

# FOREWORD

At last: the sky guide we've been waiting for! *Annals of the Deep Sky* melds through-the-eyepiece observing with up-to-date 21st century astrophysics. Its highly readable format should appeal to observers and non-observers alike. Here's a challenge for you: skip ahead to the chapter on Andromeda and start reading. Princess chained to the rocks, sea monster, slaying the Medusa, and then you encounter the spectroscopic binary star Alpheratz with anomalous amounts of mercury and manganese in the photosphere of its primary! Then double stars, exoplanets, and Groombridge 34 (a nearby flare star), all hiding out in a constellation you once thought had nothing to offer but its famous galaxy, M31, which you won't encounter until you're 40 pages into the constellation!

Then the authors devote over two dozen pages to deconstructing that famous galaxy: nucleus, bar, thin disk, thick disk, star streams, globular clusters, dust rings, and a slew of dwarf companions. Ponder how much we know today, and the questions that remain. Study the diagrams that portray Andromeda's third dimension. Think of the foreground Milky Way stars, the nearby galaxies, the Perseus-Pegasus chain (who knew?), and the Abell clusters that lie deep in space. The *Annals* leads you to so much more than merely glimpsing a fuzzy oval in the eyepiece or shooting a pretty color picture. It mixes theory, observation, and suggests opportunities to really *explore* this galaxy with the tools, techniques, and resources available to contemporary amateur astronomers.

-----

*Annals of the Deep Sky* operates at many levels. To the novice, it provides guidance and inspiration, offering both basic background and knowledge to grow with. It provides enrichment for established amateurs, pointing out new directions to pursue. And it offers an up-

to-date, one-stop astrophysical reference for advanced observers who aspire to contribute to science. Today's technological reality is that amateur astronomers can browse the same professional journals, access the same databases, download the same archived data, and make the same types of observations (with smaller instruments) as their professional colleagues. For amateurs of the 21st century, *Annals of the Deep Sky* serves as more than an observing guide, more than a reference work: it also directs you toward advanced amateur and semipro science.

As a novice, you may feel a bit overwhelmed by all of this, but there's no need for that. Relax and simply read for pleasure. You don't need to understand everything at once; put the jargon and unfamiliar terms on hold and bask in the "glow" of modern astronomy. If you don't have a telescope of your own, you might attend a star party held by the local astronomy club and view M31 in a telescope. Or on a clear fall evening, look for it yourself with your birding binoculars.

As an established amateur astronomer, with a few dozen Messier objects under your belt and a telescope to your name, you may decide to get into astro-imaging, and there are few targets more tempting than the Andromeda Galaxy. Piggyback imaging with a telephoto lens and a modern digital SLR camera will soon lead you to bagging NGC 891 as well, and thence to probing the adjacent star-fields of Cygnus, Cepheus, and Cassiopeia.

But, as you explore more deeply, you realize that astronomers do much more than take pictures. Four observational tools — direct imagery, astrometry, photometry, and spectroscopy — define optical astronomy. When you were a kid, amateur astronomy was pretty much limited to looking into an eyepiece or taking pictures on film; today, with CCDs, go-to mountings, computers, and access to the Internet, its boundaries have expanded enormously. And the *Annals* stands ready to guide you into the realm of astrophysics.

Your first efforts will be modest. Reading about the high proper motion of Groombridge 34 leads you to wonder, "Can an amateur astronomer observe this?" One night, on a lark, you make a short exposure centered on the star (and thank goodness for go-to mountings because you type in its coordinates and your telescope is centered on this obscure double star). A month later, you shoot the same field.

“Blinking” the images reveals that one pair of stars has moved, and by measuring its coordinates you make a rough determination of the annual motion. You follow this fast-moving star for several years, while adding several nearby variable stars to your observing program.

This leads you to push for something more challenging: the Cepheid variable star that, when Edwin Hubble discovered it in the Andromeda Nebula, proved the extragalactic nature of this “nebula” which we now more properly call the Andromeda Galaxy. Reaching 18th magnitude with an 8-inch telescope calls on the imaging skills you now possess: a dozen 5-minute subexposures registered and stacked do the job nicely. Two months of imaging M31 from your backyard yields a dataset of 23 images that, measured photometrically, comprise a light curve better than Hubble made with the 100-inch Mount Wilson reflector!

The low cost of a simple diffraction grating tempts you to dip your toe into spectroscopy. But you get hooked when you measure the spectrum of a supernova and determine — from your own observations — that it’s a Type Ia. As you browse *Annals*, you come to realize that most of what astronomers know comes from spectroscopy! Although your local astro-buddies find spectroscopy rather daunting, you become part of an on-line community of amateurs and professionals monitoring emission lines in Seyfert galaxies.

More important than your results is the change in your thinking. You’re beginning to understand what astronomy is really all about. Your observing program is no longer, “What should I do tonight?” but now consists of planned observations with definite goals in mind. You know what noise and observational error mean at the gut level. You understand how tough it can be to interpret ambiguous results. You quietly join a few organizations that bring amateur astronomers such as yourself together with professionals who need more observations and are willing not only to mentor amateurs, but also to include them as authors on professional peer-reviewed scientific papers.

Whether you choose the observational route or embrace comprehensive reading of the latest papers, the *Annals* opens a viewport into a modern astrophysical grasp of the universe. *Annals* coverage runs the gamut from “a lovely yellow and blue pair easily split with a 3-inch glass,” to some of the largest-scale structures in the universe.

*Annals of the Deep Sky* opens your awareness to images that you can download from the Mikulski Archive for Space Telescopes ([archive.stsci.edu](http://archive.stsci.edu)). Yes, images from the *HST* and other space observatories are placed on-line about a year after the observations are made. You can access data from the *Kepler* mission, and troll for exoplanets. The *Annals* draws on older papers that you can read in their original form on the Astrophysics Data System ([adswww.harvard.edu](http://adswww.harvard.edu)). You can read Edwin Hubble's paper "First Photographs with the 200-inch Hale Telescope" just for fun, or his historic paper from 1925 placing NGC 6822 well outside the Milky Way. And you can even review new but not-yet-published papers in the astrophysics archive ([arXiv.org/archive/astro-ph](http://arXiv.org/archive/astro-ph)).

The deep sky is open as never before to the amateur astronomer. In *Annals of the Deep Sky*, you will find inspiration to explore a whole new universe.

Richard Berry  
Alpaca Meadows Observatory  
Lyons, Oregon