

Index

- A** Abell 426, 101
 Acrux, 388, 392, 394, 400
 adaptive-optics camera, 180, 184, 188
 Advanced Satellite for Cosmology and
 Astrophysics, 406
 AE Aurigae, 122–125
 Albireo, 87, 148, 172
 Aldebaran, 164–166
 Algol, 461
 Allen, David A., 93
 Allen, Richard Hinckley, 10, 63, 288, 363, 418, 423
 Alpha Persei Moving Cluster, 339
 al-Sufi, Abd al-Rahman, 340
 American Association of Variable Star
 Observers, 181
 Ames, Adelaide, 307
 Andromeda Galaxy. *See* M31
 Anglo-Australian Observatory, 259, 266, 357
 Antlia-Hydra Cloud, 192
 Apis, 423
 Apis Indica, 423
 apparent magnitudes, 8–10
 Apus, 423
 Archinal, Brent, 8
 and catalog/atlas discrepancies, 27, 145–146,
 198–199, 432
 and galaxies, 202
 and globular clusters, 105, 172, 419
 and nebulae, 80
 and open clusters, 20, 59–60, 86, 113, 286,
 298, 382, 385, 402–403
 Arcturus, 1
 Arecibo, 192
 Arnett, Bill, 257
 Arp, Halton C., 76, 267, 332
 Ashbrook, Joseph, 318–319
 astronomical atlases
 discrepancies between, 20, 86, 144–146, 286,
 384–385, 398, 432
 Millennium Star Atlas, 14, 52, 67, 79, 86, 95,
 103, 136, 144, 146, 153, 165, 172, 192,
 206, 269, 286, 347, 374, 385, 398, 428
 Skalnate Pleso *Atlas of the Heavens*, 143, 397
 Sky Atlas 2000.0, 14, 20, 46, 52, 79, 86, 143–144,
 153, 159, 198, 240, 286, 384–385, 398, 416,
 428, 431–432, 436, 438
 Uranometria, 318–319, 381, 413, 418, 423, 426
 Uranometria 2000.0, 14, 46, 52, 86, 144, 153,
 198, 269, 286, 385, 398, 428, 432
 astronomical catalogs
 discrepancies between, 144–146, 197–199,
 228, 294, 398–399, 419, 432
 of James Dunlop, 274, 278, 285, 288, 312,
 315, 320, 337, 343, 346, 351, 372, 395,
 410, 420, 424
 General Catalogue of Nebulae (GC), xiii, 7,
 50, 92, 145, 198
 of William Herschel, 7–8, 461–462, 466
 of Nicolas Louis de Lacaille, 284–285, 320,
 341, 343, 358, 378, 382, 384, 389, 413, 418
 Messier Catalog, vii, 19, 30, 305, 336,
 432–433, 449–453
 New General Catalogue of Nebulae and
 Clusters of Stars (NGC), 7, 86, 145, 152,
 223, 279, 466
 prefixes in, 12
 Revised New General Catalogue of Nonstellar
 Astronomical Objects (RNGC), 86
 Athens Observatory, 182
 Auckland Observatory, 5, 418, 422, 425, 427
 Australia Telescope Compact Array, 374
- B** Baade, Walter, 101, 104, 255, 307
 Bailey, Solon, 169–170
 Balick, Bruce, 34, 69, 93, 115, 220–221
 Barker, Edmond S., 145
 Barlow lens, 4, 226
 Barnard 48, 303, 304
 Barnard 205, 436
 Barnard, Edward Emerson, 94, 183–184,
 197–198, 227, 274, 393, 432
 Barnard's Galaxy (Caldwell 57), 227–230
 Barrado y Navascués, David, 340
 Baume, Gustavo, 301

- Bayer, Johann
 constellations created by, 418, 423, 426
 and Greek letters for stars, 318–319
Uranometria. See astronomical atlases
- Bennett, Jack, 337
- Bettoni, Daniela, 160
- BF Centauri, **388**, 390
- Bigourdan, Guillaume, 319–320, 432
- binary stars
 in Caldwell 56, 226
 and core collapse in globular clusters, 372–373
 double stars and, 462
 Eta Carinae as, 365
 evolution of, 343
- Black Forest Star Party, 113
- black holes, 213, 279, 308, 333
- Blinking Planetary Nebula (Caldwell 15), **68–71**
- Blow, Graham, 368
- blue stragglers, 189, 216, 289, 372, 415–416, 425
- Bode, Johann Elert, 456
- Bok, Bart J., 195, 369
- Bok globules, 195
- Bond, George P., 9, 306
- Bond, Howard, 226
- Bond, William Cranch, 9
- Bortle, John, 450–451
- Bottari, Claudio, 117
- Bow-Tie Nebula (Caldwell 2), 9, **22–23**
- Box Galaxy (Caldwell 21), **89–91**
- Brandl, Bernhard, 406
- Braun, W. G., 74
- Brown, Peter Lancaster, 453
- brown dwarfs, 246, 340
- Bruck, Mary T., 349
- Bubble Nebula (Caldwell 11), **52–54**
- Bug Nebula (Caldwell 69), **274–276**
- Burbidge Chain, 247
- Burnham, Jr., Robert, 124, 179, 229, 235, 438
- Burnham's Celestial Handbook*, 6, 31, 39, 94, 99,
 133, 143, 155, 212, 384, 449
- BZ Crucis, **391**, 394–395
- Caldwell 1, **19–21**
- C** Caldwell 2, 9, **22–23**
 Caldwell 3, **24–26**
 Caldwell 4, 7, **27–29**
 Caldwell 5, 7, **30–32**, 150
 Caldwell 6, **33–36**
 Caldwell 7, **37–40**
 Caldwell 8, **41–43**, **64**
 Caldwell 9, **44–48**
 Caldwell 10, **49–51**, **64**
 Caldwell 11, **52–54**
 Caldwell 12, **55–57**
 Caldwell 13, **58–61**, **64**
 Caldwell 14, **62–67**, **64**, **449–453**
 Caldwell 15, **68–71**, **87**
 Caldwell 16, **72–74**
 Caldwell 17, **75–78**
 Caldwell 18, **75–78**
 Caldwell 19, **79–92**
 Caldwell 20, **83–88**, **87**
 Caldwell 21, **89–91**
 Caldwell 22, **92–95**, 121
 Caldwell 23, **96–99**, 150–151, 153
 Caldwell 24, **100–103**
 Caldwell 25, **104–106**
 Caldwell 26, 13, **107–108**
 Caldwell 27, **87**, **109–111**
 Caldwell 28, **112–114**
 Caldwell 29, **115–117**
 Caldwell 30, **118–121**
 Caldwell 31, **122–125**
 Caldwell 32, **126–128**, 435
 Caldwell 33, **87**, **129–134**
 Caldwell 34, **87**, **129–134**
 Caldwell 35, **135–138**
 Caldwell 36, **139–142**
 Caldwell 37, 8, 13, **87**, **143–149**
 Caldwell 38, **150–153**, 441
 Caldwell 39, **154–158**, **155**
 Caldwell 40, **159–161**
 Caldwell 41, 13–14, **162–168**, **165**, 339, 437
 Caldwell 42, **169–172**
 Caldwell 43, **173–176**

- Caldwell 44, **173**, 176–178
 Caldwell 45, **179**–181
 Caldwell 46, **182**–186, **183**
 Caldwell 47, **187**–190
 Caldwell 48, **191**–193
 Caldwell 49, 14, **194**–201
 Caldwell 50, **194**–201
 Caldwell 51, **202**–206
 Caldwell 52, **207**–210
 Caldwell 53, **211**–214
 Caldwell 54, **215**–217
 Caldwell 55, **218**–222, **220**
 Caldwell 56, **223**–226
 Caldwell 57, **227**–230
 Caldwell 58, **231**–233
 Caldwell 59, **234**–238, **440**
 Caldwell 60, 102, **239**–244, **241**
 Caldwell 61, 102, **239**–244, **241**
 Caldwell 62, **245**–247
 Caldwell 63, **248**–253, **250**, **253**
 Caldwell 64, **254**–257
 Caldwell 65, **258**–262, **260**, **439**
 Caldwell 66, **263**–265
 Caldwell 67, **266**–269
 Caldwell 68, **270**–273, **271**, **442**
 Caldwell 69, **274**–276
 Caldwell 70, **277**–283
 Caldwell 71, **284**–287
 Caldwell 72, **277**–283
 Caldwell 73, **288**–291
 Caldwell 74, **292**–295, **293**
 Caldwell 75, **296**–299
 Caldwell 76, **300**–304, **302**, **304**
 Caldwell 77, **305**–310, **307**, **309**
 Caldwell 78, **311**–313
 Caldwell 79, **314**–317, **377**
 Caldwell 80, **318**–323, **413**
 Caldwell 81, **324**–327
 Caldwell 82, **328**–331
 Caldwell 83, **332**–335
 Caldwell 84, **336**–338
 Caldwell 85, **339**–341
 Caldwell 86, 274, **342**–344
 Caldwell 87, **345**–347, **412**
 Caldwell 88, **348**–350
 Caldwell 89, 14, **351**–353
 Caldwell 90, **354**–357, **356**
 Caldwell 91, **358**–360, **377**
 Caldwell 92, **ix**, **361**–369, **363**, **377**
 Caldwell 93, **370**–374
 Caldwell 94, **376**–380, **377**
 Caldwell 95, **381**–383
 Caldwell 96, **377**, **384**–387
 Caldwell 97, **377**, **388**–390
 Caldwell 98, **377**, **391**, 395–396
 Caldwell 99, **377**, **391**–396
 Caldwell 100, 8, 13, 14, **377**, **397**–401
 Caldwell 101, **371**, 374–375
 Caldwell 102, 339, **377**, **402**–404
 Caldwell 103, **405**–408, **406**
 Caldwell 104, **409**–413, **411**
 Caldwell 105, 3, 5, **377**, **417**–420
 Caldwell 106, 321, **409**, **411**, **413**–416
 Caldwell 107, 5, **423**–425
 Caldwell 108, 5, **377**, **417**, **420**–422
 Caldwell 109, 5, **426**–429, **428**
 Caldwell Catalog
 creation of, vii–viii
 errors in original publication of, 12–14,
 398–399
 Camelopardalis, 40
 Canada-France-Hawaii Telescope (CFHT), 180,
 184, 204
 Canes Venatici Spur, 115
 Capa, Cristina E., 110
 Cape of Good Hope, 7, 236, 258, 278, 284, 297,
 300, 345, 372, 407, 418
 Carter, David, 266
 Carter Observatory, 368, 414
 Cat's Eye Nebula (Caldwell 6), **33**–36, **34**
 Cave Nebula (Caldwell 9), **44**–48
 Centaurus A (Caldwell 77), **305**–310, **307**, **309**
 Cepheid variable stars, 29, 205, 351
 CFHT. *See* Canada-France-Hawaii Telescope

- challenging targets
 galaxies, 26, 91, 98, 107, 152–153, 202–206,
 247, 252–253, 412–413
 nebulae, 35–36, 47–48, 81, 111, 195, 234
 star clusters, 51, 60, 104–106, 256
 stars, 94–95, 201
- Chamaeleon, 426
- Christmas Tree, 185
- Clark, Roger N., 25–26, 31, 91, 95, 113, 124, 437
- Clark, Tom and Jeannie, 54, 133, 368
- Clerke, Agnes, 414
- Close, Laird M., 184
- Clown-Face Nebula (Caldwell 39), 154–158, 155
- Coalsack (Caldwell 99), 377, 391–396
- Cocoon Nebula (Caldwell 19), 79–92
- Coe, Steve, 235–236, 280, 295
- Cogshall, Wilbur A., 134
- Collinder, Per Arne, 27, 145–146, 397
- Collinder 228, 368
- Collinder 249 (Caldwell 100), 8, 13, 14, 397–401
- Collinder 416, 146
- Collinder 417, 146
- Collinder 428, 88
- Collinder 429, 27
- Collins, Peter, 68
- Coma Cluster, 136
- Coma-Sculptor Cloud, 32, 38, 56, 77, 151
- comets
 Halley's, 309
 methods of searching for, 450–453
 Shoemaker-Levy 9, 282
- Cone Nebula, 185
- constellations
 boundaries redefined, 20, 191
 defined by Bayer, 418, 423, 426
 defined by Keyser and de Houtman, 370
 defined by Lacaille, 345, 418
- Cooper, Ian, 360
- Copeland, Leland, 92, 185
- Cor Caroli, 126
- Corona Australis, 311
- Corvus Cloud, 243
- Corwin, Harold G., 147–148, 202, 281
- Crab Nebula (M1), 131
- Crescent Nebula (Caldwell 27), 109–111
- Crux, 376
- Curtis, Heber D., 22, 306
- Cygnus Loop, 130, 132
- D** Dark Doodad, 420
- dark matter, 246
- dark nebulae, nature of, 392–393
- data sources, 10–12
- Davidson, Kris, 364
- Dawes, William, 9
- de Bruijpe, Jos, 166
- Deep-Sky Wonders*, 6, 236
- de Houtman, Frederick, 370, 413
- Dejonghe, Herwig, 208
- Delgado, Rosa M. Gonzalez, 178
- Delporte, Eugene, 20
- Delta Geminorum, 156–157
- Delta Scuti variable stars, 256
- Deneb, 84, 87–88
- Denning, William E., 30
- density waves
 and star formation in spiral galaxies, 328–329
- de Vaucouleurs, Gérard, 126–127, 212, 281
- Digitized Sky Survey (DSS), 16, 399, 467–468
- Double Cluster (Caldwell 14), 62–67, 449–453
- double stars
 binary stars and, 462
 in Caldwell 41, 167–168
 Herschel's catalogs of, 461
- drawing deep-sky objects, 16–18
- Dreyer, Johann Louis Emil, 7, 145, 279
 on William Herschel, 466
- DSS. See Digitized Sky Survey
- Dunlop, James
 catalog of southern deep-sky objects by, 278
 and galaxies, 278, 305–306, 335
 and globular clusters, 288–289, 312, 320, 337,
 372, 410, 420–421, 424
 John Herschel and, 278–279, 424

- and nebulae, 271, 274, 362
 and open clusters, 297, 303, 330, 351, 358, 389
- dust
 in Caldwell 99, 392–393
 in Caldwell 104, 412
- dust lanes
 in Caldwell 20, 84
 in galaxies, 97–98, 115, 150–153, 175, 177, 306–310
 in the nucleus of Caldwell 52, 208
- dwarf galaxies
 accompanying M31, 75–78
 dark matter in, 246
 globular clusters as nuclei of, 324–325
- E** EGGs. *See* Evaporating gaseous globules
- 18 Vulpeculae, 146
 80 Tauri, 167
 81 Tauri, 167
 Einstein satellite, 110, 266
 Electric Arc (Caldwell 43), 173–176
 elliptical galaxies
 dust lanes and stellar disks within, 208
 and the Hubble sequence, 139–140, 207
 as X-ray emitters, 101
 Elmegreen, Debra M., 180
 Eridanus Cloud, 266
 Eskimo Nebula (Caldwell 39), 154–158, 155
 Espin, Thomas E., 79
 E.T. Cluster (Caldwell 13), 58–61
 Eta Carinae, 363–365
 Eta Carinae Nebula (Caldwell 92), ix, 361–369, 363, 377
 European Southern Observatory
 New Technology Telescope, 208, 346
 Very Large Telescope, 274
 Evans, Rev. Robert, 309
 evaporating gaseous globules (EGGs), 53
 eye, anatomy of, 68–69
 Eye Nebula (Caldwell 59), 234–238, 440
- F** False Comet, 302
- False Comet Cluster (Caldwell 76), 300–304, 302, 304
 Fan, Zuhui, 56
 fast low-ionization emission regions (FLIERs), 69–71, 94, 237
 Ferris, Timothy, 102–103, 179
 Filamentary Nebula (Caldwell 34), 129–134
 Fisher, J. Richard, 115
 Flaming Star Nebula (Caldwell 31), 122–125
 Flammarion, Camille, 429
 Flamsteed, John, 196
 FLIERs. *See* fast low-ionization emission regions
 Fornax Cluster, 266
 47 Tucanae (Caldwell 106), 321, 409, 413–416
 FP Virginis, 181
 Fremont Park Observatory, 257
 Frost, Robert, 2, 414
- G** galactic structure
 globular clusters and, 169–170
 galaxies. *See also* dwarf galaxies, elliptical galaxies, irregular galaxies, lenticular galaxies, spiral galaxies, and starburst galaxies
 bars in, 24–25
 classification of, 8, 139–140, 207–208
 collision of or interaction between, 90, 101–102, 127, 137, 160–161, 192, 240, 243, 307
 dust lanes in, 97–98, 115, 150–153, 175, 177, 267, 306–310
 and 18th- and 19th-century perceptions of universe, 8, 89, 119, 178
 hot spots in, 180
 Hubble sequence of, 139–140
 orbital motions within, 160–161
 Seyfert, 101–102, 115, 266, 305
 velocities of, 76
 Gamma Centauri, 398
 Gamma Delphini, 172
 Geffert, Michael, 437
 Geisler, Douglas, 149
 Gemini North Telescope, 189

- General Catalogue of Nebulae (GC)*. *See* astronomical catalogs
- George III, 456, 458
- Georgium Sidus. *See* Uranus
- Ghost Globular. *See* NGC 5897
- Ghost's Goblet (Caldwell 8), 41–43
- Ghost of Jupiter (Caldwell 59), 234–238, 440
- Gingerich, Owen, 285, 449, 450
- globular clusters
- ages of, 289, 324
 - blue stragglers in, 189, 289, 372, 415–416, 424–425
 - core collapse of, 312, 372–373
 - evolution of, 289, 324, 343, 372, 406
 - extragalactic, 102, 151, 416
 - and galactic structure, 169–170, 410–411
 - William Herschel and, 465
 - orbital motions of, 263–264, 314–315
 - variable stars in, 169–170, 336, 422, 425
- Glyn Jones, Kenneth, 380
- Gómez, Yolanda, 275
- Gonzales, Guillermo, 315
- Gould, Benjamin Apthorp, 413–414
- Graham, John A., 271
- Great Sculptor Galaxy (Caldwell 65), 258–262, 260, 439
- Great Square of Pegasus, 174
- Greek letters
- in star names, 318–319
- Green, Daniel W. E., 450
- Green, David A., 110–111
- Gum Nebula, 387
- H** Hall, Rob and Lesley, 5, 411
- Halley, Edmond, 319, 362, 413
- Halley's Comet, 309
- Handler, Gerald, 70
- Hanover (Germany), 454
- Harby, Bill, 394
- Hardy, Thomas, 392–393
- Harris, William E., 104, 264, 289, 373, 419, 424
- Hartung, Ernst J.
- and galaxies, 181, 208, 212
 - and globular clusters, 325, 347, 412, 437
 - and nebulae, 295, 356
 - and open clusters, 166, 232–233, 254, 299, 303, 331
- Harvard College Observatory, 169
- Oak Ridge Station, 151
 - refractors of, 9, 132, 249, 307
- Harvard-Smithsonian Center for Astrophysics, 68
- Hawaii
- light pollution in, 4–5
 - volcanic smog (vog) above, 2–3
- Hawaii Volcanoes National Park, 2
- Hazen, Martha, 264
- HD 111973, 376, 379–380
- HD 112887, 135, 137
- HD 150136, 329–331
- HD 192163, 109–110
- HD 192182, 111
- HD 199579, 84–85
- HD 200775, 28–29
- Head, Marilyn, 374
- Heckman, Timothy, 115
- Helix Nebula (Caldwell 63), 248–253, 250, 253
- Herbig, George, 183
- Herschel, Caroline, 96, 231–232, 258, 455–458, 466
- Herschel, John, 7, 9–10, 145–147, 177, 188, 198, 320, 354, 364, 407
- James Dunlop and, 278–279, 424
- Herschel, William, 6, 27, 119, 188, 223, 234–235, 454–466
- catalogs published by, 461–462, 466
 - categories of deep-sky objects, 8
 - and 18th-century perception of universe, 8, 89, 119, 178, 392
 - family and musical career, 454–455
 - and Immanuel Kant's hypothesis, 178
 - planetary observations by, 458–460
 - telescopes of, 455–459, 458
 - discovery of Uranus by, 456

- Hevelius, Johannes, 72, 81, 452
 Hipparcos satellite, 123, 165, 181, 261, 380, 385, 403
 Hockey Stick (NGC 4656/7), **126**, 127, 435–436
 Hodge, Paul, 77
 Hodierna, Giovanni Batista, 254–255, 300
 Hogg 15, **391**, 395
 Hogg, David E., 192
 Hogg, Helen Sawyer, 105, 336
 Holmberg, Erik B., 107
 Hoogerwerf, Ronnie, 123
 Hoopes, Charles, 108
 Horologium, 345
 Horseshoe Cluster (Caldwell 10), **49–51**
 Houston, Walter Scott, 6, 19, 199, 212, 234–236, 242, 322
 Hydra Hysteria, 263
 HST. *See* Hubble Space Telescope
 H II regions, 45–46, 255–256, 362, 405
 in galaxies, 38–39, 178, 259, 267, 374–375
 star formation in, 32
 Hubble, Edwin P., 30, 108, 182–183, 192, 227
 galaxy classification and, 139–140, 207
 Hubble Space Telescope (HST)
 and black holes, 213, 308
 and galaxies, 90, 102, 136, 180, 259, 308, 435
 and nebulae, 69, 93, 134, 220, 292–293, 428
 and star clusters, 151, 189, 286, 416
 Hubble's Variable Nebula (Caldwell 46), **182–186**
 Huggins, William, 33, 236
 Humason, Milton L., 30
 Hutchings, John B., 228
 Hyades (Caldwell 41), 13–14, **162–168**, 339, 437
 stereogram of, **165**
 Hynes, Steven J., 11, 69, 385, 438
- I** IAU. *See* International Astronomical Union
 IC 342 (Caldwell 5), 7, **30–32**, 150
 IC 405 (Caldwell 31), **122–125**
 IC 410, **122**, 124
 IC 1340, 133
 IC 1496 (Caldwell 19), **79–92**
 IC 1590, 431–432
 IC 1613 (Caldwell 51), **202–206**
 IC 2391 (Caldwell 85), **339–341**
 IC 2488, 357
 IC 2602 (Caldwell 102), 339, **377**, **402–404**
 IC 2944, 8, **397–401**
 IC 2948, **397–401**
 IC 4628, 303–**304**
 IC 4637, 303
 IC 4651, 326–327
 IC 4677, 35–36
 IC 4812, **270**, 272
 IC 4836, 374
 IC 4842, 374
 IC 4845, 374
 IC 5067, 84
 IC 5070, 84
 Iddings, Joseph P., 134, 154
 Infrared Astronomical Satellite (IRAS), 110, 196, 208
 Intergalactic Tramp (Caldwell 25), **104–106**
 Intergalactic Wanderer. *See* Intergalactic Tramp
 International Astronomical Union (IAU), 191
 International Ultraviolet Explorer (IUE), 357
 Iota Orionis, 123
 IRAS. *See* Infrared Astronomical Satellite
 irregular galaxies, 204
- J** Janes, Kenneth A., 349
 Jensen, Peter, 363
 Jewel Box (Caldwell 94), **376–380**
 Johnson, Harold, 255
 Jupiter, 460
- K** Kahanpää, Jere, 50, 181
 Kant, Immanuel, 154, 178
 Kappa Crucis (Caldwell 94), **376–380**, **377**
 Kappa Tauri, 167
 Keeler, James, 175
 Kelly, Al, 128
 Keyhole Nebula, **363**, 368
 Keyser, Pieter Dirkszoon, 370, 413, 426

- Kilauea Volcano, 2
 Kitt Peak National Observatory, 241
 Knapen, Johan H., 180
 Koester, Detlev, 353, 359
 Kohle, Sven, 90
 Kohoutek, Luboš, 52, 292
 Kreimer, Evered, 449
 Krisciunas, Kevin, 408
 Kwok, Sun, 155–156, 275
- L** Lacaille, Abbé Nicolas Louis de
 catalog of, 284–285
 constellations defined by, 345, 418
 and globular clusters, 320, 413, 418–419
 and nebulae, 362, 407
 and open clusters, 297, 300, 341, 358, 378,
 384, 389
 telescopes used by, 297, 378
 Lacerta, 72
 Lada, Charles, 255
 Lambda Centauri, 13, 397–401
 Lambda Centauri Cluster (Caldwell 100), 8,
 13–14, 377, 397–401
 Lampland, Carl Otto, 182–183, 263
 Laplace, Pierre Simon, 89
 Large Magellanic Cloud (LMC), 90, 204, 228,
 360, 394, 405–406
 Lassell, William, 92, 183, 271
 Laustsen, Svend, 292
 Leander McCormick Observatory, 228
 Leavitt, Henrietta S., 352
 Lee, Young-Wook, 321
 lenticular galaxies, 139–140, 159–160, 175,
 207–208, 213, 432
 Leo Cloud, 159
 Leuschner Observatory Supernova Search, 192
 Levy, David H., ix, 401, 450
 Lick Observatory, 175, 183
 Light Blue Snowball (Caldwell 22), 92–95
 light pollution, 4–5, 199
 Liller, William, 336
 LINERs. *See* low-ionization nuclear emission-
 line regions
 Ling, Alister, 71, 198
 Lion Nebula (Caldwell 39), 154–158, 155
 Liquid Pyramid (Caldwell 64), 254–257
 Little Jewel Box. *See* NGC 3293
 LMC. *See* Large Magellanic Cloud
 Local Group, 76, 204
 Lorenzin, Tom, 59
 Lossing, Fred, 199
 Lou, Yu-Qing, 56
 Low, Frank, 183
 low-ionization nuclear emission-line regions
 (LINERs), 115–116, 119
 Luginbuhl, Christian B., 11
 and galaxies, 40, 98, 128, 141, 181, 280
 and nebulae, 35, 236
 and star clusters, 114, 217
 Lynch, Richard, 133
- M** M1 (Crab Nebula), 131
 M15, 121
 M20 (Trifid Nebula), 81
 M27 (Dumbbell Nebula), 148
 M31 (Andromeda Galaxy), 119, 174, 451, 463
 dwarf companions to, 75–78
 M32, 77
 M33, 113, 279
 M37, 388–389
 M39, 80
 M40, 81, 452
 M42 (Orion Nebula), 80, 122–123, 195
 M44 (Beehive), 216
 M50, 196
 M52, 53
 M57 (Ring Nebula), 438
 M63, 119
 M65, 160
 M74, 30
 M81, 97
 M83, 440
 M101, 30
 M102, 432–433

- M103, 49–50, 58–59
 M110, 77
 MACHOs. *See* massive compact halo objects
 MacRobert, Alan M., 58, 124, 185, 434
 Magellanic Clouds, 263. *See also* Large Magellanic Cloud, Small Magellanic Cloud
 magnitudes
 discrepancies and variations in, 8–10, 64–65, 94, 223–224, 294, 419, 421–422
 methods for determining, 39
 Malin, David, 259, 415
 Mallas, John H., 449
 Marconi, Alessandro, 334
 Mars, 459–460
 Marshall, Francis E., 406
 Marth, Albert, 197, 271
 Martin, Martha Evans, 2
 massive compact halo objects (MACHOs), 246
 Mayall, Nicholas U., 123
 Mayor, Michel, 233
 McClure, Robert, 215
 McNeil, Jay, 33, 35–36, 70, 156
 Meaburn, John, 250–251
 Méchain, Pierre, 218, 433, 462
 Meier, Rolf, 199
 Melotte 25 (Caldwell 41), 13–14, 162–168, 339, 437
 Melotte 101, 404
 Mendez, Mariano, 412
 Mermilliod, Jean-Claude, 233
 Messier Catalog. *See* astronomical catalogs
 Messier, Charles, 63, 81, 112, 131, 157, 196, 211, 300
 William Herschel and, 462
 Mexican Jumping Star, 257
 Meylan, Georges, 406
 Mice, The, 243
 Michell, John, 462
 Milkweed Seed Galaxy (Caldwell 62), 245–247
 Milky Way, *xiii*, 99, 121
 and cannibalized dwarf galaxies, 324–325
 globular clusters and structure of, 169–170
 orbital motions within, 314–315
 Minkowski, Rudolph L., 101, 134, 307
 Mitchell, Larry, *x*, 119, 128, 243–244, 435
 molecular hydrogen, 98, 388
 Moon
 William Herchel and, 459
 Moore, Patrick, *vii*, *ix*, 442
 Caldwell catalog creation and, *vii*–*viii*
 Morales, Ronald, 223
 Morris, Charles, 39
 Moulton, Forest Ray, 134
 Mount John Observatory, 415
 Mount Wilson
 60-inch reflector, 212, 221–222
 100-inch reflector, 89, 213, 227
 Mu Columbae, 123
 Murrell, Andrew, 356, 427
 Musca, 418
 mythologies
 Australian, 392
 Chinese, 363
 Greek, 163–164, 370, 423
- N** Nagler, Al, 3
National Geographic Society–
Palomar Observatory Sky Survey, 298, 437
 nebulae. *See also* dark nebulae, planetary nebulae, reflection nebulae, and variable nebulae
 classification of, 284–285
 18th-century perception of universe and, 8
 gas knots in, 251
 illumination of, 45, 84–85, 93, 182–184, 219, 271–272, 292, 405
 as imagined groupings of stars, 462
 William Herschel and, 462–465
 nebular hypothesis, 154
 Neckel, Thorston, 85
 Network Nebula (Caldwell 33), 129–134
New General Catalogue of Nebulae and Clusters of Stars (NGC). *See* astronomical catalogs
 New Technology Telescope, 208, 346

- New Zealand, 5, 360, 368
 NGC 14, 174
 NGC 40 (Caldwell 2), 9, 22–23
 NGC 55 (Caldwell 72), 277–283
 NGC 57, 175
 NGC 104 (Caldwell 106), 321, 409, 413–416
 NGC 121, 416
 NGC 134, 440–441
 NGC 147 (Caldwell 17), 75–78
 NGC 185 (Caldwell 18), 75–78
 NGC 188 (Caldwell 1), 19–21
 NGC 246 (Caldwell 56), 223–226
 NGC 247 (Caldwell 62), 245–247
 NGC 253 (Caldwell 65), 258–262, 260, 439
 NGC 255, 225
 NGC 281, 431–432
 NGC 288, 260, 439
 NGC 300 (Caldwell 70), 277–283
 NGC 346, 410, 411
 NGC 362 (Caldwell 104), 409–413, 411
 NGC 371, 410, 411
 NGC 404, 435
 NGC 406, 413
 NGC 436, 61
 NGC 457 (Caldwell 13), 58–61
 NGC 559 (Caldwell 8), 41–43
 NGC 654, 49
 NGC 659, 49, 51
 NGC 663 (Caldwell 10), 49–51
 NGC 708, 114
 NGC 752 (Caldwell 28), 112–114
 NGC 753, 114
 NGC 869. *See* Caldwell 14
 NGC 884. *See* Caldwell 14
 NGC 891 (Caldwell 23), 96–99, 150–151, 153
 NGC 1097 (Caldwell 67), 266–269
 NGC 1097A, 266, 269
 NGC 1261 (Caldwell 87), 345–347, 412
 NGC 1270, 100, 103
 NGC 1272, 100, 103
 NGC 1273, 100, 103
 NGC 1275 (Caldwell 24), 100–103
 NGC 1277, 100, 103
 NGC 1278, 100, 103
 NGC 1281, 100, 103
 NGC 1333, 436
 NGC 1360, 438
 NGC 1528, 433–434
 NGC 1647, 168, 436–437
 NGC 1792, 291
 NGC 1808, 291
 NGC 1851 (Caldwell 73), 288–291
 NGC 1893, 124
 NGC 2070 (Caldwell 103), 405–408, 406
 NGC 2237. *See* Caldwell 49
 NGC 2238. *See* Caldwell 49
 NGC 2244 (Caldwell 50), 194–201
 NGC 2246. *See* Caldwell 49
 NGC 2261 (Caldwell 46), 182–186
 NGC 2264, 185
 NGC 2354, 257
 NGC 2360 (Caldwell 58), 231–233
 NGC 2362 (Caldwell 64), 254–257
 NGC 2392 (Caldwell 39), 154–158, 155
 NGC 2403 (Caldwell 7), 37–40
 NGC 2419 (Caldwell 25), 104–106
 NGC 2420, 158
 NGC 2451, 287
 NGC 2477 (Caldwell 71), 305–310, 308, 309
 NGC 2506 (Caldwell 54), 215–217
 NGC 2516 (Caldwell 96), 377, 384–387
 NGC 2539, 216
 NGC 2669, 341
 NGC 2775 (Caldwell 48), 191–193
 NGC 2777, 192
 NGC 2867 (Caldwell 90), 354–357, 356
 NGC 3115 (Caldwell 53), 211–214
 NGC 3132 (Caldwell 74), 292–295, 293
 NGC 3149, 428
 NGC 3195 (Caldwell 109), 5, 426–429, 428
 NGC 3200, 238
 NGC 3201 (Caldwell 79), 314–317, 377
 NGC 3242 (Caldwell 59), 234–238, 440
 NGC 3293, 369

- NGC 3324, 369
 NGC 3372 (Caldwell 92), ix, **361–369**, **363**, **377**
 NGC 3532 (Caldwell 91), **358–360**
 NGC 3605, **159**
 NGC 3607, **159**
 NGC 3608, **159**
 NGC 3621, 440
 NGC 3626 (Caldwell 40), **155–161**
 NGC 3766 (Caldwell 97), **388–390**
 NGC 4027, 242
 NGC 4038 (Caldwell 60), 102, **239–244**, **241**
 NGC 4039 (Caldwell 61), 102, **239–244**, **241**
 NGC 4128, 26
 NGC 4190, 108
 NGC 4214, 108
 NGC 4236 (Caldwell 3), **24–26**
 NGC 4244 (Caldwell 26), 13, **107–108**
 NGC 4372 (Caldwell 108), 5, **377**, **417**, **420–422**
 NGC 4449 (Caldwell 21), **89–91**
 NGC 4460, 91
 NGC 4485, 434
 NGC 4490, 434
 NGC 4494, 153
 NGC 4550, 160
 NGC 4559 (Caldwell 36), **139–142**
 NGC 4562, 152
 NGC 4565 (Caldwell 38), **150–153**, 441
 NGC 4605, 430–431
 NGC 4609 (Caldwell 98), **377**, **391**, 395–396
 NGC 4627, 127
 NGC 4631 (Caldwell 32), **126–128**, 435
 NGC 4656. *See* Hockey Stick
 NGC 4657. *See* Hockey Stick
 NGC 4697 (Caldwell 52), **207–210**
 NGC 4755 (Caldwell 94), **376–380**, **377**
 NGC 4833 (Caldwell 105), 3, 5, **377**, **417–420**
 NGC 4874, 136–137
 NGC 4889 (Caldwell 35), **135–138**
 NGC 4898AB, **135**, 137
 NGC 4921, 136–137
 NGC 4945 (Caldwell 83), **332–335**
 NGC 4976, 335
 NGC 5005 (Caldwell 29), **115–117**
 NGC 5033, 116
 NGC 5082, 310
 NGC 5086, 310
 NGC 5090, 310
 NGC 5090A, 310
 NGC 5090B, 310
 NGC 5091, 310
 NGC 5102, 441–442
 NGC 5128 (Caldwell 77), **305–310**, **307**, **309**
 NGC 5139 (Caldwell 80), **318–323**, 413
 NGC 5248 (Caldwell 45), **179–181**
 NGC 5286 (Caldwell 84), **336–338**
 NGC 5307, 338
 NGC 5694 (Caldwell 66), **263–265**
 NGC 5749, 350
 NGC 5823 (Caldwell 88), **348–350**
 NGC 5866, 160, 432–433
 NGC 5897, 437–438
 NGC 5979, 383
 NGC 6025 (Caldwell 95), **381–383**
 NGC 6087 (Caldwell 89), 14, **351–353**
 NGC 6101 (Caldwell 107), 5, **423–425**
 NGC 6124 (Caldwell 75), **296–299**
 NGC 6139, 299
 NGC 6153, 299
 NGC 6188, 329
 NGC 6193 (Caldwell 82), **328–331**
 NGC 6231 (Caldwell 76), **300–304**, **302**, **304**
 NGC 6242, 303, **304**
 NGC 6268, 303, **304**
 NGC 6281, 443
 NGC 6302 (Caldwell 69), **274–276**
 NGC 6337, 276
 NGC 6352 (Caldwell 81), **324–327**
 NGC 6397 (Caldwell 86), 274, **342–344**
 NGC 6496, 312
 NGC 6541 (Caldwell 78), **311–313**
 NGC 6543 (Caldwell 6), **33–36**
 NGC 6723, **270**, **430**, 442
 NGC 6726, **270**, **272–273**, **430**
 NGC 6727, **270**, **272–273**, **430**

- NGC 6729 (Caldwell 68), 270–273, 271, 442
 NGC 6744 (Caldwell 101), 371, 374–375
 NGC 6752 (Caldwell 93), 370–374
 NGC 6818, 230
 NGC 6822 (Caldwell 57), 227–230
 NGC 6826 (Caldwell 15), 68–71
 NGC 6882, 143–149
 NGC 6885 (Caldwell 37), 8, 13, 143–149
 NGC 6888 (Caldwell 27), 109–111
 NGC 6934 (Caldwell 47), 187–190
 NGC 6939, 56–57
 NGC 6946 (Caldwell 12), 55–57
 NGC 6960 (Caldwell 34), 129–134
 NGC 6992. *See* Caldwell 33
 NGC 6995. *See* Caldwell 33
 NGC 6996, 86–88
 NGC 6997, 86–88
 NGC 7000 (Caldwell 20), 83–88, 87
 NGC 7006 (Caldwell 42), 169–172
 NGC 7009 (Caldwell 55), 218–222, 220
 NGC 7023 (Caldwell 4), 7, 27–29
 NGC 7209, 72, 82
 NGC 7243 (Caldwell 16), 72–74
 NGC 7293 (Caldwell 63), 248–253, 250, 253
 NGC 7331 (Caldwell 30), 118–120
 NGC 7335, 118, 120
 NGC 7336, 118, 120
 NGC 7337, 118, 120
 NGC 7340, 120
 NGC 7354, 48
 NGC 7479 (Caldwell 44), 173, 176–178
 NGC 7635 (Caldwell 11), 52–54
 NGC 7640, 95
 NGC 7662 (Caldwell 22), 92–95, 121
 NGC 7789, 431
 NGC 7793, 439–440
 NGC 7814 (Caldwell 43), 173–176
 19 Vulpeculae, 146
 Noctua, 264
 North America Nebula (Caldwell 20), 83–88, 87
 Nubecula Minor, 413
 nuclear dust lanes, 208
- O'Connor, John J., 231
 O'Dell, C. Robert, 251
 O'Meara, Stephen James, 3
 celestial play by, 62–63
 Deep-Sky Companions: The Messier Objects, 2
 eyepieces used by, 3–4
 method of magnitude determination, 39
 and TeleVue Genesis refractor, 3
 Texas Star Party and, 128, 133, 158, 243–244, 303
 Omega Centauri (Caldwell 80), 318–323, 413
 Omicron Velorum Cluster (Caldwell 85),
 339–341
 open clusters
 blue stragglers in, 216
 formation of, 215
 planetary nebula in, 353
 Orion Nebula (M42), 122–123, 195
 Outer Limits Galaxy (Caldwell 23), 96–99,
 150–151, 153
 Owens Valley Radio Observatory, 116
- P Pac-Man Nebula (Caldwell 56), 223–226
 Palitzsch, Johann Georg, 197
 Palomar Mountain
 Schmidt telescope, 160
 200-inch reflector, 38, 101, 186, 213
 Paraskevopoulos, John S., 307
 Parramatta, New South Wales, 278, 285, 288, 305,
 312, 320, 372, 378, 395, 410, 420
 Parsons, William (3rd Earl of Rosse), 150, 218
 Pavo, 370–371
 Pease, Frank G., 212
 Pegasus, 118, 121, 174
 Pegasus Cloud, 176
 Pegasus Spur, 119, 175
 Pelican Nebula, 83–85
 Pellepoix, Antoine Darquier de, 33
 Peltier, Leslie C., 2, 450
 Perek, Luboš, 52
 Perinotto, Mario, 438
 Perseid meteor shower, 67
 Perseus A (Caldwell 24), 100–103

- Perseus Cluster, 101
 Phi Cas Cluster (Caldwell 13), **58–61**
 photographs, selection criteria for, 15–16
 Piccolomini, Alessandro, 319
 Pickering, William, 358
 Pincushion (Caldwell 91), **358–360**
 Pitt, Mary, 455
 planetary nebulae
 formation of, 22–23, 155–156
 gas jets in, 34
 motions within, 93–94, 219–220
 in an open cluster, 353
 Pleiades, 166, 339
 Greek mythology of, 163–164
 Pogson, Rev. Norman R., 9–10
 Polakis, Tom, 107, 268
 Polaris, 19, 428
 Ptolemy, 319
 pulsars, 406
- Q** quasars, 266–267, 332
- R** Radcliffe 136 (R136), 406
 Raymo, Chet, 84
 Raynard, Arthur Cowper, 393
 R Canis Majoris, 233
 R Coronae Australis, **270–273, 271**
 R Coronae Australis Nebula (Caldwell 68),
 270–273, 271, 442
 red-dwarf stars, 343
 Reed, Darren, 34
 reflection nebulae, 27–29, 182–186, 270–273, 436
 Reimers, Dieter, 359
*Revised New General Catalogue of Nonstellar
 Objects (RNGC)*. See astronomical catalogs
 Ring Nebula (M57), 237, 438
 Ringtail Galaxy. See Caldwell 60/61
 R Monocerotis, 182–184
 Roberts, Issac, 29, 306
 Roberts, Morton S., 192
 Robertson, Edmond F., 231
 Robichon, Noël, 149
 Rosat satellite, 45–46, 110, 119, 140, 241, 246,
 279, 403
 Rosette Nebula (Caldwell 49), 14, **194–201**
 Rossi X-Ray Timing Explorer (RXTE), 406
 Roth, Joshua, 133, 153
 Roy, Jean-René, 127
 Royal Astronomical Society, 466
 Royal Society, 456, 461
 RR Lyrae-type variable stars, 169–170, 289, 336
 RS Persei, 67
 Rubin, Vera, 160
 Rudaux, Lucien, 175, 212
 runaway stars, 122–123
 RXTE. See Rossi X-Ray Timing Explorer
- S** Sagar, Ram, 379
 Samus, Nikolai, 336
 Sandage, Allan R., 435
 SAO 20575, 53
 SAO 228708, 311
 SAO 252073, **376, 380**
 Sarajedini, Ata, 424
 Saturn, 4, 460
 Saturn Nebula (Caldwell 55), **218–222, 220**
 Scarecrow, The (Caldwell 51), **202–206**
 Schaeberle, J. M., 123
 Schmidt, J. F. Julius, 182, 271
 Sculptor Galaxy (Caldwell 65), **258–262, 260,**
 439
 Sculptor Group, 246, 259, 278
 Seagrave Observatory, 133
 Secchi, Angelo, 221, 236
 Sechler, Tim, 59
 Serviss, Garrett P., 166
 Sextans, 211
 Seyfert, Carl K., 98, 101
 Seyfert galaxies, 100–103, 115, 266, 305, 333
 Shain, C. A., 307
 Shapley, Harlow, 104, 169–170, 286, 307, 359
 Sharpless, Stewart, 45
 Sharpless 2-155 (Caldwell 9), **44–48**
 Sharpless 310, 255–256

- Sheehan, William, 17, 415
 E. E. Barnard biography by, 393
 Shoemaker, Carolyn, 282, 382
 Shoemaker, Eugene, 282
 Shoemaker-Levy 9, 282, 382
 Sigma Octantis, 428
 Sigma Tauri, 167
 Silver Coin (Caldwell 65), **258–262, 260**
 Silver Needle Galaxy (Caldwell 26), **107–108**
 Sinnott, Roger W., 10–11, 14, 165
 Sirius supercluster, 339
 Skiff, Brian A., 11
 and galaxies, 98, 128, 141, 181, 280
 and nebulae, 35, 195, 236
 and star clusters, 40, 114, 217
 Skyscrapers Astronomy Club, 133
 SL 7, 443
 Small Magellanic Cloud (SMC), 228, 409–411, 413
 Smith, Bruce J., 183
 Smyth, Adm. William Henry, 9–10, 167, 177, 188,
 211, 219, 232, 234–236, 255, 437–438
 star colors and double stars, 156, 167, 172, 185
 Smyth, Piazzi, 431
 S Normae, 351–353
 S Normae Cluster (Caldwell 89), 14, **351–353**
 Sofue, Yoshiaki, 259
 solar activity
 effect on airglow, 4
 solar system, 314
 South Celestial Pole, 428
 South Galactic Pole Group, 246
 Southern Beehive (Caldwell 96), **384–387**
 Southern Butterfly (Caldwell 105), **417–420**
 Southern Cross, 315, 318, 348, **358, 362,**
 376–378, 377, 388, 418
 Southern Pinwheel (Caldwell 70), **277–283**
 Southern Pleiades (Caldwell 102), **402–404**
 Southern Ring (Caldwell 74), **292–295, 293**
 Space Telescope Science Institute, 33
 spectra and spectroscopy, 33, 166, 224–225, 357
 Spindle, The (Caldwell 53), **211–214**
 spiral galaxies
 barred, 24, 177
 classification of, 139–140
 magnetic fields in, 56
 mixed, 139–140
 molecular gas in, 116
 unbarred, 139–140
 Staal, Julius, 345
 starburst galaxies, 241–242, 259, 334
 star clusters. *See also* globular clusters, open
 clusters
 in Caldwell 65, 259
 Starfish, The (Caldwell 93), **370–374**
 star formation, 57, 90, 119, 196, 388
 and density waves, 328–329
 in H II regions, 32, 38–39, 45–46, 178, 204, 259,
 267, 374
 in interacting galaxies, 240–242
 star names
 Greek letters in, 318–319
 stars, binary. *See* binary stars
 stellar winds
 and nebula formation, 22–23, 52–53, 196
 Stephan's Quintet, **118, 121**
 Stone, Edward James, 380
 Straizys, Vytantas, 84
 String of Pearls (Caldwell 72), **277–283**
 Struve 953, 186
 Struve 1645, 91
 Struve 2890, 73–74
 Struves, 9–10
 Sullivan, III, Woodruff T., 121
 supergiant stars
 extragalactic, 205, 279, 405–406
 and Type II supernovae, 130–131
 supernovae, 117, 178, 269, 309
 remnants of, 25, 110–111, 129–134, 196, 241,
 259, 279
 star formation and, 25, 334
 Type Ia, 55, 193
 Type Ic, 178
 Type II, 55–56, 130–131
 Swift, Lewis, 197

- T** Tarantula Nebula (Caldwell 103), 405–408, 406
 Tau Canis Majoris Cluster (Caldwell 64),
 254–257
 Tau Canis Majoris, 256
 Taurus, 162–163
 T Cephei, 29
 T Coronae Australis, 273
 telescopes
 built by William Herschel, 455–456, 457–459
 Hubble Space Telescope. *See* Hubble Space
 Telescope
 limiting magnitudes of, 9–10
 Palomar Observatory. *See* Palomar Mountain
 used by author, 3–6
 Telescopium-Grus Cloud, 441
 Tele Vue Optics, 3–4
 Texas Star Party, 128, 133, 158, 243, 303, 435
 Theis, Christian, 90
 Theodor, Pieter, 381
 Theta Carinae Cluster (Caldwell 102), 377,
 402–404
 Thomson, Malcomb J., 70
 3C 84, 101
 Tirion, Wil, 14, 143, 398, 416, 428
 Tombaugh, Clyde, 156, 263
 Townes, Charles, 164
 Trapezium, 9, 122
 Triangulum Australe, 381
 True Lover's Knot, 408
 Trumpler, Robert J., 145–146, 255, 393
 Trumpler 1, 49
 Trumpler 14, 367
 Trumpler 16, 367
 Trumpler 24, 300, 303, 304
 T Tauri stars, 45
 Tucana, 410
 Tully, R. Brent, 96, 115
 Tweezers Galaxy (Caldwell 83), 332–335
 20 Vulpeculae, 143–146
 TY Coronae Australis, 272
- U** U3, 192
- Ultra-high contrast (UHC) filter, 199
 Uranus, 4, 460
 William Herschel's discovery of, 456
 2 Ursae Minoris, 20
- V** V364 Carinae, 404
 V374 Carinae, 385
 V382 Carinae, 358, 360
 V460 Carinae, 386
 V518 Carinae, 403
 V910 Centauri, 388, 390
 V973 Scorpii, 302
 Valentijn, Edwin A., 98
 Vanderbilt University Observatory, 227
 van der Werf, Paul P., 98
 variable nebulae, 182–186, 270–273, 366
 variable stars
 within the *Be* spectral class, 51, 388
 Cepheid type of, 205, 351
 Delta Scuti type of, 256
 William Herschel's observations of, 460–461
 in nebulae, 272, 363
 RR Lyrae type of, 170, 289, 336
 in star clusters, 169–170, 336, 380, 422, 425
 vdB 96, 256
 vdB-Ha 99, 367
 Vehrenberg, Hans, 249
 Veil Nebula. *See* Caldwell 33/34
 Vela Pulsar, 387
 Vela X, 387
 Very Large Array, 192
 Virgo Cluster, 207
 visual acuity, 68–69
 volcanic smog (vog), 2–3
 Volcano, Hawaii, 2
 von Auwers, Georg Fredrich Julius Arthur, 248
 von Gothard, E., 123
 VY Canis Majoris, 256
- W** Walker, Alistair R., 289
 Wallace, Kent, 427
 Warren Rupp Observatory, 146–147, 172

Webb, Rev. T. W., 157, 197, 233, 267, 434
Webb Society Deep-Sky Observer's Handbook,
 145, 223–224, 280, 380, 389, 401
 white-dwarf stars, 343, 359
 William Herschel Telescope, 205
 Wilner, David, 255
 Wilson, Barbara, 6, 8
 and elliptical galaxies, 103, 138, 210
 and globular clusters, 265, 291, 313, 412, 415
 and irregular galaxies, 91
 and nebulae, 54, 95, 221
 and open clusters, 42, 50, 144, 201
 and spiral galaxies, 40, 57, 99, 116, 127–128,
 160, 214, 282
 Winnecke 4 (M40), 81
 Winter Star Party, 54, 234, 284, 291, 412
 Wolf, Max, 29, 45, 79–80, 84, 123, 202, 228
 Wolf-Rayet stars, 109–110, 301
 extragalactic, 228, 279
 in planetary nebulae, 22, 357, 438
 WZ Velorum, 317

X X-ray sources, 101, 110, 119, 140, 246, 266–267,
 289

Y Y Lupi, 349

Z Zeta Scorpii, 300–301, **304**
 Zwicky, Fritz, 136

Bold type indicates where the subject is illustrated.