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.

October 2023

Original Photo: Lucas Pezeta

General Meeting of the Prescott Astronomy Club

Wednesday, October 4, 2023, at 6:00pm
Prescott Public Library – Founders Room

Speaker: Dr. Lawrence Wasserman, Lowell Observatory (retired)
Topic: Things that Go "Bump" in the Night — Conjunctions, Transits, Eclipses & Occupations

Background: Occasionally two (or more) objects appear to come close to each other in the sky. Some of these events are pretty, make nice pictures, but have no actual scientific use. Others are surprisingly important for astronomy. Dr. Wasserman will discuss each of these events (with emphasis on those which are scientifically important).

Bio: Lawrence (Larry) Wasserman received his PhD in astronomy from Cornell University in 1973. In 1974, he came to Lowell Observatory where over the years he has been involved in observing and predicting occultations in our own Solar System. He has also studied double stars and Kuiper belt objects. Currently he is partially retired but continues to maintain the Lowell Observatory Asteroid data base.

Partial Eclipse Viewing

October 14, 2023, 8:00am-10:00am
Location to Come

Where: Scenic Overlook, Eastbound Pioneer Pkwy

What: Members of the Prescott Astronomy Club will have their solar scopes and solar viewing glasses on hand to see the partial eclipse. While Prescott isn't in the area of eclipse totality, at our location the moon cover 82% of the sun at its maximum at 9:30am.

Directions: *The Scenic Overlook parking lot is only accessible on eastbound Pioneer Pkwy*. Starting at the intersection of Williamson Valley Rd, go east on Pioneer Pkwy for approximately 1/2 mile and turn RIGHT into the Scenic Overlook Parking lot. There is no access to the parking lot when traveling on westbound Pioneer Pkwy.

Weather: This event is weather dependent so please monitor www.prescottastronomyclub.org website for any changes due to sky conditions on the morning of Oct 14.

General Meeting of the Prescott Astronomy Club

Wednesday, November 1, 2023, at 6:00pm
Prescott Public Library – Founders Room

This is the last meeting of the year. Club officers for 2024 will be elected & we will review new club business, initiatives & events for the year to come.

Bring your ideas for the future of the club, we welcome feedback & need your participation!

Prescott Astronomy Club Holiday Party

Wednesday, December 6th, 2023, at 6:00pm
Arizona Room at the Hassayampa Inn in Prescott

The Prescott Astronomy Club will not meet at the Library in December. Instead, we are having a **Holiday Party** on Wednesday, December 6th. Show up for drinks & socializing at 6pm at the Hassayampa Inn, Arizona Room in downtown Prescott. The cost is $40 a person & includes a salad, water/tea/coffee, full dinner entree, & dessert. A cash bar will be available with wine, beer, & mixed drinks. There will be door prizes!

Meal choices are listed below. Please go to the PAC website and choose your dinner choice (& one for your significant other) & pay online via the PAC PayPal....OR mail a check (made out to "Prescott Astronomy Club") with your dinner choices to:

Prescott Astronomy Club
186 E. Sheldon St. #1122
Prescott, AZ 86301

Be sure to choose an entree & pay prior to November 22nd. The list will be turned into the hotel for purchase (so they have time to make sure they have all goods on hand). Parking is free across the street from the hotel (parking lot) or on the street. The courthouse square will be decorated for the holidays & very festive.

We had FUN last year and hope this one is, too. It is the last event of 2023, so join us to celebrate!

Holiday Party Choices

EVERYONE GETS:
**Harvest Baguette with butter
**Winter Salad with baby spinach, dried cranberries, walnuts, gorgonzola cheese, & apple cider vinaigrette
**Coffee/tea/water
**Dessert: Coconut Cream Pie (sugar free) OR Bread Pudding with Whisky Sauce (served to people equally, so trade with someone to get which one you want)

ENTREE CHOICES:
— Slow Roasted Prime Rib with red potatoes, & seasonal vegetables
— Chili Lime Salmon with tricolor couscous & seasonal vegetables
— Blackened Shrimp with Orzo & seasonal vegetables
— Asian Sticky Chicken with rice & seasonal vegetables (new choice!)

Please note that the hotel reserves the right to substitute an entree or vegetable if difficult to supply. But so far, this has never happened.

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 (@110 if you count family members).
- The speaker program has grown in popularity and our meeting attendance is larger than ever.
- New webmaster and new website
- New Editor updated the look of our newsletter.
- Our Starry nights and Outreach programs have increased, and public awareness has grown.
- METASIG has been restarted.

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

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

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

Leadership Team	Volunteers to fill the positions of President and possibly a board member. Nominations are due by the October meeting and the election in November. Contact Doug Tilley dougbt51@gmail.com
Second Webmaster	Help with updates and 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 and guides, members who will answer questions and who people around the sky. Big events coming in October - Highland Center, Talking Rock, and Partial Solar Eclipse. Contact Brian Blau. vp@prescottastronomyclub.org
Picnic	Help with setup and clean up. Show up early or stay late.
Christmas Party	Assist with party favors, name cards, door prizes. Contact Susanne Vaughn susanne.vaughan@gmail.com
Refreshments	Help and backup snack table. Contact Jill Albers.

New Programs - programs waiting on volunteers to get started.

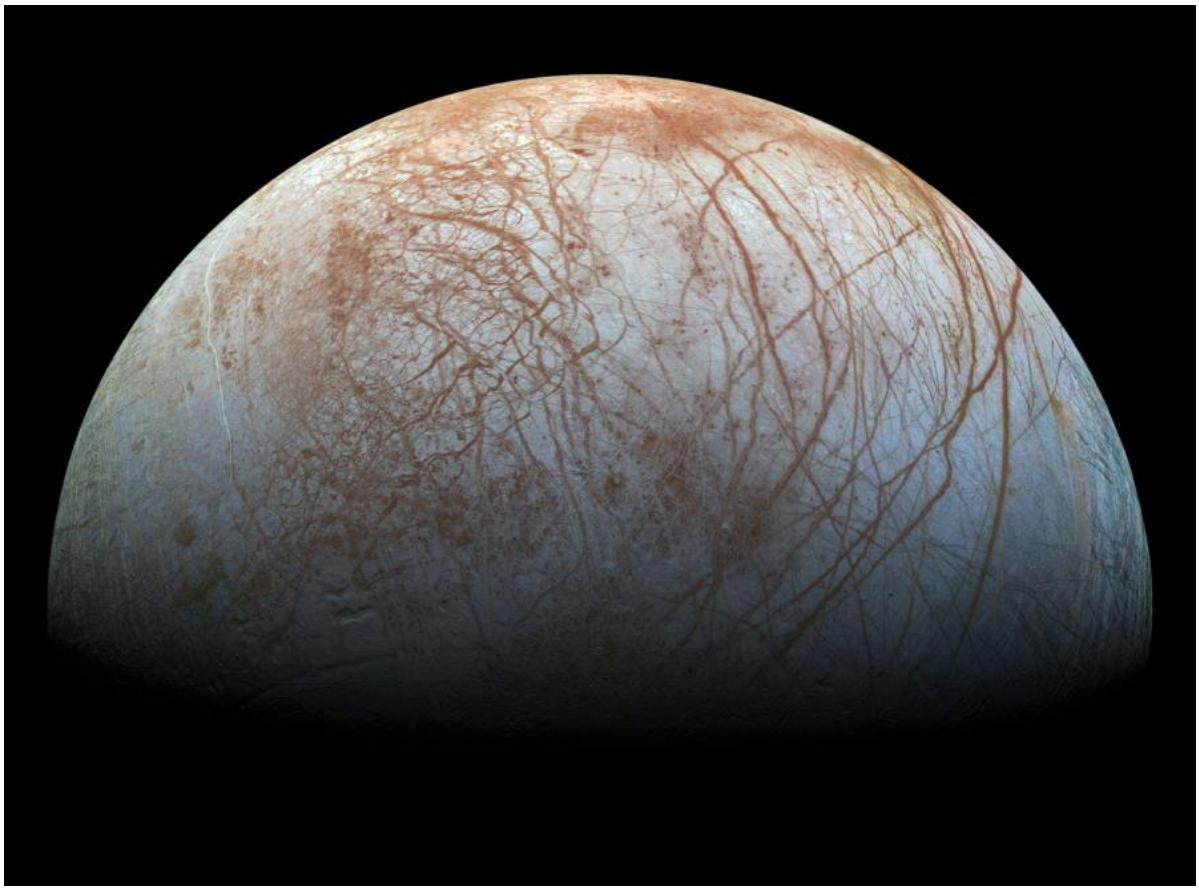
School Outreach	Contact and plan astronomical topics/activities with schoolteachers. Contact Art Arnold-Roksandich p@prescottastronomyclub.org
Outreach Coordinator	Private requests especially for young people camps, celestial events, such as eclipses, comets, etc. for public viewing. Contact Art p@prescottastronomyclub.org or Brian vp@prescottastronomyclub.org
Dark Site Committee	New committee for locating and 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 and select vendor to put our logo on mugs, water-bottles, t-shirts, caps, etc. Contact Art p@prescottastronomyclub.org
Videographer/Zoom	Video speakers and handle zoom as needed. Contact Art p@prescottastronomyclub.org

Original Photo: unknown

From Galileo to Clipper, Exploring Jupiter's Moons

By Vivian White

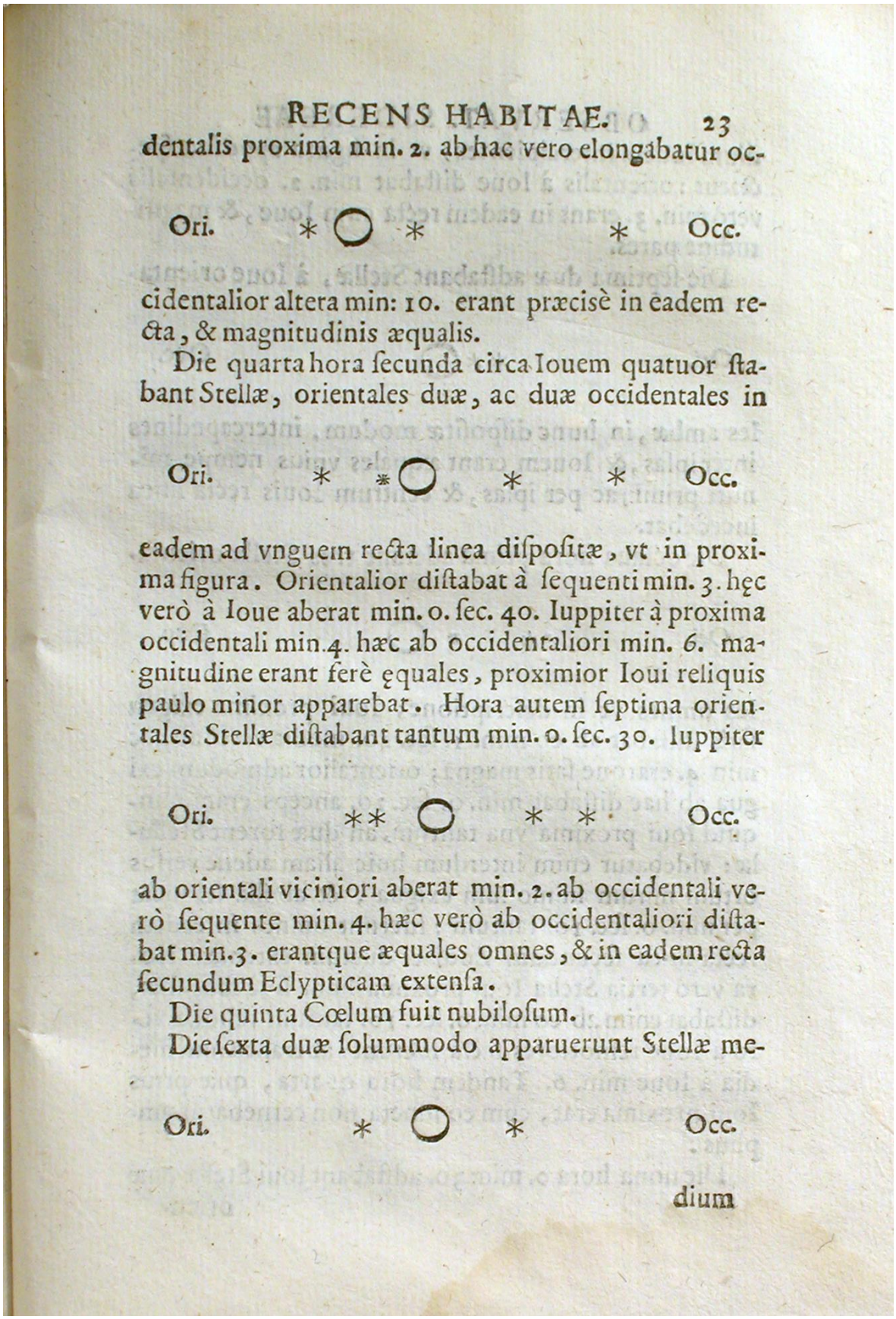
"...We, too, are made of wonders, of great
and ordinary loves, of small invisible worlds,
of a need to call out through the dark."
From *In Praise of Mystery: A Poem for Europa* by Ada Limon



As autumn begins, if you're up late, you may notice a bright point of light rising in the east. Look a bit closer, with a pair of binoculars, and you'll notice it's not a star at all. While stars look point-like no matter how big your backyard telescope, this light appears as a circle under closer examination. Even more curious, you will likely see a line of smaller dots on one or both sides. Congratulations! You've rediscovered the king of the planets - majestic Jupiter - and its four largest moons.

Galileo famously chronicled the four moving dots near Jupiter and surmised that they were orbiting the distant world. While Jupiter has well over 80 discovered moons as of September 2023, these brightest four are called the "Galilean Moons" - Io, Europa, Ganymede, and Callisto.

(Great mnemonics exist to remember these in order of distance from Jupiter, such as “I Eat Green Caterpillars”) You can follow these like Galileo did, using stargazing apps or the handy image below. A favorite beginning observing challenge is to track the movement of the Galilean Moons over the course of many nights. Even within a few hours, you will notice them moving in relation to Jupiter, just as Galileo did.



RECENS HABITAE. 23

dentalis proxima min. 2. ab hac vero elongabatur oc-

Ori. * ○ * * Occ.

cidentalior altera min: 10. erant præcisè in eadem recta, & magnitudinis æqualis.

Die quarta hora ſecunda circa Iouem quatuor ſtabant Stellæ, orientales duæ, ac duæ occidentales in

Ori. * * ○ * * Occ.

eadem ad vnguem recta linea diſpoſitæ, vt in proxima figura. Orientalior diſtabat à ſequenti min. 3. hęc verò à Ioue aberat min. 0. ſec. 40. Iuppiter à proxima occidentali min. 4. hæc ab occidentaliori min. 6. magnitudine erant ferè ęquales, proximior Ioui reliquis paulo minor apparebat. Hora autem ſeptima orientales Stellæ diſtabant tantum min. 0. ſec. 30. Iuppiter

Ori. ** ○ * * Occ.

ab orientali viciniori aberat min. 2. ab occidentali verò ſequente min. 4. hæc verò ab occidentaliori diſtabat min. 3. erantque æquales omnes, & in eadem recta ſecundum Eclypticam extenſa.

Die quinta Cœlum fuit nubiloſum.

Die ſexta duæ ſolummodo apparuerunt Stellæ me-

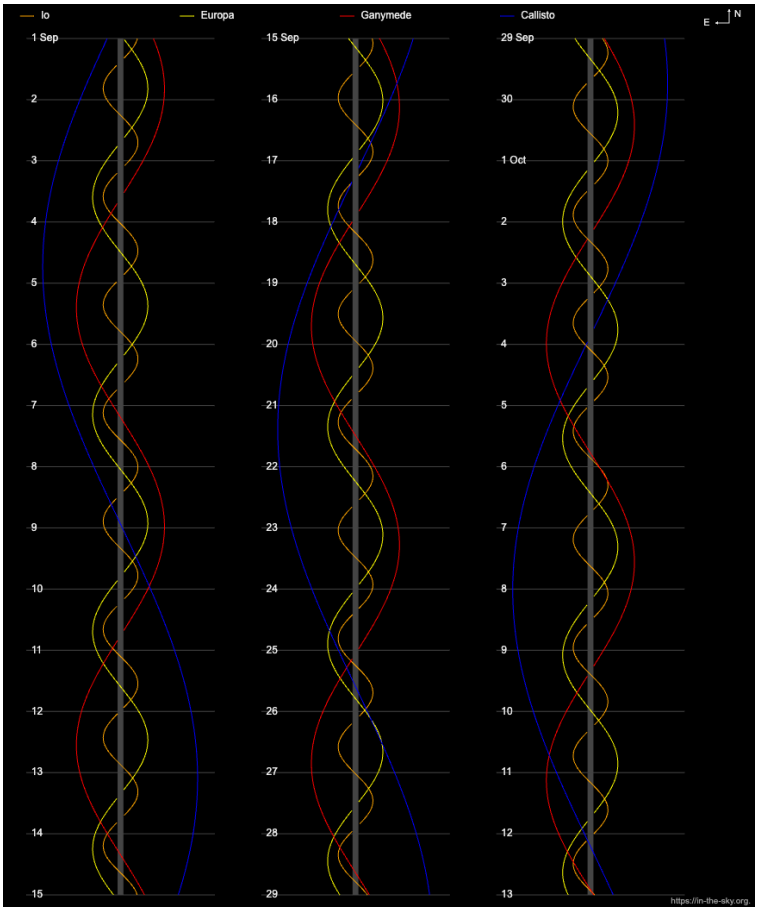
Ori. * ○ * Occ.

dium

Galileo's drawings of Jupiter and its Medicean Stars from Sidereus Nuncius.
Image courtesy of the History of Science Collections, University of Oklahoma Libraries.

Fast forward 414 years, and NASA will be sending a robotic mission to investigate the surface of one of these distant worlds. The Europa Clipper Mission is launching to the cold, icy moon in 2024, to begin orbiting in 2030. With its salty oceans covered by ice, Europa was chosen as an excellent location to continue the search for life outside of Earth. Clipper will be the largest spacecraft ever sent to another planet, designed to withstand Jupiter's punishing radiation. Once it arrives at Jupiter in 2030, NASA plans to do about 50 flybys of Europa, mapping almost the entire surface of this watery world.

What was once only dreamed of in the small telescope of Galileo, or in great works of fiction, NASA is turning our wildest imagination into reality. One of the celebrated quotes from the classic 2010: Odyssey Two warns, "All these worlds are yours, except Europa. Attempt no landing there." Science fiction fans can feel relieved knowing that writer Arthur C. Clarke gave his blessing for the Europa Clipper mission.



The position of the Galilean Moons of Jupiter in October 2023: https://in-the-sky.org/jupiter.php

Join the Europa Message in a Bottle Campaign to send your name with the spacecraft, hear the rest of the poem by the US Poet Laureate, and learn more about the wonders of space travel with the Clipper Mission: https://europa.nasa.gov/participate

Watch a wonderful Clipper webinar with Dr. Cynthia Phillips, planetary geologist with the mission: https://www.youtube.com/live/RnnLJBLRBCA?feature=shared&t=269

Backyard Astronomer

Original Photo: Eberhard Grossgasteiger

The Backyard Astronomer – October 2023

Annular Eclipse

By Adam England, The Backyard Astronomer

If you happen to be around the Four Corners area on October 14th, make sure to have your solar eclipse glasses with you. After that day, you will be able to tell your friends that you saw an eclipse from four different states! An annular solar eclipse will grace our skies that morning, with the full eclipse beginning around 9:30 MST and lasting for just under 5 minutes. You may encounter this path of totality along a swath of the United States covering from the coast of Oregon to South Texas on that day.

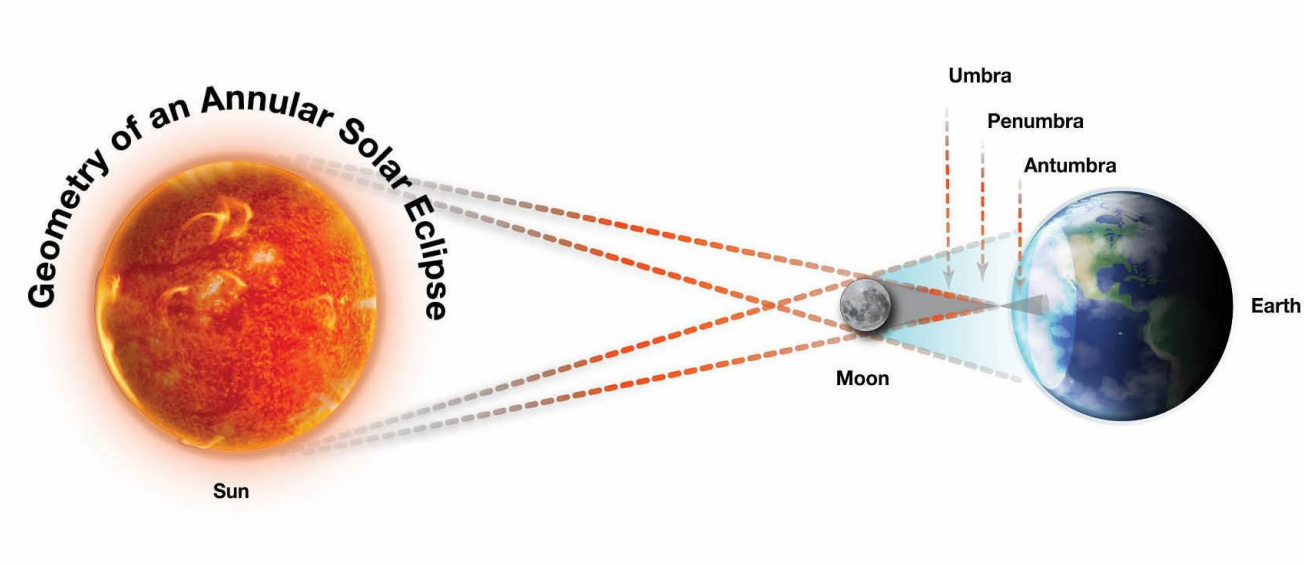


Photo: Geometry of an Annular Solar Eclipse, courtesy of NASA.

An annular eclipse is a type of solar eclipse, where the moon is directly between the Earth and Sun. When viewing a total solar eclipse, the moon will completely cover the disk of the sun, whereas an annular eclipse only covers the center of the Sun, leaving a slim ring of light visible around the Moon. This halo is the annulus, from the Latin meaning “little ring”, and mathematically is defined as the area between two concentric circles. This “little ring” is also where we get the word annual, for the circular nature of the yearly calendar.

Photo: Path of Annular Eclipse, courtesy Great American Eclipse.

The reason we have both total and annular eclipses is due to the non-circular nature of the universe. Seemingly a contradiction to all of this talk of rings and circles, objects in space are governed by the forces of gravity, and orbit in ellipses rather than true circles. At some points in the Moon's orbit, it is closer to the Earth, at which time we experience Supermoons like we did in August. This closest part of the Moon's – or any other object's – orbit is known as perigee. At other times, the ovular orbit takes the orbiting body further from the primary body, and this more distant point is called apogee. Likewise, when the moon is at apogee during a solar eclipse, the apparent diameter of the Moon as viewed from Earth is not sufficient to fully cover the Sun, giving us a "ring of fire" eclipse that is quite the sight to behold.

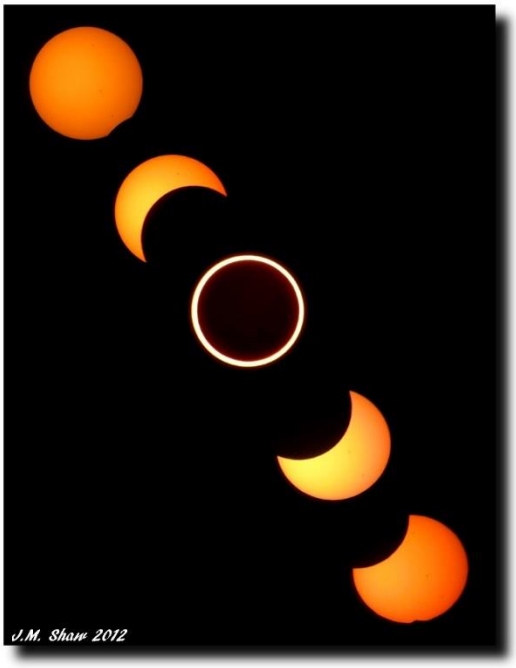


Photo: Ring of Fire Eclipse, by Jerry Shaw

Whether total or annular, a solar eclipse happens about twice per year on Earth, though with more than 70% of Earth's surface covered by water, they are not always visible from terra firma. In addition, the rotation of the Earth means that these eclipses could happen on any

continent, and so are unique events when able to be seen locally. The path of the annular eclipse is around 120 miles wide in that track across the Western United States, however a viewer hundreds of miles away can still experience a partial eclipse. Here in Central Yavapai County, we will see approximately 82% coverage of the Sun's face over the course of the morning.

AND DON'T FORGET YOUR SOLAR GLASSES FOR SAFE VIEWING!

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 and Instagram.com/TheBackyardAstronomerAZ.

Original Photo: George Desipris

International Observe the Moon Night

By Roland Albers

Mark your calendars now! Saturday, October 21st is **International Observe the Moon Night**, an annual event sponsored by NASA and its Lunar Reconnaissance Orbiter mission. The moon will be at first quarter that evening, providing excellent viewing opportunities along the terminator (the line between night and day), where shadows enhance the Moon's cratered landscape.

NASA is inviting everyone to join International Observe the Moon Night from wherever you are. You can attend or host a virtual or in-person event, observe the Moon from home, connect with fellow lunar enthusiasts around the world on NASA's Facebook page (https://www.facebook.com/observethemoon/), or #ObserveTheMoon on your preferred social media platform.

According to NASA, the goals of International Observe the Moon Night are to:

- Unite people across the globe in a celebration of lunar observation, science, and exploration.
- Raise awareness of NASA's lunar science and exploration programs.
- Facilitate sharing of Moon-inspired stories, images, artwork, and more.
- Inspire continued observation of the Moon, the sky, and the world around us.

For Prescott Astronomy Club members viewing the moon from home with binoculars or a telescope, I suggest undertaking any of the following activities:

1. From about 6:00 PM to 11:00 PM, watch the lunar sunrise sweeping across the crater Archimedes. With a diameter of just over 50 miles, Archimedes is the largest crater in Mare Imbrium. Like neighboring Plato, Archimedes is well known for its smooth floor, produced by an ancient lava flood which covered its central peak and other interior features. Those up for a challenge can try to spot the few small craterlets sprinkled across the floor of Archimedes.
2. Complete a portion of the Astronomical League's Lunar Observing Program, which can be found at: https://www.astroleague.org/lunar-observing-program/. Along with Archimedes, other prominent lunar features listed in the Observing Program that are well positioned near the terminator that night include (from north to south) Montes Alpes, Cassini, Aristillus, Autolycus, Ptolemaeus, Alphonsus, Arzachel, and Walther.
3. Simply explore the moon using your favorite moon atlas. An excellent paper atlas is Sky & Telescope's Field Map of the Moon. For those with a Windows laptop, I highly recommend downloading and using The Virtual Moon Atlas. This a superb and free lunar atlas, and it can be found at https://ap-i.net/avl/en/start.

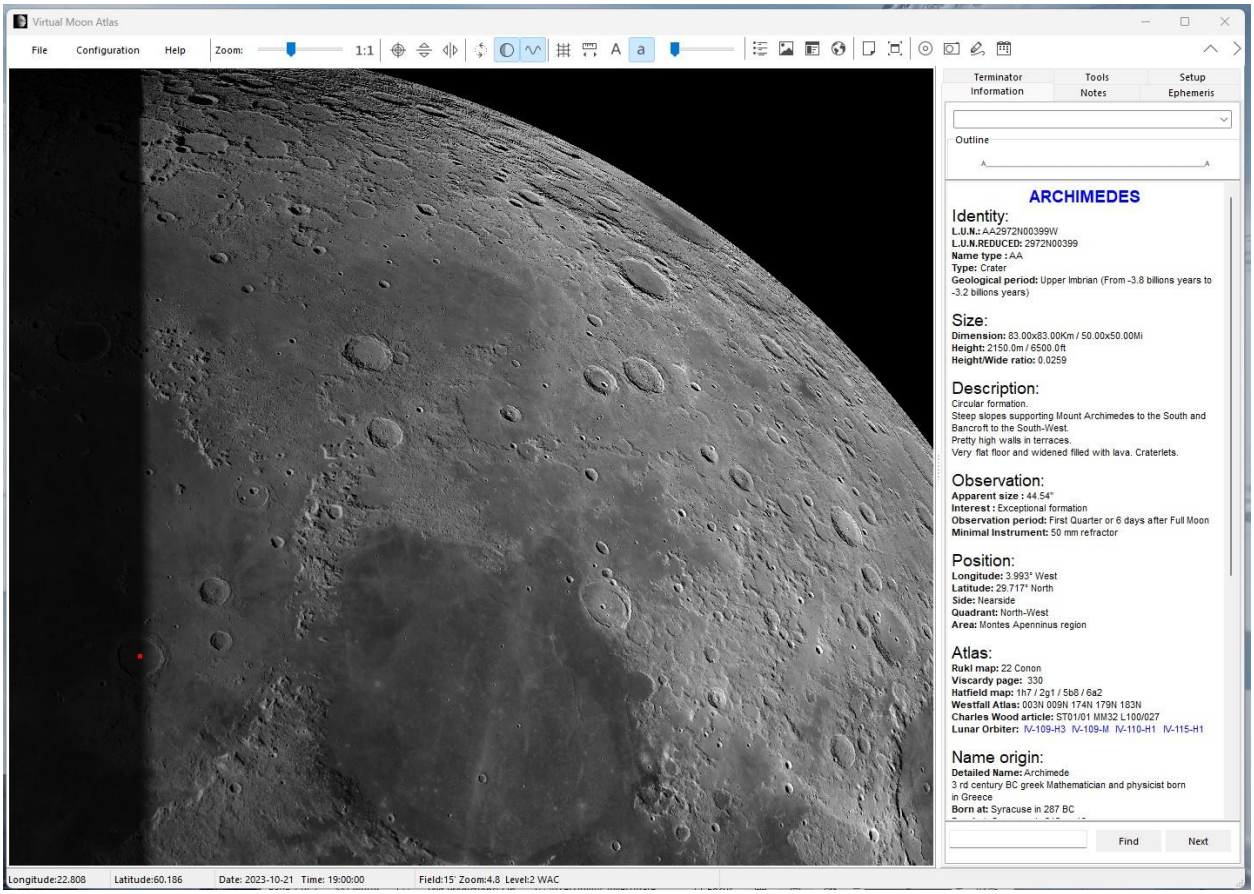


Figure 1: Virtual Moon Atlas showing position of Archimedes (red dot)

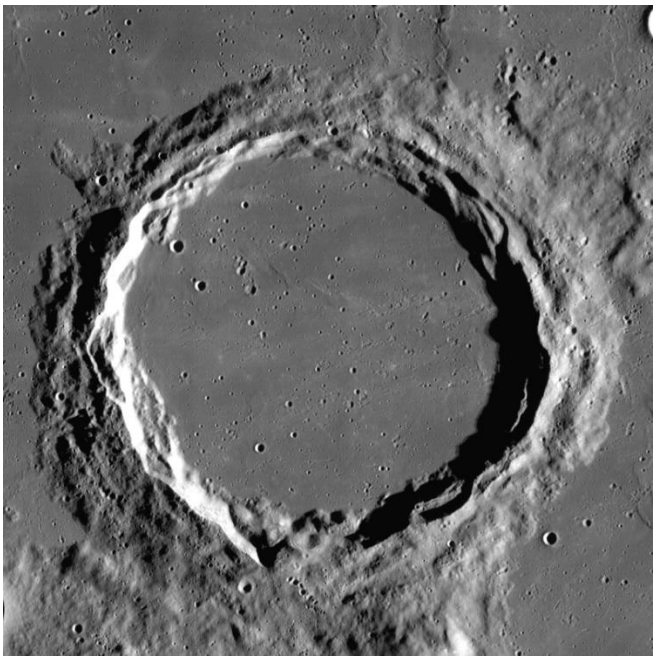


Figure 2: Close-up of Archimedes, courtesy Wikipedia

Original Photo: Camille Cox

October 2023:

This calendar is put together from several sources & shows the objects & events visible during October 2023.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 Close Approach of Moon & Jupiter Conjunction of Moon & Jupiter Asteroid 29 Amphitrite at Opposition	2 Andromeda Galaxy is Well-Placed 136472 Make at Solar Conjunction Close Approach of Moon & M45	3 NGC 253 is Well-Placed	4 Lunar Occultation of Beta Tauri PAC Meeting	5 Small Magellanic Cloud is Well-Placed NGC 300 is Well-Placed	6 October Camelopardalid Meteor Shower 2023 Last Quarter Moon	7 NGC 362 is Well-Placed
8	9 Draconid Meteor Shower 2023 Moon at Apogee	10 Conjunction of Moon & Venus Close Approach of Moon & Venus Southern Taurid Meteor Shower 2023	11 Aurigid Meteor Shower 2023	12	13	14 New Moon Annular Solar Eclipse Eclipse Viewing
15 Triangulum Galaxy is Well-Placed	16 Moon at Perihelion	17	18 Mars at Apogee Lunar Occultation of Antares 136199 Eris at Opposition Geminid Meteor Shower 2023	19 Mercury at Superior Solar Conjunction	20 Venus at Highest Altitude in AM Sky	21 First Quarter Moon
22 Orionid Meteor Shower 2023 Comet 2P/Encke Passes Perihelion	23 Venus at Greatest Elongation West	24 Conjunction of Moon & Saturn Close Approach of Moon & Saturn 136108 Haumea at Solar Conjunction	25 Leonis Minorid Meteor Shower 2023 Moon at Perigee	26 Moon at Aphelion	27 Perseus Double Cluster is Well-Placed	28 Partial Lunar Eclipse Full X Moon Close Approach of Moon & Jupiter
29 Conjunction of Moon & Jupiter	30 Close Approach of Moon & M45	31				

Original Photo: Samer Daboul

These are photographs by non-PAC members that I think you might enjoy.

Original Photo: Johannes Plenio

Original Photo: Unknown

Original Photo: Tomáš Malík

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 Käriäinen

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
Messier
Planet Maps
Binocular Showpieces Caldwell
Face-On Spiral Galaxies
Herschel II
Herschel 400
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
EJ Van Horne

PC Coordinators:

Astronomical League Coordinator: Ken Olson
Christmas Party: Susanne Vaughan
Equipment Loans: Roland Albers
Membership: Roland Albers
METASIG: 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

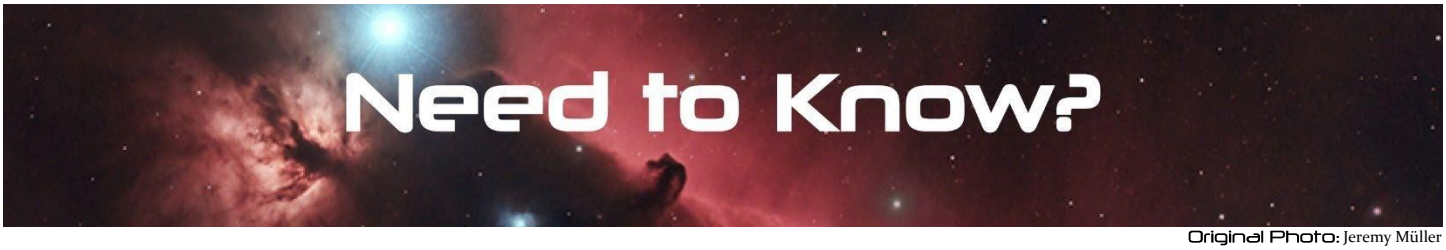
PAC Contact Information:

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



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.