

Index

- aberration of starlight, 57, 281
- accretion disk, 426
- acoustic oscillation, 405
 - opacity driven, 405
- active galactic nucleus (AGN), 474, 489–503
 - emission spectrum, 489
 - jets, 489
 - time variability, 489
 - unified model, 501
- adaptive optics, 151, 168
- adiabatic index, 358
- adiabatic process, 357
- Airy disk, 150
- albedo, 195, 197
- Alfvén point, 190
- Alpha Centauri (α Cen), 308
- altitude, 5
- analemma, 21
 - martian, 28
- Andromeda Galaxy (M31), 467, 471
 - future merger with Milky Way, 520
- angstrom (\AA), 113
- angular velocity (ω), 451
- antapex, 450
- Antarctic Circle (66.5° S), 13
- apex, 450
- aphelion, 51, 69
- Apollo missions, 226
- apparent solar time, 20
- apparent superluminal motion, 506–508
- Arctic Circle (66.5° N), 13
- Aristarchus, 31
 - and Earth-Sun distance, 31
- Aristotle, 30
 - and shape of Earth, 30
- asteroid, 194, 266
 - Earth-crossing, 268
 - origin of name, 268
 - Trojan, 269
- astigmatism, 155
- astronomical unit (AU), 44
- asymptotic giant branch (AGB), 401
- atmospheric retention, 202, 206, 290
- atomic mass unit, 126
- atomic transitions, 116
- aurora, 189, 221
- azimuth, 6
- Baade, Walter, 467
- background limited observation, 163
- bad astronomy in literature
 - Hemingway, 27
 - Shakespeare, 15
- bandwidth, 316
- Barnard's star, 446, 448
- barometric equation, 215
- baryon, 526
- baryonic matter, 526, 554
- Bessel, Friedrich Wilhelm
 - and Sirius, 325
 - and stellar parallax, 58, 308, 447
- Betelgeuse (α Ori)
 - diameter, 319
- as future supernova, 423
- Big Bang model, 486
- Big Bang nucleosynthesis (BBN), 566
- binary star
 - eclipsing, 322, 329–330
 - spectroscopic, 322, 326–329
 - double-lined, 326
 - single-lined, 326
 - visual, 322–325
- bipolar magnetic region, 188
- blackbody radiation, 140
- black hole, 423–426
 - definition of, 424
 - radius of influence, 480
 - supermassive, 463
 - accretion onto, 489
 - tidal disruption of star, 464
 - tidal disruption of you, 425
- BL Lac object, 493
- blue straggler, 516
- bolometric correction, 317
- bolometric flux (F_{bol}), 313
- Boltzmann constant (k), 125
- Boltzmann equation, 135
- boson, 411
- Brahe, Tycho, 50, 426
- bremsstrahlung, 381
- brightness
 - apparent. *See* flux
 - intrinsic. *See* luminosity
- broadening
 - natural, 123
 - pressure, 127, 345, 413
 - rotational Doppler, 126

- broadening (*continued*)
 - thermal Doppler, 126
 - turbulent Doppler, 126
 - Zeeman, 127
- broad-line region, 491, 501
- calendar, 25–26
- Callisto (satellite of Jupiter), 255
- camera obscura, 146
- cataclysmic variable, 427
- celestial pole, 6
- celestial sphere, 2
- Centaur, 275
- center of mass, 296, 325
- central force, 62
- centrifugal acceleration, 54
- Cepheid star, 402
 - period–luminosity relation, 406
 - as standard candle, 482
- Ceres (asteroid), 267
- Chandrasekhar mass, 416, 430
- charge-coupled device (CCD), 160
- Charon (satellite of Pluto), 272
- chemical differentiation, 205
- Chicxulub Crater, 288
- chromatic aberration, 152
- chromosphere, 175
- circumpolar star, 10
- civil time, 23
- classical Cepheid. *See* Cepheid star
- cluster of galaxies, 511–515
- collision
 - of galaxies, 516
 - of stars, 516
- color excess, 379
- color index, 316
- column density (N), 129, 201
- Coma Cluster, 513
- coma (part of comet), 277
- coma (type of aberration), 155
- comet, 266, 277
 - dust tail, 277
 - ion tail, 277
 - long-period, 278
 - short-period, 277
- Comet Halley, 277
- Comet Shoemaker-Levy 9, 279
- Comet Tempel 1, 277
- commensurate periods, 233
- comparative planetology, 290–292
- compressional strength, 252
- Compton wavelength, 114
- conic section, 68
- conjunction, 40
 - inferior, 41
 - superior, 41
- Consensus Model, 554
- constellations, 3
- Coordinated Universal Time (UTC), 24
- coordinates
 - comoving, 544
- Copernicus, Nicolaus, 38
- core bounce, 422
- core collapse, 422
- Coriolis effect, 54–56
- corona, 177
 - F corona, 177
 - K corona, 177
- coronal heating, 178
- coronal mass ejection, 188
- cosmic microwave background (CMB), 531
 - cooling of, 533
 - spectrum of, 531
 - temperature of, 531
- cosmic neutrino background, 553
- cosmic time, 544
- cosmological constant, 535, 547
- cosmology
 - definition of, 1
 - Newtonian, 533–535
- Crab Nebula (supernova remnant), 423
- crater, 206, 223, 287
 - ejecta blanket, 224
- Cretaceous–Tertiary extinction, 287
- critical energy density (ρ_c), 548
- critical mass density (ρ_c), 535
- cross-section (σ), 128
- Curtis, Heber, 467
- curvature constant (κ), 540
- curvature of field, 156
- curve of growth, 131
- cyclotron frequency, 250
- cyclotron radiation, 251
- damped Lyman alpha systems, 506
- damping constant, 123
- dark energy, 486
- dark matter, 442, 527
 - in clusters, 514
- day, 16
 - apparent solar, 19
 - sidereal, 17
 - solar, 18
- declination (δ), 6
- de-excitation
 - collisional, 120
- degeneracy, 399, 410
- degeneracy pressure
 - electron, 411
 - neutron, 417
- Deimos (satellite of Mars), 243
- density parameter (Ω), 549
- detector
 - photoconductive, 160
 - photoemissive, 160
- deuterium (D), 372, 566
- distance ladder, 482
- distance modulus, 313
- distortion, 157
 - barrel, 157
 - pincushion, 157
- diurnal circle, 7
- dopplergram, 371
- Doppler shift, 444
- dust sublimation radius, 501
- dwarf planet
 - definition of, 277
- Earth, atmosphere, 213–219
 - composition, 213
 - layers of, 216, 217
 - primeval, 213
 - scale height, 216
- Earth, interior, 209–213
 - asthenosphere, 212
 - crust, 209
 - inner core, 209

Index

591

- lithosphere, 212
- mantle, 209
- outer core, 209
- eclipse, 30
 - definition of, 102
 - lunar, 30, 102
 - partial, 104
 - penumbral, 104
 - total, 104
 - primary, 330
 - solar, 30, 102
 - annular, 103
 - partial, 102
 - total, 102
- eclipse window, 106
- ecliptic, 11
 - obliquity of, 12
- Eddington limit, 498
- Eddington luminosity, 498, 499
- Eddington ratio, 499, 500
- Edgeworth-Kuiper belt. *See* Kuiper belt
- effective wavelength, 316
- Einstein coefficient, 122, 138
- Einstein's field equations, 546
- electron scattering. *See* Thomson scattering
- electron volt (eV), 526
- ellipse, 50
 - eccentricity, 50
 - foci, 50
 - principal focus, 69
 - semimajor axis, 50
 - semiminor axis, 50
- elongation, 41
 - greatest, 44
- emission
 - nonthermal, 489
 - spontaneous, 119
 - stimulated, 120
- emission nebula, 381
- energy transport
 - conductive, 353
 - convective, 353, 356–359
 - radiative, 353–356
- epicycle, 35
- equation of energy transport
 - convective, 359
 - radiative, 354
- equation of state, 351
- equation of time, 20
- equator, 3
- equatorial coordinate system, 8
- equinox, 12
 - autumnal, 12
 - etymology of, 13
 - vernal, 12
 - origin of right ascension, 7
- equivalence principle, 536
- equivalent width (W), 131
- Eratosthenes, 32
 - and size of Earth, 32
- Eris (dwarf planet), 276
 - discovery of, 276
- Eros (asteroid), 271
- escape speed, 75
- Europa (satellite of Jupiter), 255
- event horizon, 424
- excitation
 - collisional, 118, 389
 - photoexcitation, 118
- excited state, 115
- exobase, 201
- exoplanet, 290, 294
- exoplanet detection
 - astrometry, 297
 - direct imaging, 297
 - lensing, 443
 - radial velocity, 297
 - transit, 300
- exosphere, 201, 217
- exposure time, 146
- extinction, 318
 - atmospheric, 318
 - interstellar, 318, 349, 376
 - wavelength dependence, 376
- Faber-Jackson relation, 483
- Fermat's Principle, 538
- fermion, 117, 411
- filament, 176. *See also* prominence
- fine structure constant (α), 113
- finger of God, 523
- flatness problem, 568–569
 - resolved by inflation, 571
- fluorescence, 381
- flux (F), 309
 - inverse square law, 310
- focal length (F), 146
- focal plane, 148
- focal ratio, 148
 - of human eye, 149
- focus
 - Cassegrain, 153
 - Coudé, 154
 - Newtonian, 153
 - prime, 153
- forbidden transition, 118, 382
- Foucault pendulum, 56
- freefall time (t_{ff}), 394
- free-free emission. *See* bremsstrahlung
- frequency (ν), 111
- Friedmann equation, 535, 547
- full width half maximum (FWHM), 159, 161
- galactic cannibalism, 520
- galaxy
 - active, 474
 - definition of, 433
 - dwarf elliptical, 473
 - dwarf irregular, 473
 - dwarf spheroidal, 473
 - elliptical, 468–470, 520
 - kinematically decoupled core, 478
 - etymology of, 433
 - irregular, 468, 471–472
 - lenticular. *See* galaxy, S0
 - radio, 495–496
 - compact, 496
 - extended, 495
 - S0, 471
 - Seyfert, 490–491
 - Seyfert 1, 490
 - Seyfert 2, 491
 - polarization, 503
 - spiral, 438, 468, 470–471, 520
 - apparent axis ratio, 476

- galaxy (*continued*)
 - spiral (*continued*)
 - barred, 471
 - Magellanic, 471
 - rotation, 476–477
 - starburst, 475
 - galaxy merger, 473, 504, 519
 - Galilean satellites, 48, 253, 254, 255
 - Galilei, Galileo, 47, 433
 - Sidereus Nuncius*, 47
 - and the telescope, 47
 - Gamow factor, 364
 - Ganymede (satellite of Jupiter), 255
 - Gaspra (asteroid), 271
 - geocentric model, 34
 - geodesic, 538
 - null, 545
 - giant impact, 291
 - giant satellites, 253
 - giant star, 343
 - globular cluster, 435
 - Goldilocks effect, 238
 - Grand Unified Theory (GUT), 571
 - granules, 174
 - gravitational constant (G), 62
 - gravitational lens, 443
 - gravitational potential energy (U), 360
 - greenhouse effect, 199
 - Greenwich Mean Time (GMT), 23
 - ground state, 115
 - H^- ion, 173
 - Hadley circulation, 218
 - half-life, 229
 - Hawking radiation, 426, 504
 - Heisenberg uncertainty principle, 123, 411
 - heliocentric model
 - explanation of retrograde motion, 39
 - proposed by Aristarchus, 31
 - proposed by Copernicus, 39
 - helioseismology, 370
 - helium
 - discovery of, 175
 - helium fusion, 400
 - triple alpha process, 368
 - Herschel, Caroline, 435
 - Herschel, William, 257, 435
 - Hertzsprung–Russell diagram, 346, 516
 - hierarchical structure, 511
 - high-velocity star, 445
 - H II region, 381, 384–390
 - Hill radius, 95
 - Hipparchus, 14, 33
 - Hohmann transfer orbit, 76
 - horizon, 2
 - horizon circle, 2
 - horizon coordinate system, 5
 - horizon distance, 530, 546
 - horizon problem, 568, 569–570
 - resolved by inflation, 571
 - horizontal branch, 400
 - Hot Big Bang model, 527, 533
 - hot Jupiter, 304
 - hour, 16
 - hour angle (H), 7
 - H–R diagram. *See* Hertzsprung–Russell diagram
 - Hubble, Edwin, 467, 468, 484
 - Hubble constant (H_0), 484, 530
 - value of, 484
 - Hubble diagram, 484
 - Hubble law, 484, 513, 530
 - Hubble parameter, 530
 - Hubble time (H_0^{-1}), 486
 - hydrogen
 - metallic, 245
 - hydrogen fusion
 - CNO cycle, 367
 - PP chain, 366
 - hydrogen transitions
 - Balmer (to/from $n = 2$), 116
 - Brackett (to/from $n = 4$), 116
 - Humphreys (to/from $n = 6$), 116
 - Lyman (to/from $n = 1$), 116
 - Paschen (to/from $n = 3$), 116
 - Pfund (to/from $n = 5$), 116
 - hydrostatic equilibrium, 215, 336, 514
 - hypocenter, 210
 - ideal gas law, 183, 215, 336, 351
 - imaging camera, 159
 - inferior planets, 40
 - inflationary theory, 570
 - infrared (IR), 165
 - instability strip, 403
 - interference
 - constructive, 320
 - destructive, 320
 - interferometry, 320
 - radio, 166
 - intergalactic medium, 505
 - International Atomic Time (TAI), 23
 - International Date Line, 23
 - interstellar dust, 376–379
 - interstellar gas, 380–390
 - absorption by, 380
 - cold molecular cloud, 382
 - star formation in, 393
 - cool atomic cloud, 382
 - emission by, 381
 - hot ionized gas, 383
 - very hot ionized gas, 383
 - warm partially ionized gas, 382
 - ionization
 - collisional, 120
 - photoionization, 120
 - Io (satellite of Jupiter), 254
 - iron catastrophe, 206
 - Jeans length (r_J), 395
 - Johnson–Cousins system (*UBVRI*), 315
 - Juno (asteroid), 268
 - Jupiter
 - Great Red Spot, 249
 - zones & belts, 248
 - Jupiter & Saturn, 243–252
 - Kapteyn’s star, 444, 447, 448
 - Kelvin–Helmholtz time, 361
 - Kepler, Johannes, 50

Index

593

- Kepler's first law, 50
 - derivation of, 66
- Kepler's second law, 51
 - derivation of, 62
- Kepler's third law, 51
 - derivation of, 72
- Kirchhoff's laws, 122, 380, 381
- Kirkwood gaps, 268
- Kuiper belt, 194, 274
 - classic, 275
- Lagrangian points, 269
- lambda-dominated universe, 556
- L and T dwarfs, 342–343
- Larmor formula, 251
- Larmor radius, 183
- last scattering surface, 564
- latitude, 3
- launch window, 78
- leap day, 26
- lens, 148
- lepton, 526
- limb darkening, 174
- limiting flux, 164
- line of apsides, 96
- line of nodes, 96, 102
- line profile, 123
- Local Bubble, 383
- Local Group, 512
- local noon, 22
- local sidereal time (LST), 25
- Local Standard of Rest (LSR), 449
- local thermodynamic equilibrium (LTE), 134, 354
 - sufficient conditions, 134
- longitude, 3
 - Galactic, 452
- Lorentz distribution, 123
- Lorentz force, 181
- luminosity class, 343–344
- luminosity density of universe, 525
- luminosity function
 - of galaxies, 523
- luminosity (L), 143, 309
- lunar libration, 100
 - diurnal, 100
 - in latitude, 101
- in longitude, 100
- Lyman alpha forest, 506
- MACHO (massive compact halo object), 442
- magnetic dipole moment, 220
- magnetogram, 186
- magnetopause, 220
- magnitude
 - absolute, 312
 - relation to luminosity, 312
 - absolute bolometric, 314
 - apparent, 311
 - relation to flux, 311
 - apparent bolometric, 314
 - invented by Hipparchus, 33
- main sequence, 343
 - definition of, 346
 - lifetime on, 362
- Makemake (dwarf planet), 276
- Mars, 239–243
 - Olympus Mons, 239
 - polar caps, 241
 - Valles Marineris, 240
- mass number (A), 111
- Mathilde (asteroid), 271
- matter-dominated universe, 556
- Maunder minimum, 186
- Maxwell-Boltzmann distribution, 124
- mean free path, 130, 354, 386
- mean molecular mass, 337
 - dependence on ionization, 337
 - of Sun's photosphere, 338
- mean solar time, 20
- mean specific intensity, 138
- Mercury, 232–235
- meridian, 4
 - nadir, 7
 - observer's, 7
 - zenith, 7
- meteor, 284
- meteorite, 286
 - carbonaceous chondrite, 286
 - iron, 286
 - stony, 286
- meteoroid, 266, 284
- meteor shower, 285
 - annual, 285
 - periodic, 285
- metric, 543
 - Minkowski, 543
 - Robertson–Walker, 543
- Milky Way Galaxy, 433
 - bulge, 436
 - disk, 436
 - thick, 436
 - thin, 436
 - halo, 437, 445
 - luminosity, 437
 - mass, 440, 441
- minor planet. *See* asteroid
- minute, 16
- molecular mass (μ), 126
- month, 16
 - anomalistic, 108
 - nodical, 108
 - sidereal, 97
 - synodic, 97
- Moon, 221–228
 - highlands, 222
 - maria, 222
- Moon formation
 - capture hypothesis, 227
 - co-creation hypothesis, 227
 - fission hypothesis, 227
 - giant impact theory, 228
- nadir, 3
- narrow-line region, 491, 502
- Neptune
 - discovery of, 257
- neutrino (ν), 442, 527
 - mass, 442
- neutron (n), 526
 - decay of, 526
- neutron star, 416–423
 - definition of, 417
- Newton, Isaac, 61
 - headache from Moon's motion, 97
- Newton's law of universal gravitation, 61
- mathematical form, 62

- Newton's laws of motion, 61
- nodes, 102
- northern hemisphere chauvinism
 - apologia for, 9
 - reason why clocks run “clockwise”, 20
- nova, 427
 - definition of, 427
 - dwarf, 428
 - recurrent, 428
- nuclear fusion
 - in stars, 361
- nuclear winter, 287
- obscuring torus, 502
- Occam's razor, 47
- Olbers, Heinrich, 527
- Olbers's paradox, 527
 - resolution of, 531
- Oort cloud, 279
- Oort constant *A*, 455
- Oort constant *B*, 455
- Oort diagram, 452
- Oort equation
 - first, 453
 - second, 454
- opacity (κ), 344
 - Kramers' law, 374
- Oppenheimer–Volkov limit, 423
- opposition, 40
- optical depth (τ), 129
- orbital resonance
 - asteroid belt, 268
 - rings, 262
- Orion Nebula, 381
- outgassing, 207, 213
- Pallas (asteroid), 268
- parallax, 37
 - annual, 37
 - diurnal, 37, 100
 - geocentric. *See* parallax, diurnal
 - heliocentric. *See* parallax, annual
- spectroscopic, 348, 482
- stellar, 37, 58, 307, 482
- parsec (pc), 59, 308
- Pauli exclusion principle, 117, 410
- penumbra, 102
- perihelion, 51, 69
- period
 - sidereal, 41
 - synodic, 41
- period of heavy bombardment, 206, 224
- permeability constant (μ_0), 183
- permitted transition, 118
- phases
 - of Moon, 30, 97
 - of Venus, 49
- Phobos (satellite of Mars), 243
 - inside Roche limit, 94
- photon (γ), 111, 527
- photon-to-baryon ratio, 554
- photosphere, 336
 - solar, 172
- photosynthesis, 213
- pinhole camera, 146
- pixel, 161
- plage, 176
- Planck constant, 111
 - reduced (\hbar), 113
- Planck function, 140, 531
 - Rayleigh–Jeans limit, 141, 316
 - Wien limit, 141, 388
- Planck time, 572
- planet, 194
 - definition of, 276
 - dwarf, 194
 - Jovian, 194
 - terrestrial, 194
- planetary magnetic fields, 207
- planetary migration, 305
- planetary nebula, 381
- planetary rings, 259–263
- planetesimal, 204
- planet formation
 - accretion, 204
 - coalescence, 204
 - condensation, 203
- plate scale, 149
 - of human eye, 150
- plate tectonics, 212
- plutino, 275
- Pluto (dwarf planet)
 - discovery of, 272
- point spread function (PSF), 158
- Poisson probability distribution, 161
- Polaris, 15, 406
- polarization of starlight, 376
- population I stars, 437
- population II stars, 437
- Poynting–Robertson effect, 281
- Poynting–Robertson timescale, 283
- precession of equinoxes, 14, 83
 - caused by torque, 84
 - discovered by Hipparchus, 33
- Prime Meridian, 4
- prominence, 176, 188
- proper distance (ℓ_p), 544
 - in Consensus Model, 558
- proper motion (μ), 445
- proton (p), 526
- protoplanetary disk, 203, 305
- protostar, 397
- Proxima Centauri, 308
 - parallax of, 59
- Ptolemaeus, Claudius, 34
 - estimate of Earth's size, 4
 - and geocentric model, 34
- pulsar, 420
 - lighthouse model, 421
- Python, Monty, 425
- QSO. *See* quasar
- quadrature, 40
- quantum efficiency, 159
 - of CCD, 161
 - of human eye, 159
 - of photographic plate, 159
- quantum mechanical tunneling, 363
- quantum number, 113
 - principal (n), 118
- quasar, 491–493
 - etymology of, 492
- radio-loud, 493
- radio-quiet, 493

Index

595

- radar, 166, 307, 482
- radiation-dominated universe, 555
- radiation pressure, 280, 351
- radiative transfer
 - equation of, 129
- radioactive dating, 223, 228–230
- radioactive decay, 228
- radio astronomy, 165
- radio line emission, 382
 - 21 centimeter, 382
- radius of curvature (r_c), 540
- random walk, 356, 372–373
- rate of energy production (ϵ), 360
- ratio of total to selective extinction
 - (R), 379
- Rayleigh scattering, 219
 - blue sky, 219
 - green flash, 219
 - red sunsets, 219
- recombination, 120
- recombination coefficient, 386
- reddening, 376, 379
- red giant, 399
- red giant branch, 399
- redshift, 545
- redshift map, 521
- refractive index, 148
- refractory material, 204
- regolith, 226
- retrograde motion, 11
- reverberation mapping, 501
- rift zone, 212
- right ascension (α), 8
- rille, 226
- Roche limit, 93
- rotation
 - constant orbital speed, 452
 - differential, 452
 - Keplerian, 452
 - rigid-body, 452
- RR Lyrae star, 402
- Russell–Vogt theorem, 409
- Sagittarius A, 462
- Sagittarius A*, 462
 - luminosity, 462
 - mass, 463
- proper motion, 462
- Sagittarius A West, 462
- Saha equation, 135
- Saros cycle, 107
- saturation, 130
- Saturn
 - ring particles, 260
 - rings
 - Cassini division, 260
 - discovery, 259
 - orbital resonances, 262
 - rotational flattening, 250
- scale factor, 551
- scale height, 216
 - of Sun's photosphere, 339
- scattered disk objects, 276
- Schechter function, 523
- Schwarzschild radius (r_{Sch}), 424, 500
- second, 16
 - definition of, 23
- seeing, astronomical, 151
- seismic wave, 209
 - P-wave, 209
 - S-wave, 209
- selection rule, 118
- sexagesimal number system, 16
- Shapley, Harlow, 435, 467
- shepherd satellites, 262
- sidereal time, 24
- sidereal year. *See* year, sidereal
- signal-to-noise, 163
- Sirius
 - mass of system, 325
 - as visual binary, 322
- Sloan Digital Sky Survey (SDSS), 522
- solar activity, 181
- solar cycle, 187
- solar flare, 188
- solar mass (M_\odot), 73
- solar neutrino, 371
 - problem, 372
- solar wind, 178
 - mass loss rate, 180
- solstice
 - etymology of, 13
- summer, 12
- winter, 12
- sound speed (c_s), 395
- space
 - flat, 539
 - negatively curved, 540
 - positively curved, 539
- space motion, 448
- spacetime, 538
- space velocity. *See* space motion
- specific flux (F_λ), 141, 163, 313
- specific intensity, 130, 137
- spectral class, 339–343
 - OBAFGKM, 341
 - OBAFGKMLT, 342
- spectral sensitivity (S), 315
- spectrograph, 159
- spectroheliogram, 176
- spectrum, 121
 - absorption, 122
 - emission, 122
- spherical aberration, 155
- spheroid, oblate, 83
- spicule, 176
- spiral arm, 437
 - trailing, 439
- standard atmospheric pressure, 216
- standard candle, 407, 482
- star
 - definition of, 307
 - main sequence, 330
 - mass–luminosity relation, 330
 - mass–radius relation, 330
- star counts, 433
- star formation, 393–398
- statistical equilibrium, 138
- Stefan–Boltzmann constant (σ_{SB}), 143
- stellar structure, 350
 - energy generation, 359
 - energy transport, 353
 - equations of, 369
 - hydrostatic equilibrium, 350
 - mass continuity, 351
- Stonehenge, 16
- Strömgren radius, 386, 387
- Strömgren sphere, 385

- strong nuclear force, 362
- subduction zone, 212
- subdwarf, 343
- subsolunar point, 218
- Sun, 172–192
 - evolution of, 402
 - spectral classification of, 345
 - velocity relative to LSR, 451
- Sun, atmosphere, 172–189
 - corona, 102
 - sunspot, 183
 - butterfly diagram, 186
 - magnetic field strength, 186
- supercluster, 511
 - density of, 521
- supergiant, 343
- superior planets, 40
- supernova, 422, 428
 - luminosity of, 431
 - type Ia, 429, 430
 - as standard candle, 482, 561
 - type Ib, 429
 - type II, 429
- supernova remnant, 422
- surface brightness (S_λ), 164
- synchronous rotation
 - of Moon, 99
- synchrotron radiation, 251, 382
 - and pulsars, 421
- tangent point method, 457
- telescope
 - reflector, 152
 - refractor, 151
 - Ritcheby-Chrétien, 157
 - Schmidt, 157
- temperature
 - equilibrium blackbody, 198
 - subsolunar blackbody, 198
- thermal inertia, 168
- thermonuclear reactions, 363
- Thomson scattering, 355
- tidal braking, 90
- tide
 - definition, 84
 - neap, 90
 - spring, 89
- time zones, 23
- Titan (satellite of Saturn), 256
- Titius-Bode Rule, 266
- transit, 17
 - lower, 17
 - upper, 17
- trans-Neptunian object (TNO),
 - 194, 266, 271
- tritium (${}^3\text{H}$), 566
- Triton (satellite of Neptune),
 - 258
- tropical year. *See* year, tropical
- Tropic of Cancer (23.5° N), 13
- Tropic of Capricorn (23.5° S), 13
- true anomaly, 70
- Tully-Fisher relation, 483
- Tunguska event, 287
- tuning fork diagram, 468
- twotino, 276
- ultraluminous infrared galaxy (ULIRG), 519
- ultraviolet (UV), 165
- umbra, 102
- Uranus
 - discovery of, 257
 - extreme axial tilt, 257
- Uranus & Neptune, 256–258
- V1500 Cygni (nova), 427
- vacuum energy, 548
- vacuum permittivity, 112
- van Allen belts, 221
- variable star, 329
 - pulsating, 329, 402
- Vega ($\alpha \text{ Lyr}$)
 - apparent magnitude, 311
- velocity
 - peculiar, 451, 487
 - radial, 64, 444
 - tangential, 64, 445
- Venus, 235–239
 - greenhouse effect on, 236
 - retrograde rotation, 236
- Vesta (asteroid), 268
- Virgo Cluster, 512
- virial theorem, 79, 478
 - applied to cluster of galaxies, 514
 - applied to galaxy, 479–480
- visible light
 - energy range, 111
 - wavelength range, 111
- vis viva equation, 76
- void, 522
 - density of, 522
- volatile material, 204
- volcanic flooding, 206
- wavelength (λ), 111
- week, 16
- white dwarf, 323, 401, 410–416
 - fade to black, 401
 - mass–radius relation, 412
- Wien's law, 197
- Wilkinson Microwave Anisotropy Probe (WMAP), 563
- WIMP (weakly interacting massive particle), 442
- W Virginis star, 468
- year, 16
 - sidereal, 25
 - tropical, 25
- Zeeman splitting, 127, 184
- zenith, 3
- zodiac, 13
- zodiacal light, 283