

Contents

Preface to Third Edition	xvi
Foreword to First Edition	xvii
Preface to First Edition	xix
Acknowledgments	xxiii
List of figures	xxvi
List of tables	xxxv
List of abbreviations and acronyms	xxxvi
1 What is a star map?	1
1.1 Constellation maps.....	1
1.2 Cosmological maps.....	3
1.3 What makes these images maps?.....	5
1.4 Circles in the sky.....	6
1.4.1 The Sun–Earth orientation	6
1.4.2 The armillary sphere	8
1.5 Directions in the sky	11
1.6 Projections of star maps.....	13
1.7 Manuscripts and prints.....	15
1.8 Bibliography	17

2	Non-European cosmology and constellation development.....	18
2.1	China.....	19
2.1.1	Cosmology.....	19
2.1.2	Time and the calendar.....	20
2.1.3	Chinese constellations.....	21
2.1.4	Chinese influences in Korea and Japan.....	25
2.1.5	Outside influences on China.....	25
2.2	Mesopotamia.....	27
2.2.1	Historical interlude.....	27
2.2.2	Cosmology.....	28
2.2.3	Time and the calendar.....	30
2.2.4	Mesopotamian constellations and the zodiac.....	30
2.3	Egypt.....	31
2.3.1	Cosmology.....	31
2.3.2	Time and the calendar.....	32
2.3.3	Orientation of temples.....	35
2.3.4	Egyptian constellations.....	35
2.3.5	Differences from China and Mesopotamia.....	37
2.4	India.....	38
2.4.1	Cosmology.....	38
2.4.2	Time and the calendar.....	41
2.4.3	Indian constellations.....	41
2.4.4	Outside influences.....	43
2.5	Astrology in ancient times.....	43
2.6	Bibliography.....	49
3	European cosmology.....	52
3.1	Classical Greek astronomy.....	53
3.1.1	Precursors.....	53
3.1.2	The cosmologies of early Greek philosophers.....	54
3.1.3	Pythagoras and his followers.....	55
3.1.4	Plato.....	56
3.1.5	Eudoxus.....	58
3.1.6	Aristotle.....	58
3.1.7	The “Pre-Copernicans”.....	60
3.1.8	Eratosthenes and the Alexandria Library.....	61
3.1.9	The eccentric model.....	61
3.1.10	Apollonius and the epicycle model.....	62
3.1.11	Hipparchus.....	65
3.1.12	Claudius Ptolemy.....	66
3.2	European astronomy during the early Middle Ages.....	70
3.2.1	Impact of the fall of Rome.....	70
3.2.2	Astronomy in the Latin West.....	71
3.2.3	Time and the calendar.....	72

3.3	Islamic astronomy.....	73
3.4	Byzantine astronomy	79
3.5	Classical Greek astronomy comes back to Europe.....	82
	3.5.1 Entry from the West: Islam	82
	3.5.2 Johannes de Sacrobosco.....	83
	3.5.3 Entry from the East: Byzantium	85
3.6	Astrology in the Middle Ages.....	86
3.7	Printing and the Renaissance.....	90
	3.7.1 Johann Gutenberg	90
	3.7.2 The spread of printing.....	92
3.8	Astronomy and Central Europe	93
	3.8.1 Georg Peurbach.....	93
	3.8.2 Regiomontanus	94
	3.8.3 Hartmann Schedel.....	95
	3.8.4 Peter Apian.....	96
3.9	Paradigm shift: heliocentrism with circular orbits.....	100
	3.9.1 Nicholas Copernicus	100
	3.9.2 Tycho Brahe	103
	3.9.3 Galileo.....	107
	3.9.4 René Descartes.....	109
3.10	Paradigm shift: heliocentrism with elliptical orbits.....	111
	3.10.1 Johannes Kepler.....	111
	3.10.2 Follow-up to Kepler	113
3.11	Bibliography	113
4	European constellation development	117
4.1	Classical Greeks.....	117
	4.1.1 Aratus' <i>Phaenomena</i>	118
	4.1.2 Eratosthenes' <i>Catasterismi</i>	119
	4.1.3 Hipparchus' star catalog	119
	4.1.4 Geminus' <i>Introduction to the Phenomena</i>	120
	4.1.5 Ptolemy's star catalog	120
	4.1.6 Hyginus' <i>Poeticon Astronomicum</i>	123
4.2	Islamic constellations.....	125
	4.2.1 Arab star names.....	125
	4.2.2 Al-Sufi and his <i>Book of Fixed Stars</i>	126
4.3	Constellations and the Age of Exploration.....	127
	4.3.1 Navigating the oceans.....	127
	4.3.2 Filling gaps in the Southern Hemisphere.....	129
	4.3.2.1 Amerigo Vespucci.....	129
	4.3.2.2 Andreas Corsali	130
	4.3.2.3 Petrus Plancius, Pieter Keyser, and Frederick De Houtman.....	130

4.3.2.4	Edmond Halley	133
4.3.2.5	Nicolas de Lacaille	136
4.3.2.6	John Herschel.....	137
4.3.3	Filling gaps in the Northern Hemisphere.....	139
4.3.3.1	Caspar Vopel	139
4.3.3.2	Johannes Hevelius.....	139
4.3.4	Impact on the Islamic World.....	141
4.4	Obsolete constellations	142
4.5	Bibliography	146
5	Early European star maps	148
5.1	The manuscript era	148
5.2	Early printed constellation images.....	149
5.2.1	Erhard Ratdolt and Hyginus' <i>Poeticon Astronomicum</i>	149
5.2.2	An early printed edition of Aratus' <i>Phaenomena</i>	152
5.2.3	Aldus Manutius and Aratus' <i>Phaenomena</i>	153
5.3	Albrecht Dürer and the first printed star maps.....	154
5.3.1	Life and times	154
5.3.2	Dürer's celestial hemispheres	155
5.4	Johannes Honter and his geocentric hemispheres	156
5.4.1	Life and times	156
5.4.2	Honter's celestial hemispheres.....	158
5.5	Alessandro Piccolomini and the first printed star atlas.....	158
5.5.1	Life and times	158
5.5.2	<i>De le Stelle Fisse</i>	159
5.6	Giovanni Paolo Gallucci and his coordinate system.....	161
5.6.1	Life and times	161
5.6.2	<i>Theatrum Mundi, et Temporis</i>	161
5.7	Thomas Hood: setting the stage for the Golden Age.....	163
5.7.1	Life and times	163
5.7.2	<i>The Use of the Celestial Globe</i>	163
5.8	Bibliography	165
6	The "Big Four" of the Golden Age of imaged star maps.....	166
6.1	Star map conventions.....	167
6.2	Johann Bayer	169
6.2.1	Life and times	169
6.2.2	<i>Uranometria</i>	169
6.2.3	Derivative atlases	172
6.2.3.1	Julius Schiller.....	172
6.2.3.2	Aegidius Strauch.....	174
6.2.3.3	Ignace-Gaston Pardies	174
6.2.3.4	Augustine Royer	176

	6.2.3.5	John Bevis.....	179
	6.2.3.6	Philippe de la Hire	180
6.3		Johannes Hevelius.....	181
	6.3.1	Life and times	181
	6.3.2	The <i>Prodromus Astronomiae</i> and the <i>Catalogus Stellarum Fixarum</i>	183
	6.3.3	<i>Firmamentum Sobiescianum</i>	184
	6.3.4	Derivative atlases	184
	6.3.4.1	Johann Zahn.....	184
	6.3.4.2	Petrus Schenck.....	186
	6.3.4.3	Georg Christoph Eimmart.....	190
	6.3.4.4	Johann Leonhard Rost	190
	6.3.4.5	Mattheus Seutter	191
	6.3.4.6	Christoph Semler	191
	6.3.4.7	Tobias Conrad Lotter	192
	6.3.4.8	Johann Doppelmayr and Antonio Zatta	192
6.4		John Flamsteed	192
	6.4.1	Life and times	192
	6.4.2	<i>Historiae Coelestis Britannicae</i>	193
	6.4.3	<i>Atlas Coelestis</i>	195
	6.4.4	Derivative atlases	196
	6.4.4.1	John Hill.....	196
	6.4.4.2	Jean Fortin.....	197
	6.4.4.3	Johann Bode.....	198
	6.4.4.4	Maximilian Hell.....	198
	6.4.4.5	Kornelius Reissig.....	199
	6.4.4.6	Society for the Diffusion of Useful Knowledge.....	199
6.5		Johann Bode.....	199
	6.5.1	Life and times	199
	6.5.2	<i>Anleitung zur Kenntniss des Gestirnten Himmels</i> and Bode's Law.....	203
	6.5.3	<i>Vorstellung der Gestirne</i>	204
	6.5.4	<i>Uranographia</i>	205
	6.5.5	Derivative atlases	206
	6.5.5.1	Christian Friedrich Goldbach	206
	6.5.5.2	Alexander Jamieson.....	207
	6.5.5.3	Urania's Mirror	208
	6.5.5.4	Elijah H. Burritt	209
	6.5.5.5	M.C.G. Riedig.....	209
	6.5.5.6	Joseph J. von Littrow	209
	6.5.5.7	G. Rubie.....	212
	6.5.5.8	Kornelius Reissig (see Section 6.4.4.5).....	212
	6.5.5.9	Karl Friedrich Vollrath Hoffmann.....	212
6.6		Bibliography	212

7	Other important star maps of the Golden Age.....	214
7.1	Andreas Cellarius.....	214
	7.1.1 Life and times	214
	7.1.2 <i>Harmonia Macrocosmica</i>	215
7.2	Athanasius Kircher	218
	7.2.1 Life and times	218
	7.2.2 Books of astronomical interest.....	219
7.3	Alain Manesson Mallet.....	220
	7.3.1 Life and times	220
	7.3.2 <i>Description de l'Univers</i>	220
7.4	Vincenzo Maria Coronelli.....	223
	7.4.1 Life and times	223
	7.4.2 Books with celestial plates.....	223
7.5	John Seller	225
	7.5.1 Life and times	225
	7.5.2 <i>Atlas Maritimus</i>	227
	7.5.3 <i>Atlas Coelestis</i>	228
7.6	John Senex	228
	7.6.1 Life and times	228
	7.6.2 Celestial maps	230
7.7	Corbinianus Thomas	232
	7.7.1 Life and times	232
	7.7.2 <i>Mercurii Philosophici Firmamentum</i>	232
7.8	Johann Doppelmayr.....	233
	7.8.1 Life and times	233
	7.8.2 Johann Baptist Homann	233
	7.8.3 <i>Atlas Coelestis</i>	235
7.9	Antonio Zatta	237
	7.9.1 Life and times	237
	7.9.2 <i>Atlante Novissimo</i>	237
7.10	Samuel Dunn	237
	7.10.1 Life and times	237
	7.10.2 <i>A New Atlas of the Mundane System</i>	237
7.11	Antoine and Nicolas de Fer	239
	7.11.1 Life and times	239
	7.11.2 <i>L'Atlas Curieux</i>	241
7.12	Philippe de la Hire	241
	7.12.1 Life and times	241
	7.12.2 Celestial maps	244
7.13	Pierre-Charles Le Monnier	244
	7.13.1 Life and times	244
	7.13.2 Celestial maps	245

7.14	The French Cassini Family	247
7.14.1	Life and times	247
7.14.2	Celestial maps of Giovanni Domenico (or Jean Dominique) Cassini.....	248
7.15	Giovanni Maria Cassini	249
7.15.1	Life and times	249
7.15.2	Celestial maps	249
7.16	Bibliography	251
8	Special topics	252
8.1	Celestial globes and gores	252
8.1.1	Early examples.....	253
8.1.2	Celestial gores.....	258
8.1.3	Important globe makers in Europe and the United States.....	258
8.2	Volvelles.....	264
8.2.1	What were volvelles?	264
8.2.2	How did volvelles work?	267
8.2.3	Planispheres and the demise of volvelles.....	271
8.3	Astronomical instruments before the telescope.....	271
8.3.1	Antikythera mechanism and the Nebra sky disk.....	273
8.3.2	Astrolabe	274
8.3.3	Nocturnal.....	278
8.3.4	Cross-staff and back-staff	278
8.3.5	Octants, sextants, and quadrants	279
8.3.5.1	Tycho Brahe's <i>Astronomiae Instauratae Mechanica</i>	279
8.3.5.2	Hevelius' <i>Machinae Coelestis</i>	281
8.4	The telescope	283
8.5	Non-stellar heavenly bodies.....	291
8.5.1	Sun, planets, and asteroids.....	291
8.5.2	Moon.....	301
8.5.2.1	Hevelius' <i>Selenographia</i> and Riccioli's <i>Lunar Map</i>	303
8.5.2.2	Later maps of the Moon.....	305
8.5.3	Eclipses	308
8.5.4	Comets	311
8.5.4.1	Stanislaw Lubieniecki's <i>Theatrum Cometicum</i>	313
8.5.4.2	Edmond Halley's comet.....	313
8.5.4.3	Charles Messier's catalog	316
8.5.5	Deep-sky objects.....	317
8.5.5.1	Current classification	317
8.5.5.2	From 1600 to 1900.....	318
8.5.5.3	The 20th Century	322
8.6	Playing cards.....	325

8.7	Frontispieces and title pages	325
8.7.1	Printer's marks	328
8.7.2	Allegorical images from the past	328
8.7.3	Contemporary instruments and people	336
8.7.4	Extension of the book's content	339
8.7.5	Combinations	344
8.7.6	Frontispiece cost-cutting measures	347
8.7.7	Conclusions	350
8.8	Bibliography	354
9	Mapping the stars in early America	358
9.1	The almanacs	359
9.2	Jedidiah Morse	360
9.3	Early American star maps	363
9.3.1	Bartholomew Burges	363
9.3.2	Enoch Gridley	363
9.3.3	William Crosswell	363
9.4	Elijah H. Burritt	365
9.4.1	Life and times	365
9.4.2	<i>The Geography of the Heavens and its Atlas</i>	365
9.5	Astronomy education in the schools	368
9.5.1	John H. Wilkins	368
9.5.2	John Vose	369
9.5.3	Denison Olmsted	369
9.5.4	Asa Smith	370
9.6	O. M. Mitchel	371
9.6.1	Life and times	372
9.6.2	Mitchel's edition of Burritt's book and atlas	374
9.6.3	<i>The Planetary and Stellar Worlds</i>	376
9.6.4	<i>Popular Astronomy</i>	377
9.6.5	<i>The Astronomy of the Bible</i>	377
9.7	Hannah Mary Bouvier	379
9.8	Bibliography	381
10	The transition to non-imaged star maps	383
10.1	The 1800s: A century of transition	383
10.1.1	Factors pushing for change	383
10.1.2	Star maps with subdued constellation images	384
10.1.2.1	Wollaston's <i>Portraiture of the Heavens</i>	384
10.1.2.2	<i>Stieler's Hand-Atlas</i>	385
10.1.2.3	Von Littrow's <i>Atlas des Gestirnten Himmels</i>	386
10.1.3	Star maps with connecting-line constellation images	389
10.1.3.1	The <i>Atlas Céleste</i> of Dien and Flammarion	389
10.1.3.2	Proctor's <i>Half-Hours with the Stars</i>	391
10.1.3.3	Ball's <i>Atlas of Astronomy</i>	395

10.1.4	Star maps with no constellation images.....	395
10.1.4.1	Argelander's <i>Bonner Durchmusterung</i>	395
10.1.4.2	Dreyer's <i>New General Catalogue</i>	399
10.1.4.3	Other star maps with no constellation images	402
10.1.5	Astrophotography and its influence on star maps	402
10.1.5.1	Early impact.....	402
10.1.5.2	<i>Carte du Ciel</i> project	403
10.1.5.3	Other photographic star maps	403
10.2	The 20th and 21st Centuries	404
10.2.1	Annie Jump Cannon and the <i>Henry Draper Catalog</i>	404
10.2.2	Constellation boundaries and the IAU	405
10.2.3	Major atlases of the 20th Century	406
10.2.3.1	<i>Norton's Star Atlas</i>	406
10.2.3.2	Becvar and his celestial atlases.....	408
10.2.3.3	Tirion and his celestial atlases	412
10.2.4	Other contemporary star maps and atlases.....	415
10.2.5	Computerized star maps.....	419
10.3	Bibliography	421
11	Terrestrial and celestial pictorial maps	422
11.1	What are pictorial maps?	422
11.2	History of terrestrial pictorial maps	423
11.3	Categories of terrestrial pictorial maps.....	426
11.4	Examples of terrestrial pictorial maps	427
11.5	History of celestial pictorial maps	435
11.6	Examples of celestial pictorial maps	437
11.6.1	Pre- <i>Sputnik</i> celestial pictorial maps	437
11.6.2	Post- <i>Sputnik</i> celestial pictorial maps	447
11.7	Fruit crate labels	454
11.8	Bibliography	458
12	Celestial images in artistic paintings	459
12.1	Historical drawings and paintings.....	459
12.2	Traditional contemporary drawings and paintings	474
12.3	Astronaut art	482
12.4	Non-traditionally made celestial art.....	485
12.5	Children's art	488
12.6	Contemporary folk art.....	492
12.7	Postal stamps and cards	494
12.8	Bibliography	501

APPENDICES

A	Collecting celestial maps and prints	502
A.1	The materials in printed celestial maps	502
A.2	Celestial map preservation and conservation.....	503
A.3	Buying celestial maps	504
A.4	Bibliography	506
A.5	Sources of antiquarian celestial maps.....	506
A.5.1	Dealers who carry celestial maps.....	506
A.5.2	Internet auction houses and fairs with a focus on celestial maps	508
A.5.3	Map societies	508
A.5.4	Journals	508
B	Supplementary reference catalog (<i>see also Index for names and sources discussed in the chapters</i>)	509
C	Indices of major constellation atlases	536
C.1	Bayer, Johann— <i>Uranometria</i> , 1603	537
C.2	Bode, Johann— <i>Uranographia</i> , 1801.....	538
C.3	Cellarius, Andreas— <i>Harmonia Macrocosmica</i> , 1660.....	539
C.4	Doppelmayr, Johann— <i>Atlas Coelestis</i> , 1742	540
C.5	Flamsteed, John— <i>Atlas Coelestis</i> , 1729	541
C.6	Fortin, Jean— <i>Atlas Céleste de Flamstéed</i> , 1776	542
C.7	Hevelius, Johannes— <i>Firmamentum Sobiescianum</i> , 1687, appearing in <i>Prodromus Astronomiae</i> , 1690.....	543
C.8	Piccolomini, Alessandro— <i>De le Stelle Fisse</i> , 1579 edition	544
D	The British Library “King’s” edition	545
	Glossary	546
	Index	553