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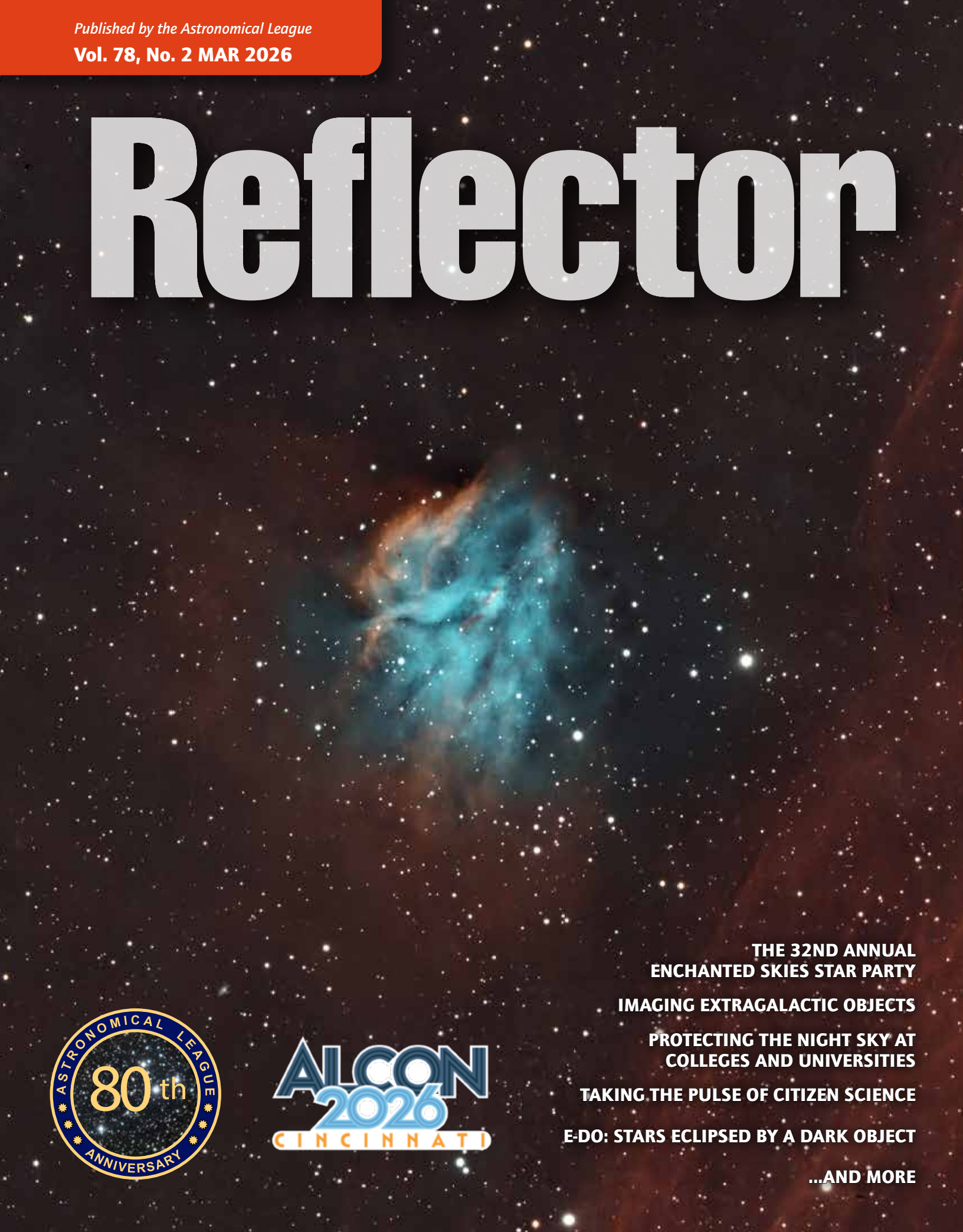
Reflector



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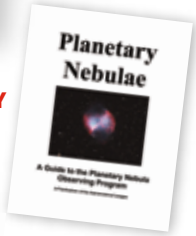

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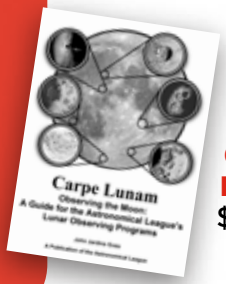

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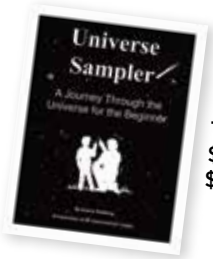

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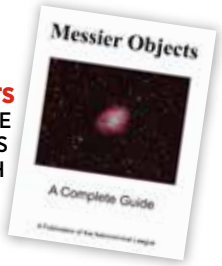

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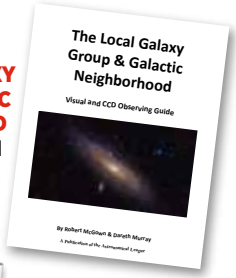

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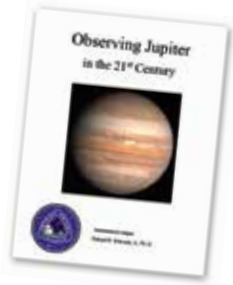

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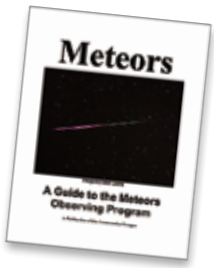

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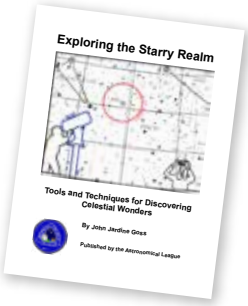

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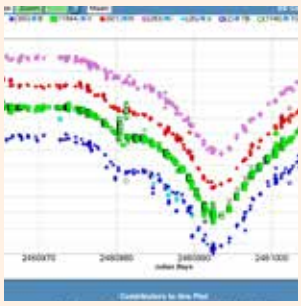

M.J. Post (Longmont Astronomical Society) captured this image of DeHt 5 (Dengel-Hartl 5) in Cepheus using a Celestron 11" RASA and a ZWO ASI 6200MC camera from his DSNM observatory in Animas, New Mexico.

Reflector

The Astronomical League Magazine

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A FEDERATION OF ASTRONOMICAL SOCIETIES
A NON-PROFIT ORGANIZATION
To promote the science of astronomy

- by fostering astronomical education,
- by providing incentives for astronomical observation and research, and
- by assisting communication among amateur astronomical societies.

Astronomical League National Office:
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Reflector

QUARTERLY PUBLICATION OF THE ASTRONOMICAL LEAGUE

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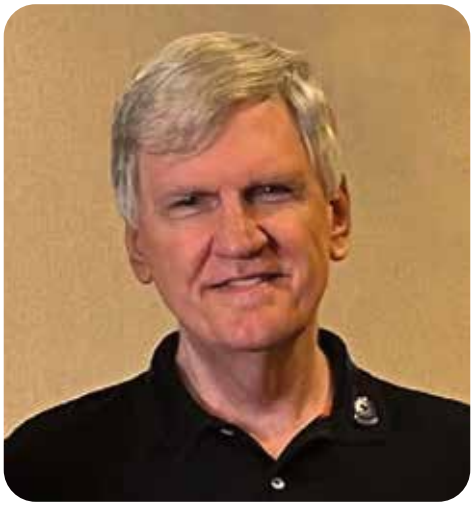
***REFLECTOR* AND CLUB ROSTER DEADLINES**

March issue	**December 15**
June issue	**March 15**
September issue	**June 15**
December issue	**September 15**

LETTERS TO THE EDITOR

Send to *larsen@ccsu.edu* with subject line "letter to editor"



President's Column

Happy 80th! The League has reached its 80th anniversary. Please come to Cincinnati and celebrate with us. ALCon '26 will be held on the riverfront at the Cincinnati Marriott at Rivercenter in Covington, Kentucky, across from downtown Cincinnati, on August 12-15, 2026. The hotel is within a free trolly ride of the Banks entertainment district, the Reds baseball stadium, and the Newport Aquarium. An extra feature of this year's ALCon is an afterparty on Sunday August 16th for all attendees. The Moeller Observatory, an exciting new private research-class observatory in Southern Ohio, in partnership with the Cincinnati Astronomical Society, is hosting this party on Sunday afternoon and evening. More details are available on the *ALCON2026.org* website. This is an event attendees will not want to miss.

The Eight Pillars. Coming out of COVID, the League has ballooned from 18,000 to 25,000 members, and is still growing because it offers something that supports every interest – what I call the eight pillars of amateur astronomy.

1. Observing. The League boasts the most robust program of observing awards of any organization in the world. Our National Observing Program Division, run by five directors and over 35 coordinators, offers more than 75 regular observing programs, most of them requiring about 100 target observations (some far more) and many requiring analytical skills. We are the only organization in the world offering master observer and binocular master observer certifications. These programs have awarded more than 20,000 certificates and pins, along with national recognition, to over 7,000 different observers since 1967. Our Leslie Peltier Award goes to those whose observational work exhibits extraordinary achievement.

2. Imaging. Many of our observing programs offer imaging options that lead to master imager certification. Plus, we offer our Horkheimer/Parker Imaging Award with large cash prizes to high school-aged members and our Williamina Fleming Imaging Awards to adult female members. Our national magazine, *Reflector*, is dedicated to the display of outstanding member images. The League also sponsors imaging competitions and local, regional, and national events.

3. Writing. Our members submit articles to *Reflector* and to our regional newsletters and websites. We offer a wide range of manuals for many of our observing programs and welcome new proposals. We offer our Horkheimer/O'Meara journalism award to League members aged 8 to 14. We also provide free Guides and Astro-Notes that can be copied and distributed to club members.

4. Research. Our National Young Astronomer Award has been recognizing extraordinary astrophysical research by teens since 1993. The program is open to high school students, regardless of League affiliation, who perform high-level research projects. Our winners receive paid convention trips and telescope prizes. Our Astronomical League Award recognizes

outstanding contributions to the science of astronomy. Our Observing Program Division supports 10 Citizen Science programs requiring direct observation and over 30 Citizen Science programs requiring active participation.

5. Outreach. The League is an exceptional source of speakers and public speaking opportunities at the national, regional, and club level. Our youth members are finding national audiences through our Global Star Parties, League Live events, and conventions. We recognize outreach with our Master Outreach Award program, with two Horkheimer Service Awards that provide large cash prizes to high school students for exceptional public outreach, and with our G.R. Wright Award program for service to the League. We also award up to 11 Library Telescopes each year to League clubs for placement in local libraries.

6. Technology. The League and its regions are in constant need of IT support, AV support, and website upgrading and maintenance. The League is expanding its own web team to meet our growing online needs.

7. Leadership. The League offers five national officer positions, 20 Council positions, scores of regional officers below Council level, and a wide range of committee and convention hosting positions.

8. Social Contact and Fun. Our national and regional conventions and online activities offer amateur astronomers a chance to make new friends and to interact with professional astronomers, astronauts, authors, television personalities, comet discoverers, pulsar discoverers, magazine editors, and leaders of related science organizations. This year's convention at Bryce Canyon, Utah, drew 460 people with attendant talks, banquets, star-b-ques, country and western shows, awards, national park visits, observing, and imaging. Conventions have offered tours to places like Lick Observatory, Yerkes Observatory, LIGO, the VLA, the Linda Hall Library, and the Kennedy Space Center.

In short, there's a place in the Astronomical League for every person and every interest. There's a place for you.

—Chuck Allen, President

TO THE EDITOR

Once again, I want to take this opportunity to thank the *Reflector* staff for publishing my image [of M8, September issue, pg. 24]. However, there is an erratum I need to report regarding that. The caption states that I captured the image during AstroCon 2025 in Utah. In actuality, it was captured from Tucson AAA's Chiricahua Astronomy Complex (CAC for short) in southeast Arizona. There is no way an image like that could have been captured during the convention. Throughout the event, the skies above Bryce Canyon and vicinity were inundated with ash from a nearby wildfire. Many thanks

—Paul Lorenz

Meet our New Ad Manager JOE FAULKNER

The League is happy to welcome our new *Reflector* Advertising Manager, Joe Faulkner. Joe lives in Spokane, Washington, and is a member of the Spokane Astronomical Society.

Joe holds a Bachelor of Science degree in Public Administration from the University of Arizona and a Master of Science degree in Business Administration from Eastern Washington University. He has extensive professional experience in sales with major companies such as General Store, Home Depot, and Lowe's. His areas of expertise extend to manufacturing and raw material management into finished goods and services, experience with MS Teams and SAP ERP software, and work with inventories, price audits, and meeting the needs of retail customers.

Those wishing to advertise products or events in our national magazine, *Reflector*, may contact Joe at *advertising@astroleague.org*. He'll help you get started with ads that reach our 25,000 members.

Deep-Sky Objects

A Tight Spiral in the Big Bear

Ursa Major, the Great Bear, is well positioned to spy its galaxies in the springtime, as the constellation is high above the northern horizon for midlatitude observers a few hours after the end of astronomical twilight. The northern and eastern sections of the constellation contain splendid galaxies such as M81, M82, M108, and M109, to name just a few. In this issue, I will concentrate on a fine spiral on the western edge of the constellation, NGC 2841.

NGC 2841 is a magnitude 10.1 spiral galaxy measuring 8.1 x 3.5 arcminutes in size. Its galactic classification is Sa or SAa where the S and SA are used interchangeably to mean it is a regular (not barred) spiral. The lower case "a" means the spiral arms are tightly wound. NGC 2841 was first catalogued by William Herschel in the year 1788 using an 18.7-inch Newtonian reflector.

NGC 2841 can be found slightly under two degrees west-southwest of the third magnitude star Theta Ursae Majoris, essentially in front of the Great Bear's knees on mythological star atlases.

In 6- to 8-inch telescopes, the galaxy has a bright star-like nucleus surrounded by the faint oval shape of the spiral structure. This structure cannot be resolved in amateur telescopes. The long axis of the galaxy extends from northwest to southeast.

In 2001, a Hubble Space Telescope survey of Cepheid variable stars in the galaxy placed its

distance at 46 million light years. This makes its diameter 150,000 light years, or 50 percent larger than our home galaxy. The galaxy is very similar to M31. It contains a plethora of hot, young blue stars and very few HII regions (ionized atomic hydrogen gas). The short, tightly wound spiral arms contain myriad dark dust lanes.

My image of NGC 2841 was captured using an 8-inch Ritchey–Chrétien Cassegrain telescope operating at f/6.4 by way of a 0.8x focal reducer. The exposure was 130 minutes with a SBIG ST-2000XCM CCD camera. The bright orange star on the northeast (upper left) side of the galaxy is magnitude 8.5 SAO 27227. It aids in centering the galaxy in a finder scope. The bright foreground star on the northwest (upper right) edge of the spiral arms is an 11th magnitude white star.

There were four supernovae discovered in NGC 2841 during the 20th century: SN 1912A, SN 1957A, SN 1972R, and SN 1999by. All of these were type Ia supernovae. Paul Wild, famous for discovering several comets that bear his name, discovered the 1972 supernova. Type Ia supernovae occur when a white dwarf star accretes mass from a binary companion. When the white dwarf's mass exceeds what is called the Chandrasekhar limit (around 1.44 times the mass of the sun) it explodes as a supernova. There have been no supernovae in NGC 2841 to date this century.

If you have never seen NGC 2841, swing by that side of the Big Bear this spring before heading over to Ursa Major's more famous galaxies.

—Dr. James R. Dire

Full STEAM Ahead

STEAM: MOVING FORWARD

The Mid-States Region continues with its youth engagement plans, which have been expanded due to interest from additional groups and individuals. The priorities evolved from a session at last year's MSRAL's Convention: to help with parental involvement, families with no club assistance, small clubs needing help and resources, home schooling families and school clubs needing partnerships, as well as individual students looking for mentors and guidance. We learned that unexpected events had created new opportunities, and at the same time we all needed to regroup and reconsider how to get the program back on track.

You can help by attending MSRAL 2026, to be held on June 26 to 28 at St. Charles Community College, Cottleville, MO, hosted by the Astronomical Society of Eastern Missouri. This year's hosts have an excellent youth mentoring program developed specifically to help mentor youth through the AL Observing Programs. This is a great time to host a youth-friendly convention, and ASEM is setting a great standard for the future of the region. For more information, including registration, see *www.asemonline.org/2026-msral.*

Another great opportunity tied to the MSRAL Convention is the Astronomical League's sponsorship of an imaging and art contest for youth (up to 18 years) and adults. President Chuck Allen, who grew up in the Astronomical League, will be taking part. For imagers, the categories are Solar System, Wide-Field, Rich-field, and Deep-sky, while the art section will feature sketching and other art media. Please let us know if you plan to submit so ample space will be arranged. Contact Rick Heschmeyer at *rickheschmeyer@gmail.com*.

We are also interested in hosting online educational sessions for families, students, school clubs, and other groups. MSRAL is rich in club observatories, and with some coordination by club members and officers, students and families will have a resource to assist in meeting educational goals and learning outcomes. The first session is an online mini Messier Marathon for novice observer families and students planned for April. If you are interested in participating, please contact MSRAL Chair, Rick Heschmeyer, at *rickheschmeyer@gmail.com* to get the link.

In response to a few questions generated by previous articles, any school club, independent student or family, or homeschooling groups are welcomed, regardless of whether or not you are a member of a club or society of the Astronomical League. This invitation is also open to those outside of the region, as it is important to further involvement in astronomy more broadly. Please feel free to join us at any of our functions and in any of our projects.

Full STEAM Ahead.

—Peggy Walker,
Broken Arrow Sidewalk Astronomers

DarkSky Corner

Drew Regan of DarkSky International (DSI) recently posted "2025: United for the night-A year of worldwide progress" (*darksky.org/news/2025-united-for-the-night-a-year-of-worldwide-progress/*). This is a very good summary of the worldwide efforts to confront light pollution. As I have mentioned for many years, my own personal feeling is we are still losing the battle for dark skies, but we are losing the battle less badly. Also, there are many strong forces being brought to the fore to help in the battle, which gives me optimism for progress in the near future. One of DarkSky International's achievements has been naming its 250th International Dark Sky Place, with the recent certification of the Lapalala Wilderness Nature Reserve in South Africa. Another important achievement is the new DarkSky Approved Port Marine Terminal Lighting program. I highly recommend reading Drew's very informative posting.

—Tim Hunter

Award Winners

Anthony and Donna Bryan of Jasper, Indiana, have been named winners of the 2025 Hans Baldauf Award, the highest award for service given by the Great Lakes Region of the Astronomical League. The plaque was presented by Astronomical League President, Chuck Allen, at the Evansville Museum of Arts, History, and Science planetarium on December 19, 2025.

The award recognizes the Bryans for their service to astronomy education and outreach in Indiana and Kentucky. Tony is a prolific astronomy educator who has provided educational programming to schools, scout troops, libraries, and public audiences in southern Indiana and western Kentucky for over 30 years. Tony served as president of the Evansville Astronomical Society for nine years (January 2017 to December 2025), provided safe observing seminars for the public in connection with recent solar eclipses, and placed library telescopes into four local libraries. Tony currently serves on the Council (Board of Directors) of the Astronomical League. Donna has taken organizational responsibility for countless regular, social, and educational functions of the EAS, and both she and Tony are regular attendees at Astronomical League national conventions where Donna has provided regular support for League youth award winners in attendance.

Congratulations to them both!

Report from New Mexico: The 32nd Annual Enchanted Skies Star Party

by John W. Briggs
Photographs by Steve Schaefer

Through six busy days in the high desert last October, astronomers in the Magdalena Astronomical Society hosted the 2025 Enchanted Skies Star Party, an event that drew over 130 enthusiasts from across the country. A surprise feature at this year's ESSP was the participation of internationally recognized astronomer Dr. Marc Buie from Southwest Research Institute. Dr. Buie was among the leading members of the team conducting the 2015 New Horizons flyby mission to Pluto and four years later to the remarkable newly discovered, very distant, double-asteroid object named Arrokoth. Buie was drawn to attend this year's ESSP because it featured occultation science, a specialty of great interest to him, and a field that engages backyard scientists in astronomical discovery.

The new location for the Enchanted Skies Star Party is located just a short drive east of the VLA.

This was the second year that the event was held at the Montosa Ranch campground, located only eight miles away from the center of the Very Large Array radio telescope, and the first at which the program was co-sponsored by the Southwest Region of the Astronomical League. The location features very dark skies that are a principal attraction for participants. The site also has a comfortable chapel building used as a lecture hall. The combination of amenities provides an ideal setting for the long-running event. The lecture hall allowed for an expanded program of distinguished speakers including both professional and amateur astronomers. Dr. David Levy, the co-discoverer of the famous Comet Shoemaker-Levy 9 that crashed into Jupiter in 1994, was among the keynote speakers. Participants were grateful that staff from the VLA turned off lights that normally illuminate the Array's central area. This accommodation made the environment at Montosa Ranch even better.

Occultation science involves the alignment of celestial objects in the sky, similar to eclipses of the Sun and Moon. Of particular interest at ESSP was stellar occultations by faint asteroids in our solar system. Major improvements in our knowledge of the positions of stars and asteroids – thanks to the European Space Agency's revolutionary Gaia Mission and its astrometric results – make predicting such events much easier than ever before. Through occultations we can gather considerable information about asteroids, such as their size, shape, and that they are sometimes double or have their own small moons. This research can be done simply, using small telescopes and video cameras set up in one's backyard.

It can, of course, become much more elaborate. Dr. Larry Wasserman of Lowell Observatory described how seeing the most interesting occultation events often involves traveling to far corners of the world. Drs. David and Joan Dunham, featured speakers at ESSP, are founders of the long-established International Occultation Timing Association (IOTA) that now has an endowment of over $1,000,000. After sharing the stage with Dr. Buie in presentations meant to encourage more participation in occultation observations, the Dunhams hosted a more specialized and technical workshop on the subject, held in Magdalena on the Monday following ESSP. Video conference technology allowed nearly half of the workshop participants to attend virtually.

Like previous years, many other ESSP presentations offered information about how to photograph the sky, a topic of great interest to typical star party participants. Among the other speakers were nationally recognized expert Dan Llewellyn returning from Georgia; Dr. Robert Q. Fugate, retired as the founding director of the U.S. Air Force Starfire Optical Range in Albuquerque; and retired software engineer Lee Maisel, a new resident who, like many others, has moved to the region to live under local dark skies. Larry McHenry traveled from Pennsylvania to speak about famed American astronomer Edward E. Barnard, a pioneer of early astrophotography. Another new New Mexico resident, former editor of ***Sky & Telescope*** magazine and press officer of the American Astronomical Society Dr. Richard Fienberg, shared an overview of infrared astronomy. John W. Briggs spoke about his experience as a winter-over scientist at South Pole Station in 1994.

This year's participants were especially pleased to see the return of Jon Spargo and Dave Finley, both retired from the National Radio Astronomy Observatory. With considerable involvement from the whole Socorro community, they founded ESSP in 1994. A signpost monument in the city's central plaza now commemorates the event. Jon and Dave reviewed ESSP's early days, including participation by New Mexico's Moon-walking Apollo astronaut, Dr. Harrison Schmitt. The speakers were very pleased to see the event's continuing momentum and its attention to preserving local dark skies, as exemplified by Dr. Albert Grauer's presentation. Grauer was a driving force in the creation of the nearby Cosmic Campground in Catron County as a certified International Dark Sky Sanctuary. With an increasing number of people coming to New Mexico specifically to pursue astronomy, often relocating here in retirement, local dark skies represent a valuable economic driver that is not being ignored.

William Hennessy sets up his 20-inch Dobsonian telescope on the first day of the 2025 Enchanted Skies Star Party.

The Southwest Region of the Astronomical League was represented by Chair Gary J. Carter, Vice Chair Viola Sanchez (who also represented the Region's large and outstanding Albuquerque Astronomical Society), and Edward Flaspoehler, a former *Reflector* editor and veteran League contributor. Together they described the League, its very large Southwest Region, and its popular observing programs, in which Viola has achieved Gold Master Observer status. Finally, and especially welcome to ESSP participants, there was a large block of time that allowed short, informal contributed presentations, following the long-running example of the "Friday Night Tent Talks" at Stellafane. These diverse presentations allowed attendees to share interests and works-in-progress, and the scheduled four hours proved fully subscribed and could have run even longer.

The 2026 ESSP event is planned for October 6-11, with optional activities likely to be scheduled on October 12. Details will be announced at *www.enchantedskies.org*. Also check the Astronomy Clubs and Star Parties specialty forum at ***cloudynights.com*** for additional information, photographs, and discussion by recent participants and organizers. At over 7,100 feet, the Montosa Ranch site can be cold at night but offers abundant space for campers in a setting that reminds many people of the old RTMC location at Camp Oaks near Big Bear, California. The dates chosen avoid the monsoon season of the American Southwest without getting too late into colder weather. The organizers remain deeply grateful to all the speakers, including the informal contributors, who made the program so interesting.

Speaker Dr. Robert Q. Fugate looks over his images before presenting at the 2025 Enchanted Skies Star Party.

John W. Briggs and Steve Schaefer are members of the Magdalena Astronomical Society, Inc. John is a frequent contributor to Reflector*, and Steve is a new resident in Magdalena, retired from a career in photojournalism.*

Reflector Readers

I've been collecting science publications for decades and currently have complete collections of *Sky & Telescope* (even some of S&T's predecessors *The Sky and The Telescope*) and *Astronomy*. There are also 50 years of *National Geographic* and the RASC's *Observers' Handbook*, plus a complete collection of the short-lived *Star and Sky*. All are bound into hardback library volumes.

I'm getting old and want to donate the collection for free to some tax-exempt club or science institution. You can pick them up here in Utah, or I can ship, with the recipient paying only the cost of shipping.

Patrick Wiggins, 4099wiggins@gmail.com

Imaging Extragalactic Objects

by Jamye Fraser

Note: The software referenced in this article has recently been updated. The step-by-step instructions may be different but the procedures themselves remain the same. To get this issue to press on time, the Reflector *staff opted to run the article as-is.*

For those of us living on Florida's northeast coast, the weather last spring and summer wasn't great for astrophotography. With complete cloud cover most nights, I spent time searching for a challenging project while waiting for a clear night to wheel out my telescope. I browsed the listings from the Astronomical League Observing Programs website. Several projects seemed interesting, but one in particular offered both a challenge and an opportunity to learn more about galaxies. After reading the introduction, I knew I had found my next project.

The Extragalactic Object Observing program (***www.astroleague.org/extragalactic-objects-observing-program/***) is described as an

opportunity to observe or image variable types of Extragalactic Objects (XGO) in host galaxies. These objects have been described visually as knots but are defined as H II star forming regions, open clusters, globular clusters, star associations, jets, planetary nebulae, supernova remnants, supergiant stars, and even Wolf-Rayet stars. At first it may seem very difficult to capture them. However, with the proper conditions and appropriate equipment, the observer or the imager will be able to document these distant, dim and often ignored objects.

As I planned out the project, I focused on four key technical areas:

Technical Literature Review: Learning to find and interpret relevant technical journals.
Equipment Precision: Optimizing the equipment for maximum precision.
Capture Process Optimization: Defining and refining the galaxy capture workflow.
Observation Processing: Streamlining the post-observation data processing pipeline.

Technical Literature Review Without the Headache

When I first cracked open the technical literature about the galaxies I struggled to comprehend it. These documents were heavy – I mean, dense with advanced math and physics principles that felt completely overwhelming. But here's the trick I learned: define exactly what you need before you dive in. By defining why I was looking at these papers, they suddenly became much more manageable and genuinely useful. I learned a lot reading through them, but instead of trying to absorb every single equation, I focused on my specific mission.

My objectives for reviewing the astronomers' technical papers boiled down to three simple, concrete questions:

1. Is there a usable image, specifically, one with the EXO objects of interest clearly marked?
2. Is the field around the images large enough? I needed clear landmarks so I could orient my own captured images against their professional data.
3. Does the source have credibility? Is this a reliable claim I can trust and build my project upon?

My Equipment

ZWO AM5N Mount
ZWO ASI533 MC Pro digital camera
ZWO ASIAIR Plus (256gb)
Starizonia HyperStar v.4
Optolong L-Quad Enhance filter
Celestron C11 (Faster/XLT)

Table 1

I need to stress an important point: even though this project gets highly technical and advanced, you can achieve similar success using surprisingly basic gear. If you look closely at Table 1, you'll notice something missing – my rig has no guiding gear! I overcome the need for guiding by understanding and pushing my equipment to its absolute maximum performance limits. I chose to upgrade my mount over time instead of adding guiding gear. This choice admittedly caps my individual exposures at 10 seconds or less. But here's the major win: it prevents the internal structures of the galaxies from getting 'blown out.' I can capture the delicate core details that long exposures miss. The ZWO ASI533 MC Pro spec sheet lists a potential gain operating range of 300–450. The precise best gain level wasn't a one-size-fits-all setting; I determined the sweet spot through rigorous multi-test runs for every single galaxy I acquired.

This leads me to another crucial step in my process. I leveraged an amazing planning website, ***astronomy.tools/calculators/ccd_suitability***, to figure out the optimum sky conditions needed to benefit my specific telescope and camera combination. To my surprise, it suggested that my equipment's optimum performance actually occurs during poor to average seeing conditions! That was a game-changer, proving you don't always need pristine dark skies to get great results with the right setup.

Capture Process Optimization: Short Bursts, High Digital Gain, Big Results

The capture process was surprisingly basic. I stuck to my system of using very short exposures of 10 seconds each combined with a high gain setting on the camera. I aimed for about 20 minutes of total capture time per galaxy. However, I realized that sometimes a longer total capture time really helped bring out those internal EXO objects buried deep within the galaxy structure. I kept a close eye on the live-view feed streaming to my iPad, and if the image looked incomplete or faint, I'd extend the capture time on the fly. I have to admit, I still tried to collect data on galaxies even when my chances of success were less than optimal. Did I always get a perfect shot? No. However, I learned something valuable with every single attempt, and the process made me a better astrophotographer. Sometimes the best learning happens when you push the boundaries of what the tools say is possible.

Observation Processing: A Targeted Approach

The overall sequence of processing steps might look familiar, but it has some major differences, as I skip a few standard steps that don't help my final product. Remember, my goal here isn't to produce the usual stunningly beautiful, wallpaper-ready, picture of a galaxy. My objective is very specific: I'm aiming for a high-definition image that clearly highlights the galaxy's EXO objects (those internal details we talked about earlier). Because of this focus, I'm only going to point out where you should change the typical galaxy processing routines to achieve similar results.

For software, I recommend using a powerful free software to process the FITS files, like Siril, GraXpert (for background extraction), and your favorite graphic editor program (such as GIMP or Photoshop) to pull it all together. If you are not familiar with the suggested free programs, there are many excellent YouTube videos demonstrating how to use these programs to process galaxy images.

This is the sequence of steps I used to process each galaxy's FITS file. There is no exact formula; it is in the user's eye. I chose a simple repeatable process for my project using Siril 1.2.4 before Siril released 1.4.0. I checked the steps in the Siril upgrade and it still works, but there are many more options you can try.

Phase 1: Siril – Linear Preprocessing and Calibration

Perform initial calibration and linear adjustments on the stacked image data within Siril.

1. *From Scripts drop-down menu: Option: Siril Scripts Files: Select: OSC Preprocessing Sequence.* This calibrates and stacks the raw frames (lights, darks, bias, flats).
2. *From Tools drop-down menu: Select Astrometry: Option: Image Plate Solver.*
3. *From Image Processing drop-down menu: Select Color Calibration: Option: Photometric Color Calibration*. This establishes accurate color balance based on internal star spectral data.
4. *From Image Processing drop-down menu: Select and run Remove Green Noise.* This removes color casts, particularly magenta/green noise common in OSC sensors.
5. *From Camera Icon:* Save the image data in a high-bitrate, lossless format (e.g., FITS or 16-bit TIFF) for transfer to the next application, ensuring data integrity.

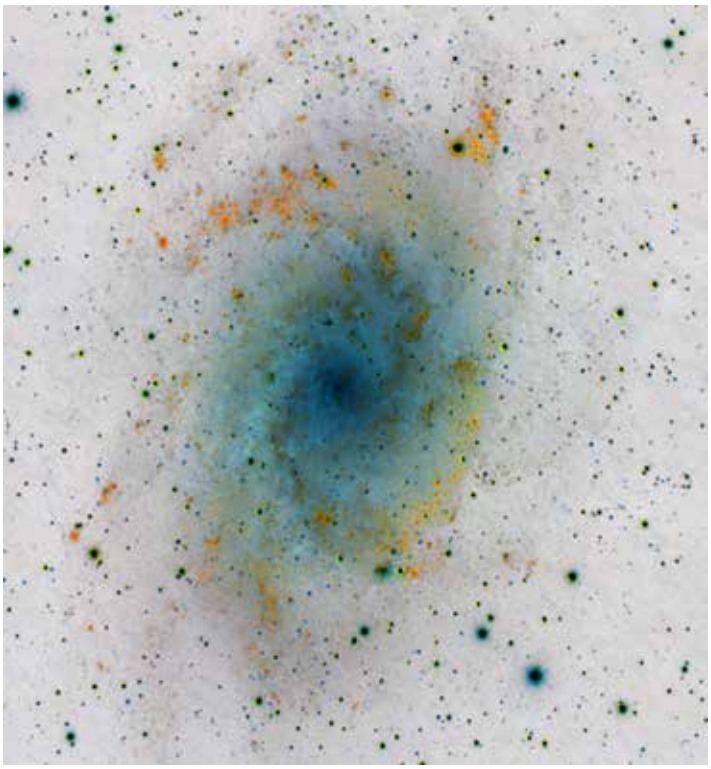
Phase 2: GraXpert – Dynamic Background Extraction

This neutralizes light pollution/vignetting gradients across the image field. I used all default options.

1. *Load Image:* Open the result.fits file saved by Siril during Phase 1.
2. *Crop:* Tighten the image boarders to near edge of the galaxy.
3. *Background Extraction:* Utilize GraXpert's algorithms to automatically sample background areas and create a representation of the unwanted gradients.
4. *Save Processed Image:* The exported corrected image is named result_. Graxpert.fits.

Phase 3: Siril – Non-Linear Stretching and Enhancement

The adjustments are more judgement and less precision. This involves moving from a linear to a stretched (non-linear) state to reveal faint details.



1. *From Open drop-down menu*: Reload the result_Graxpert.fits file.
2. *From Image Processing drop-down menu: General Hyperbolic:* Stretch to progressively reveal detail.
   - Set *Color stretch model* to *Human weighted luminance*.
   - Perform iterative, smaller stretches to achieve an optimal appearance of the galaxy's structure while preserving star integrity.
3. *From Image processing drop-down menu: Color Saturation:* Utilize color manipulation tools to selectively intensify specific hues within the whole galaxy's EXOs, not small areas
4. *From image processing drop-down menu: General Hyperbolic Stretch Tool.* This refines the black point, employing the option *Linear Stretch* for precision in clipping the background to true black.
5. *From Camera Icon:* Save the final processed image using the provided export function (e.g., PNG or JPEG format).

Phase 4: Graphic Editor - Final Tonal and Contrast Adjustments

Again, think judgement versus precision. The purpose is to intensify the existing faint color of the EXO objects within the galaxy and help differentiate between features (e.g., EXO vs. cosmic dust differentiation). Due to the variety of graphic editors and terminology, I will only describe the basic concepts through illustrations.

1. *Tonal Adjustments:* Increase overall image contrast. See figure last page
2. *Invert image:* Add contrast and adjust brightness accordingly. See figure this page

Reference List:

astronomy.tools: First Light Optics Ltd, 2025

graxpert.com: GraXpert Development Team, 2025

siril.org: C. Richard et al., Journal of Open Source Software, 2024

Jamye Fraser is a member of the Ancient City Astronomers Club and Northeast Florida Astronomy Society.

Campus SHINE: Protecting the Night Sky at Colleges and Universities

by Douglas Arion, PhD, Executive Director, Mountains of Stars
Springfield Telescope Makers

Vayujeet Gokhale
Truman State University

As amateur astronomers you have no doubt seen how the background sky brightness has been increasing, making observing more and more difficult. In fact, research conducted by Dr. Christopher Kyba using data from the Globe at Night program (*globeatnight.org*) has found that the sky is brightening by 9.4% a year! No wonder those faint fuzzies are harder and harder to find. So what can we do about this?

Prof. James Lowenthal of Smith College has been working tirelessly to promote dark sky preservation. One of his ideas has been to motivate colleges and universities to improve their lighting. Many campuses have observatories that benefit from darker skies, and student health, safety, and performance also benefit from having proper nighttime illumination. Campuses are also, generally, localized and controlled environments, where implementing improved lighting is somewhat easier than across a town or city.

College and university campuses are well equipped to address pervasive problems like light pollution due to the presence of young, environmentally conscious and diverse students, expertise across many disciplines, and potential access to funding. Astronomy courses are extremely popular among students from all backgrounds, and stargazing events on the main campus or at the campus observatory are popular with students and members of surrounding communities. They are excellent conduits for communicating the benefits of responsible night lighting practices.

Lowenthal chairs the Light Pollution subgroup of the American Astronomical Society's Committee to Protect Astronomy and Space Environments (COMPASSE), on which we also serve, which launched the Campus SHINE program. SHINE stands for Safe and Healthy Illumination for the Nighttime Environment. Members of the committee (including Prof. Michelle Wooten at the University of Alabama at Birmingham, Prof. Rachelle Lyons at Plymouth State University in New Hampshire, and Nancy Clanton of Clanton Associates) created resources to help educate people in all academic disciplines about the impacts of light pollution and ways to mitigate it. All of this is available on the Campus SHINE website (*www.campusshine.org/*).

The Campus SHINE Manual describes the issues and complications created by poor night lighting, and how to create lighting systems that promotes health, safety, and energy efficiency. There are stories on how a number of institutions have successfully made lighting improvements, such as Appalachian State University and Carnegie Mellon University. On the Campus SHINE site you can also find examples of campus lighting standards and a slew of educational materials. All are available freely to everyone.

COMPASSE has organized workshops at several of the annual American Astronomical Society meetings, where we gather astronomers from many institutions to educate them on light pollution, good lighting practices, the instruments and methods to measure light, and tools to effectively communicate with other disciplines, such as environmental studies, architecture and urban planning, and biology and human health. It's important that these other academic areas play a role in light pollution reduction, as it is an insidious problem with impacts far greater than those on astronomy alone. It's an ongoing challenge to learn the key issues and topics that will engage these other fields and motivate them to become advocates for light pollution reduction.

As amateur astronomers, you are in a special position to bring this opportunity to the attention of colleges and universities across the country, whether they are near where you are now living, or the institution you perhaps attended yourself.

Amateur astronomers are oftentimes more connected to the night sky than professional astronomers, who are increasingly working indoors on their computer screens. Amateur astronomers have the talent to connect with people and enthusiastically share the joy, wonder, and beauty of the night sky. A great number of you support, participate in, and even manage star parties and special events on college campuses and college towns. These are great opportunities to promote responsible lighting at night.

Getting colleges and universities involved in light pollution reduction will not only result in improvements on their campuses, it will also educate the next generation of graduates on the importance of responsible night lighting practices, which will eventually lead to better lighting – and darker skies – everywhere. And won't that make observing more fun?

Call for Award Submissions

Applications/nominations for all League awards must be received no later than March 31, 2026, at 11:59 pm CDT. Award rules appear on the "Awards" page at *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*.

Service Awards. 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 Youth Service Awards. Club or regional officers may nominate. The winner receives a plaque, a cash prize, and an expenses-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*.

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*.

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*.

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*** 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 their club website link to ***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 (>500mm excluding Solar System), Solar System (>500mm), Rich Field (201-500 mm), and Wide Field (200mm or less). Email the form, a photo of the entrant, and up to three .jpeg attachments **not exceeding a total of 25 MB** to *flemingaward@astroleague.org*.

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

CALL FOR OFFICER NOMINATIONS

Nominations for League President and Vice President (each 2-year terms beginning on September 1, 2026) must be received by Nominating Committee Chair John Goss at *goss.john@gmail.com* no later than March 31, 2026, at 11:59 pm 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 *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 eleven Library Telescopes (4.5-inch 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.**

Taking the Pulse of Citizen Science: The Pulsar Science Collaboratory Program

By Arjun Meenashi Sundar, Howard Astronomical League

I have had a special interest in astronomy my entire life, so I was happy to take part in a research opportunity starting in the summer of 2024. The Pulsar Science Collaboratory program (PSC) is a citizen science project for high school and undergraduate students and their teachers. Over the next year, I graded pulsar data and even had the opportunity to discover new pulsars.

A pulsar is a unique type of neutron star that emits regular pulses of radiation, typically in the form of radio waves, X-rays, or gamma rays. The pulses are emitted outward in beams from the magnetic poles of the star. As the pulsar spins very fast, its beams sweep through space like a beam sweeps across the sea from a lighthouse. When the beam is pointing in the direction of Earth, we receive a pulse of radiation, and this is why they are referred to as pulsars.

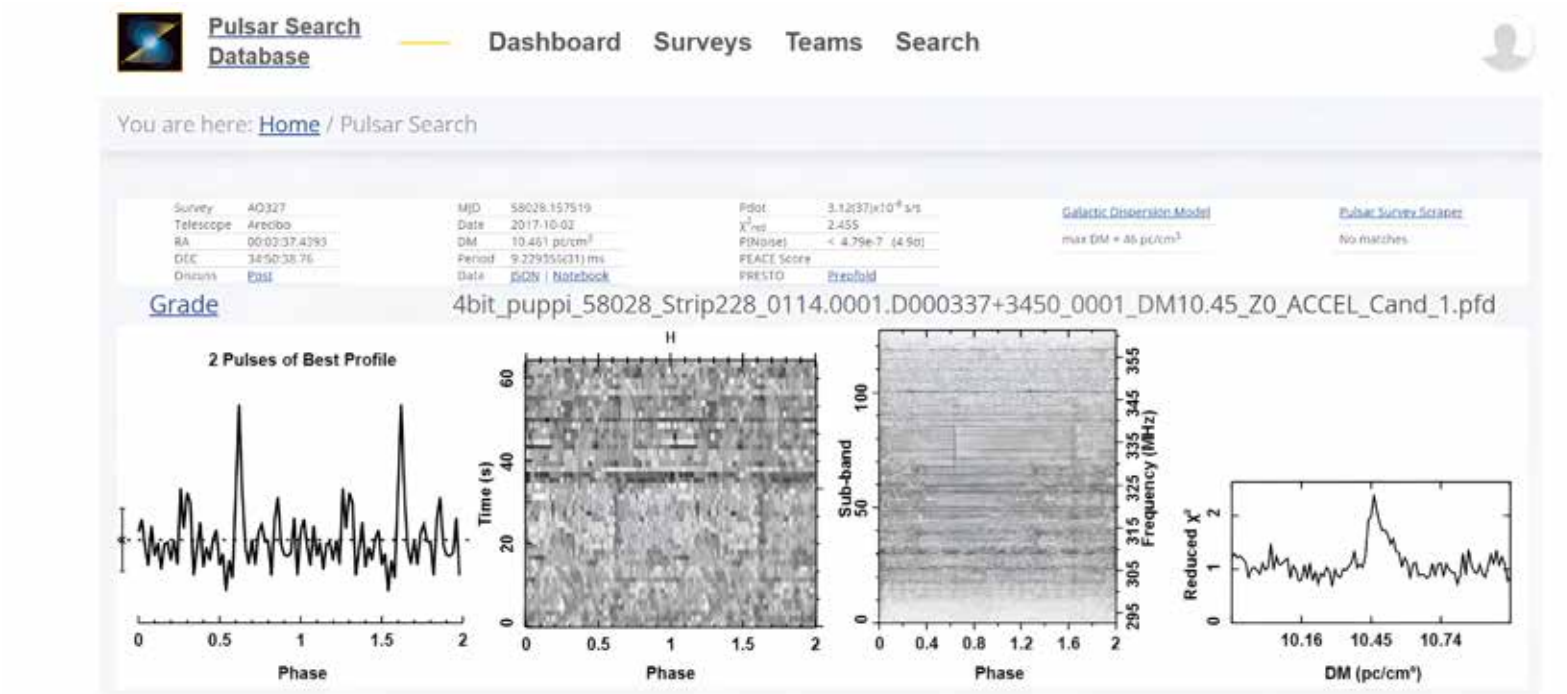
Pulsars are formed when massive stars (at least 8 solar masses) die and explode as a supernova. When the explosion occurs, the remaining core collapses into a neutron star – a dense ball of matter with about twice the mass of the Sun, but concentrated into an incredibly small volume (only about a dozen kilometers in diameter). This collapse causes the star to spin extremely fast, in some cases hundreds of revolutions per second.

The magnetic fields of pulsars are incredibly powerful. It is these magnetic fields that focus the energy into beams, generating the radiation that we detect as periodic pulses when the beam sweeps by our radio telescopes. Their periods are very short, some as short as even a few milliseconds.

Pulsars were first discovered by astronomer Jocelyn Bell Burnell in 1967 while monitoring quasars using a radio telescope. The discovery was made when she picked up a persistent, repeating radio signal with a strange pattern that appeared to repeat at extremely precise intervals. The signal was initially thought to be interference or possibly an alien message, but further examination revealed that the pulses were from a distant rotating neutron star.

Radio telescopes possess large dishes and sensitive receivers and can capture the weak and regular radio signals sent out by pulsars. Since pulsars emit in such a regular pattern, their periodicity can be used to determine and study many aspects of the dead star, such as its rotational period, magnetic field, and even the effects of relativity. From these observations, scientists can learn quite a bit about the properties of matter in extreme conditions, because pulsars are among the densest objects in the Universe.

The PSC project employs the 20-meter Green Bank Telescope (GBT) in West Virginia to collect data, which it makes available for use by students and faculty who have passed courses of training



Plot of the new pulsar discovered during the PSC camp.

and are eligible to grade data. The goal is to identify potential pulsar candidates.

The training, a 6-week course which meets once a week online, covers background about pulsars and then moves into how professional scientists and citizen scientists analyze pulsar data by looking at past data the GBT has collected. In order to be certified to grade and collect new data, you are tested on distinguishing potential pulsar signals from noise and radio frequency interference (RFI), identifying known pulsars, and more. Becoming certified gives one a greater understanding of how pulsars work and how to detect them.

Discovering a pulsar is no easy task, as there are many chances for making mistakes. The GBT is very sensitive to all radio signals, which makes it susceptible to misinterpreting noise and radio interference from technology, even though it's in a radio-quiet zone. Therefore, discovering pulsars can be difficult, as interference signals often look like pulsars.

My mentor/teacher for this program, Ms. Holly Bensel, offered the following thoughts on the project:

The people are supportive and helpful, and the course is set up for success. I would encourage anyone who is interested in astronomy to try out the Pulsar Science Collaboratory Program, and I am sure that they would love it just like I did when I first completed it.… The reason I think this is an awesome program is because it models what scientists do in real life. Individuals can take the info as far as they desire. This program is terrific for students who want to dig into a research type project that includes a chance for a workshop in the summer and a chance to work with scientists and have their name on a scientific paper. The data is authentic to the point they can find unknown pulsars, thus adding to the overall scientific understanding of pulsars.

The Pulsar Science Collaboratory project has been an amazing experience that allowed me to get hands-on experience with astronomy research. Over the past year, I've learned how to analyze scientific data, completed a rigorous certification course, and had the opportunity to search for new pulsars using data from the GBT. It was hard work, but that comes with research, and it all paid off. With support from my mentor, Ms. Holly Bensel, I gained confidence, not only in my knowledge of pulsars, but in my ability to do real science. I highly recommend this program to students who want to gain experience in conducting astronomy research.

For more information and to register for this training program, see *pulsars.nanograv.org/*.

Video about the PSC program:
youtu.be/nOTY1AgVaTY?si=3kD4BduiNonc5llv.

Arjun Meenashi Sundar is a high school sophomore in Maryland, a member of the Howard Astronomical League, and a Student Ambassador for the Maryland STEM Festival

E-DO:
Stars Eclipsed by a Dark Object

By Damien Lemay,
Member-at-Large

Since about the beginning of the 19th century, the bright star Epsilon Aurigae has been known to fade by roughly one magnitude for a duration of more than two years at a time. Careful monitoring over time eventually established this as a recurring phenomenon occurring every 27.1 years. It was suggested that this star is an Eclipsing Binary (EB) but there was a problem: it required an occulting star of prodigious proportion. Today Epsilon Aurigae is the archetype for disk occulting systems (classified as E-DO or Eclipsing-Disk Occulting variables), a family of about 40 known specimens whose number is likely underestimated. The next eclipse for Epsilon Aurigae will not happen before 2036-2038; meanwhile amateurs interested in pro-am collaborations can give attention to the other members of the list that have not received the attention they deserve.

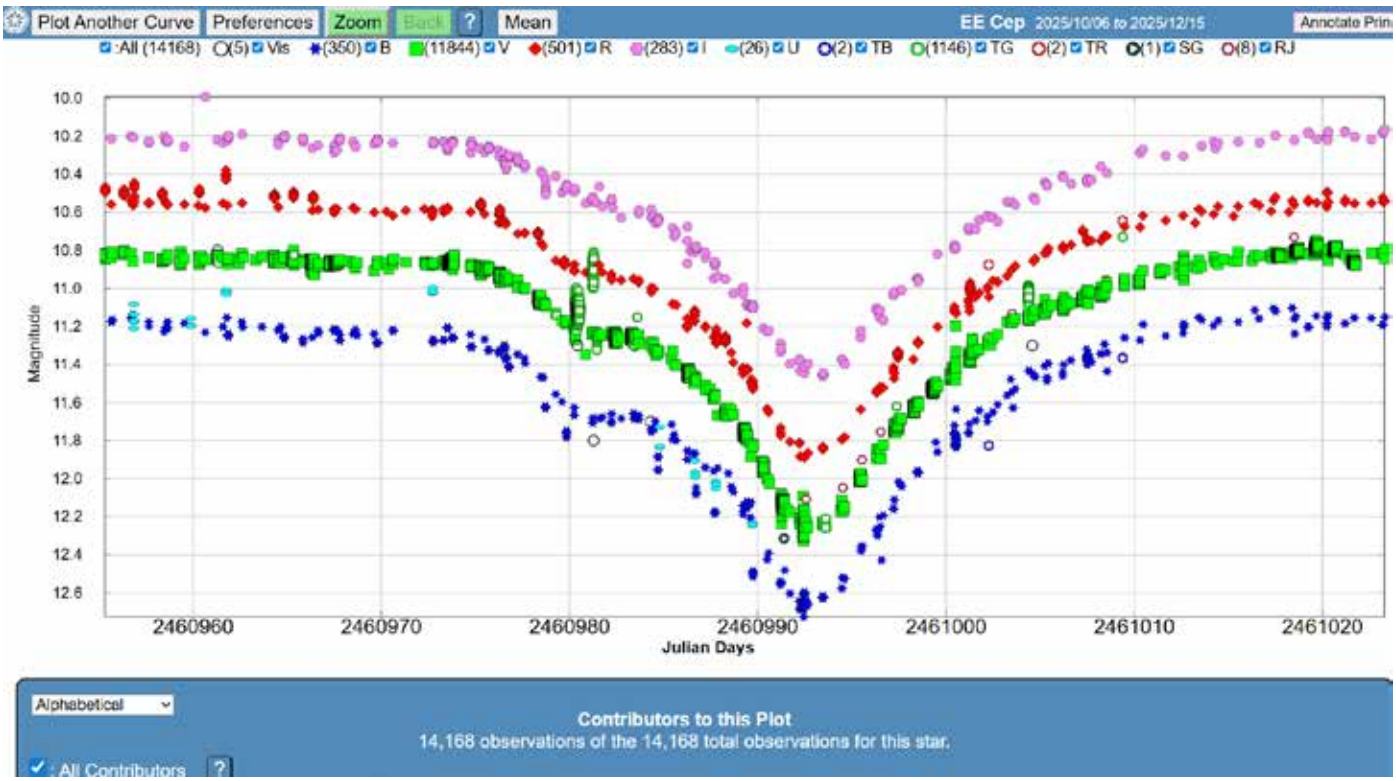
The period and brightness of these stars cover a wide range. The one with the shortest period is VSSP J184634.62-082802.0 in Scutum (0.24178 day) and the longest AS Leonis Minoris, at 69.1 years (the next eclipse will be in 2080-83). As for the magnitude, the records are Epsilon Aurigae (2.92 -3.83 V) and Gaia DR3 3815948906295129 60 (19.5 -21.5 R). Fortunately, most of them are accessible to the average sized amateur telescope and many eclipses can be observed every year.

A suitable target for 2026 that is accessible to both northern and southern observers is VSSP J171959.19-194416.9 in Ophiuchus (RA 17 19 59.19, Dec -19 44 16.9; per. 150 days; mag. 17.17-17.54 R). According to the ephemeris the eclipse will begin June 23 and last until September 5.

For southern observers (and northern ones with a remote telescope in the south) OGLE-SMC-ECL-1070 in Tucana (RA 00 46 33.75, Dec -73 12 04.7; per. 184.46 days; mag. 13.52 -13.85 Ic) will offer two eclipses during the coming year. According to the ephemeris the first one will last May 29 -July 14 and the second November 29, 2026 -January 14, 2027. You can download AAVSO finder charts with comparison stars for any variable at *apps.aavso.org/vsp/*.

An example of a recent E-DO event is EE Cephei (RA 22 09 22.75, Dec +55 45 24.3; per. 5.6 years; mag. 10.72 -12.3 V). The light curve covers the period October 5-December 15, 2025 and contain 14,168 observations by 43 observers. Each of the four colors correspond to the photometric filter used, i.e. B, V, R and I.

For more information visit the EB Section of the AAVSO at *www.aavso.org/aavso-eclipsing-binaries-section*.



Weird Sci-Fi:
To Arcturus (and Beyond)

by Kris Larsen

Reading early science fiction (late 1800s to early 1900s) is a guilty pleasure for many amateur and professional astronomers. Besides the sometimes utterly bizarre plots and scenarios, there is the 'science' to contend with. Sometimes it is obviously made up, but at other times it is an accurate reflection of the incomplete (and even erroneous) astronomical understanding of the times in which the story was written. Among the early genres of science fiction (sometimes called proto-science fiction) is the dime novel: cheap, hastily written adventure stories aimed at teenage boys. Many of these are centered on fantastic inventions (submarines, air-ships, and even interplanetary craft) used to travel to exotic locations in search of adventure. While the quality of many of these stories has correctly been questioned by historians and literary scholars, their impact on the public imagination is unquestionable. For example, some have possibly influenced more serious literary works.

Case in point is the 1901 dime novel *Two Boys' Trip to an Unknown Planet*, by Francis W. Doughty (under the Frank Tousey publishing house pseudonym of Richard Montgomery). Two teenage boys volunteer for a balloon trip, but instead find themselves on an interplanetary adventure to a bizarre world, where they find strange civilizations and survive tectonic upheavals. While the story is head-scratching at best, historians of science fiction name it a possible influence on David Lindsay's famous (but equally peculiar) novel *A Voyage to Arcturus* (1920). Lindsay's novel, in turn, was read and appreciated by C.S. Lewis and J.R.R. Tolkien, both of whom wrote famous fanciful tales. This is just one example of how an appreciation for works of admittedly dubious literary value can help us understand the growth of the genre.

Both works are freely available on Internet Archive:

Two Boys' Trip to an Unknown Planet (*archive.org/details/twoboystriptounk0174mont_u0c1*)

A Voyage to Arcturus (*archive.org/details/in.ernet.dli.2015.219659/page/237/mode/2up*)

OBSERVING AWARDS

2025 OBSERVE THE MOON CHALLENGE

Aaron Clevenson, North Houston Astronomy Club; **Steve Boerner,** Member-at-Large; **Cran Lucas,** Shreveport-Bossier Astronomical Society; **Brad Young,** Astronomy Club of Tulsa; **Matthew Peters,** Alachua Astronomy Club; **Lisa Eager,** Alachua Astronomy Club; **Warren Schmitt,** Alachua Astronomy Club; **Karen Schmitt,** Alachua Astronomy Club; **JoAnn Stevener,** Alachua Astronomy Club; **Darryl Carlyle-Moses,** Member-at-Large; **Tom Holman,** Minnesota Astronomical Society; **Chetan Anand,** Independent; **Sumukha Chetan,** Independent; **Jeff Francis,** Independent; **Mary Ann Francis,** Independent; **Jonathan D. Scheetz II,** Back Bay Amateur Astronomers; **Dean F. Herring,** Raleigh Astronomy Club; **Susan Herring,** Raleigh Astronomy Club; **Charles Urban,** Shreveport-Bossier Astronomical Society; **Eric Houston,** Member-at-Large; **Marie Lott,** Atlanta Astronomy Club; **Rose Amaral,** Astronomical Society of Southern New England; **Tawanna Hendrix,** Shreveport-Bossier Astronomical Society; **Chris Birks,** Member-at-Large; **Amy Cobb,** Independent; **Bob Christensen,** Independent; **Joyce Alaguer-Reisdorf,** Houston Astronomy Club; **Yuvan Rajpurkar,** North East Florida Astronomical Society; **Bernard Venasse,** Lifetime Member; **Dave Komar,** Northern Virginia Astronomy Club; **Kelly Dye,** Buffalo Astronomical Association; **Scott Cadwallader,** Baton Rouge Astronomical Society; **Leanna Fregia,** North Houston Astronomy Club; **Laurie V. Ansorge,** Lifetime Member; **Russell F. Pinizzotto,** Southern Maine Astronomers; **Bruce W. Nunn,** Independent; **Yvonne Varghese,** Raleigh Astronomy Club; **Doug Lively,** Raleigh Astronomy Club; **Dana Bostic,** Raleigh Astronomy Club; **James Barbasso,** North Houston Astronomy Club; **James Zappa,** Member-at-Large; **Roy Parish,** Shreveport-Bossier Astronomical Society; **Jeremy Mitchell,** Back Bay Amateur Astronomers; **Mike McCabe,** South Shore Astronomical Society; **Dave Wood,** Astronomical Society of Eastern Missouri; **David Earnst,** Buffalo Astronomical Society; **Liam Plybon,** Astronomical Society of East Texas; **Kaede Katchmarik,** Astronomical Society of East Texas; **David E. Johnson,** Independent; **Achnta Ranga Rao,** Independent; **Roger Ahlers,** Member-at-Large; **Master P. Aniketh,** Independent; **Master M. Elon Nathan Carter,** Independent; **Dan Crowson,** Astronomical Society of Eastern Missouri; **Mike Gent,** Columbus Astronomical Society; **T.J. Prakesh,** Independent; **B.P. Ch Steevatsa,** Independent

HUBBLE 35TH ANNIVERSARY SPECIAL OBSERVING CHALLENGE

Miguel Acosta, Sep., Astronomical Society of Eastern Missouri; **Laurie V. Ansorge**, Oct., Nov., Dec., Lifetime Member; **Roy Antonio**, Sep., Oct., Member-at-Large; **David Arbol**, Oct., Nov., Independent; **Mohammad Adnan Asif**, Sep., Oct., Nov., Raleigh Astronomy Club; **Mustafa M. Asif**, Sep., Oct., Nov., Raleigh Astronomy Club; **Chester Austin**, Sep., Member-at-Large; **Douglas Balogh**, Sep., Oct., Nov., Dec., Indiana Astronomical Society; **Lindsey Benson**, Oct., Nov., Dec., Youth Member-at-Large; **Richard Benson**, Oct., Nov., Dec., Member-at-Large; **Miranda Benson**, Oct., Nov., Dec., Independent; **Misty Bentz**, Sep., Oct., Nov., Dec., Independent; **Dorit Betz**, Sep., Oct., Nov., Dec., Independent; **Robert Beuerlein**, Aug., Sep., Oct., NASA Langley Exchange Skywatchers; **Leander Bill**, Sep., Oct., Nov., Dec., Independent; **Heidi Bjerke**, Aug., Sep., Oct., Nov., Champaign-Urbana Astronomical Society; **Saul Blanco**, Sep., Independent; **Steve Boerner**, Oct., Nov., Dec., Member-at-Large; **Bruce P. Bookout**, Sep., Oct., Nov., Colorado Springs Astronomical Society; **Raphael Breitenborn**, Sep., Independent; **Darryl Carlyle-Moses**, Oct., Member-at-Large; **Dana Bostic**, Sep., Oct., Nov., Raleigh Astronomy Club; **Aaron Clevenson**, Oct., Nov., Dec., North Houston Astronomy Club; **James Collins**, Sep., Oct., Nov., Albuquerque Astronomical Society; **Alberto Comodin**, Oct, Nov., Independent; **Keith Courter**, Aug., Sep., Oct., Member-at-Large; **Dan Crowson**, Oct., Nov., Astronomical Society of Eastern Missouri; **Paul Devoe**, Jan., Feb., Sep., Oct., Nov., Member-at-Large; **Jannik Diener**, Sep., Independent; **Jim Dole**, Sep, Oct., Nov., Planetary Studies Foundation; **Larry Dove**, Sep., Oct., Nov., Flint River Astronomy Club; **Steven Emenhiser**, Aug., Sep., Colorado Springs Astronomical Society; **Ben-Luca Erb**, Sep., Independent; **Silvia Fernandez**, Oct., Nov., Independent; **Chema Fernandez**, Oct., Nov., Independent; **James Fouch**, Sep., Oct., Nov., Denver Astronomical Society; **Joe Fragola**, Sep., Oct., Nov., TAC-AL; **Mary Ann Francis,** Sep., Oct., Nov., Independent; **Jeff Francis**, Sep., Oct., Nov., Independent; **Carlos Gaceo**, Oct., Nov., Independent; **Jose Vicente Gavilanes**, Oct., Nov., Independent; **Janne Emil Geisensetter**, Sep., Independent; **Antonio Gomez**, Oct., Nov., Independent; **Guillermo Gonzalez**, Oct., Nov., Independent; **Sergio Gonzalez**, Oct., Nov., Independent; **Finn Tjamo Greilich**, Sep., Oct., Nov., Dec., Independent; **Blair Groden**, Sep., Oct., Nov., Raleigh Astronomy Club; **Leif Grunau**, Sep., Independent; **Dave Halupowski**, Sep., Oct., Nov., Escambia Amateur Astronomers Association; **Al Hamrick**, Sep., Oct., Nov., Raleigh Astronomy Club; **Kevin Hartnett**, Sep., Oct., Nov., Goddard Astronomy Club; **Jessica Hatfield**, Aug., Sep., Oct., Independent; **Junnus-Liam Hedtrich**, Sep., Independent; **Nowell Helms**, Sep., Oct., Nov., Independent; **Tawanna Hendrix**, Sep., Oct., Nov., Dec., Shreveport-Bossier Astronomical Society; **Milla Henrich**, Sep., Oct., Nov., Dec., Independent; **Dean F. Herring**, Oct., Nov., Dec., Raleigh Astronomy Club; **Susan Herring**, Oct., Nov., Dec., Raleigh Astronomy Club; **Rick Heschmeyer**, Sep., Oct., Nov., Astronomy Associates of Lawrence; **Leonie Marie Honig**, Sep., Oct., Nov., Dec., Independent; **Laszlo Ilyes**, Sep., Oct., Nov., Dec., Chagrin Valley Astronomical Society; **Vansh Jariwala**, Sep., Oct., Nov., Dec., Independent; **Chris Kagy**, Oct., Nov., Northern Virginia Astronomy Club; **Michael Keefe**, Sep., Oct., Nov., Raleigh Astronomy Club; **Tim Klein**, Sep., Oct., Nov., Dec., Independent; **Ben Knittel**, Sep., Independent; **Francisco Laiz**, Oct., Nov., Independent; **Paul Liamazares**, Oct., Nov., Independent; **Doug Lively**, Sep., Oct., Nov., Dec., Raleigh Astronomy Club; **Marie Lott**, Sep., Oct., Nov., Atlanta Astronomy Club; **Cran Lucas**, Oct., Nov., Dec., Shreveport-Bossier Astronomical Society; **Edward Magowan**, Aug., Sep., Oct., Nov., Escambia Amateur Astronomers Association; **Leon Martens**, Sep., Independent; **Fernando Martinez**, Oct., Nov., Independent; **Rafael Matias**, Oct., Nov., Independent; **Ralph McConnell**, Sep., Oct., Barnard Astronomical Society; **Scott McInnis**, Aug., Sep., Oct., NASA Langley Exchange Skywatchers; **Henry Mercik**, Sep., Oct., Nov., Dec., Independent; **Brittney Miller**, Sep., Oct., Nov., Atlanta Astronomy Club; **Jeffery S. Moorhouse**, Aug., Sep., La Crosse Area Astronomical Society; **Paul Morgan**, Oct., Nov., Umpqua Astronomers; **Eva Nava**, Oct., Nov., Independent; **Adrian Newland**, Aug., Sep., Oct., Independent; **Angele Mott Nickerson**, Aug., Sep., Oct., Rose City Astronomers; **Bob Muzzi**, Sep., Oct., Nov., Dec., Raleigh Astronomy Club; **Dean Ostergaard**, Sep., Oct., Nov., Southern Maine Astronomers; **Kirk Parnell**, Sep., Oct., Nov., Shreveport-Bossier Astronomical Society; **Nathan Paskach**, Aug., Sep., Oct., Nov., Independent; **Russell Pinizzotto**, Oct., Nov., Dec., Southern Maine Astronomers; **Jody Raney**, Sep., Oct., Nov., Shreveport-Bossier Astronomical Society; **Rob Ratkowski**, Sep., Oct., Nov., Haleakala Amateur Astronomers; **Nathan Raynor**, Aug., Sep., Raleigh Astronomy Club; **Beatriz de la Red**, Oct., Nov., Independent; **Greg Rigelman**, Sep., Oct., Nov., St. Louis Astronomical Society; **Lauren Rogers**, Oct., Nov., Dec., Escambia Amateur Astronomers Association; **Rachel Ryan**, Aug, Sep., Colorado Springs Astronomical Society; **Can Sakarya**, Sep., Oct., Nov., Dec., Independent; **Hector Sanchez**, Oct., Nov., Independent; **Maximilian Schafer**, Sep., Oct., Nov., Dec., Independent; **Daniel Schmidt-Lat**, Sep., Independent; **Clara Schnell-Kretschmer**, Sep., Independent; **Roberta Shaner,** Sep., Oct., Nov., Delaware Valley Amateur Astronomers; **Gregory T. Shanos**, Oct., Nov., Dec., Southern Maine Astronomers; **Kendal Shipley**, Sep., Oct., Nov., Barnard Astronomical Society; **Jennifer Siders**, Sep., Oct., Nov., Tri-Valley Stargazers; **Michael Simmons**, Sep., Oct., Southern Maine Astronomers; **Mark Simonson**, Aug., Sep., Oct., Nov., Dec., Everett Astronomical Society; **Henry Skirbst**, August., Sep., Oct., Member-at-Large; **Karen Smith**, Sep., Oct., Independent; **Levin Sohn**, Sep., Oct., Nov., Dec., Independent; **Marlene Monika Stahl**, Sep., Oct., Nov., Dec., Independent; **Lennard Strauch**, Sep., Oct., Nov., Dec., Independent; **Denise Terpstra**, Oct., Nov., Dec., Lifetime Member; **Teresa Torregimeno**, Oct., Nov., Independent; **Charles Urban**, Sep., Oct., Nov., Shreveport-Bossier Astronomical Society; **Bernard Venasse**, Sep., Oct., Lifetime Member; **Jannis Vogelsang**, Sep., Oct., Nov., Dec., Independent; **Debra Wagner**, Sep., Oct., Nov., Dec., Member-at-Large; **Nicole Walker**, Sep., Oct., Colorado Springs Astronomical Society; **David Warner**, Sep., Oct., Colorado Springs Astronomical Society; **Leon Weins**, Sep., Independent; **Tom Gordon Wetz**, Sep., Oct., Nov., Dec., Independent; **Richard Wheeler**, Aug., Sep., Oct., Northeast Florida Astronomical Society; **Ronan Wilson**, Aug., Sep., Oct., Independent; **Max Windolf**, Sep., Oct., Nov., Dec., Independent; **Chris Wittum**, Aug., Sep., Oct., Raleigh Astronomy Club; **Douglas Woods**, Aug., Sep., Oct., Nov., Central Florida Astronomical Society; **Kelsey Yocum**, Aug., Sep., Rose City Astronomers; **Brad Young**, Sep., Oct., Nov., Astronomy Club of Tulsa; **Thilo Zerbe**, Sep., Oct., Nov., Dec., Independent.

HUBBLE 35TH ANNIVERSARY SPECIAL OBSERVING CHALLENGE- GOLD LEVEL

Laurie V. Ansorge, Lifetime Member; **Douglas Balogh**, Indiana Astronomical Society; **Lindsey Benson**, Youth Member-at-Large; **Richard Benson**, Member-at-Large; **Miranda Benson**, Independent; **Misty Bentz**, Independent; **Dorit Betz**, Independent; **Leander Bill**, Independent; **Steve Boerner**, Member-at-Large; **Aaron Clevenson**, North Houston Astronomy Club; **Finn Tjamo Greilich**, Independent; **Milla Henrich**, Independent; **Dean F. Herring**, Raleigh Astronomy Club; **Susan Herring**, Raleigh Astronomy Club; **Leonie Marie Honig**, Independent; **Laszlo Ilyes**, Chagrin Valley Astronomical Society; **Vansh Jariwala**, Independent; **Tim Klein**, Independent; **Doug Lively**, Raleigh Astronomy Club; **Henry Mercik**, Independent; **Russell Pinizzotto**, Southern Maine Astronomers; **Lauren Rogers**, Escambia Amateur Astronomers Association; **Can Sakarya**, Independent; **Maximilian Schafer**, Independent; **Gregory T. Shanos**, Southern Maine Astronomers; **Mark Simonson**, Everett Astronomical Society; **Levin Sohn**, Independent; **Marlene Monika Stahl**, Independent; **Lennard Strauch**, Independent; **Denise Terpstra**, Lifetime Member; **Jannis Vogelsang**, Independent; **Debra Wagner**, Member-at-Large; **Tom Gordon Wetz**, Independent; **Max Windolf**, Independent; **Thilo Zerbe**, Independent.

HUYGENS TOES OBSERVING CHALLENGE

Greg Ruppel, Tucson Amateur Astronomers; **Steve Boerner,** Member-at-Large; **Dan Crowson,** Astronomical Society of Eastern Missouri; **Debra Wagner,** Member-at-Large; **Jeff Hoffmeister,** Olympic Astronomical Society; **Kendal Shipley,** Barnard Astronomical Society of Chattanooga; **Bill Boike,** Planetary Studies Society; **Kyra Pontnack,** Planetary Studies Society; **Gary Gordon,** Planetary Studies Society; **Jim Dole,** Planetary Studies Society; **Aaron Clevenson,** North Houston Astronomy Club; **Douglas Smith,** Tucson Amateur Astronomy Association; **Dave Komar,** Northern Virginia Astronomy Club; **Mike McCabe,** South Shore Astronomical Society; **Alan Sheidler,** Popular Astronomy Club; **Roy Gustafson,** Popular Astronomy Club; **Dale Hachtel,** Popular Astronomy Club; **Greg Rigelman,** St. Louis Astronomical Society; **Darryl Carlyle-Moses,** Member-at-Large; **Scott Cadwallader,** Baton Rouge Astronomical Society; **Christopher Moss,** Olympic Astronomical Society; **Mary Barteau,** St. Louis Astronomical Society; **Mohammad Adan Asif,** Raleigh Astronomy Club; **Chris Randall,** Member-at-Large; **Chris Cole,** Raleigh Astronomy Club; **Al Hamrick,** Raleigh Astronomy Club; **James Zappa,** Member-at-Large; **Alexander McCarthy,** Richland Astronomical Society; **Jeremy Mitchell,** Back Bay Amateur Astronomers

ACTIVE GALACTIC NUCLEI OBSERVING PROGRAM

No. 40, **David Wickholm**, San Antonio Astronomical Association; No. 41-I, **Jason Wolfe**, Member-at-Large

ADVANCED BINOCULAR DOUBLE STAR OBSERVING PROGRAM

No. 69, **Craig Endres,** Milwaukee Astronomical Society; No. 70, **DeVonna Ishmael,** Member-at-Large

ARP PECULIAR GALAXIES NORTHERN OBSERVING PROGRAM

No. 129-I, **Wesley G. Morrison, Jr.,** Member-at-Large

ASTERISM OBSERVING PROGRAM

No. 98-E/B, **Cindy La Russa,** Huachuca Astronomy Club; No. 99-I, **Robert Togni,** Central Arkansas Astronomical Society; No. 100-E/B, **Richard Wheeler,** Northeast Florida Astronomical Society; No. 101-E/B, **Lloyd Watkins,** Banard-Seyfert Astronomical Society; No. 102, **Teresa Bippert-Plymate,** Bear Valley Springs Astronomy Club

ASTEROID OBSERVING PROGRAM

No. 86, **Gerard J. Jones**, Gold, Minnesota Astronomical Society

BAMBURY 600 CERTIFICATE

Brad Young, Astronomy Club of Tulsa

BENNETT – IMAGING OBSERVING PROGRAM

No. 1-I, **Matthew Russell,** Full List, Colorado Springs Astronomical Society

BINOCULAR DOUBLE STAR OBSERVING PROGRAM

No. 225, **DeVonna Ishmael,** Member-at-Large; No 226, **Simon Lowther,** Member-at-Large; No. 227, **Cindy La Russa,** Huachuca Astronomy Club

BINOCULAR MESSIER OBSERVING PROGRAM

No. 1280, **Matthew Russell**, Colorado Springs Astronomical Society; No. 1281, **Danny Glover**, Madison Astronomical Society

BRIGHT NEBULA OBSERVING PROGRAM

No 52-I, **Laurie V. Ansorge**, Gold, Lifetime Member; No. 53-I, **Lauren Rogers**, Silver, Escambia Amateur Astronomers Association

BEYOND POLARIS

No. 80, **Pedro Cabinillas**, West Kentucky Amateur Astronomers; No. 81, **Chris Koer**, San Antonio League of Sidewalk Astronomers

CALDWELL IMAGING PROGRAM

No. 16, **Andrew Corkill,** Silver, Lifetime Member

CALDWELL OBSERVING PROGRAM

No. 309, **Cindy La Russa,** Silver, Huachuca Astronomy Club

CITIZEN SCIENCE SPECIAL PROGRAM

Dan Crowson, Bronze, Active, Rubin Difference Detectives, Astronomical Society of Eastern Missouri; **Dan Crowson**, Gold Class 2, Active, Rubin Comet Catchers, Astronomical Society of Eastern Missouri; **Mark Ellison,** Gold Class 3, Observational, Variable Stars, Member-at-Large; **L. John Keller**, Bronze, Active, Backyard Worlds: Planet 9, The Villages Astronomy Club; **Al Lamperti**, Gold Class 554, Active, Active Asteroids, Delaware Valley Amateur Astronomers; **Al Lamperti**, Gold Class 38, Galaxy Zoo, Cloudspotting on Mars, Delaware Valley Amateur Astronomers; **Al Lamperti**, Gold Class 5, Supernova Host Herding, Delaware Valley Amateur Astronomers; **Al Lamperti**, Gold Class 10, Stellar Stream Classification, Delaware Valley Amateur Astronomers; **Al Lamperti**, Silver, Observational, Variable Stars, Delaware Valley Amateur Astronomers; **Brad Young**, Gold Class 19, Observational, Variable Stars, Astronomy Club of Tulsa

COMET OBSERVING PROGRAM

No. 148, **Michael Stephens**, Silver, Member-at-Large

CONSTELLATION HUNTER OBSERVING PROGRAM - NORTHERN SKIES

No. 334, **Benjamin Greiner**, Oklahoma City Astronomy Club; No. 335, **Cindy La Russa**, Huachuca Astronomy Club; No. 336, **Matthew Russell**, Colorado Springs Astronomical Society; No. 337, **John Keogh**, Albany Area Amateur Astronomers; No. 338, **Ken Davy**, Member-at-Large, No. 339, **DeVonna Ishmael**, Member-at-Large; No. 340**, James Fouch**, Denver Astronomical Society; No. 341, **Dan Fry**, Astronomy Enthusiasts of Lancaster County, No. 342, **Greg Shabert**, Minnesota Astronomical Society; No. 343, **Andrew Hall**, Member-at-Large

CONSTELLATION HUNTER OBSERVING PROGRAM – SOUTHERN SKIES

No.18, **Simon Lowther**, Member-at-Large; No. 19, **Bernard Venasse**, Lifetime Member

DEEP SKY BINOCULAR OBSERVING PROGRAM

No. 457, **DeVonna Ishmael**, Member-at-Large; No. 458, **Marie Lott**, Atlanta Astronomy Club

DOUBLE STAR OBSERVING PROGRAM

No. 726, **Mark Ellison**, Member-at-Large; No. 727, **Justin Modra**, Denver Astronomical Society

EXTRAGALACTIC OBJECTS OBSERVING PROGRAM

No. 9-I Gold, **Jamye Fraser**, Ancient City Astronomy Club; No. 10-I Gold, **Keith Kleinstick**, Lifetime Member

GALAXY GROUPS AND CLUSTERS OBSERVING PROGRAM

No. 64-I, **Mark L. Mitchell,** Delaware Astronomical Society

GALILEO OBSERVING PROGRAM

103-B, 103-E, **Marie Lott,** Atlanta Astronomy Club; 104-B, **Jeffrey G. Hiscock,** Patron Member; 105-E, **Cindy La Russa,** Huachuca Astronomy Club

GALILEO'S TOES OBSERVING CERTIFICATE

No. 10, **Paul Harrington,** Member-at-Large; No. 11, **Jonathan L. Schuchardt**, Albuquerque Astronomical Society

GLOBULAR CLUSTER OBSERVING PROGRAM

No. 425, **Jack Shelton**, Minnesota Astronomical Society; No. 426, **Carol Young**, Colorado Springs Astronomical Society; No. 427, **Mark Ellison**, Member-at-Large; No. 428, **Brian Hayward**, Rose City Astronomers

HERSCHEL SOCIETY

Jonathan L. Schuchardt, Silver, Albuquerque Astronomical Society

HERSCHEL 400 CERTIFICATE

No. 678-I, **Thomas R. McDonough**, Oklahoma City Astronomy Club; No. 679-I, **Randal Finden**, Raleigh Astronomy Club; No. 680, **Christian Weis,** Tucson Amateur Astronomy Association

HERSCHEL II OBSERVING PROGRAM

No. 134-I, **Thomas R. McDonough,** Oklahoma City Astronomy Club

IMAGING-MESSIER OBSERVING PROGRAM

No. 32, **Charles Martin**, Atlanta Astronomy Club; No. 33, **Steven Powell**, Houston Astronomical Society; No. 34, **Guy Earle**, St. Petersburg Astronomy Club; No. 35, **Peter McLean**, St. Petersburg Astronomy Club; No. 36, **Michael Maas**, Lima Astronomical Society

LIBRARY TELESCOPE PROGRAM

No. 48, **Darcy Howard**, Silver & Gold, Central Arkansas Astronomical Society; No. 40 **Bill Pence**, Gold, Amateur Observers' Society of New York

LUNAR EVOLUTION OBSERVING PROGRAM

No. 45, **Edgar G. Fischer**, Regular, Albuquerque Astronomical Society

LUNAR OBSERVING PROGRAM

No. 1280, **Darryl Carlyle-Moses**, Regular, Binocular, Member-at-Large; No. 1281, **Paul DeVoe**, Regular, Eyes-Only, Member-at-Large; No. 1282, **John Keogh**, Regular, Binocular, Eyes-Only, Albany Area Amateur Astronomers; No. 1283, **Mitchell Christopher**, Imaging, Bear Valley Springs Astronomy Club; No. 1284, **Marie Lott**, Eyes-Only, Atlanta Astronomy Club; No. 1285, **Gus Gomez**, Binocular, Tucson Amateur Astronomy Association; No. 1286, **Rick Ray**, Regular, Binocular, Eyes-Only, North Houston Astronomy Club

LUNAR II OBSERVING PROGRAM

No. 146-E/I, **Mitchell Christopher**, Bear Valley Springs Astronomy Club; No. 147, **Darcy Howard**, Central Arkansas Astronomical Society

MESSIER OBSERVING PROGRAM

No. 2904, **Mark Ellison**, Gold, Member-at-Large; No. 2943, **Dan DeGard**, Gold, Olympic Astronomical Society; No. 2949, **Matthew Russell**, Gold, Colorado Springs Astronomical Society; No. 2950, **Ben Greiner**, Silver, Oklahoma City Astronomy Club; No. 2951, **David Sharp**, Silver, Tucson Amateur Astronomy Association; No. 2952, **Andrew Hall**, Silver, Member-at-Large; No. 2953, **Jon Adams**, Silver, Member-at-Large

METEOR OBSERVING PROGRAM

No. 212, **Gustavo Gomez**, Silver, Tucson Amateur Astronomy Association

MULTIPLE STAR OBSERVING PROGRAM

No. 30, **Pete Hermes,** Tucson Amateur Astronomy Association

OPEN CLUSTER OBSERVING PROGRAM

No. 138-I, **Doug Newman**, Gold Imaging, Minnesota Astronomical Society; No. 139-I, **Thomas R. McDonough**, Gold Imaging, Oklahoma City Astronomy Club; No. 140-I, **Wayne E. Frey**, Gold Imaging, St. Petersburg Astronomy Club

OUTREACH PROGRAM

No. 1150, **Debra Wagner**, Stellar, Member-at-Large; No. 1320, **Chris Morisette**, Master, Fort Bend Astronomy Club; No. 1381, **Richard Lighthill**, Master, Huachuca Astronomy Club; No. 1409, **Thrayee Rao**, Stellar, Fort Bend Astronomy Club; No. 1413, **Dennis Latinette**, Stellar, River Bend Astronomy Club; No. 1429, **Charles Rivera**, Stellar, Kansas Astronomical Observers; No. 1440, **Miguel Duarte,** Stellar, Fort Bend Astronomy Club; No. 1595, **Charles Webb**, Stellar, Fort Bend Astronomy Club; No. 1613, **Tom Partin**, Outreach, Flint River Astronomy Club; No. 1627, **Charles Urban**, Outreach, Shreveport-Bossier Astronomical Society, Inc.; No. 1639, **Nathan Kappelman**, Outreach, Kansas Astronomical Observers; No. 1640, **David Urban**, Outreach, Austin Astronomical Society; No. 1641, **Tracy Urban**, Outreach, Austin Astronomical Society; No. 1642, **Edgar Fischer**, Outreach, Albuquerque Astronomical Society; No. 1644, **Jim Fouch**, Outreach, Denver Astronomical Society; 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; No. 1721, **David Ostanski**, Outreach, Buffalo Astronomy Association; No. 1722, **Greg Simpson**, Outreach, Stellar, St. Petersburg Astronomy Club; No. 1723, **Liz Simpson**, Outreach, Stellar, St. Petersburg Astronomy Club; No. 1724, **Peter McLean**, Outreach, St. Petersburg Astronomy Club; No. 1725, **Twila Dove**, Outreach, Flint River Astronomy Club; No. 1726, **Brittney Miller**, Outreach, Atlanta Astronomy Club

SOLAR NEIGHBORHOOD OBSERVING PROGRAM

No. 49, **Cindy La Russa**, Eyes-Only, Huachuca Astronomy Club; No, 50, **Cindy La Russa**, Binocular, Huachuca Astronomy Club

SOLAR SYSTEM OBSERVING PROGRAM

No. 251, **Cindy La Russa**, Regular, Huachuca Astronomy Club; No. 252, **Andrew Hall**, Regular, Member-at-Large; No. 253, **Marie Lott**, Eyes-Only, Atlanta Astronomy Club; No. 254, **Albert E. Smith**, Regular, Member-at-Large; No. 255, **Michael Stephens**, Member-at-Large

SUNSPOTTER OBSERVING PROGRAM

No. 266, **Larry Dove**, Flint River Astronomy Club; No. 267-I, **Thomas V. Schumann**, Lifetime Member; No. 268, **Greg Rigelman**, St Louis Astronomical Society; No. 269-I, **Tom Holman**, Minnesota Astronomical Society

UNIVERSE SAMPLER PROGRAM

No. 173-T, **Mark Ellison,** Member-at-Large, No. 174-T, **Bob Vickers,** West Kentucky Amateur Astronomers

MASTER OBSERVER PROGRESSION

FOR YOUR EYES ONLY

Bernard Venasse, Lifetime Member; **Marie Lott**, Atlanta Astronomy Club

OBSERVER AWARD

Cindy La Russa, Huachuca Astronomy Club; **Albert E. Smith**, Member-at-Large

BINOCULAR MASTER AWARD

Marie Lott, Atlanta Astronomy Club

ADVANCED OBSERVER

Edgar G. Fischer, Albuquerque Astronomical Society

A Short Dictionary of Astronomical Daffy-nitions

By Andrew Fraknoi

Many good books on astronomy provide a helpful glossary of technical terms for the beginning reader. Useful as such lists are, they usually list only the standard definition of each term. Here are some decidedly non-standard explanations of important astronomical concepts.

Antiproton: Whom Uncle Proton is married to

Declination: Thanks, Norbert, but I already have plans for tonight

Decoupling Era: The second decade of many Hollywood marriages

Degenerate Stars: The cause of the Decoupling Era

Early-type Star: Oh, I'm sorry Mr. Nolan, I thought the cast party started at 8

Effective Temperature: The one at which the pizza bakes evenly and crisply

Einstein Ring: What Albert bought Mileva

Exit Pupil: A student who didn't finish Astronomy 101

Exoplanet: Where all they do is play tic-tac-toe

Fission: What some astronomers like to do to relax during the summer

Fixed Stars: Terse report from the planetarium technician

G Star: Actor who appears mainly on the Disney Channel

Hubble's Constant: What his wife Grace hoped he would always be

Image Tube: Television set with the sound broken

International Date Line: Where lonely astronomers can call 24 hours a day

Interstellar Medium: Fortune teller in Hollywood between jobs

Inverse Square Law: Making a poem out of the Pythagorean theorem

Jansky: What Jan uses to open his door

Jeans Instability: What happens when you forget to wear your belt

Leap Second: You have to; I leaped first

Lepton Era: When the big cats roamed the jungle

Light Year: When your classes were easy and you didn't have to take too many in your major

Local Group: The rock band that plays down the street

Messier Catalog: The one that got dropped in the mud

Olbers' Paradox: Before she had that operation, Mrs. Olbers wanted an opinion from another doctor

Peculiar Motion: Astronomers trying to do the hula during a conference in Hawaii

Photomultiplier: Instagram

Prominence: Being invited to write a review paper for *Annual Reviews*

Proper Motion: Bill to increase funding for astronomical research

Radio Burst: Time to get another set

Recombination Line: Darling, I've never loved anyone but you; please take me back

Sirius B: What Yoda was always trying to teach his apprentices

Spectral Line: Beware, this house is haunted

Stellar Envelope: The one with the announcement of best actress at the Oscars

T Association: The Mad Hatter, the March Hare, and the Dormouse

Tektite: Maybe piping some music into the dome will loosen him up

Termination Shock: When your last post-doctoral fellowship runs out

Van Allen Belt: What Dr. Van Allen wears to hold up his pants

Andrew Fraknoi retired as the chair of the Astronomy Department at Foothill College near San Francisco in 2017, but is still teaching noncredit classes for retired people at two universities. For 14 years, he served as the executive director of the Astronomical Society of the Pacific. He is the lead author of *Astronomy*, a free, open-source, electronic textbook that is published by the non-profit OpenStax project, which is now the most frequently adopted introductory astronomy textbook in the United States. These definitions, however, somehow got left out of that book.

Gallery

David Stearn (Tucson Amateur Astronomy Association) captured this image of the Heart and Soul nebulae from his backyard in Vail, Arizona with an Askar SQA55 and a ZWO ASI2600MC Pro camera.

Steven Bellavia (Amateur Observers Society of NY) captured this image of the sodium tail of Mercury from Bacon's Castle in Surry, Virginia using a Borg 90FL with 0.72X – F/4.0 and a ZWO ASI 294MM Pro camera.

Gallery

Upper right: Bernard Miller (East Valley Astronomy Club) captured this image of M77 with a PlaneWave 17" CDK with and a FLI 16803 CCD camera from his observatory in Animas, New Mexico.

Lower left: Steven Bellavia (Amateur Observers Society of NY) captured this image of LDN 1355 from Cold Spring Lodge (Big Indian, New York) using a Williams Optics FLT-91 and a ZWO ASI 533MC Pro camera.

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