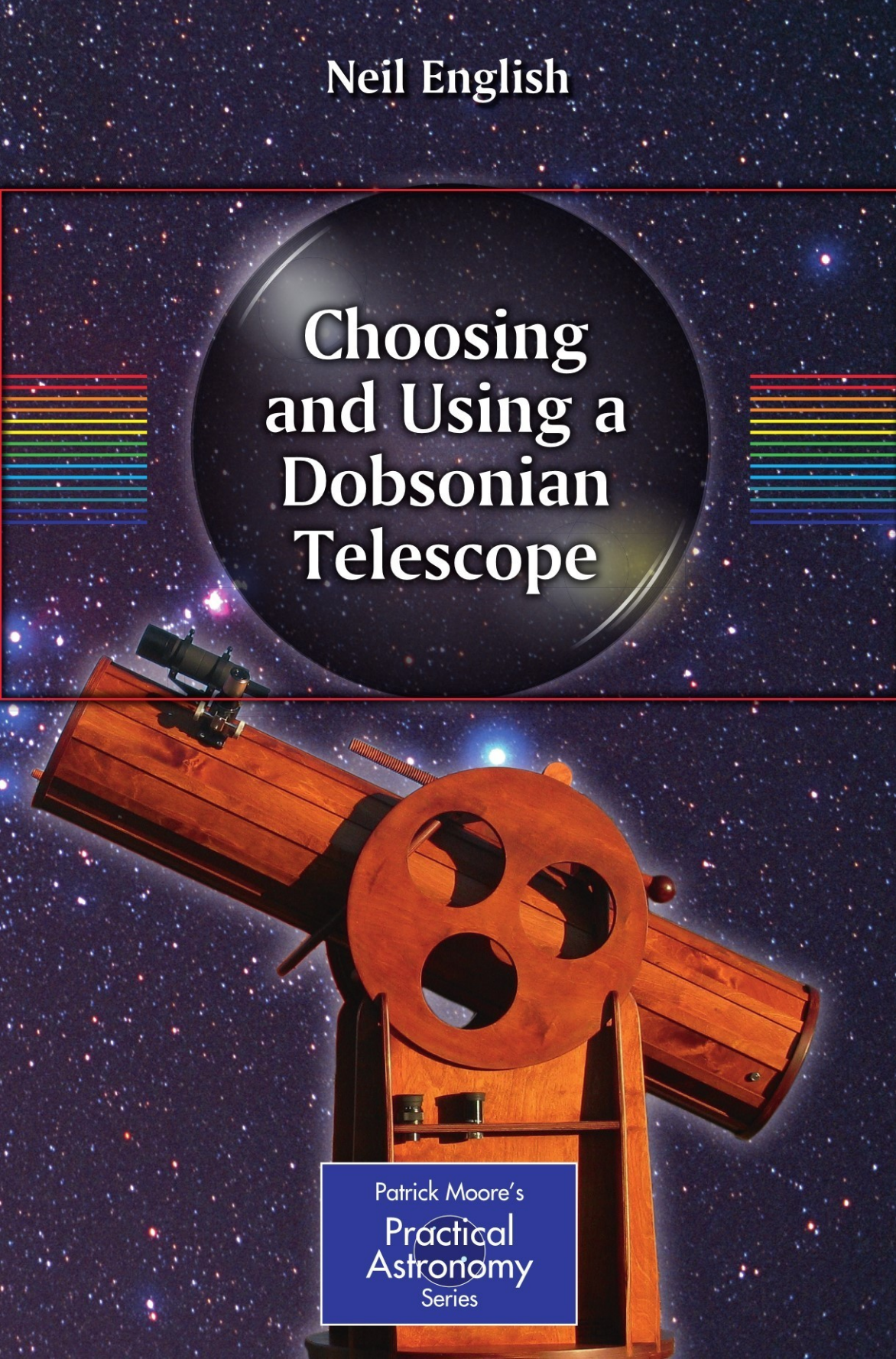
Neil English

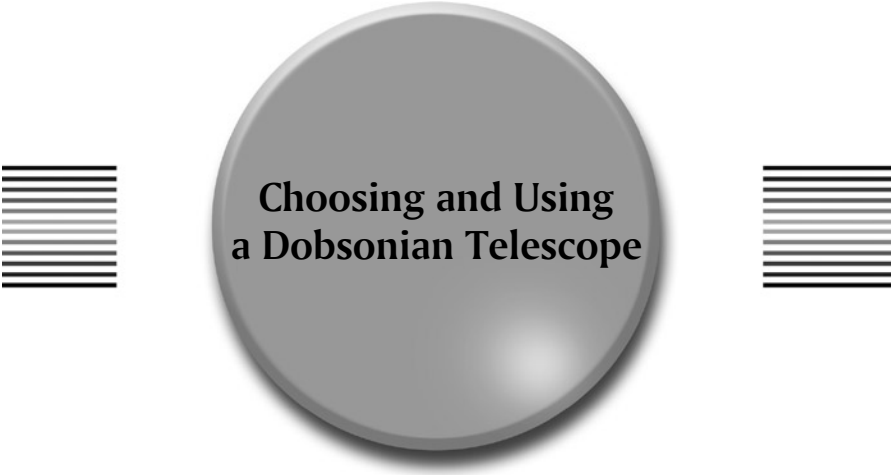
Choosing and Using a Dobsonian Telescope



Patrick Moore's Practical Astronomy Series

Patrick Moore's Practical Astronomy Series

For futher volumes:
http://www.springer.com/series/3192



Neil English

Springer

Dr. Neil English
G63 0YB Glasgow
UK

ISSN 1431-9756
ISBN 978-1-4419-8785-3 e-ISBN 978-1-4419-8786-0
DOI 10.1007/978-1-4419-8786-0
Springer New York Dordrecht Heidelberg London

Library of Congress Control Number: 2011931711

Preface

The 1960s gave the world flower power, the contraceptive pill, the Moon rocket, and Billy Graham. But on the sidewalks of San Francisco, amateur astronomer John Dobson began an extraordinary evangelistic movement of his own, showing throngs of ordinary people how to build and use large aperture 'scopes from just about anything. Up until that time, large reflecting telescopes meant using heavy mirrors and complicated mounts, but Dobson almost single-handedly changed all that. By placing a large telescope on a simple, Lazy Susan mount, Dobson opened up large aperture observational astronomy to the masses. The Dobsonian revolution, as it came to be known, continues apace in the twenty-first century, with new and improved models appearing on the market every year.

Dobsonian-mounted reflectors marry simplicity of design with portability and large aperture prowess in ways that other telescope designs simply can't do. This book serves as the ultimate guide to buying and using a commercial Dobsonian for recreational astronomy. It provides in-depth accounts of the various models (plus accessories) on the market – both economy and premium – together with describing the wealth of innovations that amateurs have made to their Dobs to optimize their performance in the field.

There has been a huge increase in the popularity of these telescopes in the last few years, and Dobsonians (Dobs) have been heavily advertised in all the major astronomy magazines. In fact, they are now the best-selling large telescopes, both in Europe and the United States. Furthermore, if you happen to visit one of the many star parties taking place at different times of year around the world, you'll see a great variety of different Dob styles, ranging from the extravagant to the simplistic.

This book will be of particular interest to the many amateur astronomers who already have, or are intending to purchase, a Dobsonian telescope, perhaps to complement their existing arsenal of smaller 'scopes or to find out more about a premium model. But it is equally an attempt to attract enthusiasts of other telescope genres – refractors and catadioptrics, for example – to the great benefits these 'light buckets' can confer, as well as the very high quality images even economy-priced models can produce. Sadly, many thousands of Dobs lay dormant in the homes of amateurs around the world, neglected perhaps, for their portliness in comparison to a new ultraportable refractor. In this capacity, the goal of this book is to re-engage with this subset of 'lost amateurs' by expounding the great virtues Dobsonians already possess.

The book is arranged into two sections, for convenience. Part I recounts the story of John Dobson and the extraordinary movement he championed, before delving into the contemporary market. We will be showcasing everything from the very large to the very small and have endeavored to cover as many telescope models as possible. Due to space constraints, however, some products receive little or no mention. Our apologies in advance if we've not covered yours!

In Part II, we'll be dipping into the wealth of accessories that bring out the best performance of your Dobsonian, together with looking at ways to evaluate their optical performance under the stars. In this section too, we'll also be exploring how the humble Dob has now entered the twenty-first century, as auto-tracking and even Go-To models are now readily available, allowing amateurs to do things that were inconceivable only a few years ago. As you'll discover, things move pretty fast in the Dobsonian world!

May 2011

Dr. Neil English
Fintry, Scotland, UK

Acknowledgements

Any work of this nature could not have been accomplished without the help of a great many people. My gratitude is extended to Norman Butler, Peter Read, Bob Royce, Tom McCarthy, Scott Holland, Dave Bonandrini, Dave Rogers, Pat Conlon, David Hartley, Part Veispak, Javier Medrano, Vic Graham, Steve Dodson, John Compton, Normand Fullum, Doug Reilly, Kerry Robbert, Chris Hendren, Andy Sheen, Shane Farrell, Andre Hassid, Robert Katz, Jonathan Usher, and Dan Price.

I would also like to thank John Watson and Maury Solomon for endorsing the project and all the editorial team at Springer for a job well done. I would also like to thank my family for putting up with my seemingly endless retreats to the office to get this work done on time. Daddy's back!

About the Author

Experienced observer and writer on astronomy, Neil English has enjoyed looking through and writing about Dobsonian telescopes of all vintages. A Fellow of the Royal Astronomical Society, Neil has been a regular contributor to Britain's *Astronomy Now* for over 15 years. His work has also appeared in *Astronomy* magazine and *New Scientist.* He holds a PhD. in biochemistry and a BSc in physics and astronomy. English is the also the author of the sister Springer title, *Choosing and Using a Refracting Telescope*. He observes from the dark skies of rural, central Scotland, where he lives with his wife and two young sons.

Contents

Preface v
Acknowledgements vii
About the Author ix

Part I The Dobsonian Telescope 1
Chapter 1 John Dobson, The Man and His Legacy 3
The Revolution Unfolds 7
Variations on a Theme 10

Chapter 2 Know Thy Dob 13
From Speculum to Glass 15
Support Your Mirror 16
The Secondary Mirror 17
Image Quality 20
Tube Design 24
Focusers 25
Mirror Cooling 26
Pause for Thought – The Newtonian Logic 27

Chapter 3 The Mini-Dobs 33
The 4.5-inch Brigade 37
The 6-inch Crew 41
The Starblast 6 41

Going Long 47
Sky Watcher Magic 49
Meet the Contestants 52
A British-Made Classic 55

Chapter 4 Getting Serious 59
A Truss Tube for the Masses 59
A Super Cool Dob 66
A Dob That Finds Things 68

Chapter 5 The Planetary Dobs 79
A British Planetary Dob 86
The Off-Axis Brigade 90
Fancy an 8-inch Planetary Dob? 93
The Discovery Compromise 'Scope 96

Chapter 6 The 12- to 16-inch Dobs 99
Large Aperture Dobs from Sky Watcher 100
A Big Dob That Finds Things 102
The Orion Optics UK, OD 300 L 110
American Favorites 114
Reaching the Stars With a Starmaster 117
The Devil in the Details 118
Teeter Triumphs 119

Chapter 7 Different Strokes 121
Portability Plus: The Ultralight 8 127
Works of Art 131
The "Dob Buster" 139
When a Passion Becomes a Business 143
Design Considerations 145

Chapter 8 Here Be Monsters 151
Flying the Flag for Britain 153
Orion Optics UK New Mega Dobs 156
Big Dobs from Down Under 157
American Behemoths 159
The AstroSystems Range 161
A New Kid on the Block 162

Part II Using Your Dobsonian 167
Chapter 9 Accessorizing Your Dob 169
The Curse of Coma 169
Eyepiece Considerations 173
Barlows and Image Amplifiers 178
Filters for Deep Sky Work 180
Battling Against Dew 182
Getting Your Dob to Track 184

Chapter 10 Adjusting, Maintaining, and Testing Your Dob 191
Cleaning Mirrors 193
Star Testing Your Dob 194
High Power Test 198

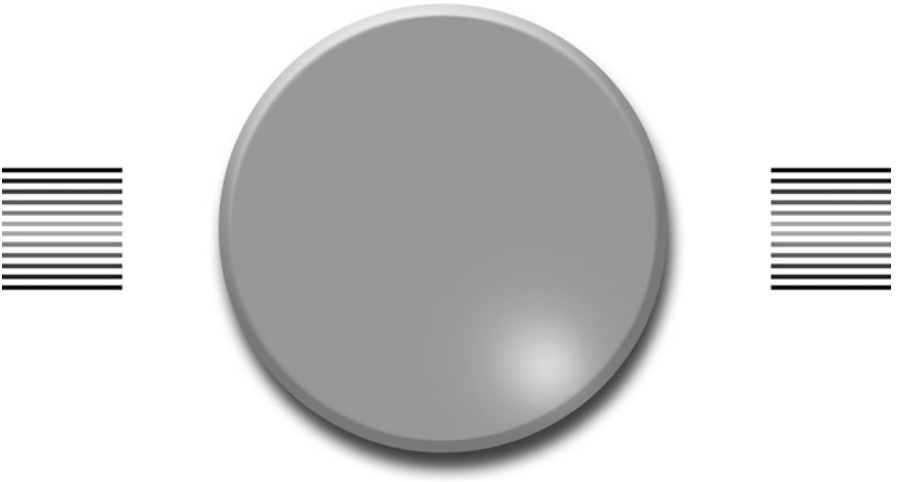
Chapter 11 Sketching and Imaging with Your Dob 201
Electronic Eyes on the Sky 206

Chapter 12 Where Next, Columbus? 213
The Story of LAT 214
Going Faster? 215
The Conical Mirror 217

Appendix 221

Index 229

PART ONE



The Dobsonian Telescope

CHAPTER ONE

John Dobson, The Man and His Legacy

All great movements, whether political or cultural, begin with the individual. This is particularly apt when considering the legacy of John Dobson, who, almost singlehandedly started a revolution in amateur astronomy that has steadily gained momentum over the past 30 years.

John Lowry Dobson was born to American parents in Beijing, China, on September 14, 1915. His maternal grandfather was the founder of Peking University. His father was a lecturer in zoology at the university and his mother a musician. By the time John entered high school, China was experiencing considerable political unrest, and in 1927, the entire Dobson family (three brothers included) packed up and returned to the United States. John's father got a job teaching high school science, retiring in the 1950s. After completing high school, John read chemistry at the University of California at Berkeley, receiving his bachelor's degree in chemistry and mathematics in 1943. Like many of his fellow graduates, Dobson had to forego any chance of continuing his studies while the war in Europe and the Pacific raged on. Like so many bright young graduates, he soon found himself working on the Manhattan Project.

But Dobson quickly learned that such tasks were unsuited to his intellectual inclinations. His life changed forever when, out of sheer curiosity,

N. English, *Choosing and Using a Dobsonian Telescope*, Patrick Moore's Practical Astronomy Series 1, DOI 10.1007/978-1-4419-8786-0_1,

he attended a meeting at the Vedanta Center in San Francisco and was so bowled over by what he heard that he immediately enlisted and became a trainee of the Ramakrishna order. That was the way it would stay for Dobson for the next 23 years. While in the monastery he was assigned to reconciling the conflict between science and religion. In order to do that, he had to sample the wider universe for himself, which first led him to think about telescopes.

So in 1956, the 41-year-old holy man scraped together the materials to make a tiny 2-inch refracting telescope with a focal length of 14 inches delivering a magnification of 37×, from material he had scrounged from junk stores. With this he spied the minute Saturnian globe and its spell-binding system of rings. Those first glimpses had a profound effect on him. Indeed, it was as if he had some kind of religious experience. Only when he exhausted the limited power of the 2-inch glass did Dobson begin to pine for more light-gathering ability. A fellow monk at the monastery suggested he make his own mirror to satisfy his aperture fever. And dutifully, Dobson did just that, grinding it out of a piece of 120-inch 'marine-salvage' porthole glass.

Although the telescope was held together on a shoestring budget, the first look at a gibbous Moon through it changed his life forever and sent him headlong towards the evangelistic amateur astronomer and telescope maker he was to become. He brought his telescopes out onto the streets of San Francisco, for example, and began to preach the gospel according to John Dobson. He'd set up his ragtag Newtonian on the sidewalks of the city and cordially invite passersby to come take a look through his telescope. Gentle persuasion was his way of doing things.

From the very beginning, it seems, Dobson wanted everyone to witness the cosmic apparition that he himself encountered on that fateful evening in 1956. Two years later, Dobson had been transferred to another monastery in Sacramento. By then, he was churning out better and better telescopes. The first one was a little 50-inch reflector with a mirror ground from the bottom of a dug-out gallon jug. But soon he was busy grinding much bigger mirrors from free donations 'smuggled' into the monastery by appreciative fans. And he quickly became very good at it, too!

Grinding mirrors is a very time consuming activity, however, and public outreach demands even more. Soon, his superiors at the monastery grew concerned that it was eating too much into his monastic duties. Still, they tolerated his long AWOL spells from the monastery for many years to come. It was only in the spring of 1967 that the great man was asked to leave the monastery on the grounds that he could not fulfill his

duties and continue playing the sky-watching evangelist. So after 23 years of living the Spartan existence of a monk, Dobson left in search of a new life. Predictably enough, he decided to dedicate the rest of his career to public astronomy outreach.

The type of telescope that bears his name was not patented. "That would be like trying to patent a cup with a handle on it," Dobson once remarked. His goal was to create a telescope that had good optics simply mounted. Equatorial platforms were far too complex for the task, so he settled for a simple Lazy Susan design in which the 'scope sits in a cradle that allows it to move up and down as well as from side to side. Actually, Dobson did not invent this mounting scheme, either. If you look at some old photographs from Stellafane dating back to 1941 – before the great man ever looked through a telescope – you can clearly see a few Newtonian reflectors that are mounted in a configuration that is remarkably similar to the 'Lazy Suzan' mounts found on contemporary Dobs (Figs. 1.1 and 1.2).

Dobson did, however, wish to reduce the cost of assembling a decent telescope and so resorted to the simplest mount he could put together on a minimalist budget. A simple cradle alt-azimuth mount was by far the simplest option available. By 1968, some of the folk John had guided and inspired started a public-service organization named the San Francisco Sidewalk Astronomers. At first, only fairly small 'scopes were used, but as the organization grew, larger telescopes were made and hauled out onto the streets. By 1970, the Sidewalk Astronomers had a 24-inch telescope that could be transported to any location. Soon they were bringing their light buckets to dark sky sites across the United States to every major star party. And at nearly every one, a big Dob looked skywards. In 1978, he was invited to Hollywood, not to star in a movie but to lecture adoring crowds and teach telescope making. And he did that faithfully for a further 26 years. Nobody knows exactly how many telescopes the man built, but it's probably of the order of several thousand.

As a teacher of telescope making, he could be impatient, even rude, so eager was he to impart the proper mirror grinding skills to his students. His methods of testing the figure of mirrors using a light bulb were also crude, but he was never aiming for perfection, just adequacy.

Dobson's ideas about the wider world are eccentric, even today, to put it mildly. You only need to view a few YouTube clips of his lectures to see what we mean.

Dobson has also tried his hand at book writing. In 1991 he authored *How and Why to Make a User-Friendly Sidewalk Telescope* with his editor, Norman Sperling. This very influential book helped popularize

Fig. 1.1. Amateurs standing behind an alt-aziumth-mounted Newtonian at Stellafane, 1941 (Image credit: Stellafane).

the Dobsonian mount that we know today. It also provides a mine of information about Dobson's own background and his belief in the importance of popular access to astronomy for proper appreciation of the universe. It even delves into his belief in a steady state universe. John Dobson, just past his 95th trip round the Sun at the time of writing, is as colorful and charismatic as ever.

Fig. 1.2. Another picture of the same telescope in the foreground from Stellafane 1941 (Image credit: Stellafane).

The Revolution Unfolds

Revolutions begin slowly and gain momentum before impacting the world. So it was with Dobson's evangelism. Although his mission to get everyone making telescopes on a nickel and dime budget appealed to many, others were slow to warm to the movement. Back in 1969, the former editor-in-chief of *Sky & Telescope* magazine, Charles A. Federer, doubted that Dobson's simple plywood mountings and light-bulb testing procedures would be of any lasting value to serious observers. But Federer misunderstood Dobson's point and underestimated his influence. Dobson wanted to show that practically anybody could build, transport, and use a big 'scope.

The first company to adopt the Dobsonian as a viable commercial product was Coulter Optical, which entered the astronomy world in 1968. They were also the first company to standardize the f/4.5 focal ratio seen on many commercial Dobs. Back then, the company specialized in producing low cost, so-so quality parabolic mirrors. By getting into the Dob business they struck gold, quickly establishing a reputation

for themselves for producing their inexpensive but optically adequate Dobsonian-style reflectors. By 1980, Coulter had become the first manufacturer to market the "Dobsonian" telescope much as we know it today. Their Odyssey series catered to those with a taste for small, medium, and large aperture.

All of these telescopes utilized a very simple 1 ¼ inch sliding focuser tube made using a sleeve with adjustable tension. The Odyssey 1, for example, was a basic 13.1 inch f/4.5 instrument that allowed many amateurs to enjoy impressive deep sky views for a remarkably low price. The first Coulter tubes had a large box shape at their lower extremity, with a trapdoor where the mirror sat in a sling. Unfortunately, that meant that the mirror had to be removed each time you moved the telescope. It wasn't exactly portable either, weighing in at 120 pounds. The design was later changed to the more common tube we see today, comprised of a particle board push-pull mirror cell. Its thickness was reduced from the standard 1:6 ratio to 1:13. This shaved almost 20 pounds off the total weight, resulting in a much more transport-friendly telescope (Fig. 1.3).

All the Odyssey'scopes came with their characteristic painted Sonotubes and particle board boxes. And it's easy to see why the series became a hit almost overnight. Even the clumsiest amateurs were keen to try their hand at building their own 'scopes. Soon, to sate the aperture fever of the amateur community, the company starting offering a 10.1"" f/4.5 Odyssey Compact telescope. Another model was their giant Odyssey II, which had a 17.5" f/4.5 optical tube. All of these were initially produced with the box at the lower end of the tube, but later Coulter redesigned them with a standard tube.

By 1984, the company began offering much more portable Dobs, such as the Odyssey 8. This made use of an 8-inch f/4.5 optical tube on a small but sturdy Lazy Susan mount. This was supplemented about a decade later with the Odyssey 8-inch f/7 mounted on the same cradle. This spurred the 1995 announcement of the Odyssey 8 Combo, a unique combination of two optical tube assemblies, one Dobsonian mount, and one eyepiece. Both tubes could be placed on the one mount to provide either wide field views or greater magnification and both had 1¼"" helical focusers. Shortly before the company's demise a new Odyssey 2 was made available – a 16-inch f/4.5 telescope with a standard 1 ¼-inch helical focuser and eyepiece.

Coulter Optical enjoyed great success for the best part of quarter of a century, but finally folded late in 1995, not long after the death of the creator of the company. In 1997, Murnaghan Instruments once again made the Coulter line of telescopes available, but admittedly at somewhat

Fig. 1.3. An advertisement for the Coulter 13.1-inch Dob appearing in the June 1980 issue of *Sky & Telescope*.

lower quality. In 2001 Murnaghan brought the line to the end for the last time. By then, the big telescope manufacturers had gotten the message loud and clear, and all maneuvered to capture a piece of the market. Meade, Celestron, and Bushnell all produced a line of good, but relatively inexpensive, Dobs. Cheap labor costs for Chinese workers meant that mirrors of good optical quality could be produced to fit these telescopes. That said, the Dobsonian revolution was far from over, and new innovations in design were just around the corner, led, as ever, by amateur telescope makers (ATMs).

Variations on a Theme

Although the Dobsonian, in its original form at least, provides large aperture in a transportable format, these 'scopes were still very heavy and awkward to move. What's more, while closed tube designs were adequate for smaller apertures, other ATMers sought new ways of cutting weight. The first documented breakthrough came with the publication, in *Telescope Making* magazine, issue 17 in 1981, of Ivar Hamberg's truss tube alt-az telescope. This innovation was unlike anything that had come before. Although it still used Teflon on Formica bearings, Hamberg's truss tube was designed to be taken apart for transport. Of course, it was still considered to be a Dobsonian, but it really bore as much relationship to Dobson's design as a go cart does to a car.

As a result, almost all large modern alt-az mounted telescopes of over 12.5-inch aperture today copy this design. Ivar's article introduced the collapsible truss tube, allowing disassembly and transport to dark skies from urban areas. This opened up a whole new field of large aperture deep sky observers and a whole new trend. Following on from that, a great number of refinements were introduced by David Kreige, who put an enormous amount of original thought and effort into this design to make it relatively inexpensive and user friendly. Ivar's original blueprint has further evolved to some ultralight designs to reinforce this trend. Despite all of these radical new designs they are not called "Hambergians" or "Kreigian" but universally as "Dobsonians."

In 2003, Orion USA launched their innovative SkyQuest Intelliscope series of closed tube Dobs that came with a computerized object locator. Of course, neither the telescope nor the locator were anything new, but they did offer a new level of versatility to the Dob user. As we'll see in a later chapter, the object locator was coupled to high resolution encoders on both altitude and azimuth axes – with a database of 14,000 objects – that could be found by pushing the telescope to the desired object in the