

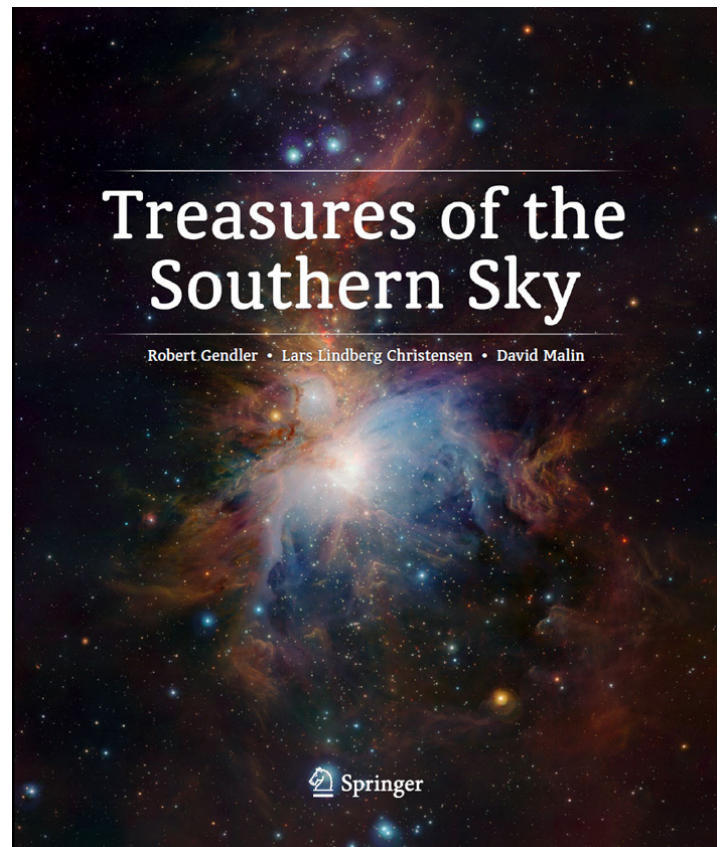
## Forays into Astronomical Imaging: One Person's Experience and Perspective

Robert Gendler

### Editor's Introduction

A number of amateur astronomers now do photography and image processing that rivals the work of professionals and complements their work. But few are as talented and hard-working as Robert Gendler, a Connecticut physician, astronomy devotee, and author. We asked Dr. Gendler to tell us how he got involved with astronomical imaging and what some of the highlights of his imaging career have been.

**A**strophotography has existed as a medium of astronomical research for well over a century and for much of that period was practiced only by astronomical and photographic scientists. Without question, astrophotography has profoundly advanced our understanding of the universe and unlocked many secrets of the physical processes that drive the cosmos. Even today it remains a dominant tool of astronomical research. However, in the last several decades, celestial imaging has entered a new realm: the realm of "art". Once considered the arcane cousin of traditional photography, astrophotography in its various forms has undergone a remarkable creative transformation and the number of people worldwide who recognize and value it on an artistic level has grown exponentially. The pursuit of astronomical imaging for capturing and displaying the beauty of the cosmos has proved to be complimentary to its use for achieving greater understanding of its mysteries.



*Treasures of the Southern Sky* is being published in September 2011.

The fascinating natural forms and colors of the universe revealed by modern photographic techniques can profoundly move people. In terms of its artistic value, astrophotography unquestionably rivals other forms of photographic art in its power to evoke emotion and inspire the human imagination. More recently the advent of the digital detector and digital



This image of the Whirlpool Galaxy (M51) is one I took myself in 2006, using my telescope at the Nighthawk Observatory in New Mexico. About 42 hours of exposure went into making the image. This system of two galaxies, about 37 million light years away, is likely the result of an earlier interaction between the two of them, in which the smaller one encountered the disk of the larger one in a highly inclined passage. *(Robert Gendler)*

image processing methods has unleashed a vast reservoir of creative possibilities all aimed at revealing the transcendent beauty of nature on the largest of scales. What makes astrophotography unique is that it serves as our only portal to many of the more subtle wonders of the universe. We as humans are unequipped to behold these faint and distant wonders with our own eyes, and hence they are revealed to us only through the marvels of astrophotography.

My personal journey into astrophotography was gradual and unexpected. I would never have imagined it would become such a rich part of my life. I became passionate about astronomy as a child, inspired in great part by frequent visits to the legendary Hayden Planetarium in New York City. It was there, under the planetarium

dome, that I first became captivated by space, planets, galaxies, and the vast unseen universe. The memorable black and white photographs of distant worlds in the blackness of space on display there would become the seeds of a future life passion. My interest remained dormant for quite a while as I completed my medical training and started a family. Once my life became settled, I was finally able to continue my childhood fascination with the cosmos. I moved to darker skies (Connecticut), bought a telescope, and began gradually to explore the night sky visually. I remember keenly the exhilarating feeling of finding distant galaxies in the eyepiece. This was surely exciting, but deep down I yearned to take photographic images like the ones I had looked at in amazement earlier in my life.



My calling in astrophotography evolved in several distinct phases. The earliest phase involved imaging next to my home from a portable home observatory — something I did for over 10 years until 2005. During this initial learning phase, I went from imaging many objects in a single night to devoting several nights to a single target. There was much to learn in the early to mid 1990's, since there were no books or tutorials on color CCD imaging and the craft was learned in the field by “trial and error” and by participating and sharing results on the few web forums that existed at the time. There were probably fewer than a few hundred people worldwide doing color CCD imaging

in the early to mid 1990s.

In those days, I would roll out my telescope and mount, which was set up on large castors that I would lock into the ground once I positioned the setup in my driveway. I covered the street lamp in front of my home with a large cloth and would image all night and then go to work the next day — a practice that was both exhausting and exhilarating at the same time. It was a very productive phase in astrophotography for me and I have very fond memories of that period including the many lasting friendships I made. There was a great sense of camaraderie in the astro-imaging community at that time.



Here is an example of using amateur and professional data to make a new image. The professional image is in infrared light, from the European Southern Observatory's VISTA, the world's largest survey telescope. The amateur image is a visible light image I made from my home observatory. This wide-field view shows a region in the constellation of Orion that includes the Flame Nebula (NGC 2024), a cloud where new stars are forming, plus the dark outline of the Horsehead Nebula. (Robert Gendler)





Here is an example of an image that I processed from the Hubble Space Telescope archives. The galaxy known by its catalog number NGC1672 has a barred spiral shape and is about 60 million light years away. You can see many regions of active star formation (red in color) along its spiral arms. *(Robert Gendler)*

From about 1998 to 2005 there was exponential growth both in technology and participation in CCD astro-imaging. Around 2005 I entered my next phase of astroimaging. With the growing problem of light pollution in urban areas, a few imagers were building remote observatories located in dark sky locations such as the southwest, and learning to control those observatories via the internet from their homes many miles away. At that time, I was presented with an opportunity to image remotely from an observatory at New Mexico Skies, an operation owned and operated by Mike and Lynn Rice. This proved to be extremely fruitful and I successfully captured and processed many images from the dark skies of New Mexico. In 2007 I moved my equipment to a similar setup in Western Australia, and since that time have been creating images of the wonderful skies of the southern hemisphere.

My last and current phase of astro-imaging involves processing data acquired by professional observatory instruments. As my skills in astrophotography and digital image processing improved and became recognized, I was surprised to find that professional observatories began to request my help in processing image data taken with their large telescopes. Over the last several years I have enjoyed creating true color astronomical images for several professional observatories including the 1.5-meter Danish telescope at La Silla Chile (as well as other facilities within the European Southern Observatories), the Brigham Young University Observatory, and the Subaru Observatory at Mauna Kea.

I have also enjoyed assembling many images and mosaics from Hubble data made available on the Hubble Legacy Archive. Many of these images have



been featured on the “Astronomy Picture of the Day” website (see Astronomy Beat #7). Working with such world class professional data has been a wonderful and gratifying experience. I have taken this type of work a step further and made composite images incorporating both amateur and professional data or ground and space-based professional data within a single image. For example, I recently assembled a composite-mosaic image of the spiral galaxy NGC 2403 using both Hubble and Subaru data, which was selected as an Astronomy Picture of the Day.

Probably every serious astro-photographer has a defining image, and mine was almost certainly my mosaic of M31 (the Andromeda Galaxy, our nearest large galaxy neighbor), which I made from my driveway over the course of several months in 2002 incorporating 40 individual frames into a single image. Years later, this image is still popular and used in

books, magazines, and outreach programs. In 2003 it was featured by Astronomy Magazine as one of the greatest astronomical images of the last 30 years.

Some of my other milestones include being featured in the PBS documentary “Seeing in the Dark” by Timothy Ferris, and having my images appear in two national stamp series, one in the United Kingdom (2007) and the other in Germany (2011). Last year, several of my images were used to create a three dimensional fly-through sequence for the IMAX movie, IMAX: Hubble 3-D.

Many serious imagers have a niche area they enjoy most and I would say mine is the assembly of large mosaics. Making large high resolution images that cover vast stretches of sky has always intrigued me. For one, I like to make and frame large prints and these images tend to print very nicely. The more important motive is that I like to create memorable images that take time for



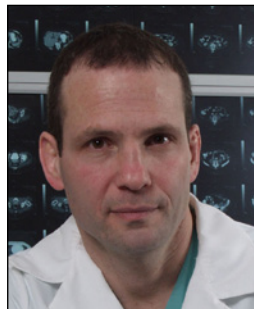
The Andromeda Galaxy image discussed in the column. This galaxy is about 2.5 million light years away and is estimated to have twice as many stars as our own Milky Way. (Robert Gendler)

the viewer to explore — images to which the viewer can return to again and again, and each time discover something new and different. The defining quality of a great image in my opinion is that they inspire people not just for a moment but for years or even a lifetime. These types of images have a timeless quality. Whether or not I achieve that goal it is always the motivating philosophy behind every new imaging project.

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## About the Author

Robert Gendler is a physician who found his passion in astro-photography. In 2007 he received the “Hubble Prize” at the Advanced Imaging Conference in San Jose California. He has written three books on astrophotography: “A Year in the Life of the Universe”



(2006, Voyageur Press), “Capturing the Stars; Astrophotography by the Masters” (2009, Voyageur Press), and most recently “Treasures of the Southern Sky” (Springer), coauthored with David Malin and Lars Christensen, and which will be published in September 2011.

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## Resources for Further Information

Robert Gendler’s web site can be found at:  
<http://www.robgendlerastropics.com>

For more on his books and articles, see:  
<http://www.robgendlerastropics.com/publications.html>

The Astronomy Picture of the Day website:  
<http://apod.nasa.gov/apod/astropix.html>

The Seeing in the Dark PBS television program web site:  
<http://www.pbs.org/seeinginthedark/> ♦

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