The sky erupts with an amazing display of the northern lights above the moonlit Talkeetna Mountains southeast of Alaska's Denali National Park. The bright planet Jupiter lies to the lower right of the overexposed gibbous Moon. The author captured this scene March 23, 2002, combining seven overlapping wide-angle images.

Dennis Mammana's cosmic portraits

This night sky photographer blends the terrestrial with the celestial to share the wonder and mystery of the cosmos. **text and photographs by Dennis Mammana**

It was a warm, starry night in the mid-1960s, and, as was my custom, I was in my Easton, Pennsylvania, backyard peering skyward with my telescope. Suddenly, through an open kitchen window, I heard my dad whisper to my mom, "What the heck does that kid do out there all night anyway?"

There was silence. Apparently, my mom had no clue either.

It was at that moment I realized the difficulty of explaining why the universe fascinated me so, why it made me feel so alive and part of something so wonderfully grand. If I could somehow capture and share with others the magic I felt beneath stars, I was sure they would become equally enthralled.

But how?

I frequently marveled at all of the glorious photographs in astronomy magazines of the day and thought to myself, "How tough could that possibly be?" So, I saved some money from odd jobs and bought myself a used Kodak Vigilant Junior Six-20 bellows camera and tripod, and set out to capture the cosmos.

Dennis Mammana *is an astronomy author, lecturer, and photographer who works under the dark skies of Southern California's Anza-Borrego Desert.*

The author frequently captures his night sky photos from Southern California's Anza-Borrego Desert, but he also travels all over the world to bring images of amazing celestial phenomena like solar eclipses and the northern lights to the public.

First light

My first attempts at night sky photography weren't terribly elaborate. I would load the camera with Kodak Tri-X roll film, park it in the backyard after dark, open the shutter, and return before dawn to harvest the star trails I hoped the camera had recorded. Sure, these first images weren't great, but I could process my own film while learning how much fun — and challenging — this activity could be.

This all-sky photo of the northern lights above a resort outside Fairbanks, Alaska, on March 12, 2012, shows three different forms of aurorae: "Patches" are visible low toward the south (bottom in this image), a wide green "band" appears higher in the south, and the eerie "black aurora" (mysterious voids in which the aurora doesn't appear) lie overhead.

Each winter, the author travels to the frozen tundra of Alaska to capture the northern lights. Here he photographs a beautiful auroral display from a site near Wickersham Dome north of Fairbanks, Alaska.

MAMMANA'S LAWS OF NIGHT SKY PHOTOGRAPHY

First Law: If you can see it, you can photograph it. A camera with manual settings and a tripod are all the gear you need to capture that wonderful scene you see in the night sky.

Second Law: Taking a sky photo is easy; taking a great one, however, is tough. Beautiful night sky photography requires a bit more skill and practice than you might think, but it's not brain surgery. You can do it!

Third Law: If it's too bright, darken it. If it's too dark, brighten it. Don't be afraid to experiment with your camera's manual settings. Only by accident will you get it right the first time.

Fourth Law: One muffed sky photo requires the purchase of two new pieces of equipment. I don't know why this is true; it just is! — *D. M.*

The overexposed nearly First Quarter Moon appears among the stars of Taurus in this fairy-tale scene from the top of the mountain at a resort outside Fairbanks, Alaska. Jupiter shines brilliantly above the trees to the right.

The Full Moon rises over the glistening waters of San Diego Bay. The author captured this image October 29, 2012, from the Old Point Loma Lighthouse on the southernmost tip of Southern California's Point Loma peninsula.

On the morning of July 22, 2009, the Moon appeared to drift in front of the Sun, creating a total solar eclipse over the Zhenjiang Pavilion in Yichang, China. The event allowed our star's outer atmosphere, the corona, to shine forth and caused the sky to take on the appearance of twilight. Mercury appears below the eclipsed Sun in this image.

A bright meteor flashes across the summertime Milky Way over Southern California's Anza-Borrego Desert on June 6, 2011. In the foreground are silhouettes of wild horse statues, two of dozens of life-size metal sculptures by the artist Ricardo Arroyo Breceda created at the request of land owner Dennis Avery on various parts of his property.

The zodiacal light — the dusty disk of our solar system backlit by the Sun — streams upward behind Southern California's Anza-Borrego Desert during the first glimmers of dawn September 20, 2012. Brilliant Venus stands out at center.

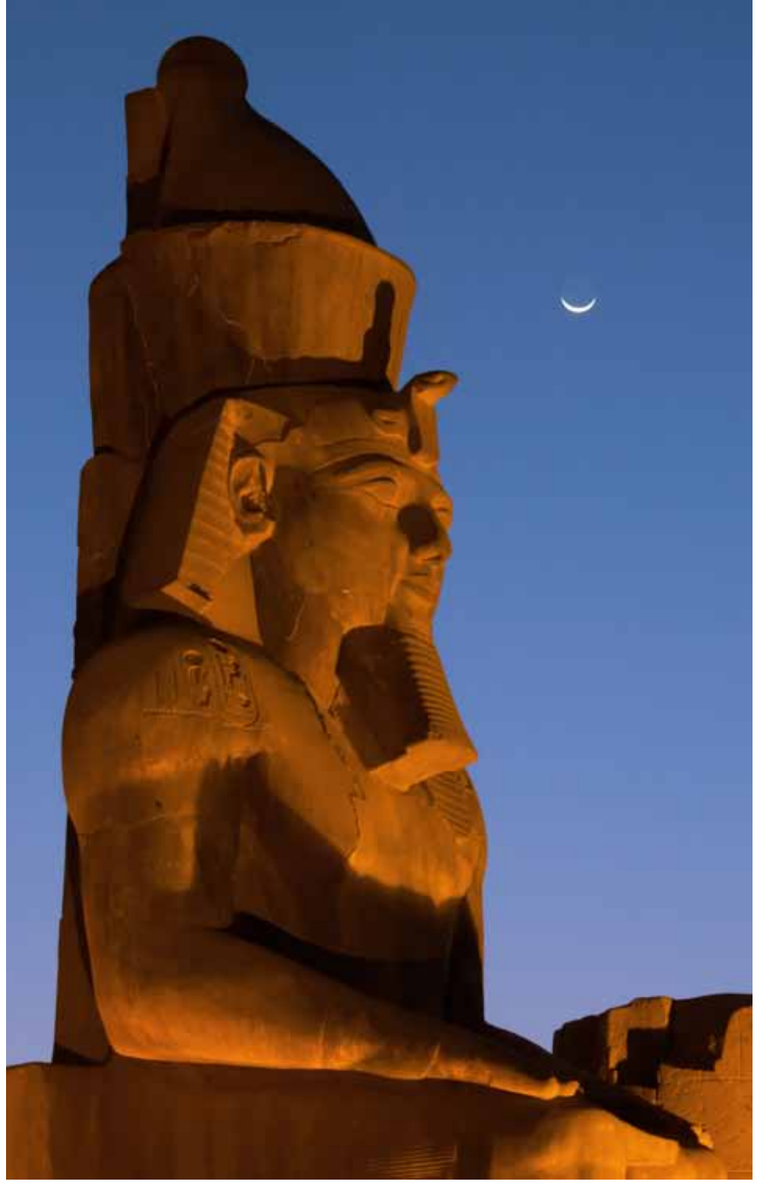
Soon I had progressed to a 35mm single-lens reflex (SLR) camera, and I found that others were beginning to take notice of my work. In fact, this year marks the 45th anniversary of my first published photo.

The date was April 12, 1968, and somehow my father had arranged for me to shoot that night's total lunar eclipse with my hometown newspaper's photographer. Despite listening patiently to my advice about eclipse-shooting techniques, the photographer chose to trust his own sensibilities rather than believe some dorky 16-year-old. Later that night, we developed our film, and, well, his photos landed in the trash while mine appeared in the next evening's newspaper.

Changing times

In the time since those eclipse photos, we have seen a stunning revolution in our ability to capture the cosmos. Although my gear has changed — today my main camera is a Nikon D700 digital SLR along with my workhorse lens, a remarkably sharp (and painfully expensive) AF-S Nikkor 14–24mm f/2.8G ED — my goals remain much the same. I wish to capture the color, motion, and majesty of the heavens in ways one rarely sees, and, by blending the terrestrial with the celestial, offer a unique sense of perspective and wonder. Achieving such goals, however, is not so easy.

During a single night, I may shoot dozens or hundreds of images, and if I come away with one that's really good, I'm quite happy. If I should find two or three, I'm ecstatic. But it's never immediately obvious; in fact, I'm rarely happy with what I see on



A crescent Moon lingers above a statue of Egyptian pharaoh Ramesses II in the ancient city of Thebes, a World Heritage Site at Luxor, Egypt.

An intrepid lunar eclipse campout group hovers over a toasty campfire beneath the Full Moon of December 9, 2011, hours before the event.

A towering tree in the mountains near Julian, California, provides a stark contrast to the twinkling lights of the Milky Way. The author had to wander some 75 yards off a path into thick knee-high grasses, careful to avoid snakes, to capture this image July 16, 2012.

The Milky Way arches beautifully across Southern California's Borrego Valley on most nights. Although light domes of desert communities appear in the distance, Borrego Springs is surrounded by the Anza-Borrego Desert and is the state's first (and only) International Dark Sky Community. The greenish light near the horizon results from natural airglow.

The light from the nearly Full Moon interacts with cloud droplets and high ice crystals in the desert sky to create the colorful scene of a lunar corona from August 15, 2008. This atmospheric phenomenon has an intensely bright central aureole that is almost white and fringed with yellows and reds.

On the night of March 23, 2001, the heavens over Fairbanks, Alaska, lit up with the most spectacular of auroral displays: a corona. A corona occurs when an auroral curtain appears at the magnetic zenith — which lies nearly overhead in Fairbanks — and viewers look up one of its long rays.

the camera's LCD screen. Only after a few clicks and adjustments in *Lightroom* and *Photoshop* do I begin to realize what I've got. And then my reaction is, "Hey, this is pretty good stuff!"

Sharing the cosmos

While I enjoy little more than seeing a new image I've just created, the pursuit is not just about taking photos; it's about sharing my knowledge and passion. What I call night sky photography — capturing wider scenes such as the Milky Way arching over a reflective lake or a spectacular desert moonrise behind wispy clouds — not only is achievable by anyone with a camera and tripod, but also creates a unique image with every exposure.

Since the mid-1980s, I've offered photography workshops around the country to inspire others to aim their cameras skyward. With the instant feedback of digital technology, today's participants can learn in only two days what took me decades.

I also lead public tours around the globe to help others view and photograph such exotic phenomena as total solar eclipses, comets great and small, the northern lights, and more. In the process, I've managed to come away with a few good shots of my own.

But for all the sky shows that have performed before my camera, nothing can match the mystical dancing lights of the aurora borealis. Since 2000, I've traveled to the Arctic 19 times to stand slack-jawed in sub-zero temperatures while trying to capture what can only be described as the greatest light show on Earth.

Coming full circle

Yes, it's an odd pursuit — heading into the darkness with my camera as others retreat to the comfort and safety of their homes, only to return home at sunrise, exhausted, to sleep the day away. Yet I know that if I can capture a sense of my celestial experience and bring it home to share with those not fortunate enough to join me under the stars, I will have achieved my goals. And, in the process, I will have confirmed once again the words of Grand Canyon pioneer Bessie Hyde: "We of the night will know many things of which you sleepers will never dream."

Nearly five decades after I first pressed a camera shutter, my need to share with others the exhilaration and connection I feel under the stars has now come full circle.

It was little more than a year ago that I was back in my hometown visiting my 98-year-old mother shortly before she passed away. I showed her some of my most recently published night sky photos, and as she pored over them with delight, I could only imagine the memories she must have been reliving of that young boy spending nights in the backyard doing who knows what under the stars.

And then, with such pride in her eyes, she looked up at me and said, "You're really alive when you're out doing this, aren't you?"

Indeed I am, Mom. Indeed I am!

SEE MORE IMAGES FROM DENNIS MAMMANA AT **www.Astronomy.com/toc.**