

# The New CCD Astronomy

Ron Wodaski

How to capture the stars  
with a CCD camera  
in your own backyard.



NEW ASTRONOMY PRESS

## Comments from Readers

*"While the popularity of CCD's for astronomical imaging has grown exponentially in the last few years, there is a surprising dearth of informative or helpful literature on this exciting new field of amateur astronomy. This book fills that niche admirably, providing a complete "how-to" for the beginning to intermediate CCD astronomer. It removes the "black art" from CCD imaging and allows anyone to easily learn what it takes to begin maximizing the use of their CCD camera and get started down the path to acquiring wonderful images. A must-have that will become the bible of many CCD astronomers."*

- Jeff Hapeman

*"Ron has the knack of explaining and then demonstrating processing techniques in an understandable manner. For me as a Photoshop novice, I was able to become productive in image processing very quickly. Also, this book is chock full of practical insights on both hardware and software. This book will become the essential handbook for CCD Imaging."*

- John Smith, Tucson, AZ

*"An excellent resource and reference guide for the amateur and experienced astrophotographer which provides a thorough description of the issues, rationale and processes involved for each step in the CCD imaging of the universe and its countless wonders. Many valuable illustrations are also supplied to support each underlying theme and issue as well as an analysis of imaging software and hardware. A complete reference guide which is a must for any astrophotographer's library."*

- Anthony Ayiomamitis, Athens, Greece

*"I attempted ccd imaging in the mid 1990's and gave up on it after some pretty dismal results. After learning about this book, and utilizing the information provided here, I took up the hobby again and was producing good images after just a few nights out (and excellent images after just a few months!)"*

- Randy Nulman

*"At long last! A superb volume of information that helped me transition 25 years of film photography experience into the new realm of CCD imaging."*

- John Gleason, [www.celestialimage.com](http://www.celestialimage.com)

*"If you want to learn CCD imaging (and skip the PhD in mathematics!), this is your guide to success."*

- John Polhamus

*"The most complete and helpful guide to CCD imaging available anywhere. A must have for both the beginner and seasoned CCD imager."*

- Rob MacKay, [www.darkhorizons.org](http://www.darkhorizons.org)

## More Comments from Readers

*“As I strive to achieve the highest level of quality possible in Astronomical CCD imaging, The New CCD Astronomy has been there every step of the way. It is without a doubt, the most comprehensive and authoritative ‘how to’ book ever written for this most rewarding hobby.”*

- Mark Jenkins  
Beloit, WI

*“Mr. Wodaski gives an excellent coverage of methods to be used in taking CCD images with equipment available to any amateur. This is a practical book, full of comprehensive advice, which rescued me from the muddle of conflicting, confusing literature previously available. The New CCD Astronomy is a classic that all neophyte and experienced imagers should own.”*

- Morgan S. Wilson, MD

*“As a newcomer to CCD imaging, I was reading everything I could find. I ordered Ron's book after reading the first online drafts.”*

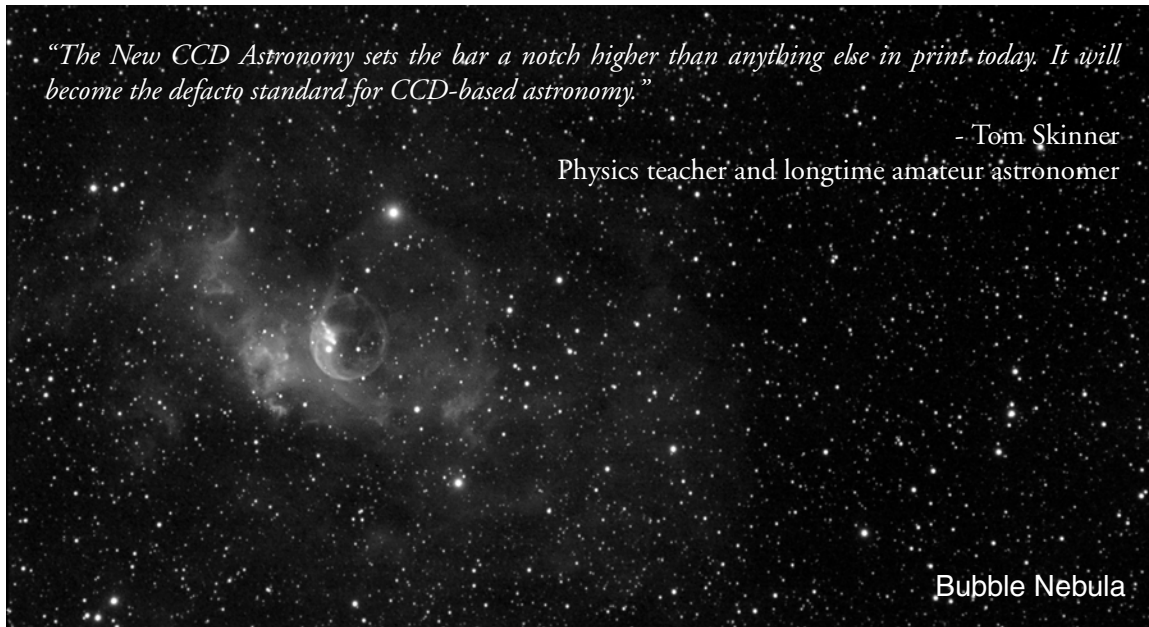
- Frank Hainley  
Moraga, California

*“When I pack for the dark sky site, The New Astronomy gets packed first...even before my scope! A scope, a CCD camera, a little starlight, and The New Astronomy are a recipe for success. Your images will improve dramatically almost overnight.”*

- Mark R. Holbrook  
[www.ccdastronomy.com](http://www.ccdastronomy.com)

*“The New CCD Astronomy sets the bar a notch higher than anything else in print today. It will become the defacto standard for CCD-based astronomy.”*

- Tom Skinner  
Physics teacher and longtime amateur astronomer



Bubble Nebula

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*For my wife Donna Brown.  
Without her support, none of this  
would have been possible.*

## *Acknowledgements*

I would like to extend a hearty thank you to the many online readers who supported me in a wide variety of ways during the time I wrote this book. This includes everything from contributing images to the book, to volunteering to review chapters and making suggestions. My readers have been a major motivation to me during the time I've been writing and researching this book. Among my best helpers were those who took the time to ask insightful and sometimes desperate questions about the art of CCD imaging.

Various companies have supplied hardware or software to make it easier for me to review their products. These include SBIG, Finger Lakes Instruments, Software Bisque, Hutech, and Custom Scientific, who provided products and took time to explain sometimes complex hardware or software. Many other companies provided assistance in a variety of ways, including Anacortes Telescope & Wild Bird, Diffraction Limited, Astro-Physics, Axiom Research, Excelsior Optics, Optec, and Tom Osypowski.

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Unless otherwise noted, images were taken by the author. Images contributed by other individuals are attributed individually. They are copyrighted by their respective authors who retain all rights.

## *About the cover*

The cover image is built from two different images taken by Tony Hallas. The lower half is a time exposure of the observing field at Sunglow Ranch in Arizona, where Tony, myself, and a number of other imagers and observers spent a wonderful week under the stars in May, 2000. Tony walked around to the individual observers and "painted" their equipment with a red flashlight during the exposure. The white glowing objects are laptop screens; mine is the second one from the right. The upper half of the image is the Sagittarius star cloud, an area full of imaging opportunities.

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## Tips for readers:

I have spent over a year researching and writing the book you hold in your hands. It is chock full of practical advice for everyone interested in imaging the objects that populate the skies, night and day. CCD imaging has given me more pleasure than I can possibly describe, and I can only hope that this book will help you do the same.

Unlike many books, this one is more than the paper it is printed on. There is a book web site, and you can also order a CD-ROM with a copy of the web site and the book content for a small fee. The book stands well on its own, but you will get the most out of your hard-earned dollars by checking out the suggestions below.

- Be sure to visit the book web site at [http://www.newastro.com/newastro/book\\_new](http://www.newastro.com/newastro/book_new).
- You can download files from the web site that will allow you to follow along with many tutorials. Look for links at the start of the tutorials.
- The complete text of the book is available online in Acrobat format. Many of the images in the book are shown in color in the online version of the book. This is especially useful for the content in chapter 7, but many images throughout the book will reveal more information when seen in color. Be sure to take advantage of the free one-year web subscription that comes with the book, and download the Acrobat files!
- Your one-year subscription to the web site also includes other benefits. These include additional tutorials, discussion groups moderated by the author, a searchable database of CCD imaging targets, software downloads, and more. If you purchased the book direct, you received username/password when you ordered the book. If you bought the book in a bookstore, follow the instructions below to obtain your username and password.

Thank you for trusting me to lead you on the journey to CCD imaging. The trip has been a delight to me, and I hope that I have managed to convey my sense of excitement and wonder in these pages.

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If you would like to send comments about the book, or ask questions about the book or CCD imaging in general, please join the Yahoo discussion group that has been set up for readers of this book at <http://groups.yahoo.com/group/ccd-newastro>.