

# Reflector



HIGHLIGHTS FROM ASTROCON 2025

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F. W. HERSCHEL, MASTER OF PRACTICAL OPTICS

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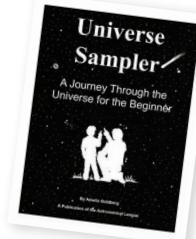


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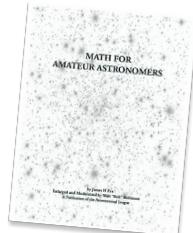
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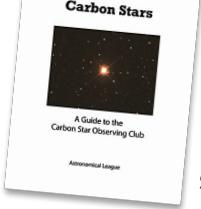
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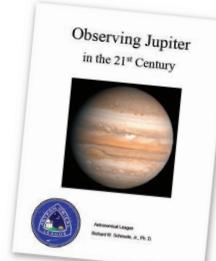
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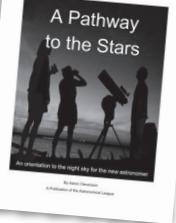
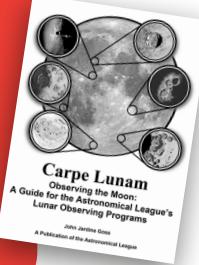
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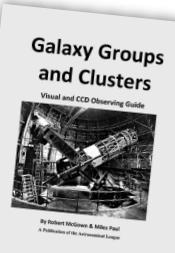


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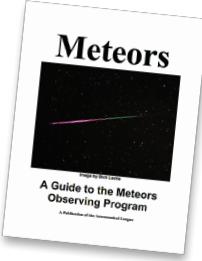


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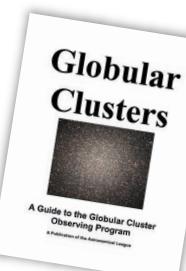
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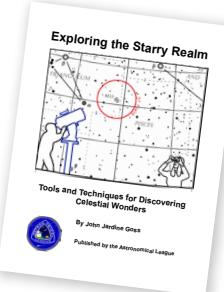
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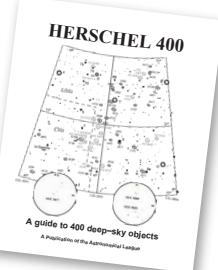
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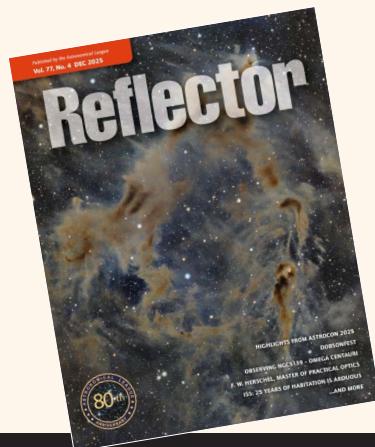
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**Steven Bellavia** (Amateur Observers Society of New York) captured this image of LBN 468 from Cherry Springs State Park, Pennsylvania, using a William Optics Star 71-II and a ZWO ASI 533MC Pro camera.

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# Reflector

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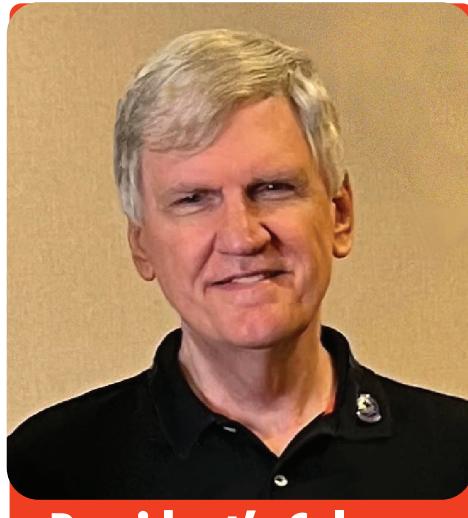
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## President's Column

**Anniversary Time!** Next year, 2026, will mark the 80th anniversary of the League. The League was born on November 15, 1946. When members left our first official convention in Philadelphia in 1947, the nascent League claimed 1,568 members in 31 societies and \$67.52 in its treasury. We've come a long way since. Now we have 25,000 members, 300 societies, and a treasury and trust fund boasting well north of one million dollars. Two regions grew to 11, no observing programs grew to nearly 80, and an absence of youth awards has grown to five. Please incorporate the logo that John Goss designed for our 80th anniversary in your publications if you can. Talking about success breeds success.

**Thank you, Maynard.** Maynard Pittendreigh recently concluded his six years as executive secretary of the League. He received an overdue G. R. Wright Service Award at Bryce Canyon for his work, not only as executive secretary, but as convention chair of our cruise-and-land-based 2019 convention in Florida and the Bahamas, his still-running 10 years of service as a national director of our Observing Program division, and as a member of the bylaws revision committee. Maynard is one of our very few Triple Crown Observers, having achieved Master Observer – Platinum, Binocular Master Observer, and Master Imager status. Thank you, again, Maynard, for all that you have done, and continue to do, for the League.

**New Exec Sec!** Please welcome our newly elected executive secretary, Dr. Lucia Harcum of Waco, Texas. An architect and a professor at Baylor University, Lucia is a director-at-large for the Central Texas Astronomical Society. Her three-year term runs until 2028. She is responsible for supervising our national office staff, among many other tasks, and we're thrilled to have her on the executive committee.

**Upcoming Conventions.** The North Central Region will hold its 2026 regional convention at the Doubletree by Hilton in Cedar Rapids, Iowa, and at the Eastern Iowa Observatory on May 15–18, 2026.

The Mid-States Region will hold its 2026 regional convention at St. Charles Community College in St. Charles, Missouri, on June 26–28, 2026.

**Our national convention,** ALCon 26, will be held on the riverfront at the Cincinnati Marriott at RiverCenter in Covington, Kentucky, directly across from downtown Cincinnati on August 15–18, 2026. The hotel is walking distance or a free trolley ride from The Banks entertainment district downtown. A very special additional event is also in the planning. Please save the date!

**Scam Warning.** Scammers have been busy sending emails (and possibly texts) to our officers, committee members, and other volunteer staff members. These communications often claim to be from me or from another officer and either request "assistance" in paying money to someone or request certain proprietary information. Usually, the email suggests that I or some other officer is traveling or tied up in a meeting and needs help in sending money or a gift card to someone, perhaps a supposed vendor or award winner, with reimbursement to follow. These phishing emails are becoming increasingly sophisticated and are utterly fraudulent.

We have no way to stop these phishing attacks. Our names and contact information are publicly available in the *Reflector* and on our website. Phishing emails usually come from unknown email addresses but be aware that email address spoofing is possible. The bottom line is this:

**NO LEAGUE OFFICER OR OTHER OFFICIAL WILL EVER ASK YOU TO SEND MONEY OR GIFT CARDS TO SOMEONE ON THEIR BEHALF. NEVER PAY MONEY, PROVIDE INFORMATION, OR EVEN REPLY TO SUCH COMMUNICATIONS WITHOUT CHECKING THE EMAIL ADDRESS AND CONTACTING THE SUPPOSED REQUESTOR USING A SEPARATE EMAIL ADDRESS OR PHONE NUMBER THAT YOU KNOW TO BE RELIABLE.**

I wish all of you clear weather during these long winter nights!

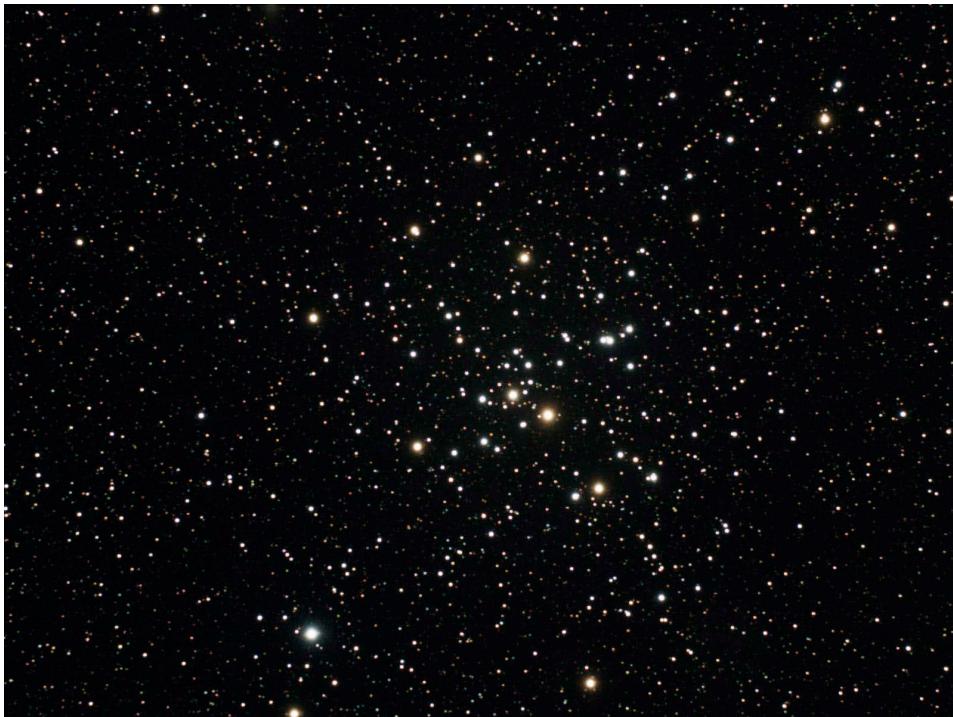
—Chuck Allen, President

## Deep-Sky Objects

### The Heart of the Great Dog

The constellation Canis Major (the Great Dog) is one of the most recognized constellations in the winter night sky. The constellation lies along the Milky Way southeast of Orion and due south of Monoceros. Canis Major is mythologically associated with Orion; Canis Major and Canis Minor (the Small Dog) are known as Orion's two hunting dogs.

Canis Major is home to the brightest star in the nighttime sky, Sirius. The constellation is also home to scores of fabulous star clusters. One of



the brightest, and in my opinion the finest, star clusters in Canis Major is Messier 41.

M41 is located four degrees south of Sirius. The cluster lies at the heart of the mythological dog. Shining at magnitude 4.5, it can be seen with the unaided eye from a dark site. It is 39 arcminutes in diameter and lies 2,350 light-years away.

In 325 BCE, Aristotle noted M41 as a cloudy patch in the sky. The cluster was first cataloged by the Italian astronomer Giovanni Batista Hodierna in 1654, and then by John Flamsteed in 1702. Charles Messier added it to his catalog in 1765, the only object in Canis Major to make his famous list.

M41 contains approximately 100 stars. The brightest, cataloged as HD 49091, is a magnitude 6.9 red giant star near the apparent center of the

cluster. This K3 star is 700 times the luminosity of the Sun, and although it is young (190 to 240 million years old), it has a chemical composition similar to the Sun. HD 49091 is actually a foreground star located 1,000 light-years closer to Earth than the cluster itself.

My image of M41 was taken with a Stellarvue 102 mm f/7.9 refractor using a Tele Vue 0.8× focal reducer/field flattener and a SBIG ST-2000XCM CCD camera. The exposure was 30 minutes. North is up and east to the left.

The brightest star in the image, near the bottom edge, left of center, is known as 12 Canis Majoris or HK Canis Majoris. HK is a magnitude 6.1 blue giant star with a surface temperature of 18,000 K, three times hotter than the Sun. The star is located 707 light-years away, much closer than the cluster. A pulsating star, it varies in brightness by 0.05 magnitude with a period of

2.18 days. The next brightest star in the image is the aforementioned HD 49091.

The brightest star cluster in Canis Major is NGC 2362, located 8.5 degrees east-southeast of M41. NGC 2362 is sparsely populated compared to M41 (dominated by one brilliant blue giant star) and is just over 5 arcminutes in diameter. Messier did not put this cluster in his catalog, for reasons unknown. Maybe he simply missed it. Regardless, keep Charles Messier in mind while enjoying a fantastic view of M41 this winter.

—Dr. James R. Dire

## Full STEAM Ahead

### STEAM in the Spotlight: The Lost Art of Touch

The Tulsa Community College campus in downtown Tulsa, Oklahoma, put out a call for artwork that could be touched. Immediately I thought of the corona tulle fabric panel I had made for the Oklahoma School for the Blind in Muskogee. The panel was initially made for the April 2024 total solar eclipse, and this was an opportunity to make some improvements.

The original design represented the corona's activity during a total solar eclipse. The twisted electromagnetic fields lines were done in tulle, with wave-like particle and gas activity; this was enhanced by better differentiation between these parts. The first addition was pale yellow tulle flares glued immediately next to the black foam shadow, underneath the silver pipe cleaner magnetic loops. The strong field lines were redone with chrome paint markers to represent the ionized particles in the gaseous "waves" emanating from the Sun. Also modified was the beaded piece around the black foam core with the addition of more small gemstones all over to help delineate the sheet that would potentially break off as a coronal mass ejection.

The McKeon Center for Creativity at Tulsa Community College started this "Touch My Art" project at the end of September; all submitted artwork must withstand touching by the guests. On the opening night of the exhibition, TCC had a readable narrative panel along with a Braille panel. Conversations with students and adults, some in wheelchairs, others reading and touching the panel on their own, continued all night. Engaging with the visitors was quite fun, but one key visitor made the night unforgettable.

A young visually impaired woman named Brook got a personalized tour of the piece. After introducing myself, her hand was taken over the piece starting from the magnetic lines to the

## Observing Program Coordinator N E E D E D

In January, the Observing Program division will be filling a few coordinator positions. If you are interested, please send an email to Aaron Clevenson at [aaron@clevenson.org](mailto:aaron@clevenson.org). Known positions at this time are the Herschel II Observing Program and the Outreach Observing Program coordinators. There may be others.



ionized particles in the waves, up to the foam core center. Her comments confirmed that she understood the concepts being explained to her. The best part was when it came to the magnetic loops and Baily's beads; she stated she had read about this in a book, and it was exciting to make the connection.

She shared with me that she was very involved in the blind community through various organizations, but there was nothing currently available like this for the adults that she worked with. An offer was made to host special sessions for her and her peers, and that may be a possibility in the future. The takeaway message was that she was utterly overjoyed as what she had previously only read came to life through my piece – through her fingertips. She thanked me for such a great experience; however, in reality, it was I who will never forget this encounter. It has me now looking for other potential opportunities to further assist adults in the visually impaired community.

Full STEAM ahead, using more of our senses!

—Peggy Walker,  
Broken Arrow Sidewalk Astronomers

## DarkSky Corner

The USTA Billie Jean King National Tennis Center, home of the U.S. Open Tennis Championships, has been upgraded to DarkSky Approved lighting. This uses shielded LED fixtures to reduce glare, limit light spill into surrounding neighborhoods, and minimize sky glow. The lighting system improves playability on the tennis courts. This is the first major sports complex to join a program which hopes to set a new standard for nighttime sports lighting. Read more about this game-changing program at [darksky.org/what-we-do/darksky-approved/outdoor-sports-lighting](https://darksky.org/what-we-do/darksky-approved/outdoor-sports-lighting).

—Tim Hunter



## Al Nagler

The astronomical world lost a giant on October 27, 2025, with the passing of Albert "Al" Nagler. While many amateur astronomers knew Al through his Tele Vue Optics company, Al was also a fixture at star parties and conventions, including Stellafane. Like many amateur (and professional) astronomers, Al's passion for bringing the universe into clearer view goes all the way back to his building of a telescope in high school. Astronomy was more than a vocation for Al – it was a true calling. Numerous obituaries and remembrances have been posted online, including <https://skyandtelescope.org/astronomy-news/al-nagler-1935-2025>, and we hope they give you reason to pause and reflect on how Al Nagler's life and work have impacted your own observing of the night sky.



## End of a Stellar Era

In 2013, then *Reflector* Editor Ron Kramer recruited Kevin Jones and me to be his Assistant Editors. From the start, Kevin and I worked together seamlessly, playing off our individual strengths. Kevin was truly born with an editor's red pen in his hand, and with eagle-eyed intensity kept myriad bloopers and blunders from entering the magazine. When Ron retired in October 2019, Kevin was quite happy to remain as my trusted righthand man as I moved up into the editor's chair, and he has continued to catch hyphens that were dashes, capitalization that was cringeworthy, and numerous other oopsies that I simply overlooked. It was certainly understandable when, earlier this year, Kevin let the team know that he would be hanging up his red pen at the end of 2025, after a dozen years with the magazine. I will miss Kevin's collegial corrections more than I can say, and I hope you all appreciate all that he has done for the *Reflector*, quietly and largely behind the scenes. While he will be helping me with the transition to a new team member, his official responsibilities will soon be coming to their conclusion. If you would like to serve as Assistant Editor, please email me at [larsen@ccsu.edu](mailto:larsen@ccsu.edu) and we can chat about the opportunity. I promise I won't expect you to stay 12 years (unless you really want to).

—Kris Larsen, Editor

## CALL FOR AWARD SUBMISSIONS

Applications/nominations for all League awards must be received no later than March 31, 2026, at 11:59 p.m. CDT. Award rules appear on the "Awards" page at [www.astroleague.org](http://www.astroleague.org). Submissions are not complete until you receive an email confirming receipt from the League vice president.

### LEAGUE YOUTH AWARDS

**National Young Astronomer Award.** U.S. citizens or U.S. school enrollees under the age of 19 who are engaged in astronomy-related research, academic scholarship, or equipment design may apply. League membership is not required. The top two winners receive expense-paid trips to the League's national convention (U.S. travel only) and receive Explore Scientific telescope prizes. Email the application, research paper, and a photo of the nominee to [NYAA@astroleague.org](mailto:NYAA@astroleague.org).

**Service Award.** League members under the age of 19 who are engaged in service to the League or their clubs, schools, and/or the astronomy community may apply for the Horkheimer/Smith Youth Service Award. Club or regional officers may nominate. The winner receives a plaque, a cash prize, and an expense-paid trip to the League's national convention (U.S. travel only). Email the application and a photo of the nominee to [HorkheimerService@astroleague.org](mailto:HorkheimerService@astroleague.org).

**Imaging Award.** League members under the age of 19 who engage in astronomical imaging may apply for the Horkheimer/Parker Youth Imaging Award. Club or regional officers may nominate. The winner receives a plaque. The top three finishers receive cash prizes. Email the application, image, and a photo of the nominee to [HorkheimerParker@astroleague.org](mailto:HorkheimerParker@astroleague.org).

**Journalism Award.** League members aged 8 to 14 may seek the Horkheimer/O'Meara Youth Journalism Award by submitting a 250-word science essay. The winner receives a plaque. The top three finishers receive cash prizes. Email the application, essay, and a photo of the nominee to [HorkheimerJournalism@astroleague.org](mailto:HorkheimerJournalism@astroleague.org).

## LEAGUE AWARDS

The following League awards are open to all League members regardless of age. Winners receive award plaques.

**Mabel Sterns Award.** Club officers may nominate their newsletter editor for the Mabel Sterns Award by emailing a copy of the club's newsletter as a .pdf file, or by emailing a link to an online newsletter, to [sternsnewsletter@astroleague.org](mailto:sternsnewsletter@astroleague.org), along with a nomination cover letter (.pdf) that includes the name, address, and photo of the nominee.

**Webmaster Award.** Club officers may nominate their webmaster for the Webmaster Award by emailing the club website link to [WebmasterAward@astroleague.org](mailto:WebmasterAward@astroleague.org), along with a nomination cover letter (.pdf) that includes the name, address, and photo of the nominee.

**Williamina Fleming Imaging Awards.** These awards, sponsored by Explore Scientific, are open to female League members 19 years of age or older in four categories: Deep Sky (>500 mm excluding Solar System), Solar System (>500 mm), Rich Field (201–500 mm), and Wide Field (200 mm or less). Email the form, a photo of the entrant, and up to three .jpeg attachments not exceeding a total of 25 megabytes to [flemingaward@astroleague.org](mailto:flemingaward@astroleague.org).

**Sketching Award.** Members may apply by emailing one sketch as a high-resolution .jpeg file (10 megabytes maximum) along with a photo of the applicant to [Sketch@astroleague.org](mailto:Sketch@astroleague.org). Cash prizes are awarded to the top three winners.

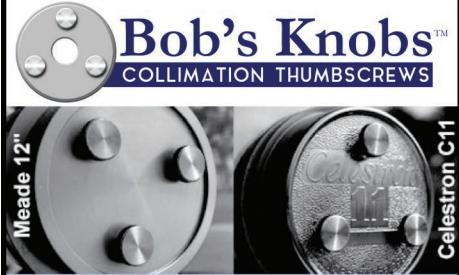
## CALL FOR OFFICER NOMINATIONS

Nominations for League president (2-year term) and vice president (2-year term) beginning on September 1, 2026, must be received by nominating committee chair John Goss at [goss.john@gmail.com](mailto:goss.john@gmail.com) no later than March 31, 2026, at 11:59 p.m. EDT. The duties of each office appear in the League bylaws (see League website under "About Us"). Nominations should be accompanied by a background statement of 250 words indicating qualifications and/or reasons for seeking the position and a photo of the nominee,

both for inclusion in the *Reflector* and on the ballots.

## LIBRARY TELESCOPE GIVEAWAY

The League's annual Library Telescope Giveaway drawing will take place in July. The League gives away up to 11 Library Telescopes (4.5-inch StarBlast reflectors), one to a club in each of its ten regions and one to a member-at-large. Winners then place the telescopes with local libraries. This is an excellent recruitment tool for new and younger members for winning clubs. Applications may be found on the League website (see link at bottom for Library Telescope Program). Applications must be received by June 30, 2026.



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## Annals of the Deep Sky

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# Observing NGC 5139 – Omega Centauri

By Larry McHenry  
[www.stellar-journeys.org](http://www.stellar-journeys.org)

**A**s a mid-latitude northern hemisphere visual observer going back to the 1980s, one of the visual bucket-list deep-sky objects that everyone chased was the great globular cluster Omega Centauri (NGC 5139). As only the northernmost stars of the constellation of Centaurus crest our horizon, viewing Omega was mostly just a daydream read about in magazines, unless we traveled south.

Over the years, I did get a few chances to visually observe NGC 5139; the first was a May in the late 80s in the eastern outskirts of Louisville, Kentucky, from a ridge with a 38-degree latitude using a homebuilt 10-inch f/5.6 Dob. The cluster was a large unresolved oval glow, filling the low-power eyepiece field of view. It quickly passed through a tiny cleft in the hills without enough time to really view it using higher magnifications. I wasn't able to get back to that park until a year later, only to find that trees had grown into the cleft.



Single 5-second snapshot using my Canon 100 mm CCTV lens, 8-inch SCT at f/6.3 on an Atlas GEM, ZWO ASI294MC camera with L-Pro filter, 20-second subs, not guided, live-stacked using SharpCap for 80 seconds

In 2012, I was more successful on a late May vacation to Anna Marie Island (27.5 degrees latitude) in the Gulf of Mexico off the coast of Florida. Unfortunately, the only optical equipment that I had with me was a pair of 8×60 binoculars. Even with that, I had to wait until well after midnight for Omega to clear the hotel lights along the beach before I could observe and sketch it as it



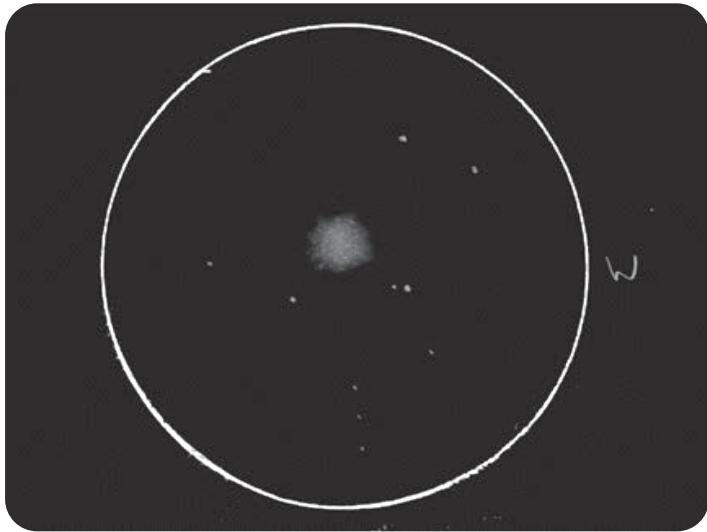
M13: 8-inch SCT at f/6.3 on an Atlas GEM, ZWO ASI294MC Pro camera with L-Pro filter, ROI=2072×1410; 15-second subs stacked for 5 minutes

was setting into the gulf. The view was enough to whet my appetite for more.

Fast-forward a few years to my third chance for Omega, on an 1100-foot-elevation ridge in Calhoun County Dark-Sky Park, West Virginia, at latitude of 38.5 degrees. It was Wednesday, April 27, 2022, close to midnight. Using my 8-inch SCT optical tube on a German equatorial mount, I slewed the telescope south towards the horizon where the stars of Centaurus were hovering over the nearby treetops. I then moved the telescope further south to the lower position of Omega Centauri.

Talk about low-elevation observing! NGC 5139 had an elevation of just shy of 3.5 degrees above the horizon. Using a wide-field Canon lens set to 100 mm, I could see the large diffuse glow of the cluster shining through and around tree branches. I walked over to the telescope and sighted down the nearly horizontal tube to see where I was pointing. I quickly realized that the globular was never going to actually clear the treetops. But it was nearing a thinner section of limbs where I had a chance to get in an observation. Within a few minutes NGC 5139 moved into a slight gap in the branches and I quickly made an EAA (electronically assisted astronomy) observation with the main camera on the 8-inch SCT. Soon afterwards the cluster dived back into the thicker branches and was lost to view. I was lucky — the foliage was noticeably thicker a few days later, as warm weather really brought out the budding leaves.

Using a very short exposure, I was able to EAA observe the dark feature called the “Eye of Omega,” which is possibly a dark molecular cloud in front of the cluster within our line-of-sight (*Cloudy Nights 2024*). This is generally only seen visually, as most images are longer exposures to pull out more of the fainter cluster stars, and tend to cause the “Eye” to blend in. To me, the feature resem-



Pencil sketch using 8×60 binoculars

bles the face of a skull. While not a “pretty picture,” I had definitely completed an EAA challenge observation, capturing NGC 5139. Still, I knew I could do better at Calhoun, from the new observing field that was being built.

The following year, in late April 2023, I was once again back at Calhoun for my fourth attempt at Omega. Now on the new observing field with a clear horizon sightline into the Appalachian Mountains, the clock was just past midnight; the “witching hour” of Centaurus was fast approaching.

After first settling on a nearby bright second-magnitude star Menkent (Theta Centauri) to check the camera focus, I then slewed the telescope further south, nearly horizontal, to the position of Omega, which was approaching the meridian at its maximum elevation of about 3.44 degrees. After a 15-second sub-frame exposure, the globular cluster filled the center of the laptop display, with streamers of stars extending towards the edges of the field. Quite a sight! According to information in the *Annals of the Deep Sky*, a number of Omega’s astrophysical characteristics points to the possibility that the cluster is actually the remnant nucleus of a dwarf galaxy that was consumed by the much larger Milky-Way (Kanipe & Webb 2017, 74).

I was able to immediately see the dark feature that I had noted last spring. I would have liked to have gone a little deeper on the EAA observation, but the telescope mount was in an awkward, near horizontal position, and guiding was not working very well. With this observation, I finally had a good view of the greatest globular cluster in the northern sky, a bucket-list astronomical goal that I had been carrying with me since the mid-80s.

Then in late May 2025, I found myself once again at Calhoun County Dark-Sky Park. While I planned on mostly EAA observing galaxies that night, I had set myself a special goal of viewing my favorite Calhoun southern sky object once more. As Omega transited the meridian at 10:30 p.m., I made it my first target of the night and planned to spend some time on it. The night sky started off beautifully clear, transparent all the way to the horizon. After powering on the telescopes and cameras, I slewed the 8-inch SCT



Omega: 8-inch SCT at f/6.3 on an Atlas GEM, ZWO ASI294MC Pro camera with L-Pro filter, ROI=2072×1410; 30-second subs stacked for 2 minutes

to Spica to focus the camera and waited there for full darkness to fall. Then I slewed the scope down in elevation until the SCT optical tube and piggybacked EVO 50 mm refractor and counter-weight shaft were nearly parallel to the horizon. There, once again at 3.4 degrees above the horizon, just skimming along the distant treetops was the great fabled globular cluster.

To help visualize how large NGC 5139 is compared to M13, imagine the difference between about 10 million stars in Omega to about 500,000 stars in M13. At magnitude 3.7, a diameter of 270 light-years, and distance of 17,000 light-years, Omega is easily visible to the unaided-eye at higher elevations of a dark southern site, visually 55 arcminutes in size and slightly larger than the angular size of the Moon (Kanipe & Webb 2017, 77). In contrast, M13 is magnitude 5.8, has a diameter of 145 light-years, and is about 22,000 light-years distant, visually 20 arcminutes in size (less than half Omega’s angular diameter) (Kanipe & Webb 2024, 181); it can be a challenge to see with the unaided eye, even from a dark site under very good conditions.

With this last EAA observation, I can finally cross the cluster off my 1980s daydream bucket list. I encourage other northern observers to also find a suitable southern location and view this giant stellar city.

#### References:

- Cloudy Nights. 2024. “Omega Centauri.” [www.cloudynights.com/topic/924540-omega-centauri/?p=13488000](http://www.cloudynights.com/topic/924540-omega-centauri/?p=13488000)
- Kanipe, J., & Webb, D. 2019. *Annals of the Deep Sky Volume 5*. Willmann-Bell.
- Kanipe, J., & Webb, D. 2019. *Annals of the Deep Sky Volume 11*. Willmann-Bell.

#### Did you know...

Astronomers Without Borders’ AstroPoetry Blog features astronomy-related poetry from around the world ([astronomerswithoutborders.org/programs/astroarts/astropoetry](http://astronomerswithoutborders.org/programs/astroarts/astropoetry)).

# F. W. Herschel, Master of Practical Optics

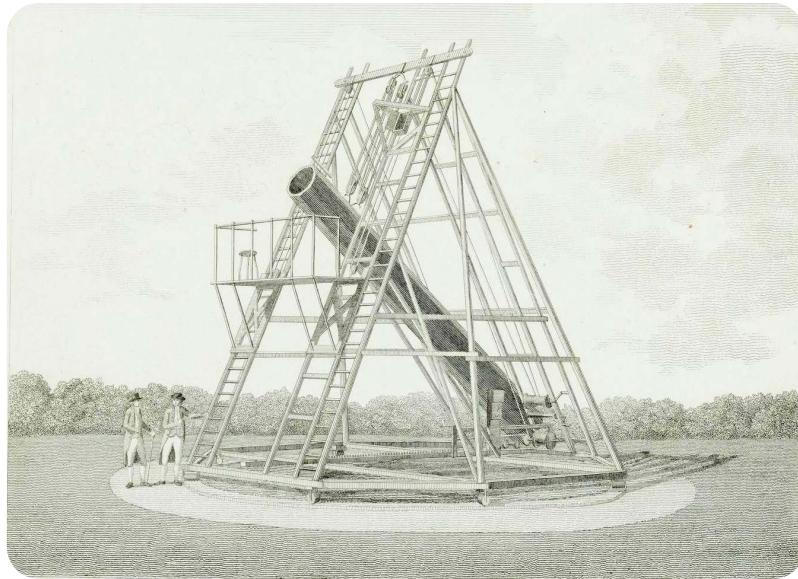
By Bob Kerr

In her *A Popular History of Astronomy during the Nineteenth Century*, astronomy historian Agnes M. Clerke refers to William Herschel as the “Founder of Sidereal Astronomy” (1902, 9). I believe he’s also the founder of modern astronomy as we amateurs know it. Herschel began as many of us: curious about the heavens and largely self-directed. Our ranks include those who, like Herschel, are zealous about grinding mirrors and constructing telescopes, and, now and again, we stumble across something surprising in the night sky. Our Astronomical League Observing Programs include the popular Herschel 400 and Herschel II programs, as well as the Herschel Hustle and the Herschel Society.

In 1773, while a musician in Bath, England, Frederick William Herschel resolved that if he was to own a well-performing telescope he would have to construct it and methodically taught himself to create speculum alloy mirrors of increasing size and capability. Herschel authority Michael Hoskins writes in *Discoverers of the Universe* (2011, 43), “...In November 1778 he achieved a mirror for his 7-foot reflector that he considered ‘a most capital speculum’; quite simply a masterpiece, the finest of its size anywhere on earth.” And in *Sir William Herschel, His Life and Works*, Edward S. Holden, first Director of Lick Observatory, quotes Herschel: “Before 1795 I made not less than 200 7-foot, 150 10-foot and about 80 20-foot mirrors, not to mention the Gregorian telescopes” (1881, 123). These mirrors customarily had figured apertures of 6.5 inches, 8 inches and 18.7 inches, respectively, with focal lengths of f/12 or greater. Herschel most favored the performance of his 20-foot design, using it for “sweeps for nebulae and clusters that would prove to be one of the most remarkable observational campaigns in history” (Hoskins 2011, 98).

After Herschel’s serendipitous 1781 discovery of Uranus, the doors of opportunity swung wide, including his appointment as court astronomer to King George III. Relocating to the neighborhood of Windsor Castle, in 1786 he and sister Caroline moved to a large property in nearby Slough that he designated

Observatory House. Here Herschel’s ambitious plan was to raise up a telescope with sufficient penetrating power to pierce “lucid clouds,” such as the puzzling Orion cloud, and reveal them to be dense assemblies of faint stars. He mistakenly calculated that a telescope bearing a 48-inch speculum would constitute a size and mass that he and his helpers could manage. But the instrument proved unworkable from the outset, given that era’s inadequate building materials and construction techniques. Its speculum, mounting, and maneuverability fell well short of his performance expectations. And when its large aperture failed to penetrate the clouds as he had hoped, he essentially abandoned it and reverted to his 20-foot. Understandably, we may be inclined to diagnose Herschel as aperture fever’s first victim, but Edward Holden pardons him, quoting “I have made it a rule never to employ a larger telescope when a smaller will answer the purpose” (122).



20-foot telescope with observing platform, 1783.  
Samuel Bunce, artist Science Museum Group Collection.

century. In 1924 they invited medical doctor and specialist of the human eye, William H. Steavenson, Fellow, Royal Astronomical Society (FRAS), to study approximately 150 of William’s optical components still residing there. His report, *A Peep into Herschel’s Workshop*, begins, “William Herschel’s great reputation as an astronomer has ... overshadowed and obscured his almost equal claim to fame as a master of practical optics” (1925, 1).

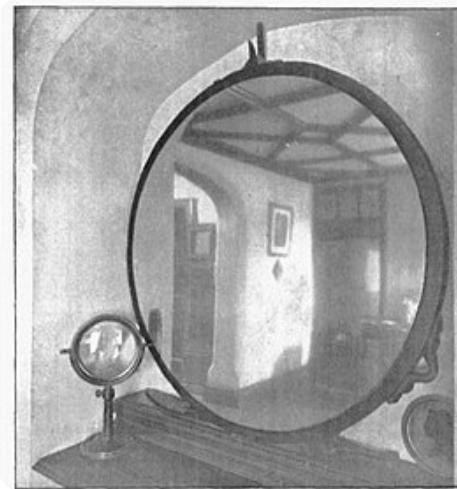
In the entryway, Steavenson found the 40-foot’s second 48-inch speculum cast in 1788. Although the mirror was known to be f/10 he was unable to test its figure, but noted the surface was discolored and covered with fine pits. Herschel had last observed with it in 1814, and, thereafter, it remained outside, neglected, for decades. Fortunately, some of its polish was still intact, reflecting objects in the room (Steavenson 212). In 1785, Herschel’s original mirror had been poorly cast, and less than 2 inches thick, lacking the rigidity to prevent deformation and loss of figure in the telescope. The 1788 speculum’s thickness

was increased to 3.5 inches, providing the desired rigidity but imparting a burdensome weight in excess of a ton. Rigidity had further been enhanced by increasing the speculum's copper content from 70% to 75%, of necessity decreasing the tin from 30% to 25%. The unhappy effect was a less reflective surface that tarnished more quickly (212).

Steavenson next Foucault-tested one of the 18.7-inch mirrors last polished by John in 1834. He noted, "The entire surface was remarkably smooth and free from rings and other irregularities. It was clear at first glance that the mirror was considerably over-corrected, but with its large f/13.3 focal ratio the departure from a sphere would scarcely have been perceptible" (Steavenson 213). He then inventoried a stock of smaller mirrors: four pierced alloy 3- to 9-inch Gregorians, five alloy between 5 and 8.8 inches, and four glass of 6.5 to 9 inches backed with black velvet for solar observing. "Virtually all mirrors were long focal length, well-polished and in splendid condition" (Steavenson 214).

Steavenson eagerly inspected an intact 7-foot telescope equipped with a 6.2-inch mirror, 1.1-inch secondary, and focal length of just over 7 feet. Its octagonal tube and sturdy stand were mahogany and likely the work of an accomplished local woodworker. Using lemon juice he restored the telescope's tarnished optics "to a useful proportion of the original reflectivity" (Steavenson 217). Its mirror tested beautifully regular, but slightly under-corrected. He placed the instrument outside to cool down, and the effects of the falling temperature were marked. "Whereas the mirror's figure had earlier appeared somewhat under-corrected, it was now found to have passed through the paraboloid to a state of slight over-correction." Using Herschel's 361 $\times$  eyepiece he observed "definite rings visible in the expanded star images on both sides of focus, while at the latter there was nothing to indicate any departure from perfect correction." Accordingly, the performance of the 7-foot was judged "most admirable" and "a beautiful little telescope" (Steavenson 217).

Steavenson inspected 48 eyepieces. Herschel preferred single-lenses, inasmuch as they optimally transmitted to the eye 95 percent of the incident light received from the mirror. He had been accused of making exaggerated claims about using magnifications well beyond 1,000. Steavenson tested nine biconvex lenses, finding "They are well-formed and generally



1789 48-inch mirror, 1924. W. H. Steavenson. University of Cambridge Repository, Images from the Institute of Astronomy Library, Photographs of Herschel telescopes and optics-Apollo.

produced sharp images in the micro-focometer, and their focal lengths were quite easily and accurately measured." Catalog D18 thru D26 are representative (Steavenson 216):

Eyepiece	Focal length (inches)	Magnification
D18	0.064	1,331
D19	0.046	1,852
D22	0.023	3,704
D24	0.019	4,484
D25	0.0175	4,869
D26	0.0111	7,676

When D26 was tested in a 6-inch Wray refractor, he found the images dim, diffuse, and somewhat astigmatic, producing a small 20 arc-second field that could not have been held in view without a precision drive. Although these minuscule lenses did indeed form images, they were "of little practical use" (216). These optics were eventually distributed among other Herschel collections in the United Kingdom. In sad disrepair, Observatory House was demolished in 1963. An office building and parking lot now intrude on the cherished ground where William and Caroline devoted countless evenings measuring stars and organizing the universe. Do late night workers perhaps hear echoes of him calling out to her?

The finely curated Herschel Museum of Astronomy occupies his last residence in Bath. A marker in its garden celebrates that cool evening of March 13, 1781, when a series of events were put into motion that would prove consequential beyond measure – William's most admirable telescope introduced him to a new world.

#### References

Clerke, A.M. 1902. *A Popular History of Astronomy during the Nineteenth Century*. Adam & Charles Black.

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Holden, E.S. 1881. *Sir William Herschel, His Life and Works*. Charles Scribner's Sons. The Project Gutenberg eBook.

Steavenson, W.H. 1925. *A Peep into Herschel's Workshop*. IOP Publishing Ltd. Transactions of the Optical Society, Vol. 26, No. 4.



Students of the Bath Spa University, UK, created a 3D interactive model of Herschel's 20-foot telescope (see QR code).

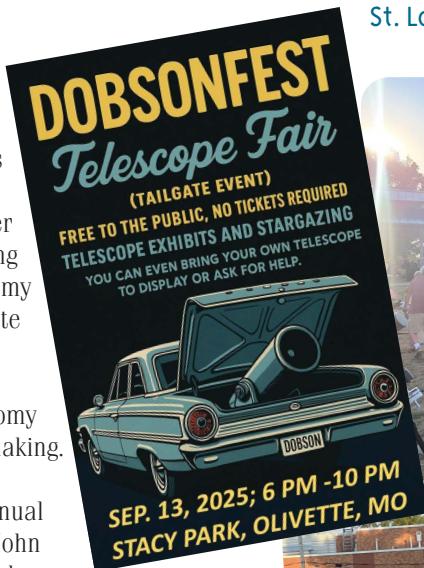


# Dobson Fest: A Celebration of John Dobson, Telescope Making, and Amateur Astronomy

By Mark Jones,  
St. Louis Astronomical Society

In 2022, the four astronomy clubs in the St. Louis area got together to discuss hosting a public astronomy event to celebrate John Dobson's contributions to amateur astronomy and telescope making. The idea was to make this an annual event, close to John Dobson's September 14th birthday, with each club taking a turn hosting at a location of their choice. Our objective was not only to bring together amateurs from across the St. Louis region, but also the public and unaffiliated amateur astronomers, raising awareness about what each club has to offer. Based on all of our experiences, we knew that many telescopes sit idly in closets, garages and basements, and we wanted to encourage the public to get out and use those telescopes.

In the spirit of Dobson, we wanted each event to be organic; each host club was encouraged to envision the event as big or small, with no standard budget, no right way or wrong way, no "must do" activities. Press releases to the public typically stated: *"Are you thinking about buying a telescope? Get tips from local amateur astronomers on selecting a good telescope. Do you need help with the telescope you already have? Bring your own telescope and get help and advice on setup and use. Are you interested in making your own telescope using 3D printing? Do you want to learn how to take photos of the night sky? We can provide tips and advice. We will have observing with solar telescopes during daytime and telescopes for viewing the stars after dark. We will have attendance prize drawings for free astronomy items during this event."*



Most of us have heard of John Dobson, but this name recognition does not extend to the public. As we approached 2025, we shifted the theme to more of a "telescope fair," similar to a car show or tailgate party. Once again, we had a great turnout from our local astronomy clubs, even though temperatures reached the mid-90s. We estimated there were more than 30 telescopes set up and, based

on free raffle tickets collected, we had more than 100 participants. Each year, clubs like ours receive telescopes donated by the public. Many of the telescopes are small reflectors, which can be cleaned, collimated, and fitted with two lower power eyepieces to make excellent raffle prizes. Of the three we refurbished and raffled off, two were "go-to" type, and we disabled the gearing and turned them into completely manual telescopes. In addition, our local

telescope makers gave away two telescopes made from 3D printed components. More info about the 2025 event can be found on our club website at [tinyurl.com/bdlfcs3rx](http://tinyurl.com/bdlfcs3rx).

I would like to thank members of the four regional astronomy clubs for their continuing support: the Astronomical Society of Eastern Missouri, Eastern

Missouri Dark Sky Observers, River Bend Astronomy Club, and St. Louis Astronomical Society. Also, thank you to the clubs that recently joined in: the Astronomical Society of Southern Illinois and Sangamon Astronomical Society.

Next year, DobsonFest will be hosted by the Astronomical Society of Eastern Missouri at Broemmelsiek Astronomy Park on September 19, 2026.

# A Single Spark Between Two Eternities: My Journey into Astronomy and Astrophotography

By Brett Beidler  
Delaware Valley Amateur Astronomers

Just over a year ago, I stumbled into a world that would change me in ways I never imagined. At 64 years old—recently retired and searching for something more than the routine—I discovered the universe; not metaphorically, but literally. Astronomy and astrophotography didn't just become a hobby. They became a source of joy, awe, and an almost spiritual connection to time, light, and the cosmos.

From the moment I first aligned a telescope under a darkening sky, I was hooked. I dove headfirst into the deep end: joining astronomy clubs, learning from seasoned veterans, and acquiring gear piece by piece (yes, I went overboard). And in doing so, I discovered something just as amazing as the stars themselves: the people. Everyone I met—everyone—was kind, generous, and patient. They gave freely of their time and knowledge, and many went out of their way to help me understand the craft and science behind imaging the night sky. These communities have become my mentors, my peers, and my friends.

There's nothing quite like the ritual of preparing for a clear night of imaging. I love setting up my equipment. As everything locks into place and the cameras begin collecting photons from light-years away, I lay out a blanket and settle in under the stars with my number one assistant: Millie, my Irish Setter. Those quiet hours with Millie, beneath a glittering sky, are some of the happiest moments of my life.

Time has taken on new meaning. As the stars drift westward, pushed by Earth's constant spin, I am reminded of the passage of time—not just hours or nights, but years, decades, life itself.



Astronomy has made me acutely aware of my own brief existence. As David Gilmour put it, this is “a single spark between two eternities.” That realization doesn't make me sad; it makes me present. I feel the urgency of time, especially starting this journey later in life. I want to do everything this hobby offers: solar imaging, planetary detail, widefield mosaics, narrowband deep-sky photos—and visual astronomy.

One concern I have is that the hobby seems to be drifting away from visual observation, which I think is unfortunate.

There's something primal and irreplaceable about the visceral experience of looking through an eyepiece; it should be part of everyone's journey.

I've already traveled to dark-sky sites in Arizona and New Mexico. Coming from my home in Pennsylvania, these aren't casual trips. The solitude of the New Mexico desert, alone with the stars, was deeply peaceful—meditative even. And just like back home, I met other passionate stargazers who welcomed me without hesitation. I'm already planning the next step: the Atacama Desert in Chile, spring of 2026. I cannot wait!

But this isn't just about what I can see or photograph. I want to give back. I want to get involved in outreach—to share the spark that lit up my own sky. My enthusiasm is real, and I want it to be contagious.

In retirement, this hobby has given me purpose. It's filled my days with curiosity, learning, creativity, and gratitude. I've come to appreciate not just the vastness of space, but the preciousness of now. I want to tell that story—to anyone who will listen. Because somewhere out there is another person, maybe at a crossroads like I was, who just needs to look up and see that spark.

That's where it all begins.

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# Highlights from AstroCon 2025

## Bryce Canyon National Park, Utah

### June 25–28, 2025

By Lowell Lyon,  
Salt Lake Astronomical Society and event coordinator for AstroCon 2025

The 79th annual national convention of the Astronomical League was held “under the stars” at Bryce Canyon National Park in southern Utah. League officials had expressed interest in having another convention at a dark sky site, possibly adjacent to a National Park. The 2011 ALCon convention had been held at Bryce, and I was contacted about the possibility of going back there and asked to help orchestrate the convention. The 2025 event proved very successful, with almost 400 paid attendees coming to enjoy the dark skies that make Bryce Canyon famous among amateur astronomers. To borrow from the movie industry, you might call it Bryce Canyon: The Sequel or Bryce Canyon II. This event was called AstroCon instead of the typical ALCon for marketing purposes. This AstroCon, as had been done in 2011, focused (pun intended) on personal viewing and astrophotography/digital imaging.



It was decided to have the convention sponsored by the MARS region of the Astronomical League instead of a single club, as members of several clubs were actively involved in planning and implementing the activities. Members from the Salt Lake Astronomical Society and Utah Valley Astronomy Club were primarily involved with marketing and management. Toby Sheets with the Denver Astronomical Society was the creator of the much-acclaimed website. Marcy Curran with the Cheyenne Astronomical Society helped early on with graphic design work. Others outside the MARS region also helped, and I can't thank them enough for their moral support.



Mother Nature threw a curve ball at us, as there was a wildfire less than 10 miles from the park at the time of convention. Hazy skies were more or less of an issue depending upon which way the wind was blowing. Some of those with respiratory issues understandably chose not to attend.

The National Park Service says that Bryce Canyon usually gets about as dark as anywhere, with visual limiting magnitudes approaching 7.4. It probably didn't get quite that dark at the 2025 convention when there was any remaining wildfire haze, yet you could still easily see the Milky Way arcing across the sky on those nights when the wind blew most of the smoke elsewhere.



The Ruby's Inn Convention Center was the venue for exhibitor displays and some of the late afternoon and evening presentations. A venue across the street, Ebenezer's Barn and

Grill, was the location for most of the speakers, workshops, Star-B-Que, and Gala Awards Banquet. Conveniently located just a few miles from the entrance to Bryce Canyon, Ruby's Inn provided many fine amenities to help conference-goers relax during scheduled free time each day.

AstroCon 2025 daytime presentations showcased six workshops: Astrophotography/Digital Imaging – Novice; Astrophotography/Digital Imaging – Advanced; Observing – Personal Program/Journal; Observing – Tips & Ideas/Eyepieces/ Filters; Observing – Charts/Books/Observing Lists; and Sketching what you see at the eyepiece. Other presentations relating to observing or photography filled out most of the rest of the speaker schedule. Astronomical talks for a more general audience



were offered by two of my favorite speakers, Dr. Stacy Palen and Dr. Shane Larson. It was not unusual to see close to 200 people at any given presentation. Don Abernathy with the Salt Lake club was an outstanding master of ceremonies, introducing each guest speaker. Solar telescopes were set up adjacent to Ruby's Inn during the middle part of each day for attendees and the public to look through. To see more about the speakers, please go to the ASTROCON website at [www.astrocon2025.org](http://www.astrocon2025.org), click on "AstroCon 2025," then use the pull-down menu to get to "Activities" and then "Presenters."

The exhibitor area was open all four days of the convention with interesting and varied displays. AstroCon sponsors ZWO and Sky & Telescope were on hand with products and expert advice. Other AstroCon sponsors, unable to attend in person, were AAVSO and Mile High Astronomy. All four sponsor contributions were greatly appreciated. The rest of the exhibit hall was filled with additional enticing displays. You may go to the AstroCon website, click on "AstroCon 2025," and then use the pull-down menu to get to "Exhibitors" and see details about each company that was present at the event or otherwise supported the Astronomical League. Door prizes were offered each morning and afternoon, donated by various exhibitors plus additional supporting companies. These product giveaways included digital telescopes, binoculars, reference books, and other fun items.

Each of the four nights of the convention, the star, or rather stars, of the show were the dark skies of southern Utah. Even with wildfire haze, if the winds were blowing in the right direction, the night skies were satisfying. At close to 7,900 feet elevation, public star parties were held across the highway from the park's main visitor center. Thursday through Saturday nights, there were up to 40 telescopes on hand to showcase the night sky to an enthusiastic crowd of many hundreds of park visitors. AstroCon attendees, University of Utah Department of Physics & Astronomy staff, and members from Utah clubs including Salt Lake, Ogden, and Utah Valley provided most of the telescopes. For those wanting a more private viewing experience, a limited number of scopes were at Rainbow Point at the far south end of the park for personal viewing, thanks to a special use permit from the Park Service. This site, at over 9,000 feet elevation, offered generous views of the night sky as the winds seemed to keep most of the wildfire smoke away.

Two special programs were created specifically for AstroCon 2025 as they were for the 2011 convention: the AstroCon Observing Contest and the AstroCon Astrophotography Contest. Salt Lake club members Jenette Scott, Krista Lemoine, Leslie Fowler, and Max Byerly compiled and edited a list of 50 objects to be sleuthed out. As Salt Lake City hosted the 2002 Winter Olympics and will again do so in 2034, it was decided to have bronze, silver, and gold winners plus special recognition for finding all 50 objects. The goal was to challenge those participating to see celestial jewels often overlooked. Sky & Telescope editor-in-chief Diana Hannikainen's signature was affixed to all the award certificates given to the winners. The



Astrophotography Contest had specific parameters to follow and all entries had to be taken during AstroCon 2025. The winning photos will be published separately in the Reflector. These winners were also awarded certificates plus given Olympic-style medals to honor their accomplishments. A special area about a mile east of Ebenezer's Barn & Grill was set aside for those participating in the Astrophotography Contest.

For lunch on Friday, a special Star-B-Que social event took place at Ebenezer's Barn & Grill, featuring a taco and fajita bar. The Star-B-Que has often been held Friday evening, but due to



Many thanks go to all those who helped to make AstroCon 2025 a success. The workshops and guest presenters were varied and interesting, and a lot of networking took place. All the exhibitors were greatly appreciated. Ruby's Inn was a great venue, with its rustic architecture and great amenities, and kept us well-fed. The Ruby's Inn staff, and Brad Cowen in particular, helped keep things running smoothly with few hiccups. We appreciate the Bryce Canyon National Park "Dark Rangers" that help promote and work to preserve the night skies for our and future generations to enjoy. Many helping hands from members of clubs in Salt Lake, Utah Valley, Denver, Cheyenne, and beyond were invaluable and greatly appreciated. For those who attended AstroCon, please especially take note of those planning committee members whose pictures appeared in the program brochure.

the nature of AstroCon 2025, we didn't want to interfere with the evening star party activities.

The annual Gala Awards Banquet was also held at Ebenezer's Barn & Grill, on Saturday evening from 5 to after 8:30 p.m. After the food was served, the Bryce Canyon Wranglers put on an amazing country and western music extravaganza. Following the music, a representative for ZWO offered a presentation about how seasoned visual observers may transition into astrophotography. Observing Contest and Astrophotography Contest winners were then presented their awards. This was followed by the annual Astronomical League awards, presented to each recipient by League president Chuck Allen and vice president Terry Mann. I was surprised by my local club president with the receipt of a lifetime achievement award, and then even more surprised when my wife and I jointly received a special award from the Astronomical League for helping to put together AstroCon 2025. Thank you! After the Saturday evening festivities, it was off to stargaze one more time!

The planning committee is grateful for the large attendance, excitement, and synergy at the event. We hope this convention will remain a positive memory for all who attended and hopefully all had a lot of fun!

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# ISS: 25 Years of Habitation Is Arduous

By Timothy Milligan

**S**paceflight is hard. Complacency is deadly. These two simple truths are easy to forget when I look up at the night sky and see the International Space Station (ISS) silently orbiting overhead. But its presence is no accident. The ISS was designed to pass over 90 percent of the world's population (NASA 2025), a constant reminder that "we are up here."

I grew up in the 1960s, fortunate enough to witness the live broadcast of Neil Armstrong's first steps on the Moon on July 20, 1969. NASA has been a part of my vocabulary since I was five years old. So, decades later, standing at NASA's press site to cover a space launch, I felt like I'd come full circle.

The launch in question was NASA's Northrop Grumman Commercial Resupply Services 23, CRS-23 for short. Being at the Kennedy Space Center's (KSC's) press site, a place I'd only ever seen on television or online, was surreal. The nostalgia, the triumphs, the tragedies... it's all part of the history here. I felt honored. Humbled. But I was also there to work, to cover the launch from Space Launch Complex 40.

Before this experience, I might have thought, "it's only a resupply mission." But not anymore. These missions are the lifeblood of the ISS. Without them, the station would become uninhabitable. Every launch is critical. Every payload matters. Every person involved is part of something extraordinary. After 25 years



of continuous human presence aboard the ISS, it's easy to forget just how hard it is to keep people alive in space. It takes constant effort, vigilance, and an unwavering belief in the mission. Complacency is not an option—not when the stakes are this high.

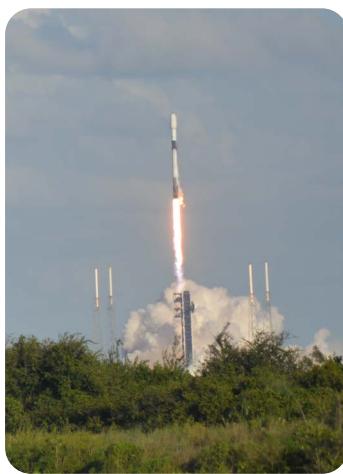
A bit of history before I dive in too deep: The first component of the ISS was launched by Russia. The Functional Cargo Block (FGB in Russian) was deployed in November 1998. It took two more years of construction before permanent habitation of the ISS started in October 2000 (NASA 2015). This year we are celebrating the 25th anniversary of habitation on the ISS. But how do you keep, on average, six people happy for months at a time while they live and work on the ISS? You give them what they need: first and foremost, air, water, and food.

So it was that on September 14, 2025, I observed the launch of the CRS-23 resupply mission to the ISS at Cape Canaveral Space Force Station. The launch vehicle was a SpaceX Falcon 9, carrying the Cygnus XL spacecraft. The mission delivered over 4,911 kg (10,828 pounds) of scientific investigations, research materials, and cargo to the ISS.

Liftoff occurred on schedule at 6:11 p.m. EDT. The skies were mostly clear, with only a few cumulus clouds in the distance. It was a beautiful Florida day, a comfortable 83 °F (28 °C). This was my first time attending a Falcon 9 launch from the official NASA press site, which is located on KSC, not on Cape Canaveral. Standing 6.2 miles (10 km) from the pad, I wasn't quite sure what to expect, particularly in terms of launch trajectory and booster return.

Fortunately, the rocket's direction was easy enough to follow visually, but the booster's reentry burn proved harder to track. In front of me, a tracking camera belonging to a major online platform was already aimed at the sky. Following its guidance, I looked up just in time to see what resembled a bright firework at the zenith. A large, fiery bloom marked the Falcon 9's reentry burn, used to slow its descent back through Earth's atmosphere. Moments later, a collective murmur spread through the press observers: "There it is!" The Falcon 9 booster became visible as





it descended gracefully toward Landing Zone 2. Then came the telltale sound: three sharp sonic booms echoed across the flat landscape, followed by the bright visual of the booster lowering itself behind the tree line for a precise, controlled landing.

The visual spectacle was stunning, but what stood out most was the intensity of the sonic booms, which felt louder than the initial launch sound. I heard three sonic booms in quick succession, a rapid triple report that echoed sharply across the press site. The sensation was physical as well as auditory, it felt like someone lightly pounding on your chest, each boom delivering a soft, percussive thump that you could feel. Then came the echoes off the Vehicle Assembly Building. It felt like the sound would never stop, bouncing and rolling across the landscape. These booms were generated by different parts of the booster (the engine section, interstage, and grid fins) as they broke the sound barrier during descent (Anderson 2025).

Words like “wow,” “amazing,” and “spectacular” only begin to describe how I felt witnessing this launch. The weather was perfect, the countdown proceeded without delay, and ignition occurred precisely on time. Most importantly, the launch was not “scrubbed,” a dreaded word around KSC.

As thrilling as it was to see the Falcon 9 lift off in person, it’s essential to remember the purpose behind it. The ISS is only as valuable as the international crew that lives aboard it, conducting research, maintaining systems, and representing a global effort in space exploration.

For more than 25 continuous years, humanity has maintained a presence on the ISS. Expedition 1, launched in 2000, began with just three crew members. As of this writing, Expedition 73 consists of 10 astronauts, a significant increase in both personnel and capability. When was the last time you had 10 people living in your house? Thankfully, the ISS is equipped with three toilets to accommodate that many residents (Guinness World Records 2021).

But everything we take for granted on Earth, such as breathable air, clean water, and tasty food, must be transported or produced onboard. Most of these essentials are delivered via uncrewed resupply missions, including Northrop Grumman’s Cygnus, SpaceX’s Cargo Dragon, JAXA’s HTV, and Russia’s Progress spacecraft. These launches are not just about rockets, they are lifelines to the ISS in low Earth orbit.

Now, for the facts (NASA 2024; Wikipedia 2025):

Total cargo flown to the ISS: 453,512.50 kg (999,822.73 pounds). This includes consumable supplies such as air, water, food, and fuel. This figure does not include six launches for which I could not find data, nor does it account for launches that failed to deliver their cargo to the ISS. It also excludes manifest items not intended to be brought inside the ISS, such as satellites and special scientific investigations.

To help visualize this, imagine a fully loaded Boeing 747 jet, complete with passengers, luggage, and yes, even the kid kicking the back of your seat. That’s the scale we’re talking about.

Let’s break it down further:

- Total unmanned cargo flights: 169
- Failed missions: 5
- Fuel delivered: 57,426.5 kg (126,597 pounds)
- Air delivered: 3,830.0 kg (8,443.7 lbs.)
- Water delivered: 26,602.5 kg (58,648.4 lbs.)
- Food: Not listed separately in most sources, but rest assured, they’re not starving up there.

Now, for a fun visual: Imagine you’re floating through the ISS and decide to visit the newly opened (and entirely fictional) ISS Star Hop Bar. You secure your feet in the stirrups on the floor and ask for something simple, just some water. You are brought a small bag containing about 8 ounces, and then the bill. You gasp. “\$3,170 for a bag of water!?” The bartender sees the look on your face, but shrugs and says, “That’s our SpaceX special price. It used to be higher.” You both laugh. As history reminds us, spaceflight is not easy. It is dangerous. It is expensive. It can be deadly.

So next time the ISS passes overhead, step outside, whether with a telescope, binoculars, or just your eyes, and take a moment to reflect. If you’re lucky, you might even catch it transiting the Sun or Moon (NASA 2025). But remember, the ISS is more than a piece of hardware orbiting Earth. It is humanity, science, life, and above all, hope, circling above the only home we have.

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—Timothy Milligan is an avid astrophotographer and a member of the Astronomical League, as well as a freelance reporter. He completed the Messier Observing Program (Imaging) earlier this year.

## Did you know...

### December Birthdays

- 11: Annie Jump Cannon (1863)
- 24: Jean-Louis Pons (1761)
- 25: Isaac Newton (1642)
- 27: Johannes Kepler (1571)

# A Universe of Learners: Continuing Education for Astronomy

By Chris Morisette

**A**t an outreach event some time ago, I was approached by an attendee who had just listened to my presentation about one of our evening's celestial targets. They asked, "Would you be interested in teaching a class for students aged fifty and over at our local community college (Lone Star College, Houston, Texas)?" Initially, the idea seemed daunting, but after a conversation with Kathleen Bakat, the program coordinator for continuing education at Lone Star, I decided to accept the challenge. Having served as the Novice Committee chairperson for the Houston Astronomical Society for a year gave me confidence that I could rise to the occasion.

Designing the "Introduction to Astronomy" course was straightforward, thanks to my prior experience with the novice program. I decided on four weekly sessions, each an hour long—although in later semesters, the sessions expanded to ninety minutes. The course syllabus unfolded as follows:

## **Week 1: Getting Started**

We begin by covering basic astronomy terminology and reviewing helpful resources such as books, star maps, and websites. This first session also focuses on learning about the students' goals for the course, such as identifying constellations and understanding where they can be found in the night sky.

## **Week 2: Navigating the Night Sky**

The second week introduces students to the concept of the celestial sphere and teaches them how to use prominent constellations like Orion, or asterisms like the Big Dipper and the Summer Triangle, as celestial signposts. I conclude with a demonstration of Stellarium, which helps make these ideas more tangible.

## **Week 3: Telescopes, Mounts, and "Astronomy on the Road"**

This session delves into different types of telescopes (refractor, Newtonian, and Schmidt-Cassegrain) as well as mounts (altazimuth, equatorial, and Dobsonian). We discuss the function and advantages of each, and I provide two one-page evaluation guides by Dr. Aaron B. Clevenson to help students choose suitable equipment. We also explore opportunities for road trips to nearby dark-sky locations and observatories, although in Texas, "nearby" might mean a ten-hour drive!

## **Week 4: Our Place in the Universe**

In the final week, we embark on a journey through the cos-

mos, exploring how the Earth, Moon, Solar System, and Milky Way fit into the universe. I share images of planets, nebulae, star clusters, and galaxies, discussing each one's location and significance. Our tour culminates 260 million light-years away at galaxy IC 1296. Before concluding, we revisit the goals set in week 1 to ensure all student objectives were addressed.

Each week ends with a short homework assignment. During our February class, students locate Orion (week 1), then use it to find Aldebaran, Sirius, Pollux, and Castor (week 2). In week 3, they use Orion again to find M42 and M45.

## **Challenges and Improvements**

Students sometimes struggle to translate classroom knowledge into real-world sky navigation. After our homework assignments some students are still unsure how to find Orion. Moving forward, I'd like to incorporate outdoor evening sessions for hands-on learning using a laser sky tour. To expand the class's reach, we plan to offer both in-person and virtual instruction, taking advantage of Lone Star College's many campuses in Houston and its suburbs.

## **Reflections on Outreach**

If you're contemplating outreach, I highly recommend engaging with the fifty-plus community. These students are eager, friendly, and genuinely interested in the subject. Look into continuing education programs near you. There may be interest in adding astronomy to their offerings.

In summary, teaching "Introduction to Astronomy" is a rewarding way to share knowledge and passion for the cosmos. It's enjoyable, builds connections with others, and helps newcomers embark on their journey into the wonders of astronomy.

Note: The evaluation guides used are "Binocular Buying Basics for Beginners" ([www.astroleague.org/wp-content/uploads/2025/09/Binocular-Buying-Basics-v2.pdf](http://www.astroleague.org/wp-content/uploads/2025/09/Binocular-Buying-Basics-v2.pdf)) and "So You Want to Buy a Telescope?" ([www.astroleague.org/wp-content/uploads/2025/09/Telescopes-2.pdf](http://www.astroleague.org/wp-content/uploads/2025/09/Telescopes-2.pdf)).

Chris Morisette is the Novice Committee chairperson of the Houston Astronomical Society, as well as an active member of the North Houston Astronomy Club and the Fort Bend Astronomy Club. Chris is also a member of the McDonald Observatory and Department of Astronomy Board of Visitors, which provides support for the Texas Astronomy Program and is affiliated with the University of Texas at Austin.

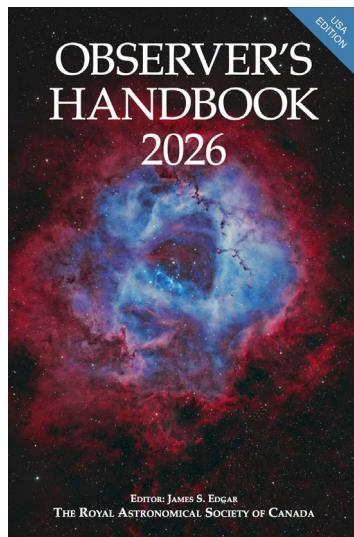
## **Did you know?**

The National Science Foundation website features astronomy and space educational resources you can use for teaching and outreach ([www.nsf.gov/focus-areas/astronomy-space/educational-resources](http://www.nsf.gov/focus-areas/astronomy-space/educational-resources)).



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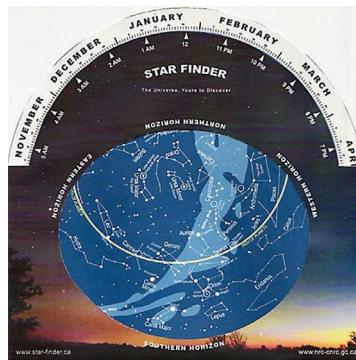
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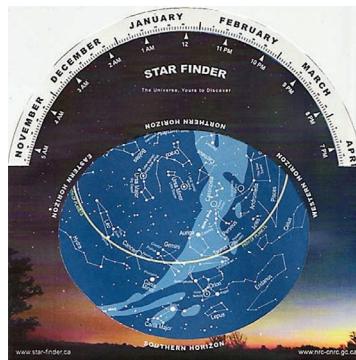
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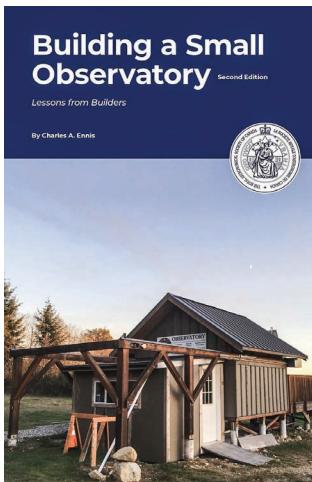
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No. 35, **Brad Payne**, Advanced, Northern Virginia Astronomy Club; No. 36, **Benito Loyola**, Intermediate, Back Bay Amateur Astronomers; No. 37, **Benito Loyola**, Advanced, Back Bay Amateur Astronomers

## OPEN CLUSTER OBSERVING PROGRAM

No. 133-I, **Richard Wheeler**, Gold Imaging, Northeast Florida Astronomical Society; No. 134-I, **Viola Sanchez**, Gold Imaging, The Albuquerque Astronomical Society; No. 135-I, **Jason Wolfe**, Gold Imaging, Member-at-Large; No. 136, **Jeff Wilson**, Gold, Rose City Astronomers; No. 137-I, **Laurie V. Ansorge**, Gold Imaging, Lifetime Member

## OUTREACH PROGRAM

No. 1153, **Debra Wagner**, Stellar, Member-at-Large; No. 1320, **Chris Morissette**, Master, Fort Bend Astronomy Club; No. 1381, **Richard Lighthill**, Master, Huachuca Astronomy Club; No. 1409, **Thrayee Rao**, Stellar, Fort Bend Astronomy Club; No. 1440, **Miguel Duarte**, Stellar, Fort Bend Astronomy Club; No. 1595, **Charles Webb**, Stellar, Fort Bend Astronomy Club; No. 1647, **Bill Dillon**, Stellar, Fort Bend Astronomy Club; No. 1698, **Brenda Olsen**, Outreach, Stellar, Master, Westminster Astronomical Society; No. 1699, **Neal Lewis**, Outreach, Shoreline Astronomical Society; No. 1700, **Mark Stevens**, Outreach, Raleigh Astronomy Club; No. 1701, **Kevin Liu**, Outreach, Stellar, Fort Bend Astronomy Club; No. 1702, **Bhavana Sangam**, Outreach, Fort Bend Astronomy Club; No. 1703, **Hudson Hallenbeck**, Outreach, Fort Bend Astronomy Club; No. 1704, **Joseph Culligan**, Outreach, Fort Bend Astronomy Club; No. 1705, **John Spencer**, Outreach, Fort Bend Astronomy Club; No. 1706, **Lori Daisley-Harlow**, Outreach, Fort Bend Astronomy Club; No. 1707, **Isaias Citron**, Outreach, Fort Bend Astronomy Club; No. 1708, **Jonah Reyes**, Outreach, Fort Bend Astronomy Club; No. 1709, **Thomas Wise**, Outreach, Fort Bend Astronomy Club; No. 1710, **Tom Wise**, Outreach, Fort Bend Astronomy Club; No. 1711, **Jessica Reyes**, Outreach, Fort Bend Astronomy Club; No. 1712, **Clariza E Kern**, Outreach, Pontchartrain Astronomy Society; No. 1713, **Stephen Kelly**, Outreach, St. Louis Astronomical Society; No. 1714, **Mary Barteau**, Outreach, St. Louis Astronomical Society; No. 1715, **Joseph Barteau**, Outreach, St. Louis Astronomical Society; No. 1716, **Gerald Drake**, Outreach, Grand Strand Astronomers; No. 1717, **Larry Dove**, Outreach, Flint River Astronomy Club; No. 1718, **Pedro Cabanillas**, Outreach, West Kentucky Amateur Astronomers; No. 1719, **Terri Sutton**, Outreach, Flint River Astronomy Club; No. 1720, **Mark Sutton**, Outreach, Flint River Astronomy Club

## PLANETARY NEBULA OBSERVING PROGRAM

No. 31-I, **Dean F. Herring**, Gold, Raleigh Astronomy Club; No. 32-I, **Thomas V. Schumann**, Gold, Lifetime Member; No. 33-I, **David Babb**, Gold, Member-at-Large; No. 111, **Jeff Wilson**, Gold, Rose City Astronomers

## RADIO ASTRONOMY OBSERVING PROGRAM

No. 36, **Dale Nichols**, Silver, Spokane Astronomical Society; No. 49, **Dale Nichols**, Bronze, Spokane Astronomical Society;

## SKETCHING PROGRAM

No. 72, **Debra Wagner**, Member-at-Large; No. 73, **Craig Lamison**, Houston Astronomical Society No. 74, **Jonathan Cross**, Seattle Astronomical Society

## SKY PUPPY OBSERVING PROGRAM

No. 108, **Vincent Witcher**, River Bend Astronomy Club; No. 109, **Wilfred Ball**, Independent

## SOLAR NEIGHBORHOOD OBSERVING PROGRAM

No. 43, **Stephen J. Nugent**, Telescope, Member-at-Large; No. 44, **Stephen Pavela**, Telescope, La Crosse Area Astronomical Society; No. 45, **Anthony J. Kroes**, Eyes-only, Minnesota Astronomical Society; No. 46, **Anthony J. Kroes**, Binocular, Minnesota Astronomical Society; No. 47, **Richard Wheeler**, Eyes-Only, Northeast Florida Astronomical Society; No. 48, **Richard Wheeler**,

Binocular, Northeast Florida Astronomical Society

## SOLAR SYSTEM OBSERVING PROGRAM

No. 249, **John Lilly**, Binocular, Boise Astronomical Society; No. 250, **Mohammad Adnan Asif**, Regular, Raleigh Astronomy Club

## SOUTHERN SKIES BINOCULAR OBSERVING PROGRAM

No. 114, **Simon Lowther**, Member-at-Large

## SOUTHERN SKIES TELESCOPIC OBSERVING PROGRAM

No. 71, **Simon Lowther**, Member-at-Large

## SUNSPOTTER OBSERVING PROGRAM

No. 263, **Andrew Hall**, Member-at-Large; No. 264-I, **Alex McConahay**, Riverside Astronomical Society; No. 265-I, **Fred Schneider**, Member-at-Large

## TWO IN THE VIEW OBSERVING PROGRAM

No. 74-I, **Brad Payne**, Gold, Northern Virginia Astronomy Club; No. 75-I, **Rod Hughes**, Gold, Member-at-Large

## UNIVERSE SAMPLER OBSERVING PROGRAM

No. 112-N, **Steve Boerner**, Member-at-Large; No. 172-N, **Teresa Bippert-Plymate**, Bear Valley Springs Astronomy Club

## URBAN OBSERVING PROGRAM

No. 254, **Paul Morgan**, Umpqua Astronomers; No. 255, **Eric Hanson**, Member-at-Large; No. 256, **Andrew Hall**, Member-at-Large; No. 257, **David Wickholm**, San Antonio Astronomical Association; No. 258, **Ranger Hendershot**, Northern Virginia Astronomy Club

## VARIABLE STAR OBSERVING PROGRAM

No. 68-I, **Robert Togni**, Central Arkansas Astronomical Society

## MASTER OBSERVER PROGRESSION

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**Michael A. Hotka**, Longmont Astronomical Society; **Steve Boerner**, Member-at-Large

### BINOCULAR MASTER OBSERVER AWARD

**Joe Fazio**, Cumberland Astronomy Club; **Jason Wolfe**, Member-at-Large

### MASTER OBSERVER AWARD

No. 275, **Gus Gomez**, Tucson Amateur Astronomy Association; No. 276, **Stephen J. Nugent**, Member-at-Large

### ADVANCED OBSERVER AWARD

**Paul Morgan**, Umpqua Astronomers; **Richard Wheeler**, Northeast Florida Astronomical Society

### MASTER IMAGER AWARD

**Brad Payne**, Northern Virginia Astronomy Club

### MASTER OBSERVER AWARD – SILVER

**Paul Morgan**, Umpqua Astronomers

### MASTER OBSERVER AWARD – PLATINUM

**Brad Payne**, Northern Virginia Astronomy Club

### MASTER OBSERVER – TRIPLE CROWN AWARD

**Brad Payne**, Northern Virginia Astronomy Club

## Did you know...

StarryTrails.com features astronomy puzzles and activities for children ([starrytrails.com/kids-astronomy-activities-puzzles/](http://starrytrails.com/kids-astronomy-activities-puzzles/)).



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Jeffrey O. Johnson (Astronomical Society of Las Cruces) took this image of NGC 6888 from his backyard in Las Cruces, New Mexico, with an Astro-Tech AT12RCT with a QSI 690wsg CCD camera.



M.J. Post (Longmont Astronomical Society) captured this image of NGC 6914 using a PlaneWave CDK14 and a ZWO ASI 6200MC camera from his DSNM observatory in Animas, New Mexico.



Gregg Ruppel (Tucson Amateur Astronomy Association) captured this image of van den Berg 88, 90, and 92 from his remote observatory at DSNM in Animas, New Mexico, with an ASA 10N f/3.8 Astrograph with an SBIG STL-11000M CCD camera.



David Wickholm (San Antonio Astronomical Association) captured this image of the Saturn and Titan shadow transit on August 19 using a 22-inch F/4.5 Dobsonian with 2× PowerMate and a ZWO ASI178MC camereia.

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