Cosmic Challenge

Listing more than 500 sky targets, both near and far, in 187 challenges, this observing guide will test novice astronomers and advanced veterans alike. Its unique mix of Solar System and deep-sky targets will have observers hunting for the Apollo lunar landing sites, searching for satellites orbiting the outermost planets, and exploring hundreds of star clusters, nebulae, distant galaxies, and quasars.

Each target object is accompanied by a rating indicating how difficult the object is to find, an in-depth visual description, an illustration showing how the object realistically looks, and a detailed finder chart to help you find each challenge quickly and effectively. The guide introduces objects often overlooked in other observing guides and features targets visible in a variety of conditions, from the inner city to the dark countryside. Challenges are provided for viewing by the naked eye, through binoculars, to the largest backyard telescopes.

Philip S. Harrington is the author of eight previous books for the amateur astronomer, including *Touring the Universe through Binoculars*, *Star Ware*, and *Star Watch*. He is also a contributing editor for *Astronomy* magazine, where he has authored the magazine's monthly "Binocular Universe" column and "Phil Harrington's Challenge Objects," a quarterly online column on Astronomy.com. He is an Adjunct Professor at Dowling College and Suffolk County Community College, New York, where he teaches courses in stellar and planetary astronomy.

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The Ultimate Observing List for Amateurs

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For my wife Wendy, the center of my universe

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Preface

Surely there is not another field of human contemplation so wondrously rich as astronomy! It is so easy to reach, so responsive to every mood, so stimulating, uplifting, abstracting, and infinitely consoling. Everybody may not be a chemist, a geologist, a mathematician, but everybody may be and ought to be, in a modest, personal way, an astronomer, for star-gazing is a great medicine of the soul.

With those words, Garret Serviss embarked on his book *Round the Year with the Stars*. Published in 1910, *Round the Year with the Stars* brought readers to sights that few had ever seen before. Serviss was one of his generation's best-known astronomical authors, with several previous titles to his credit. Indeed, he was almost apologetic for writing this latest work. "The writer's only real excuse for appearing again in this particular field is that he has never yet finished a book, and seen it go forth, without feeling that he had overlooked, or cast aside, or of necessity omitted a multitude of things quite as interesting and important as any he had touched upon."

That is my excuse, as well. In the 100 years since Serviss's book first appeared, there have been hundreds, if not thousands, of observing guides published. I have written a couple of them myself. Some were general guides intended to introduce the reader to the sky's finest objects. Others paid homage to only certain classes of objects, restricting their discussion to only deep-sky objects or perhaps members of the Solar System. Many were geared toward newcomers to the hobby and to science, while others were intended for veterans who had been around the block many times.

Many of the published guides, my own included, have overlooked some fascinating objects, perhaps in part because the author felt those objects were too difficult for the intended audience.

The book you hold before you is a little different. *Cosmic Challenge* focuses on a wide variety of sky targets, including some old favorites and some that you probably have never even heard of before. Each object included will have been selected not because it is easy, but because it is difficult to spot in some way. The type of challenge posed will vary from one target to the next. An object might be very faint, or very small, or tough to spot for any of a number of other reasons.

Of course, what's challenging to one person might be an easy catch for another. So much depends on each person's level of experience, the clarity and darkness of the observing site, and the telescope used. A tough test for a 4-inch telescope should be quite easy through a 14-inch. To help level the playing field, each chapter is devoted to one of six instrument categories based on aperture: naked eye, binoculars, 3- to 5-inch telescopes, 6- to 9.25-inch telescopes, 10- to 14-inch telescopes, and 15-inchers and up. Each chapter is then further segmented by season.

Although the book mainly covers deep-sky objects that may require dark skies regardless of telescope size, each chapter also includes targets of interest to city dwellers. Many lunar and planetary features, visible year-round, as well as some close-set double and multiple star systems, are included, since they are equally challenging regardless of the observing site.

I would very much enjoy hearing from you, the reader, as you attempt to view the objects outlined in this book. Feel free to email me at phil@philharrington.net. And be sure to check for additions and addenda in the "Cosmic Challenge" section of my website, www.philharrington.net.

Acknowledgments

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I also wish to thank John Boudreau, Bill Bradley, Kevin Dixon, Bob King, Larry Landolfi, Frank Melillo, and Dan Wright, the astrophotographers whose work adorns some of the pages to come. I find it truly amazing to see the results being produced by accomplished backyard astronomers these days. These seasoned amateurs are among today's most talented astrophotographers.

My thanks to Christian Legrand and Patrick Chevalley, creators of Virtual Moon Atlas software, for allowing me to use their program as the basis for the lunar charts found in the later chapters.

Many thanks also to my editor Vincent Higgs, Abigail Jones, Megan Waddington, and Claire Poole at Cambridge University Press for their diligent guidance and help throughout the production phase of this book. Without their input, the book as it exists simply would not.

I would also like to single out four people who were very influential in my early days as a teenage amateur astronomer. The first is George Clark, my 6th-grade science teacher in Norwalk, Connecticut. It was his homework assignment to watch the total lunar eclipse of April 13, 1968, that sparked my interest, and ultimately lifelong passion, in astronomy in the first place.

My thanks also to Russ Harding, former director of the Robert B. Oliver Planetarium for the Norwalk school system. With the patience of a saint, he allowed this high schooler to putter around the planetarium nearly every day after school, very likely getting in the way and causing trouble rather than helping. But I loved it.

Another influential teacher in my life was Fred Bump from the neighboring Westport, Connecticut, schools. Fred was the power behind resurrecting Rolnick Observatory and the Westport Astronomical Society, where I was an active member "back in the day."

Finally, thanks to Charles Scovil, curator of Stamford Observatory in Stamford, Connecticut. He fostered my interest, and that of many other young astronomers. My parents would drive me there every Friday night, as the observatory became my "hang out."

And, of course, were it not for my parents, Frank and Dorothy Harrington, none of that would have happened. I love them dearly for that gift.

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