



## 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

## MAY 2016

### UPCOMING EVENTS

Wednesday, May 4 - Regular PAC meeting @ 6:30 PM in Rm 107, Bldg 74, Embry-Riddle Aeronautical University. Andrew Odell will present "Interstellar Medium".



Saturday, May 7 - Starry Nights @ 8:00 PM at Vista Park in Prescott. Sign up at meeting on May 4.

Monday, May 9 - Prescott High School @ 8:00 PM. Sign up at meeting on May 4.

Wednesday, May 11 - METASIG @ 5:00 PM at a local restaurant. Sign up at meeting on May 4.

Friday, May 13 - US Vets @ 8:00 PM located at 917 E. Gurley Street. Sign up at meeting on May 4.

Wednesday, May 18 - Board Meeting @ 6:30 PM.

Thursday, May 19 - Third Thursday Presentation @ 6:00 PM in the Founder's Suite, Prescott Public Library. Club member Fulton Wright, Professor - retired, will present "The Great Solar Eclipse of 2017". Your best chance to see a solar eclipse in the old 48 states is August 21, 2017. The talk will cover what you can see and where you can see it. It is not too early to plan your trip.

### WORLDWIDE SOLSTICE DAY

Worldwide Solstice Day is Monday, June 20. The Board has decided the club should celebrate the summer solstice with public solar observing at the Bluegrass Festival at the Prescott Courthouse Square on Saturday, June 25. Clearly volunteers and scopes will be needed for the event. Discussions and planning for the event will begin at the May 4 regular meeting.



## OBSERVING MINI-MARATHONS

A proposal has been made that PAC conduct a couple of observing mini-marathons. The first mini-marathon, focusing on double stars, has been postponed to Saturday, July 9, 8:00 PM to 12:00 midnight at Jeff Stillman's home in Chino Valley, pending organizing and agreement of interested individuals. A second mini-marathon, focusing on deep-sky objects, would be held in September. Details about this proposal will be described and discussed at the May 4 general club meeting.



## HUBBLE SHATTERS THE COSMIC RECORD FOR MOST DISTANT GALAXY

By Ethan Siegel

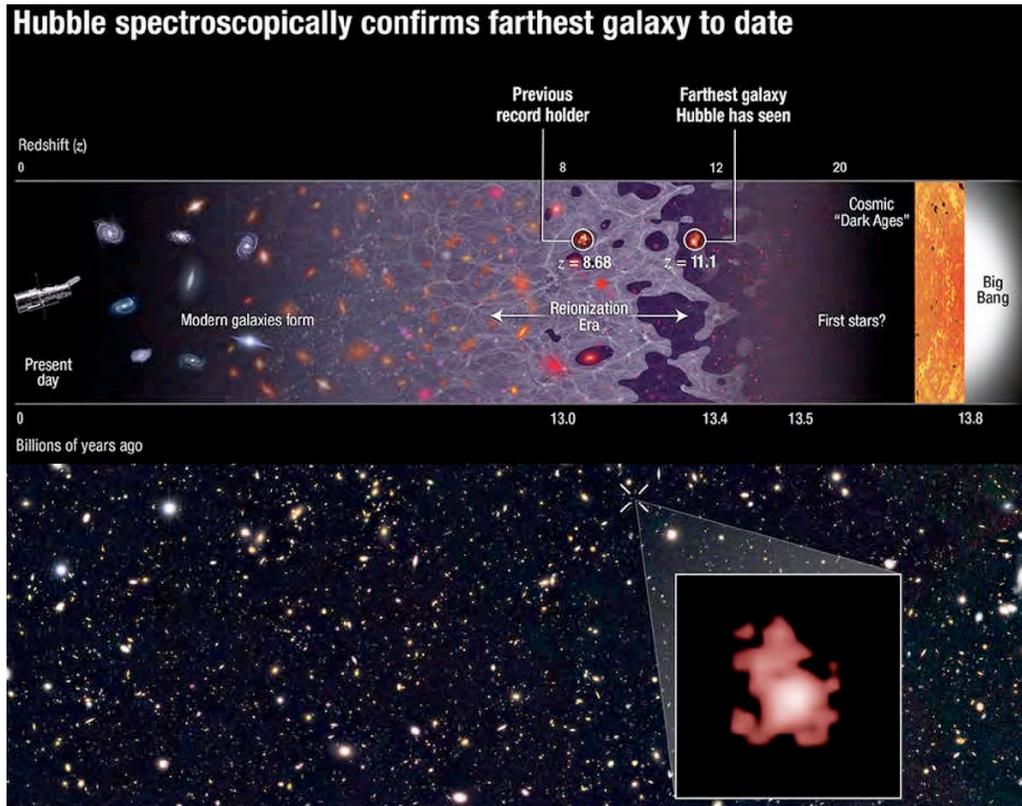
The farther away you look in the distant universe, the harder it is to see what's out there. This isn't simply because more distant objects appear fainter, although that's true. It isn't because the universe is expanding, and so the light has farther to go before it reaches you, although that's true, too. The reality is that if you built the largest optical telescope you could imagine -- even one that was the size of an entire planet -- you still wouldn't see the new cosmic record-holder that Hubble just discovered: galaxy GN-z11, whose light traveled for 13.4 billion years, or 97% the age of the universe, before finally reaching our eyes.



There were two special coincidences that had to line up for Hubble to find this: one was a remarkable technical achievement, while the other was pure luck. By extending Hubble's vision away from the ultraviolet and optical and into the infrared, past 800 nanometers all the way out to 1.6 microns, Hubble became sensitive to light that was severely stretched and redshifted by the expansion of the universe. The most energetic light that hot, young, newly forming stars produce is the Lyman- $\alpha$  line, which is produced at an ultraviolet wavelength of just 121.567 nanometers. But at high redshifts, that line passed not just into the visible but all the way through to the infrared, and for the newly discovered galaxy, GN-z11, its whopping redshift of **11.1** pushed that line all the way out to 1471 nanometers, more than double the limit of visible light!

Hubble itself did the follow-up spectroscopic observations to confirm the existence of this galaxy, but it also got lucky: the only reason this light was visible is because the region of space between this galaxy and our eyes is mostly ionized, which *isn't true* of most locations in the universe at this early time! A redshift of 11.1 corresponds to just 400 million years after the Big Bang, and the hot radiation from young stars doesn't ionize the majority of the universe until 550 million years have passed. In most directions, this galaxy would be invisible, as the neutral gas

would block this light, the same way the light from the center of our galaxy is blocked by the dust lanes in the galactic plane. To see farther back, to the universe's first true galaxies, it will take the James Webb Space Telescope. Webb's infrared eyes are much less sensitive to the light-extinction caused by neutral gas than instruments like Hubble. Webb may reach back to a redshift of 15 or even 20 or more, and discover the true answer to one of the universe's greatest mysteries: when the first galaxies came into existence!



*Images credit: (top); NASA, ESA, P. Oesch (Yale University), G. Brammer (STScI), P. van Dokkum (Yale University), and G. Illingworth (University of California, Santa Cruz) (bottom), of the galaxy GN-z11, the most distant and highest-redshifted galaxy ever discovered and spectroscopically confirmed thus far.*

## PAC MEMBER SPOTLIGHT

Doug Tilley is the focus for this month's spotlight.

**What got you started in Astronomy?** Discovering Saturn with my first telescope in my parents backyard on Long Island in New York. This was reinforced many years later by a friendship with an astronomy professor at the local community college.



**When did you get your first telescope?** At the age of 14 I purchased a used 3 inch Unitron refractor telescope.

**What equipment have you had, and what do you have now?** Besides the Unitron refractor (which I still have), I owned a 3 ½ inch Questar Maksutov. Currently I have 3 additional telescopes: the 14inch PlaneWave Dall-Kirkham telescope, a Stellarvue 115mm APO refractor, and a 9.25 inch Celestron SCT used for star parties.

**Do you have a special field of interest in Astronomy?** My goal is primarily imaging galaxies with an emphasis on multiple galaxies in a single image.



**What equipment or accessories do you plan on purchasing in the future?** The only other items that I am considering in purchasing are software for post processing imaging such as Astro Art.

**Do you have any plans with your interest in Astronomy? (Public outreach, collaboration with other groups) If so, what are they?** I currently volunteer at most PAC star party outings. I am also the current PAC secretary.

**When and why did you join the Prescott Astronomy Club and what's your favorite activity with the club?** I joined PAC in October 2014 after retiring from Boeing Airplane Company and moving my wife and I from Washington to Arizona. I especially enjoy the club's star party outings and the annual star party held at the Grand Canyon National Park.

## 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, May 6, it is new Moon and you have all night to hunt for faint fuzzies.

Also on the night of Friday, May 6, you can see some events with Jupiter's moons. Here is the schedule:

08:10 PM Callisto's shadow falls on the north-west (IAU, terrestrial) part of Jupiter. (1 shadow)

08:31 PM Io moves in front of Jupiter.

09:39 PM Io's shadow falls on Jupiter. (2 shadows)

10:33 PM Callisto's shadow leaves Jupiter. (1 shadow)

10:46 PM Io moves from in front of Jupiter.

11:51 PM Io's shadow leaves Jupiter. (no shadows)

12:04 AM (Saturday) Europa moves in front of Jupiter.

02:23 AM Europa's shadow falls on Jupiter. (1 shadow)

02:52 AM Europa moves from in front of Jupiter and Jupiter sets.

On Monday, May 9, in the morning, you can observe a transit of Mercury. Here is the schedule:

04:14 AM Transit starts (We can't see it yet.)

05:32 AM Sunrise

05:34 AM Mercury rises (theoretically first chance to observe the transit)

06:30 AM (Approx) Sun 10 degrees above the horizon. (You have some chance of actually seeing the transit.)

11:39 AM Third contact, Mercury starts to leave the Sun's face.

11:42 AM Fourth contact, the transit is over.

Because Mercury is only 12 arc-seconds in diameter, you will have a tough time seeing this with binoculars (WITH A PROPER SUN FILTER). You will have more luck with a small (2 or 3 inch) telescope (WITH A PROPER SUN FILTER) at 20 power or more. Don't even think about trying to see this without a solar filter on the front of your telescope that is as dark as a number 14 welder's glass.

On Thursday, May 12, the Moon is at first quarter phase and sets at 1:00 AM (Friday). Ganymede's shadow will be on Jupiter from 8:38 PM to 11:45 PM.

On Tuesday, May 17, at 11:46 PM, the Moon occults the magnitude 4.4 star, Theta Virginis. The star reappears on the bright limb of the Moon at 1:10 AM (Wednesday).

On Saturday, May 21, the Moon is full and rises at 7:27 PM spoiling any chance of seeing faint fuzzies for the night.

Also on the night of Saturday, May 21, Mars is at opposition. This means it will be up all night. It also means that it will be closer than any other time for the next two years. It will be about 18

arc-seconds in your telescope for a couple of weeks around this date, which isn't great, but it is as good as it gets. In a couple of years it will be somewhat closer but lower in the sky.

On Saturday, May 28, the Moon is at last quarter phase and rises at 12:54 AM (Sunday).

## 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.



*TeleGizmo 365 Series telescope cover T3R5 for 4 to 5-inch refractors*

The 365 series covers are ruggedly designed to protect equipment for 24/7 365-day outdoor exposure. Very lightly used. Original cost: \$150;  
For sale: \$50

Contact David Viscio, [pkmist@gmail.com](mailto:pkmist@gmail.com)



## 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

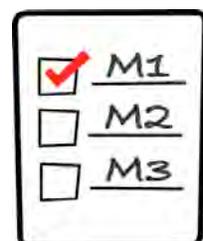
David Viscio - General - 928-775-2918

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
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	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

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Vice President: David Viscio

Secretary: Doug Tilley

Treasurer: Stephen Eubanks

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## **PAC COORDINATORS**



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Magazine Subscriptions: Stephen Eubanks

METASIG: Marilyn Unruh

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

PAC Store Sales: Dick Felgenhour

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Schools & Camps Outreach: Pat Birck

Third Thursday Coordinator: Corinne Shaw & Pat Birck

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Refreshments: Janie Thompson

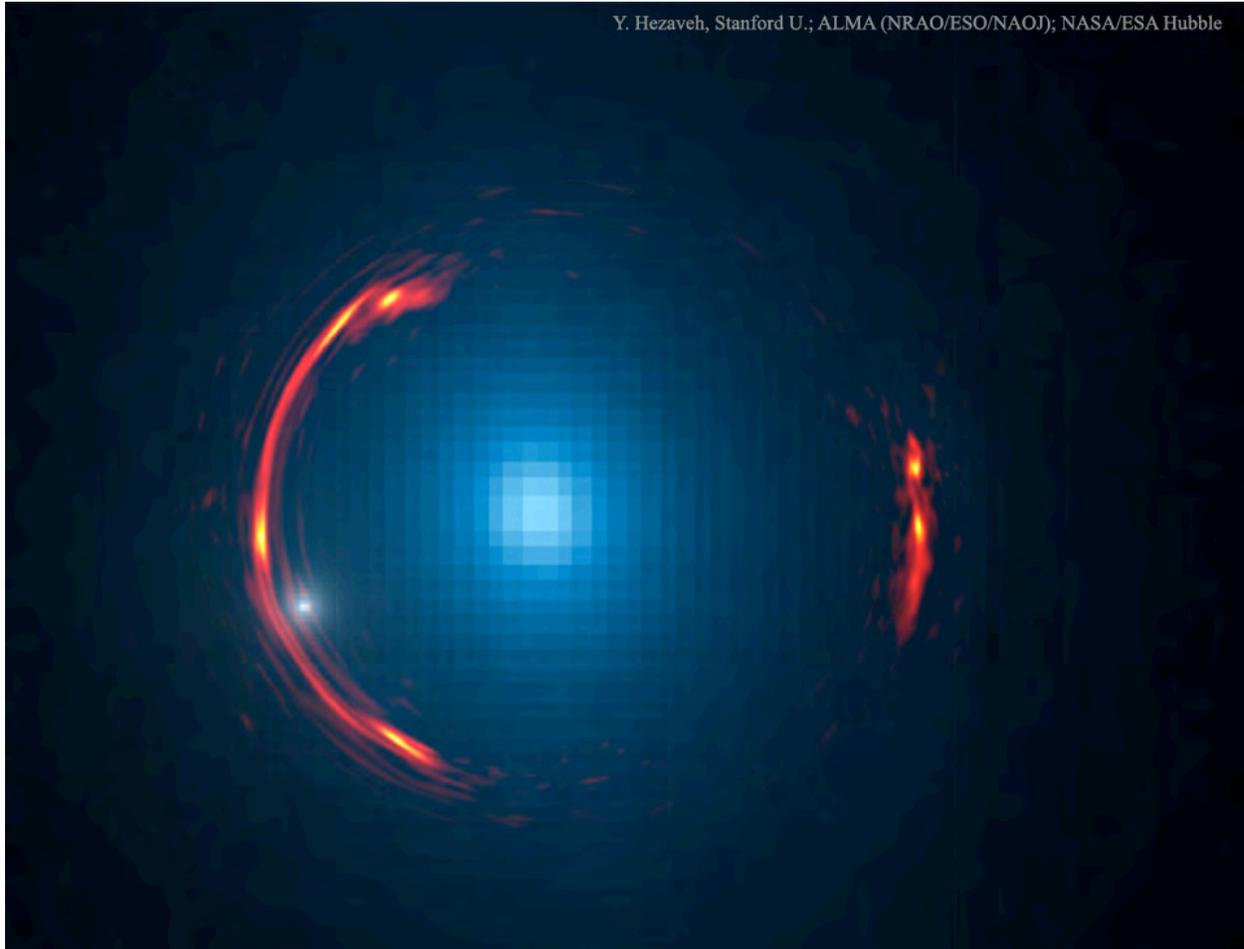
Publicity Coordinator: John Carter

Starry Nights Coordinator: Open

## Astronomy Picture of the Day - April 20, 2016

Y. Hezaveh (Stanford) et al., ALMA (NRAO/ESO/NAOJ), NASA/ESA Hubble Space Telescope

### Galaxy Einstein Ring



Can one galaxy hide behind another? Not in the case of SDP.81. Here the foreground galaxy, shown in blue in an image taken by the Hubble Space Telescope, acts like a huge gravitational lens, pulling light from a background galaxy, shown in red in an image taken in radio waves by the Atacama Large Millimeter Array (ALMA), around it, keeping it visible. The alignment is so precise that the distant galaxy is distorted into part of a ring around the foreground galaxy, a formation known as an Einstein ring. Detailed analysis of the gravitational lens distortions indicate that a small dark satellite galaxy participates in the deflections, bolstering indication that many satellite galaxies are quite dim and dominated by dark matter. That small galaxy is depicted by a small white dot on the left. Although spanning only a few arcseconds, the featured Einstein ring is really tens of thousands of light years across.