

Index

- absolute magnitude
 - correlation with asteroid size 289
 - definition 45
 - search program limits 288, 295
 - stellar 45
- achondrite
 - aubrite, *see* enstatite achondrite
 - definition 113
 - diogenite 114
 - euclite 113
 - exotic or unusual 115
 - howardite 114
 - howardite–eucrite–diogenite 114, 127, 274
 - irons, *see* iron meteorites
 - lunar 120
 - Martian 119
 - mesosiderite 116
 - pallasite, *see* pallasites
 - primitive 115
 - shergotite–nakhilite–chassignite 119
 - urelite 5, 115
- adaptive optics
 - definition 44
 - guide star 225
 - operation 224–5
 - resolution 225
- albedo, visual 48
- Alvarez, Walter and Luis 132
- Apophis, asteroid 99942
 - discovery 283
 - history of threat 283–4
 - size 283
 - Torino scale 293
- Arnold, Steve 97
- asteroids
 - albedo 48
 - Amor, *see* near-Earth asteroids
 - Aten, *see* near-Earth asteroids
 - Apollo, *see* near-Earth asteroids
 - Atira, Aphohele, *see* near-Earth asteroids
 - binary, *see* asteroids, moons
 - Centaurs, *see* Centaurs
 - classification, *see* asteroid classification
 - Edgeworth–Kuiper belt, *see* trans-Neptunian objects
 - families, *see* Hirayama families
 - Hildas 65
 - naming conventions 28
 - near-Earth, *see* near-Earth asteroids
 - origin of term 13
 - regolith 122
 - satellites, *see* asteroids, moons
 - search programs, *see* asteroid search programs
 - spectra, *see specific asteroids*
 - threats, *see* impacts
 - trans-Neptunian object, *see* trans-Neptunian object
 - Trojan 19–20
- asteroids, moons
 - 45 Eugenia 244
 - 87 Sylvia 245
 - 90 Antiope 244
 - 243 Ida and Dactyl 243
 - 762 Pulcova 245
 - 185851 2000 DP₁₀₇ 245
 - 2001 SN₂₆₃ 245
 - discovery methods 245
 - formation mechanisms 246–7
 - population reservoirs 245
- asteroids, number and name
 - 1 Ceres, *see* Ceres, asteroid 1
 - 2 Pallas, *see* Pallas, asteroid 2
 - 3 Juno 15
 - 4 Vesta, *see* Vesta, asteroid 4
 - 21 Lutetia, *see* Lutetia, asteroid 21
 - 45 Eugenia 244
 - 87 Sylvia 245
 - 90 Antiope 244
 - 135 Hertha 230
 - 243 Ida and Dactyl 243

342 INDEX

- asteroids, number and name (cont.)
 - 253 Mathilde, *see* Mathilde, asteroid 253
 - 433 Eros, *see* Eros, asteroid 433
 - 588 Achilles 19
 - 762 Pulcova 245
 - 951 Gaspra 243, 255
 - 1221 Amor 31
 - 2060 Chiron 21
 - 2062 Aten 31
 - 2100 Ra-Shalom 32, 241, 249
 - 2867 Steins, *see* Steins, asteroid 2867
 - 3200 Phaethon 52
 - 4689 Golevka 207
 - 4769 Castalia 238
 - 5000 IAU 30
 - 7968 Elst–Pizarro 26
 - 25143 Itokawa, *see* Itokawa, asteroid 25143
 - 54509 YORP 248
 - 99942 Apophis 284
 - 101955 Bennu 280–1
 - 134340 Pluto 24, 31
 - 136199 Eris 24
 - 136472 Makemake 31
 - 162173 (1999 JU₃) 280
 - 185851 2000 DP₁₀₇ 245
 - 367943 Duende (2012 DA₁₄) 129
 - 2001 SN₂₆₃ 245
- famous people and places 31–2
- asteroid classification
 - Bus taxonomy 63
 - B-class 280–1
 - C-class 60
 - definition 49, 56
 - E-class 61
 - M-class 60
 - P-class 126
 - photometric system 56
 - Q-class 123
 - R-class 61
 - S-class 60
 - Tholen taxonomy 62
 - U-class 60
 - V-class 127
- asteroid families, *see* Hirayama families
- asteroid mining
 - companies 311
 - metals 310–11
 - rationale 308
 - water 309–10
- Asteroid Retrieval Mission (ARM) 306–8
- asteroid search programs
 - assumptions 289–90
 - ATLAS 287
 - B612 foundation 302
 - Catalina Sky Survey 285
 - fireball networks 86–7
 - George E. Brown NEO Survey 285, 298
 - Large Synoptic Survey Telescope (LSST) 299
 - limiting magnitudes 289
 - LINEAR 286
 - NEOCAM 302–3
 - NEOWISE 287
 - Pan-STARRS 285, 299
 - search methods 288
 - space-based 301–2
 - Spacewatch 286
 - Spaceguard survey 284
- asteroid shapes
 - 135 Hertha 230
 - 2100 Ra-Shalom 241
 - 25143 Itokawa, *see* Itokawa, asteroid 25143
 - combining multiple datasets 231, 249–50
 - lightcurves 229–30
 - occultation, *see* occultation
 - online database 230
 - radar 240–1
- asteroid surveys
 - Eight-Color Asteroid Survey 61
 - Small Main-belt Asteroid Spectroscopic Survey (SMASS II) 63, 123
- astronomical unit 6, 15
- atomic mass or weight 93
- atomic number 93, 164
- B612 Foundation 302
- Barringer, Daniel 141–3
- Binzel, Richard 63, 123, 292
- Bode, Johann Elert 7, 9, 12
- Bode's Law 6
- bolide, *see* fireball
- Bus, Schelte “Bobby” 63
- Bus asteroid classification 63
- C-class asteroid
 - definition 60
 - distribution 64

- meteorite analog 126
 - specific asteroids, *see* 243 Mathilde, 101955 Bennu, 162173 (1999 JU₃)
- caldera 137
- carbonaceous chondrite
 - abundance 108
 - asteroid analogs 60
 - definition 108
 - excess xenon 182
 - interstellar grains within 183–4
 - organics 92
 - similarity to solar composition 109
 - types 108–11
 - water 92
- Cassidy, William 67–8
- Cassini, Giovanni 38, 196
- Centaur
 - definition 22
 - discovery 21
 - naming conventions 31
- Ceres, asteroid 1
 - adaptive optics imaging 278
 - classification 277
 - composition 277
 - discovery 11–12
 - dwarf planet 25
 - evidence of water ice 279
 - meteorite analogs 277
 - naming 12
 - orbit intersection with Pallas 15
 - size 41
 - spectra 277
 - structure 278
- Chapman, Clark 57, 59, 63
- Chelyabinsk impact
 - damage and injuries 133
 - fireball 133
 - meteorite 135
- Chesley, Steve 1, 88, 207
- Chladni, Ernst 72
- chondrites
 - carbonaceous, *see* carbonaceous
 - chondrite
 - classification 106–7
 - components, *see* meteorite components
 - definition 77
 - enstatite 111
 - equilibration 112
 - formation 77
 - ordinary, *see* ordinary chondrite
 - petrological types 112
 - shock grade or state 112
- chondrules
 - ages 181
 - classification 84
 - discovery 78
 - naming 78
 - origins 83–5, 180
- comets
 - Churyumov–Gerasimenko 264
 - coma 26
 - difference from asteroids 26
 - Elst–Pizarro 26
 - Jupiter family comet 268
 - naming conventions 28, 31
 - nucleus 26
 - Shoemaker–Levy 9 131
 - Tempel 1 268
 - volatiles 26
- Comprehensive Nuclear Test Ban Treaty Organization Preparatory Commission 90
- cosmogenic nuclide 173
- Cretaceous–Paleogene boundary
 - Chicxulub Crater 154
 - controversy over extinction 156–7
 - crater search 154
 - Deccan Traps 151
 - extinction 150
 - geological evidence of impact 155
 - impact hypothesis 151, 153
 - iridium enrichment 152
 - meteorite size 154
 - proper name 152
 - supernova hypothesis 153
- Cretaceous–Tertiary boundary, *see* Cretaceous–Paleogene boundary
- Dawes Limit 43
- Dawn mission
 - arrival at 4 Vesta 274
 - departure for 1 Ceres 277
 - goals 273–4
 - instruments 274
 - launch 274
 - major results, *see* Vesta, asteroid 4
- declination 10
- deuterium 93
 - deuterium/hydrogen ratio chondrites 94
 - comets 94

344 INDEX

- deuterium (cont.)
 - definition 93
 - Earth water 93
 - solar nebula 93
- differentiation 104
- Discovery Program 257
- E-class asteroid
 - definition 61
 - distribution 64
 - meteorite analog 126
- electromagnetic spectrum 49
- enstatite achondrite
 - asteroid analog 61, 264
 - asteroid parent body 127
 - definition 115
- ephemerides 13, 201
- Eros, asteroid 433
 - bulk density 261
 - internal structure 261
 - meteorite analogs 260
 - regolith ponds 260
 - size 222
 - space weathering 260
 - spectral type 260
- exposure age dating
 - clusters 176–7
 - cosmogenic nuclides 173
 - definitions 162
 - meteorite material strength 176
 - physics of 173
 - terrestrial age (time on Earth) 175
 - time in space 173–4
- false dawn, *see* zodiacal light
- fireball 3
 - definition 73
 - historical accounts 73, 85–7
 - link to asteroid belt 86
 - observation networks 86–7
- Gaffey, Michael 122, 127, 260
- Galilei, Galileo 38, 196
- Galileo spacecraft
 - discovery of asteroid moon Dactyl 244, 256
 - flyby 243 Ida 243, 256
 - flyby 951 Gaspra 243, 255
 - launch 243
- Gilbert, Grove Carl 138
- gravity tractor 304
- Harris, Alan W. 295
- Harvey, Ralph 68
- Hayabusa mission
 - goals 269
 - instruments 270
 - launch 270
 - loss of signal and recovery 271
 - major results, *see* Itokawa, asteroid 25143
 - naming of mission 258
 - touchdown on Itokawa 270
- Helin, Eleanor 29–30, 32, 238
- helium-3 214–15
- Herschel, William
 - coins the term asteroid 13
 - discovery of Uranus 8
 - early life 8
 - volcanism on the Moon 81
- Hildebrand, Alan 132, 154
- Hirayama, Kiyotsugu 208
- Hirayama families
 - Beagle 212
 - computer simulations 210
 - criteria 210
 - dating 211
 - definition 209
 - Eos 208
 - Flora 209
 - Karin 210
 - Koronis 208
 - Themis 208
 - Veritas 212, 216
- Howard, Edward C. 78
- impacts
 - avoidance, *see* impact threat responses
 - Chelyabinsk, *see* Chelyabinsk impact
 - damage from 149–50, 297–8
 - dinosaur extinction, *see* Cretaceous–Paleogene boundary
 - frequency of 295–7
 - National Research Council Report 297
 - power-law scaling 147
 - search programs, *see* asteroid search programs
 - Tunguska, *see* Tunguska impact
- impact threat responses
 - civil defense 304
 - deflection options 304
 - gravity tractor deflection 304
 - impact deflection 305
 - manned missions 306–8

- nuclear options 305
- overview of strategies 303
- Infrared Astronomical Satellite (IRAS)
 - asteroid discoveries 52
 - launch 49
 - wavelengths 51
 - zodiacal cloud discoveries 211
- infrasound
 - definition 88
 - monitoring network 90
- International Astronomical Union
 - asteroid naming body xiii, 28
 - Minor Planet Center 291
 - Pluto demotion 24
- interplanetary dust particles 176, 213
- iron meteorites
 - classification 116–18
 - kamacite 118
 - magmatic 118
 - Neumann lines 118
 - number of parent bodies 119
 - origin 117
 - size of parent body 118
 - taenite 118
 - Widmanstätten/Thomson pattern
 - 116–17
- Itokawa, asteroid 25143
 - bulk density 271
 - contact binary structure 272
 - internal structure 271
 - Hayabusa mission, *see* Hayabusa mission
 - meteorite analogs 271
 - naming 31
 - origin 272
 - regolith pond 272
 - shape from radar 241
 - size 269
 - space weathering 271
 - spectral type 269
- Jenniskens, Peter 3, 91
- Kepler, Johannes 5, 192
- Kepler's Laws of Planetary Motion 193
- Kirkwood, Daniel 198
- Kirkwood gaps 198
- Kowalski, Richard 1, 88
- Lagrange, Joseph-Louis 19
- Lagrangian points 20, 301
- Late Heavy Bombardment, *see* Lunar Cataclysm
- Le Verrier, Urbain 18, 22, 199
- lightcurve
 - amplitude 228
 - asteroid database 227
 - definition 226
 - measurement of obliquity 228
 - methods 226
 - shapes from, *see* asteroid shapes
- Louis, Jacques, Comte de Bournon 78
- Lowell, Percival 22–3
- Lunar Cataclysm
 - alternative hypotheses 179
 - evidence for 178–9
 - Nice Model 188
- Lutetia, asteroid 21
 - bulk density 265
 - internal structure 267
 - meteorite analogs 265
 - Rosetta flyby 265
 - size 265
 - spectral type 264
- M-class asteroid
 - definition 60
 - distribution 64
 - meteorite analogs 61, 126
 - spectra 60
- maar 137
- magnitude scale 24, 44
- mass spectrometer
 - invention 170–1
 - on Rosetta spacecraft 172
 - secondary ion mass spectrometer 171
- Mathilde, asteroid 253
 - bulk density 263
 - internal structure 263
 - meteorite analogs 263
 - size 263
 - slow rotation 263
 - spectral type 263
- Meteor Crater 131, 138
 - Barringer 141–3
 - description 138
 - Gilbert's hypothesis 140
 - hypotheses for origin 138
 - meteorite, Canyon Diablo 168
 - object that created 145
 - Shoemaker maps 143–4

346 INDEX

- meteorite ages
 - exposure 162
 - formation 161
 - terrestrial 175
 - shock or gas retention 162
- meteorite components
 - calcium–aluminum inclusions 179
 - chondrules, *see* chondrules
 - fusion crust 77
 - groundmass or earthy consistence 78
 - impact melt 113
 - pyrites 78
 - refractory compounds 181
 - suevite 144–5
 - volatiles, *see* carbonaceous chondrites
- meteorites, general
 - achondrites, *see* achondrites
 - Antarctic search program 68, 120
 - chondrites, *see* chondrites
 - classification, early systems 103
 - fall 99
 - find 99
 - fusion crust 75, 77
 - iron, *see* iron meteorites
 - Japanese National Institute of Polar Research 68
 - Meteoritical Bulletin Database 119, 121
 - naming conventions 4
 - native irons 77
 - organics 92, 95
 - origins 75, 80–1
 - panspermia 94
 - parent body, *see* parent body
 - percentages of each type (136) 77
 - stony 77
 - stony-iron 103, 116
 - strewn field 2
- meteorites, named
 - Abee (enstatite chondrite) 111
 - Alais (CI-chondrite) 108
 - ALH81005 (lunar) 120
 - Allende (CV-chondrite) 109, 182
 - Almahata Sitta (urelite) 4, 99, 115, 121
 - Bencubbin (CB-chondrite) 111
 - Brenham (pallasite) 97
 - Canyon Diablo (iron) 118, 168
 - Chelyabinsk (ordinary chondrite) 112, 135
 - Ensisheim (ordinary chondrite) 69
 - Innisfree (ordinary chondrite) 87
 - Ivuna (CI-chondrite) 108
 - Karoonda (CK-chondrite) 110
 - Krasnoyarsk (pallasite) 72, 117
 - L'Aigle (ordinary chondrite) 76
 - Lost City (ordinary chondrite) 87
 - Mighei (CM-chondrite) 109
 - Murchison (CM-chondrite) 92, 109, 182
 - Neuschwanstein (enstatite chondrite) 87
 - Nogata (ordinary chondrite) 69
 - Odessa (iron) 118
 - Orgueil (CI-chondrite) 108
 - Ornans (CO-chondrite) 110
 - Pribram (ordinary chondrite) 86
 - Renazzo (CR-chondrite) 110
 - Siena (ordinary chondrite) 75
 - Sikhote-Alin (iron) 85
 - Stannern (eucrite) 113
 - Vigarano (CV-chondrite) 109
 - Wold Cottage (ordinary chondrite) 76
 - Yamato 791197 (lunar) 120
- Minor Planet Center 283, 291
- missions
 - Dawn, *see* Dawn mission
 - Deep Impact 305, 267
 - Galileo, *see* Galileo mission
 - Hayabusa, *see* Hayabusa mission
 - Hayabusa-2 280
 - Infrared Astronomical Satellite (IRAS) 49
 - NEAR-Shoemaker, *see* NEAR-Shoemaker
 - NEOWISE 55
 - OSIRIS-ReX 280–1
 - Rosetta, *see* Rosetta mission
 - WISE 54
- National Research Council/National Academies report 297
- near-Earth asteroids
 - Amor 17
 - Apollo 17, 20
 - Aten 17
 - Atira, Aphohele 18
 - definition 16
 - naming conventions 30
 - numbers of 296
 - potentially hazardous object 297
 - threat, *see* impact threat responses
- Near-Earth Object Dynamic Site (NEODyS) 283, 292

- Near-Earth Object Program Office
 - 291
- near-infrared, *see* reflected infrared
- NEAR-Shoemaker mission
 - flyby of 253 Mathilde 262
 - instruments 259
 - landing on 433 Eros 255, 261
 - loss of signal and recovery
 - 253–5
 - major results 259–61
 - naming of mission 258
 - safe modes 254
- Nesvorný, David 125, 210
- Nice Model
 - distribution of asteroids 189
 - grand tack 189
 - Lunar Cataclysm 188
 - origin 187–8
 - Trojan asteroids 189
- nuclear weapons 2
- observatories
 - Arecibo radar 219, 231
 - Goldstone radar 231, 233
 - Keck 39, 43
 - Lowell 23
 - Mauna Kea 35, 43
 - NASA Infrared telescope facility
 - 36
 - Ondrejov 86
 - Palermo 10
- occultation
 - 2 Pallas 221
 - 420 Beolha 223
 - 433 Eros 222
 - definition 221
- ocean cores 215
- opposition surge 48
- orbital properties
 - aphelion 17
 - argument of perihelion 196
 - ascending node 196
 - eccentricity 193
 - ecliptic plane 196
 - ellipse 193
 - ephemerides 13, 201
 - inclination 196
 - mean motion 195, 198, 208
 - opposition 30, 48
 - perihelion 17
 - precession 199
 - resonance 25, 197
 - secular resonance 200
 - semi-major axis 16, 193
 - vernal equinox 10, 196
- ordinary chondrite
 - abundance 107
 - H-chondrite 108
 - L-chondrite 108
 - LL-chondrite 108
- Ostro, Steven xiv, 238, 240
- Palermo circle 10
- Pallas, asteroid 2
 - discovery 14–15
 - meteorite analog 110
 - occultation 221, 223
 - size and shape 231
 - spectra 58
- Pallas, Simon Peter 70
- pallasites
 - Brenham 97
 - description 70, 73, 116
 - Krasnoyarsk 72
 - origin 116
- panspermia 94
- parent body
 - definition 103
 - destruction by impact 105
 - differentiation 104
 - link to meteorites 105–6
 - onion-shell model 104
- Patterson, Clair 168
- Permian extinction
 - causes 151
 - Siberian traps 151
 - time frame 151
- petrographic microscope 81–2
- phase angle 46
- Piazzi, Giuseppe 10
- Planck's Law 50
- Plutino 25
- Pluto
 - discovery 23
 - planet status 24
- polarized light 82
- potentially hazardous object, *see* near-Earth asteroid
- Poynting, John H. 202
- Poynting–Robertson Effect 203

348 INDEX

- radar
 - active mode 221
 - continuous wave mode 236–8
 - delay depth 238
 - delay time 234
 - delay-Doppler imaging 238–9
 - Doppler Effect 235
 - Doppler frequency 234
 - imaging 238–9
 - observatories, *see* observatories
 - orbital ephemerides 235
 - passive mode 221
 - power 233, 234
 - shapes from, *see* asteroid shapes
 - wavelengths 233–4
- radioactive dating
 - age of the Earth 170
 - alpha-particle emission 166
 - assumptions 165–6
 - beta-particle emission 166
 - calcium–aluminum inclusions 180
 - chondrules, *see* chondrules
 - explanation 164
 - exponential decay law 164
 - exposure age, *see* exposure age dating
 - extinct isotope dating 181
 - formation age 161
 - half-life 164
 - isochron 168
 - isotopes 164
 - lead–lead 168
 - parent–daughter 164
 - shock age (aka gas retention age) 162
 - uranium–helium 166
 - uranium–lead 165, 167
- radioactivity
 - definition 163
 - discovery 163
- reflectance spectra
 - absorption feature 58
 - ambiguities 126, 128
 - asteroid 58
 - definition 56
 - laboratory 58
 - space weathering effects 122–3
 - telescopic 58
- reflected infrared 49
- right ascension 10
- Robertson, Howard P. 203
- rock, descriptive terms
 - basalt 100
 - breccia 101, 121
 - chemical weathering 100
 - clast 100
 - hydrothermal metamorphism 102
 - igneous 100
 - mechanical weathering 100
 - metamorphic 102
 - monomict 121
 - plutonic 100
 - polymict 121
 - regional metamorphism 102
 - sedimentary 101
 - shock metamorphism 102
 - volcanic 100
 - xenolith 121
- Rosetta mission
 - launch 264
 - flyby 21 Lutetia 265
 - flyby 2867 Steins 264
 - orbit Comet 67P/
Churyumov–Gerasimenko 264
- S-class asteroid
 - 243 Ida and Dactyl 243
 - 433 Eros, *see* Eros, asteroid 433
 - 951 Gaspra 243, 255
 - 25143 Itokawa, *see* Itokawa, asteroid
25143
 - conundrum 122
 - distribution 64
 - meteorite analog 122, 126
 - space weathering on 122
- secondary ion mass spectrometer 166
- Sentinel Space Telescope, *see* B612
Foundation
- Sentry Warning System 291
- Shoemaker, Eugene 258
- Shoemaker–Levy 9
 - discovery 132
 - impact into Jupiter 132
- Small Bodies Assessment Group (SBAG) 307
- solar nebula
 - first solids 186
 - formation 184–6
 - Nice Model 187–8
 - parent body formation 186
 - snow line 186
- solar wind 122–3, 162, 173, 203, 214
- Sorby, Henry Clifton

- chondrule descriptions 83
- chondrule origins 84
- petrographic microscope 81
- space weathering
 - factors 125
 - lunar 122
 - mechanisms 122–3
 - observed in asteroid families 125
 - Q-class asteroid 123
 - S-class conundrum 119, 120
 - Sq-class 124
- Steins, asteroid 2867
 - internal structure 264
 - meteorite analogs 264
 - rapid rotation 264
 - size 264
 - spectral type 264
- strewn field 2
- Tambora volcanic eruption 153
- telescopes
 - adaptive optics, *see* adaptive optics
 - charge-coupled device camera 41
 - limiting magnitudes 289
 - reflecting 39
 - refractor 38
 - resolution 39, 42–3
 - seeing 42–3
 - spectra 2, 241
- terrestrial craters
 - caldera 137
 - Coon Butte, *see* Meteor Crater
 - maar 137
 - Meteor Crater, *see* Meteor Crater
 - origins debated 135
 - Ries Crater 145
 - Teapot Ess 144
 - Vredefort Crater 145
- thermal inertia 205
- thermal infrared
 - definition 49
 - peak wavelengths 50
 - principles 50
 - use in estimating asteroid diameter 54
- Tholen, David 61, 283
- three-body problem 19
- Titius, Johann Daniel 6
- Tombaugh, Clyde 22
- Torino Scale 292–3
- trans-Neptunian objects
 - definition 24
 - discovery 24
 - naming conventions 31
 - Pluto 25
 - Plutino 25
- Trojan asteroids
 - definition 19–20
 - naming conventions 31
 - Nice Model 189
 - spectra 61, 65
- Tunguska impact
 - damage 149–50
 - observations 148
- uniformitarianism 163
- V-class asteroid, meteorite analog 127
- vernal equinox 10
- Vesta, asteroid 4
 - bulk density 276
 - carbonaceous contamination 277
 - classification 123, 127
 - composition 273, 275
 - core 276
 - differentiation 273
 - discovery 15
 - impact basins 275, 276
 - magnitude 45
 - meteorite analogs 273, 277
 - size 41, 276
 - spectra 58
 - structure 273
 - variation in albedo and composition 274
- Vestoids 276
- Vulcan 18, 200
- water
 - deuterium 93
 - in comets 92
 - isotopes 93
 - origin on Earth 92
 - presence in meteorites 92
 - resource for mining 309–10
 - solar nebula 92
- Widmanstätten, Count Alois von Bech 116
- Yarkovsky, Ivan O. 204
- Yarkovsky Effect
 - effect on ephemerides 207

350 INDEX

Yarkovsky Effect (cont.)	time needed 248
explained 205	
rotation differences 205–6	zodiacal cloud
time needed 207	definition 192
YORP Effect	formation 192
asteroid named for 248	narrow dust bands 211
discovery 247	zodiacal light
effectiveness 248	Arabian sky watchers 191
evidence 248	cause, <i>see</i> zodiacal cloud
forming binary asteroids 247	European observations 191