flow properties. Fusion, nuclear Gamma rays Geiger-Müller counter. Geophysical exploration. Graphite. Hafnium. Half-life Health physics. Heat exchanger. Heavy water. Helium Hydrazine Hydrogen bomb. Impulse generator. Indium Ion exchange. Ionization chamber. Irradiation, isotropic. Isomerism, nuclear. Isotope Isotope dilution techniques Isotope separation (stable isotopes). Lanthanum Lead. Linear accelerator Low-level counting Luminous paint. Magnetogas dynamics. Magnetohydrodynamics. Mass number Mean free path Monitoring (ionizing radiation). Neutron. Neutron, delayed Neutron cross section Nonstoichiometric compounds. Nuclear aircraft propulsion. Nuclear battery. Nuclear chemistry Nuclear engineering Nuclear explosion Nuclear fuels Nuclear fuels reprocessing. Nuclear power Nuclear radiation Nuclear reaction Nuclear rocket. Nucleonics. Nucleus, atomic. Nuclide. Particle accelerator Particle detector. Pinch effect Pipe flow Plasma physics Plutonium. Polonium Propulsion Prospecting Proton Rad Radiation Radiation damage (manimate materials). Radiation shielding Radioactive fallout Radioactive waste disposal. Radioactivity Radioactivity (applications) Radioactivity, standards Radiochemical laboratory Radiochemistry Radioisotope Radioisotope assay. Radioisotope production. Radiometric assay Radium Reactor, nuclear Reactor, nuclear (classification) Reactor, ship propulsion. Reactor physics Refractory Resonance transformer Rocket Rocket engine Roentgen unit Saline water reclamation Scintillation counter. Scintillation detector, liquid Silver Sintering. Size reduction Spark counter Stainless steel Stripping Synchrocyclotron Synchrotron Thermal expansion Thermal neutrons Thermal stress Thermocouple Thermonuclear reaction Thorium Thulium. Tracer, radioactive Transmutation. Transuranium elements Tritium Unit operation Uranium Uranium metallurgy Van de Graaff generator Well logging Xenon Zirconium.

See also NUCLEAR PHYSICS

Nuclear physics

Absorption Absorption (electromagnetic radiation) Actinium Alpha rays Americium Antimatter. Astatine. Astrophysics. Atom Atomic bomb Atomic energy. Atomic mass unit. Atomic number Atomic weight. Barn (unit) Baryon Berkelium Beta rays. Betatron. Binding energy. nuclear Bismuth. Boltzmann transport equation Bubble

chamber. Carbon star. Carbon nitrogen cycle. Chain reaction, nuclear Cloud chamber. Critical mass. Crystal counter. Curie. Curium Cyclotron. Deuterium Deuteron Elements (chemical). Fission, nuclear Fusion, nuclear. Gamma rays. Half-life. Heavy water Hydrogen bomb Hyperfine structure Ionization chamber. Isomerism, nuclear. Isotone. Isotope Linear accelerator. Magnetic resonance. Magnetogas dynamics. Magnetohydrodynamics Magneton Mass defect Mass number. Mean free path Multipole radiation. Neutron. Neutron, delayed Neutron cross section. Neutron optics. Nuclear chemistry Nuclear explosion Nuclear moments Nuclear physics. Nuclear power Nuclear radiation Nuclear reaction. Nuclear structure Nucleon. Nucleonics. Nucleus, atomic. Nuclide Packing fraction. Pair production (electron-positron). Parity (quantum mechanics). Particle accelerator Particle detector. Pinch effect Plasma physics Plutonium. Positron. Probability in physics. Proton Proton-proton chain Quantum (physics). Quantum field theory. Radiation Radiation chemistry Radioactive species produced by cosmic rays. Radioactivity. Radioactivity, standards. Radio-frequency spectroscopy Radioisotope. Radium. Radon. Reactor, nuclear. Reactor physics. Resonance transformer. Roentgen unit Scattering experiments, atomic and molecular. Scattering experiments, nuclear Scintillation counter Selection rules (physics) Spallation reaction Spin (quantum mechanics) Strange particle. Symmetry laws (physics) Synchrocyclotron. Synchrotron. Technetium Thermal neutrons. Thermonuclear reaction. Thorium Transmutation Transuranium Triton Uranium Van de Graaff generator. V-particle

See also ATOMIC PHYSICS; MOLECULAR PHYSICS, NUCLEAR ENGINEERING

Oceanography

Antarctic Ocean Antisubmarine warfare Arctic Ocean. Atlantic Ocean. Atoll Baltic Sea Barrier reef Bathyscaph. Bathythermograph Bering Sea Black Sea Caribbean Sea Continental shelf and slope Coral reef Coriolis acceleration and force. Deep-sea fauna. Delta Echo sounder Estuarine oceanography Fringing reef Gulf of Mexico Gulf Stream Halocline Harbor. Hydrophone Hydrosphere. Hydrosphere geochemistry of Ice islands Iceberg Indian Ocean Mangrove swamp Marine ecosystem Marine fisheries Marine marsh Marine navigation. Marine resources Marine sediments Mediterranean Sea Naval meteorology North Sea Northwest Passage. Ocean currents. Ocean waves. Ocean meteorological relations Oceanic islands Oceanography Oceans and seas Organic reef Pacific Ocean Reef River tides Sargasso Sea. Scattering layer SCUBA Sea Sea ice. Sea level (datum planes) Sea level fluctuations Sea state. Sea water Sea water fertility Seamount and guyot. Seiche Shore processes Skin diving SOFAR Sonar Sonobuoy. Southeast Asian waters Storm surge. Submarine canyon. Submarine topography Texas Towers. Thermocline. Tidal bore. Tide. Tsunami. Turbidity current. Underwater photography. Underwater sound. Underwater television. Wave (capillary). Wave (internal).

For related geophysical phenomena *see* GEOCHEMISTRY; GEOPHYSICS; METEOROLOGY AND CLIMATOLOGY. For related aspects of marine biology *see* ANIMAL ECOLOGY; PLANT ECOLOGY.

Optics

Aberration of light. Aberration, optical. Absorption Absorption (electromagnetic radiation). Albedo. Angstrom. Aspheric surfaces, optical. Astronomical instruments. Astronomical spectroscopy Atomic structure and spectra. Band spectrum Binoculars Black. Brocken specter. Camera. Candle Candlepower. Cathodoluminescence. Chemical microscopy Chemiluminescence. Chromatic aberration Cinematography Color. Color centers Color vision. Colorimetric analysis Colorimetry. Comparator Compton effect. Cystal optics DeBroglie wavelength Dichroism. Diffraction. Diffraction grating Diopter. Dispersion (radiation). Doppler effect Electroluminescence Electrooptics. Energy level (quantum mechanics). Eyepiece. Faraday effect Filter, color Fine structure (spectrum lines) Flame photometry. Focal length. Foot-candle Foot-lambert Franck Condon principle. Frequency (wave motion). Fringe (optics) Ghost image optical. Gray. Ground state. Gun sights. Huygens' principle Illuminance Image, optical. Inertia of energy Interference filter, optical Interference of waves Interferometry. Isotope shift. Kerr effect Lambert. Lantern slides. Latent image. Lens, optical Light. Light amplifier Light panel. Line spectrum. Lumen. Lumen hour. Luminance. Luminescence Luminosity factor. Luminous effi-

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cro cope Mirage Mirror optics. Molecular structure and spectra. Observatory, astronomical Opaque medium. Opera glasses Optical fibers. Optical flat. Optical materials. Optical methods of chemical analysis. Optical recording. Optical tracking instruments Optics. Optics, geometrical. Optics, physical Paschen-Back effect Penumbra Periscope Phosphorescence. Phot. Photon. Photoelasticity Photoelectric devices Photoelectricity. Photography. Photography, color. Photoluminescence. Photometer Photometry Planck's constant. Pleochroism Point source. Polarimetric analysis. Polarized light Prism, optical Projection systems, optical Projector (light). Pyrometer. Quantitative chemical analysis Quantum mechanics. Quantum physics. Radiation. Rainbow. Raman effect Rangefinder, optical Reflection (electromagnetic

Re

cip

netic radiation). Schlieren photography. Schmidt camera. Shadow. Shadowgraph of fluid flow. Sine wave. Spectrochemical analysis. Spectrography. Spectrophotometric analysis. Spectroscopy. Spectrum. Spherical and aspheric surfaces (optical). Stereoscopy. Stroboscopic photography. Sundog. Telephoto lens. Telescope. Telescope, astronomical. Thermoluminescence. Translucent medium. Transparent medium. Trichroism. Ultraviolet radiation. Umbra. Vectograph. Vision. Wave (physics). Wave equation. Wave motion. Wave optics. Wavelength. White. X-ray optics. Zeeman effect. Zoom lens.

For articles on electromagnetic radiation in general *see* ELECTROMAGNETIC RADIATION. For articles on photoelectric effects and devices *see* SOLID-STATE PHYSICS.

Organic chemistry

Acetaldehyde Acetic acid Acetone. Acetophenone. Acetyl phosphate. Acetylcholine Acetylene. Acid anhydride. Acid halide. Acridine. Acrolein. Acrylonitrile. Acylation. Addition polymerization. Addition reaction. Adenosinediphosphate (ADP). Adenosinetriphosphate (ATP). Adenylic acid Adhesive. Adiponitrile. Adrenal cortex steroid. Adrenal gland. Alanine. Albumin. Alcohol. Aldehyde. Aldosterone. Alicyclic hydrocarbon. Aliphatic hydrocarbon Alkaloid Alkane Alkanolamine. Alkene. Alkyl radical. Alkyne. Almond. Amide. acid. Amine Amino acids Amino resins. para-Aminobenzoic acid. para-Aminophenol. Amylase Androgen Aniline. Anise. Anthocyanin. Anthracene Anthranilic acid. Anthraquinone pigments. Antibacterial agents. Antiseptic. Arginine Aromatic hydrocarbon. Ascorbic acid. Asparagine. Aspartic acid Aspirin Asymmetric synthesis Atropine. Auxin. Axole. Belladonna. Benzaldehyde. Benzene. Benzidine. Benzoic acid. Benzophenone. Benzyme. Bile acid. Bilirubin Biochemistry. Biotin Biphenyl. Blood 1,3-Butadiene 2,3-Butanediol. Butane. Butanol. Caffeine. Camphor. Camphor tree Carbanion. Carbazole. Carbohydrate. Carbon tetrachloride. Carbonium ion. Carboxylic acid Carotenoid. Catechol. Cell protoplast. Cellobiose Cellophane. Cellulose. Cellulose derivatives Cetane Cetane number. Cetyl alcohol. Chelation Chemical warfare. Chitin Chloramine-T. Chlorophyll. Cholesterol. Choline. Chromophore. Clinical pathology Cocaine Coenzyme Condensation polymerization Condensation reaction. Conformational analysis Creatine-creatinine Creosote. Cresol Cyclododecatriene. Cyclooctatetraene. Cyclopentadiene. Cysteine. Cystine Cytochrome. Demethylchlortetracycline. Dextran. Dextrin Diastereoisomer. Diazine Diazotization. Diels-Alder reaction. Diene. Digitoxigenin. Dioxane. Diphenylmethane. Diphosphopyridine nucleotide (DPN). Disulfide Drying oil Dye. Electrophilic and nucleophilic reagent. Enantiomorph. Enzyme Epinephrine. Epoxidation. Epoxy resin. Epoxysuccinic acid Ergosterol Essential oils Ester. Estrogen. Ethane. Ether. Ethyl acetate Ethyl acetoacetate. Ethyl malonate. Ethylene chlorohydrin. Ethylene glycol. Ethylene oxide. Ethylenediaminetetraacetic acid. Eucalyptus. Fat and oil, nonedible. Fibrinogen. Flavone. Folic acid. Formaldehyde. Formic acid. Freon Friedel-Crafts reaction. Fructose. Fumaric acid. Furan. Furfural Galactose. Gallic acid. Gamma globulin. Globulin. Gluconic acid. Glucose. Glucose-1-phosphate. Glucose-6-phosphate. Glucoside. Glue. Glutamic acid Glutamine. Glutelin. Glycerol. Glycine. Glycogen Glycol Glycolipid. Glycoside. Gonad. Grignard reaction. Haloform reaction. Halogenated hydrocarbon. Hemicellulose. Hemoglobin. Heterocyclic compounds. Hexamethylenetetramine. Hexaphenylethane. Histidine. Hormone. Hormone, adenohypophyseal. Hormone, adrenal cortex. Hormone, adrenal medullary. Hormone, neurohypophyseal. Hyaluronic acid. Hydrocarbon Hydrocarbon resin. Hydroquinone. Hydroxylation reaction. Imidazole. Indene. Indole. Insulin. Inulin. Iron metabolism. Isocyanate. Isoleucine. Isomerism, molecular. Isoprene. Isoquinoline. Ketene. Ketone. Kolbe hydrocarbon synthesis Krebs cycle. Lactam and lactim Lactase. Lactide and lactone Lactose. Lanolin. Leucine. Levan Linoleum Linseed oil. Lipid. Lipid metabolism. Lysine. Maltase. Maltose. Mannan. Menthol. Mercaptan Methane. Methanol. Methionine. Methyl ethyl ketone Microtechnique. Monosaccharide Morphine Morpholine. Mucilage Naphthalene Naphthol. Naphthylamine. Niacin Nicotine Nitrile. Nitrobenzene Nitrogen excretion. Nitroparaffin Nucleic acid Nucleoprotein. Nutrition. Nylon. Octane Octane number Olefin sulfide Oligosaccharide Optical activity. Organic chemical synthesis Organic chemistry. Organic reaction mechanism Organoarsenic compound Organometallic compound Organophosphorus compound. Organosulfur compound Orthoester Oxalic acid. Oxazole. Oxime. Oxytetracycline Oxonization Pancreas Pantothenic acid Parathyroid gland. Pectin. Pentaerythritol Peppermint Peptide. Pharmaceutical chemistry. Pharmacognosy. Pharmacology. Pharmacy. Phenanthrene Phenol Phenolformaldehyde resin Phenylalanine Phosphatide. Photographic materials Photography. Photoreception Photosynthesis Phthalic acid Phthalimide Picric acid. Pinene. Plant fermentation Plant hormones Plant metabolism Plant physiology. Plant respiration. Plant translocation (organic solutes) Plasmal Polyacrylate resin Polyacrylonitrile resin Polyalkene Polyamide resin Polyester resins Polyether resins Polyethylene glycol Polyfluoroolefin resin Polyhydroxy alcohol Polymer Polymer properties Polymerization Polynuclear hydrocarbon Polyolefin resins Polyoxyethylation of alcohol Polysaccharide Polystyrene resin Polysulfide resins Polyurethane resins Polyvinyl resins Poppy Porphyrin Progesterone Prolamine Proline Propane. Propanol Propylene. Protein Protein, fibrous. Protein, globular Pyran Pyrazole Pyridine

Pyrimidine. Pyrrole Quaternary ammonium salts. Quinine. Quinoline Quinone. Racemization. Raffinose Reformatsky reaction Resonance (molecular structure). Resorcinol. Respiratory pigments. Riboflavin Rosin. Saccharin. Schiff base. Serine. Serotonin Serum. *Silicone resins.* Soap and detergent Sphingolipid. Squalene. Stereochemistry. Steric effect (chemical reaction). Steroid Sterol. Strychnine Styrene Substitution reaction. Sucrose Sulfamic acids Sulfanilic acid. Sulfenyl chloride Sulfinic acid. Sulfonamide Sulfone (chemical). Sulfonic acid. Sulfonyl chloride Sulfoxide Tall oil. Tannin. Tartaric acid Tautomerism. Terpene. Testis Tetracycline Tetraethyllead Theobromine. Thiamine. Thiazole. Thio compounds Thioaldehyde and thioketone Thioether Thiophene. Thiourea. Threonine. Thyroid gland. Toluene. Toluidine Transamination. Trichloroacetic acid Triglyceride Triphenylmethane. Triphosphopyridine nucleotide (TPN) [illegible]

vegetable. Wood fiber products Wood preservation Wurtz reaction Wurtz-Fittig reaction Xylene

For theoretical aspects *see* ATOMIC PHYSICS For the biochemical interrelationships and life processes *see* BIOCHEMISTRY For technical applications and production methods *see* CHEMICAL ENGINEERING. For construction applications *see* MECHANICAL ENGINEERING For the molecular theory of *see* MOLECULAR PHYSICS For the daily application of organic synthesis *see* PETROLEUM ENGINEERING. For the physical methods of determining critical constants *see* PHYSICAL CHEMISTRY.

Paleobotany

Algae fossils [illegible] tales Calam [illegible] toniales Ce[illegible] paleobotany Coenopteridales Coralline algae. Cordaitales Cretaceous Cryptozoon Cycadeoidales Cycadofilicales Devonian Eocene Evolution, organic Fossil seeds and fruits Girvanella. Halimeda Hyeniales Jurassic Lepidodendrales Mesozoic Miocene Mississippian Nematophytales Noeggerathiales Oligocene Ordovician Paleobotany. Paleocene. Paleozoic Palynology Pennsylvanian Permian Petrifaction Petrified forests Plant evolution Pleistocene Pleuromeiales Pliocene Postglacial vegetation and climate Pseudoborniales Psilophytales Pteridospermae. Quaternary Recent Silurian Solenopora Speciation Sphenophyllales Tertiary. Triassic.

For phylogenetic considerations *see* EVOLUTION, for classification of the plant kingdom *see* PLANT TAXONOMY

Paleontology

Acanthodii. Aistopoda. Amphibia fossils. Anapsida. Anaspida. Animal evolution. Annelida fossils. Anthracosauria. Anthropology, physical. Anthroposcopy. Antiarchi. Apsidospondyli Archaeocyatha. Archaeornithes. Archosauria. Arctolepiformes. Arthrodira. Artiodactyla fossils Astrapotheria. Atremata. Aves (fossil). Batoidea fossils. Brachiopoda. Brachythoraci Bradyodonti. Bryozoa fossils. Cambrian. Carboniferous. Carnivora fossils. Cenozoic. Cephalopoda fossils. Cetacea fossils. Chemical fossils. Chimaerae. Chiroptera fossils. Cladoselachii Coccolithophorida (Coccolithidae). Coelenterata fossils Coelolepida Condylarthra Coniconchia. Conodont. Conularida. Cotylosauria. Cretaceous. Cro-Magnon man. Crocodilia fossils. *Dermoptera* fossils. Desmostylia. Devonian. Dinocerata. Dinornithiformes. Dinosaur. Docodonta. Echinodermata fossils. Edentata fossils. Elasmobranchii fossils. Embolomeri Embrithopoda Eocene. Euryapsida. Eurypterida. Evolution, organic. Fontéchevade man. Foraminifera fossils. Fossil Fossil man Fusulinidae. Gastrolith Gastropoda fossils Graptolithina. Heidelberg man. Hesperornis. Heterostraci. Hybodontoidea. Hyracoidea fossils. *Ichthyopterygia.* Ichthyornis. Ichthyosauria. Ichthyostegalia Ictidosauria Index fossil. Insecta fossils. Insectivora fossils Java man [illegible] morpha [illegible] origin [illegible] fossils [illegible] sauria. Mesozoic. Micropaleontology Microsauria. Miocene Mississippian Monoplacophora Monotremata fossils Multituberculata. Myodocopa Neanderthal man Nectridia. *Neotremata.* Notoungulata Nummulites Oligocene. Ordovician Ornithischia Osteichthyes (fossil) Osteostraci. Ostracoda. Ostracoderm Palaeospondyloidea. *Palaeotremata* Paleocene. Paleoecology. Paleoecology (geochemical aspects) Paleontology Paleozoic Pantodonta Pantotheria Peking man. Pelecypoda fossils Pelycosauria Pennsylvanian. Perissodactyla fossils. Permian. Pholidota fossils Piltdown man Placodermi Pleistocene. Pleuracanthodii Pliocene Porifera fossils. Primates (fossil) Proboscidea fossils Protista Protorosauria Protremata. Pterosauria. Pyrotheria Quaternary Recent. Reptilia fossils Rhachitomi. Rhodesian man Rodentia fossils. Rugosa Saurischia. [illegible]

[illegible] Stegoselachii Steinheim man Stereospondyli. Stromatoporoidea Swanscombe man Symmetrodonta Synapsida Tabulata. Taeniodonta. Telotremata. Temnospondyli Ternifine man. Tertiary. Thecodontia Therapsida Tillodontia. Tintinnina. Trematosauria Triassic Triconodonta Tubulidentata fossils. Xenungulata

For phylogenetic aspects *see* EVOLUTION; for

netic radiation). Schlieren photography. Schmidt camera. Shadow. Shadowgraph of fluid flow. Sine wave. Spectrochemical analysis. Spectrography. Spectrophotometric analysis. Spectroscopy. Spectrum. Spherical and aspheric surfaces (optical). Stereoscopy. Stroboscopic photography. Sundog. Telephoto lens. Telescope. Telescope, astronomical. Thermoluminescence. Translucent medium. Transparent medium. Trichroism. Ultraviolet radiation. Umbra. Vectograph. Vision. Wave (physics). Wave equation. Wave motion. Wave optics Wavelength. White. X-ray optics. Zeeman effect. Zoom lens.

For articles on electromagnetic radiation in general *see* ELECTROMAGNETIC RADIATION. For articles on photoelectric effects and devices *see* SOLID-STATE PHYSICS.

Organic chemistry

Acetaldehyde. Acetic acid. Acetone. Acetophenone. *Acetyl phosphate. Acetylcholine. Acetylene. Acid* anhydride. Acid halide. Acridine. Acrolein. Acrylonitrile. Acylation. Addition polymerization. Addition reaction. *Adenosinediphosphate (ADP).* Adenosinetriphosphate (ATP). Adenylic acid Adhesive. Adiponitrile Adrenal cortex steroid. Adrenal gland. Alanine. Albumin Alcohol. Aldehyde Aldosterone Alicyclic hydrocarbon. Aliphatic hydrocarbon. Alkaloid Alkane. Alkanolamine Alkene. Alkyl radical Alkyne. Almond. Amide. acid Amine. Amino acids Amino resins. para-Aminobenzoic acid. para-Aminophenol. Amylase Androgen. Aniline. Anise Anthocyanin. Anthracene Anthranilic acid. Anthraquinone pigments Antibacterial *agents. Antiseptic. Arginine* Aromatic hydrocarbon Ascorbic acid. Asparagine Aspartic acid. Aspirin. Assymmetric synthesis Atropine. *Auxin. Avole. Belladonna. Benzaldehyde. Benzene* Benzidine. Benzoic acid Benzophenone Benzyme Bile acid Bilirubin Biochemistry. Biotin Biphenyl. *Blood. 1,3-Butadiene. 2,3-Butanediol.* Butane. Butanol Caffeine. Camphor. Camphor tree. Carbanion. Carbazole. Carbohydrate. Carbon tetrachloride. Carbonium ion. Carboxylic acid Carotenoid. Catechol. Cell protoplast. Cellobiose Cellophane. Cellulose. Cellulose derivatives Cetane Cetane number. Cetyl alcohol Chelation *Chemical warfare.* Chitin. Chloramine-T Chlorophyll. Cholesterol. Choline Chromophore Clinical pathology Cocaine Coenzyme. Condensation polymerization Condensation reaction. Conformational analysis Creatine-creatinine. Creosote Cresol Cyclododecatriene Cyclooctatetraene. Cyclopentadiene Cysteine. Cystine. Cytochrome. Demethylchlortetracycline. *Dextran.* Dextrin. Diastereoisomer Diazine. Diazotization. Diels-Alder reaction. Diene. Digitoxigenin. Dioxane. Diphenylmethane. Diphosphopyridine nucleotide (DPN). Disulfide. Drying oil. Dye. Electrophilic and nucleophilic reagent Enantiomorph. Enzyme. Epinephrine. Epoxidation Epoxy resin. *Epoxysuccinic acid. Ergosterol.* Essential oils. Ester. Estrogen. Ethane. Ether. Ethyl acetate. Ethyl acetoacetate. Ethyl malonate. Ethylene chlorohydrin. Ethylene glycol. Ethylene oxide. *Ethylenediaminetetraacetic acid. Eucalyptus.* Fat and oil, nonedible. Fibrinogen. Flavone. Folic acid. Formaldehyde. Formic acid. Freon. Friedel-Crafts reaction. Fructose. Fumaric acid. Furan Furfural Galactose. Gallic acid. Gamma globulin. Globulin Gluconic acid. Glucose. Glucose-1-phosphate. Glucose-6-phosphate. Glucoside. Glue. *Glutamic acid.* Glutamine. Glutelin. Glycerol. Glycine. Glycogen. Glycol. Glycolipid. Glycoside. Gonad. Grignard reaction. Haloform reaction. Halogenated hydrocarbon. Hemicellulose Hemoglobin. Heterocyclic compounds Hexamethylenetetramine. Hexaphenylethane. Histidine. Hormone. Hormone, adenohypophyseal. Hormone, adrenal cortex. Hormone, *adrenal medullary. Hormone, neurohypophyseal* Hyaluronic acid Hydrocarbon Hydrocarbon resin. Hydroquinone Hydroxylation reaction. Imidazole *Indene. Indole.* Insulin. Inulin. Iron metabolism. Isocyanate. Isoleucine Isomerism, molecular. Isoprene. Isoquinoline. Ketene Ketone. Kolbe hydrocarbon synthesis Krebs cycle. Lactam and lactim Lactase. Lactide and lactone Lactose. Lanolin Leucine Levan. Linoleum. Linseed oil. Lipid. Lipid metabolism. Lysine Maltase. Maltose. Mannan. Menthol. Mercaptan. Methane. Methanol Methionine. Methyl ethyl ketone Microtechnique Monosaccharide. Morpholine Morpholine. Mucilage. Naphthalene. Naphthol Naphthylamine. Niacin. Nicotine. Nitrile Nitrobenzene. Nitrogen excretion Nitroparaffin. Nucleic acid Nucleoprotein. Nutrition Nylon. Octane Octane number. Olefin sulfide. *Oligosaccharide. Optical activity Organic chemical* synthesis. Organic chemistry. Organic reaction mechanism Organoarsenic compound. Organometallic *compound Organophosphorus compound.* Organosulfur compound Orthoester Oxalic acid Oxazole Oxime Oxytetracycline Ozonization. Pancreas *Pantothenic acid Parathyroid gland* Pectin Pentaerythritol. Peppermint Peptide Pharmaceutical chemistry Pharmacognosy Pharmacology Pharmacy *Phenanthrene Phenol Phenolformaldehyde resin* Phenylalanine. Phosphatide Photographic materials Photography Photoreception Photosynthesis *Phthalic acid* Phthalimide. Picric acid. Pinene. Plant fermentation Plant hormones Plant metabolism. Plant physiology Plant respiration. Plant translocation (organic solutes). Plasmal Polyacrylate resin Polyacrylonitrile resin Polyalkene Polyamide resin Polyester resins Polyether resins Polyethylene glycol Polyfluoroolefin resin Polyhydroxy alcohol Polymer Polymer properties Polymerization Polynuclear hydrocarbon Polyolefin resins Polyoxyethylation of alcohol Polysaccharide Polystyrene resin Polysulfide resins Polyurethane resins Polyvinyl resins Poppy Porphyrin Progesterone Prolamine Proline Propane. Propanol Propylene Protein Protein fibrous. Protein, globular Pyran Pyramole Pyridine

Thinner. Tyndall effect. Underwater photography. Valence Viscosity of liquids Water softening Zoom lens.

Physical chemistry

Absorption. Activity (thermodynamics). Adhesion, molecular Adiabatic demagnetization. Adsorption Aerosol Amphoterism. Antioxidant. Archimedes' principle Atomic bomb Atomic clock. Avogadro's law Avogadro number. Azeotropic mixture. Base, chemical Battery (electric). Beattie-Bridgeman equation Bernoulli's theorem. Bioelectric model. Biopotentials and electrophysiology. Black body. Boiling point Boyle's law British thermal unit (Btu) Buffer solution Burning velocity measurement Calomel electrode Calorie Calorimetry. Carbon star. Carbon nitrogen cycle. Carnot cycle Catalysis Cell (electric). Cell (pressure temperature effects). Cell membranes and monolayers Chain reaction, chemical Charles' law Chemical energy Coacervation Colloid Color temperature Combustion wave measurement Concentration scales Conduction (heat) Conservation of energy Coordination chemistry Convection (heat) Coulometer. Countercurrent mass-transfer operation Critical constant Cryogenics Curie Dalton's law. Decomposition potential Deliquescence Dewar flask Dialysis Diffusion in gases and liquids Distillation. Distillation, molecular Donnan equilibrium Dry cell Edison battery Efflorescence Electrochemical equivalent Electrochemical process Electrochemistry Electrode Electrode potential Electrokinetic phenomena. Electrokinetic transducer Electrolysis Electrolytic conductance. Electromotive force (cells) Electroosmosis Electrophoresis Electroplating of metals Electrostatic precipitator Emulsion. Energy Energy sources. Enthalpy. Entropy Equilibrium, chemical. Equilibrium, ionic. Equilibrium, phase Evaporation. First order transition Foam Free energy Free radical Frequency

[illegible] Gray body Half life. Heat Heat balance Heat capacity Heat radiation Heat transfer Helium, liquid. Hydration Hydrogen bomb [illegible]

[illegible]

Inhi

phas [illegible] energy Ionization Ionization chamber Ionization gage Ionization potential Ion-permeable membrane Irradiation, isotropic Isoelectric point Isomerism nuclear Isotone Isotope Isotope dilution techniques Isotope separation (stable isotopes) Isotope shift Joule. Kilogram Kinetics (chemical) Kinetics (classical) Kinetic theory of matter Latent image Length Linear accelerator Liquefaction of gases Liquid Loschmidt's number Low level counting. Low-temperature physics Low-temperature thermometry. Mass Mass spectroscope Matter (physics) Melting point Mercury battery. Meter (unit). Metric system. Micelle Molar volume. Molecular association. Molecular sieve Neutralization. Neutron. Neutron, delayed. Neutron cross section Osmosis. Overvoltage. Oxidation process. Photochemistry Photographic materials. Photography. Photoreception Physical chemistry. pK. Planck's radiation law. Power Plasticity. Primary battery Pyrometer. Quantum chemistry. Quantum physics. Radioactivity. Refraction (molar). Refrigeration cycle. Reserve battery Resistance welding Rheology. Salt bridge Salting out effect. Saturation of solutions Science Scientific methods. Second order transition. Silver chloride electrode Sine wave Solid solution Solion Solubility product constant. Solution. Solvation. Specific gravity. Spectroheliroscope. Storage battery. Streaming potential. Sublimation. Superconductivity Superfluidity. Surface phenomenon. Surface tension. Surface-active agent. Temperature. Temperature measurement. Thermal expansion. Thermoanalysis. Thermochemistry. Thermocouple Thermodynamics (chemical). Thermometer Transference number Transition point. Triple point. Tyndall effect. Ultracentrifuge. Ultrafiltration Ultramicroscopy. Units, systems of. Valence. Van der Waals equation. Vapor pressure Vernier Viscosity of gases Viscosity of liquids. Wave (physics) Wave equation Wavelength. Weight. Weight measurement. Wet cell Wood physics. Work Work function (thermodynamics). X-ray diffraction X-ray powder method

For the theoretical aspects of the atom and the nucleus *see* ATOMIC PHYSICS. For the life sciences applications *see* BIOCHEMISTRY. For the visible and invisible wave applications *see* ELECTROMAGNETIC RADIATION. For the solid state relationships *see* SOLID-STATE PHYSICS, THEORETICAL PHYSICS

Physical geography

Aerial photograph Africa Alidade Antarctic Circle Antarctica Arctic and subarctic islands Arctic Circle Asia Australia and New Zealand. Azimuth Basin Cartography Chinook. Climatology Clinometer Conservation of resources. Continent Continentality, weather and climate Contour. Coordinate systems, terrestrial Cordilleran belt Desert Earth Earth (orbital motion). Earth resource patterns East Indies Environmental protection Equator Equinox Europe Forest conservation Forest mapping Forest vegetation Geography, mathematical Geography, physical Globe, terrestrial. Great circle, terrestrial Hill and mountain terrain. Hydrography. Hydrolaccolith. International Date Line. Lake Land use planning Level (surveying) Map design Map projections. Map reproduction Map scale Marine influence on weather and climate Mineral fuel areas Mineral resource areas Mineral resources conservation. Monsoon. Mountain Mountain systems. North America. North Pole. Oasis Pacific islands. Permafrost Photogrammetry. Plains. Plane table. Plateau Polar

living groups of animals see INVERTEBRATE ZOOLOGY; VERTEBRATE ZOOLOGY.

Parasitology

Acanthocephala. Acnidosporidea Actinomyxidia. Adeleida Ameba. Amebiasis. Amphilinidea. Anoplura. Aphelenchoidea. Aporidea. Archiacanthocephala. *Arhynchobdellae. Ascariasis.* Ascaridida. Ascaridina. Ascaris. Aspidogastrea. Axonolaimoidea. Balantidiasis. Bedbug. Branchiura. Calanoida Caligoida. Cephalobaenida. Cercaria. Cestoda. Cestodaria. Cestoidea. Chagas' disease. Chemotherapy Chigger. Chromadoroidea. Cirripedia Cladocopa Clonorchiasis. Cnidosporidia. Coccidia. Coenurosis. Copepoda. Cyclophyllidea. Cyclopoida. Cysticercosis. Desmodoroidea. Dicyemida. Digenea. Dioctophymoidea. Diphyllidea. Dorylaimoidea. Dracunculoidea. Echinococcosis Eimeriida. Eocanthocephala. Epicaridea. Eucestoda. Eugregarinida Fasciolíasis. Fasciolopsiasis. Filariasis. Filarioidea. Flea. Gregarinidia. Guinea worm infection. Gyrocotylidea. Haemosporidiida. Haplo-poridia. *Helicosporidia. Heterophyiasis. Hirudinea. Hookworm* Hookworm disease Hyperiidea Ixodidea Lecanicephaloidea. Leech. Leishmaniasis Lernaeopodoida. Louse. Mallophaga Mermithoidea Mesostigmata. Mesozoa. Microsporidia Mite Monhysteroidea. Monogenea. Moruloidea. Myiasis. Myodocopa. Myxosporidia. Nematoda. Nippotaenioidea. Onychophalpida. Orthonectida Oxyurina. Oxyuroidea Palaeacanthocephala. Paragonimiasis. Parasitic castration. Parasitology. Parasitology, medical Pentastomida Pinworm Pinworm infection Platyhelminthes. Plectoidea. Pneumocystosis. Porocephalida. Proteocephaloidea. Proteomyxida. Pseudophyllidea Rhabdiasoidea. Rhabditoidea Rhizocephala Rhynchobdellae. Sarcoptiformes Sarcosporidia. Schizogregarinida. Siphonaptera. Sparganosis Spiruroidea. Sporozoa Strongyloidea Strongyloidiasis. Tapeworm. Tapeworm disease. Telosporidea Tetraphyllidea. Tick Toxoplasmosis. Trematoda *Trichinosis. Trichomoniasis Trichuroidea. Trombidiformes.* Trypanorhyncha Trypanosomatidae. Tylenchoidea. Whipworm disease.

Pathology

See ANIMAL PATHOLOGY; MEDICAL MICROBIOLOGY; MYCOLOGY; PARASITOLOGY; PLANT PATHOLOGY, PSYCHOLOGY, PHYSIOLOGICAL AND EXPERIMENTAL, VIROLOGY.

Petroleum chemistry

Aircraft fuel. Alkylation Analytical chemistry. Antifreeze mixture. Antiknock agents. Aromatization. Carbon black. Coking (petroleum refining) Cracking. Depolymerization. Dewaxing (petroleum). *Diesel fuel.* Distillate fuel. Flash point Fractionating column Fuel oil. Gas field and gas well. Gasoline. Isomerization. Jet fuel. Kerosine. Liquefied petroleum gas (LPG). Lubricant. Lubrication. engine *Naphtha.* Oil analysis. Oil and gas field development. Oil and gas storage. Oil and gas wells. Petrochemical. Petrolatum. Petroleum engineering Petroleum processing. Petroleum products. Pour point. Reforming *(petroleum refining). Sampling* techniques. Textile chemistry. Tube-still heater Wax, petroleum.

For design methods and unit operations *see* CHEMICAL ENGINEERING; for relationships with earth sciences *see* GEOCHEMISTRY; for the components of production *see* MECHANICAL ENGINEERING; for methods used in petroleum synthesis *see* ORGANIC CHEMISTRY

Petroleum engineering

Cable-tool drill. Centrifugal pump. Displacement pump. Gas field and gas well. Geophysical prospecting. Oil and gas field development. Oil and gas field exploitation. Oil and gas storage. Oil and gas well *drilling* Oil and gas wells. Oil *mining* Oil-field model Petroleum engineering. Petroleum geology. Petroleum reservoir engineering Petroleum secondary recovery. Photochinometer. Prospecting, petroleum. Pump. Pumping machinery. Rotary tool drill Turbodrill.

See also MINING ENGINEERING; PETROLEUM CHEMISTRY.

Petrology

For articles pertaining to rocks and minerals *see* GEOLOGY (MINERALOGY AND PETROLOGY); for additional treatment of related geochemical processes *see* GEOCHEMISTRY.

Photography

Aberration, optical. Acetic acid, para-Aminophenol Astronomical photography Bleaching. Buffer solution Camera. Camphor Candle Candlepower. Catechol Cellulose derivatives. Chelation. Chemical engineering Chemical microscopy Chemical process control. Cinematography. Colorimetry Colloid. Crystallization Desiccant Distillation, molecular *Drying* Dye *Dyeing Equilibrium chemical* Extraction. Ethylenediaminetetraacetic acid Exposure meter Filter color Focal length Foot-candle. Foot-lambert. Free radical. Gel Glycerol Hydroquinone Image, optical Indicator, acid-base Inhibitor, chemical Ion Lantern slides Latent image. Lens, optical Lumen Melting point Metallography Microfilming Microradiography. Neutralization Optical tracking instruments Organic chemistry Paper and paper products Phot. Photochemistry Photoflash lamp Photographic materials Photography, Photography color Photolysis (photochemistry) Photometer Photometry Physical chemistry Pigment Polymer Polymer properties Projection systems, optical. Radiography Rangefinder, optical Saturation of solutions Schlieren photography Schmidt camera Shadowgraph of fluid flow. Solution. Sound track Stroboscope photography. Spectrography. Surface coating. Telephoto lens Telephotography Thickening

ymithulales Lactobacillaceae. Larch. Legume. Leitneriales. Lemon Lepidodendrales. Leptospira. Leptostromataceae. Lespedeza. Lettuce. Lichens. Licorice. Lignumvitae. Liliales. Lime (botanical). Linen Locust (forestry). Lupine. Lychee. Lyco-

berry Musci. Mushroom. Muskmelon. Mustard. Mycelia Sterilia. Mycobacteriaceae. Mycoplasmatales Myriangiales. Myricales. Myrtales. Myxobacterales. Myxomycetes. Nectarine Neisseriaceae. Nematophytales Nitrobacteriaceae. Noeggerathiales Nutmeg Oak Oats Okra. Olive Onion. Oph-

(black). Peppermint Phaeophyta. Phycomycetes. Pine P
plar
mor
Pon
pionibacteriaceae. Proteales. Proteus. Protophyta

isiotales. Pteridospermae Pteropsida. Pyrethrum. Pyrrophyta. Quebracho Quince Quinoa Radish Ramie. Ranales. Rape Raspberry. Rauwolfia. Red alder Redtop grass. Redwood. Rhamnales. Rhizobiaceae Rhodobacteriineae. Rhodophyta. Rhubarb Rosales Rose Rubber tree Rubiales Rutabaga R

Saxifragales Sclerotinia Sclerotiniaceae Siderocapsaceae Sisal. Sourwood Soybean. Spearmint Sphaeriojdaceae Sphaeropsidales Sphenophyllales Sphenopsida Spirillaceae Spirochaetales. Sporobolomycetales. Spruce. Staphylococcus. Stilbellaceae. Strawberry Streptococcus. Streptomycetaceae Stophanthus C
gum Sy
rine Tea
Tobacco
Tracheophyta Tuberculariaceae Tubiflorales Tulip tree. Tung tree Tupelo Turmeric Turnip Umbellales Uredinales Urticales. Ustilaginales Vanilla. Varnish tree. Venus' flytrap. Vetch Virales Walnut. Wheat. Willow. Yeast Zythiaceae.

For the economic and practical aspects of these groups *see* AGRICULTURE. For the use of certain plants related to the control of soil erosion, water and land range management *see* CONSERVATION. For structure *see* PLANT ANATOMY. For environmental considerations of many of these groups *see* PLANT ECOLOGY For diseases *see* PLANT PATHOLOGY. For functional aspects *see* PLANT PHYSIOLOGY.

Plant pathology

Abaca. Alfalfa. Apricot. Ascomycetes. Bacteria. Barley. Basidiomycetes. Bean. Cabbage. Cacao. Cherry. Clover Coconut. Coffee. Corn. Cotton. Cowpea. Cucumber Currant. Eumycetes. Flax. Fruit (tree) diseases. Fungi Imperfecti. Grass crops. Jute. Lettuce. Melon growing. Millet. Oats. Onion. Ornamental plant. Pea. Peach. Peanut. Phycomycetes. Plant disease. Plant disease control. Plant virus. Plum Potato, Irish. Potato, sweet. Ramie. Raspberry. Rhizosphere. Rice. Rust (microbiology). Sisal Smut (microbiology) Soil microbiology. Soil sterilization. Sorghum. Soybean. Squash. Strawberry. Sugar beet. Sugar cane. Sunflower. Tobacco. Tree Turnip. Wheat. Wood decay. Yeast.

For other articles on the effects of plant disease *see* AGRICULTURE. For articles on the effect of plant disease on the animal and plant communities *see* ANIMAL ECOLOGY, PLANT ECOLOGY. For more articles on techniques in studying plant disease *see* MICROBIOLOGY

Plant physiology

Acetyl phosphate. Adenosinediphosphate (ADP). Adenosinetriphosphate (ATP) Adenylic acid. Alanine Amino acids Amylase. Arginine. Ascorbic acid Asparagine Aspart
oxidati
tabolisi
tine-cre
trin D
(DPN)
Folic acid. Fructose. Galactose. Glucose Glucose-1-phosphate Glycose-6-phosphate. Glutamic acid Glutamine Glutelin. Glycine Glycolipid Hydroponics Inositol Inulin Isoleucine. Krebs cycle. Lactase Leucine Lipid Lipid metabolism Lysine. *Metabolism* Methionine Monosaccharide Niacin. *Nucleic acid* Nucleoprotein. Oligosaccharide Pantothenic acid. *Peptide* Phenylalanine. Phosphatide Photochemistry Photoperiodism in plants. Photosynthesis. Plant, mineral nutrition of. Plant, minerals essential to Plant, water relations of. Plant fermentation Plant growth. Plant hormones. Plant metabol
ogy. Plant
solutes).
Proline.
Riboflavin
Sucrose Thiamine Threonine. Transamination Triglyceride Triphosphopyridine nucleotide (TPN). Tryptophan Tyrosine. Valine Vitamin.

For applications in farming *see* AGRICULTURE; for applications in tree and lumber management *see* FORESTRY; for applications in various plant tissues *see* PLANT ANATOMY, for applications in the study of plant relations to each other and the environment *see* PLANT ECOLOGY.

meteorology. Polygonal ground. Prairie. Precession of Equinoxes. Range land conservation. River. Sirocco. Snow line. Soil (great soil groups). Soil, zonal distribution. Soil conservation. Solstice. *South America. South Pole. Stadia. Steppe.* Surveying. Terrain areas, world-wide. Theodolite. Time. Topographic surveying and mapping. Tropic of Cancer. Tropic of Capricorn. Tundra. Vegetation zones (world). Water conservation. Weather map. *West Indies.*

For biogeography articles *see* ANIMAL ECOLOGY; PLANT ECOLOGY. For articles on the origin of land forms and major earth forms, *see* GEOLOGY (SURFICIAL AND HISTORICAL). For related articles on the earth and its atmosphere *see* GEOPHYSICS; METEOROLOGY AND CLIMATOLOGY. For articles on the oceans and seas *see* OCEANOGRAPHY.

Physics

See ACOUSTICS; ATOMIC PHYSICS; CLASSICAL MECHANICS; ELECTRICITY AND ELECTROMAGNETISM; ELECTROMAGNETIC RADIATION; FLUID MECHANICS; HEAT; MOLECULAR PHYSICS; OPTICS; NUCLEAR PHYSICS; SOLID-STATE PHYSICS; THEORETICAL PHYSICS; THERMODYNAMICS.

Physiology

See BIOCHEMISTRY; BIOPHYSICS; COMPARATIVE PHYSIOLOGY; GENERAL PHYSIOLOGY; MICROBIOLOGY; PLANT PHYSIOLOGY; PSYCHOLOGY, PHYSIOLOGICAL AND EXPERIMENTAL.

Plant anatomy

Bark. Bud (botany). Budding. Collenchyma. Cortex. plant. Endodermis. Epidermis, plant. Flower (botany). Fruit (botany). Grafting of plants. Hypodermis. Leaf (botany). Meristem, apical. Meristem, lateral. Parenchyma. Pericycle. Periderm. Phloem. Pith. Plant anatomy. Plant morphogenesis. Plant organs. Plant tissue systems. Root (botany) Sclerenchyma. Secretory structures, plant. Seed (botany). Stele. Stem (botany). Stem cuttings. Vascular bundles. Wood (anatomy and identification). Xylem.

For certain economic aspects *see* AGRICULTURE; FORESTRY; for environmental and functional aspects of plants *see* PLANT ECOLOGY; PLANT PHYSIOLOGY; for classification of plants *see* PLANT TAXONOMY.

Plant ecology

Biome. Biotic isolation. Climax community. Climax plant formations. Community. Dune. Ecologic interactions. Ecology. Ecology, applied. Ecology, physiological. Ecosystem. Environment. Forest vegetation. Fresh water ecosystem. Island faunas and floras. Mangrove swamp. Marine marsh. Merriam's life zones. Oasis. Plant community. Plant geography. Plant societies. *Population dispersal.* Population dispersion. Species population. Steppe. Terrestrial ecosystem. Territoriality. Tundra. Vegetation zones. Vegetation zones (world). Zoogeographic region.

For economic aspects *see* AGRICULTURE; for certain biotic factors *see* ANIMAL ECOLOGY; for marine environments *see* OCEANOGRAPHY; for physical factors of the environment *see* PHYSICAL GEOGRAPHY. For structure and function of plants and plant tissues *see* PLANT ANATOMY; PLANT PHYSIOLOGY.

Plant kingdom

Abaca. Acrasiales. Actinomycetaceae. Actinomycetales. Actinoplanaceae. Aerobacter. Alfalfa. Algae. Algae fossils. Allspice. Almond. Angiospermae. Anise. Anthocerotae. Apple. Apricot. Arales. Arborvitae. Archaeopteris. Archichlamydeae. Aristolochiales. Artichoke. Ascomycetes. Ash. Asparagus. Avocado Azotobacteraceae. Bacillaceae. Bacteroidaceae. Balanopsidales. Balsa. Bamboo. Banana. Barley. Basidiomycetes. Basswood. Bean. Beech. Beet. Beggiatoales. Belladonna. Bennettitales Bermuda grass. Betel nut. Birch. Blackberry Blueberry. Bluegrass. Bluestem grass. Breadfruit. Brevibacteriaceae. Broccoli. Brome grass. Brucellaceae. Brussels sprouts. Bryophyta. Buckeye. Buckwheat. Cabbage. Cacao. Cactus. Calamitales. Campanulales. Camphor-tree. Cantaloupe. Caraway. Cardamon. Carrot. Caryophanales. Cashew. Cassava. Castor bean. Casuarinales. Cauliflower. Caulobacteraceae. Caytoniales. Cedar. Celery. Centrospermales. Charophyta. Cherry. Cherry, wild black. Chestnut. Chicory. Chlamydobacteriales. Chlorophyta. Cholera vibrio. Chrysophyta. Cinchona. Cinnamon Citron *Citronella. Clove. Clover. Coca. Coconut. Coenopteridales.* Coffee. Cola. Colchicine. Collard. Coniferales. Coniferophytae. Cordaitales. Coriander Corn. Cotton. Cowpea. Crabapple. Cranberry. Cress. Cryptococcales. Cubeb Cucumber. Cumin. Currant. Curry. Cyanophyta. Cycadales. Cycadeoidales. Cycadofilicales. Cycadophytae. Cypress. Dallis grass Dasheen Date. Dematiaceae. Derris. Diatom Dicotyledoneae. Digitalis. Dill. Discellaceae. Douglas-fir. Ebenales. Ebony Eggplant. Elm Embryophyta English walnut. Enterobacteriaceae. Ephedra. Equisetales. Equisetineae. Ericales. Erysiphales. Escherichia Eubacterales. Eucalyptus. Euglenophyta. Eumycetes. Eurotiaceae. Eurotiales. Fagales. Farinales. Fennel Fescue. Fig. Filbert. *Filicales.* Filicineae. Fir. Flax. Fungi. Fungi Imperfecti. Gaffkya tetragena. Garlic. Gentianales. Geraniales. Ginger. Ginkgoales. Ginseng. Gnetales. Gooseberry. Graminales. Grapefruit. Guava. Guayule. Gymnospermae. Hackberry. *Helobiales. Hemlock. Hemp.* Hepatic[illegible] Hickory. Holly. [illegible] Hop. H[illegible] nisles. Hyphomicrobiales. Ipecac. Isoetales. *Juglandales.* Jute. Kale. Kapok tree. Kentucky coffee-tree. Klebsiella pneumoniae. Kohlrabi. Kudzu. Lab-

yrinthulales Lactobacillaceae Larch. Legume Leitneriales. Lemon Lepidodendrales. Leptospira Leptostromataceae Lespedeza. Lettuce. Lichens. Licorice. Lignumvitae. Liliales. Lime (botanical). Linen Locust (forestry). Lupine Lychee. Lycopodiales. Lycopodineae. Lycopsida Magnolia. Ma-

berry. Musci. Mushroom. Muskmelon. Mustard. Mycelia Sterilia Mycobacteriaceae. Mycoplasmatales Myrtangiales Myricales. Myrtales. Myxobacterales Myxomycetes. Nectarine. Neisseriaceae Nematophytales. Nitrobacteriaceae. Noeggerathiales Nutmeg. Oak. Oats. Okra Olive. Onion. Ophioglossales. Opuntiales. Orange. Orchid. Orchidales. Osage-orange Palm Palmales. Pandanales Papaverales Paprika Parietales. Parsley Parsnip. Pea. Peach Peanut. Pear Pecan Pepper Pepper (black). Peppermint. Phaeophyta Phycomycetes. Piña. Pine. Pineapple Piperales. Pistachio Pitcher plant. Plantaginales. Pleuromeiales. Plum. Pneumococcus Poison ivy Poison sumac Polygonales. Pomegranate. Poplar. Poppy. Primulales. Propionibacteriaceae Proteales Proteus Protophyta Pseudobormiales. Pseudomonadaceae Pseudomonadales. Pseudomonadineae Pseudomonas aeruginosa Psilophytales Psilophytineae Psilopsida. Psilotales. Pteridospermae. Pteropsida Pyrethrum. Pyrrophyta Quebracho Quince. Quinoa Radish Ramie Ranales Rape. Raspberry. Rauwolfia. Red alder

Rosa

Rye

Safflower. Saffron Sage. Salicales. Salmonella Sandalwood. Santalales Sapindales Sarraceniales Sarsaparilla. Sassafras Schizomycetes Schizophyceae Scitaminales Selaginellales Sequoia. Shigella. Siderocapsaceae Sisal Sourwood Soybean Spearmint. Sphaerioidaceae. Sphaeropsidales. Sphenophyllales. Sphenopsida Spirillaceae Spirochaetales Sporobolomycetales Spruce Staphylococcus Stilbellaceae. Strawberry Streptococcus Streptomycetaceae. Stophanthus Strychnos Sundew Sunflower Sweetgum Sycamore Sympetalae Synanthales. Tangerine. Tea Thallophyta Thiobacteriaceae. Timothy Tobacco Tomato Tracheophyta Tuberculariaceae Tubiflorales Tulip tree Tung tree. Tupelo Turmeric. Turnip Umbellales Uredinales Urticales. Ustilaginales Vanilla Varnish tree. Venus' flytrap. Vetch Virales Walnut Wheat. Willow. Yeast. Zythiaceae

For the economic and practical aspects of these groups *see* AGRICULTURE For the use of certain plants related to the control of soil erosion, water and land range management *see* CONSERVATION. For structure *see* PLANT ANATOMY For environmental considerations of many of these groups *see* PLANT ECOLOGY For diseases *see* PLANT PATHOLOGY. For functional aspects *see* PLANT PHYSIOLOGY.

Plant pathology

Abaca Alfalfa. Apricot. Ascomycetes. Bacteria. Barley. Basidiomycetes. Bean. Cabbage. Cacao. Cherry. Clover. Coconut. Coffee Corn Cotton. Cowpea. Cucumber. Currant. Eumycetes Flax. Fruit (tree) diseases. Fungi Imperfecti Grass crops. Jute. Lettuce. Melon growing. Millet. Oats. Onion. Ornamental plant Pea. Peach. Peanut. Phycomycetes. Plant disease. Plant disease control. Plant virus. Plum. Potato, Irish. Potato, sweet. Ramie. Raspberry. Rhizosphere. Rice. Rust (microbiology). Sisal. Smut (microbiology). Soil microbiology Soil sterilization. Sorghum. Soybean. Squash. Strawberry Sugar beet Sugar cane. Sunflower. Tobacco. Tree. Turnip. Wheat. Wood decay. Yeast.

For other articles on the effects of plant disease *see* AGRICULTURE. For articles on the effect of plant disease on the animal and plant communities *see* ANIMAL ECOLOGY; PLANT ECOLOGY. For more articles on techniques in studying plant disease *see* MICROBIOLOGY.

Plant physiology

Acetyl phosphate. Adenosinediphosphate (ADP). Adenosinetriphosphate (ATP). Adenylic acid. Alanine Amino acids Amylase. Arginine. Ascorbic acid. Asparagine Aspartic acid. Auxin Biological oxidation. Biotin. Carbohydrate. Carbohydrate metabolism. Carotenoid. Chlorophyll. Coenzyme. Creatine-creatinine Cysteine. Cystine. Cytochrome. Dextrin. Digitoxigenin. Diphosphopyridine nucleotide (DPN). Enzyme Enzyme inhibition. Ergosterol. Folic acid. Fructose Galactose. Glucose Glucose-1-phosphate. Glycose-6-phosphate Glutamic acid. Glutamine Glutelin Glycine Glycolipid. Hydroponics. Inositol Inulin. Isoleucine. Krebs cycle. Lactase Leucine Lipid. Lipid metabolism. Lysine. Metabolism. Methionine Monosaccharide. Niacin Nucleic acid Nucleoprotein Oligosaccharide Pantothenic acid Peptide Phenylalanine Phosphatide. Photochemistry Photoperiodism in plants. Photosynthesis Plant, mineral nutrition of. Plant, minerals essential to Plant, water relations of

Lactose Thiamine Threonine. Transamination Triglyceride Triphosphopyridine nucleotide (TPN). Tryptophan. Tyrosine Valine Vitamin

For applications in farming *see* AGRICULTURE; for applications in tree and lumber management *see* FORESTRY, for applications in various plant tissues *see* PLANT ANATOMY; for applications in the study of plant relations to each other and the environment *see* PLANT ECOLOGY

meteorology. Polygonal ground. Prairie. Precession of Equinoxes. Range land conservation. River. Sirocco. Snow line. Soil (great soil groups). Soil, zonal distribution. Soil conservation. Solstice. South America. South Pole. Stadia. Steppe. Surveying. Terrain areas, world-wide. Theodolite. Time. Topographic surveying and mapping. Tropic of Cancer. Tropic of Capricorn. Tundra. Vegetation zones (world). Water conservation Weather map. West Indies.

For biogeography articles *see* ANIMAL ECOLOGY; PLANT ECOLOGY. For articles on the origin of land forms and major earth forms, *see* GEOLOGY (SURFICIAL AND HISTORICAL). For related articles on the earth and its atmosphere *see* GEOPHYSICS; METEOROLOGY AND CLIMATOLOGY. For articles on the oceans and seas *see* OCEANOGRAPHY.

Physics

See ACOUSTICS; ATOMIC PHYSICS; CLASSICAL MECHANICS; ELECTRICITY AND ELECTROMAGNETISM; ELECTROMAGNETIC RADIATION; FLUID MECHANICS; HEAT; MOLECULAR PHYSICS; OPTICS; NUCLEAR PHYSICS; SOLID-STATE PHYSICS; THEORETICAL PHYSICS; THERMODYNAMICS.

Physiology

See BIOCHEMISTRY; BIOPHYSICS; COMPARATIVE PHYSIOLOGY; GENERAL PHYSIOLOGY; MICROBIOLOGY; PLANT PHYSIOLOGY; PSYCHOLOGY, PHYSIOLOGICAL AND EXPERIMENTAL.

Plant anatomy

Bark. Bud (botany). Budding Collenchyma. Cortex, plant. Endodermis. Epidermis, plant. Flower (botany). Fruit (botany). Grafting of plants. Hypodermis Leaf (botany). Meristem, apical Meristem, lateral. Parenchyma. Pericycle. Periderm. Phloem. Pith Plant anatomy. Plant morphogenesis Plant organs. Plant tissue systems Root (botany) Sclerenchyma Secretory structures, plant. Seed (botany) Stele. Stem (botany). Stem cuttings. Vascular bundles. Wood (anatomy and identification) Xylem.

For certain economic aspects *see* AGRICULTURE; FORESTRY; for environmental and functional aspects of plants *see* PLANT ECOLOGY; PLANT PHYSIOLOGY; for classification of plants *see* PLANT TAXONOMY.

Plant ecology

Biome. Biotic isolation. Climax community. Climax plant formations. Community. Dune. Ecologic interactions. Ecology. Ecology, applied. Ecology, physiological Ecosystem. Environment. Forest vegetation. Fresh water ecosystem. Island faunas and floras. Mangrove swamp. Marine marsh. Merriam's life zones. Oasis. Plant community. Plant geography. Plant societies Population dispersal. Population dispersion Species population. Steppe. Terrestrial ecosystem. Territoriality. Tundra. Vegetation zones. Vegetation zones (world). Zoogeographic region.

For economic aspects *see* AGRICULTURE; for certain biotic factors *see* ANIMAL ECOLOGY; for marine environments *see* OCEANOGRAPHY; for physical factors of the environment *see* PHYSICAL GEOGRAPHY. For structure and function of plants and plant tissues *see* PLANT ANATOMY; PLANT PHYSIOLOGY.

Plant kingdom

Abaca. Acrasiales. Actinomycetaceae. Actinomycetales. Actinoplanaceae. Aerobacter. Alfalfa. Algae. Algae fossils. Allspice. Almond. Angiospermae. Anise. Anthocerotae. Apple. Apricot. Arales. Arborvitae. Archaeopteris. Archichlamydeae. *Aristolochiales. Artichoke. Ascomycetes.* Ash. Asparagus Avocado. Azotobacteraceae. Bacillaceae. Bacteroidaceae. Balanopsidales Balsa. Bamboo. Banana. Barley. Basidiomycetes. Basswood. Bean. Beech. Beet Beggiatoales. Belladonna. Bennettitales. Bermuda grass. Betel nut. Birch Blackberry. Blueberry. Bluegrass Bluestem grass. Breadfruit Brevibacteriaceae. Broccoli Brome grass. Brucellaceae. Brussels sprouts Bryophyta. Buckeye. Buckwheat. Cabbage. Cacao Cactus Calamitales. Campanulales. Camphor-tree. Cantaloupe Caraway. Cardamon. Carrot. Caryophanales. Cashew Cassava. Castor bean. Casuarinales. Cauliflower. Caulobacteraceae. Caytoniales. Cedar. Celery. Centrospermales Charophyta. Cherry. Cherry, wild black. Chestnut. Chicory. Chlamydobacteriales Chlorophyta. Cholera vibrio Chrysophyta. Cinchona Cinnamon. Citron Citronella Clove. Clover. Coca Coconut. Coenopteridales Coffee. Cola. Colchicine. Collard. Coniferales. Coniferophytae. Cordaitales. Coriander Corn. Cotton. Cowpea Crabapple. Cranberry. Cress. Cryptococcales. Cubeb Cucumber Cumin Currant. Curry Cyanophyta Cycadales. Cycadeoidales. Cycadofilicales. Cycadophytae. Cypress Dallis grass. Dasheen Date Dematiaceae. Derris. Diatom. Dicotyledoneae. Digitalis. Dill Discellaceae Douglas-fir. Ebenales Ebony Eggplant Elm Embryophyta. English walnut Enterobacteriaceae. Ephedra Equisetales. Equisetineae. Ericales. Erysiphales. Escherichia Eubacteriales Eucalyptus. Euglenophyta. Eumycetes. Eurotiaceae Eurotiales Fagales Farinales Fennel Fescue Fig. Filbert Filicales Filicineae. Fir Flax. Fungi. Fungi Imperfecti Gaffkya tetragena. Garlic. Gentianales Geraniales Ginger Ginkgoales. Ginseng Gnetales Gooseberry. Graminales. Grapefruit. Guava. Guayule. Gymnospermae. Hackberry Helobiales Hemlock Hemp Hepaticae. Heterobasidiomycetidae. Hickory Holly. Homobasidiomycetidae. Honeydew melon Hop Hophornbeam. Hornbeam Horseradish, Hyeniales. Hyphomicrobiales. Ipecac. Isoetales. Juglandales Jute. Kale. Kapok tree Kentucky coffeetree. Klebsiella pneumoniae. Kohlrabi Kudzu Lab-

Serology

See MEDICAL MICROBIOLOGY.

Soil

Agricultural soil and crop practices Agriculture (drainage) Clay. Clay minerals. Dust storm. Erosion Evapotranspiration Fertilizing. Forest soil Humus Irrigation of crops. Pedology. Plant, water relations of Regolith Soil Soil balance, microbial. Soil conservation Soil mechanics. Soil microbiology. Soil microorganisms Soil mineral (microbial utilization). Soil phosphorus (microbial cycle) Soil sterilization Soil sulphur (microbial cycle) Terracing (agriculture). Weathering processes

For a consideration of parent materials and other factors which influence the development of soils *see* GEOLOGY (MINERALOGY AND PETROLOGY), GEOLOGY (SURFICIAL AND HISTORICAL), HYDROLOGY.

Solid-state physics

Absorption (electromagnetic radiation). Acceptor atom. Adhesion, molecular Adiabatic demagnetization. Alloy. Alloy structures Alnico. Amalgam Amorphous solid Anelasticity Angstrom. Anisotropy (physics) Antiferromagnetism Atomic clock Band theory of solids Barium titanate Bloch theorem Boltzmann constant Boltzmann transport equation Bose-Einstein statistics Brillouin zone Cathodoluminescence. Ceramic technology Cermet Chemical binding Chemiluminescence Cohesion (physics) Color centers Conduction (heat) Conduction band Contact potential difference Contact rectifier. Controlled rectifier Coordination number Cryosar Cryotron Crystal. Crystal defects Crystal growth Crystal optics Crystal structure Crystallization Crystallography. Curie temperature, magnetic Curie-Weiss law. Cyclotron. Dark current [illegible]
[illegible] in solids
[illegible] lography
ductivity of metals Electroluminescence. Electron diffraction Electron emission Electronegativity Energy level (quantum mechanics) Esaki tunnel diode. Exciton Exclusion principle. Fermi-Dirac statistics Ferrimagnetic garnets Ferrimagnetism. Ferrite. Ferrite devices Ferroelectrics. Ferromagnetism Fluorescence Franck-Condon principle Free-electron theory of metals Galvanomagnetic effect. Gel Germanium Germanium diode. Grain boundaries (metallurgy) Ground state Gyrator [illegible]

[illegible] phase intermetallic compounds Ionic crystals Iron silicon alloys. Isomorphism (crystallography) Isotropy (physics). Junction diode. Junction transistor Kerr effect Kinetic theory of matter Kronig Penney model Langevin function Larmor precession. Lattice constant Lattice vibrations Liesegang rings. Light amplifier Light [illegible]

Luminescence. Luminous paint. Madelung constant. Magnetic materials. Magnetic relaxation. Magnetic resonance. Magnetism. Magnetization. Magnetocaloric effect. Magnetoresistance. Magnetostriction Maser. Matthiessen's rule. Mean free path. Meissner effect Metal Metallic-disk rectifier. Molecular electronics. Morphotropism. Mumetal. Neutron diffraction. Paramagnetism. Parametric amplifier. Permalloy Phonon Phosphorescence. Photoconductive cell Photoconductivity. Photodiode. Photoelasticity. Photoelectric devices. Photoelectricity Photoluminescence. Photolysis (photochemistry) Photon. Phototransistor. Photovoltaic cell Photovoltaic effect. Piezoelectric crystal Piezoelectricity Plasticity. Point-contact diode. Point-contact transistor. Polarization of waves. Polymorphism (crystallography). Potential barrier. Potentials (physics) Probability in physics. Pyroelectricity Quantum (physics) Quantum mechanics Quantum statistics. Quantum theory, nonrelativistic Reciprocity, principle of. Refractory. Relaxation time (electrons) Resilience. Resistivity, electrical Resonance experiments. Rheology Rochelle salt. Selenium Semiconductor Semiconductor rectifier Silicon diode. Single crystal. Sintering Solar battery Solid solution. Solid-state chemistry. Solid-state physics Specific heat of solids Stationary state Statistical mechanics. Sublimation. Superconductivity. Surface-barrier transistor Surface phenomenon Susceptibility, magnetic. Temperature. Thermal expansion Thermal stress. Thermoanalysis Thermoluminescence Thermomagnetic effects Titanate Transistor Traps in solids Twinning Valence
Wiedemann-[illegible]
function (ele[illegible]
diffraction X[illegible]

Sound

See ACOUSTICS

Space technology

Aerodynamic center Aerodynamic force Aerodynamic wave drag Aerodynamics Afterburner Aircraft fuel Air-velocity measurement. Aluminum Apogee Astronautical engineering Astronautics Astronomical coordinate systems Astronomical geophysics Astronomy Astrophysics Ballistic missile. Ballistic range Ballistics exterior. Borane Boron fuel Boundary-layer flow Center of gravity. Center of mass Centrifugal force Centripetal force Ceramic technology Chemical fuel Combustion. Cosmic rays Ducted flow Electromagnetic propulsion. Energy sources Escape velocity Explosion and explosive Flight Flight dynamics Flight science. Fuel. Gas dynamics Hydrazine. Hydrogen Hypersonic flight Impulse (mechanics). Interplanetary propulsion Interstellar matter Interstellar space Ion propulsion Jet propulsion. Latitude

Plant taxonomy

Arboretum. Botanical gardens Classification, biological. Herbarium Plant classification. Plant keys. Plant kingdom. Plant names. Plant taxonomic literature. Taxonomy.

For specific plants and plant groups *see* PLANT KINGDOM.

Production engineering

See INDUSTRIAL AND PRODUCTION ENGINEERING.

Propulsion

Aerodynamic wave drag. Afterburner. Aircraft engine. Aircraft engine, reciprocating. Aircraft engine performance Aircraft fuel. Aircraft propulsion. Air-cushion vehicle. Automotive engine. Benzene. Borane. Boron fuel. Butane. Ceramic technology. Cesium. Chemical fuel. Diesel engine Diesel fuel. Distillate fuel. Electromagnetic propulsion Energy sources Engine. Explosion and explosive. Fire Flight. Flight science. Fossil fuel. Fuel. Fuel gas. Fuel gas supplements Gas dynamics Gas turbine. Gasoline. Hydrazine. Hydrocarbon Hydrogen. Hypersonic flight Internal combustion engine. Interplanetary propulsion Ion Ion propulsion. Jet flow. Jet fuel. Jet propulsion. Jet velocity. Kerosine. Liquified petroleum gas (LPG). Locomotive. Marine engine. Metal-base fuel Missile Nozzle. Nuclear aircraft propulsion Nuclear rocket. Octane. Oxidation process. Oxygen Power. Propellant. Propeller, air Propulsion Pulse jet Radiation pressure Refractory. Rocket engine. Rocket-sled testing. Skin friction Solar energy. Solar engine. Sonic barrier Specific fuel consumption. Specific impulse Steam engine Streamline flow. Streamlining. Subsonic flight Supersaerodynamics Supercharger Supersonic flight. Thermodynamic principles. Thermodynamic processes Throttled flow. Thrust. Toluene. Turbine. Turbine propulsion. Turbofan. Turbojet. Turboprop Turboram jet.

For drive mechanisms *see* MECHANICAL ENGINEERING

Psychology, physiological and experimental

Abnormal behavior. Adrenal gland Aggression Agnosia Amnesia Aphasia. Apraxia Astereognosis Audiometry. Behavior, ontogeny of Behavior and heredity. Behavioral psychophysics Black Blindness. Body rhythm Chemoreception. Color Color vision Convulsive disorders. Cretinism Cutaneous sensation. Deafness. Defecation Delusion Effector systems. Electroencephalography. Emotion. Endocrine mechanisms. Ephaptic transmission. Epilepsy. Equilibrium, biological Extrasensory perception (ESP). Freudianism. Frustration. Gray. Hallucination. Headache. Hearing. Hibernation Hoarding behavior. Homeostasis Hormone Human engineering. Hunger. Huntington's chorea Hypnosis Hypothermia. Hysteria. Instinctive behavior. Insulin shock. Intelligence. Involutional melancholia. Itch. Kinesthetic sensation. Learning theories. Lie detector. Loudness. Manic depressive psychosis. Mechanoreceptors. Memory. Mental deficiency. Methods study. Migratory behavior. Mongolian idiocy. Motivation. Motor systems Muscular system. Nervous system Neurophysiology. Neurosis. Noise, acoustic. Obsessive compulsive reaction Operator training Ovary. Pain, cutaneous. Pain, deep. Pancreas. Paralysis agitans. Paranoia. Paranoid state Parathyroid gland. Paresis, general Paresthesia. Perception. Periodicity in organisms Personality theory. Phenylpyruvic oligophrenia. Phobic reaction. Phonoreception. Photoreception. Pitch Posture, regulation of. Problem solving (psychology). Psychic energizer Psychoacoustics. Psychoanalysis Psychogalvanic response Psychology, physiological and experimental Psychopharmacologic drugs Psychophysical methods Psychosis Psychosurgery. Psychotherapy. Psychotomimetic drug. Reflex, conditioned Reflex, unconditioned. Reproductive behavior. Reticular formation (brain) Schizophrenia. Senile dementia. Sensation Sense, chemical Sensory learning Sight. Sleep. Smell. Somatization. Someshesis. Speech. Stereognosis. Stress (psychological). Synaptic transmission Taste Taxis Temperature senses Thermoregulation Thirst Thyroid gland Tickle Tone (music and acoustics). Touch Tranquilizer. Urination Verbal learning. Vision Wage incentives White. Work measurement

For more information on the chemistry of various physiological processes *see* BIOCHEMISTRY; for articles on cellular physiology *see* CYTOLOGY; for aspects related to inheritance of traits *see* GENETICS.

Sanitary engineering

Amebiasis Analytical chemistry Ascariasis. Bacillary dysentery. Cholera vibrio Colorimetric analysis Enteric bacilli Escherichia Extraction Flame photometry. Flocculation Fluorimetric analysis Gas analysis. Gravimetric analysis Imhoff tank IMViC test Infectious disease control. Infectious disease transmission Ion exchange Nephelometric analysis Polarographic analysis Precipitation chemistry. Qualitative chemical analysis Radiometric assay. Refractometric analysis Sampling techniques. Sanitary engineering Schistosomiasis Septic tank. Sewage. Sewage collection systems Sewage disposal Sewage solids Sewage treatment Spot-test analysis. Stoichiometry Titration, amperometric. Titration, conductimetric Titration, potentiometric Typhoid fever. Volumetric analysis Water analysis. Water microbiology Water pollution Water softening. Water treatment Waterborne disease.

See also BACTERIOLOGY; MEDICAL MICROBIOLOGY; MICROBIOLOGY

Cuckoo. Cuculiformes Curlew. Cyclostomata (Chordata). Cypriniformes. Cyprinodontiformes. Dace. Darter. Deer. Dermoptera Diatrymiformes. Dickcissel. Dinornithiformes Diplasiocoela. Dipnoi Dog Dogfish. Dolphin. Donkey Dove. Duck. Eagle Echeneiformes. Edentata. Eel Elasmobranchii Elephant. Elk. Eutheria. Falconiformes.

nuie Gannet. Gar. Garter snake. Gasterosteiformes. Gaviiformes. Gecko Gila monster Giraffe. Gnathostomata Gnu. Goat. Gobiesociformes. Goldfish. Goose. Gopher. Gorilla Grackle Grebe Green snake Grosbeak. Grouse. Gruiformes Guinea hen.

Hawk

Hog

Ich-

Kan-

fisher

orpha.

Lamprey. Lampridiformes. Lark Lemming Leopard. Lion. Lizard. Llama Loon *Lophiiformes* Lovebird Lungfish. Lynx Mackerel Magpie. Mammalia. Manatee Marsupialia Martin. Mastacembeliformes Meantes Menhaden. Metatheria. Mink. Minnow Mockingbird. Mole Mongoose Monkey. Monotremata Moose. Mouse Mud puppy Mule Multituberculata Musk ox Muskrat Myctophiformes. Myxiniformes. Neognathae Neornithes Nighthawk. Notacanthiformes. Nutcracker. Nuthatch Ocelot Odontognathae. Opisthocoela Opossum. Orangutan Oriole. Osteichthyes Osteoglossiformes Ostrich Otter Ovenbird Owl Panda Pantotheria. Parrot Partridge. Passeriformes Peacock *Peccary* *Pegasiformes* Pelecaniformes Pelican Penguin Perch Perciformes Percopsiformes Perissodactyla Petromyzontiformes Pewee. Phalarope. Pheasant. Phoebe Pholidota. Pleuronectiformes. Pickerel. Pisces (zoology) Pleuronectiformes Podicipitiformes Polypteriformes. Porcupine. Porpoise Prairie chicken Prairie dog Primates. Proboscidea. Procellariiformes. Procoelia Proteales. Prototheria Psittaciformes Ptarmigan Pteraspidomorphi Puffin. Python Quail Rabbit. Raccoon Rail. Rajiformes Rat Rattlesnake Ratites Raven Ray Redstart Reindeer. Reptilia Rheiformes Rhinoceros Rhynchocephalia. Road runner Robin Rodentia Sable Saccopharyngiformes Salamander. Salamandroidea Salientia Salmon Sandpiper Sapsucker Sarcopterygii Sculpin Sea horse Sea lion Seal (zoology). Semionotiformes Shad Shark Sheepshead Shiner Shrew. Shrike Sirenia Skink. Skunk. Sloth. Smelt. Snake. Snipe Sparrow Sphenisciformes Squaliformes. Squamata Squid Squirrel. Starling Stickleback. Strigiformes Struthioniformes. Sturgeon. Sucker. Sunfish Swallow. Swan. Swift. Symmetrodonta. Synbranchiformes Taeniodonta. Tanager. Tapir. Tarpon. Tern. Terrapin. Tetraodontiformes. Tetrapoda. Theria. Thrasher. Thrush. Tiger. Tillodontia. Tinamiformes. Titmouse. Toad. Towhee. Trogoniformes. Trout. Tubulidentata. Tuna. Turkey. Turnstone. Turtle. Vertebrata Vireo. Vulture. Walleye. Walrus. Warbler. Water snake. Waxwing. Weasel. Whale. Whippoorwill. Whitefish. Wolf. Wolverine. Woodchuck. Woodcock. Woodpecker. Wren. Yak. Zebra. Zebu Zeiformes.

For classification schemes and methods *see* ANIMAL SYSTEMATICS; for fossil vertebrates *see* PALEONTOLOGY

Virology

Actinophage. Adenovirus. Animal virus. Antibody. Antigen. Antigen-antibody reaction. Antitoxin Arbor viral encephalitides. Avian leukosis. Bacteria, lysogenic. Bacteriophage Bioassay. Cat scratch disease. Chickenpox and shingles Cold, common Coliphage. Complement (serum). Complement fixation test. Conglutination. Coxsackie virus. Culture, embryonated egg Culture, tissue. Disease carrier ECHO virus Encephalitis, equine Enterovirus. Epidemiology Exanthem subitum Fever. German measles Hemadsorption viruses. Herpes simplex. Hypersensitivity. Immunity. Inclusion blennorrhea Inclusion bodies (virus). Infection, lytic Infectious disease control. Infectious disease transmission Infectious mononucleosis. Infective dose 50. Influenza. Keratoconjunctivitis (epidemic) Louping ill Lymphocytic choriomeningitis Lymphogranuloma venereum Lysin. Lytic reaction Measles Meningitis. Microscope, electron. Microscope, fluorescence Microtatobiotes. Molluscum contagiosum. Mouse viral leukemias. Mumps. Myxomatosis, infectious (rabbits) Myxovirus. Neutralization reaction (antibody). Newcastle disease Nucleic acid Papillomatosis, infectious (rabbit). Pathogen (soil) Phlebotomus fever. Plant disease Plant virus. Pneumonitis Poliomyelitis. Psittacosis Public health Rous sarcoma. Salivary gland virus disease Serology Smallpox Soil balance, microbial Soil microbiology. Tick fever. Colorado. Trachoma Tumor viruses Virales Virulence Virus Wart West Nile fever. Yellow fever.

Zoology

See ANIMAL ANATOMY, ANIMAL ECOLOGY; ANIMAL PATHOLOGY, ANIMAL SYSTEMATICS; BIOCHEMISTRY; BIOPHYSICS; COMPARATIVE PHYSIOLOGY; CYTOLOGY; EVOLUTION, GENETICS, GENERAL PHYSIOLOGY; GROWTH AND MORPHOGENESIS; HISTOLOGY, INVERTEBRATE ZOOLOGY, PALEONTOLOGY; PHYCHOLOGY, PHYSIOLOGICAL AND EXPERIMENTAL; VERTEBRATE ZOOLOGY

pad complex. Mach number. Magnesium. Metal-base fuel. Minitrack. Missile. Model theory. Nose cone. Nuclear aircraft propulsion. Nuclear rocket. Optical tracking. Orbital motion. Oxidation process. Parachute. Planet, artificial. Propellant. Propulsion. Radiation. Radiation pressure. Reentry. *Rocket. Rocket astronomy. Rocket engine.* Rocket staging. Rocket-sled testing. Rudder, aircraft. Satellite, artificial. Similitude. Solar energy. Solar engine. Solar radiation. Space. Space biology. Space flight. Space station. Space technology. Space vehicle. Spacecraft structures. Specific fuel consumption. Specific impulse. Stabilizer. Stellar magnetic field. Supersonic flight. Tail assembly. Thermal stress. Thrust. Trajectory. Transonic flight. Turbine propulsion. Van Allen radiation. Weightlessness.

For articles on aeronautics *see* AERONAUTICAL ENGINEERING. For astronomical bodies *see* ASTRONOMY. *For articles on the upper atmosphere see* GEOPHYSICS; METEOROLOGY AND CLIMATOLOGY.

Strength of materials

See ENGINEERING MECHANICS.

Systematics

See ANIMAL SYSTEMATICS and various articles in INVERTEBRATE ZOOLOGY; PALEONTOLOGY, VERTEBRATE ZOOLOGY. *See also* PLANT TAXONOMY and various articles on plant groups in PALEOBOTANY.

Systems engineering

See CONTROL SYSTEMS ENGINEERING.

Taxonomy

See ANIMAL SYSTEMATICS; PLANT TAXONOMY; and various articles in INVERTEBRATE ZOOLOGY; PALEONTOLOGY; VERTEBRATE ZOOLOGY; the various plant groups in PALEOBOTANY.

Theoretical physics

Antimatter Antineutron. Antiproton Boltzmann constant. Boltzmann statistics. Boltzmann transport equation. Bose-Einstein statistics Brownian movement. Causality. Clock paradox. Compton effect. Conservation of mass. De Broglie wavelength Degeneracy (quantum states). Eigenfunction. Eigenvalue. Electrochemical process. Electrolyte. Energy. Energy level (quantum mechanics) Excited state. Exclusion principle. Fermi-Dirac statistics. Field theory, classical. FitzGerald-Lorentz contraction. Fourth dimension. Ground state Inertia of energy. Kinetic theory of matter. Mathematical physics. Matrix mechanics. Mean free path. Metastable state. Perturbation (mathematics). Perturbation (quantum theory). Photon. Planck's constant. Potentials (mathematics). Potentials (physics). Probability in physics. Quantization. Quantum (physics). Quantum electrodynamics. *Quantum field theory.* Quantum mechanics Quantum numbers. Quantum statistics. Quantum theory, nonrelativistic. Quantum theory, relativistic. Relativistic electrodynamics. Relativistic mechanics. Relativity. Rest mass. Ritz's combination principle. Schrödinger's wave equation. Space time. Spinor. Stationary state. Stationary wave. Statistical mechanics. Superposition, principle of. Symmetry laws (physics). *Theoretical physics.* Transformation theory, quantum. Uncertainty principle. Unified field theories. Wave mechanics. Wave packet.

Thermodynamics

Activity (thermodynamics). Adiabatic process Aerothermodynamics. Aircraft engine performance. Beattie-Bridgeman equation. Boltzmann constant. Boltzmann statistics Boyle's law. Brayton cycle. Carnot cycle. Charles' law. Chemical energy. Chemical engineering Combustion. Compressible flow. Conservation of energy. Crocco's equation. Dalton's law. Diesel cycle. Energy. Enthalpy. Entropy. Free energy *Gibbs function. Heat. Heat balance. Heat* exchanger. Heat pump. Internal energy. Isentropic process. Isobaric process. Isometric process. Isothermal process. Otto cycle. Polytropic process Potentials (physics). Propulsion. Rankine cycle. Refrigeration cycle Specific heat Statistical mechanics. Thermoanalysis. Thermochemistry. Thermodynamic cycle. Thermodynamic principles. Thermodynamics (chemical) Turbine propulsion. Van der Waals equation Vapor cycle Virial equation. Work.

See also PHYSICAL CHEMISTRY

Ultrasonics

See ACOUSTICS

Vertebrate zoology

Acipenseriformes Actinopterygii Aepyornithiformes Agnatha Albatross Alligator. Allotheria Amiiformes Amniota Amphibia. Amphicoela. *Anamnia. Anguilliformes Anomocoela Anseriformes.* Anteater Antelope Apodiformes. Apterygiformes. Archaeornithes. Armadillo Artiodactyla Auk. Aves. Avocet. Baboon Badger Barracuda. Bass Bat. Batrachoidiformes Bear. Beaver. Beloniformes Berveiformes. Bird. Bison. Blackbird. Blacksnake. Bluebird Bluefish. Boa. Bobcat Bobolink Bullsnake Bunting. Bushmaster Caiman. Camel. Canary Caprimulgiformes. Capybara. Cardinal Caribou. Carnivora. Carp. Casuariiformes. Cat Catbird. Catfish. Cattle. Caudata. Cephalaspidomorphi Cetacea. Chamaeleon. Chamois Charadriiformes Chat. Chelonia. Chickadee Chicken. Chimpanzee. Chinchilla. Chipmunk. Chiroptera. Chuckwalla. Chondrichthyes. Chordata Ciconiiformes. Civet. Clupeiformes. Cobra Cockatoo. Codfish. Coelacanthiformes. Coliiformes Columbiformes Cony. Coot. Copperhead Coraciiformes Coral snake Cormorant. Cottonmouth Cougar. Cowbird. Coyote. Crane (zoology). Craniata. Crappie. Creeper. Croaker. Crocodile. Crocodilia. Crossbill. Crossopterygii. Crow. *Cryptobranchoidea.*