

Contents

List of illustrations	ix
Preface.	xiii
1 A little astronomy	1
1.1 The moving Earth.	1
1.2 Geographical coordinates	2
1.3 The Celestial Sphere and the local Celestial Sphere.	4
1.4 The Sun's annual motion	5
1.5 The Sun's diurnal motion.	10
1.6 The hour angle of the Sun	15
1.7 The equation of time.	17
2 An introduction to sundials	25
2.1 A brief history of sundials	25
2.2 A brief history of time.	34
2.3 The general principle of the sundial.	37
2.4 The conversion of solar time to clock time	40
2.5 Finding the local meridian	42
3 The gnomon	47
3.1 The first gnomons.	47
3.2 Determining local latitude	47
3.3 The solar calendar.	51
3.4 A seasonal indicator	53
4 Equatorial sundials	57
4.1 The principle of the equatorial sundial	57
4.2 Marking out the classic equatorial sundial.	60

4.3	Uses of the equatorial sundial	61
4.4	Determining the meridian	63
4.5	The armillary equatorial sundial	64
5	Horizontal sundials	67
5.1	The principle of the horizontal sundial	67
5.2	Marking out, using the equatorial sundial	69
5.3	Trigonometrical marking	70
5.4	Indicating the dates of the equinoxes	75
5.5	Indicating noon for a different location	75
5.6	Marking out a horizontal sundial without calculation	77
5.7	Babylonian and Italic time	78
6	Polar sundials	81
6.1	The principle of the polar sundial	81
6.2	Marking out the sundial	84
7	Vertical sundials	89
7.1	Vertical sundials	89
7.2	Making a vertical direct south sundial	89
7.3	Making a vertical direct north sundial	95
7.4	Making vertical direct west and direct east sundials	98
7.5	Making a reflection sundial	102
7.6	Making a sundial on a plane surface without calculation	105
8	Horizontal analemmatic sundials	111
8.1	The analemmatic sundial	111
8.2	Marking out the analemmatic sundial	112
8.3	Demonstration of the principle of the analemmatic sundial	118
8.4	Making a solar compass	119
8.5	The circular analemmatic sundial	122
9	Altitude sundials	125
9.1	The principle of the altitude sundial	125
9.2	The Saint Rigaud Capuchin sundial	125
10	Sundials in the tropics	133
10.1	Sundials in the tropics	133
10.2	Sundials north of the Equator	133
10.3	Sundials south of the Equator	138

APPENDICES

A	A little test	141
B	Hour lines	144

C	The equation of time and the Sun's declination	146
D	Formulae for diurnal motion	150
E	Demonstrations	155
F	Small problems in gnomonics.	160
G	Practicalities of constructing a sundial	165
H	Mottoes on sundials	167
 Bibliography.		 171
Glossary.		173
Index.		177