## Index

Page numbers in bold type indicate definitions and principal entries. Page numbers in *italic* indicate illustrations and material mentioned in captions. Page numbers followed by the letter Tindicate that the entry will be found in a table.

aberrations, optical 229, 230 absorption, interstellar 45, 183-4, 198 abundances of elements 54 achromatic Ramsden eye-piece 21 accretion discs around black holes 75 in galactic centre 190 in novae 66 in X-ray sources 75 achondrites **15**8 active galaxies (see galaxies, active) active regions, solar 79, 81 Adrastea 140T aerials, radio 84 aether 216 age, of Earth 93-4, 160 of galaxies 193 of Moon 118 of Solar System 94, 118, 160-1 of Sun 55, 61 of universe 224, 225, Alba Patera (Mars) 125 albedo 95, 101T Alpher, Ralph 224 Amalthea 139-40 Ambartsumian, Viktor 211 Andes 93 Andromeda galaxy (M31) 191, distance of 197 stars in 168, 200 angular momentum 161 antennae 239 'Antennae', The (NGC4038 & 4039) 203 Anti-Atlas (Morocco) 94 apertures, of binoculars 18 of photographic lenses 30-1 of telescopes 18 aphelion 26 Aphrodite Terra (Venus) 122 apoapsis 26 apogee 26 Apollo missions 104, 117 landing sites: Apollo 15: 116, 117 Apollo 16: 116 Apollo 17: 106-7 Apennines, lunar 104, 116-7 Ares Vallis (Mars) 132 Argyre (Mars) 126-7 Arp, Halton 227 'asteroids' (see minor planets) asthenosphere of: Earth 92

Baade, Walter 66, 71, 168, 197, 200, 224 Baily's Beads **15**, 86 Balmer series 178 Barlow lens 21, 31 Barnard 68 & 72 (nebulae) 181 Barnard's star 12, 161 barred irregular galaxies (see galaxies, irregular, barred) barred spirals (see galaxies, spiral, barred)

Moon 117T, 117

102

astronomical twilight 22

Astronomical unit 27, 29

atomic time 17 aurorae 79, 84, 100, **102-3** 

auroral regions 100, 102-3

variations with sunspot cycle

basalt (lunar) 116 basıns, multi-ringed, on: Mercury 120, 121 Moon 107 Mars 125 Bayer, Johann 8 Bergh, Sidney van den 194, 198 Bessel, Friedrich 9, 70 Beta Regio (Venus) 122 big bang, 224 and element formation 226 helium abundance in 226 stages of 226 temperatures of 226 big bang, hot 225-6 binaries, close 65, 66 determination of orbits 53, 234 eclipsing **53**, 56 evolution of **66** semi-detached *66* spectroscopic 53 visual 53 binoculars 18-19, 56-7 choosing 18 mounting 18 black body, 47 radiation 47, 206 temperature 49 black dwarfs 152, 161 black holes 73 et seq, 222, 224 and accretion discs 75 in binary systems 75 in Cygnus X-1 75 detection of 74 as energy sources 75, 190, 210 evaporation of 223 event horizon of 74, 223-4 formation of 74, 223 in galactic centre 190 in galaxian nuclei 210 in LMC X-3 75 masses of 74, 223

and missing mass of galaxian clusters 205 in M87 210

origin of 74 primordial 223 rotating 223, 224 Schwarzschild radius of **73-4**, 222

size of 73, 74 tiny 223 in X-ray binaries 75 Bode, Johann 28 Bok, Bart J. 166 Boksenberg, Alexander 235 Bondi, Herman 224 Brahe, Tycho 10 Brans-Dicke theory 72 breccias, lunar 107, 116, 158 bremsstrahlung, thermal 200-1,

204 Brown, Hanbury 232 Bunsen, Robert 20-21 butterfly diagram 81

cD galaxies (giant elliptical) **194**, 201, 202, 203 calderas 125 Callisto 29, 139, 140T Caloris basin (Mercury) 120, 121 Calypso 145 cameras 21, 30 et seq, 57 Campbell, William 221 carbon dioxide on: Earth 95T, 95 Mars 127

Venus 123 carbon monoxide: in external galaxies 201 interstellar 182 Jovian 135 carbonaceous chondrites 132, 154, 158

eta Carinae 67 Cassegrain focus 229 Casseiopeia A 184-5 Cassini division (Saturn's rings) 141 Castor 68

celestial: co-ordinates 12-13 equator 13

latitude 13 longitude 13 poles 12 'censorship, cosmic' 74 alpha Centauri C (=Proxima Centauri) 9, 53T omega Centauri (globular cluster) 170 Cepheid variables 66 classical 66, 67 Chandrasekhar,

Subrahmanyan 65 Chandrasekhar limit 70 chaotic terrain (Mars) 126, 132 charge-coupled devices (CCDs)

Charon 100, **152** Chiron (1977 UB) 153-4 chondrites, carbonaceous 158 chondrules 158 Chrétien, Henri 229 Christianson, Willem 241 Chryse Trough (Mars) 126 Chryse Plain (Mars) 126

classifications: galaxian luminosity 194 galaxies 191 et seq stellar luminosity 49 et seq stellar spectra 48

globular (see globular clusters) of galaxies (see galaxies, clusters of) galactic (open) (see galactic

clusters) Coalsack nebula (crux) 166, 180 coelostat 238 Colorado River 94

colour: of galaxies 200 of stars 45-6 colour index 45-6

coma **15**6 Coma cluster 203, 204, 205 comet(s) 150-1, **155** et seq Bennett 155, 157T Biela 157

'colliding' 156 coma of 156 composition 156 discoveries of **150** during solar eclipses 88 drawing 150 Great, 1811 156 Great, 1843 154

Great, 1843 156 Halley 155, 156, 157T haloes of 92, 103 Ikeya-Seki 156 IRAS-Araki-Alcock (1983d)

150, 151 magnitudes, estimating 150 nomenclature 155 nucleus of 156

long period 156 masses of 156 mass loss by 156 and meteors 156-7 observing 150

equipment for 150 orbits of 155, 157T origin of 161 photographing 30, **150** Perrine-Mrkos 155, 157T Schuster 156

Schwassmann-Wachmann 1 151 short period 156

Sun-grazing 155 tails of 156
Tempel-Tuttle 155, 157T
West 155, 157T
constellations 8, 12, 34

of the Zodiac 34 continuum radio 200 continental drift 93, 227 cooled-emulsion photography

31, 177 co-orbital satellites 145 Copernicus (crater) 112, 114 Copernicus, Nicolaus 10 Cordilliera, Montes (Moon) 105 coronagraph 77, 86, 238 Cos-B (satellite) 185

cosmic background radiation 205 (see also microwave background radiation)

cosmic rays 184-5 composition of 184 detection of 185 energies of 184-5 origin of 185 radio emission by 185 and solar wind 99 and gamma-ray emission 185 cosmological models **224** big bang 224, 225, 226 Eddington-Lemaître 226 Einstein-de Sitter 224, 226 evidence for 225, 227 Friedmann 225 Lemaître 225

steady-state 225 cosmological principle 224 cosmological principie 224 cosmological redshifts 222 COSMOS equipment 237 coudé focus 229 Crab Nebula 71, 72, 185 Crab pulsar 71-2, 185 crater counts 118, 121, 125, 139

Milne 224

craters on: Earth 158, 160T Mars 124-5 Mercury 120

Moon **105** et seq, 118 Phobos 132 Venus 122 cratons 93

Crêpe ring 141 Crommelin, Andrew 155, 221 curvature of space-time 220 et

Nova Cygni 1975 65 P Cygni stars 55, 65 61 Ćygni 8, 9 Cygnus A (radio source) 209, 210

Cygnus Loop 64 Cygnus X-1 75

Danjon, André 112 dark adapted vision 22 day:

changing length of 101 mean solar 16, 27 sidereal 16, 27 declination 12, 13, 20 degenerate material 64, 70 et seq

Deimos 132 density:

interstellar 178 et seq, 186 stellar 54, 67 of universe 205-6

density wave 188 Descartes (Apollo 16 site) 116

diamond ring effect 15, 86 Dicke, Robert 227 Dione 144, 145T dipole 239 Dirac, Paul 227 direct motion 26 direct rotation 26

disc, spurious (see spurious disc)

distance: early measurements 9 et seq extragalactic scale of 191, 197 galactic scale of 173-4 methods of measurement:

Cepheid variables 66, 191, 197 galaxian luminosity 198 geometrical 9 H II regions 197

moving-cluster 173-4 novae and supernovae 197radar 10

distance modulus 45 Doppler, Christian 46 Doppler shift 47, 55, 65, 161 30 Doradus 212 double stars, observing 68-9

Dreyer, Johann 191 dust, in comets 156 in Earth's atmosphere 157

in galaxies 200 interstellar 166, **180**, **184** on Mars 124, 127 on Moon 107 in solar nebula 160

and zodiacal light 157 dwarf stars 49, 52 white 52, 64-5, 70 black 161

Earth 92 et seq age of 93-4 age of life forms 94 age of rocks 93-4 asthenosphere 92 atmosphere 94 et seq absorption by 49, 206-7, 238 and artificial satellites 96 composition of 95T effects of 17, 206-7 structure of 94, 95 aurorae 79, 100 composition 92-3 continents 93, 160 core 92, 93 crust 92, 93 earthquakes 92, 93 geomagnetism 98-9 heat flow 93 interior of 92-3 life on 94 lithosphere 92 magnetic field of 98-9, 100 reversals 93 magnetosphere 100 mantle 92, 93T mesosphere 100 mountain building on 93 oceans 93, 160 orbit 60 et seq, 62T radiation belt of 99

seismic waves in 92 sidereal axial period 16, 28T size and shape 92 synodic period 27 temperature, of atmosphere 95 of interior 93 of surface 95 thermosphere 100 troposphere 100 Earth-Moon system 99, 100 et eccentricity 27

'eclipse wind' 88 eclipses 13 annular 13 lunar 13, 22, **112-4** solar 13-14 observing 8086-7 timing 86 total 13-14 ecliptic 13, 24, 26 Eddington, Arthur 221, 228 Eddy, John 91 Einstein, Albert 216, 218-20 Einstein relation 58, 218 ejecta blankets 105, **107**, 120, 121, 125 electromagnetic radiation 17

electron multiplier 234 electronic detectors 234 electronographic camera 234, 235 elements, abundances of 29

elliptical galaxies (see galaxies, elliptical) ellipticity of galaxies 191-2, 201 Elysium (Mars) 125

Enceladus 144 Encke Division (Saturn's rings) 142

ephemeris time 17, 109 Epimetheus 142 epochs 40 equation of time 16 equinox 13 equipotential surfaces 66 Erfle eyepiece 21 Eros 154 escape velocity **73**, **244** Europa **139**, 140T evolution:

of galaxies 214-5 of Galaxy 168 et seq of Solar System 106 of stars 58 et seq

of universe **224** et seq event horizon **74**, 222, 223 expansion, superluminal 211, 214