



Ephemeris

The Official Newsletter of the Prescott Astronomy Club (PAC)

e-phem-er-is: a time-based listing of future positions of solar system objects.

50th Anniversary Special Edition

July-August 2024

A Brief Look Back at the Prescott Astronomy Club over the last 50 Years

By Art Arnold-Roksandich

In September of last year, the PAC Board of Directors went looking for our founding documents. While searching, we uncovered an old PAC web page, with a banner that said “Founded in 1974.” This makes 2024 our 50th year. Wow, perhaps we should celebrate. We started planning in January and have now scheduled several events. We have a swap meet on August 4th at the Museum of Indigenous People. A special Star Party at the Highland Center on Sept 25. The 50th Anniversary Celebration Party is on Sept. 28 at the Hassayampa, and our keynote speaker at the Oct. 2 meeting is Father Corbally, from the Vatican Observatory in Tucson. See the Events section for details.

We looked through a couple of boxes of pictures from past events, newsletters, and other documents some of which go back 50 years. We found the following history.

Five people met at Jay Osborne’s home to establish an astronomy club to promote sharing interests and informing the public. Jay Osborne held the first meeting at his home and became the club’s first president when the club incorporated in 1974. In 1996, the club filed for tax-exempt status. The club has had 18 presidents, although we seemed to have lost track of the name of the second. The club continued to meet at members’ homes over the years. After the club meetings, the members set up telescopes for an evening of viewing.

In the January 1996 newsletter, then president, Howard Moore observed that the club had grown so much that it could no longer fit comfortably in members’ living rooms, and that they should look for larger venues. Meeting rooms over the years have included ERAU classrooms, St. Germaine Catholic Church, St. Luke’s Episcopal Church, Prescott Public Library and Touchmark. In 2020 and 2021 during the pandemic, we used Zoom meetings. Since then, we’ve been meeting at the Prescott Public Library.

This newsletter is, hopefully the first of many, and is the result of a donation of a BITTO machine from U.S. Motors. The subject was discussed at our last meeting, which was hosted by the Wildmans, which proved to be a very constructive meeting. The subject of a raise in dues was discussed and it was decided that only one class of membership would be used from now on, and that the new dues will be Twenty dollars, effective with the annual re-ewal. Also, the annual dinner will be club sponsored pending the treasury condition at that time.

We welcome a new membership, Pat Vidston, who in the process of building an 8 inch reflector under the aid and help of Jay Osburn.

On Saturday, May 9th, we will be having a public star party in observance of NATIONAL ASTRONOMY DAY at Granite W. Jr. High School. All members with portable telescopes are needed to give the public a real show. We will meet at 6:30 and set up. If we get the response we had last fall, then there will be lots of viewers and we will need all the help we can get. This will serve for the May meeting. The June meeting will be held at The Johnson residence.

Jim Morgan, Carol, and I attended the A.A.V.S.O. spring meeting in Tucson and had a very informative and enjoyable time. We visited Plaztan planetarium, the optical shops, Insley and planetary lab. The multiple mirror on Mt. Hopkins, and of course Kitt Peak, where we had an unforgettable time visiting those facilities, inside control rooms, ~~and~~ stood on the 4 story Mayall instrument, and in general got the behind the scenes look at all these **LONG EYES!** The professional astronomers were very enthusiastic for our observations and explained the discoveries that they have been able to make by the use of our data. Jim Morgan was nominated to the A.A.V.S.O. council for 1982 / 83. **CONGRATULATIONS, JIM!** We will give a full report at a future meeting.

As you can see, I am not good typist, and this newsletter is in sorry condition, so I am asking if anyone would be interested in the position of editor. You would be responsible for this newsletter which will be done on a now & then basis, and printing same. Any volunteers??

Everyone should make an effort to view the skies, at least visually each clear night, you never know what might be seen. A good example was the recent display of the coronal borealis (northern lights) which were seen as far south as Mexico City. The last time I saw them was in person in 1956. This recent show was spectacular for the moon was up and they are not that bright most of the time. *****KEEP LOOKING UP*****

If anyone wants to list any items for sale, we can publish it here, or if any announcements or interesting ideas for an article of interest to our membership is in order, please let us know.

Jim Eckendorf

Image Credit: PAC's first newsletter, published in the 1980's.

For the public, the club held star parties at Watson Lake, Prescott Ranch, Highland Center, Lynx Lake, Pronghorn Ranch, Williamson Valley Trailhead and at members' homes. For a few years, the club sponsored the Northern Arizona Star Party, a 3-day event. In the early 2000's, the library co-sponsored "Spotlight on the Stars", a public outreach event to educate and inform the public about astronomy and current events.

Today, we have ninety memberships, 130 people, counting spouses and family members. Annually, we hold several star parties for the public, a couple of members-only star parties, and several private star parties for young people at camps and schools. Currently, our meetings focus on speakers from surrounding institutions: Professors, Project Directors, and experts. Topics have included Dart, Solar Activity, OsirisRex, Planetary Defense, Exoplanets, Stellar physics, Binary Stars, Cosmic Evolution, Spitzer Infrared Space Telescope, USGS Astrogeology, Hubble, JWST to name just a few. The speakers came from ERAU, NAU, ASU, UA, Lowell Observatory, Kitt Peak, USGS and other prestigious institutions.

Fifty years ago, science textbooks listed 9 moons for Jupiter and 12 for Saturn. There were 9 planets in our solar system and only speculation about planets outside our solar system. A few probes had been sent to Mars, Venus, and the Moon. Observatories collected data on the expanding universe fine tuning the Hubble constant, gathering data about black holes. Space missions such as COBE, WMAP and Planck mapped the CMBR (Cosmic Microwave Background Radiation) from the beginning of the universe. Space agencies sent many observatories into space to get above the earth's atmosphere to observe gamma rays, cosmic rays, and ultraviolet rays. They still haven't figured out what dark matter or dark energy is. We still have new knowledge to look forward to.

In the 80's, images and data from Voyager 1 and 2 expanded our view of the solar system and dozens of missions have been sent out to explore the moon, Mars, Venus, Mercury, Jupiter, Saturn and Pluto. Voyager 1 has been repurposed now to send back data from Interstellar space.

I still remember viewing the images from Voyager 1 and 2, the volcano of Io spewing sulfur, the ice world of Europa, the close up of Jupiter, Saturn's Rings and shepherding moons, details of Saturn's, Uranus's and Neptune's atmospheres. And then came the Hubble Space Telescope that not only brought our solar system into clearer focus but took us to the edge of the universe and time. And now the James Webb Space Telescope is bringing us even clearer data.

Back on Earth, the largest telescope in 1974 was the 5.1-meter Hale telescope at Mt. Palomar. Today, the 10.4M Gran Telescopio in the Canary Islands is the largest scope in operation followed closely by the 10m scopes at the Keck Observatory in Hawaii. These will be surpassed in 2028 by the at 39.3M Extremely Large Telescope in the Atacama Desert in Chile.

We now know that Jupiter has 95 moons with confirmed orbits, Saturn has 146, Uranus has 28, Neptune has 16, and even Pluto has 1. IAU reclassified Pluto to a dwarf planet in 2006, so we now have 8 planets. It's not clear that this reclassification has been all that useful. Exoplanets started with a trickle, but the Kepler space observatory helped to discover nearly three thousand of them. Today, observatories in space and on Earth have discovered over 6000 exoplanets.

The impact on amateur astronomy goes beyond new knowledge. The technology from these space missions and earth-bound observatories have greatly affected amateur astronomy. Fifty years ago, many astronomy groups focused on making telescopes. Then affordable commercial telescopes became available in the 70's. Still, focus, alignment, locating and tracking our targets were manual processes. Even in the 90's, with one of Celestron's first series of GPS scopes, it took me a half hour or so to get set up at star parties.

Tracking encoders have given way to hand controllers and computers. We've gone from star-hopping to plate solving, guiding by hand through a cross-haired eyepiece to guide scopes and software, hyper-sensitized film to CMOS cameras. Today, I have a device on my 20-year-old Nexstar 6se that takes a set of images, plate solves, and aligns the telescope in less than 5 minutes. This greatly decreases the pressure on my back, dependency on my eyesight, and the boredom of the waiting public.

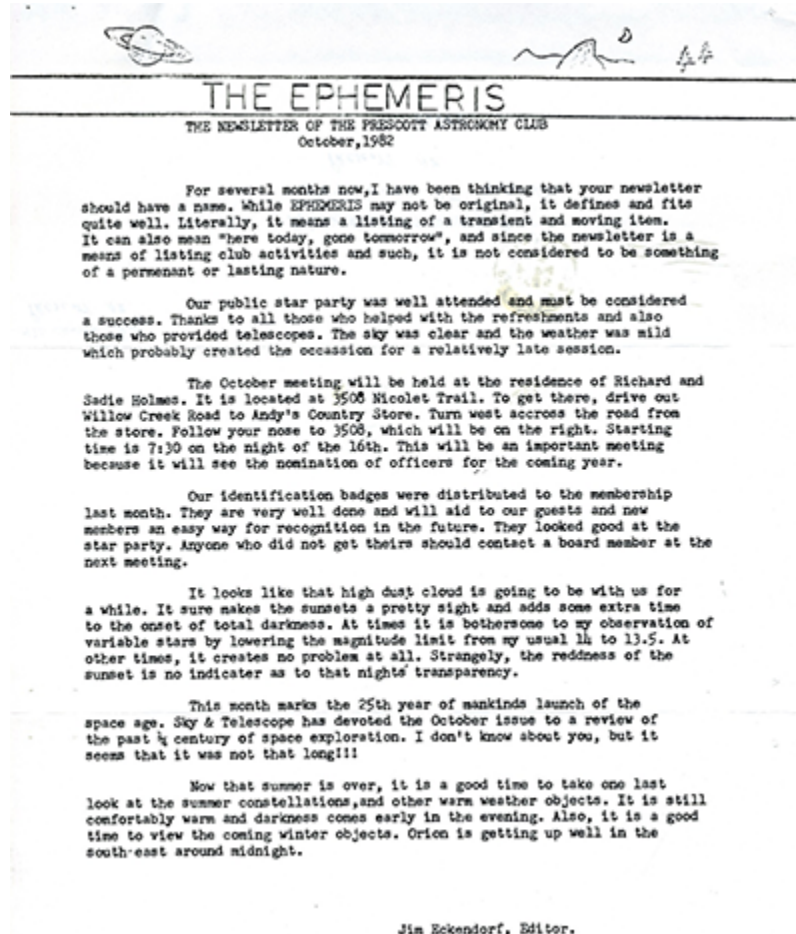


Image Credit: PAC's first Ephemeris, published in October, 1982.

For the astro-imagers, autofocusing facilitates that dreary and often frustrating task of focusing and staying focused. Plate-solving has greatly improved our alignment and go-to procedures. Apps on our smart phones allow us to find or identify objects and constellations

All this new technology has led to EAA (Electronically Assisted Astronomy) where we now use imaging to present planets and deep sky objects in near real-time. We no longer have to settle for blurry nebula objects. We can now offer sharper pictures with color, details that thrill the crowds.

In all this change, our club's mission has not changed, "to further educate its members and the public in astronomy and related sciences by offering public lectures, star parties and community events." We continue to educate the public and inspire young people by introducing them to the wonders of the universe. And I believe we are needed more than ever to inform the public, educate and encourage young people to study astronomy. Throughout the ages, mankind has been curious about the universe, its patterns, its views and our place in it. As a club, we still have an important mission.

Our motto, from the beginning, is still pertinent today. "Get out. Look up." and include your friends and family. Here's to another 50 years.



Original Photo: Lucas Pezeta

Prescott Astronomy Club Astronomy Swap Meet

Sunday, August 4th, 2024 from 1:00pm-4:00pm
Museum of Indigenous People, Pueblo Room

The August 2024 club meeting will feature member presentations. If you would like to give a presentation on something you have done in the past year with astronomy, please contact Brian Blau vp@prescottastronomyclub.org. Include information about your topic & if you are bringing presentation materials. Please limit your speaking time to 10 min so we can hear as many people as possible.

Astronomy Swap Meet
Sunday August 4th, 2024, 1p-4p.
Museum of Indigenous People, Pueblo Room

The Prescott Astronomy Club is holding an astronomy swap meet! This event is open to the public and we invite those interested in swapping, purchasing or selling astronomy-related items. Expect to find telescopes, mounts, eye pieces, books & more.

To reserve a table, you must contact Brian Blau vp@prescottastronomyclub.org prior to the event. One table per seller unless other arrangements are made. Tables are free for astronomy club members. We ask for a \$10 donation from all other sellers, & a \$20 donation from vendors. Setup time starts at noon.

DIRECTIONS:

[Maps Link](#)

PARKING:

Parking location: [Parking info](#)

Attendee: Front of building in one way lot.

Table setup only: Back near the handicap spaces.

General Meeting of the Prescott Astronomy Club

Wednesday, August 7th, 2024 at 6pm
Prescott Public Library - Founders Suite

The August 2024 club meeting will feature member presentations. If you are a club member & would like to give a presentation on an astronomy topic, please contact Brian Blau at vp@prescottastronomyclub.org.

Include information about your topic & if you need to use the podium computer for your presentation materials (PDF's, PowerPoint & Microsoft Word files).

Please limit your speaking time to 10 min so we can hear as many people as possible.

Prescott Astronomy Club Annual Picnic

Wednesday, August 17th, 2024 from noon - 4pm
Upper Ramada, Watson Lake under the gazebo

The annual PAC Picnic will be Saturday, August 17th starting at 11:30am. Food will be brats and burgers. Serving starts about noon. Bring your own drinks and a dish to share with all. It will be held at the big red pavilion (red roofed ramada) at Watson Lake Park. Parking is in front of the pavilion.

Be sure and sign up so we can order enough parking passes for all attendees, as well as have enough food ready! You tell the parking attendant at the entrance that you are with the Prescott Astronomy Club and he/she will hand you the pass when you enter.

Sign up by sending a text or email to either of these Directors:

d3@prescottastronomyclub.org

d1@prescottastronomyclub.org

You can also contact Doug at doughbts1@gmail.com or by phone at (206) 369-2108.

General Meeting of the Prescott Astronomy Club

Wednesday, September 4th, 2024 at 6pm
Prescott Public Library - Founders Suite

Speaker: Kevin Schindler from the Lowell Observatory
Topic: *Dark Skies Over Arizona*

Background: Dark skies are a disappearing resource. This session will look at the benefits of dark skies, how Arizona has helped lead the charge to protect them, & how we all can do our part in reducing artificial light pollution.

Bio: Kevin Schindler is the historian at Lowell Observatory where he has worked for 28 years as an active member of the Flagstaff history & science communities.

Prescott Astronomy 50th Anniversary Auction & Raffle

The Prescott Astronomy Club is thrilled to announce its 50th Anniversary, marking five decades of inspiring the community with the wonders of the night sky. To commemorate this milestone, the club is hosting a series of special events that promote astronomy education from September 25 to October 2, 2024. These events are designed to celebrate the club's rich history in the Prescott area, to engage the community in the fascinating field of astronomy, & to support the club for a long-lasting future.

Starry Nights Star Party

September 25th, 2024 at 7:00pm
Highlands Center for Natural History

Join us for an evening under the stars at the Highlands Center for Natural History. Attendees will have the opportunity to view celestial objects through telescopes provided by the club. Carpooling is encouraged due to limited parking space. This event is open to the public & is a perfect way to kick off the anniversary celebrations.

Prescott Astronomy Club 50th Anniversary Celebration Fundraising Party

September 28th, 2024 from 5:00pm-8:00pm
Hassayampa Inn

Celebrate with us at the Hassayampa Inn with a special fundraising party. Enjoy an evening of fun, food, & festivities as we raise funds to support our ongoing educational and outreach programs. Tickets are available at <https://www.prescottastronomyclub.org>. Don't miss this chance to contribute to the future of astronomy education in Prescott.

50th Anniversary General Meeting of the Prescott Astronomy Club

Wednesday, October 2nd, 2024 from 6:00pm-8:00pm
Prescott Public Library - Founders Suite

Speaker: Rev. Christopher J. Corbally, S.J., Vatican Observatory & University of Arizona
Topic: *Celebrating 50 years of Astronomy in Arizona*

Background: Join us for a special monthly meeting featuring a talk by Rev. Christopher J. Corbally, S.J., of the Vatican Observatory & the University of Arizona. His presentation, "Celebrating 50 years of Astronomy in Arizona," will reflect on the innovative achievements of astronomy in Arizona, particularly since the founding of the club. From the Clark Refractor to Lowell's Discovery Telescope, from the Steward Reflector to the Large Binocular Telescope, from photographic plates to digital detectors & adaptive optics, we shall glimpse the innovative achievements of astronomy. This event is free and open to the public

Bio: Christopher Corbally is a Jesuit priest, emeritus vice director of the Vatican Observatory, and an adjunct astronomer at the University of Arizona. He was a project scientist for building the Vatican Advanced Technology Telescope and pursues his interest in stars primarily through spectroscopy.

CONTACT INFORMATION FOR ALL 50TH ANNIVERSARY EVENTS:

For more information about the Prescott Astronomy Club and its 50th-anniversary events, visit <https://www.prescottastronomyclub.org> or contact us at info@prescottastronomyclub.org.

MEDIA CONTACT:

Brian Blau

Vice President, Prescott Astronomy Club

vp@prescottastronomyclub.org

NASA Night Sky Notes

Original Photo: unknown

A Hero, a Crown & Possibly a Nova!

By Vivian White

High in the summer sky, the constellation Hercules acts as a centerpiece for late-night stargazers. At the center of Hercules is the “Keystone,” a near-perfect square shape between the bright stars Vega and Arcturus that is easy to recognize and can serve as a guidepost for some amazing sights. While not the brightest stars, the shape of the hero’s torso, like a smaller Orion, is nearly directly overhead after sunset. Along the edge of this square, you can find a most magnificent jewel - the Great Globular Cluster of Hercules, also known as [Messier 13](#).

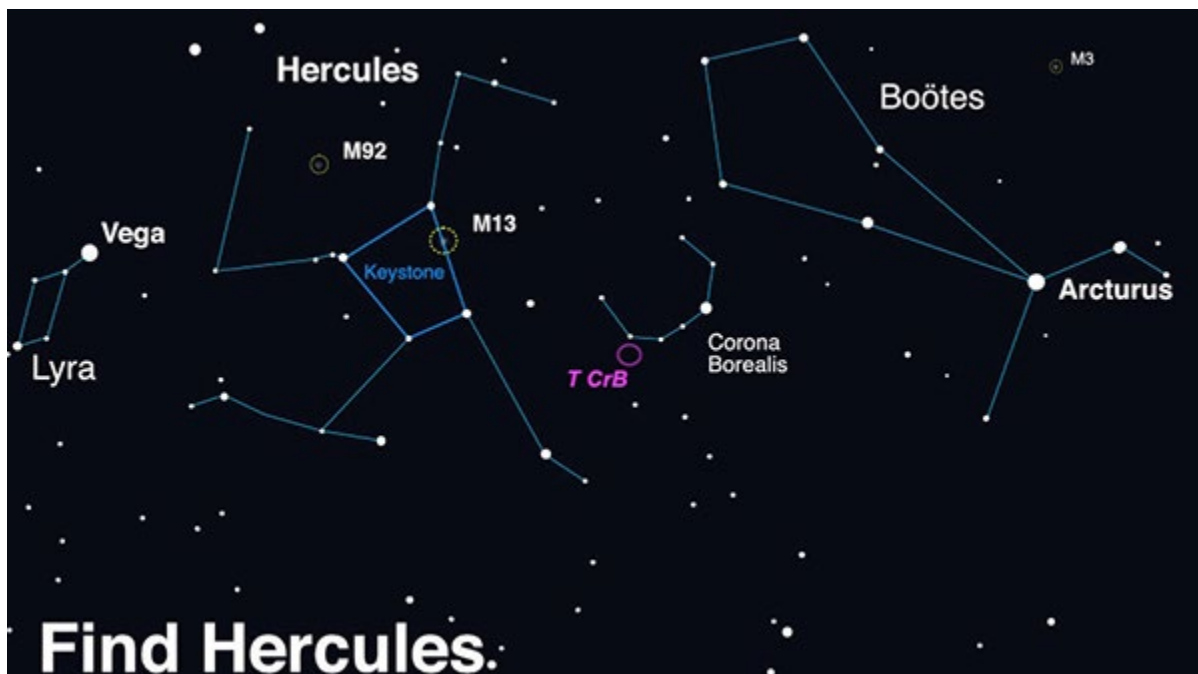


Image Credit: Image created with assistance from Stellarium: www.stellarium.org.

Look up after sunset during summer months to find Hercules! Scan between Vega and Arcturus, near the distinct pattern of Corona Borealis. Once you find its stars, use binoculars or a telescope to hunt down the globular clusters M13 (and a smaller globular cluster M92). If you enjoy your views of these globular clusters, you're in luck - look for another great globular, M3, in the nearby constellation of Boötes.

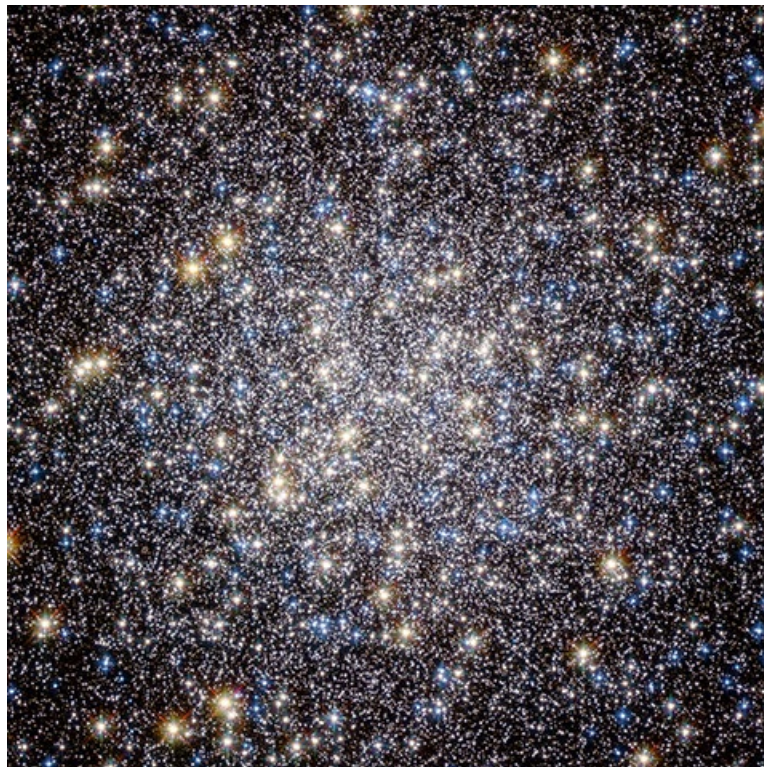
Globular clusters are a tight ball of very old stars, closer together than stars near us. These clusters orbit the center of our Milky Way like tight swarms of bees. One of the most famous short stories, [Nightfall](#) by Isaac Asimov, imagines a civilization living on a planet within one of these star clusters. They are surrounded by so many stars so near that it is always daytime except for once every millennium, when a special alignment (including a solar eclipse) occurs, plunging their planet into darkness momentarily. The sudden night reveals so many stars that it drives the inhabitants mad.

Back here on our home planet Earth, we are lucky enough to experience [skies full of stars](#), a beautiful [Moon](#), and regular [eclipses](#). On a clear night this summer, take time to look up into the Keystone of Hercules and follow this sky chart to the Great Globular Cluster of Hercules. A pair of binoculars will show a faint, fuzzy patch, while a small telescope will resolve some of the stars in this globular cluster.



Image Credit: NASA/Goddard Space Flight Center.

A red giant star and white dwarf orbit each other in this animation of a nova similar to T Coronae Borealis. The red giant is a large sphere in shades of red, orange, and white, with the side facing the white dwarf the lightest shades. The white dwarf is hidden in a bright glow of white and yellows, which represent an accretion disk around the star. A stream of material, shown as a diffuse cloud of red, flows from the red giant to the white dwarf. When the red giant moves behind the white dwarf, a nova explosion on the white dwarf ignites, creating a ball of ejected nova material shown in pale orange. After the fog of material clears, a small white spot remains, indicating that the white dwarf has survived the explosion.



Bonus! Between Hercules and the ice-cream-cone-shaped Boötes constellation, you'll find the small constellation Corona Borealis, shaped like the letter "C." Astronomers around the world are watching T Coronae Borealis, also known as the "Blaze Star" in this constellation closely because it is [predicted to go nova sometime this summer](#). There are only 5 known nova stars in the whole galaxy. It is a rare observable event, and you can take part in the fun! The Astronomical League has issued a [Special Observing Challenge](#) that anyone can participate in. Just make a sketch of the constellation now (you won't be able to see the nova) and then make another sketch once it goes nova.

Seeing Double

By Kat Troche

During the summer months, we tend to miss the views of Saturn, Jupiter and other heavenly bodies. But it can be a great time to look for other items, like globular star clusters such as Messier 13, open star clusters such as the Coma Star Cluster (Melotte 111), but also [double stars](#)!

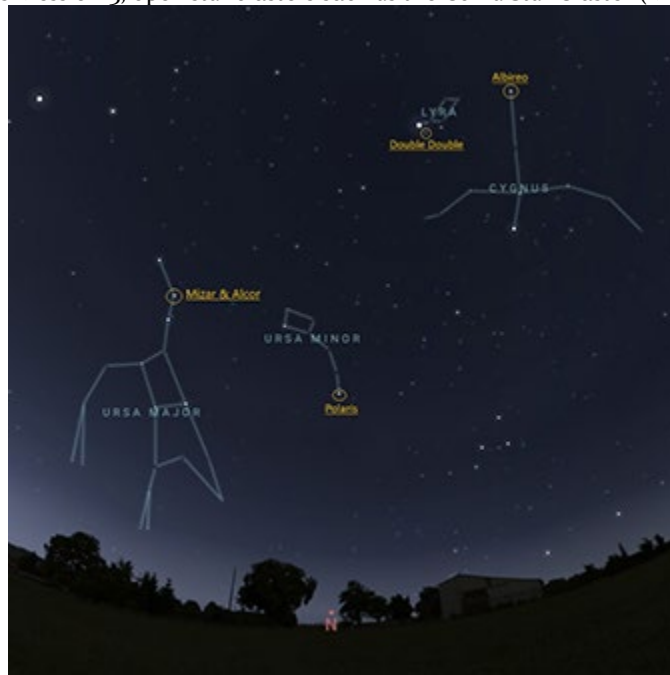


Image Credit: Stellarium Web.

Mid-August night sky constellations with the following multiple star systems highlighted: the Double Double in Lyra, Albireo in Cygnus, Polaris in Ursa Minor, Mizar and Alcor in Ursa Major.

What Are Double Stars?

If you have seen any movies or read any books that refer to having two suns in the sky, that would be a *double star system*. These star systems typically come in two types – binary and optical doubles. Binary stars are two stars that are gravitationally bound and orbit each other, and optical double stars only *appear* to be close together when viewed from Earth, but in reality, are extremely far apart from another, and are not affected by each other's gravity. With a small telescope, in moderately light polluted skies, summer offers great views of these stellar groupings from the Northern Hemisphere:

- **Double Double:** also known by its technical name, Epsilon Lyrae, this multiple star system appears as one star with naked eye observing. But with a small telescope, it can be split into 'two' stars. A large telescope reveals Epsilon Lyrae's secret – what looks like a single star is actually a *quadruple* star system!
- **Albireo:** a gorgeous double star set – one blue, one yellow – in the constellation Cygnus.
- **Polaris:** while technically a multiple star system, our North Star can easily be separated from one star to two with a modest telescope.
- **Mizar and Alcor:** located in the handle of the Big Dipper, this pair can be seen with the naked eye.

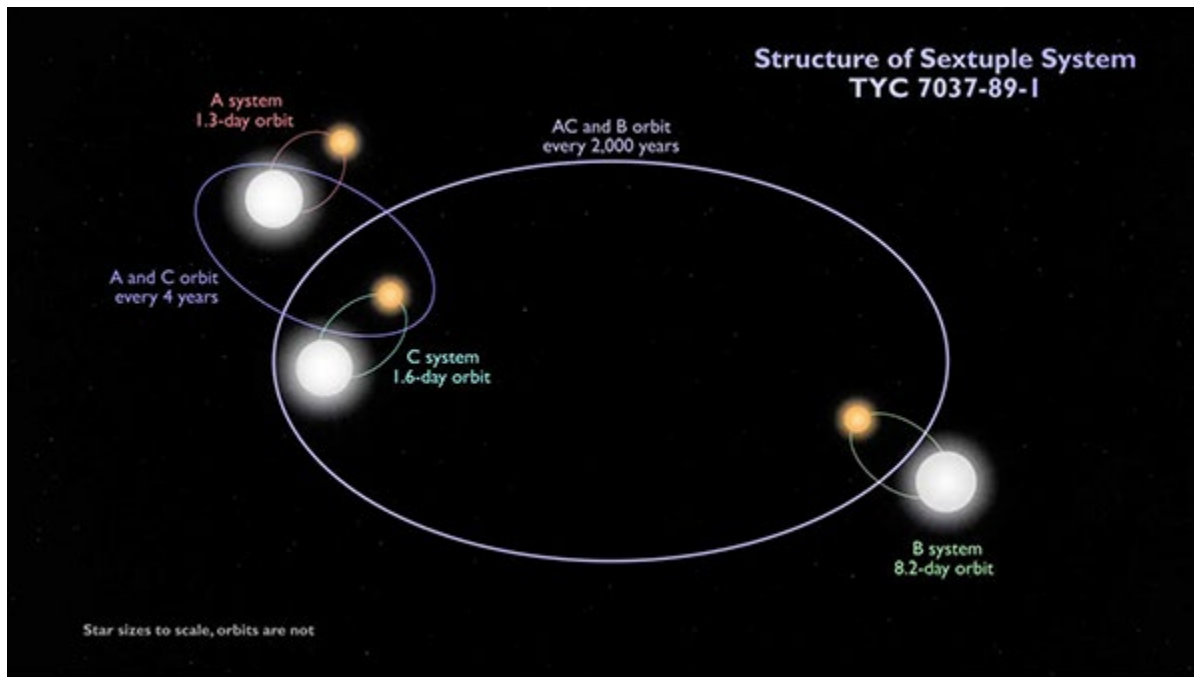


Image Credit: NASA's Goddard Space Flight Center.

This schematic shows the configuration of the sextuple star system TYC 7037-89-1. The inner quadruple is composed of two binaries, A and C, which orbit each other every four years or so. An outer binary, B, orbits the quadruple roughly every 2,000 years. All three pairs are eclipsing binaries. The orbits shown are not to scale.

Aside from looking incredible in a telescope or binoculars, double stars help astronomers learn about measuring the mass of stars, and about stellar evolution. Some stars orbit each other a little too closely, and [things can become disastrous](#), but overall, these celestial bodies make for excellent targets and are simple crowd pleasers.

Up next, learn about the Summer Triangle's hidden treasures on our mid-month article on the [Night Sky Network](#) page.

Backyard Astronomer



Original Photo: Eberhard Grossgasteiger

The Backyard Astronomer - July 2024

T Coronae Borealis — The Blaze Star

By Adam England, The Backyard Astronomer

The Ancients observed many of the same “naked eye” phenomena that we also see today, and although their understanding of these astronomical events was limited, they knew something unique was occurring. Episodes such as a lunar or solar eclipse or the passing of a comet could be seen as messages from the heavens, heralding great events or omens of destruction. We know now that these astronomical events have no impact on the sociopolitical landscape, nor do the stars you are born under determine specific personality traits, however it was by tracking these happenings that patterns began to emerge.

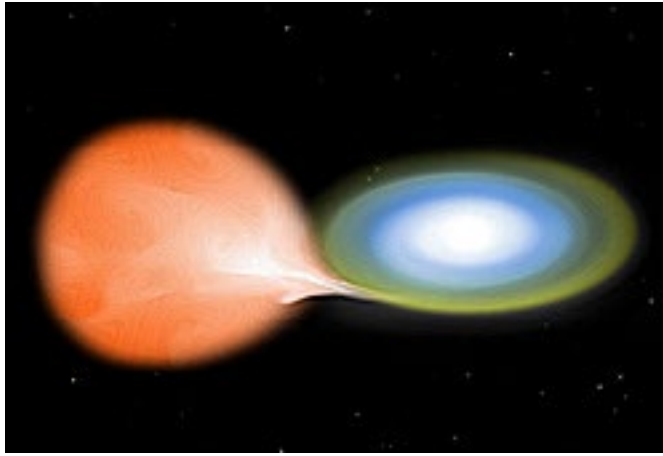


Image Credit: Artist rendering of nova, courtesy of NASA.

Meteor showers were one of the first sights to be known as regularly occurring. As humans worldwide saw these recurring fireballs seasonally and in specific parts of the sky, we refer to most meteor showers based on the constellation they appear to stem. Likewise, astronomers from many cultures documented a “guest star” that appeared on 10 July 1054 and continued to shine bright through April 1056. Compiling astronomical records from Chinese, Islamic, European, and Native American cultures lead us to the Crab Nebula, giving us nearly 1000 years of recorded history of this distinctive event.



Image Credit: Crab Nebula, courtesy NASA James Webb Space Telescope.

Other novae have been registered in the same location many times over the centuries. Where a supernova registers the end of a star's life as it bursts into a nebula, a recurrent nova continues to feed off a neighboring star again and again, establishing a pattern of brightening and dimming. Enter T Coronae Borealis stage left.

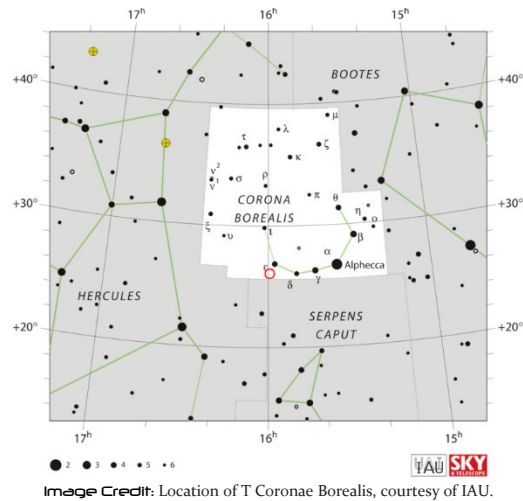


Image Credit: Location of T Coronae Borealis, courtesy of IAU.

The small constellation Coronae Borealis — The Northern Crown — is essentially 7 stars in a semicircular arc, filling the space between Hercules and Bootes. This void contains just a few faint galaxies that are difficult for even seasoned backyard astronomers to view, but one of the stars holds a secret. Every 78 years, T Coronae Borealis or the Blaze Star suddenly brightens from a dim magnitude 10 to a peak of near magnitude 2. The smaller, hotter white dwarf continuously sucks the outer layers off the larger, cooler red giant, separated by only the distance from the Earth to the Sun, forming a large accretion disk surrounding the white dwarf, and all hidden away inside a thick cloud of gas and dust. After slowly devouring its larger neighbor for three quarters of a century, the white dwarf gets stellar indigestion and ejects huge volumes of material into the cosmos, brightening tremendously as it does. This recurrent brightening has been documented by astronomers in 1866 and 1946, with historical records dating as far back as 1217 recording a similar event in the same part of the sky likely to be the Blaze Star. We can't predict exactly when this will happen, so keep your eyes to the Northern Crown and Blaze Star this summer for an extra special surprise.

The Backyard Astronomer - August 2024

The Sky is Falling

By Adam England, The Backyard Astronomer

Recently there have been a string of stories in the news regarding objects falling from space. Both the universe and humanity have contributed to these episodes, such as a recent fireball that burned bright over New York City, or the Florida family who in April received quite the surprise when a piece of refuse from the International Space Station crashed through the roof of their home. So, what is going on? Are we now living in the space-junk-pocalypse?



Image Credit: Tunguska Event, courtesy of Wikimedia Commons.

To put it simply — no, objects falling from the heavens is not a new phenomenon. Over 3600 years ago in the Dead Sea valley, evidence points to the destruction of a city from a fireball bursting in the air and causing the deaths of around 8,000 inhabitants. Russia has been hit twice in the last century or so, with the 1908 Tunguska event leveling 80 million trees across 830 square miles of unpopulated Siberia, and again in 2013 when the city of Chelyabinsk experienced a massive shockwave from an approximately 59ft wide space rock that caused millions of dollars in damage to more than 7200 buildings.

Smaller and more isolated events can still cause harm. In 1888 a town in Iraq experienced a bolide that exploded and rained down stones on the villagers, killing one and paralyzing another. Closer to home, Alabama resident Ann Hodges was resting on her couch in 1954 when a grapefruit sized rock smashed through her roof, bounced off her radio and smacked her on the side of her torso.



Image Credit: Ann Hodges meteorite, courtesy of University of Alabama.

Since the dawn of the Space Age with the launch of Sputnik I on 4 October 1957, we humans have continued to send terrestrial materials into orbit around Earth. As satellites age and die, or fail prematurely, orbital decay drags these inert bodies from the sky, and the intense heat of

atmospheric friction often disintegrates most if not all of the object. What remains has a high probability of falling in the ocean, or some inhospitable corner of the Earth, but the law of averages tells us that the more stuff we put up there, the more we will see some coming back down.

On 9 May 2024, a farmer in Saskatchewan was prepping his fields for seed when he found an object the size of a truck hood sticking out of the ground. This was the second time in 2 years that a piece of a SpaceX rocket had survived reentry, against expectations, but that doesn't make them the only culprit. In 2000, worldwide orbital launches tallied at 85. The year 2023 saw 223 launches, and 2024 is set to blow that record out of the sky – pun intended.



Image Credit: Saskatchewan farmer and space junk, courtesy Gillian Massie, X/Twitter.

As more players have entered the growing space economy, the United Nations Office of Space Affairs has formulated ground rules for both governmental and commercial entities and the liabilities they incur. 115 countries are party to the Outer Space Treaty, which says the launching state (government) is ultimately responsible for anything that originates from their sovereignty, which is often passed on to private space companies through insurance policies. Likewise, most standard home insurance policies do cover falling debris also.

So, rest assured, Chicken Little — you have a far better chance at winning the lottery or being eaten by a shark than that of being hit by space junk. But it does happen!

Adam England is the owner of Manzanita Insurance and Accounting and moonlights as an amateur astronomer, writer, and interplanetary conquest consultant. Follow him @ [Facebook.com/BackyardAstronomerAZ](https://www.facebook.com/BackyardAstronomerAZ) and [Instagram.com/TheBackyardAstronomerAZ](https://www.instagram.com/TheBackyardAstronomerAZ).



Original Photo: Adrian Lang

Sagittarius A

By Susanne Vaughan

In 1933, one of the first radio astronomers, Karl Jansky, discovered a radio signal coming from Sagittarius, near the center of the Milky Way Galaxy. This radio source was named Sagittarius A, shortened to Sgr A. Later observations at CSIRO radio telescope in Dover Heights (New South Wales in Australia) found it to be in the center of our galaxy.

Four decades later, the National Radio Astronomy Observatory found Sgr A had one very compact component. Astronomers were beginning to suspect that Sgr A could very possibly be a black hole, so in 1994, a Berkeley team of Charles H. Townes and Reinhard Genzel used infrared and sub-millimeter spectroscopy to show that Sgr A had over three million solar masses concentrated in a small area, making it a very exciting possibility. A later team headed by Genzel studied the motions of stars near Sgr A for ten years. This analysis showed it was not a cluster of dark stars and had 4.31 million solar masses, evidence which showed that it must be a black hole.

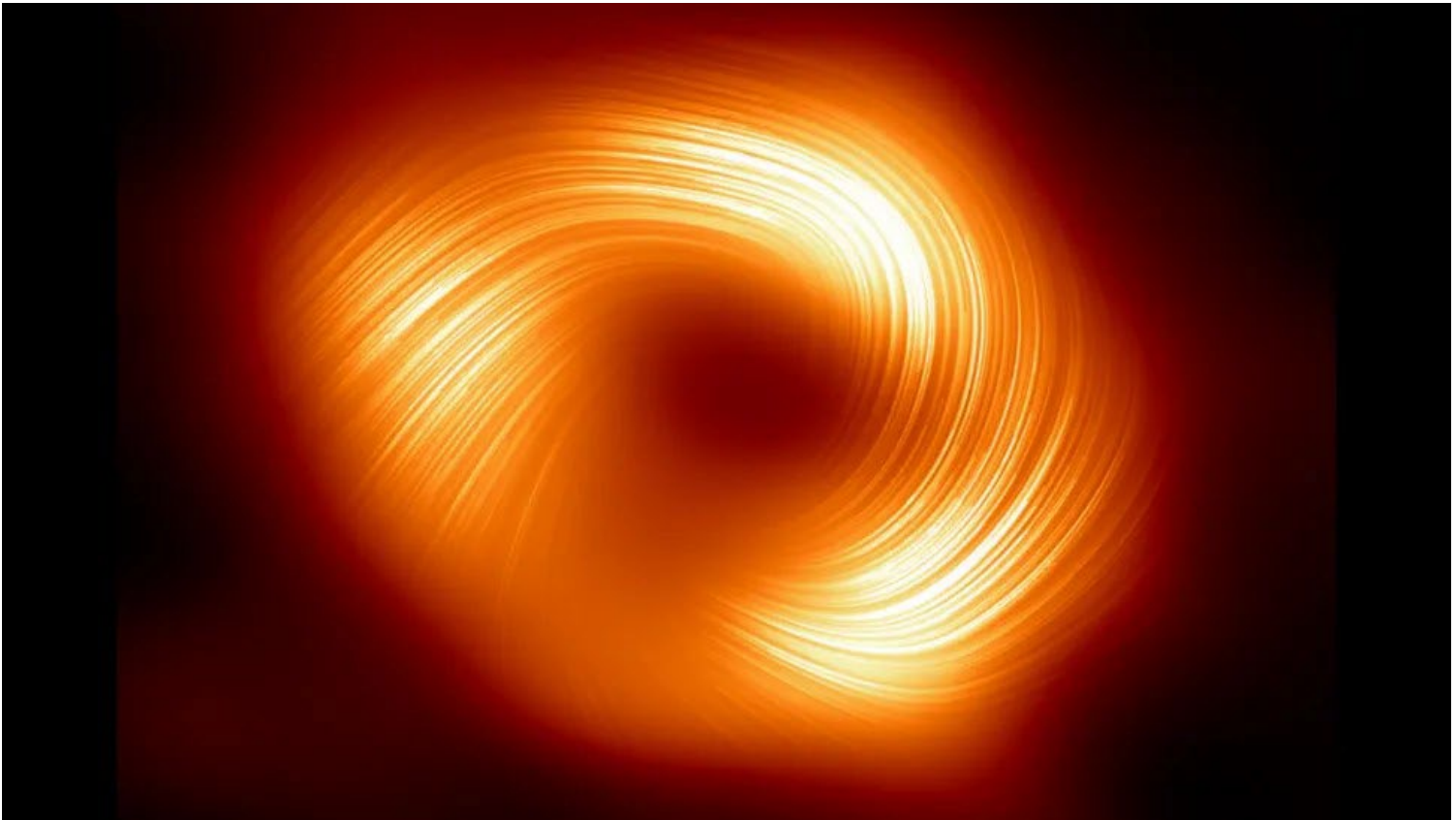
In 2015, NASA observed an X-Ray flare from Sgr A that was 400x brighter than usual, which may have been caused by an asteroid falling into Sgr A. Finally, in 2018, a paper was published that had conclusive evidence that Sgr A was indeed a black hole. The exact mass of Sgr A is still in question, depending upon how it is calculated. The very next year, the Keck Observatory saw a sudden event of Sgr A which was 75x brighter than usual, which means it may have encountered another stellar object. The flash was the object entering the event horizon.

In 1983, a thread-like structure was found associated with Sgr A that was puzzling. Farhad Yusef-Zadeh and colleagues at Northwestern University discovered the filament-like structures near Sgr A and by 2024, over 1000 of these filaments have been discovered. These filaments stretch 5 to 10 light years through space, spreading out from the galactic center. Using the MeerKAT radio telescope on the Northern Cape of South Africa, the most sensitive radio telescope in the world, they have traced these filaments back to Sgr A at our galactic center. The threads were perpendicular to the galactic plane and later, horizontal threads were also discovered. They have very strong magnetic fields which accelerate particles to almost light speeds. They are still a mystery, but theories are being generated to propose what the filaments are and how they work.

This year, astronomers using the Event Horizon Telescope (EHT) at the Center for Astrophysics (Harvard and Smithsonian) released their research papers on using polarized light images of this supermassive black hole. This research shows that Sgr A has a magnetic field like that of the black hole at the center of the M87 galaxy, which suggests that there are similar strong magnetic fields around all black holes.

In the next few years, a next-generation EHT will be in space and new radio telescopes are being built on earth. Together, these will help detail the structure and dynamics of the strong magnetic fields on event horizons, as well as the effects of strong gravity around black holes, as predicted by General Relativity. Below is the first image of Sgr A (by EHT in 2022). It shows how it looks in polarised light with its magnetic field lines.

It is possible that by figuring out how the strong gravitational forces of Sgr A create strong magnetic fields may aid physicists in understanding the Grand Unified Theory (GUT) and the Theory of Everything. GUT theory says three of the four main forces of the universe (electromagnetic, weak and strong atomic forces) were once only one force. If these forces can be tied to gravity, then we have the Theory of Everything. This would be a monumental leap in physics and our understanding of the universe.



Sources:

“Astronomers Unveil Strong Magnetic Fields Spiraling at the Edge of Milky Way’s Central Black Hole”, news release 2/27/24 from Fred Lawrence Whipple Observatory, Center for Astrophysics/Harvard & Smithsonian. Research by Sara Issaoun, Angelo Ricarte, and Paul Tiede.

“Scientists Discover Mysterious Cosmic Threads in Milky Way”, by Ian Sample, Science Editor, The Guardian (www.theguardian.com), June 2, 2023.

“Sagittarius A”, Wikipedia.

“Astronomers Reveal First Image of the Black Hole at the Heart of Our Galaxy”, <https://eventhorizontelescope.org>, May 12, 2022.

Photos from the PAC

Original Photo: Zukiman Mohamad

James Vaughan

Images

- 1st Photo: The aurora from the big solar flare on the night of May 10-11. Taken with a Canon EOS Rebel T8i using the 18-55 mm lens zoomed all the way out. Aperture is F4.5 (as wide as the lens will go), 4-second exposure at ISO 8000.
- 2nd Photo: M 20, Trifid nebula. 60-minute exposure with the Seestar S50, tweaked slightly with Google photo app.



Photo Credit: James Vaughan, May 10-11.



Photo Credit: James Vaughan.

David Visco

Solar Images

- Stellarvue SV115 triplet apo refractor with ScopeTronix MaxPower 1.6x amplifier (1470mm f/12.8)
- Kendrick Astro Baader film solar filter
- Canon EOS 60Da DSLR
- Images 1 to 10: single exposures, ISO 200, 1/1000 second, Canon raw CR2
- Processed and optimized in Adobe Photoshop CS6
- Images 11 to 14: Crop 640x480 video mode, ISO 200, 1/1000 second per frame at 60fps, 2-min videos (7200 frames)
- Videos processed in Autostakkert!, stacking 800 best frames for stacked image
- Registax 6 used to Wavelet sharpen stacked images
- Slight final optimization in Adobe Photoshop CS6

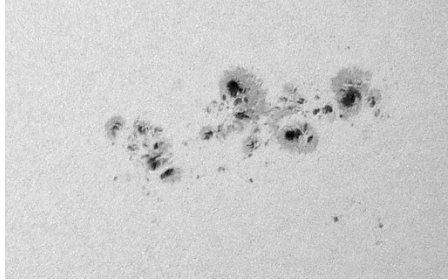


Photo Credit: David Visco, Sunspot AR3615, March 25, 2024.

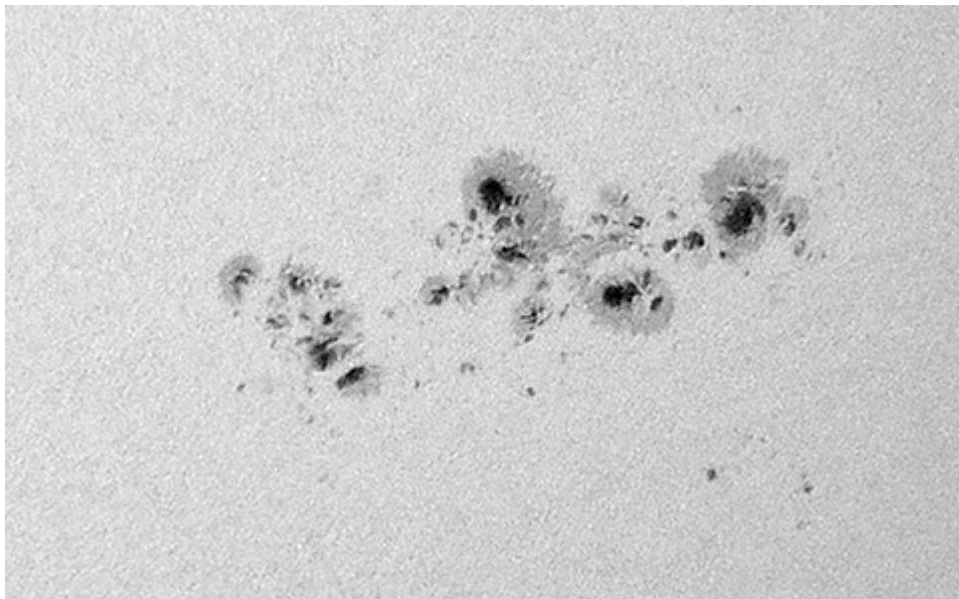


Photo Credit: David Visco, Sunspot AR3615, March 25, 2024.

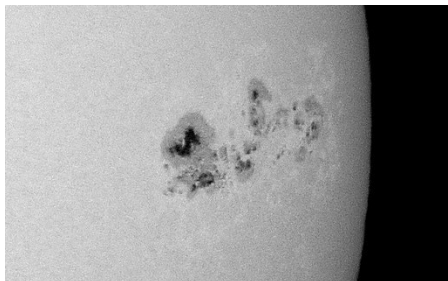


Photo Credit: David Visco, Sunspot AR3615, March 28, 2024.

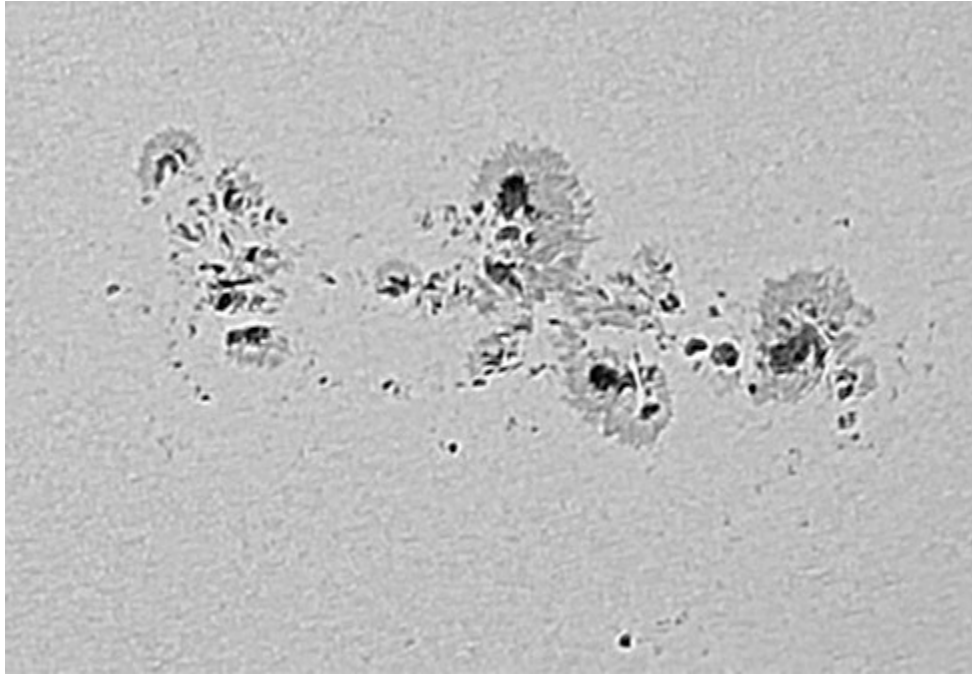
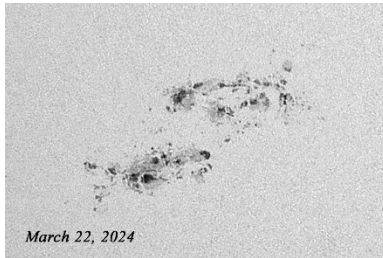
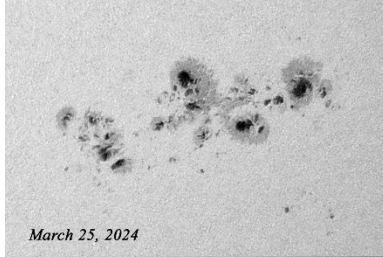


Photo Credit: David Visco, Sunspot AR3615, March 25, 2024.



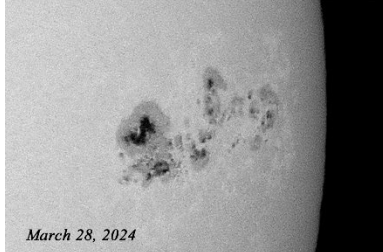
March 22, 2024



March 25, 2024



March 27, 2024



March 28, 2024

Photo Credit: David Visco, Sunspot AR3615, March 22-28, 2024.

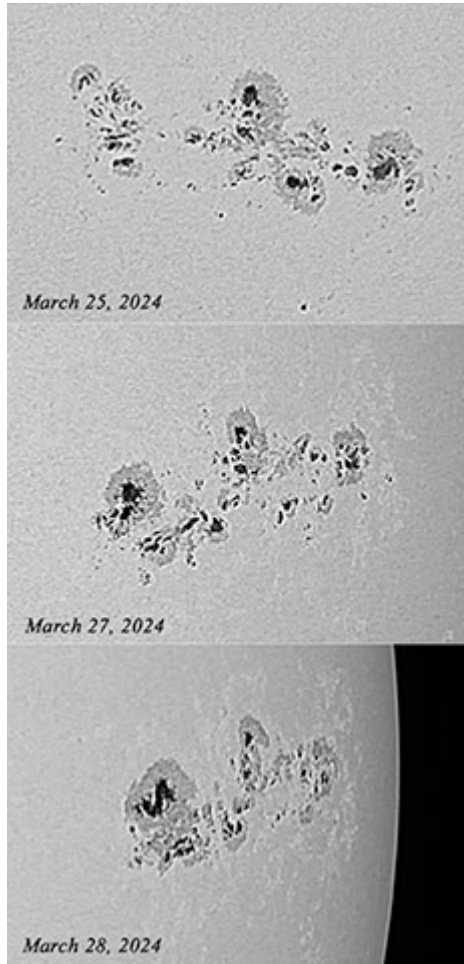


Photo Credit: David Visco, Sunspot AR3615, March 25-28, 2024.

Celestial Calander

Original Photo: Camille Cox

August 2024:
 This calendar is from In-the-Sky.org & shows the objects & events visible during August 2024.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1	2	3
4 New Moon	5 Moon at Perihelion Conjunction of Moon & Venus Conjunction of Moon & Mercury	6 Conjunction of Venus & Mercury Asteroid 7 Iris at Opposition Asteroid 16 Psyche at Opposition	7 PAC Meeting	8 Moon at Apogee	9	10 Lunar Occultation of Spica

11	12 First Quarter Moon Perseid Meteor Shower 2024	13 Lunar Occultation of Antares Messier 15 is Well-Placed	14 Close Approach of Jupiter & Mars Conjunction of Jupiter & Mars Messier 2 is Well-Placed	15	16	17 Moon at Aphelion κ-Cygnid Meteor Shower 2024
18 Mercury at Inferior Solar Conjunction	19 Full Sturgeon Moon	20 Moon at Perigee Close Approach of Moon & Saturn Conjunction of Moon & Saturn Lunar Occultation of Moon & Saturn	21 Lunar Occultation of Neptune	22	23	24
25 Close Approach of Moon & M45	26 Last Quarter Moon	27 Close Approach of Moon & Mars Conjunction of Moon & Mars Close Approach of Moon & Jupiter Conjunction of Moon & Jupiter Lunar Occultation of Beta Tauri	28	29	30	31 Aurigid Meteor Shower 2024



Original Photo: Egil Sjøholt

We'd Love Your Photos & Ideas for the Newsletter!

I am requesting any & all photographer members of PAC to submit astronomical &/or sky photographs to share with all the members by their inclusion in **Ephemeris**. Images can be sent to Hilary Legacy at ed@prescottastronomyclub.org. Please include descriptions of equipment, cameras, image capture parameters & processing, as well as what's in the image & when & where you took it. Or, for anyone who likes to photo edit or make their own images, I'd love to hear from you too. Thanks!

I'm also asking for anyone with ideas of things we could put in our newsletter to contact me. If there's something you'd like to see here, then tell me about it. Email Hilary Legacy at ed@prescottastronomyclub.org.



Original Photo: Joonas Kääriäinen

Observing lists are available in PDF format on the PAC website to provide guidance & goals for visual & astrophotography programs. This list These lists graciously provided by Past President David Viscio to assist in planning your observation activities. The lists are in PDF format and may be viewed, downloaded or printed with the permission of David Viscio.

Astroleague Lunar 100
Bright Nebulae Dunlop 100.
Globular Clusters

Binocular Showpieces Caldwell
Face-On Spiral Galaxies
Herschel II

Messier

Herschel 400

Planet Maps

Royal Astronomical Society of Canada Finest NGC Saguaro Astronomy Club Best NGC S&T

SCAVENGER HUNTS IN THE SKY

Lists for Any Occasion

Need ideas for your visual or astrophotography program? We have you covered with observing lists for your personal exploration or use at a star party.

Click on the links below to open an observation list in another window to view or print it.

[Astroleague Lunar 100](#)

[Astroleague Urban](#)

[Binocular Showpieces](#)

[Bright Nebulae](#)

[Caldwell Objects](#)

[Double Stars](#)

[Dunlop 100 \(Southern Hemisphere\)](#)

[Face-On Spiral Galaxies](#)

[Globular Clusters](#)

[Herschel 400](#)

[Herschel II](#)

[Hidden Treasures](#)

[Messier Objects](#)

[Open Clusters](#)

[Planet Maps](#)

[Planetary Nebulae](#)

[RAS of Canada Finest NGC](#)

[Saguaro Astronomy Club Best NGC](#)

[Secret Deep](#)

[Space & Telescope Lunar 100](#)

[Telescope Showpieces by Month](#)



Original Photo: Tobias Bjørkli

PAC Board of Directors:

President: Art Arnold-Roksandich

Vice-President: Brian Blau

Secretary: Jack Evans

Treasurer: Roland Albers

PAC Directors-at-Large:

Ken Olson

Doug Tilley

Susanne Vaughan

Lisa Anderson

PAC Coordinators:

Astronomical League Coordinator: Ken Olson

Christmas Party: Susanne Vaughan

Equipment Loans: Roland Albers

Membership: Roland Albers

METASIC: John Dwan

Newsletter: Hilary Legacy

Night Sky Network: Open

Outreach Coordinator: Brian Blau

Refreshments: Jill Albers

Speakers: Lisa Anderson

Starry Nights Coordinator: Brian Blau

Summer Picnic: Doug Tilley

Webmaster: EJ Van Horne

Here are job descriptions of the open positions:

PAC Contact Information:

Website: <http://www.prescottastronomyclub.org>

Email: pacinfo@prescottastronomyclub.org

PAC Mentors:

If you need advice on the purchase of astronomy equipment, setting up equipment, astrophotography, etc., contact a PAC mentor.

Astrophotography: Open

General & Astrophotography: David Viscio

Visual Observation: Greg Lutes



Need to Know?

Original Photo: Jeremy Müller

Ask a Member!

A 15-minute segment is being added to the regular general meetings where members can have their burning questions answered by other knowledgeable members. If you have an astronomy-related question you would like answered, submit it to Art Arnold-Roksandich at p@prescottastronomyclub.org. You can also bring up the question at the meeting.