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# A Buyer's and User's Guide to Astronomical Telescopes and Binoculars

James Mullaney

Second Edition

 Springer

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## Preface

In Robert Frost's famous poem *The Star-Splitter*, he states that someone in every town owes it to the town to keep a telescope. I would take that a step further and say that someone in *every home* should have one! For without one of these magical instruments, we are out of touch with the awesome universe in which we live and the many wonders it offers. I have no doubt that Frost himself would have agreed with me, for he was an avid stargazer throughout his long life.

The book you're holding in your hands will make it possible for you to be that someone who has the vision and curiosity of owning a telescope. It will help answer such questions as: "Should I buy a new or used telescope?" "Can I make one myself?" "Which type is best?" "What size should I get and how much should I spend?" "How much power do I need?" "What can I see with it once I get it?" And, "Do I really need a telescope or will binoculars suffice?" These are all important concerns—and ones which should be addressed before plunging into the purchase of any instrument intended for stargazing. This book contains two main themes. One deals with the various kinds of astronomical telescopes and binoculars, along with recommended sources for them. The other tells you once you've acquired one of these optical devices—what I like to call "spaceships of the mind"—how to use them and what to look at in the sky.

Perhaps this is as good a place as any to explain what is meant when we describe an instrument as "astronomical" (as in the title). This term relates to its optical quality. While just about any telescope will show the features of the Moon's alien landscape, the four bright Galilean satellites of Jupiter, and perhaps even the majestic ice-rings of Saturn, there's a significant difference in what's seen of these and a host of other celestial wonders through a precision optical system compared to that viewed in one of poor or mediocre quality. Binoculars and most low-end "spotting grade" telescopes are designed with terrestrial use in mind rather than celestial.

The optical precision needed to produce razor-sharp views of the Moon and planets and pinpoint images of stars is an order of magnitude above that required for ground-based observing. Since binoculars are normally used at very low magnifications (typically at 10× or less), optical aberrations are not nearly as critical for them as they are for a telescope with its correspondingly greater magnifications (typically 50× and higher).

For many readers—particularly those who are already somewhat familiar with telescopes and binoculars and their use—two especially valuable features of this book should be noted. One is the extensive compilations in Chaps. 8 and 9 providing handy references to the principal manufacturers and sources for binoculars and telescopes. These have been updated for this second edition up to the time of printing, listing new products that have been introduced since the first one—as well as new companies that have appeared on the market since 2007. Likewise, firms that have since gone out of business are so indicated, but still retained in the listings for reference purposes. Here you'll find mailing and Web site addresses, telephone numbers (in some cases), and an overview of types and models offered. Since new or upgraded instruments are constantly being added to most manufacturers' lines, you'll be able to get information and specifications on the very latest available models, current prices, and delivery times through their catalogs and other literature (both online and print copies).

The other valuable feature is the celestial showpiece roster that appears as Appendix 3. Based on more than half a century of “harvesting” the heavens for its visual treasures and delights by the author, it provides enough targets for a lifetime of viewing pleasure! Some of its entries like the Pleiades Star Cluster can be readily seen with the unaided eye, while many others are visible in binoculars (including some of the wider double stars, clusters, nebulae, and even a few of the brighter galaxies—and let's not forget the magnificent Milky Way itself!). But the roster is especially intended for “backyard telescope” users.

Two other features new to this edition are chapters on the exploding field of astroimaging and professional–amateur collaboration in conducting cutting-edge astronomical research for those wishing to go beyond the simple joys and pleasures of stargazing itself. The former subject was touched upon in the Accessories section of the first edition but now has a chapter of its own. This is placed just before that on the latter subject since it's astroimaging technology that has largely made possible amateur astronomers being able to do professional-level research today.

Distilled in this volume is the author's more than 60 years of experience making, designing, selecting, testing—and especially using—literally thousands of different sizes, types, and makes of telescopes. These have included refractors from 2- to 30-in. (!) in aperture, reflectors from 3- to 60-in., and compound catadioptric scopes from 3.5- to 22-in. in size, employed for both casual personal observing and (in the larger apertures) for research work as well. And after all those instruments and all those years, I'm as excited about telescopes and stargazing as ever!

It should be mentioned here that this present book is *not* intended to be a comprehensive treatise on all the intricate technical aspects of telescope and binocular optics—nor is it intended to be an all-encompassing guidebook on their use in

astronomy. (References are given throughout the text for those who do wish to dig deeper into these areas.) Its purpose, instead, is to offer readers a condensed trustworthy treatment of these various topics sufficient to make informed decisions on the selection and use of these instruments—but general enough so as to not overwhelm them. And while telescopes costing many thousands of dollars are discussed, so too are ones priced at only a few hundred dollars or less.

Stargazing can be a very affordable pastime. If you are new to the field, it's best to start with a basic instrument of good quality (especially optically) and then in time graduate to a larger and/or more sophisticated one if desired. Despite all the varied types and sizes of telescopes I've used over the years, my most pleasurable and rewarding observing experiences continue to be those with a 3-in. short-focus refractor at 30×, a 4-in. rich-field reflector at 16×, and a 5-in. catadioptric telescope at magnifications of 40× to 100×. Any one of these used on an interchangeable, lightweight but sturdy altazimuth mounting with smooth slow motion controls and wooden tripod weighs in at less than 12 lb. And as we will learn, the smaller (more portable) the telescope, the more likely it is to be used!

It is the author's sincere wish that whatever level your present familiarity and experience with telescopes and binoculars may be, a careful reading of this book will result in the selection of a quality optical instrument ideally suited to your needs and intended purposes. And even more importantly, that it will lead you to the ultimate use of these marvelous devices—whether it be a binocular or telescope, new or used, large or small, inexpensive and basic or costly and highly sophisticated; viewing the wonders of the heavens in a way that will excite, enrich, and ennoble your life, as well as that of others you share the sky with.

Rehoboth Beach, DE

James Mullaney







## Acknowledgments

There are many people in the astronomical and telescope manufacturing community who have helped to make this book possible. The companies listed in Chaps. 8 and 9 have kindly supplied the resource information given there on their products, as well as images of many of their instruments. Of these, special thanks must go to Orion Telescopes & Binoculars which has generously made images available to the author of many telescopes, binoculars, and accessories typical of those widely used by amateur astronomers today. I am also indebted to astroimagers Dennis di Cicco (a Senior Editor at *Sky & Telescope* magazine) and Steve Peters of Orion for the use of previously unpublished images from their private collections. Sky Publishing has also generously supplied images that have previously appeared in *Sky & Telescope* and *Night Sky* magazines. In addition to my editors at Springer for the first edition of this work (Dr. John Watson and Nicholas Wilson in the London office, Dr. Harry Blom and Louise Farkas in the New York office, and general series editor Dr. Mike Inglis), those for this second edition—Maury Soloman and Nora Rawn in the New York office—have been most helpful and a pleasure to work with. Finally, I wish to again thank my dear wife, Sharon McDonald Mullaney, for her encouragement and continued support of my lifelong mission of celebrating the universe and sharing the joys of stargazing with as many people on this planet as possible!



## About the Author

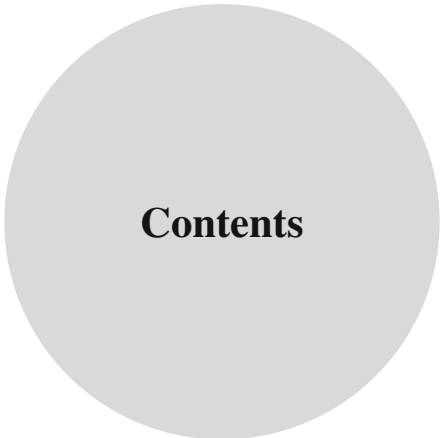


The author, shown holding a copy of his book *Celestial Harvest: 300-Plus Showpieces of the Heavens for Telescope Viewing & Contemplation*. Originally self-published in 1998 (and updated in 2000), it was reprinted in 2002 by Dover Publications in New York. This labor-of-love was more than 40 years in the making! Image Courtesy of Warren Greenwald.

James Mullaney is an astronomy writer, speaker and consultant who has published nearly a thousand articles and nine books on observing the wonders of the heavens, and logged over 20,000 hours of stargazing time with the unaided eye, binoculars and telescopes. Formerly Curator of the Buhl Planetarium & Institute of Popular Science in Pittsburgh and more recently Director of the DuPont Planetarium at USCA, he served as staff astronomer at the University of Pittsburgh's Allegheny Observatory and as an assistant editor for *Sky & Telescope* magazine. One of the contributors to Carl Sagan's award-winning *Cosmos* PBS-Television series, his work has received endorsement from such notables (and fellow stargazers) over the years as Sir Arthur Clarke, Johnny Carson, Ray Bradbury, Dr. Wernher von Braun, and former student - NASA scientist/astronaut Dr. Jay Apt. His lifelong mission has been to "Celebrate the Universe!" - to get others to look up at the majesty of the night sky and personally experience the joys of stargazing. In recognition of his work, he has been elected a Fellow of the prestigious Royal Astronomical Society of London.



The author shown with his 5-inch Celestron Schmidt-Cassegrain optical tube assembly mounted on an exquisite old Unitron altazimuth mounting with slow motion controls. With excellent optics and a total weight of just 12 pounds, this highly portable instrument can go anywhere and is a joy to use. Image courtesy of Sharon Mullaney.



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