



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

MARCH 2017

UPCOMING EVENTS



Wednesday, March 1 - Regular PAC meeting @ 6:30 PM in Rm 107, Bldg 74, Embry-Riddle Aeronautical University. Club president Jeff Stillman will present "Astrophotography for Everyone". Jeff will show images taken with a DSLR and tripod and provide a brief explanation of exposure time and how to process DSLR images.

Wednesday, March 8 - METASIG @ 5:00 PM at local restaurant. Sign up at March 1 meeting.

Wednesday, March 15 - Board meeting @ 6:30 PM.

Thursday, March 16 - Third Thursday Presentation @ 6:00 PM in the Founder's Suite, Prescott Public Library. Pat Beldsoe, club member, USAF Colonel retired, Alaska Airlines Captain, retired, will present "High-Tech Navigation Before GPS; How The SR-71 Found Its Targets". In 1957, the CIA and the Air Force began a search for a reconnaissance aircraft that would be invulnerable to Soviet surface-to-air missiles. Lockheed won the design competition over Convair, and began serious development work in September 1959, which resulted in the A-12, YF-12, and finally the SR-71. The SR-71 served the U.S. all over the world until it was retired by the Air Force in 1990. Colonel Bledsoe flew the SR-71 for seven years and will explain how the aircraft was built and operated, with special emphasis on its unique astro-inertial navigation system.

Saturday, March 18 - Starry Nights @ 7:30 PM at The Highland Center for Natural History. Sign up at meeting on March 1.

Thursday, March 23 - American Heritage Academy @ TBD in Camp Verde. Sign up at meeting on March 1.

Saturday, March 25 - All Arizona Messier Marathon @ the Salome Emergency Airfield Site. Details for this Saguaro Astronomy Club sponsored event can be found in the appendix.

VOLUNTEERS NEEDED

Volunteers are needed for two club activities: refreshment coordinator and PAC Store Sales coordinator. If you would like to help and need additional information, please contact Jeff Stillman (jstillman50@cableone.net).

PROPOSED CLUB PURCHASE - PA SYSTEM

The PAC board is seeking member approval to purchase a new PA system to be used at all club meetings. The details and costs are below. The request for the expenditure will be brought up for a vote at the March 1 general meeting.



BASE SYSTEM: \$268.50 – Professional Duel-Diversity UHF wireless system with 100 adjustable frequencies. The base system includes:

- 1 – hard storage case
- 2 – antennas
- 2 – handheld wireless mics
- 1 – 1/4” to 1/4” 3-foot cord
- 1 – AC adapter

ADDITIONAL EQUIPMENT:

- \$ 16.00 – 12 wind-blocking mic covers Part Number: AWS403B
- \$ 59.00 – 1 body transmitter with lapel mic Part Number: AWX6540M
- \$ 59.00 – 1 body transmitter with light-weight head set Part Number: AWX6540H
- \$ 8.10 – 1 XRL to XRL 6 foot connection cord Part Number: ADC203L

SHIPPING: \$20.00

TAXES: None for non-profit – quoted prices are also reduced for a non-profit

TOTAL COST: \$430.60 (approx.)

SOLAR ECLIPSE PROVIDES CORONAL GLIMPSE

By Marcus Woo

On August 21, 2017, North Americans will enjoy a rare treat: The first total solar eclipse visible from the continent since 1979. The sky will



darken and the temperature will drop, in one of the most dramatic cosmic events on Earth. It could be a once-in-a-lifetime show indeed. But it will also be an opportunity to do some science.

Only during an eclipse, when the moon blocks the light from the sun's surface, does the sun's corona fully reveal itself. The corona is the hot and wispy atmosphere of the sun, extending far beyond the solar disk. But it's relatively dim, merely as bright as the full moon at night. The glaring sun, about a million times brighter, renders the corona invisible.

"The beauty of eclipse observations is that they are, at present, the only opportunity where one can observe the corona [in visible light] starting from the solar surface out to several solar radii," says Shadia Habbal, an astronomer at the University of Hawaii. To study the corona, she's traveled the world having experienced 14 total eclipses (she missed only five due to weather). This summer, she and her team will set up identical imaging systems and spectrometers at five locations along the path of totality, collecting data that's normally impossible to get.

Ground-based coronagraphs, instruments designed to study the corona by blocking the sun, can't view the full extent of the corona. Solar space-based telescopes don't have the spectrographs needed to measure how the temperatures vary throughout the corona. These temperature variations show how the sun's chemical composition is distributed—crucial information for solving one of long-standing mysteries about the corona: how it gets so hot.

While the sun's surface is ~9980 Farenheit (~5800 Kelvin), the corona can reach several millions of degrees Farenheit. Researchers have proposed many explanations involving magneto-acoustic waves and the dissipation of magnetic fields, but none can account for the wide-ranging temperature distribution in the corona, Habbal says.

You too can contribute to science through one of several citizen science projects. For example, you can also help study the corona through the Citizen CATE experiment; help produce a high definition, time-expanded video of the eclipse; use your ham radio to probe how an eclipse affects the propagation of radio waves in the ionosphere; or even observe how wildlife responds to such a unique event.

Otherwise, Habbal still encourages everyone to experience the eclipse. Never look directly at the sun, of course (find more safety guidelines here: <https://eclipse2017.nasa.gov/safety>). But during the approximately 2.5 minutes of totality, you may remove your safety glasses and watch the eclipse directly—only then can you see the glorious corona. So enjoy the show. The next one visible from North America won't be until 2024.

For more information about the upcoming eclipse, please see:

NASA Eclipse citizen science page

<https://eclipse2017.nasa.gov/citizen-science>

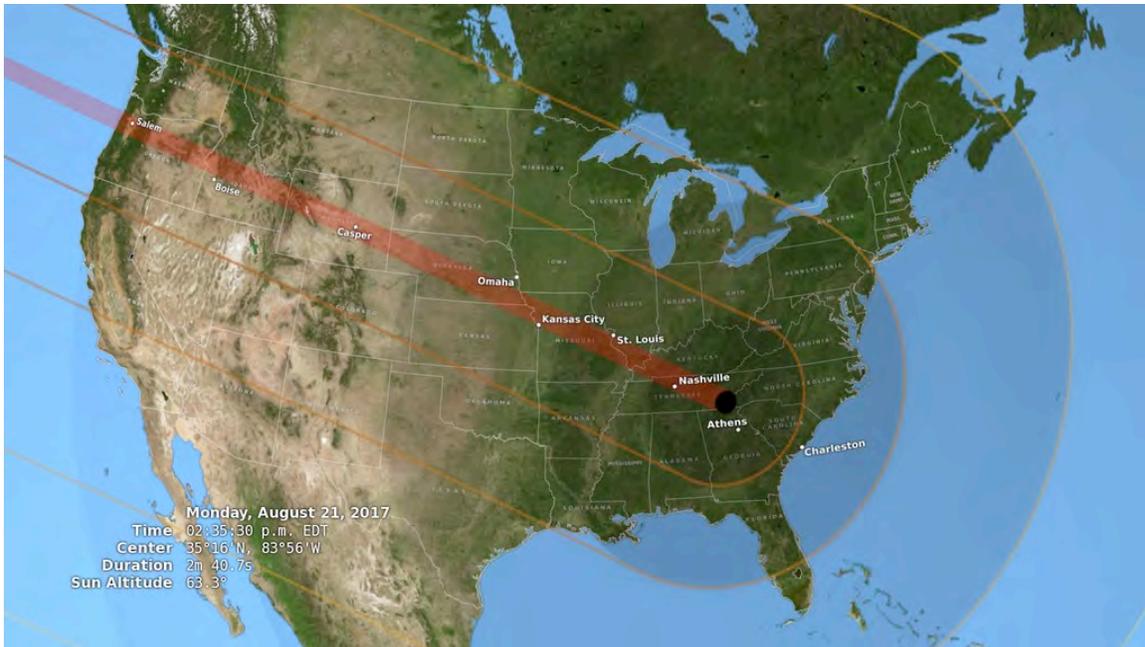


Illustration showing the United States during the total solar eclipse of August 21, 2017, with the umbra (black oval), penumbra (concentric shaded ovals), and path of totality (red) through or very near several major cities. Credit: Goddard Science Visualization Studio, NASA

NAVY PRECISION OPTICAL INTERFEROMETER TOUR

By Corinne Shaw

On Saturday, January 28th, Dr. Gerard van Belle, from Lowell Observatory hosted fifteen members of our club on a tour of the Perkins telescope, the Hall telescope and the amazing Navy Precision Optical Interferometer.

Our tour began with the 1.8 meter Perkins telescope. The telescope is no longer in use, but in the past had been used in research on the solar system, irregular galaxies, and dark matter. The Perkins is the telescope used by Vera Rubin, a groundbreaking astrophysicist who discovered evidence of dark matter.

Our next stop was the 1.1 meter Hall telescope. This telescope is used for studying comets, asteroids and Sun-like stars. Dr. David Schleicher utilizes the Hall telescope to conduct research on Comets. Dr. Schleicher presented to our club at a 3rd Thursday Star Talk in 2014. His talk was entitled Comet Smorgasbord.

Our third and final tour was the Navy Precision Optical Interferometer. The NPOI is a specialized astronomical telescope called an interferometer. Instead of a single telescope, an

array of six mirrors spaced tens of meters apart precisely direct beams of light from a star to a point. Extraordinary image detail can be derived from the resulting data.

NPOI can record images of stars and optically separate distant pairs of stars so close together that they appear as a single star in even the largest conventional telescopes. The NPOI has the ability to measure the precise relative positions of stars across the sky. Currently operating at about one-fourth of its designed capability, when finished the interferometer will span the distance of over four football field lengths, 430 meters.

NPOI is a collaborative effort between the U.S. Navy Observatory, the Naval Research Laboratory and Lowell Observatory.

The Prescott Astronomy Club would like to extend our Thanks and Gratitude to Dr. Gerard van Belle for sharing his time and expertise on “an astronomical walk through time” from the Perkins, the Hall and the Interferometer.





IF IT'S CLEAR

By Fulton Wright, Jr., PAC

Celestial events (from Sky & Telescope magazine, Astronomy magazine and anywhere else I can find information) customized for Prescott, Arizona. Remember, the Moon is 1/2 degree or 30 arcminutes in diameter. All times are Mountain Standard Time.



On Wednesday, March 1, starting about 7:30 PM, you can see a lot of solar system objects. First find Venus, bright at magnitude -4.6, about 18 degrees above the horizon in the west. Use a telescope to see the slim but big crescent with its horns pointing up. Next, look for comet 2P/Encke, much dimmer at magnitude 5, and halfway to the horizon below Venus. This will be the tough one to observe. Next, look up and to the left from Venus for the thin crescent Moon (magnitude -6.6). Next move a short distance to the right for Mars (magnitude +1.3, size 4.6 arc-seconds, don't expect to see much through a telescope). Finally, look a short distance below Mars (half the distance from the Moon, but down) for Uranus (magnitude 5.9, size 3.4 arc-seconds). That gets you the Moon, three planets, and a comet.

From Thursday, March 2 through Monday, March 6 the Northern part of the Moon is tipped toward us so it is a good time to look along the terminator above and below Mare Frigoris.

On Saturday, March 4, the Moon is at first quarter phase and sets at 1:15 AM (Sunday). At 8:19 PM (Saturday), the dark limb of the Moon occults Aldebaran. At 9:34 PM the star reappears from behind the bright limb of the Moon.

On Sunday, March 12, at 2 AM, most of the rest of the United States engages in the silly ritual of going on Daylight Savings Time (springing forward by setting their clocks to 3 AM). Arizona, with its superior knowledge of the universe, remains on Mountain Standard Time.

On Monday, March 13, the full Moon rises at 7:54 PM, spoiling any chance of hunting for faint fuzzies for the night.

On Friday, March 17, Io and its shadow transit Jupiter between 10:16 PM and 12:55 AM (Saturday). Notice how the satellite and its shadow grow closer as Jupiter approaches opposition (April 7).

On Sunday, March 19, the Moon is at third quarter phase and rises at 1:17 AM (Monday).

On Monday, March 20, spring comes to the northern hemisphere and we have equal days and nights.

On Wednesday, March 22, Europa and its shadow transit Jupiter from 10:23 PM to 1:32 AM (Thursday).

On Monday, March 27, it is new Moon and you have all night to hunt for faint fuzzies.

On Friday, March 31, at around 7:30 PM, Mercury will be about 10 degrees above the western horizon. It is not going to be more visible in the evening for the rest of the year. At 8:45 PM, the Moon occults the magnitude 3.6 star Gamma Tauri. The star reappears at 9:16 PM. The program I use, Sky Safari, lists it as a very close double, but doesn't give the secondary's magnitude, so you might see it disappear in two steps.

NEED TO KNOW - ASK A MEMBER

A new 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 explained, submit the question to Jeff Stillman (jstillman50@cableone.net). You can also bring up the question at the meeting.

BOOKS AND MAGAZINES

Over the years astronomy books have been donated to PAC. Boxes of these books will be available at the regular meetings. For a donation to PAC of \$1 per book, anyone can have a book. Books that are not purchased at a regular meeting will be available at the following Third Thursday programs. Any remaining unsold books will be donated to the Friends of the Prescott Public Library. We also have copies of past Sky and Telescope magazine. These will be available to any member wishing to take them. Unclaimed magazines will be recycled.



FOR SALE

Please visit the Classified Ads section of the club website to view the items posted there for sale:

<http://prescottastronomyclub.org/classified-ads/>

New items are added now and then, so don't miss out on something that you would like to get for yourself...or a friend.



PAC MENTORS

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

Jeff Stillman - Astrophotography - 928-379-7088

David Viscio - General - 928-775-2918

Greg Lutes - Visual Observing - 928-445-4430



OBSERVING LISTS

Observing lists are available on the PAC website to provide guidance and goals for visual and astrophotography programs. Current lists are:

Astroleague Lunar 100

Binocular Showpieces



Bright Nebulae	Caldwell
Dunlop 100	Face-On Spiral Galaxies
Globular Clusters	Herschel 400
Herschel II	Hidden Treasures
Messier	Open Clusters
Planet Maps	Planetary Nebulae
Royal Astronomical Society of Canada	Finest NGC
Saguaro Astronomy Club	Best NGC
Telescope Showpieces	S&T Lunar 100
	The Secret Deep

The lists are in PDF format and can be downloaded and printed for use.

PAC WEBSITE & YAHOO GROUPS

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

E-mail: <mailto:pacinfo@prescottastronomyclub.org>

Astrophotography special interest group:

<https://groups.yahoo.com/neo/groups/pacastrophotography/info>



BOARD OF DIRECTORS

President: Jeff Stillman

Vice President: Joel Cohen

Secretary: Doug Tilley

Treasurer: Stephen Eubanks

At Large: Pat Bledsoe

At Large: Dick Lewis

At Large: Bill McDonald

At Large: John Baesemann



PAC COORDINATORS

Astronomical League Coordinator: Pat Birck

Facebook: Jeff Stillman & Pam Shivak

Highland Center Coordinator: David Viscio

Hospitality: Corinne Shaw & Dick Lewis



Magazine Subscriptions: Stephen Eubanks

METASIG: Marilyn Unruh

PAC Affiliate Partner w/ NAU Space Grant Program – Jerry & Corinne Shaw

PAC Store Sales: Open

Property Records: Doug Tilley

Schools & Camps Outreach: Pat Birck

Third Thursday Coordinator: Corinne Shaw & Pat Birck

Membership: Stephen Eubanks

Newsletter: David Viscio

Refreshments: Janie Thompson

Publicity: Stephen Eubanks

Starry Nights Coordinator: Open

Webmaster: Russell Chappell

APOD FEB. 16, 2017 - THE TULIP & CYGNUS X-1

Image Credit & Copyright: Ivan Eder



Explanation: Framing a bright emission region, this telescopic view looks out along the plane of our Milky Way Galaxy toward the nebula rich constellation Cygnus the Swan. Popularly called the Tulip Nebula, the reddish glowing cloud of interstellar gas and dust is also found in the 1959 catalog by astronomer Stewart Sharpless as Sh2-101. About 8,000 light-years distant and 70 light-years across the complex and beautiful nebula blossoms at the center of this composite image. Ultraviolet radiation from young energetic stars at the edge of the Cygnus OB3 association, including O star HDE 227018, ionizes the atoms and powers the emission from the Tulip Nebula. HDE 227018 is the bright star near the center of the nebula. Also framed in the field of view is microquasar Cygnus X-1, one of the strongest X-ray sources in planet Earth's sky. Driven by powerful jets from a black hole accretion disk, its fainter visible curved shock front lies above and right, just beyond the cosmic Tulip's petals



Saguaro Astronomy Club



2017 All Arizona Messier Marathon Events

Saturday, March 25th, @ The Salome Emergency Airfield Site

More info here: <http://saguaroastro.org/content/messier2017.htm> Directions to the site: <http://saguaroastro.org/content/AAMM/directions.txt>
Contacts: About the Marathon, Rick Tejera: Mailto:saguaroastro@cox.net; In General, Mike Collins: Mailto:president@saguaroastro.org

Swap Meet

Saturday, March 25, 3:00 - 4:30 PM
@ Central Tables/Canopies

You can bring your unused astronomy items you would like to sell. This could be a great time to pick up previously loved items and get a little cash for your own. Bring plenty of small bills so you can make change for your sales. Bring a chair and table if you can.

Silent Auction

New this year, you can Silent Bid on astronomy related items. Bidding from 3:00 PM - 6:00 PM. Winners will be announced after the dinner. Items up for bidding with (Opening Bids):

- Sold Out, Signed & Numbered Kim Poor prints:
- "Saturn From Dione" & "Jupiter From Io" (\$25 each)
- iOptron Cube Pro mount (\$50)
- Book, "The Stars," H. A. Rey (\$5)
- 10" Pierre Schwaar telescope w/Telrad, (such as it is) & Solar Filter (\$75)
- Tele Vue 19mm & 24mm Wide Field eyepieces (\$25 each)
- Tele Vue 7 mm Nagler eyepiece (\$50)
- Tele Vue 2.5x 1-1/4" Barlow (\$25)
- Meade 8.3 mm Super Wide Field eyepiece (\$15)
- Orion 2x 2" Barlow (\$15)
- Lumicon UHC Premium filter, 1-1/4" (\$25)
- Lumicon OIII filter, 1-1/4" (\$20)
- Lumicon Deep Sky Premium filter, 1-1/4" (\$25)

* **Terms of sale:** Item is sold "as is," with no warranty expressed or implied. Full payment to Treasurer of SAC required prior to transfer of possession to winning bidder. Make checks payable to: **SAC**. If winning bidder fails to make arrangements for payment **before 8:00PM 3-25-2017**, the next highest bidder will be offered the item at their bid price. Payment is not required at the site of the All Arizona Messier Marathon, however the item may not be claimed by the winning bidder until payment arrangements have been accepted by the Treasurer.

Thanks to Lori Prause for doing the dinner. Also, a great big thank you goes out to Claude Haynes who provides the tables and shade canopies.

If you can bring some ice Saturday for the soda, that would be great.

The **Midnight Cafe** will again serve hot cocoa, coffee, snacks and lots of encouragement. Please consider donating a snack such as some cookies, cupcakes, a pie or other treats to stock up the cafe. A gallon of drinking water would also be appreciated.

The 25th Annual All Arizona Messier Marathon

Saturday Eve, March 25, 2017 * Rick Tejera, Coordinator

This year marks the 25th year of the AAMM held by the Saguaro Astronomy Club!

In addition, the field will be available on the night of Friday, March 24 for an extra night of observing. Reminder, the Friday date is NOT the marathon. It has been set aside for more time to observe from your personal observing list. It will also provide more time for socializing on Saturday.

In recent years there has been growing participation by younger astronomers. To help encourage this trend, this year, the All Arizona Messier Marathon will offer a separate award category for observers under the age of 18. All U18 observers will receive a certificate of participation. Those observing 25 or more objects will receive a certificate of achievement. And the top 3 observers in the U18 category will receive plaques as well as the certificates. So, if you are under 18 and have an interest in astronomy come on out and observe! If you know a young astronomer, let them know and encourage them to join us. The only caveat is all U18 observers must be accompanied by a responsible adult and must be listed on that adults Liability waiver.

Required Waiver for all attendees to fill out: <http://saguaroastro.org/content/AAMM/2017waiver.pdf>

Set your own goals. The marathon is for having fun!
Set your goals in order for you to have fun!
The guidelines are pretty simple, please read them over if you plan on participating.

It's an honor system. No one is going to be looking over your shoulder to verify your Observations. Have an observing list (from the coordinator) to keep track of observations Fill out the heading.
Find an object.
Observe/image it with your eye through the main eyepiece of your telescope.
Mark off the entry. Go to the next object.
Hand in your filled out sheet to Rick Tejera's camp table by Sunrise before leaving!

AAMM Dinner and Raffle



Panorama of the 2015 AAMM Dinner and Raffle photos: Rick Rotramel
Dinner starts at 5:00 PM, for \$5.00 each, that you can reserve in advance:

Email Lori Prause: Mail to:loriprause@gmail.com

The dinner menu is a large hunk of sub sandwich along with fruit, a soft drink and dessert.



Enjoy the **Raffle** after the dinner, before the **Sunset Talk**, by coordinator, Rick Tejera, about the Messier Marathon. **Arrive early** to set up your telescope. **Raffle tickets** sold before & at the dinner, \$1 ea, or 6 for \$5 or 25 for \$20.

Special Door Prize: Sky-Watcher 14" Telescope:
All in attendance will have a ticket for this **Special Door Prize!**

Thank you to Kevin Le Gore & Sky-Watcher Telescopes!



March 25	
Sunset meeting	18:15
Sunset	18:50
Astro twilight ends	20:14
Moonrise (Sun.)	05:44
Astro twilight begins (Sun.)	05:06
Sunrise (Sun.)	06:30

Evening	March 25
M74 at sunset	22°
M74 at twilight	4°
M74 sets	20:43
M77 at sunset	27°
M77 at twilight	9°
M77 sets	21:06
Morning	March 26
M30 rises	05:52
M30 at twilight	1°
M30 at moonrise	7°
M30 at sunrise	14°



Salome Emergency Airfield (Hovatter Airstrip) (south of I-10 at Exit #53)