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# Reflector

**THE BLUE PLANET**

**REPORT FROM STELLAFANE**

**PERSPECTIVE ON APOLLO**

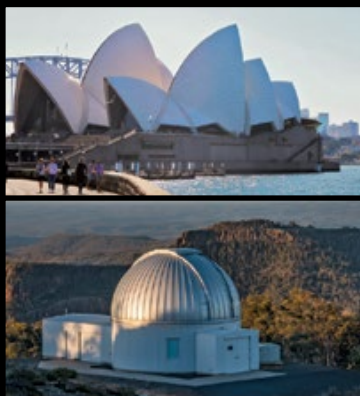
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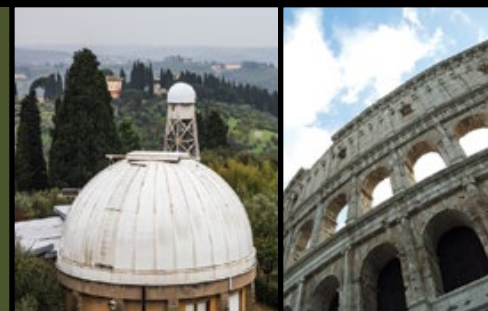


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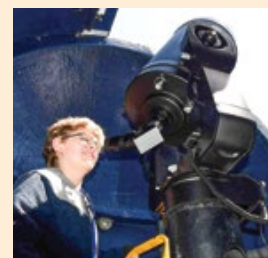


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**Cover image:** Andrew Klinger (Texas Astronomical Society) took this image of IC 1396 from a dark site in Texas using a William Optics GT81 (reduced to f/4.7, 382mm) with a ZWO ASI1600MM-Cool CMOS camera.

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## Reflector



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- by providing incentives for astronomical observation and research, and
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# Reflector

## QUARTERLY PUBLICATION OF THE ASTRONOMICAL LEAGUE

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March issue	January 1
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## President's Corner

The weather is turning cooler, the trees are changing color, and the summer constellations are getting lost in the glow of sunset. It must be time for autumn, which means ALCon 2019 is a recent memory and we are knee-deep in preparations for ALCon 2020.

The 2019 convention was a wonderful and unique experience, especially for first-time cruisers. Food was plentiful (actually, endless), and we enjoyed very calm seas and ports-of-call in Nassau and CocoCay (Bahamas). There were several great presentations and two interesting panel discussions which will benefit both the League and individual clubs and societies. Many thanks to Carroll Iorg, Maynard Pittendreigh, and others for a great time.

I am pleased to report we are on a sound financial footing with an approved balanced budget for the next fiscal year. Three new observing programs are being added to our current offerings and we have a very bright future ahead. Of course, we can always use a few more volunteers. Also, if you have any ideas or comments, pass them along.

We now can set our sights on Albuquerque, New Mexico, and ALCon 2020. Mark your calendars for July 15 (council meeting), July 16 to 18 (conference days), and July 19 (VLA tour), plus a chance for your youngster to build their own 6-inch telescope with our very first ALCon Jr. STEAM conference. More details are still to come, but be sure to check out the advertisements in this issue of *The Reflector*. The online application form will be available soon.

In addition, we are starting to plan the 2024 convention (another great solar eclipse is coming our way), and news will be forthcoming.

It looks like we have found a new information technology manager, and he has been sitting under our noses all this time. John Martin, who works in IT at a major hospital (and is presently editor of the *Reflector*) has agreed to become our new IT and webmaster maven effective in the very near future. We can't expect John to wear too many hats, so he will be retiring as editor. So, if you have publishing experience, including the use of the Adobe and Microsoft Office suites, and are willing to handle this critical task, please let me know at [president@astroleague.org](mailto:president@astroleague.org). This volunteer position is very important to the continued success of the League.

We are also seeking someone with successful fundraising experience, at the local, corporate, and national levels, to help your League attain some future goals, including growth of the outreach programs, expanded website, monthly digital *Reflector*, collaboration with additional citizen science programs, and many more. We do everything we do with an operating budget of about \$100,000. Imagine what we could do with an extra \$50,000 or \$100,000 in grants!

Remember, this is your League and only you can help make it better.

—Ron Kramer, League President

## Editor's Note

As you may have noticed, the most recent issues of the *Reflector* have arrived late. We express our sincere apologies. The *Reflector* is managed and produced by a small team of Astronomical League volunteers. Producing each issue requires a significant amount of time and effort, and the availability of each member of our small staff can adversely affect our timeline.

We are changing our processes and expanding the *Reflector* team with the goal of mitigating this issue and ensuring we deliver the *Reflector* to you on time. Thank you for your understanding and patience.

## Library Telescope Giveaway

Through the vision of the Horkheimer Charitable Fund, the Astronomical League again offered a free Library Telescope to a lucky Astronomical League club in each region, plus one to a member-at-large.

The Library Telescope consists of a 4.5-inch Dobsonian Z114 Zhumell reflector fitted with an 8–24 mm zoom eyepiece and a nameplate commemorating the late Jack Horkheimer. The value of this opportunity is approximately \$200; the potential is enormous.

The Library Telescope program was initiated ten years ago by the New Hampshire Astronomical Society and has grown into a nationwide presence. A club donates an easy-to-use portable telescope with quality optics and a sturdy mount to their local library. Patrons can then check it out as they do books.

Thank you, Horkheimer Charitable Fund, Zhumell Telescopes, and Celestron, for making this wonderful program possible!

### Congratulations to the 2019 winners:

Miami Valley Astronomical Society, GLRAL  
St. George Astronomy Group, MARS  
Kansas Astronomical Observers, MSRAL  
Door Peninsula Astronomical Society, NCRAL  
Olympic Astronomical Society, NWRAL  
Atlanta Astronomy Club, SERAL  
Astronomers of Verde Valley, SWRAL

## Library Telescope Update

As the winner of the 2108 member-at-large category for the Library Telescope Program, I am sending you this update.

The Library Telescope was presented to the board of directors for the Amherst Public Library, Amherst, New York, on May 8, 2019.



Amherst Library Director Roseanne Butler-Smith introduces the Library Telescope to a young patron. The telescope was prepared and presented by Astronomical League member-at-large Jim Zappa, not pictured.

The Library Telescope was sponsored and supported by Astronomical League member-at-large Jim Zappa. In addition to the telescope, Zappa donated books, constellation maps, a planisphere, and a map of lunar features.

The Library Telescope has been in circulation since mid-May 2018, and feedback from the library staff is that the telescope is very popular

with the library patrons. In fact, the library director, Roseanne Butler-Smith, has provided funding to procure two more Library Telescopes and make them available to the patrons of other branches of the Amherst library.

—Jim Zappa, AL Member-at-Large

## Full STEAM Ahead

### BILL BOGARDUS'S VISION FOR THE ASTRONOMICAL LEAGUE'S LEGACY

At ALCon 2017 in Casper, Wyoming, Bill Bogardus offered me the youth coordinator position that had been empty for over a decade on the Astronomical League Council. I was honored and shocked at the same time, since I had just asked the council what were they doing to stop the "graying" of the clubs. Quite frankly, I thought I was going to be asked to leave the meeting. But Bill liked my suggestion about opening up the national conferences to families and students so that instead of just older kids coming with one parent, the whole family would choose an ALCon as a yearly summer event since it would include the younger children.

At the Minneapolis ALCon in 2018, Bill continued to move forward on an ALCon Jr. family STEAM conference for 2020. He supported funding the calendar that I created for the council to see what I was recommending. Bill and Ron Kramer worked together to secure the funding to make this calendar happen. It was agreed that the profits from the calendar would support activities and resources for families and students at the Albuquerque ALCon in 2020. Bill told me he loved my passion and ideas and felt this was a great new venture for AL and encouraged me, to which I gave him a hug and kiss on the cheek and thanked him for his vision and support.

So here we are, working on this 2020 ALCon Jr. conference with the new AL 2020 Calendar. Back when it was suggested, I was told to get NASA images and I said, "no, everyone does that – I want it to be amateur astronomers from the membership." Last year's calendar introduced me to the great imagers and sketchers from the League, and I was overwhelmed by their support for Bill's vision. I was highly encouraged and so I continue to move the ball forward.

You see, the graying of clubs is everywhere, and is noticeable in organizations that were once filled to the brim with amateur astronomers and telescope makers. The crowds are dwindling and

the art of telescope making is losing its foothold in this hobby. As a board member of Sidewalk Astronomers, this has been difficult to watch over the past several years. Now with AL welcoming me on board, I am addressing the graying of the hobby as a whole by planning a telescope-making workshop at the ALCon Jr. in 2020. After all, it does fit under the STEM/STEAM umbrella.

Right now, Rob Teeter of Teeter's Telescopes and the Astronomical League have partnered to generate telescope making kits for students and families to assemble. Rob has spent hours figuring and calculating as well as offering to lead the ATM workshop. Rob will be cutting all the wooden pieces out of high-quality wood, individually pre-boxing all his parts, and shipping them to New Mexico when the time is right. (Little did I know that Rob won a telescope-making award at Stellafane when he was a student in the 1990s). In addition, Pat Murnaghan, of Coulter Optical, Odyssey, and e-Scopes has waived the \$25 per kit shipping cost because of our bulk order. Pat told me he believes in and wants to support what we are trying to do. I told Pat that I hoped this would be a yearly activity for AL and create a "renaissance" of amateur telescope making in the United States.

The goal is to offer these telescope kits at a reasonable price, but with quality mirrors, and solid wooden bases; we hope to fund half of the cost. Currently, the ATM telescope kits cost approximately \$400, and we plan offer these telescope kits, ready to assemble, for \$200. So, for every \$1,000 of calendar profits, we will be able to cover five telescope kits. The Astronomical League has 750 calendars at the League Store. See the goal here? In addition to this ATM workshop, there will also be astronomy STEAM activities planned for elementary students and will also include an Astro Camp for Saturday Night during the adult banquet.

I want to note that this telescope workshop is best suited for middle school and older students, parents with their upper elementary (third- to fifth-grade) children, and teachers with students. Since we do not know how the calendar sales will go, this will be on a first-come, first-served basis with a slot assured with a payment for half of the telescope costs. Because the facilities are still being worked out, it is uncertain how many kits we will be able to assemble, but we are pursuing as many as we can fit comfortably in the space provided.

I encourage those interested 1) students, to start mowing extra lawns, or babysitting, dog

walking, and so on; 2) parents, hold a garage sale; and 3) teachers with students, encourage your parent-teacher associations to host a bake sale specifically for a school telescope. Remember, this is only a plan and won't become reality unless the 750 Astronomical League 2020 Calendars fly out of the League Store. To club presidents: please consider placing a bulk order for your club members and even to sell to attendees at your star parties since these are packed with astronomical information and trivia. I was informed that if they sell quickly, we might have an option to order more. I personally buy a dozen calendars for my family and close friends for Christmas off the Internet. But not anymore – they get this one with all the information they always ask me about throughout the year. I also sell these at the star parties I attend and my Broken Arrow Sidewalk Astronomy sites every month.

So, in the spirit of Bill Bogardus and his vision, I want to thank you in advance for your support in fulfilling his legacy. Full STEAM ahead!

—Peggy Walker

## Night Sky Network



### CELEBRATING INTERNATIONAL OBSERVE THE MOON NIGHT

Look skyward and find the Moon on Saturday, October 5, 2019! You'll join millions around the world celebrating our planet's nearest neighbor during the 10th annual International Observe the Moon Night. Anyone can participate anywhere, and there are many ways to join the festivities. Individuals can attend a nearby Moon viewing party, host their own observing session, or simply take a quick peek up during their busy day to appreciate our neighbor's quiet beauty.

International Observe the Moon Night is one of the most successful annual outreach events in the world. The Moon is the most easily observed object in our skies, and, unlike almost any other object, it can be seen both day and night, in even the most severely light polluted skies. Not only is

the Moon large and bright, it rewards observers with its regularly changing appearance throughout the month. While most astronomers find the Moon's brilliance in the night sky a nuisance, since its light drowns out observations of faint fuzzies, the Moon's brightness is a strength for outreach. Its brilliance makes it a perfect object to share with the public, especially folks who have never looked through a telescope, or even binoculars. Seeing the fine details in a galaxy, cluster, or nebula takes experience as an observer, but the Moon shines so brightly through an eyepiece that its details are much easier for novices to identify. Plus, you can tell if your telescope's visitor has a good view by spotting the moonshine glinting from their eyes.

This year's International Observe the Moon Night is a great opportunity to commemorate the 50th anniversary of the Apollo program with your family, friends, and community. Celebrate humanity's first steps on another world and share the inspiring story of how we went there while observing the Moon. Share your own story of how the Apollo program touched your life and ask others about their memories of that historic time. You can even share your Apollo story with NASA and hear others' stories at [nasa.gov/apollostories](http://nasa.gov/apollostories).

Discussions of Apollo's triumph often turn to hopes and dreams for future lunar exploration. People often ask why humans haven't gone back, and while the answer is a bit complicated, we can now answer that we will be going back, and soon! You can discuss the Artemis program – NASA's plan to return to the Moon with crewed missions in orbit and on the surface. Humans have robotic emissaries there, right now, that are helping us prepare for the next set of boot prints in that dusty soil. NASA's Lunar Reconnaissance Orbiter is currently in orbit and has been mapping the lunar surface in rich detail for 10 years. Other



Griffith Observatory was host to a large public star party held by the Los Angeles Astronomical Society during International Observe the Moon Night 2018. Photo by Todd Kunioka

countries and agencies have successfully sent orbiters, landers, and rovers, including Russia, Japan, India, China, and the member nations of the European Space Agency. It's getting busy on the Moon, and with humans returning in just a few years it's bound to get even more exciting.

So how can you participate in International Observe the Moon Night for 2019? Find recommendations and resources on the official website, [moon.nasa.gov/observe](http://moon.nasa.gov/observe). There is an observer's map of the Moon in the phase it will be on October 5, featuring areas of interest visible with the naked eye and through binoculars and telescopes.



Oklahoma City Astronomy Club member Peter Khor helped visitors "Walk on the Moon" during their International Observe the Moon Night event by sending live video from his telescope's eyepiece to a projector pointing to the ground from a tall tripod.

There are slide sets presenters can use, activity recommendations, event evaluation materials, and more. The Night Sky Network recently released a new toolkit of Moon resources in honor of Apollo 11 that your club may find handy at observing events at [bit.ly/nsnmoon](http://bit.ly/nsnmoon), and additional Moon-related NSN resources are at [bit.ly/nsnmoonnight](http://bit.ly/nsnmoonnight).

You can register your event by adding it to the official International Observe the Moon Night event map. If your club participates in the

Night Sky Network program, you can schedule your upcoming event to the NSN's calendar and it will be automatically cross-posted as an International Observe the Moon Night event – just make sure that "Moon" is in the title and that the event is public. If October 5 is inconvenient, you can host an event any date between September 28 and October 13. The times, dates, and locations of public events will appear on the International Observe the Moon Night event map; private events can also be registered and will appear on the map without specific information.

If you prefer to visit rather than host, and want to attend an event, or even drop in on several events, you can check out the map to find one near you. Or you can mark your observing spot on the map as an individual lunar observer. Please share your takes, photos, and experiences using #ObserveTheMoon on social media. Find everything you need to know on the official International Observe the Moon Night website, [moon.nasa.gov/observe](http://moon.nasa.gov/observe).

—David Prosper and Andrea Jones

## Deep-Sky Objects

### THE BEST STAR CLUSTER IN PEGASUS

One of the most recognizable constellations in the autumn evening sky is Pegasus. It is located far from the Milky Way and high above Polaris when it transits, and its main stars are easy to see, even with moderate light pollution. The constellation's most notable asterism is the Great Square, formed by the stars Markab, Sheat, Algenib, and Alpheratz. Alpheratz is technically part of the constellation Andromeda, but some older star charts give Alpheratz the dual designation of Alpha Andromedae and Delta Pegasi.

Pegasus doesn't contain a plethora of bright deep-space objects. Almost all of the 319 New General Catalog (NGC) objects in the constellation are galaxies. Of those, only 15 are brighter than magnitude 12, and only one is brighter than magnitude 10. That outlier is NGC 7331, the Deer Lick Galaxy, a decent magnitude 9.5 spiral. Many of the remaining galaxies are brighter than magnitude 15. So anyone with a 14-inch or larger telescope in dark skies can score many of them, including the famous Stephan's Quintet.

There are three open clusters in Pegasus, all loosely scattered and unimpressive. However, there is one very impressive globular cluster in Pegasus that more than makes up for the constel-



lation's lack of open clusters – M15.

The French astronomer Jean-Dominique Maraldi discovered M15 in 1746 while searching for the de Chéseaux comet. His countryman Charles Messier independently found M15 in 1764 and added it to his now-famous catalog.

M15 is easy to find. Start at the magnitude 3.5 star Baham (Theta Pegasi) and go 7.5 degrees northwest to the magnitude 2.4 star Enif (Epsilon Pegasi). Continue in the same direction another four degrees to M15. A side note: although Enif is given the designation Epsilon Pegasi, it is actually the brightest star in the constellation. For most constellations, the bright stars are labeled in descending order of brightness: Alpha (the brightest), Beta (the next brightest), Gamma, Delta, and so on. Enif is a tenth of a magnitude brighter than Alpha Pegasi, also called Markab. This assumes you ignore "Delta Pegasi," which is brighter than all of them, but really isn't in Pegasus. It's a confusing constellation!

M15 is a beautiful star cluster and is one of the richer and more compact globulars. The cluster's integrated magnitude is 6.2 and it has a diameter of 18 arcminutes. It can be spied in binoculars but will require a 3- to 4-inch telescope with good magnification to begin to resolve the individual stars. An 8-inch telescope will resolve it into countless stars and reveal its intense brilliant central core.

M15 contains scores of RR Lyrae class variable stars. These stars enable M15's distance to be determined fairly accurately. The cluster lies 33,600 light-years away. This distance shows the true diameter of the cluster to be 175 light-years. Approximately 100,000 stars reside in that spherical region of space, with a brightness equivalent

to 360,000 Suns. The cluster also contains the first planetary nebula discovered in a globular star cluster, Pease 1. The nebula was discovered by Francis Pease in 1927 using a photographic plate made with the 100-inch telescope at Mt. Wilson.

My image of M15 was taken with an 8-inch f/6.4 Ritchey-Chrétien reflector using an SBIG ST-2000XCM CCD camera. The exposure was 30 minutes. In the image, north is up and east to the left. The image spans 25 arcminutes in right ascension, and most of the stars in the image belong to the globular cluster. The brightest star in the image (with the diffraction spikes) is a magnitude 7.6 foreground star, SAO 107179, located approximately 200 light-years away. The faintest stars in the image are magnitude 17.

The yellow arrow points to the almost-resolved planetary nebula Pease 1, estimated magnitude 15.5. It can be imaged with an 8-inch telescope using narrowband filters or seen in a 14-inch telescope under dark skies with an O-III nebula filter, but it takes a 32-inch telescope to resolve any detail in the nebula! All telescope and binocular owners should visit M15 this fall. Those with large light buckets will enjoy the challenge of capturing its planetary nebula!

—Dr. James R. Dire

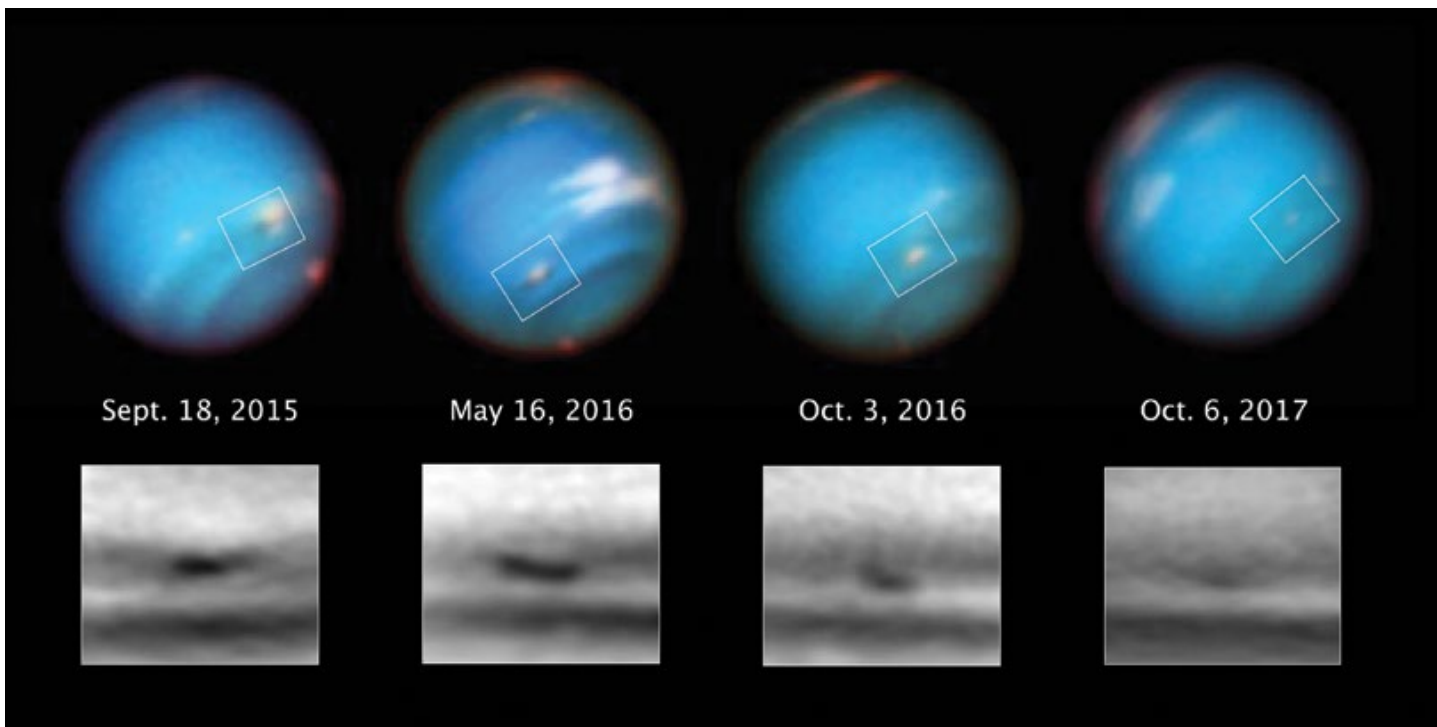
Kauai Educational Association for Science and Astronomy

## Wanderers in the Neighborhood

### THE BLUE PLANET

With the demotion of Pluto to a dwarf planet, Neptune once again became the most distant planet from the Sun in our Solar System. The color of this blue planet is not due to liquid water like on the Earth, but from trace amounts of methane and other substances in its hydrogen and helium atmosphere. Neptune is the Solar System's third most massive planet after Jupiter and Saturn. These three, along with Neptune's neighbor Uranus, make up the local population of gas giant planets.

Neptune is the densest of all the gas giants. Its mass of 17 times the mass of Earth is just slightly more than that of similar Uranus. The gravitational pull of Neptune's higher mass causes its atmosphere to be more compressed than that of Uranus, making Neptune physically smaller than its twin.



The Hubble Space Telescope took these images of a dark spot on Neptune's surface as it slowly shrank over two years. In 2015, the spot's long axis was 3100 miles long. By 2017, the spot had moved further south and lost some of its energy, shrinking to only 2300 miles long. It also lost some of its color. Image credit: M.H. Wong and A.I. Hsu (UC Berkeley)/NASA/ESA

Neptune is the only planet not visible to the naked eye, with an apparent magnitude of 7.7. Even being 3.88 times the diameter of the Earth, Neptune's remoteness provides a telescopic disk that is only 2.4 arcseconds across at its largest. Earthbound views of Neptune never showed any detail in its atmosphere – it was just a blue dot.

In 1989, the Voyager 2 spacecraft on its "Grand Tour" of the outer Solar System made a flyby of Neptune, providing the first close-up views of its atmosphere. Uranus had not shown Voyager 2 much activity, and with Neptune receiving less of the Sun's energy than Uranus, it was thought that Neptune would also have a bland disk.

But Voyager's images showed that all was not quiet on Neptune. The most obvious feature was a spot in the southern hemisphere dubbed the Great Dark Spot, similar to Jupiter's Great Red Spot. Neptune's atmosphere also contained cloud streams, bands and smaller storms, showing that it was active despite the weak sunlight.

While Voyager 2 has been the only spacecraft to visit Neptune, when the Hubble Space Telescope became operational, astronomers began regularly monitoring Neptune's atmosphere. They found dark spots like the Great Dark Spot were common. These anticyclonic storms (clockwise in the northern hemisphere, counterclockwise in the southern hemisphere) churn up darker material from deeper in the atmosphere as they move with the upper atmosphere.

Unlike the Great Red Spot on Jupiter, which has been around for over two hundred years, Neptune's dark spots only last for a few years. A dark spot found in 2015, for example, was 3100 miles long at discovery, but by 2018, it had moved toward the south pole, had shrunk to only 2300 miles long, and was fading.

Most of Neptune's storms have been found in its southern hemisphere, because it is now summer there. Neptune's poles are tilted 28.3 degrees to the ecliptic, so Neptune goes through seasons like the Earth. The southern hemisphere has been tilted toward the Sun since 1962, and this tilt reached a maximum in 2003. So, for all the time we have been able to observe Neptune, the southern hemisphere has been in spring and summer. As the planet continues around its orbit, summer will move to the northern hemisphere and we can expect to see dark spots form there.

The spots and clouds ride on one of three jet streams circling Neptune. There is a westward jet stream around the equator where the winds howl at 900 miles per hour. Near each pole, an eastward jet stream travels at over 500 miles per hour. Neptune has the fastest winds measured in the entire Solar System, with wind speeds in the storms reaching 1300 miles per hour, an almost supersonic speed in Neptune's atmosphere.

Neptune's atmosphere is only the thin top layer of the planet. At its heart is a rocky core, probably composed of silicates and solid nick-

el-iron. The mantle sitting on the core is a hot fluid of water, ammonia, and methane forming a water-ammonia ocean. This fluid has a high electrical conductivity and probably provides the electric current to form Neptune's magnetic field. The top of the mantle is an ocean of liquid carbon with hailstones of diamond falling from the sky. The diamond hailstones form when methane higher in the atmosphere decomposes and the carbon atoms are compressed at high pressure to form diamonds.

The atmosphere over the carbon ocean consists of 80 percent molecular hydrogen and 19 percent atomic helium, with traces of methane to give Neptune its color. Uranus's atmosphere has a similar composition but it is only a pale blue. The vivid blue of Neptune must be due to an additional trace component of its atmosphere.

Higher clouds in Neptune's atmosphere cast their shadows on the lower, more solid cloud deck. The lower cloud deck is composed of chemicals like ethane and ethyne that are formed when ultraviolet light from the Sun breaks down methane. Most of the action in the atmosphere occurs between thirty and seventy miles above the cloud deck. The atmosphere is somewhat warmer than would be expected if it was only receiving energy from the Sun. There is an internal energy source, probably gravitational, that adds energy to Neptune's atmosphere and helps power the storms we see from time to time.

While it is hard to see this gas giant far from

the Sun, Neptune is an active place that astronomers will observe as long as we have the facilities to do so. Hubble spied a new dark spot forming in 2018–2019. Hubble will keep watching to see how it will evolve and how long it will last.

—Berton Stevens

## All Things Astronomical

### HEAVY METAL PLANET FRAGMENT SURVIVES DESTRUCTION FROM DEAD STAR

A fragment of a planet that has survived the death of its star has been discovered by University of Warwick astronomers in a disk of debris formed from destroyed planets, which the star ultimately consumes.

The iron- and nickel-rich planetesimal survived a system-wide cataclysm that followed the death of its host star, SDSS J122859.93+104032.9. Believed to have once been part of a larger planet, its survival is all the more astonishing as it orbits closer to its star than previously thought possible, going around it once every two hours.

The discovery, reported in the journal *Science*, is the first time that scientists have used spectroscopy to discover a solid body in orbit around a white dwarf, using subtle variations in the emitted light to identify additional gas that the planetesimal is generating.

Using the Gran Telescopio Canarias in La Palma, Canary Islands, Spain, the scientists studied a debris disk orbiting a white dwarf 410 light-years away, formed by the disruption of rocky bodies composed of elements such as iron, magnesium, silicon, and oxygen – the four key building blocks of the Earth and most rocky bodies. Within that

disk they discovered a ring of gas streaming from a solid body, like a comet's tail. This gas could either be generated by the body itself or by evaporating dust as it collides with small debris within the disk.

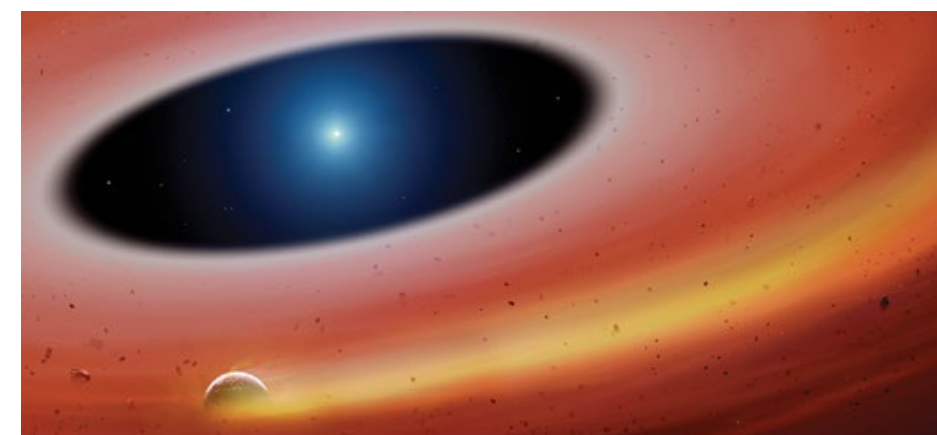
The astronomers estimate that this body has to be at least a kilometer in size, but could be as large as a few hundred kilometers in diameter, comparable to the largest asteroids known in our Solar System.

White dwarfs are the remains of stars like our Sun that have burned all their fuel and shed their outer layers, leaving behind a dense core which slowly cools over time. This particular star has shrunk so dramatically that the planetesimal orbits within its sun's original radius. Evidence suggests that it was once part of a larger body further out in its solar system and is likely to have been a planet torn apart as the star began its cooling process.

Lead author Dr. Christopher Manser, a research fellow in the Department of Physics, said, "The star would have originally been about two solar masses, but now the white dwarf is only 70 percent of the mass of our Sun. It is also very small – roughly the size of the Earth – and this makes the star, and in general all white dwarfs, extremely dense.

"The white dwarf's gravity is so strong – about 100,000 times that of the Earth – that a typical asteroid will be ripped apart by gravitational forces if it passes too close to the white dwarf."

Professor Boris Gaensicke, coauthor from the Department of Physics, adds, "The planetesimal we have discovered is deep into the gravitational well of the white dwarf, much closer to it than we would expect to find anything still alive. That is only possible because it must be very dense and/or very likely to have internal strength that holds it together, so we propose that it is composed



A planetary fragment orbits the star SDSS J122859.93+104032.9, leaving a tail of gas in its wake. Credit: University of Warwick/Mark Garlick

largely of iron and nickel.

"If it was pure iron it could survive where it lives now, but equally it could be a body that is rich in iron but with internal strength to hold it together, which is consistent with the planetesimal being a fairly massive fragment of a planet core. If correct, the original body was at least hundreds of kilometers in diameter because it is only at that point planets begin to differentiate – like oil on water – and have heavier elements sink to form a metallic core."

The discovery offers a hint as to what planets may reside in other solar systems, and a glimpse into the future of our own.

Dr. Manser said, "As stars age, they grow into red giants, which 'clean out' much of the inner part of their planetary system. In our Solar System, the Sun will expand up to where the Earth currently orbits, and will wipe out Earth, Mercury, and Venus. Mars and beyond will survive and will move further out.

"The general consensus is that 5–6 billion years from now, our Solar System will be a white dwarf in place of the Sun, orbited by Mars, Jupiter, Saturn, the outer planets, as well as asteroids and comets. Gravitational interactions are likely to happen in such remnants of planetary systems, meaning the bigger planets can easily nudge the smaller bodies onto an orbit that takes them close to the white dwarf, where they get shredded by its enormous gravity.

"Learning about the masses of asteroids, or planetary fragments that can reach a white dwarf can tell us something about the planets that we know must be further out in this system, but we currently have no way to detect.

"Our discovery is only the second solid planetesimal found in a tight orbit around a white dwarf, with the previous one found because debris passing in front of the star blocked some of its light – that is the transit method widely used to discover exoplanets around Sun-like stars. To find such transits, the geometry under which we view them has to be very finely tuned, which means that each system observed for several hours mostly leads to nothing. The spectroscopic method we developed in this research can detect close-in planetesimals without the need for a specific alignment!"

Manser and Gaensicke were supported by the European Research Council under the European Union's research and innovation program (grant agreement 320964).

— University of Warwick Press Release

# Telescope Targets for Halloween

One of my fondest childhood memories is the Halloween tradition of trick-or-treating. Halloween falls on October 31, and the Sun sets early. I started to show people objects through the telescope on Halloween about 30 years ago. Since then, thousands of children and their parents have received close-up views of the Moon, Jupiter, Saturn, Venus and other objects through the telescope. On a few occasions, children have also had a chance to view our Sun before sunset using a safe Sunspotter.

In my community, many children start trick-or-treating an hour before sunset and continue until about three hours after sunset. There is also a lot of ambient light from streetlights and other sources in my town. Therefore, I have selected bright objects for viewing since they are the easiest to find and see.

What is the best object to show children? Based on my many years of experience, the Moon ranks first, followed by Saturn. I prefer the Moon because it is easy to find when lights are around and children are more likely to see it. Furthermore, inexperienced observers are more likely to see a big bright Moon in the eyepiece than a small planetary disk. One may even show the Moon during the day, but twilight or nighttime viewing is better. Because of its brightness, children may also see Venus during the daytime. Jupiter,

Saturn, and Mars are visible starting in twilight. For the next few Halloweens, Jupiter and Saturn are well-placed for evening viewing. The best opportunity to show Mars will be in 2020 when it is nearly at opposition. One may show children the double star Albireo or a terrestrial object in the distance as well. One of the distant objects I have shown in the daytime is the steeple at the top of the First Methodist Church in Barnesville, Georgia. Table 1 lists what I consider the best target and an alternative for Halloween viewing between 2019 and 2030.

On a few occasions, I have set up a Sunspotter during the daytime for those early trick-or-treat children. One needs a clear western horizon to show the Sun. The Sun is more interesting to view when sunspots are visible. Sunspot maximum should happen around 2024.

I recommend a few things to those who want to do public outreach on Halloween. Firstly, children sometimes grab or touch the eyepiece, so use an inexpensive one. I gently warn children not to touch the telescope. In my area, parents have learned to tell their children not to touch the eyepiece, causing the telescope to shift. For this reason, a Dobsonian telescope with a good finder-scope is a good choice for Halloween outreach. A small stool or booster ladder may help very small viewers. Sometimes, parents hold their children up to look through the eyepiece. One may also place a monitor-connected video camera in the telescope and people can easily see the object on a screen. Finally, I have my bag of goodies next to my telescope so that the children get two treats!

—Richard W. Schmude Jr.

The writer used the JPL Horizons software package to determine the visibility of each target for his location. Visibility should be similar for cities near 33° north latitude like Atlanta, Dallas, and San Diego.

Year	Best Target	Alternate target
2019	Moon (waxing crescent, west)	Saturn (west)
2020	Moon (full)	Saturn, Jupiter, and Mars
2021	Jupiter (south)	Saturn and Venus (west)
2022	Moon (first quarter, high)	Saturn and Jupiter
2023	Saturn (southeast)	Jupiter (low in west)
2024	Saturn (southeast)	Albireo or something else
2025	Moon (waxing gibbous, east)	Saturn (southeast)
2026	Saturn (east)	Albireo or something else
2027	Saturn (east)	Albireo or something else
2028	Moon (full)	Albireo or something else
2029	Venus very low in the west*	Albireo or something else
2030	Moon (waxing crescent, west)	Albireo or something else

\*15° above the horizon at sunset, and the altitude decreases afterwards.

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Apr. 25 — May 4	Oct. 19 — 28
May 25 — June 3	Nov. 18 — 27
	Dec. 18 — 27



# Perspective on Apollo

By Richard C. Wilde

The Apollo Program was a true expedition – a series of nine reconnaissance flights to the Moon with six actual landings on the surface. These voyages charted cislunar space, proved our mastery of two-week life support capabilities in space, mapped the Moon, conducted experiments, and returned with more than 800 pounds of Moon rocks and regolith to Earth for study and evaluation (which is still occurring).

Apollo equipment was characterized by the word expendable: use it once and throw it away. All supplies including food were brought up from Earth, and only breathing oxygen was cleaned up and reused in an otherwise open-loop life support system. Everything else was expendable: the booster rockets, the space vehicles themselves, and the hydrogen and oxygen used to produce electrical power and water, remove carbon dioxide, dispose of urine and feces, and reject waste heat. For Apollo this was appropriate. Disposable rockets based on military missiles were all we had at the time, and open-loop life support systems using expendables remain the lightest-weight approach for two-week missions.

Shuttles were reusable. The solid boosters and engines were used for approximately ten flights, and each orbiter was designed for 100 missions. Only the external launch-fuel tank was expendable, a victim of an initial cost-cutting decision made early in the

1990s, the United States began designing and then building Space Station Freedom, our first outpost in space to be permanently inhabited. Initially intended for a 30-year life, it was radically different from Apollo and the Space Shuttle.



NASA photo

program. Tragically, the Shuttle program did not live up to its expectations. Two vehicles were lost in flight taking 14 crewmembers to their deaths – Challenger in 1986 and Columbia in 2003. The five vehicles that were built flew a total of just 137 flights before NASA terminated the program in 2011.

However, the Shuttle did represent continuous access to space, albeit to the low Earth orbit already explored during Apollo. This was analogous to the Portuguese trading voyages to West Africa beginning in 1440, after some of that coastline had been discovered and defined by Europeans.

In the late 1980s and early

1990s, the United States began designing and then building Space Station Freedom, our first outpost in space to be permanently inhabited. Initially intended for a 30-year life, it was radically different from Apollo and the Space Shuttle.

Similarly, the Soviet Union built and crewed a space station they called Mir, meaning “peace.” Following the breakup of the Soviet Union in the late 1980s, the United States and Russia recognized an opportunity for cooperation in space, first demonstrated by the Apollo-Soyuz Test Project in 1975, in which an Apollo vehicle rendezvoused and docked with a Soyuz capsule, and the two crews performed what became known as the ceremonial “handshake in space.” Thus in the early 1990s, the United States invited Russia to join in designing and constructing the newly renamed International Space Station, which became operational in 1998.

The International Space Station has been used to exploit the resources of its location in the zero-g vacuum of its low Earth orbit. It has supported life science studies and manufacturing in weightlessness, been used for astronomical studies unimpeded by Earth’s distorting and increasingly contaminated atmosphere, and supported terrestrial observations of global phenomena from its high vantage point. In the future it may be used as a way-station in low Earth orbit between Earth and other points in the Solar System. As an outpost in Earth orbit, it is analogous to first Portuguese fort, built in 1448 on the island of Arguin off the coast of present-day Mauretania, to support the burgeoning trade along Africa’s West Coast.

■ First, unlike Shuttle and Apollo vehicles which were used in space but were assembled and serviced on Earth, Freedom’s modules were built on Earth and delivered to orbit by Shuttle for assembly and maintenance in space. This drove the design of equipment for long life, low maintenance, and easy servicing to an unprecedented degree.

■ Second, the intended mission life of 30 years necessitated the closure of all thermal control and life support loops, except for food and feces. Thus carbon dioxide removal is regenerable, and the carbon dioxide itself is broken down to recycle the oxygen. Wash water, humidity condensate, and urine are reprocessed to recover

2

What of the future? The historian Arnold Toynbee ranked the Apollo Moon expeditions as one of the three most significant human achievements of the last thousand years. We don’t yet know where it will lead us. There is a debate in this country today about how to proceed in space relative to other priorities and demands on our national resources.

Should we continue with the Space Station for another 10 years or more or plan to shut the program down? What about sending humans back to the Moon, or going to Mars or beyond, and doing it alone or teaming with industrial partners, Europeans, Russia, Japan, India, or China? Why not use robots instead of humans for space exploration?

What does the past tell us? In the 1400s, there was another major sea-exploration power, the Ming Chinese. At that time, China was the world’s most advanced civilization, with technology vastly superior to that of Western Europe. Between 1405 and 1433, China, using ships with five or six masts that were upwards of 400 feet long, weighed 1,600 tons, and carried crews of as many as 500 sailors, explored East Africa and the Indian Ocean.

The Chinese accomplished this by assembling expeditions of 60 ships and 30,000 men. These ships were capable of going anywhere in the world. It was only a matter of time before they would have discovered the Americas and established direct contact with Europeans. By contrast, the Portuguese used little ships with three masts, weighing 60 to 80 tons and carrying crews of just

25. They sailed in expeditions of just one to three ships.

A great irony of the 15th century is that the Ming dynasty suddenly stopped its explorations due to other national pressures. The nation turned inward and became xenophobic. Science and technology decayed, trade became passive, and for the next five centuries China devolved into one of the world’s most exploited nations. However, in the last 30 years or so, China has begun to reemerge, and is now aggressively pursuing its own economic and territorial interests and developing its presence in world politics. In space, China has successfully flown its astronauts (taikonauts) aboard space vehicles launched by their Long March rocket boosters into low Earth orbit. They have also landed two robotic spacecraft on the Moon, including one on the far side, and a

private Chinese company has just launched several satellites into a 300-mile Earth orbit.

Are we Americans to become the 21st century Ming Chinese? While we still possess superior space technology, do we lack the national resolve to continue? Space will be explored and exploited by humans. Will it be by Americans, or will it be by others using cruder but adequate technology? History has shown that to abdicate is ultimately to stagnate. America must press on. ★

*This essay is an update of a presentation by Richard C. Wilde at the Connecticut Science Museum in West Hartford at a press conference on July 20, 1989, for Connecticut Remembers Apollo 11: Twenty Years Ago Today.*

*The Moon images in the title and section numbers are from a photo by Gregory H. Revera, via Wikimedia Commons*

1

During the Space Shuttle era, which started in the 1980s, missions were still about one to two weeks long, so life support systems remained open-loop and vehicles were fuel-cell powered. The main difference between Shuttle and Apollo was economic.



## Smart Planning for Imaging

People don't usually plan their imaging beyond finding objects that pass high in the sky. This is because they don't have enough information. Every camera and telescope combination is different. Every object in the sky is different. Basic questions arise that have no clear answers. How long to expose to get a nice image? What sub exposure time to use? What order to observe the filters in? How much moonlight is allowed for a narrow band filter to still get a good result?

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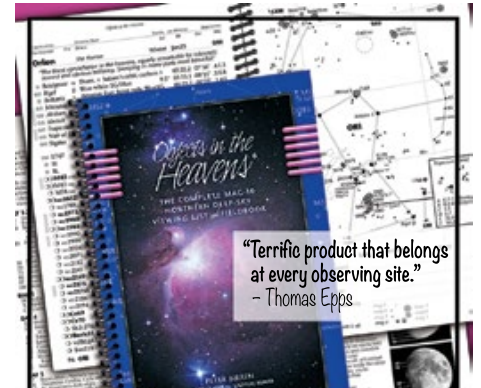
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# FROM AROUND THE LEAGUE

## NCRAL REPORT

**MAY 3–5, 2019:  
“ASTRONOMICAL VOYAGES OF  
DISCOVERY: PAST, PRESENT,  
AND FUTURE”**

The Popular Astronomy Club hosted the 73rd annual convention of the North-Central Region of the Astronomical League (NCRAL) May 3–5 at Stoney Creek Hotel and Conference Center in Moline, Illinois.

First, a little history about the Popular Astronomy Club (PAC) and its connection to the Astronomical League. The club was founded in 1936 by Carl H.

Minnesota, Iowa, Wisconsin, Illinois, and Michigan’s Upper Peninsula. Thirty-six societies now comprise NCRAL. PAC previously hosted NCRAL in 1953 and 1986. Since this year is the 50th anniversary of the Apollo 11 Moon landing, our planning committee decided on the theme “Astronomical Voyages of Discovery: Past, Present, and Future.” We wanted to offer presentations covering everything from ancient Native American views of astronomy to the Large Synoptic Survey Telescope. Our committee worked for two years to put together an

committee was to attract students and boost attendance, including inviting societies from other regions and non-League-affiliated clubs. We introduced the theme at NCRAL 2018 in Sturgeon Bay, Wisconsin, and fliers were available at ALCon 2018 in Minneapolis. We placed ads in the December 2018 and March 2019 issues of the *Reflector*. We got the word out about our event through Facebook, direct mailings, and visits to other clubs. We had 88 registered attendees from three regions, and we also attracted some high-school students and their families as they contemplated their future collegiate studies. The highest attendance during any session – 103 – was when our college students and native Quad Citians updated us on their studies and research.

We wanted to make the Quad Cities a destination not just for the amateur astronomers attending the conference, but also for spouses and family members. We offered a Thursday evening hospitality suite at Stoney Creek for early arrivals to check in and receive their welcome bags and T-shirts. We expanded the event to include pre-conference tours at the John Deere Harvester Works Combine Factory and the Rock Island Arsenal Museum. We offered “Best Practices for Community Outreach” and “Astrophotography 101” classes before our planning chair, Mike Gacioch, formally kicked off the meeting. We invited attendees to bring do-it-yourself projects to share with others in the DIY and vendor room. We had quite an assortment of displays including a meteorite display, OSIRIS-REx literature, an International Dark-Sky Association display, a

book giveaway, and a collection of Voyager mission memorabilia. DIY items included an observing chair, solar filter kits, a telescope adapter for cellphone photography, and a library telescope. Astronomical trivia followed our Friday catered dinner. There was plenty of time for networking and camaraderie with fellow attendees.



NCRAL Chair Carl Wenning

We had ten speakers, beginning Friday evening with Dr. Lee Carkner of Augustana College with his program titled “A Relativistic Century: Eddington, Einstein, and the Great Eclipse.” Then Carl Wenning’s talk, “Voyages of Discovery,” provided a discussion of his literary journey over his lifetime and the impact reading has made on him. He challenged the audience to go out and do some observing and have their own voyages of discovery.

Friday evening ended with a visit to the John Deere Planetarium and Gamble Observatory on the campus of Augustana College with telescopic views of Mars, hosted by Dr. Carkner. Saturday morning began with the NCRAL business meeting at 8 a.m. Despite the early start, 35 or 40 dedicated individuals attended. We then had two more presentations before breaking for the group photo and lunch. These ex-

cellent programs were “A Discussion of Historical Tests of General Relativity Theory” by Dr. Robert Mutel of the University of Iowa, followed by “Meteorites: Messengers From Space and Time” by Dr. Paul Sipiera from the Planetary Studies Foundation, Galena, Illinois. After a foggy start Saturday morning, the skies cleared for the rest of the day, affording nice solar viewing through the PAC’s mobile observatory (PACMO) in Stoney Creek’s parking lot.

After our lunch buffet, Dr. Esteban Araya gave a program on “Voyages of Discovery in Radio Astronomy” and had some interesting demonstrations using diffraction gratings, infrared camera views of the audience, and demonstrations of spectroscopy. Dr. Robert Mitchell of St. Ambrose University then gave his talk on gravitational waves, updating us on recent discoveries in this field.

Next on the schedule were our two native Quad-Citians and current college students. Katie Melbourne, Yale University, presented “Our Coolest Stellar Neighbors: the Role of M Dwarf Stars in the Search for Earth 2.0” followed by Tiffany Fields, St. Mary’s University, Nova Scotia, who talked about “Tweeting to the Stars with the Burke-Gaffney Observatory and Learning About Galaxy Evolution Using Simula-



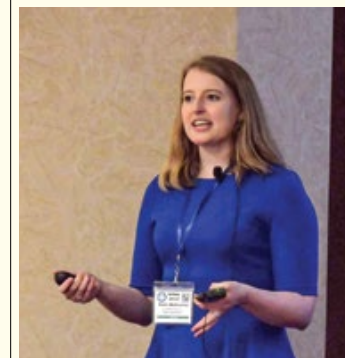
Dr. Paul Sipiera

tions.” The Burke-Gaffney Observatory is a research, educational, and outreach facility and the world’s first Twitter-con-



Group photo in front of the Popular Astronomy Club Mobile Observatory

trolled observatory. Dr. Mike Solontoi of Monmouth College presented his animated talk on “The Large Synoptic Survey Telescope: Your Own 8.4-Meter Telescope” and outlined the challenges and progress of this innovative telescope being constructed in Chile.



Katie Melbourne

At the conclusion of the Saturday evening banquet, NCRAL chair Carl Wenning took the podium to announce several regional award winners. The Newspaper Editor Award went to Bill Davidson, Rochester Astronomy Club, and the Membership Recruitment Grant was awarded to the Twin City Amateur Astronomers. The 2018 Region Award was presented to Roy E. Gustafson of the Popular Astronomy Club, and Lynda Schweikert accepted the 2019 Region Award for John Heasley, Iowa County Astronomers. Carl also announced the NCRAL logo

design winner, Terry Dufek of the Popular Astronomy Club, whose design received the most votes out of those being considered.

Dr. Steven Spangler, University of Iowa, gave the thought-provoking keynote presentation, “Different Views of the Sky; American Indian Views of Astronomy,” which delved into the connection between ancient cave drawings and astronomy. Saturday evening ended with a 40-minute drive to St. Ambrose University’s Menke Observatory to see their equipment and do some observing on a clear night.

On Sunday morning, we concluded at Bettendorf High School with a panel discussion led by Ian Spangenberg, physics instructor at Pleasant Valley High School and sponsor of an after-school astronomy club. Students discussed the perceptions that many young people have about astronomy as a hobby, including the cost for equipment, the time required, and constraints such as involvement in sports, music, and needed time for studies. Chris Like, the Bettendorf High School planetarium director, then gave us a tour of the planetarium and showed us some of the student-produced shows he uses for elementary school visits to the planetarium to learn about the

universe. That concluded NCRAL 2019.

The Popular Astronomy Club planning committee for “Voyages of Discovery: Past, Present, and Future” worked diligently to have something for everyone. We had an ambitious agenda with flexible registration fees, including the full conference with meals, the conference without meals, and low student prices. We could also accommodate requests for family members who only wanted to attend a meal or two. We accommodated several walk-in attendees at the start of the event on May 3. Time for questions was built into the schedule after every program.

Door prizes were a big part of the conference, and thanks to our sponsors, everyone was a winner. Each club received a Galileoscope to take home to their members and use for outreach. Each attendee received a padfolio as a “thank you” for coming. There were many facets to planning a conference of this size. We were gratified by the positive comments we received when it was over. Thanks to everyone who traveled to Moline, Illinois, to join us at NCRAL. See you in May in Port Washington, Wisconsin, for NCRAL 2020, hosted by the Northern Cross Science Foundation!

—Sara Sheidler



Solar viewing in the Popular Astronomy Club Mobile Observatory

Gamble, the manager of the John Deere Spreader Works. During the formative years of the Astronomical League, Mr. Gamble advocated for organizing the country’s amateur societies under one umbrella organization. The PAC is one of the 12 founding societies of the Astronomical League, and Mr. Gamble attended the first convention, held in Philadelphia in 1947.

The Astronomical League splits the country into regions, and our North-Central Region contains North and South Dakota,

agenda with so many activities that the convention had to be expanded to two and a half days. Early in our planning, we asked professors from the colleges and universities within 60 miles of the Quad Cities about their availability to do programs.

We wanted to include current college students studying astronomy, so we also contacted them. Lastly, we wanted to have a panel discussion with students to learn about their perceptions of astronomy as a hobby. A major goal of the conference planning





The assembled crowd for Saturday evening's keynote program. Photo by Tom Spirock.

## REPORT FROM STELLAFANE

The eighty-third Stellafane Convention was held on August first through fourth this year, as always at a new moon, and under mostly clear skies. Around a thousand amateur astronomers and family members made the pilgrimage to Breezy Hill. Most camped on the Springfield Telescope Makers' 85-acre site east of the original Stellafane clubhouse area.

It took a lot of work to get the Convention up and running. STM members and volunteers started arriving on the site a week or more before the public came, and did everything from cutting brush around campsites to painting buildings and mowing many acres of grass. Winter damage to roads was repaired, and fallen limbs and branches were removed. Owning a chainsaw is a major plus for prospective STM members! Maintenance work was also done on the Porter Turret Telescope, the Stellafane Schupmann Telescope, and other instruments on the site.

Much of the work, though, started months earlier, as Eileen Myers and Kris Larsen lined up an extensive list of presenters and developed the schedule. The Convention Bulletin was compiled and printed, and members prepared their own demonstrations, talks, and workshops. The web

page was updated so that attendees could register online.

This year the recently acquired Hale spectroheliograph, now housed near the clubhouse in its own building, was brought to a very high performance standard through the efforts of Matt Consideine, Dave Groski, Jim Daley, Ken Slater, and others who have painstakingly worked out many mechanical, optical, and operational kinks in this long-neglected instrument.

Somehow all this happens with little central management; when members see jobs that need doing, they just do them. It helps to have almost a century of tradition behind the operation. STM members are intensely devoted to a culture that dates back to the club's founding in 1923, after

a remarkable polymath named Russell Porter taught a group of Springfield machine tool factory workers and others to make mirrors and build telescopes.

Later Porter would be instrumental in the design of the 200-inch telescope at Mount Palomar.

This year's convention featured talks on aspects of imaging technique by Al Takeda, Tom Spirock, and Gary Walker; on ways for amateurs to contribute to real astronomical research by Brad Vietje, Mario Motta, and others; on historical topics, including Kris Larsen's talk about Margaret Burbidge; and on observing techniques by Dan Gray, Richard Berry, Richard Sanderson, Phil Harrington, Stephania and Paul Schuler, Larry Mitchell, and others.



STM Members gather for their annual Thursday night Convention dinner and meeting, in front of the Stellafane Clubhouse, a National Historic Site. Photo by Michael Patterson

Kris Larsen led fun astronomy activities for children, and Paul Fucile conducted a project workshop for teens in which participants constructed a New Horizons-inspired robotic "spacecraft" and simulated the mission's flyby of "Ultima Thule."

Despite having been up late observing on Friday, lots of folks were up very early Saturday morning for the swap tables. The club limits swap-meet sales to non-commercial individual sellers; from the beginning the Convention has always been a completely non-commercial event.

Nights were filled with the familiar star party murmur and the dim glow of red flashlights, as several dozen telescopes craned skyward and observers shared eyepieces and tales of astronomical glory with old friends and new. It's not New Mexico, but skies at Stellafane are dark for New England, and nowhere else has the historical resonance of this storied hilltop in Vermont where the first organized group of American amateur astronomers once gazed in awe at galaxies (before they were widely understood as galaxies!) and star clusters.

As always at Stellafane, amateur telescope making was an important focus, with demonstrations of every phase of mirror making, optical testing, and telescope construction. The



Dr. Alan Stern consults with a young participant in the teen robotics program. Photo by Paul Fucile.



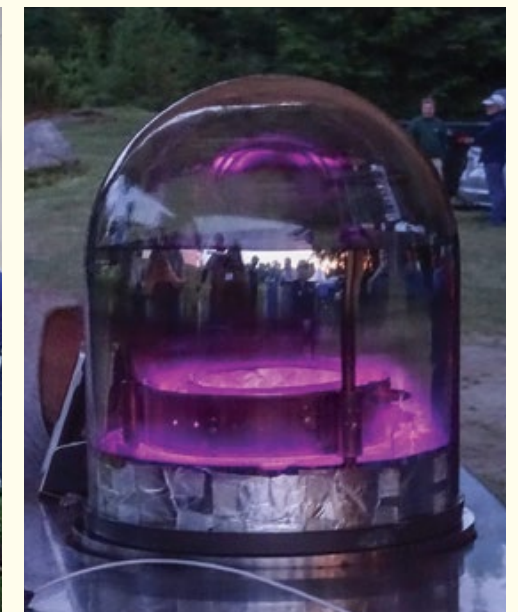
Homemade telescopes and antique restorations on the clubhouse grounds near the Stellafane Clubhouse and the Porter Turret Telescope. Photo by Richard Sanderson



Conventioners begin to ready their telescopes for the night, at the main observing field near the Breuning Observatory at Stellafane East. Photo by Ken Slater.



Alan Ward drew a crowd with his portable coating machine; he aluminized several conventioners' mirrors on site. Right: The glow of pumpdown at twilight. Photos by Patrick Dodson.





The swap tables open early Saturday morning...some people just never go to bed on Friday night! Photo by Mike Hayes.



Kids working on models of the Sun in Kris Larsen's children's workshop. Photo by Richard Sanderson



Dave Kelley preparing to test a mirror with his autocollimation flat. Photo by Doug Arion.

demos were organized by Read Predmore, with presentations by Glenn Jackson, Rick Hunter, Junie Esslinger, Phil Rounseville, Dick Parker, and Dave Kelley. Peter Pekurar demonstrated an innovative method for silvering mirrors and Alan Ward brought his amazing portable coating machine, aluminizing mirrors for several conventioners. George Roberts gave a talk about testing with the Bath interferometer, and Phil Rounseville gave some very good reasons to consider an antique design – the Gregorian – for homemade planetary telescopes. Corey Mooney gave a talk on 3D printing for ATMs.

The heart and soul of Stellafane, of course, is the homemade telescope competition. Mirror-making workshops around the country have produced a wave of very high-quality amateur-made mirrors. The optical judges, who use star testing to evaluate optical systems, had a very hard time picking a winner; when the testing and deliberations were finally over at about 1:30 in the morning, there were three Standard Class mirrors scoring well within one percent of each other in the 160-point rating scale. (There were no Master Class entries.) Steve Hannah, Mathew Paul, and George Springston tied for first place, and Steven Maiaroto came in a very close second. All of these telescopes were small Newtonians with 6-inch or 8-inch apertures. This is unusual; often amateur builders bring much larger homemade “light buckets,” but this year, small telescopes filled the clubhouse lawn, aimed at Altair for their moment of truth.

In the mechanical competition, Master Class, Joe Dechene won first place for mechanical design with his versatile wooden mount, which can easily convert from alt-az to GEM configurations, and Doug Arion won first for craftsmanship with his 200 mm

Newtonian. In the Standard Class, Patrick Dodson won a first for mechanical design for his 8-inch Newtonian reflector, and George Springston won first for craftsmanship with his 6-inch Newtonian. In the Antique Restoration competition, Dave Groski won first for his beautifully restored 1960s Criterion Dynascope Newtonian.

The big finale of the Stellafane convention is the Saturday night keynote program. In this year's nice weather it was held outdoors in the Thayer Amphitheater. The raffle prizes were awarded, including several thousands of dollars worth of eyepieces donated by Al Nagler of Tele Vue Optics, to ecstatic cheers from winners and groans from those of us with long chains of losing tickets.

Dr. Alan Stern, the principal investigator for the New Horizons mission, returned to Stellafane to give us an update on the fly-bys of Pluto and “Ultima Thule,” the bizarre contact-binary Kuiper belt object recently imaged by the probe, and left us all awaiting news of what may be next for New Horizons. A dynamic speaker, Dr. Stern very generously answered questions from a cluster of curious amateurs after the program.

People who come to Stellafane even once tend to keep coming, marking the years by Conventions – comments like “this is my forty-fourth Convention” are not uncommon among STM members and friends. Many people have large, sentimentally important collections of Convention badges and camping permit ribbons. It's a place to see people perhaps met only once a year, and to form new friendships with fellow amateurs and quite a few professionals.

—Michael Patterson

Visit [stellafane.org](http://stellafane.org) to learn more about the *Springfield Telescope Makers*, *Stellafane*, and the *Stellafane Convention*.



Steve Hannah tied for a first-place Optical Award with two other entrants. Photo by Ken Slater. Note: Mathew Paul of Florida, New York, also tied for first place; no photo is available.



George Springston also tied for first place in the Optical division, and took second place in Mechanical Design and first place for Craftsmanship as well. Photo by Ken Slater.



Patrick Dodson with his first homemade telescope, an 8-inch Newtonian. He took first place in Mechanical Design and second place in Craftsmanship. Photo by Michael Patterson.



In the Master Class, Joe Dechene won first place for Mechanical Design, second place for Craftsmanship, and an Innovative Component Award. Photo by Richard Sanderson.



In the Junior Division, Andrew Parenteau won first-place awards in Optical and Mechanical with his first homemade telescope, a 6-inch f/5 Dobsonian. Photo by Michael Patterson.



Douglas Arion won a Master Class second place award for Mechanical Design and first place for Craftsmanship, with his beautiful 120 mm Newtonian. Photo by Michael Patterson.



Some amateur astronomy luminaries at Stellafane: (left photo) Richard Berry, delivering his talk on amateur confirmation of Einstein's gravitational deflection predictions during the 2017 eclipse; (right photo) Ken Launie, Dennis Di Cicco, and Phil Harrington at the swap tables. Photos by Richard Sanderson.



## REFLECTING ON ALCON 2019

ALCon 2019 offered our members a unique opportunity to celebrate the 50th anniversary of the Apollo 11 mission. In 1969, humans landed on the Moon, and ALCon 2019 started with our attendees touring the facility from which that mission was launched. Attendees had the opportunity to view an actual launch of a rocket sent to resupply the International Space Station. A highlight of ALCon was boarding a cruise ship for the Bahamas after leaving Florida's Space Coast, making this the first Astronomical League convention to be held outside the United States.

The first full day of ALCon began with a tour of Kennedy Space Center. Attendees were able to hear a presentation by astronaut Al Worden, who piloted the Apollo 15 mission to the Moon in 1971, making him one of only 24 humans to have flown to the Earth's nearest celestial neighbor. His mission qualified him for being listed in the Guinness Book of World Records as the "most isolated human being" in history because of his time alone in the command module, Endeavour, during which he was 2,235 miles away from fellow astronauts Scott and Irwin during their time on the Moon. This distance was greater than other that of other command module pilots during lunar missions. Those attending the presentation had the pleasure of joining Worden for a photo op.

While enjoying a tour of Kennedy Space Center may have been considered a sufficient way for ALCon to celebrate the 50th anniversary of Apollo 11, attendees at ALCon were able to enjoy an unexpected gift. The launch of a SpaceX resupply mission to the International Space Station had been delayed several times over recent weeks. Attendees gathered

to witness the launch, but it was frustratingly scrubbed with less than 10 seconds to go! The next evening, however, after six delays, we found that the seventh time was the charm. Watching from various locations, Astronomical League members were able to view the rocket's launch from the Canaveral Air Station's Launch Complex 40.

The rocket rose from the launch pad and into the sky. After a few seconds it began to leave behind a white contrail that contrasted against the beautiful blue Florida skies. The rumble of the rocket engines were clearly heard as the spacecraft disappeared from view. After a few moments, the SpaceX Falcon 9 could be seen once again with its fiery engines burning, this time slowing the descent of the booster for a controlled landing on Landing Zone 1 so it could be reused. The Dragon capsule continued on its way to the ISS for SpaceX's 18th resupply mission. Moments after the booster's successful landing, a loud sonic boom was heard.

After viewing the spectacular launch, we held our annual Star-B-Que. In a tradition started by our recently deceased president, Bill Bogardus, we presented plaques to those who had received certificates in the Master Observer program and who were in attendance at ALCon. Recipients this year were Jim Ketchum, Marie Lott, David Whalen, Valorie Whalen, and Charles E. Allen III.

Kim Bogardus offered a wonderful memorial reflection about her husband. With humor and grace, she recalled many of the characteristics of our past League president. She also donated a number of items from her husband's meteorite collection for use as door prizes. These became highlights for the frequent raffle drawings and many of those who won them commented how mean-

ingful it was to them to have one of these in their own collections.

Derek Demeter, the director of the Emil Buehler Planetarium at Seminole State College of Florida, gave the keynote address. He was president of the Southeastern Planetarium Association from 2017 to 2018. A long-time member of the Astronomical League, Demeter has served as the president and observing chair of the Central Florida Astronomical Society. His keynote showcased his great skill in being able to talk to both the experienced and the novice astronomer at the same time.

On Friday morning, most of us departed the Space Coast of Florida for the Bahamas, making this the first ALCon to be held outside the United States, and the first to involve a cruise at sea. Everyone had time to enjoy both the cruise and the conference. Some presentations were offered twice to allow more flexibility in taking advantage of the ship's offerings.

Pranvera Hyseni offered our first onboard presentation by sharing her personal history and her experiences studying asteroids. Hyseni is a native of Kosovo, which was at war during her childhood. She began to develop a passion for astronomy and is now a world-renowned presence on social media advocating interest in astronomy. Dawn Davies presented a program on myths of the constellations. Al Lamperti had us donning 3D glasses to take a special tour through the universe. David Prosper shared news from the Night Sky Network. Two presentations took the form of panel discussions designed to involve participation of our members and to offer help for local clubs. League vice president Carroll Iorg moderated a panel addressing gaining and retaining members in local clubs. League president

Ron Kramer moderated a panel addressing how to diversify our club memberships.

Binocular observing was offered nightly on the helipad of the cruise ship, *Mariner of the Seas*. Our first night was a bit cloudy, but we had sufficiently clear skies during the other evenings for many to work their way through an observing list that focused on more southerly objects.

In addition to our focus on astronomy, the cruise offered the advantages of visiting the port city of Nassau and the private island of CocoCay. Food and entertainment were offered throughout the cruise, affording our members a variety of ways to enjoy each other's company. For many of us who attend ALCons frequently, lifelong friendships have been established over the years. For first-time attendees, and for those who attend ALCon infrequently, this aspect of ALCon 2019 offered ways to begin what we hope will become new lifelong relationships.

ALCon 2019 had been the dream of our late president, Bill Bogardus. He believed we needed to commemorate the 50th anniversary of Apollo 11 in a unique and meaningful way. It was Bill Bogardus who had the vision for an ALCon that started at Kennedy Space Center and which included a cruise to the Bahamas. ALCon 2019 was the fulfillment of his vision.

—Dr. W. Maynard Pittendreigh

## FROM ALCON 2019: HOW TO GAIN AND RETAIN NEW MEMBERS

Local clubs are the backbone of the Astronomical League. Membership matters, and it is in each club's interest to consider how to build membership.

"How to Gain and Retain New Members" was the subject of two panel discussions at ALCon 2019.

Panelists included this year's Horkheimer Youth Service Award winner Tyler Hutchison, Astronomy Outreach of Kosovo founder Pranvera Hyseni, Astronomical Society of the Pacific program manager David Prosper, and past League president Chuck Allen. Carroll Iorg moderated the discussions, which generated great ideas on how to grow your club's membership:

1. Appoint a membership chair and devote a club meeting to the subject of winning and keeping new members.

2. Make meetings more appealing. Dump the business portion. Serve refreshments and create interpersonal greeting time. Adopt the Astronomy Society of Kansas City's "Astronomy 101" idea – a short 10- to 20-minute pre-program dedicated to basic astronomy.

3. Get your club on social media, and post and comment regularly.

4. Don't ignore visitors! Have designated greeters who are good with people. Appoint a "sergeant-at-arms" whose job is to see that new members are welcomed. Don't ask about visitors' work lives. Instead, ask how they got interested in astronomy, how they found your club, and what kind of astronomy activities interest them. Suggest ways they can contribute to the club.

5. Wear name tags at all meetings. Even some of your long-standing members don't know everyone's names.

6. Follow up! Any professional with clients knows that follow-up is survival. Get visitors' contact information and write or email them after the meeting thanking them for coming and encouraging them to return. Let them know about upcoming activities. Have several people write them, if possible.

7. Give star party visitors a memento of their visit – a trifold, a meteorite sample, a pair of eclipse glasses, a calendar of upcoming events. Get contact information, thank them for attending, and encourage them to come to a meeting. Send them pictures taken at the event.

8. Prepare new member packages. Include a club trifold; a calendar of events; a membership application (or web address where they can join); a club pen, patch, or t-shirt; and contact information for club officers. If you can afford it, give them some astronomy materials like a booklet, a red light, or a small planisphere.

9. Create free associate memberships for students. The value of having young people in aging clubs vastly outweighs the loss of dues income.

10. Understand that people join astronomy clubs for different reasons, including to lead, to socialize, to teach, and to tinker (for example, imaging, telescope building, and information technology). Once you know what they desire from your club, find opportunities that satisfy those desires.

11. Create easy online membership application and dues payment options. People are more impulsive and quicker to make purchases online.

12. Get on television. Two brief 6 a.m. morning show appearances once brought 5,000 people to a Perseids event...in the rain!

13. Conduct a Student Night. Get permission to put notices in high school and university science classes, school papers, libraries, and museums, and put a small ad in the newspaper. Post similar notices about your public Moon, Mars, Jupiter, Saturn, transit, eclipse, meteor, and comet watches.

14. Create colorful club posters. Get permission to post them permanently in high school classrooms, university labs and commons areas, libraries, and museums.

15. Anticipate parental concerns over minor children being with people they don't know at remote observing locations. Provide names and background information on adults who will be present along with contact information.

16. Contact members who don't renew. Tell them they're missed and invite them back.

17. Register your club with Night Sky Network. One club received nine requests for library programs in one month through NSN alone.

18. Consider a telescope loan program. Better yet, consider a small telescope or binocular giveaway program contingent on continued membership and outreach participation. One club finds used binoculars for sale at thrift shops and makes them available to new members.

19. Have interesting programs at your meetings. Consider programs with authors and astronomers. Invite local professors or grad students. Bring in key members from nearby clubs. Seek programs from people and organizations having tangential relationships with astronomy – science fairs, ophthalmologists, engineering firms, NASA, teachers, math societies, and the like.

20. Submit articles and photos about club activities and member accomplishments to your local newspaper's Metro and Science editors. If they use them...boom...huge publicity for your club.

21. Ask inactive members to participate on committees or work on projects. Involved members are happy members.

22. Send questionnaires to your members that can be returned anonymously, or employ a survey platform like Google Forms or SurveyMonkey. Ask what aspects of club meetings, observations, and activities your members like and don't like. Ask what changes they would recommend. You'll get painfully frank responses, but you'll learn a lot.

23. Consider whether your by-laws should impose term limits. Depending on personalities, if officers rule in perpetuity, clubs may seem closed and unappealing to those wishing to become involved.

24. Try to include well-known people in your major outreach activities. Invite a researcher, politician, or author to one of your major star parties, or find a sponsor and invite someone famous to speak at a public forum where your club will be seen.

25. Conduct meetings devoted entirely to new members, basic astronomy, and instruction on the use of their telescopes.

26. Have annual picnics and dinners where the entire focus is socialization and where the spouses and children of members will feel equally comfortable.

Membership matters, so give these ideas a try. You've got everyone to gain!

—Chuck Allen

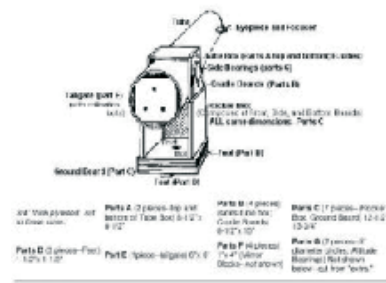
# ALCon Jr. 2020 STEAM Conference

for families and students  
(activities in the works)



Telescope Making Workshop with Rob Teeter of Teeter's Telescopes

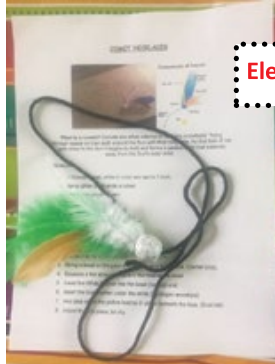
Six-inch Telescope Overview with Plywood Cut Pattern



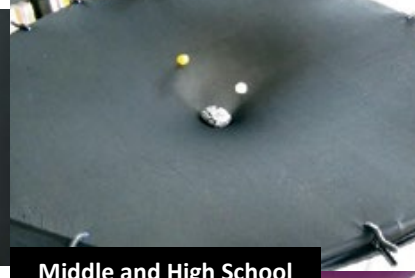
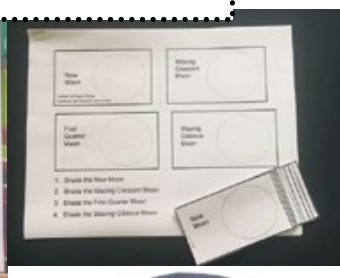
Observing and sky advocacy activities



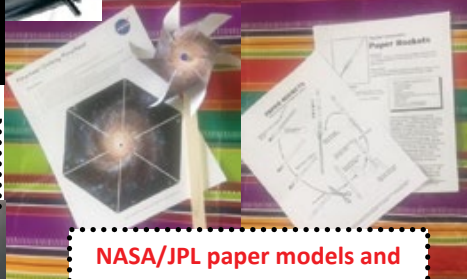
Globe @ Night



Elementary activities

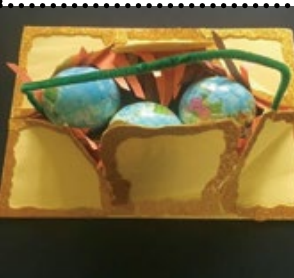


Middle and High School activities



NASA/JPL paper models and other activities

Tactile activities for other abled attendees



dome movies

Astro Graphic Novels - Comic Books



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- \*Moon Phases \*Meteor Showers \*Planetary Oppositions
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- \*Some Star Parties \*Fall and Spring Astronomy Days \*Some Regional Meetings \*Dues and AL Award Submission Reminders
- \*ALCON 2020 and \*ALCon Jr. Information \*AL Observing Program Progression Guidelines \*Executive Board Contact Information and \*Regional Representative Information

## Coming Events

**SEPT. 21-29 Okie-Tex Star Party**  
Kenton, Oklahoma  
Oklahoma City Astronomy Club  
[www.okie-tex.com](http://www.okie-tex.com)

**SEPT. 25-29 Acadia Night Sky Festival**  
Mount Desert Island, Maine  
[acadianightskyfestival.com](http://acadianightskyfestival.com)

**SEPT. 26-28 Great Basin National Park Astronomy Festival**  
Baker, Nevada [nps.gov/grba/planyourvisit/astronomy-festival.htm](http://nps.gov/grba/planyourvisit/astronomy-festival.htm)

**SEPT. 26-28 Illinois Dark Skies Star Party**  
Jim Edgar Panther Creek State Fish and Wildlife Area, Illinois [sas-sky.org](http://sas-sky.org)

**SEPT. 26-29 Great Lakes Star Gaze**  
Gladwin, Michigan [greatlakesstargaze.com](http://greatlakesstargaze.com)

**SEPT. 26-29 Heart of America Star Party**  
Butler, Missouri [hoasp.askc.org](http://hoasp.askc.org)

**SEPT. 27-29 Hidden Hollow Star Party**  
Hidden Hollow Camp, Ohio  
[wro.org/?page\\_id=7](http://wro.org/?page_id=7)

**SEPT. 27-29 Idaho Star Party**  
Bruneau State Park, Idaho  
[boiseastro.org/isp.html](http://boiseastro.org/isp.html)

**OCT. 18-20 Bays Mountain StarFest**  
Bays Mountain Park, Kingsport, Tennessee  
[baysmountain.com/astronomy/astronomy-club/?GTabs=4#starfest](http://baysmountain.com/astronomy/astronomy-club/?GTabs=4#starfest)

**OCT. 20-27 Peach State Star Gaze**  
Deerlick Astronomy Village, Georgia  
[atlantaastronomy.org/PSSG](http://atlantaastronomy.org/PSSG)

**OCT. 21-26 Eldorado Star Party**  
X-Bar Ranch, Eldorado, Texas  
[eldoradostarparty.org](http://eldoradostarparty.org)

**OCT. 21-27 Staunton River Star Party**  
Scottsburg, Virginia  
[stauntonriver-starparty.org](http://stauntonriver-starparty.org)

**OCT. 22-26 Enchanted Skies Star Party**  
Socorro, New Mexico [enchantedskies.org](http://enchantedskies.org)

**OCT. 22-27 Deep South Regional Star Gaze**  
White Horse Christian Retreat Camp, Mississippi [stargazing.net/dsrsg](http://stargazing.net/dsrsg)

**OCT. 24-27 Nightfall**  
Borrego Springs, California  
[nightfallstarparty.com](http://nightfallstarparty.com)

**OCT. 24-26 Chiefland Star Party**  
Chiefland, Florida  
[chieflandstarpartygroup.com](http://chieflandstarpartygroup.com)

**OCT. 25-26 Kopernik AstroFest**  
Vestal, New York [kopernikastro.org/astrofest](http://kopernikastro.org/astrofest)

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## Staunton River Star Party - Fall 2019

[IDA Dark Park](http://IDA Dark Park)

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Scottsburg, VA (near South Boston)

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# GALLERY

MEMBER ASTROPHOTOGRAPHS

*All photos © 2019 by their respective creators.*

Jeff Ball (Ohio Valley Astronomical Society) took this image of the Rho Ophiuchi to Pipe Nebula area from the Green Bank Star Quest using a ZWO ASI294MC camera with a 85 mm f/1.4 Rokinon lens. This result consists of two panels, each with two hours of exposure.



Steven Bellavia (Amateur Observers' Society of New York) took this image of Lynds Bright Nebula 468 from Cherry Springs State Park using a Borg 90FL f/4 astrograph with a ZWO ASI183MM Pro CMOS camera on a Celestron AVX mount.



Kurt Kimbrell (Texas Astronomical Society) took this image of M33 using a GSO RC6 with an Astro-Physics AP-CCDT67 reducer and ZWO ASI1600MM-Cool CMOS camera.

## New Award Programs

By Dr. Aaron Clevenson,  
Observing Program Director

Since the first award was issued on January 1, 1967, over 15,000 observing certificates have been issued by the Astronomical League, in 68 different Observing Programs. This past year has seen the addition of some great new opportunities for our members. These include the addition of a Mentor Certification for those members who have made a special effort to welcome and introduce the hobby to new members, a new program to encourage participation in citizen science and to recognize those who make contributions, two new Observing Programs (Spectroscopy and Multiple Star), and a Special Observing Award for the November Mercury Transit.

Citizen Science is recognizing 100 (bronze), 500 (silver), and multiples of 1000 (gold) contributions to various citizen science projects outside of the Astronomical League. Included are two types of contributions: active projects such as those found in Zooniverse, and observing projects that go beyond the observing requirements of some of our existing Observing Programs.

A Spectroscopy Observing Program has been added to go beyond the Stellar Evolution Observing Program (a prerequisite). This does require the use of a spectroscope and involves capturing spectra of various star classes and other objects.

A Multiple Star Observing Program has been added to go beyond the Double Star Observing Program (a prerequisite). This program involves measuring the separations and position angles of the stars in the groupings.

There are Observing Programs to meet anyone's goals and passions, novice to expert, naked-eye to telescope and special equipment, visual and imaging. Which one will you tackle next? Haven't done one yet? Then which one will you try? More information on all of the opportunities is in the "Observe" section of the AL website in the alphabetical listing: [astroleague.org/al/obsclubs/AlphabeticObservingClubs.html](http://astroleague.org/al/obsclubs/AlphabeticObservingClubs.html).

## Top Award Finishers for 2019

By Carroll Iorg, Vice President

It is my honor to recognize the top award finishers for 2019.

### NATIONAL YOUNG ASTRONOMER AWARD

First- and second-place winners in the National Young Astronomer Award program received a trip to ALCon 2019 and the related cruise, as well as one of Explore Scientific's fine telescopes. Thanks to Scott Roberts, CEO and president of Explore Scientific, for his long-time support of the program.

The top finisher for 2019 is **Ashini Modi**. Ashini is from Shreveport, Louisiana, and will be in 10th grade this fall at Caddo Magnet High. She was nominated by Dr. Roy C. Parish, professor emeritus of the University of Louisiana and past president of the Shreveport-Bossier Astronomical Society.

Her research was titled "A Search for Exoplanets in High Metallicity Open Clusters Using a Large-Scale Photometric Algorithm."

From her conclusions: "My research has led to the discovery of seven new exoplanet

candidates and has shown that exoplanets can form and exist in clusters of stars, furthering the scientific understanding of planetary formation in crowded and overpopulated environments. These discoveries may impact the scientific community's understanding of sustainability of large planets in unsuitable conditions. We conclude that exoplanets, especially Hot Jupiters similar to the ones discovered in this research, are cosmic extremophiles, and can survive in much harsher conditions than previously believed.

"We conclude that the high metallicity of the stars in the open clusters provides elements and materials needed to form exoplanets, and that exoplanets are just as prevalent around clustered stars as they are around isolated stars. We theorize that planets can form in densely packed stellar environments, but that due to gravitational stellar interactions, planetary ejection and migration from the open clusters can occur later in their lifetimes."

Second place for the 2019 National Young Astronomer Award went to **Isaac Broudy**, an incoming senior at Bonita Vista High School in Chula Vista, California.

He is an aspiring astrophysicist and amateur astronomer. His passion for astronomy and physics stems from a young age when he had the opportunity to visit the Kennedy Space Center and meet with astronauts, learn about astronomy and telescopes, and most importantly, see the Orion spacecraft launch!

Isaac has also spent the last three years working in Dr. Brian Keating's experimental cosmology lab at the University of California, San Diego. In doing so, he has worked with a variety of telescopes, learned about astronomy and physics, and fostered a strong

passion for the subject.

He has won first place for the past three years in the Greater San Diego Science and Engineering Fair in the Physics and Astronomy section.

Isaac is president of his high school's astronomy club. In the club, they image with different telescopes and are currently making their own telescope. Additionally, the club spreads interest in astronomy and astrophysics to local high-schoolers and the public. He is also president of his school's robotics club and a member of the San Diego Astronomy Association.

The title of his research project was "Testing Special Relativity with High-Resolution Differential Photometry of Eclipsing Binary Star Systems." The study hypothesized that light of differing wavelengths produced from distant stars will travel at different speeds because of interactions with either the interstellar medium or quantum vacuum. This study demonstrated that, at high precision, over astronomical distances, the speed of light remained constant at all wavelengths of light; there were no significant differences measured beyond the 95% confidence interval for each eclipse timepoint.

### HORKHEIMER YOUTH AWARDS

A big thanks to Dwight Horkheimer for his continuing his support of the Horkheimer Youth Awards, with plaques and monetary awards! Also, Celestron, Inc., is an important supporter of the program.

### Horkheimer/Smith Service Award

The first-place Horkheimer/Smith Service Award winner is **Tyler McLean Hutchison**. Tyler just finished his high school career at St. Christopher's School in Richmond, Virginia, where he lives. Tyler will receive a gener-

ous cash award from the Dwight Horkheimer Foundation, plus other prizes.

In addition to taking multiple Advanced Placement and honors courses during high school, he served as editor of the school's yearbook and photographer for the student newspaper and was a founding member of the Saints for Environmental Awareness and Action.

His educational achievements outside of school included Virginia Space Grant Consortium participant, Virginia Earth System Science Scholars, VASTS Summer Academy at NASA Langley Research Center, Virginia Space Coast Scholars Summer Academy at NASA Wallops Island, Massachusetts Institute of Technology's SPLASH program, and Virginia Regional High School Science Bowl 2018 team captain.

Tyler's extensive community involvement includes being elected an at-large board member for the Richmond Astronomical Society, presenting at one of the society's monthly meetings, interning for three years at the Science Museum of Virginia, serving as a volunteer exhibitor for Astronomy Day at the Science Museum of Virginia, interning for the Science Museum of Virginia's climatology program, implementing a recycling program at the Canterbury Recreation Association, presenting on astrophotography at the

Richmond Photography Meetup Group, and being chosen by ABC News, New York, as the subject for the pilot of a new series about America's Amazing STEM Teens, which went into preproduction in early 2019.

Tyler was the 2018 first-place winner of the Astronomical League's Horkheimer/D'Auria Youth Service and Horkheimer/Parker Youth Imaging Awards.

#### Horkheimer/D'Auria Youth Service Award

The first-place winner of the Horkheimer/D'Auria Youth Service Award is **Hubert Eubanks**.

He will be a fourth-grader this school year at Evans Elementary School in Evans, Georgia. The essence of his exceptional work with the Astronomy Club of Augusta, Georgia, is captured in these comment excerpts from the sponsor, Kenneth Beard, vice president of programs for the club.

"His mother has discovered that she has an exceptional son with an early and exceptional interest in science.

"The Astronomy Club of Augusta services the Central Savannah River Area that includes Aiken, South Carolina, and Augusta, Georgia, by doing community outreach especially related to astronomy. His mother contacted us.

"I believe that we are trying to give him an outlet for his interest and reward him when he completes some tasks. He has presented a light show exhibit at one of our past sponsors/collaborators, the University of South Carolina at Aiken's Ruth Patrick Science Education Center. He has given a lecture to our club membership on the same subject. We have tried to keep him busy but

not overworked.

"We appreciate that you have allowed us to recommend him for this prestigious formal recognition."

#### Horkheimer/Parker Youth Imaging Award

**Vivek Vijayakumar** is the first-place winner for 2019.

Vivek imaged NGC 2174, the Monkey Head Nebula, during late December 2018 and early 2019 from his home town of San Marcos, California. He is a junior at San Marcos High School. His equipment included an 8-inch Newtonian Celestron, CEM 60, ASI1600MM, and S-II, H-alpha, and O-III filters.

Vivek is a youth member-at-large of the Astronomical League.

#### Horkheimer/O'Meara Youth Journalism Award

**Nicholas Bauer** is the first-place winner of the Horkheimer/O'Meara Youth Journalism Award.

He hails from Rochester, Minnesota. His sponsor, Julie Gawarechi, is treasurer of the Rochester Astronomical Society. Nicholas is homeschooled and will be in eighth grade in the fall.

#### WEBMASTER AWARD

**Jim Hendrickson** from the Amateur Astronomical Society of Rhode Island has been awarded first place in the webmaster competition.

He has been the webmaster and the editor of his society's newsletter, *The Skyscraper*, for about 17 years. The website URL is [theskyscrapers.org](http://theskyscrapers.org).

#### MABEL STERNS NEWSLETTER AWARD

The first-place winner for the Mabel Sterns Award for outstanding society newsletter is **Marcia Young**, editor of the *Cosmic Messenger* for the Astronomical Society of Kansas City.

She has been the newsletter editor for more than 15 years

and continues to make significant improvements every year.

The *CM*, as it is called, is appealing to the eye and is organized in a way that makes it easy to read and easy to find monthly articles. Marcia's skills have also been crucial to adapting the *Cosmic Messenger* from a print to digital format.

The newsletter includes numerous segments that make it valuable to the society's 650+ members, including regularly featured articles by ASKC members, magazine and forum membership subscription information, the calendar of society events, and the newly added "Members' Corner."

The Members' Corner provides newer members with basic information on telescopes in addition to the history, structure, and activities of the club. In addition, there are monthly columns from the president, observatory directors, "Our Vintage Skies," and a column from Astronomical League Observing Award chair Scott Kranz on the League's observing programs and hints on working on them. All of this is complemented by articles from members and outside contributors to catch the interest of society members.

Marcia's professional experience, her dedicated efforts, and her on-time publication of the newsletter are wonderful assets for the Astronomical Society of Kansas City.

#### ASTRONOMICAL LEAGUE SKETCHING AWARD

The first-place winner of the Astronomical League Sketching award is **Gerry Kocken** from the Neville Public Museum Astronomical Society in Green Bay, Wisconsin.

His excellent 2018 sketching project is his first attempt at sketching at the eyepiece, and he chose the Moon's craters for this project.

## Observing Awards

#### Active Galactic Nuclei Program

No. 18-V, **Mark Bailey**, Member-at-Large

#### Advanced Binocular Double Star Observing Program

No. 33, **Paul Byrne**, Member-at-Large

#### Arp Peculiar Galaxies Northern Observing Program

No. 0-V, **John Wagoner**, Texas Astronomical Society of Dallas

#### Arp Peculiar Galaxies Southern Observing Program

No. 17-I, **Dan Crowson**, Astronomical Society of Eastern Missouri

#### Asterism Observing Program

No. 50, **Thomas Gazzillo**, Chesmont Astronomical Society

#### Astronomy Before the Telescope

No. 1, **Aaron Clevenson**, North Houston Astronomy Club

#### Beyond Polaris

No. 27, **Alfred Schovanez**, Astronomical Society of Eastern Missouri; No. 28, **Joseph Hannigan**, Member-at-Large; No. 29, **Doug Lively**, Raleigh Astronomy Club; No. 30, **Kiefer Iacaruso**, Harford County Astronomical Society

#### Binocular Double Star Observing Program

No. 147, **Alfred Schovanez**, Astronomical Society of Eastern Missouri; No. 148, **Larry M. Elsom**, Member-at-Large; No. 149, **Paul Byrne**, Member-at-Large

#### Binocular Messier Observing Program

No. 1162, **Jim Michnowicz**, Raleigh Astronomy Club; No. 1163, **Lynn Ward**, Neville Public Museum Astronomical Society; No. 1164, **Larry M. Elsom**, Member-at-Large; No. 1165, **Tom Gazzillo**, Chesmont Astronomical Society

#### Binocular Variable Star Observing Program

No. 33, **Neil Simmons**, Member-at-Large; No. 34, **Valorie Whalen**, Atlanta Astronomy Club; No. 35, **Paul Harrington**, Member-at-Large

#### Bright Nebula Observing Program

No. 14, **Roy Troxel**, Basic, Member-at-Large

#### Caldwell Observing Program

SILVER AWARDS

No. 256, **James Bruce McMath**, Central Arkansas Astronomical Society; No. 257, **Jarret Lingle**, Mason Star Gazers; No. 258, **Robert B. Harrison**, Patron Member; No. 259, **Bill Bond**, Omaha Astronomical Society; No. 260, **Wayne E. Frey**, Imperial Polk Astronomical Society

#### Carbon Star Observing Program

No. 99, **D. Keith Lawrence**, Vermont Astronomical Society; No. 100, **Gerard Jones**, Minnesota Astronomical Society; No. 101, **Charles E. Allen**, Evansville Astronomical

Society; No. 102, **Dee Friesen**, Albuquerque Astronomical Society; No. 103, **Juan Valasquez**, Denver Astronomical Society; No. 104, **Roger Joyner**, Greensboro Astronomy Club

#### Citizen Science Observational

**Steve Boerner**, Variable Stars Silver, Member-at-Large

#### Comet Observing Program

No. 109, **Mike Myer**, Silver, Astronomical Society of Kansas City

#### Constellation Hunter Observing Program (Northern Skies)

No. 221, **Jeffrey G. Hiscock**, Member-at-Large; No. 222, **John Strebeck**, St. Louis Astronomical Society; No. 223, **Brad Nessel**, Minnesota Astronomical Society; No. 224, **Scott Cadwallader**, Baton Rouge Astronomical Society; No. 225, **David Collings**, Echo Ridge Astronomical Society; No. 226, **Sam Pitts**, Temecula Valley Astronomers; No. 227, **Keith Kleinstick**, Member-at-Large

#### Deep Sky Binocular Observing Program

No. 407, **Bernard Venasse**, Member-at-Large

#### Double Star Observing Program

No. 621, **Rakhal Kincaid**, Haleakala Amateur Astronomers; No. 622, **Edgar G. Fischer**, Albuquerque Astronomical Society; No. 623, **Bruce Scodova**, Richland Astronomical Society; No. 624, **Michael C. Neal**, Echo Ridge Astronomical Society; No. 625, **Michael McShan**, Oklahoma City Astronomy Club; No. 626, **Mark Mitchell**, Delaware Astronomical Society; No. 627, **Alfred Schovanez III**, Astronomical Society of Eastern Missouri; No. 628, **Roger D. Joyner**, Greensboro Astronomy Club; No. 629, **David E. Cooper**, The Astronomy Connection; No. 630, **Sean Neckel**, Flint River Astronomy Club; No. 631, **Scott Azmus**, Member-at-Large

#### Galileo Observing Program

No. 52, **Bernie Venasse**, Telescopic, Member-at-Large; No. 53, **James Zappa**, Telescopic, Member-at-Large; No. 54, **Peter Detterline**, Binocular, Member-at-Large; No. 55, **Jonathan Poppele**, Binocular, Minnesota Astronomical Society

#### Globular Cluster Observing Program

No. 325-V, **Mike Myer**, Astronomical Society of Kansas City; No. 326-V, **Wayne E. Frey**, Imperial Polk Astronomical Society; No. 327-I, **Jack Fitzmier**, Member-at-Large; No. 328-V, **Bernie Venasse**, Lifetime Member; No. 329-V, **Fernando Torres**, Albuquerque Astronomical Society; No. 330-V, **Jeff Willson**, Rose City Astronomers

#### Herschel 400 Observing Program

No. 602, **Edgar G. Fischer**, Albuquerque Astronomical Society; No. 603, **Cindy L. Krach**, Haleakala Amateur Astronomers; No. 604, **Bill Jones**, Astronomical Society of Eastern Missouri; No. 605, **Jarret Lingle**, Mason Star Gazers; No. 606, **Jeff Wilson**, Rose City Astronomers; No. 607, **Fernando Torres**, Albuquerque Astronomical Society; No. 608, **Carl Stanley**, Member-at-Large

#### Herschel II Observing Program

No. 106, **Mark Simonson**, Device-Aided, Everett Astronomical Society; No. 107, **Paul Harrington**, Manual, Member-at-Large

#### Lunar Observing Program

No. 1024, **Ozgar Aklas**, Tri-Valley Star Gazers; No. 1025, **John Cassidy**, Ventura Astronomical Society; No. 1026, **Keith Northon**, Minnesota Astronomical Society; No. 1027, **Bruno Pancorbo**, Member-at-Large; No. 1028, **Reba Cain**, Mountain Astronomical Research Region

#### Lunar II Observing Program

No. 98, **Brian McGuinness**, Northern Colorado Astronomical Society; No. 99, **Charles E. Allen III**, Evansville Astronomical Society

#### Mars Observing Award

No. 4, **Vincent Giovannone**, Member-at-Large

#### Master Observer Award

BINOCULAR MASTER OBSERVER AWARD

**Rob Ratkowski**, Haleakala Amateur Astronomers

MASTER OBSERVER

No. 223, **John Wagoner**, Texas Astronomical Society of Dallas; No. 224, **Scott Azmus**, Member-at-Large; No. 225, **Fernando Torres**, Albuquerque Astronomical Society

MASTER OBSERVER – GOLD

**Rodney Rynearson**, St. Louis Astronomy Club

#### Messier Observing Program

No. 2696, **Bernard Venasse**, Honorary, Member-at-Large; No. 2800, **Alan Snook**, Honorary, Member-at-Large; No. 2804, **Paul Pulaski**, Honorary, Albuquerque Astronomical Society; No. 2807, **Don Martin**, Honorary, Von Braun Astronomical Society; No. 2808, **Robert J. Olsen**, Regular, Member-at-Large; No. 2809, **Joe Timmerman**, Honorary, Minnesota Astronomical Society; No. 2810, **Sam Finn**, Regular, Central Pennsylvania Observers; No. 2811, **Tom Nelson**, Regular, Tucson Amateur Astronomy Association; No. 2812, **Gus Gomez**, Honorary, Tucson Amateur Astronomy Association; No. 2813, **Robert Harrison**, Honorary, Patron Member-at-Large

#### Meteor Observing Program

No. 189, **David Whalen**, 12 hours, Atlanta Astronomy Club; No. 192, **Charles E. Allen III**, 6 hours, Evansville Astronomical Society

#### NASA Observing Challenge – Apollo 50th

**Aaron Clevenson**, North Houston Astronomy Club; **Loyd Overcash**, North Houston Astronomy Club; **Robert Togni**, Central Arkansas Astronomical Society; **Mark Simonson**, Everett Astronomical Society; **Scott Cadwallader**, Baton Rouge Astronomical Society; **Jim Michnowicz**, Raleigh Astronomy Club; **John Strebeck**, St. Louis Astronomical Society; **Kathleen Strebeck**, Member-at-Large; Tom Doyle, Member-at-Large; **Frankie Dunne**, Member-at-Large, **Brian Kelly**, Member-at-Large; **Lorna Kelly**, Member-at-Large; **Bonnie Orlando**, Member-at-Large; **Willem Weber**, Member-at-Large; **Willow Weber**, Member-at-Large

#### Nova Observing Program

No. 8, **Bradley E. Schaefer**, Gold, Baton Rouge Astronomical Society

#### Outreach Observing Award

No. 828-M, **James Wooten**, Fort Bend Astronomy Club; No. 915-S, **Irwin Horowitz**, Boise Astronomical Society; No. 926-M, **Aneesa Haq**, Fort Bend Astronomy Club; No. 1021-M, **Ed Magowan**, Escambia Amateur Astronomers Association; No. 1122-M, **Pamela Shivak**, Member-at-Large; No. 1124-0, **Gisela Esteve**, Fort Bend Astronomy Club; No. 1125-0, **Adam England**, Prescott Astronomy Club; No. 1126-5, **Bradley Nasset**, Minnesota Astronomical Society; No. 1127-0, **Charles Dean Covey III**, Escambia Amateur Astronomers Association; No. 1127-5, **Charles Dean Covey III**, Escambia Amateur Astronomers Association; No. 1128-0, **Kristin Hendershot**, Member-at-Large; No. 1129-M, **Jim Erwin**, Naperville Astronomical Association; No. 1130-0, **Sam Finn**, Central Pennsylvania Observers; No. 1131-0, **Sam Pitts**, Temecula Valley Astronomers; No. 1132-0, **William Arden**, Central Pennsylvania Observers; 1133-M, **Tom Bennett**, Member-at-Large; No. 1134-M, **Randy Shivak**, Member-at-Large; No. 1135-0, **Barton Meeks**, Raleigh Astronomy Club

**Radio Astronomy Observing Program**

No. 26-B, **David Whalen**, Atlanta Astronomy Club; No. 27-B, **W. Maynard Pittendreigh**, Brevard Astronomical Society; No. 22-5, **David Whalen**, Atlanta Astronomy Club

#### Radio Astronomy Observing Program

No. 26-B, **David Whalen**, Atlanta Astronomy Club; No. 27-B, **W. Maynard Pittendreigh**, Brevard Astronomical Society; No. 22-5, **David Whalen**, Atlanta Astronomy Club

#### Sketching Observing Award

No. 34, **Kevin C. Carr**, Minnesota Astronomical Society

#### Sky Puppy Observing Program

No. 61, **Gavin Sijanskj**, Houston Astronomical Society

#### Solar System Observing Program

No. 136, **Janet Pullen**, Island County Astronomical Society; No. 137, **Brian Chopp**, Neville Public Museum Astronomical Society; No. 138, **Denise Moser**, Astronomical Society of Kansas City; No. 139, **Jack Fitzmier**, Member-at-Large; No. 140-B, **Rob Ratkowski**, Haleakala Amateur Astronomers; No. 141, **Charles E. Allen III**, Evansville Astronomical Society; No. 142, **Michael Blase**, Olympic Astronomical Society

#### Southern Sky Telescopic Observing Program

No. 59, **Joe Timmerman**, Minnesota Astronomical Society

#### Sunspotters Observing Program

No. 196, **Charles E. Allen III**, Evansville Astronomical Society

#### Two in the View Observing Program

No. 36, **Joe Timmerman**, Minnesota Astronomical Society

#### Universe Sampler Observing Program

No. 138, **Marilyn Perry**, Telescopic, Member-at-Large

#### Variable Star Observing Program

No. 33, **Preston Pendergraft**, Member-at-Large



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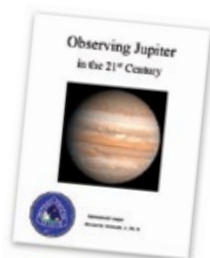
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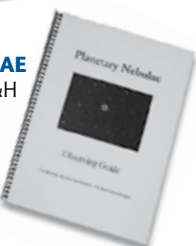
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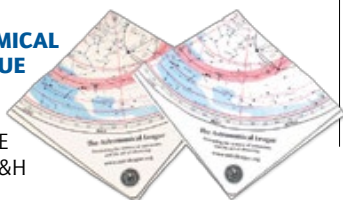
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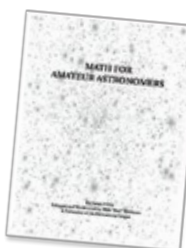
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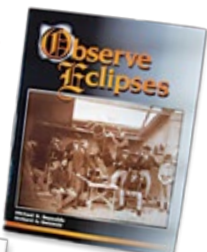
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# NATIONAL YOUNG ASTRONOMER AWARD WINNERS: WHERE ARE THEY NOW?

The Astronomical League started issuing National Young Astronomer Awards in 1993. Have you ever wondered what became of these young folks and where are they now? Mark Moretto was awarded the National Young Astronomer Award for his work titled "Deep Impact Spectral Observations of Naturally Occurring Mini-Outbursts" at ALCon 2013 in Atlanta, Georgia.

By Al Lamperti

As part of a high school science research program, Mark Moretto began working with the Small Bodies Group at the University of Maryland (UMD). Upon graduation, he began his undergraduate studies and continued his research at UMD, continuing to work with the Small Bodies Group analyzing infrared spectra acquired by NASA's Deep Impact mission.

The focus was "to better understand the distribution and composition of volatiles in Comet Tempel 1's coma and how they vary with time, as well as in the ejecta cloud created by the impact experiment." His research and conference travel were funded by NASA Planetary Data Systems.

At UMD, Mark pursued bachelor's degrees in aerospace engineering and astronomy. For his honors thesis, he conducted anchoring experiments in cometary simulant and compared terrestrial anchoring mechanics theory to the results of these experiments. He found traditional anchoring theory does not apply to highly porous, under-dense media, such as that found on a comet.

He continued as an intern at the Jet Propulsion Lab (JPL) in the Instrument & Data Systems Operations group during his junior year as an undergraduate. At JPL he "tested and expanded the Open-Source Multi-Instrument Analysis System (OMINAS), the open-source version of Cassini's MINAS." He refined and created example scripts and products, wrote additional functions, and provided feedback on functionality, documentation, usability, and installation.

He graduated summa cum laude from UMD in 2017 with two degrees.

He is currently working on his PhD in aerospace engineering at the University of Colorado Boulder. As a NASA Space Technology Research Fellow, he is studying "spacecraft dynamics about active comets and spacecraft drag modeling." He is using analytical techniques and numerical simulations to gain insights about the highly per-

turbed dynamic environment surrounding active comets. He is looking to leverage these dynamics for science and engineering applications.

As an intern in the Navigation and Mission Design Branch of NASA's Goddard Space Flight Center, Mark demonstrated "next-generation navigation filter capabilities in the context of satellite proximity operations and rendezvous with uncooperative clients." He also applied his PhD research to characterize and provide drag acceleration estimates for the CAESAR mission

He was also a coauthor on the paper "Simultaneous Localization and Mapping for Satellite Rendezvous and Proximity Operations Using Random Finite Sets," which was presented at the same conference.

Michael A'Hearn, a Distinguished University Professor Emeritus of astronomy at UMD who collaborated with Mark, stated that "Mark is one of the most remarkable students I have encountered in my career for his combination of both ability and purpose." ★

Most recently he presented a paper, "Attitude Dependent Evolution of Orbits About Active Comets," at the American Astronomical Society and American Institute of Aeronautics and Astronautics Space Flight Mechanics Meeting in Hawaii.

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