Prescott Astronomy Club

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

JANUARY 2016

UPCOMING EVENTS

Wednesday, January 6 - Regular PAC meeting @ 6:30 PM in Rm 107, Bldg 74, Embry-Riddle Aeronautical University. Robert Esson will discuss the art of drawing/sketching astronomical observations. Rob will also share some of his drawings and encourage members to start their own astronomical drawing collection.

NOTE: The regular PAC meetings will be held at a new venue. See details below.

Wednesday, January 13 - METASIG @ 6:00 PM at a local restaurant. Sign up at meeting on January 6.

Wednesday, January 20 - Board Meeting @ 6:30 PM.

Thursday, January 21 - Third Thursday Presentation @ 6:00 PM in the Founder's Suite, Prescott Public Library. Mr. Bryan Bates from Coconino Community College will present "Ancient Astronomy of the Southwest", sharing his research from Wupatki National Monument, Chaco Canyon and Mesa Verde National Parks and other sites.

NEW REGULAR MONTHLY MEETING VENUE

Given the uncertainty of the availability of the Prescott Public Library meeting rooms later in the year, the PAC board explored other locations for the regular monthly meetings. Beginning with the January 6, 2016 meeting, the regular monthly meeting venue will be at Embry-Riddle Aeronautical University, Room 107 in Building #74 (Academic 1). A map of the location is included as an appendix to this newsletter. The easiest way to reach the meeting location is to enter ERAU at Haas Blvd. (north entrance) off Willow Creak Road, follow Haas until it ends at Parking Lot A. Building #74 is a short walk up the hill from the parking lot. For those who require them, there are several handicap parking spaces up the hill at the entrance of Building #74.

NEW CLUB OFFICERS FOR 2016

At the November 4 regular monthly meeting, club officers were elected for 2016. The new officers are:

President - Jeff Stillman Vice-President - David Viscio

Treasurer - Steve Eubanks Secretary - Doug Tilley

At Large Directors - John Baesemann, Fred Arndt, Joel Cohen, Dick Lewis

2016 CLUB MEMBERSHIP DUES

It is time to renew your PAC membership for 2016 if you wish to continue receiving all the benefits of club membership. Dues are $25 for individuals, $35 for families and $15 for juniors. Dues can be paid directly to the treasurer Steve Eubanks with cash or a check made out to 'Prescott Astronomy Club' or online at the club's website using major credit cards or PayPal.

HOW WILL WE FINALLY IMAGE THE EVENT HORIZON OF A BLACK HOLE

by Ethan Siegel

One hundred years ago, Albert Einstein first put forth his theory of General Relativity, which laid out the relationship between spacetime and the matter and energy present within it. While it successfully recovered Newtonian gravity and predicted the additional precession of Mercury's orbit, the only exact solution that Einstein himself discovered was the trivial one: that for completely empty space. Less than two months after releasing his theory, however, the German scientist Karl Schwarzschild provided a true exact solution, that of a massive, infinitely dense object, *a black hole*.

One of the curious things that popped out of Schwarzschild's solution was the existence of an event horizon, or a region of space that was so severely curved that nothing, not even light, could escape from it. The size of this event horizon would be directly proportional to the mass of the black hole. A black hole the mass of Earth would have an event horizon less than a centimeter in radius; a black hole the mass of the sun would have an event horizon just a few kilometers in radius; and a supermassive black hole would have an event horizon the size of a planetary orbit.

Our galaxy has since been discovered to house a black hole about four million solar masses in size, with an event horizon about 23.6 million kilometers across, or about 40 percent the size of Mercury's orbit around the sun. At a distance of 26,000 light years, it's the largest event horizon in angular size visible from Earth, but at just 19 micro-arc-seconds, it would take a telescope the size of Earth to resolve it – a practical impossibility.

But all hope isn't lost! If instead of a single telescope, we built an *array* of telescopes located all over Earth, we could simultaneously image the galactic center, and use the technique of VLBI (very long-baseline interferometry) to resolve the black hole's event horizon. The array would only have the light-gathering power of the individual telescopes, meaning the black hole (in the radio) will appear very faint, but they can obtain the resolution of a telescope that's the distance between the farthest telescopes in the array! The planned Event Horizon Telescope, spanning four different continents (including Antarctica), should be able to resolve under 10 micro-arc-seconds, imaging a black hole directly for the first time and answering the question of whether or not they truly contain an event horizon. What began as a mere mathematical solution is now just a few years away from being observed and known for certain!

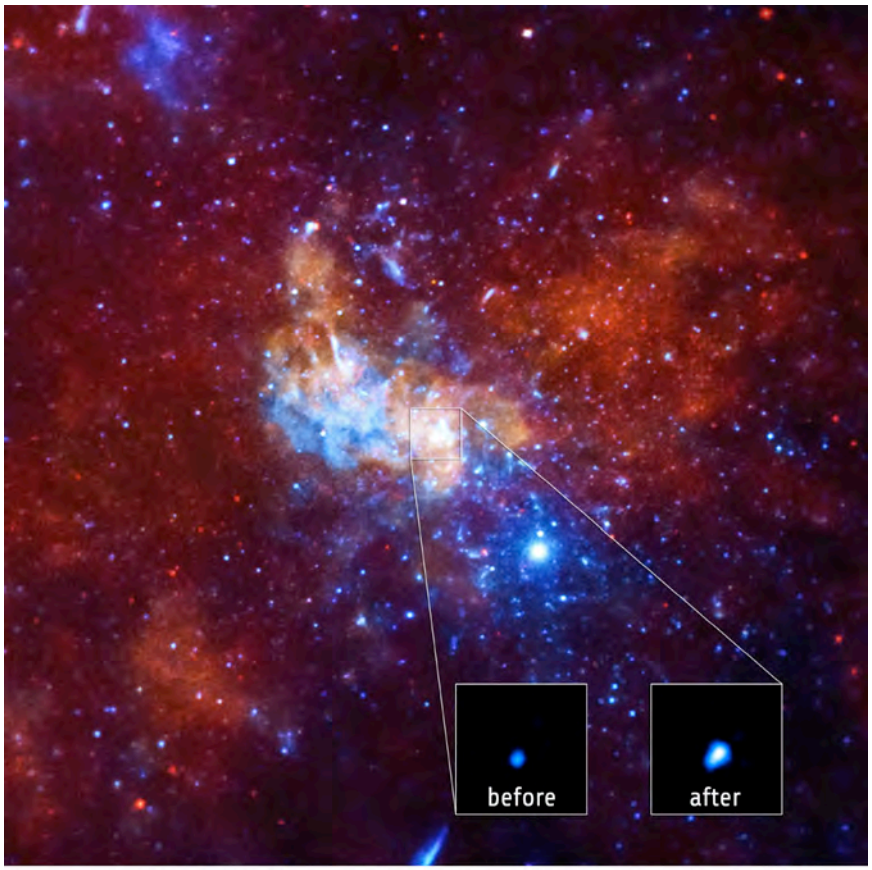


Image credit: NASA/CXC/Amherst College/D.Haggard et al., of the galactic center in X-rays. Sagittarius A is the supermassive black hole at our Milky Way's center, which normally emits X-ray light of a particular brightness. However, 2013 saw a flare increase its luminosity by a factor of many hundreds, as the black hole devoured matter. The event horizon has yet to be revealed.*

Note: This month's article describes a project that is not related to NASA and does not suggest any relationship or endorsement. Its coverage is for general interest and educational purposes.

2016 BUDGET

List below is the projected 2016 PAC budget of recurring expenses. There will be a review of the budget at the January 6 regular meeting and a vote by club members to approve the budget.

Account	Projected Budget
Income	
Donations	$500.00
Membership Fees	$2,350.00
Other Income (Raffle & Clothes)	$320.00
Total Income	**$3,170.00**
Expense	
Business Expenses (Corporate)	$10.00
Advertising (Fliers & Web Maintenance)	$350.00
Bank Charges (Fees and Supplies)	$50.00
PayPal Fees	$15.00
Office Supplies	$150.00
Raffle Expenses	$100.00
Special Events	
Science Fair	$25.00
Other Events	$95.00
Liability Insurance	$552.00
Astronomical League	$430.00
Third Thursday Speakers	
Speaker Honoraria	$300.00
Speaker Dinners	$240.00
PAC Picnic	$160.00
Miscellaneous Expenses	$50.00
Total Expense	**$2,527.00**
Budget Surplus	**$643.00**

VATICAN OBSERVATORY FOUNDATION ANNUAL SEMINAR

The Vatican Observatory's annual seminar will be in Phoenix on Saturday, January 23rd. Living in the Arizona desert, we all know the importance of water for life. The search for life outside Earth often follows the theme of "look for the water." But in fact water plays an important role in many other aspects of astrophysics as well. In preparation for the 2016 Vatican Observatory Summer School, on the theme of Water in the Universe, the Vatican Observatory Foundation is happy to sponsor a special seminar open to the public on this theme.

Our speakers include:

Dr. Chris Impey, University of Arizona Distinguished Professor and Deputy Head, Astronomy

Dr. Andy Rivkin, Johns Hopkins University Applied Physics Laboratory

Dr. Bobt Macke SJ, Vatican Observatory Curator of Meteorites,

Dr. Lindy Elkins-Tanton, Arizona State University, Director, School of Earth and Space Exploration

Topics will range from the role of water in the formation of Earth, water in asteroids and meteorites, and water in interstellar space. All the speakers are notable for their remarkable scientific credentials and their engaging speaking styles.

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 Friday, January 1, the Moon is at last quarter phase and rises at 12:42 AM (Saturday).

On Monday, January 4, before astronomical twilight (6:07 AM), you might see some Quanrantid meteors. The radiant is in Bootes. As usual, there are no guarantees with meteor "showers". When I try to observe meteors, they have a tendency to miss the earth's atmosphere. I promise not to look.

On Saturday, January 9, it is new Moon and you have all night to hunt for faint fuzzies. If you are up about 6 AM, you can find Venus and Saturn within half a degree of each other in the east.

On Saturday, January 16, the Moon is at first quarter phase and sets at 1:11 AM (Sunday).

On Tuesday, January 19, at 6:12 PM the Moon occults Aldebaran. Sunset is at 5:47 PM so you should be able to see the star with your unaided eye as is disappears behind the dark limb of the Moon. The star reappears on the bright limb of the Moon at 7:23 PM. You might want binoculars or a small telescope to watch that event.

On Saturday, January 23, at 5:53 PM (3 minutes after sunset) the full Moon rises, spoiling any chance of seeing faint fuzzies for the night.

On Sunday, January 24, the dedicated Jupiter watchers can see several events with Jupiter's moons. Here is the schedule:

09:36 PM Jupiter rises.

12:34 AM (Monday) Europa's shadow falls on the planet.

02:24 AM Europa moves in front of the planet.

03:20 AM Europa's shadow leaves the planet.

05:09 AM Europa moves from in front of the planet.

06:08 AM Io's shadow falls on the planet.

07:02 AM Io moves in front of the planet.

07:33 AM the Sun rises.

On Sunday, January 31, the Moon is at last quarter phase and rises at 1:12 AM (Monday).

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 advise on the purchase of astronomy equipment, setting up equipment, astrophotography, etc., contact a PAC mentor.

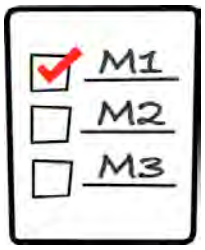
John R. Carter Sr. - General - 928-458-0570

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
- Caldwell
- Dunlop 100
- Face-On Spiral Galaxies
- Herschel 400
- Hidden Treasures
- Messier
- Planet Maps
- Royal Astronomical Society of Canada Finest NGC
- Saguaro Astronomy Club Best NGC
- S&T Lunar 100
- Telescope Showpieces
- 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

General PAC user group:

https://groups.yahoo.com/neo/groups/Prescott-Astronomy-Club/info

Astrophotography special interest group:

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

BOARD OF DIRECTORS

President: Jeff Stillman
Vice President: David Viscio
Secretary: Doug Tilley
Treasurer: Stephen Eubanks

At Large: Joel Cohen
At Large: Dick Lewis
At Large: Fred Arndt
At Large: John Baesemann

PAC COORDINATORS

Astronomical League Coordinator: Pat Birck
Facebook: John Carter
Highland Center Coordinator: David Viscio
Hospitality: Corinne Shaw & Dick Lewis
Magazine Subscriptions: Stephen Eubanks
METASIG: Marilyn Unruh
Membership: Stephen Eubanks
Newsletter: David Viscio
PAC Affiliate Partner w/ NAU Space Grant Program – Jerry & Corinne Shaw
PAC Store Sales: Dick Felgenhour
Property Records: Fred Arndt
Schools & Camps Outreach: Pat Birck
Refreshments: Janie Thompson
Publicity Coordinator: John Carter
Starry Nights Coordinator: Open
Third Thursday Coordinator: Corinne Shaw & Pat Birck
Webmaster: Russell Chappell

Astronomy Picture of the Day

December 16, 2015

Jose Jimenez Priego

Embry-Riddle Aeronautical University