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Contents

<i>List of Illustrations</i>	viii
<i>Preface</i>	xiii
<i>Acknowledgements</i>	xvii
1 Optics	1
Rock, clay and ceramic mirrors	1
Plastic optics	3
Metal and composite material mirrors	3
Glass/metal mirrors	6
Flexible mirrors	10
Liquid mirrors	10
Membrane mirrors	15
Flexible glass mirrors	16
Gaseous mirrors	19
Planets, stars and galaxies used as optical elements	19
Classification by number of optical elements	21
Single-mirror systems	21
The schiefspiegler	34
Three-mirror systems	37
Wide field optics	44
Miscellaneous optics	52
Moving the optics around	57
Convertible telescopes	58
Pinholes and optics that don't look like optics	60
Double field telescopes	61
Lens/mirror combinations	65
Eliminating diffraction spikes	69
2 Telescope mounts	71
Zero-axis telescopes	71
One-axis telescopes	74

CONTENTS

Two-axis telescopes	79
Altitude-azimuth (alt-az) mounts	79
Equatorial mounts	82
Elevation-elevation (el-el) mounts	84
Three-axis telescopes	86
Four-axis telescopes	89
Infinite-axis telescopes	91
Floating telescopes	93
3 Telescope and mount materials	95
Tube materials	97
Wood	98
Mount materials	100
Poncet mounts and other equatorial platforms	101
Axle materials and bearings	103
Mount vibrations	105
4 Strange drivers	110
Tangent-arm drives	115
Manual drives	119
Motive power	122
Miscellaneous drives	125
5 Moving the whole telescope	129
Moving the telescope short distances	129
Trailer-mounted telescopes	130
Truck-mounted and vehicle-mounted telescopes	138
6 The moving eyepiece	141
Riding the telescope	144
7 The stationary eyepiece	147
Putting the observer in the center	147
Turret telescopes	149
Springfield mounts	155
Coudé mounts	161
Siderostats, heliostats, coelostats and uranostats	164
Telescopes built into houses	173
8 Limits	180
Large aperture refractors	180
Long focal length refractors	182
Large telescope platforms	184
Multiple mirrors and lenses	185
Multiple optical systems on a single mount	186

CONTENTS

Noncoherent multiple mirror light-buckets	187
True multiple mirror telescopes	195
Arrays of telescopes on separate mounts	200
Small telescopes	204
9 Whimsy	208
<i>Index</i>	215

Illustrations

Figure 1.	A slightly unusual telescope	<i>page</i> xiv
Figure 2.	The Paris Observatory Coudé Refractor	xv
Figure 1.1.	20.32 cm (8 in) $f/8.2$ obsidian primary mirror	2
Figure 1.2.	Tokyo Observatory 3.8 m (150 in) metal mirror	5
Figure 1.3.	Lightweight telescope	6
Figure 1.4.	X-ray telescope	7
Figure 1.5.	Hairbrush mirror mount	7
Figure 1.6.	Primary mirror built up by epoxying glass plates together	9
Figure 1.7.	Photographic Zenith Tube	11
Figure 1.8.	Liquid mirror formed by rotating a pool of mercury	12
Figure 1.9.	Lloyd's mirror	14
Figure 1.10.	Vacuum-formed aluminized mylar mirror	16
Figure 1.11.	Interferogram of 15.2 cm (6 in) $f/2$ vacuum-formed mirror	17
Figure 1.12.	Vacuum-formed thin glass mirror	18
Figure 1.13.	Herschel's forty foot telescope	22
Figure 1.14.	Herschelian telescope	24
Figure 1.15.	63.5 cm (25 in) $f/3$ telescope used at prime focus	25
Figure 1.16.	Rail-mounted Newtonian	26
Figure 1.17.	Tubeless Cassegrain telescope at Mount Hopkins	27
Figure 1.18.	Solar telescope using welder's glass	29
Figure 1.19.	Optical path of bent Schmidt telescope	30
Figure 1.20.	Folded 35.56 cm (14 in) Schmidt telescope	31
Figure 1.21.	Proposed off-axis Cassegrain radio telescope	32
Figure 1.22.	Solid and thick mirror Schmidts	33
Figure 1.23.	Yolo telescope	34
Figure 1.24.	Common schiefspiegler optical paths	35
Figure 1.25.	Schiefspiegler finder telescope	36
Figure 1.26.	Mechanical layout of a schiefspiegler	38
Figure 1.27.	Unobstructed Newtonian telescope diagram	39
Figure 1.28.	Tri-schiefspiegler telescope	40
Figure 1.29.	15.24 cm (6 in) Kutter tri-schiefspiegler	41
Figure 1.30.	FAR telescope	42

LIST OF ILLUSTRATIONS

Figure 1.31. Bent Cassegrain telescope	43
Figure 1.32. Bent Newtonian telescope	45
Figure 1.33. Baker Super-Schmidt camera optics	46
Figure 1.34. Baker–Nunn camera	47
Figure 1.35. All-sky meteor camera at Aberdeen University	48
Figure 1.36. Hub cap all-sky camera	50
Figure 1.37. All-sky camera made from a silvered plastic egg	51
Figure 1.38. Split objective lens	52
Figure 1.39. Twenty foot interferometer	53
Figure 1.40. Michelson’s fifty foot interferometer	55
Figure 1.41. Dialytic telescope	56
Figure 1.42. Solar eclipse telescope with switchable output beam	57
Figure 1.43. Convertible telescope	59
Figure 1.44. Fresnel zone plate	61
Figure 1.45. Double field refractor telescope	62
Figure 1.46. Gregory–Maksutov telescope	63
Figure 1.47. Lindsay’s double field reflector/refractor telescope	64
Figure 1.48. All-spherical catadioptric Newtonian telescope	67
Figure 1.49. Schupmann (medial) refractor	68
Figure 1.50. Secondary mirror holder with three vanes	70
Figure 2.1. Calibration horn telescope (horn antenna)	73
Figure 2.2. Six Inch Transit Instrument	75
Figure 2.3. A replica of Karl Jansky’s antenna	76
Figure 2.4. Grote Reber’s original radio telescope	78
Figure 2.5. Reverend John Craig’s telescope	80
Figure 2.6. South Pole telescope	81
Figure 2.7. Rapidly Moving Telescope with alt-az mounted mirror	83
Figure 2.8. † Solar eclipse camera mount used in Kenya.	84
Figure 2.9. El-el mounted FAR telescope by Max Bray	85
Figure 2.10. Wehler’s el-el mount	86
Figure 2.11. Cloudcroft Observatory 1.22 m (48 in) telescope	88
Figure 2.12. Three-axis 25.4 cm (10 in) $f/5$ telescope	90
Figure 2.13. Four-axis satellite-tracking telescope	91
Figure 2.14. Huygens’ pole-mounted telescope	92
Figure 2.15. Common Telescope at Harvard Observatory	94
Figure 3.1. Porter’s Garden Telescope	96
Figure 3.2. Ceramic tube zenith telescope	98
Figure 3.3. Bent wood telescope	99
Figure 3.4. The Great Melbourne Reflector	100
Figure 3.5. Detail of a Poncet mount mechanism beneath an observatory	102
Figure 3.6. Observing hut mounted on a Poncet platform	103
Figure 3.7. Newtonian telescope made from farm machinery	104

LIST OF ILLUSTRATIONS

Figure 3.8.	Using a telescope packing case as a mount	105
Figure 3.9.	Mount designed to dampen building vibrations	107
Figure 3.10.	Springless-damper oil-filled mount	108
Figure 4.1.	Drive corrector built from a Meccano™ set	111
Figure 4.2.	Periodic gear error corrector	112
Figure 4.3.	Louis Boyd's fully automated telescope	114
Figure 4.4.	Scottish mount diagram	116
Figure 4.5.	Scottish mount compensated for tangent error	117
Figure 4.6.	Double-arm drive by David Trott	118
Figure 4.7.	Curved-bolt drive	119
Figure 4.8.	Dick Housekeeper's Scottish mount	120
Figure 4.9.	Fishing-reel drive	121
Figure 4.10.	Ball and groove drive	123
Figure 4.11.	Sand drive	124
Figure 4.12.	Hiss drive	126
Figure 4.13.	CERGA interferometer	127
Figure 5.1.	Portable telescope mounted on a lawnmower chassis	130
Figure 5.2.	Trailer-mounted Celestron C-16	131
Figure 5.3.	Trailer-mounted 0.81 m (32 in) telescope	133
Figure 5.4.	Observing hut being mounted on its transport trailer	134
Figure 5.5.	Large trailer-mounted telescope	135
Figure 5.6.	Trailer-mounted four-axis telescope	136
Figure 5.7.	Trailer-mounted Pfund telescope	137
Figure 5.8.	Jeff Schroeder's large refractor mounted on a car	139
Figure 5.9.	Refractor mounted in the Sun roof (Moon roof?) of a car	140
Figure 5.10.	Goodyear truck-mounted telescope	140
Figure 6.1.	Lassell's Telescope	142
Figure 6.2.	The Leviathan of Parsontown	143
Figure 6.3.	Pierre Schwaar's merry-go-round trailer-mounted telescope	145
Figure 6.4.	Heated observing hut with alt-az drives	146
Figure 7.1.	Typical Nasmyth telescope	148
Figure 7.2.	The Great Treptow Refractor	149
Figure 7.3.	Hartness House turret telescope exterior	150
Figure 7.4.	Hartness House turret telescope interior	151
Figure 7.5.	Proposed reflecting turret telescope	152
Figure 7.6.	Porter's turret telescope at Breezy Hill, Stellafane	153
Figure 7.7.	Stellafane turret telescope interior	154
Figure 7.8.	Turret telescope at Stellafane under construction	154
Figure 7.9.	The original concept for the Springfield mount	155
Figure 7.10.	The original Springfield mount	156
Figure 7.11.	Trailer-mounted 30.48 cm (12 in) Springfield telescope	158
Figure 7.12.	Oscar Knab's tri-schiefspiegler Springfield telescope	159

LIST OF ILLUSTRATIONS

Figure 7.13. Cassegrain Springfield	160
Figure 7.14. Tim Parker's wooden Springfield telescope	161
Figure 7.15. Paris Coudé Refractor	162
Figure 7.16. Domeless coudé refractor for solar work	163
Figure 7.17. Capri solar observatory	164
Figure 7.18. Solar siderostat telescope	166
Figure 7.19. Grubb polar refractor telescope	167
Figure 7.20. Snow solar telescope	168
Figure 7.21. Snow solar telescope interior	169
Figure 7.22. McMath solar telescope	170
Figure 7.23. The 45.7 m (150 ft) tower telescope	172
Figure 7.24. Vacuum solar telescope	174
Figure 7.25. Wall-mounted refractor telescope	175
Figure 7.26. Gerrish student telescope	177
Figure 7.27. Roof-mounted insulated observatory	178
Figure 8.1. The Great Paris Refractor of 1900	181
Figure 8.2. Eyepiece detail of the Great Paris Refractor of 1900	182
Figure 8.3. Long focal length refractor built by Hevelius	183
Figure 8.4. Large platform for astrophotography	185
Figure 8.5. Bosscha Observatory, Indonesia twin astrographs	187
Figure 8.6. Multiple lens lunar-ranging telescope	189
Figure 8.7. 10 m (32.8 ft) optical reflector	190
Figure 8.8. Solar Thermal Test Facility	191
Figure 8.9. Solar Power Tower mirrors illuminated by Vega	193
Figure 8.10. Spectroscopic Survey Telescope	194
Figure 8.11. Väisälä's multiple mirror telescope	196
Figure 8.12. Fred Lawrence Whipple Multiple Mirror Telescope	197
Figure 8.13. Cornell Cosmic House	201
Figure 8.14. Cross-section of the Cornell Cosmic House	202
Figure 8.15. Array of telescopes used to detect cosmic-rays	203
Figure 8.16. Galilean telescopes mounted in glasses	205
Figure 8.17. Fiber optic solar telescope	207
Figure 9.1. Fork-mounted telescope	209
Figure 9.2. Telescope-driven clock	210
Figure 9.3. Telescope made from a beer can	211
Figure 9.4. I am a telescope	212
Figure 9.5. The Great Pedrick	212
Figure 9.6. A 46 cm (18 in) $f/3$ shaving mirror	213
Figure 9.7. Freemont Peak at Sunset	214

Preface

This book is about the art and technique of telescope design, although to a certain extent it comes under the heading of “astronomical trivia”. While complete descriptions of the designs are not possible in a single volume, more information can be obtained from the reference lists for each telescope. The book isn’t about just slightly unusual telescopes as shown in Fig. 1 – it’s about some blatantly odd instruments such as that shown in Fig. 2. These are mystical machines. They are often at the leading edge of technology. They are not as unusual, however, as the student of a far Eastern philosophy who told me that she focused the whole life force of the Universe to peer into other and much more distant planes of existence. In this book, we’re not going to travel that far afield.

In order for astronomy to be successful, there must be observers, theoreticians, instrumentation engineers, writers, technical managers and even janitors who maintain the astronomical industry (and if you don’t think janitors are important, just ask a professional observer how much work gets done when the drains back up on Kitt Peak).

This book is dedicated to the astronomers who have an interest in the machines, devices and techniques of observation. It is dedicated to the amateurs and professionals who have designed telescopes. They may have created new telescopes to further the state of the art in high technology scientific endeavor or they may have designed a telescope simply because they were too poor to buy a commercially made instrument. They may have brought forth a new type of telescope to make a specific observation which was not possible on any existing telescope. Perhaps nobody had ever thought of making that kind of observation before. Most important, the new telescope often resulted in an observation which led to an understanding of some phenomenon which clarified our perception of the wonderful Universe in which we live. Such an observation may actually clarify a little, but it often opens up even more questions which still must be answered. Such is the nature of science.

The telescope is the prime tool of the observational astronomer. Yes, I know that the computer is also a big tool. Let somebody else write about astronomical computers. The theoreticians may want to lynch me but I feel the telescope is, indeed, the prime tool of astronomy, especially for amateur observers. Its history

PREFACE

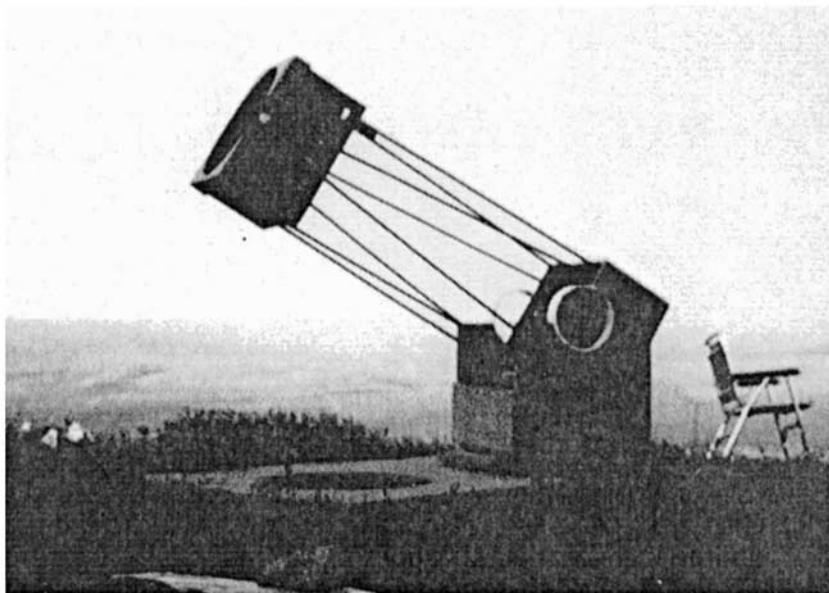


Figure 1. A slightly unusual telescope. While the telescope is functional, it is slightly out of proportion with its base and the truss structure is too long. The balance also appears to be a problem.¹ Photograph courtesy of Steve Coe, Saguaro Astronomy Club.

since Hans Lippershey² or some other early seventeenth-century designer discovered the principle, has been colorful. In nearly four centuries, thousands have been built for many purposes. The first crude instruments have been reduced to exacting practice by hundreds of engineers, observers and tinkerers. As tools of science and technology, telescopes often incorporate state of the art advancements in optics, mechanics and control systems.

It's hard to classify unusual telescopes when each of the illustrations presented here is already categorized "Miscellaneous". There are some instruments about which you'll ask "That's a telescope?". Indeed, they are all telescopes, although some are telescopes only by stretching the definition. Most of the telescopes were made to serve the desirable purpose of observing the skies. Some were obviously made to allow the owner to possess an impressive looking machine. Some show the careful craftsmanship indicative of a lover of well-made scientific instruments. These

¹ The evolution of this telescope is described in *Telescope Making*, No. 26, Summer, 1985, p. 10. The telescope was used in this form for only two nights before it was rebuilt.

² *The History of the Telescope*, Henry C. King, Dover Publications, 1955. There has been considerable discussion concerning the discovery of the telescope. A short summary of various claims can be found in an article by Brian Slade, FRAS, in *Telescope Making*, No. 30, Summer, 1987, p. 44. The subject is also discussed in *The Telescope*, Louis Bell, Dover Publications, 1981 edition, p. 3.

PREFACE

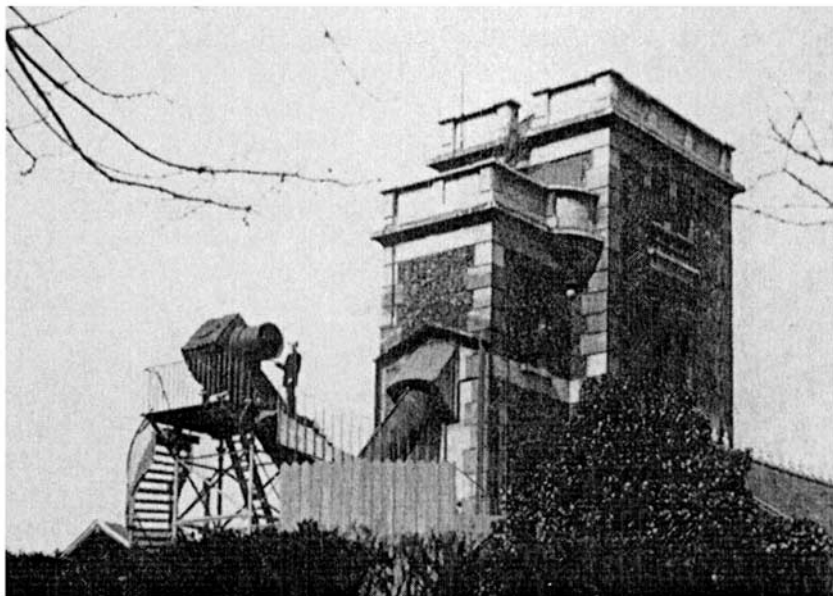


Figure 2. The Paris Observatory Coudé Refractor. Illustration courtesy of Paris Observatory. Note: a complete description of this telescope is covered in Chapter 7.

devices, with their hand-tooled brass knobs, polished hardwoods and functional design are a work of art in the eye of a mechanical engineer. Others appear as if they were thrown together by a demented scrap dealer (indeed, one telescope often seen at the Riverside Telescope Makers Conference was used for a prop in a TV show, masquerading as a laser cannon operated by a mad scientist).

Some telescope designers simply march to the beat of a different drummer. They want a machine which looks different just to be different. One telescope designer admitted that he only wanted a telescope that didn't look like any other telescope in the astronomy club – and especially not like one of those orange store-bought things.³

This is very much a story of honest engineering attempts to push forward the state of the art in astronomical instrumentation. Most of these inventions actually worked – after a fashion. Some didn't but when they didn't, at least we learned something (we learned how not to make a telescope). It is instructive to the telescope designer to see some of the more notable failures. I will try to point out design flaws gently, for I have produced my own flawed designs in the past and I understand the receipt of criticism. Many of the ideas in telescope design presented here looked, at

³ I have nothing against those orange store-bought things. In fact, I own two of them and use them regularly. Of course, I've tinkered with the design a little.

PREFACE

first glance, like quantum leaps in the state of the art. Alas, some new engineering concepts were like a Greek tragedy in that they included a fatal flaw. We'll see at least one design, multiple mirrors, in which the fatal flaw was surmounted decades later by new mirror-support technology and the concept worked beautifully.

There is no logical starting point in a subject where everything is miscellaneous so we'll just dive right into the middle. We'll consider telescopes that work in optical, infrared (IR), radio and every other portion of the electromagnetic spectrum.

In rough order, we'll see optics, telescope mounts, limits (both large and small) and, of course, miscellaneous telescopes. While researching this book I was surprised to find what I thought were some radical designs – only to discover later that the same design had been invented 20, 40 or 100 years earlier. Indeed, some strange concepts appear to have a reincarnation period of about 20 years, judging by publications like *Sky & Telescope*, the *Journal of the British Astronomical Association* and *Astronomy*. There are some names and organizations which surface often such as Léon Foucault, Russell Porter, Richard Buchroeder, Donald Dilworth, John Dobson, Oscar Knab, John Wall, Joe Perry, the Riverside Telescope Makers Conference, Stellafane, the David Levy telescope collection and just about any telescope associated with the Paris Observatory.

A note to the reader; if you see your telescope listed here and are offended that I have called it unique, please accept my apology. It must have been at least slightly unusual to come to my attention. On the other hand, if you don't see your telescope here and are offended because you think it's unusual then please write me. I can be reached at;

1533 West 7th Street, Tempe, AZ 85281–3211, USA

You can try to reach me on the phone but most clear evenings I'll be out by the telescope – and most evenings in Arizona are clear. You will also have the problem of getting through the busy signals, for I have teenage children who believe telephone privileges are part of the Bill Of Rights. I should be reachable by phone in around 1996 when the youngest will be away in school.

A note to my US friends; please do not write me to say that I spell words funny. My publisher allowed me to write the book using North American words. While editors are usually very understanding about most things, they may add text during final proof reading using words such as color (colour), program (programme), etc. In essence, I have been dragged kicking and screaming from the outback of the Great American Desert into civilized British publishing standards.

Acknowledgements

I would like to thank David Levy, who convinced me to tackle a book by myself. There are almost a hundred people who contributed photographs, provided descriptions of telescopes and gave me leads to even more unusual telescopes. Most of them are mentioned under each telescope but they deserve acknowledgement here too. There were, however, several who took an avid interest in the book, dug up references and searched out old photographs. They include, in no particular order, Dr Clyde Tombaugh, Richard Buchroeder, John Wall, Berton C. Willard, John F. Martin V, Dan Brocius and Oscar Knab. The members of the Saguaro Astronomy Club, the East Valley Astronomy Club, the Phoenix Astronomical Society and the Writer's Refinery were instrumental in critiquing the subject matter. I would also like to thank Rick and Patti Cook and Leroy and Frances Paller for providing computer and printing assistance at critical times.

Then there is my family, who have refrained from bothering me while providing a never ending supply of coffee and munchies.

The manuscript for this book was written on Macintosh™ 512+ and Macintosh™ SE computers operating with a Crate Technology® 60 Megabyte hard drive. Both MacWrite™ and Microsoft® Word were used to create text while MacDraw™, MacDraft™ and MacPaint™ software were used to create drawings. Some illustrations from old or damaged photos were scanned into the computer using a ThunderScan® picture digitizer and then cleaned up with GIFConverter© image processing software. I would never have attempted writing a book without all of that hardware and software.