

The Cambridge Encyclopedia of Amateur Astronomy

Being an amateur astronomer is great fun, with many different and interesting areas to get involved in. This complete reference provides a wealth of practical information covering all aspects of amateur astronomy. Organized thematically for ease of use, it covers observing techniques, telescopes and observatories, internet resources, and the objects that can be studied. Those new to the field will find tips, techniques and plans on how to begin their quest, and more advanced observers will find lots of useful advice on how to get more out of their hobby. Containing the most recent data, the book is highly accurate, and is illustrated throughout with stunning color images and graphics. It is an essential guide for both beginning stargazers and more advanced observers.

MICHAEL E. BAKICH obtained a Bachelor's degree in Astronomy from Ohio State University in 1975, and a Master's degree in Planetarium Education from Michigan State University in 1977. He has written numerous original planetarium programs, and gives lectures on astronomy to groups of all ages. He is also a tour guide to eclipses and astro-archaeological sites. Bakich has written two previous books – *The Cambridge Guide to the Constellations* and *The Cambridge Planetary Handbook* – both published by Cambridge University Press.

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Michael E. Bakich
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THE CAMBRIDGE
ENCYCLOPEDIA OF
AMATEUR
ASTRONOMY

Michael E. Bakich



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Foreword

Jeff Medkeff

Contributing Editor, *Sky & Telescope*

When I got my start as an amateur astronomer at about age nine, I proceeded with a planisphere and my grandmother's opera glasses. From the front yard of my childhood home in Cuyahoga Falls, Ohio, I was able to identify Vega and the summer triangle, and find many of the brighter summer Milky Way clusters. Over the years, I gained proficiency in recognizing the constellations and observing the sky, and I found myself wanting to spend time under the stars more and more. I acquired a telescope and a few eyepieces, and some spiffy star charts. I began to enjoy hunting down obscure deep-sky objects and striving to see fine detail in tiny planetary images on nights of steady seeing. But more than this, I made friends of my fellow astronomers – people who proved to be important mentors to me.

And yet nothing has proved more enduring and closer to my soul than the night sky itself. As the years have passed, the night sky has more and more proven to be my natural element. Nowhere do I feel more comfortable or more natural than out in the countryside, alone or with a few good friends, in the dark, looking at the night sky. Urban paranoia may not sympathize with my enjoyment of nighttime walks in the country, spent mostly looking upward; nor do corporate managers relate well to the special circumstances required for my nocturnal pursuits. It doesn't bother me much at all. Every clear, dark night, I can plunge deep into the wilderness – a wilderness untouched by humans, and utterly isolated from every nuisance of society. I lay my eyes on things and places that few, if any, humans have ever seen, and where none have ever been. And only there – even with all the special places in this world of ours, and even with all its people to spend time with – only there, in the night sky, do I find my true element. The night sky is my true home.

Today, over twenty years since I first directed opera glasses toward the summer Milky Way, I sleep soundly while a robotic telescope and electronic camera automatically take images of variable stars for later analysis. With this equipment, my backyard has turned into a fully fledged research observatory, complete with published scientific papers and recognition from the IAU.

I have not lost my passion for looking at the night sky with my eyes, binoculars, and telescopes. But the twenty years I

have spent in this hobby have been years of change. When I got my start, an eight inch scope on standard German equatorial mount was a good-sized scope – with the now-venerable C-8 a new-fangled alternative for those who drove subcompact or sports cars. I was observing with a 4.5" reflector that my uncle had picked up for me at an astronomy convention – a scope whose optics are still in use today. Within a few years, an inexpensive alt-az design swept through the ranks of amateur astronomy like a wildfire – the Dobsonian revolution had hit us hard. By the mid-1980s I upgraded to a ten inch Coulter dob – which, judging by the weight, was built of neutron star material. In short order, wide-field eyepieces were replacing the narrow-field Plossls as the observer's ocular of choice. Soon Dobsonians didn't weigh as much as a semi truck. By the early 1990s, the computer revolution took off in earnest, and we began to see computerized telescopes, CCD cameras, and online amateur astronomy discussion forums.

The hobby, in short, has not been static. The changes have shocked some of the old timers, who increasingly retreat to their observatories and star party sites for secluded observing in the old style. (I am shocked, in my turn, to be identified by some as one of the "old timers" myself.) Others have embraced the changes and have pursued new facets of the hobby with gusto. The changes have attracted a new crop of amateur astronomer as well – some of whom adopt the latest technology for its own sake, or as a tool; while others prefer to "go retro," keeping the heritage of amateur astronomy alive.

This book serves as a snapshot of where we are as amateur astronomers today. For many of us, it will also show where we've been. There is no facet of the hobby, as it has existed in the last quarter century or more, which isn't at least hinted at here. Those looking for current information will find much more than hints. I'm convinced that both beginner and veteran will find plenty of material here to instruct and entertain. I expect I'll get a lot of use out of my copy. I hope you do too.

The past twenty years have been quite a ride. It will be interesting to see where we are in another twenty years. When we get there, be sure to look me up. You'll find me somewhere dark.

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Preface

You want to observe the sky, but you don't know where to start. You are ready to buy equipment, but you don't know which would be the best for you. You want to produce results, but you don't know how. To top it all off, you are in a hurry. Purchasing this book may be the first step you have taken in your quest to become an amateur astronomer.

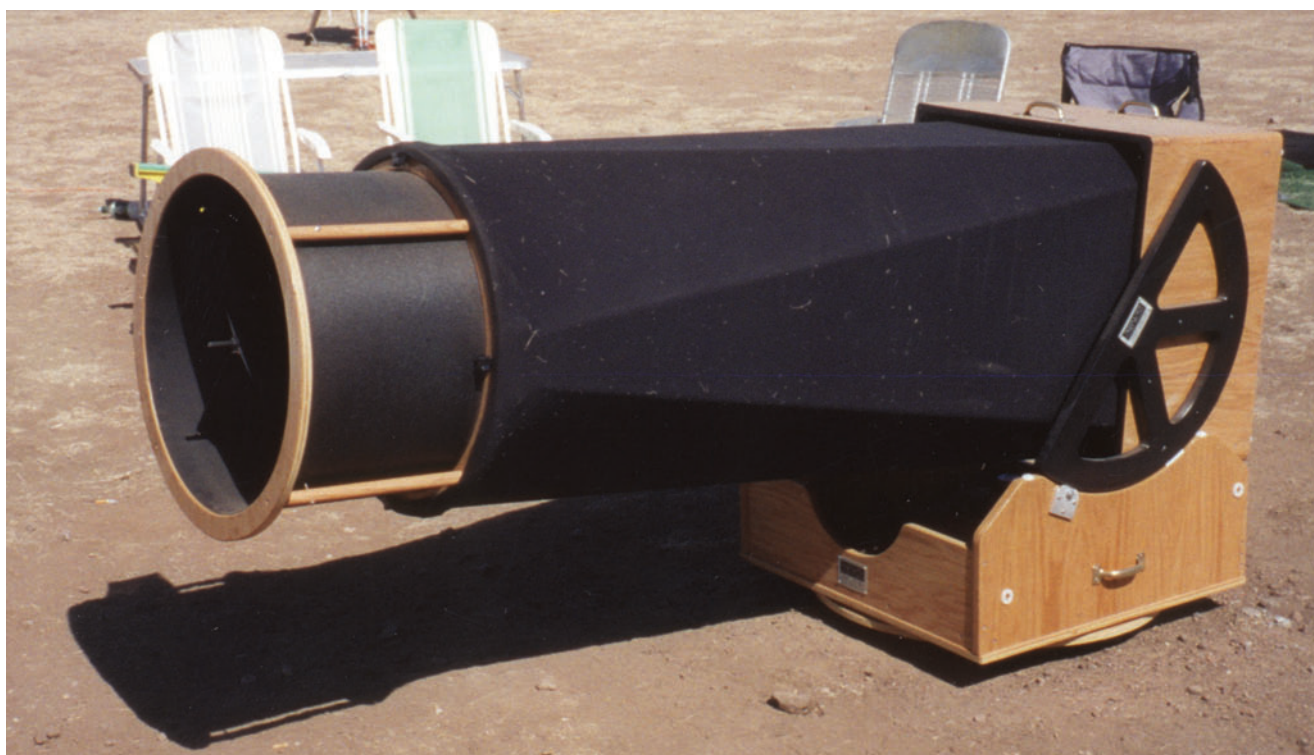
Practical. If I could only use one word to sum up what I am trying to accomplish with this book, it would be the word "practical." There are so many books that present great quantities of facts about astronomy. I'm not saying there's anything wrong with that. After all, I wrote two of them! And while this book will indeed present many facts related to astronomy, its main purpose is to help the reader learn more about how to *do* astronomy.

I started learning about the sky 40 years ago. I suppose when one begins that young and stays that long with any subject it no longer seems as difficult. As an educator in planetariums for half of those years, however, I have been forced to take a step back and see the reactions of those who are just being introduced to what I like to call "the wonders of the heavens." In most cases, it isn't easy for them. Things that I now take for granted are met with wide-eyed puzzlement. "How do you know that's Jupiter?", "Is this a good telescope for me?" and "When can I start taking pictures of what I see?" are only three of a myriad of questions asked by budding amateur astronomers.

I intend that this book provide some answers. Those new to the field of amateur astronomy will find tips, techniques, and plans on how to begin their quest. The first few chapters will provide a working knowledge of some of the terminology and concepts involved. More enlightened amateurs may find a review of this information helpful. Advanced amateurs will, I am certain, pick and choose from the many sections within this book.

This book is intended as a beginning, not an end. There is so much information on each of the subjects covered. If you view this work as a personal tour through what I consider "the highlights," you will be on the right track. The "highlights" of others may differ somewhat. Because of this, I have provided an annotated bibliography, as well as information on catalogs, software and websites, for those wishing to go into more depth on a particular subject. Each of us has a higher interest in one or two of the topics covered here. Whatever the subject, I hope that this book will help you not only to understand astronomy better, but, in the most practical sense, to *do* astronomy better as well.

The telescope of the author's dreams. A 500 mm StarMaster with GoTo drive. This is the personal "travel scope" of Rick Singmaster, owner of StarMaster Telescopes. (Photo by the author)



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Acknowledgements

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When this project was conceived, my thought was to include contributions from as many amateur astronomers as possible. I therefore put out a “call for images” and I also contacted a number of individuals, asking if they would like to contribute an image or more. The response of the amateur astronomy community was heartening. The next paragraph lists, alphabetically, the people to whom I am indebted and to whom I extend my sincere gratitude. Each is also credited in the caption beneath all images they contributed or with their direct quotation.

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I have saved the mention of three individuals for special recognition. These are the people who went above and beyond the call of duty in the provision of images or the offer of comments and critiques related to specific sections of this book. Alphabetically, they are: Adam Block, of Tucson, Arizona, who runs the Advanced Observers Program at Kitt Peak. With few exceptions, if you see a galaxy in this book, Adam had a hand in providing it. Early on, the many high-quality images and information that Adam provided helped to set my mind at ease and assure me that the book would look great. Thanks, Adam.

The second person I have singled out for special recognition is Robert Kuberek, of Valencia, California. No request I made was too much for Bob. Whether it was for an image of a celestial object or an image of a piece of equipment (Bob is known for the high quality of “stuff” that he has accumulated), I never heard anything other than, “Sure, I’ll get that off to you right away.” Thanks, Bob.

The last (but not least) of the notables is Jeff Medkeff, of Sierra Vista, Arizona. I have learned a great deal about a number of areas of amateur astronomy from Jeff, who was always willing to share information and answer questions. More than simple knowledge, however, Jeff has inspired me in areas (CCD, the Moon, etc.) where I really had no interest before. Thank you, Jeff.

On the corporate end of things, there are also many individuals and companies to thank. First, I extend my gratitude to Meade Instruments Corporation for the generous loan of a 300 mm LX200 GPS model Schmidt–Cassegrain telescope. I used this telescope to test several pieces of equipment, filters, etc., reports of which are included in this book.

Thanks to Thomas M. Bisque of Software Bisque for providing a brand new, full-blown copy of their excellent software TheSky. Whether he gets credit or not, Tom has been a great supporter from my very first book.

Al Misiuk, of Sirius Optics in Kirkland, Washington, provided a number of filters for evaluation and to aid in observation from my light-polluted backyard. My only regret was that my deadline was such that I was unable to test several exciting upcoming products. And thanks for some enlightening phone calls, Al.

Thanks to Glenn Eaton, the Advertising & Marketing

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Finally, my thanks go out to the staff of Cambridge University Press as well. Once again their professionalism and expertise have guided me, nearly effortlessly, through the complex world of book publishing. Specifically, I wish to thank Dr Simon Mitton, who started the process and saw this book through the acceptance process, and Miss Jacqueline Garget, who has taken over the lead editor's spot for Dr Mitton. Both have been kind and helpful, answering all of my questions and providing much valuable advice.

But my final, and highest, praise goes to my copy editor, Fiona Chapman. If you like this book – I mean, really like it – Fiona is the one to thank. Yes, mine was the idea and mine were the words, but hers was the craft which molded these words into this book. Thank you, Fiona.