



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.

April 2024



Original Photo: Lucas Pezeta

Prescott Astronomy Club Meeting

Wednesday, April 3rd, 2024, at 6:00pm
Prescott Public Library, Founder's Room

Speaker: Dr. Jason Barnes of the University of Idaho, *NASA's Rotorcraft Lander Mission to Saturn's Moon Titan*

Topic: Dragonfly is a robotic octocopter space mission heading to Titan, the giant moon of Saturn. Dragonfly will land on the surface of the hazy moon to explore prebiotic chemistry, to evaluate its habitability, & to look for chemical biosignatures.

Bio: Dr. Barnes studies the physics of planets & planetary systems. He uses NASA spacecraft data to study planets that orbit stars other than the Sun & the composition & nature of the surface of Saturn's moon Titan. He is Deputy Principal Investigator on the Dragonfly NASA space mission, which will land a robotic rotorcraft on Titan in 2034.

Prescott Astronomy Club Solar Eclipse Viewing

Monday, April 8th, 2024, at 10:00am
Prescott Valley Civic Center Theater on the Green

On Monday, April 8th, 2024, a total solar eclipse will cross North America, passing over Mexico, the United States & Canada. Join the Prescott Valley Public Library & the Prescott Astronomy Club at the Civic Center Theater on the Green to learn more about solar eclipses & to safely experience this rare astronomical event.

Telescope viewing stations will be provided by the Prescott Astronomy Club. They will also share scientific facts about eclipses alongside a large viewing screen, as well as safe viewing tips leading up to peak viewing time, shortly after 11:02am. Activity stations will be hosted by the library, including paper viewer supplies & fun giveaways.

Viewing the partial eclipse yourself requires special glasses; never look directly at the sun without proper eye protection. Solar glasses will be distributed for free at Prescott Valley Public Library on March 29th between 10:00am-noon & 2:00pm-4:00pm. Due to limited supplies, the library cannot guarantee that solar glasses will be available at the April 8th event, so please take advantage of the solar glasses giveaway on March 29th.

Stop by the Prescott Valley Civic Center Theater on the Green at 7501 E. Civic Circle on April 8, 2024, anytime from 10:00am-12:30 to participate in this fun free event.

Prescott Astronomy Club Meeting

Wednesday, May 1st, 2024, at 6:00pm
Prescott Public Library, Founder's Room

Speaker: Jeffery Hall is the Executive Director of Lowell Observatory, *The Curious Case of Our Wild & Crazy Sun*

Topic: The Sun seems to shine each day with a steady, unchanging light, but our star is anything but calm. About every 11 years, the Sun undergoes a steady cycle of violent activity that has many effects on Earth. In this talk, we'll have a look at what causes solar variations & what effects they have, how we've figured out some of the Sun's secrets (including through eclipses, so we'll talk about those as well), & how we try to anticipate what it might do in the future.

Join Jeffery Hall, a solar astronomer & the Executive Director of Lowell Observatory in Flagstaff, for an exploration into the strange behavior of our nearby star.

Need More kNights in Shining Armor

Wow! The Prescott Astronomy Club has come a long way in the last couple of years.

- Membership has grown from 43 memberships to over 80 (100 if you count family members).
- The speaker program has grown in popularity & our meeting attendance is larger than ever.
- New webmaster & new website
- New Editor updated the look of our newsletter.
- Our Starry nights & Outreach programs have increased, & public awareness has grown.
- METASIG has been restarted.

This is due to the hard work of the club's board & volunteers. I want to thank all of you for your enthusiasm & generosity.

Before the pandemic, membership & volunteer participation were declining, which left the club ill-prepared to deal with the challenges of such a blow. In the meantime, our webmaster & newsletter editor retired after years of service. We have been able to fill the board again, replace our respected predecessors, grow our volunteer pool, & overcome the challenges we faced over the last two years.

Moving forward, we need more volunteers. Right now, we have 8 board members & 5 other volunteers that bear much of the load. There are another 5 or 6 people who regularly volunteer their time, telescopes, binoculars, & knowledge of the sky for Starry Nights and Outreach. To continue & grow our mission, the club needs more members to help. **Come & help with the Prescott Astronomy Club & spread the love of our hobby!**

LIST OF CURRENT NEEDS. Contact info is included, or you can talk to the person or board member at the meeting.

Second Webmaster	Help with updates & support of website based on WordPress. Contact Brian Blau vp@prescottastronomyclub.org
Telescope Volunteers for Starry Nights and Outreach Star Parties	Expand our pool of telescope volunteers & guides, members who will answer questions & who people around the sky. Big events coming in October — Highland Center, Talking Rock, & Partial Solar Eclipse. Contact Brian Blau. vp@prescottastronomyclub.org
Picnic	Help with setup & clean up. Show up early or stay late.
Christmas Party	Assist with party favors, name cards, door prizes. Contact Susanne Vaughan susanne.vaughan@gmail.com
Refreshments	Help & backup snack table. Contact Jill Albers.

New Programs - programs waiting on volunteers to get started.

School Outreach	Contact & plan astronomical topics/activities with schoolteachers. Contact Art Arnold-Roksandich p@prescottastronomyclub.org
Outreach Coordinator	Private requests especially for young people camps, celestial events, such as eclipses, comets, etc. for public viewing. Contact Art p@prescottastronomyclub.org or Brian vp@prescottastronomyclub.org
Dark Site Committee	New committee for locating & listing dark sites near Prescott for members, possibly locating a permanent site for the club. Dark Sky Promotion — increase public awareness for preserving dark skies. Contact Brian vp@prescottastronomyclub.org
Publicity and Social Media	Notify local media of upcoming events. Establish a social media presence. Contact Art p@prescottastronomyclub.org
Club Merchandise	Design & select vendor to put our logo on mugs, water-bottles, t-shirts, caps, etc. Contact Art p@prescottastronomyclub.org
Videographer/Zoom	Video speakers & handle zoom as needed. Contact Art p@prescottastronomyclub.org



NASA Night Sky Notes

Original Photo: unknown

Participating in Eclipse Science

By Kat Troche

April is NASA's Citizen Science Month, and there is no shortage of projects available. Here are some [citizen science projects](#) that you can participate in on April 8th, on and off the path of totality right from your smartphone!



Image Credit: Eclipse Soundscapes, ARISA Lab/NASA.

Eclipse Soundscapes

Eclipse Soundscapes will compare data from a 1932 study on how eclipses affect wildlife – in this case, crickets. There are a number of ways you can participate, both on and off the path. NOTE: you must be 13 and older to submit data. Participants 18+ can apply to receive the free Data Collector kit. Learn more at: eclipsesoundscapes.org/

GLOBE Eclipse

Folks that participated in the **GLOBE Eclipse 2017** will be glad to see that their eclipse data portal is now open! With the GLOBE Observer smartphone app, you can measure air temperature and clouds during the eclipse, contributing data to the GLOBE program from anywhere you are. Learn more at: observer.globe.gov/



Image Credit: HamSCI, The University of Scranton/NASA.

HamSCI

HamSCI stands for **Ham Radio Science Citizen Investigation**. HamSCI has been actively engaged in scientific data collection for both the October 14, 2023, annular solar eclipse and the upcoming April 8, 2024, total eclipse. Two major activities that HamSCI will be involved in around the solar events will be the **Solar Eclipse QSO Party (SEQP)** and the **Gladstone Signal Spotting Challenge (GSSC)** which are part of the HamSCI Festivals of Eclipse Ionospheric Science. Learn more about these experiments and others at: hamsci.org/eclipse



Image Credit: SunSketcher, Western Kentucky University/NASA.

SunSketcher

If you're traveling to totality, help the **SunSketcher** team measure the oblateness, or shape, of the Sun during the eclipse by timing the flashes of Baily's Beads. You will need a smartphone with a working camera for this, along with something to hold the phone in place - don't forget a spare battery! NOTE: The app will need to run from five minutes *before* the eclipse starts until the end of the eclipse. Any additional phone use will result in Sun Sketcher data loss. Learn more at: sunskecher.org/

Don't stop at the eclipse - NASA has citizen science projects you can do all year long - from [cloud spotting on Mars](#) to [hunting for distant planets](#)! By contributing to these research efforts, you can help NASA make new discoveries and scientific breakthroughs, resulting in a better understanding of the world around us, from the critters on the ground, to the stars in our sky.

We'll be highlighting other citizen science projects with our mid-month article on the [Night Sky Network](#) page, but we want to wish all you eclipse chasers out there a very happy, and safe solar eclipse! For last minute activities, check out Night Sky Network's [Solar Eclipse Resources section](#)!

Backyard Astronomer



Original Photo: Eberhard Grossgasteiger

The Backyard Astronomer - April 2024

Solar Cycles & Sunspots

By Adam England, The Backyard Astronomer

Nearly 3,000 years ago, The Chinese *Yi Jing* or "Book of Changes" documented small, irregular concealments in the surface of the Sun. By 300 BC, both Eastern and Western cultures were documenting their changing views of our star, and the patterns that would grow and then disappear on its disk. English Monk John of Worcester is the first known to have captured these obscurations in his drawings dating to 1128, and just a year after Galileo showcased his first optical telescope in 1609, English astronomer Thomas Harriot turned one of these new inventions to the leading lady of our Solar System. Taking from the work of so many great minds before him, Danish astronomer Christian Horrebow first proposed a regular cycle in 1775, noting, "it appears that after the course of a certain number of years, the appearance of the Sun repeats itself with respect of the number and size of the spots." By 1852, Swiss astronomer Rudolf Wolf compiled all the data available to him, finding an approximate 11-year period from one minimum through maximum and back to minimum. Choosing to begin with the best possible

documented records, Wolf denoted February 1755 as the beginning of Solar Cycle 1, with Solar Cycle 25 having begun in December 2019, and estimated to peak during Mid 2024.

Though I must suppose these early solar astronomers spent much of their later years suffering from poor vision after a lifetime of staring at the Sun, we now have technology allowing anyone to document their own backyard observations of our closest star. The more complex Hydrogen Alpha (H-Alpha) filters allow an extremely narrow bandwidth of the light spectrum through a lens to the eyepiece of one's telescope or camera sensor. The simpler form many of us are familiar with are the cardboard solar glasses you might find at an eclipse or other educational event, with lenses made of thin polymers reducing the sun's penetrating radiation to the equivalent of shade 14 welding glass. NASA and the ESA have also provided us with the ability to view the sun remotely in many different wavelengths, courtesy of the Solar and Heliospheric Observatory — or SOHO — launched in 1995. Continuing to provide valuable observations of the sun nearly 30 years later, the SOHO Viewer app is available on most mobile platforms, allowing backyard astronomers to observe sunspots, prominences, and solar flares in real time.

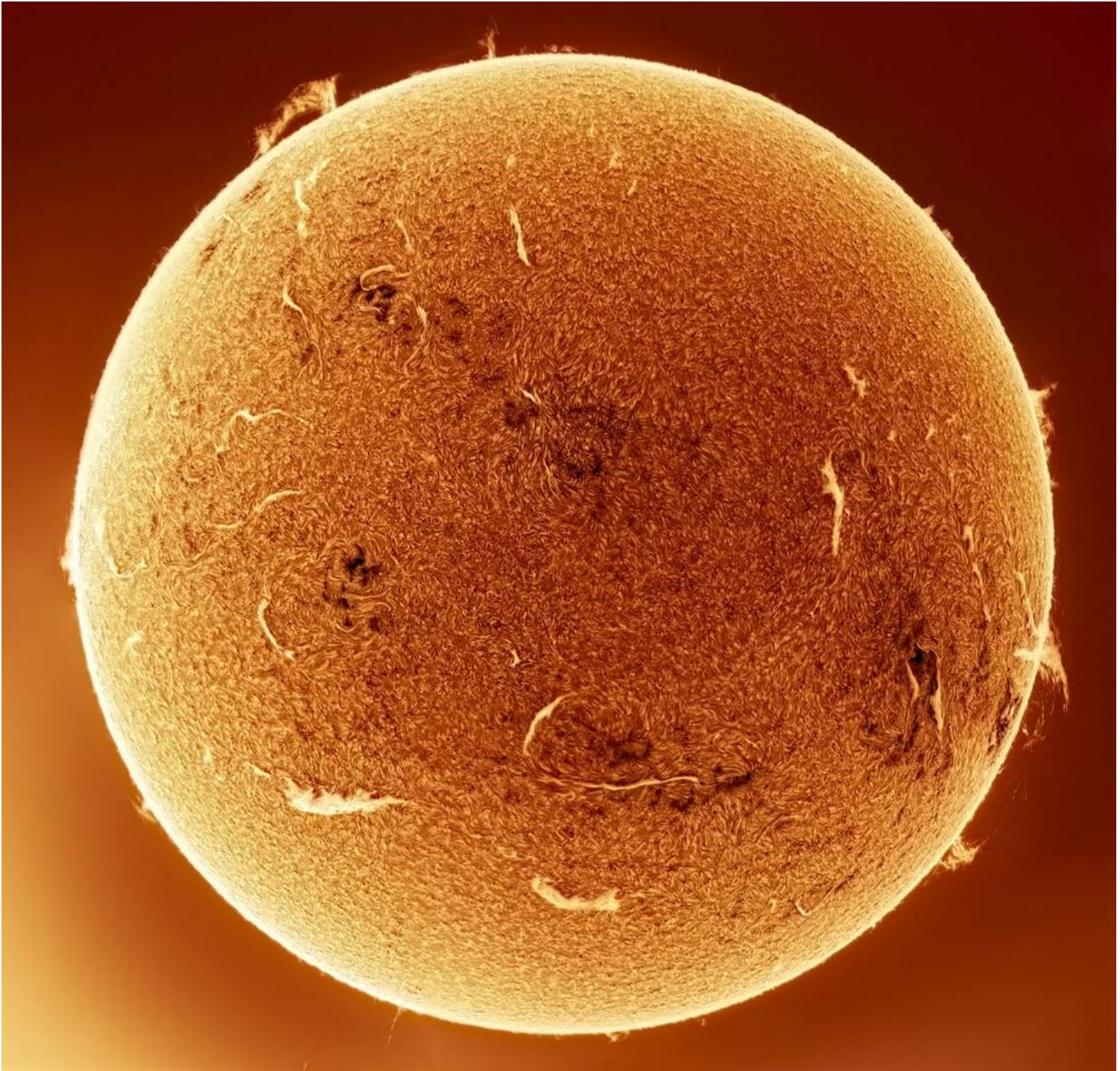


Image Credit: Our Sun, courtesy Mark Johnston, Phoenix Astronomical Society @AZAstroGuy

More than just observing dark spots on the Sun, Solar Maximum can have diverse impacts on the environments of the Solar System. Periods of Solar Maximum may be accompanied by flares and storms, the largest of which are known as CMEs or Coronal Mass Ejections. In December

2021, Mars suffered a direct hit from a CME, and both orbiting and ground craft there documented how it affected the Martian atmosphere. Closer to home, 1859's Carrington Event during Solar Cycle 10 caused Aurorae to be visible from the poles to the equator. Telegraph operators worldwide experienced electrical shocks, disconnected the power from the equipment, and were still able to send and receive messages, with some operators reporting better transmission for up to two hours, despite not being connected to a power source. Multiple telegraph offices even reported fires starting from such high electromagnetic activity.

Check with your local library and the Prescott Astronomy Club for events relating to the April 8th solar eclipse, and use your safe viewing instruments to enjoy this event and document the number of sunspots and prominences you observe during this Solar Maximum.

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: George Desipris

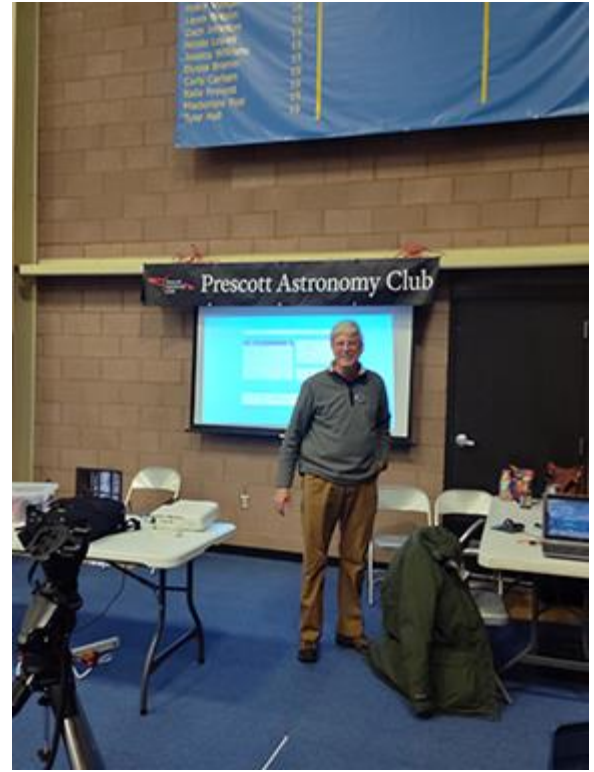
Prescott Astronomy Club at the ERAU SciTech Fest

On Saturday, March 2, the Prescott Astronomy Club participated in the SciTech Fest at Emery-Riddle Aeronautical University in Prescott. This is the first time the club has participated in the Fest since the pandemic. The club put up a booth with information about the club, information about dark sky preservation, how to safely view the upcoming solar eclipse as well as a projection screen showing astroimages by Brian Blau. James also brought his radio telescope and answered questions. It was too windy to set up any viewing experiences for the solar scope or radio telescope outside, but we did put them up inside the activity center so visitors could ask questions about them.

Art Arnold-Roksandich, Brian Blau, James and Susanne Vaughn, and Ken Olson manned the booth to answer questions about the club, star parties, telescopes, dark sky preservation, and the upcoming solar eclipse. We were kept busy from 10am to 3pm as @ 600 visitors stopped by.

Prescott Regional SciTech Festival promotes a culture that celebrates and embraces education, research, collaboration, innovation, and economic growth in the Prescott region, related to science, technology, engineering, mathematics, and the arts (STEAM). ERAU estimated @ 1000 attendees this year, much larger than last year.





Eye on the Sky

Original Photo: Adrian Lang

Unique Ways to Safely Observe Partial Solar Eclipses

By Doug Tilley

Unlike viewing an eclipse from a point of totality where the Sun is **COMPLETELY** blocked by the Moon and filters can be removed temporarily to view the totality time-period, partial eclipses must always use safety glasses or indirect methods instead.

Fortunately, there are many easy ways to watch the show safely. Below are some methods to protect one's eyes from damage and enjoy the event.

Pinhole Projection

The simplest safe way to view a partial solar eclipse is to watch the Sun's image projected onto a piece of white paper. Poke a small hole in a piece of aluminum foil with a pencil point, face it toward the Sun, and hold a second card three or four feet behind it in its shadow. The hole will project a small image of the Sun's disk onto the lower card. This image will go through all the phases of the eclipse, just as the real Sun does. Experiment with different size holes. A large hole makes the image bright but fuzzy; a small hole makes it dim but sharp.

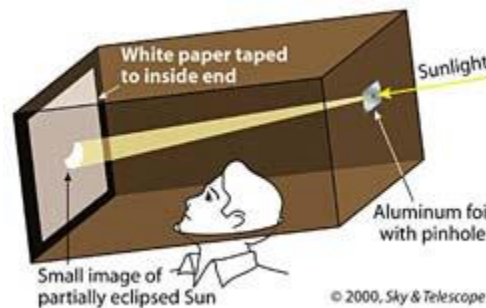


Image Credit Sky & Telescope illustration

For a better view, you can reduce the amount of daylight shining on the viewing card by enclosing it in a long box. This lets you use a small pinhole giving a sharp image.

Even at its best, pinhole projection gives only a small image. The throw distance in feet, divided by 9, gives the image diameter in inches. Pretty small!

Project a Partial Solar Eclipse with Binoculars or a Telescope

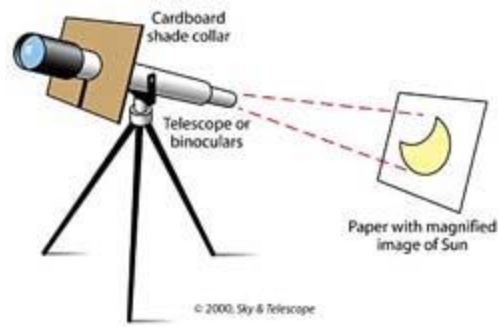


Image Credit Sky & Telescope illustration

You can form a much sharper and bigger Sun image by projection through a small telescope or binoculars. This is best done outdoors to avoid the distorting effect of a windowpane. To aim the instrument safely, look at its shadow on a white card as you swing the tube around. (**Don't use your finderscope — make sure it's capped at the front end or removed completely.**) When the scope's shadow nears its minimum size, a brilliant beam of sunlight will burst out of the eyepiece and fall onto the card. Turn the focus knob and experiment with the card's distance behind the eyepiece until the Sun's disk is sharp and as big as you want. **Look for sunspots!**

How to Directly View a Partial Solar Eclipse



Image Credit Johnny Horne

If you prefer to look directly at the Sun, you can use a square or rectangular arc-welder's glass of shade #13 or #14, available for a few dollars from local welding-supply stores. (Don't get a lower-numbered shade; the Sun will be too bright to look at safely.) **Alternatively, special, cheap "eclipse glasses" (left) are widely made from safe solar filter materials.**

A solar filter that's designed to be used with a telescope is also safe for viewing with the otherwise unaided eye.

Remember, safety is paramount. Never look directly at the Sun without using a safe solar filter.



Original Photo: Zukiman Mohamad

James Vaughan's Photograph

Here is a photo taken on March 9, 2024 of 12P/Pons Brooks using a Seestar with 15 minute exposure.



Image Credit: James Vaughan

Calendar of Events

Original Photo: Camille Cox

April 2024:

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

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1 Sombrero Galaxy is Well-Placed Last Quarter Moon	2	3 Conjunction of Venus & Neptune PAC Meeting	4 Messier 94 is Well-Placed Jewel Box Cluster is Well-Placed	5 Conjunction of Moon & Mars Close Approach of Moon & Mars	6 Conjunction of Moon & Saturn Close Approach of Moon & Saturn Lunar Occultation of Saturn Moon at Perihelion
7 Close Approach of Moon & Venus Conjunction of Moon & Venus Lunar Occultation of Venus Moon at Perigee	8 New Moon Total Solar Eclipse Asteroid 532 at Opposition Eclipse Viewing	9	10 Close Approach of Saturn & Mars Conjunction of Saturn & Mars Conjunction of Moon & Jupiter	11 Close Approach of Moon & M45 Mercury at Inferior Solar Conjunction	12 Lunar Occultation of Beta Tauri	13 Centaurus A is Well-Placed Omega Centauri is Well-Placed

14 136199 Eris at Solar Conjunction Whirlpool Galaxy is Well-Placed	15 First Quarter Moon Messier 83 is Well-Placed	16	17 Messier 3 is Well-Placed	18	19 Moon at Apogee	20 Conjunction of Jupiter & Uranus 136108 Haumea at Opposition
21 Comet 12P/Pons-Brooks Reaches Peak Brightness Comet 12P/Pons-Brooks Passes Perihelion	22 Lyrid Meteor Shower 2024 Messier 101 is Well-Placed	23 Full Pink Moon π -Puppis Meteor Shower 2024	24	25	26 Moon at Aphelion Lunar Occultation of Antares	27
28 Conjunction of Mars & Neptune Close Approach of Mars & Neptune	29	30 Mercury at Aphelion				

Call for Images & Ideas

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.

Observing Lists

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.

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](#)



PAC Business

Original Photo: Tobias Björkli

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

PAC Contact Information:

Website: <https://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: Brian Blau

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.