

CONTENTS

<i>Foreword</i>	xi
<i>Preface</i>	xiii
<i>Acknowledgements</i>	xv
<i>Abbreviations used in this book</i>	xvii
<i>Introduction: Why observe the planets?</i>	1
1 The Solar System	4
General	4
A scale model of the Solar System	9
Bode's Law	10
Kepler's Laws of Planetary Motion	11
Elements of planetary orbits. Perturbations	12
Planetary conjunctions, oppositions, phases and transits	12
The sidereal and synodic orbital periods of the planets	15
The brightness of the planets	18
<i>Further reading</i>	19
2 The celestial sphere	20
General	20
Positions on the celestial sphere	21
The ecliptic and the Zodiac	21
Celestial latitude and longitude	25
The precession of the equinoxes. Nutation	26
Sidereal time (star time)	27
The apparent motions of the planets on the celestial sphere	27
<i>Further reading</i>	30
3 Telescopes and accessories	31
Types of telescopes	31
The choice of telescope	40
Protecting the telescope from dust and atmospheric pollution	65
Cleaning the mirror of a Newtonian reflector	66
Housing and care of your telescope	66
<i>Further reading</i>	68
	vii

Contents

4	The atmosphere and seeing	69
	General	69
	Assessing atmospheric seeing conditions	70
	The effect of telescope aperture	70
	Local effects on seeing	71
	<i>Further Reading</i>	72
5	Mercury	73
	General	73
	History of observation	75
	Visibility of Mercury	85
	The axial rotation of Mercury	88
	Observing Mercury	90
	Transits of Mercury	95
	<i>Further reading</i>	100
6	Venus	102
	General	102
	History of observation	105
	Space probe exploration of Venus	120
	Observing Venus	124
	Transits of Venus	133
	<i>Further reading</i>	134
7	Mars	135
	General	135
	Orbital characteristics	136
	Predicting oppositions	138
	The retrograde motion of Mars	139
	Martian seasons	141
	Surface features	143
	Atmospheric phenomena	146
	History of observation	148
	Observing Mars	170
	Features for observation	177
	Longitude determination of Martian features	183
	<i>Further reading</i>	186
8	The minor planets (asteroids)	188
	General	188
	Discovery and history of observation of the minor planets	189
	Visibility of the minor planets	197
	Observing the minor planets	197
	<i>Further reading</i>	207
9	Jupiter	209
	General	209
	History of observation	213
	Variations in the cloud belts	222

	Contents
	The 1994 Shoemaker–Levy cometary impact event on Jupiter 227
	Surface markings of the satellites 230
	Spacecraft observation of Jupiter 223
	Visibility of Jupiter 236
	Observing Jupiter 237
	Determination of the longitudes of Jovian features by central meridian transit timings 238
	Classification and description of Jovian disc features 243
	Determination of latitudes of Jovian features 245
	Disc drawings, strip and sectional sketches 249
	Determination of rotational periods of Jovian features from longitudinal drift 251
	Observations of the Great Red Spot 253
	Colour changes and intensity estimates of Jovian features 256
	General observing notes 257
	<i>Further reading</i> 269
10	Saturn 270
	General 270
	History of observation 273
	Spacecraft exploration of Saturn 301
	The satellites of Saturn 305
	Visibility of Saturn 307
	Observing Saturn 307
	Recent oppositions of Saturn 320
	<i>Further reading</i> 321
11	Uranus 323
	General 323
	The discovery of Uranus 327
	Prediscovery sightings of Uranus 330
	History of observation 330
	Spacecraft exploration of Uranus 339
	Visibility of Uranus 341
	Observing Uranus 341
	<i>Further reading</i> 344
12	Neptune 346
	General 346
	The discovery of Neptune 346
	Prediscovery sightings of Neptune 352
	History of observation 353
	Spacecraft exploration of Neptune 357
	Visibility of Neptune 361
	Observing Neptune 361
	<i>Further reading</i> 362
13	Pluto 364
	General 364
	ix

Contents

	The search for a trans-Neptunian planet	365
	The discovery of Pluto	366
	History of observation	367
	Beyond Pluto	372
	Visibility of Pluto	374
	Observing Pluto	374
	<i>Further reading</i>	375
14	Constructing maps and planispheres	377
	General	377
	The horizontal orthographic projection	377
	Cylindrical projections	378
	The polar projection	381
	<i>Further reading</i>	382
15	Planetary photography and videography	383
	General	383
	The planetary photographer's camera	383
	Choice of film	387
	Characteristics of some films	388
	Black and white film processing	389
	Photography of individual planets	389
	Exposure times	392
	Video and CCD photography (videography) of the planets	393
	Using a CCD camera	396
	Suppliers of CCD cameras	400
	Video-assisted drawing (VAD) of the planets	402
	A note on digital imaging	403
	<i>Further reading</i>	403
16	Photoelectric photometry of the minor planets, planets and their satellites	405
	General	405
	The photoelectric photometer and its components	406
	Telescopes for photoelectric photometry	408
	Photoelectric photometric procedure	409
	Photoelectric photometry of the minor planets	409
	Colorimetric photoelectric photometry	411
	Photoelectric photometry of the planets and their satellites	412
	<i>Further reading</i>	414
	<i>Appendix: Milestones in Solar System exploration</i>	415
	<i>Name index</i>	417
	<i>Subject index</i>	421