



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

AUGUST 2016

UPCOMING EVENTS

Wednesday, August 3 - Regular PAC meeting @ 6:30 PM in Rm 107, Bldg 74, Embry-Riddle Aeronautical University. Instead of a featured presentation, this meeting will have the annual club equipment swap-meet and sale. Bring your unwanted astronomical equipment to sell or swap. Sellers may keep the proceeds of their sale or donate all or portion to the club. The club will also offer a selection of equipment for sale.



Wednesday, August 10 - METASIG @ 5:00 PM at a local restaurant. Sign up at meeting on August 3.

Wednesday, August 17 - Board Meeting @ 6:30 PM.

OBSERVING MINI-MARATHONS

The first mini-marathon, focusing on double stars, is tentatively scheduled for Tuesday, September 27. The venue for the event has not been finalized, pending organizing and agreement of interested individuals. Details will be described and discussed at the August 3 general club meeting.



3rd ANNUAL FLAGSTAFF STAR PARTY

The 3rd Annual Flagstaff Star Party will be held Thursday, September 22 through Saturday, September 24. Details can be found in the Appendix.

VENUS AND JUPITER PREPARE FOR THEIR CLOSE-UP THIS AUGUST

By Ethan Siegel

As Earth speeds along in its annual journey around the Sun, it consistently overtakes the slower-orbiting outer planets, while the inner worlds catch up to and pass Earth periodically. Sometime after an outer world—particularly a slow-moving gas giant—gets passed by Earth, it appears to migrate closer and closer to the Sun, eventually appearing to slip behind it from our perspective. If you've been watching Jupiter this year, it's been doing exactly that, moving consistently from east to west and closer to the Sun ever since May 9th.



On the other hand, the inner worlds pass by Earth. They speed away from us, then slip behind the Sun from west to east, re-emerging in Earth's evening skies to the east of the Sun. Of all the planets visible from Earth, the two brightest are Venus and Jupiter, which experience a conjunction from our perspective only about once per year. Normally, Venus and Jupiter will appear separated by approximately 0.5° to 3° at closest approach. This is due to the fact that the Solar System's planets don't all orbit in the same perfect, two-dimensional plane.

But this summer, as Venus emerges from behind the Sun and begins catching up to Earth, Jupiter falls back toward the Sun, from Earth's perspective, at the same time. On August 27th, all three planets—Earth, Venus and Jupiter—will make nearly a perfectly straight line.

As a result, Venus and Jupiter, at 9:48 PM Universal time, will appear separated by only 4 arc-minutes, the closest conjunction of naked eye planets since the Venus/Saturn conjunction in 2006. Seen right next to one another, it's startling how much brighter Venus appears than Jupiter; at magnitude -3.80 , Venus appears some *eight times brighter than* Jupiter, which is at magnitude -1.53 .

Look to the western skies immediately after sunset on August 27th, and the two brightest planets of all—brighter than all the stars—will make a dazzling duo in the twilight sky. As soon as the sun is below the horizon, the pair will be about two fists (at arm's length) to the left of the sun's disappearance and about one fist above a flat horizon. You may need binoculars to find them initially and to separate them. Through a telescope, a large, gibbous Venus will appear no more distant from Jupiter than Callisto, its farthest Galilean satellite.

As a bonus, Mercury is nearby as well. At just 5° below and left of the Venus/Jupiter pair, Mercury achieved a distant conjunction with Venus less than 24 hours prior. In 2065, Venus will actually occult Jupiter, passing in front of the planet's disk. Until then, the only comparably close

conjunctions between these two worlds occur in 2039 and 2056, meaning this one is worth some special effort—including traveling to get clear skies and a good horizon—to see!

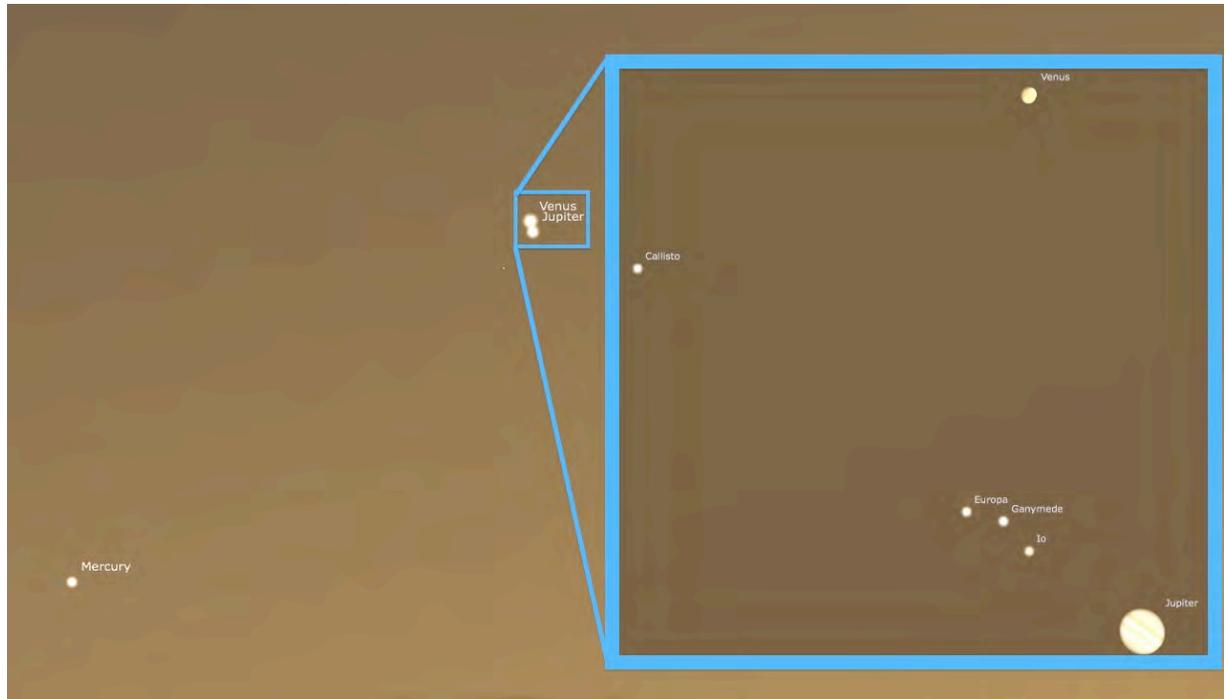


Image credit: E. Siegel, created with Stellarium, of a small section of the western skies as they will appear this August 27th just after sunset from the United States, with Venus and Jupiter separated by less than 6 arc-minutes as shown. Inset shows Venus and Jupiter as they'll appear through a very good amateur telescope, in the same field of view.

THE 15 MOST COMPELLING SCIENTIFIC FINDINGS THAT SUGGEST ALIENS ARE REAL

By Jessica Orwig, Business Insider, October 15, 2015

Earlier this year, a team of scientists estimated that about 4.5 billion years ago at least one-fifth of Mars was covered in an ocean more than 450 feet deep. Any signs of life that swam in these waters could therefore be hidden in the Martian soil.

But water isn't enough. You also need time. As it happens, a study last August discovered that water had existed on Mars for 200 million years longer than previously thought. What's more, there was life on Earth the same time as some of the last lakes on Mars.

And just last September, NASA made the groundbreaking announcement that liquid water still exists on Mars today, albeit in much smaller amounts than 4.5 billion years ago. This unique find

suggests that fossilized ancient life on Mars could be secondary to living organisms on the red planet's surface.

Asteroids and comets are key to the formation of life on Earth, scientists think. In particular, comet impacts, according to a report last August, likely caused amino acids to combine and form the building blocks of life. From what we know about solar-system formation, there are other comets in other planetary systems that could be doing the same thing right now.

Jupiter's tiny moon Europa is scarred with brown veins that are suspected to show where warmer, dirtier liquid water in the moon's mantle seeped through its crust. Europa could harbor more water than Earth, which is why both America and Europe are investing hundreds of millions of dollars into designs for future missions that would search for life beneath its surface.

Beyond Europa is Saturn's moon Enceladus, which scientists confirmed this month houses a giant, global ocean beneath its icy outer shell. Like Europa, Enceladus' ocean is an ideal place where life beyond Earth could live.

Even more convincing evidence for life on Enceladus was included in two papers published earlier this year. They strongly suggest that hydrothermal vents — the same kind that may have spawned life on Earth — seem to be lining the moon's ocean floors.

In addition to those on Europa and Enceladus, vast subsurface oceans could exist on at least a dozen objects in our solar system, planetary scientists suspect. The problem with detecting life on any of these is reaching the watery mantle that exists hundreds of miles underground.

Besides Earth, Saturn's largest moon, Titan, is the only body in the solar system with lakes on its surface. These lakes would not spawn similar life to Earth because they are made of liquid methane, not water. However, earlier this year a group at Cornell showed how methane-based, oxygen-free living cells could exist on Titan.

It's possible that life can only form and thrive on Earth-like planets, which would mean our only chance of detecting aliens is on planets beyond our solar system. Last July, scientists detected an Earth-like planet 1,400 light-years away. Its size, orbit, sun, and age provide the "opportunity for life to arise somewhere on the surface ... should all the necessary ingredients and conditions for life on this planet [exist]," one scientist said.

This October, scientists discovered something they cannot explain: Unusually large hunks of matter orbiting the distant star KIC 8462852. Though the chances are very low, the bizarre matter could be a type of alien-built megastructure called a Dyson swarm. Right now, SETI scientists are using the Allan Telescope Array to determine if an alien civilization lives in this star system 1,500 light-years from Earth.

The famous Drake equation allows us to estimate how many alien civilizations might exist in the Milky Way. It looks like this: $N=R*(fp)(ne)(fl)(fi)(fc)L$, with each variable defined below. With

basic statistics, this equation suggests there are potentially thousands, even millions, of alien civilizations out there.

- R^* : How fast stars form in our galaxy.
- f_p : The percentage of stars that have planets.
- n_e : The number of earthlike planets around each star that has planets.
- f_l : The percentage of earthlike planets that develop life.
- f_i : The percentage of planets with life that develop intelligent life.
- f_c : The percentage of intelligent species that go on to create technology that could be detected by an outside civilization like ours. One example of this is radio signals.
- L : The average number of years the advanced civilizations release detectable signals.

If there are millions of intelligent alien civilizations out there, then why haven't we heard from them? It could be that our home galaxy, the Milky Way, is not an entirely hospitable galaxy for life, according to a scientific report last month that suggests other galaxies in the universe could host 10,000x more habitable planets than the Milky Way.

In another statistical study, astronomers estimate that 92% of Earth-like planets in the universe haven't been born yet. Their results are based on Hubble Space Telescope observations of the prevalence of dust throughout the universe that could eventually coalesce into rocky Earth-sized planets.

We're all made of heavy atoms forged in the explosions of supermassive stars. This not only connects us to the universe, but highlights the possibility of alien life, explains famed astrophysicist and director of the Hayden Planetarium, Neil deGrasse Tyson: "These ingredients become part of gas clouds that condense, collapse, form the next generation of solar systems — stars with orbiting planets. And those planets now have the ingredients for life itself."

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 Tuesday, August 2, it is new Moon and you have all night to hunt for faint fuzzies.

On Thursday, August 4, about 8:00 PM, you can see the thin crescent Moon near Mercury, and down and to the right, Venus near Regulus. The next night the Moon has moved near Jupiter, but Venus is still near Regulus. This will be a difficult observation because it all happens very low in the West.

On Saturday, August 6, at 8:20 PM, the Moon occults the 4th magnitude star, Eta Virginis. The star reappears on the bright limb of the Moon at 9:18 PM, before the 9:47 PM setting of the star.

On Wednesday, August 10, the Moon is at first quarter phase and sets at 12:04 AM (Thursday).

On the night of Thursday, August 11, the Perseid meteor "shower" peaks. The Moon sets about 12:40 AM (Friday) and after that you should have a dark sky for observing. The prediction is that the event might even be better than usual. But remember, with meteors, there are no guarantees.

On Saturday, August 13, as darkness is falling (about 8:00 PM) the Moon will be passing through the open cluster, M23. I'm not sure how much of the show will be visible, but it might be worth a look.

On Wednesday, August 17, at 6:51 PM (24 minutes before sunset), the full Moon rises spoiling any chance of seeing faint fuzzies for the night.

On Tuesday, August 23, after about 8:00 PM, you can see Mars pass between Antares (which also looks red) and Saturn. The show will also be good the night before and after.

On Wednesday, August 24, the Moon is at last quarter phase and rises at 11:43 PM.

On Saturday, August 27, in the early evening, you can see two bright planets near each other. Venus (magnitude -4) and Jupiter (magnitude -2) are 12 arc-minutes (less than half a full Moon diameter) from each other. The sun sets at 7:00 PM. The pair set an hour later. Look low in the West. Mercury (magnitude 1) is nearby (down and to the left) and sets 15 minutes before the other planets.

On Wednesday, August 31, it is new Moon (second time this month) and you have all night to hunt for faint fuzzies.

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.

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

Bright Nebulae

Dunlop 100

Globular Clusters

Herschel II

Messier

Planet Maps

Royal Astronomical Society of Canada Finest NGC

Saguaro Astronomy Club Best NGC

Telescope Showpieces

Binocular Showpieces

Caldwell

Face-On Spiral Galaxies

Herschel 400

Hidden Treasures

Open Clusters

Planetary Nebulae

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: David Viscio
Vice President: Open
Secretary: Doug Tilley
Treasurer: Stephen Eubanks

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



PAC COORDINATORS

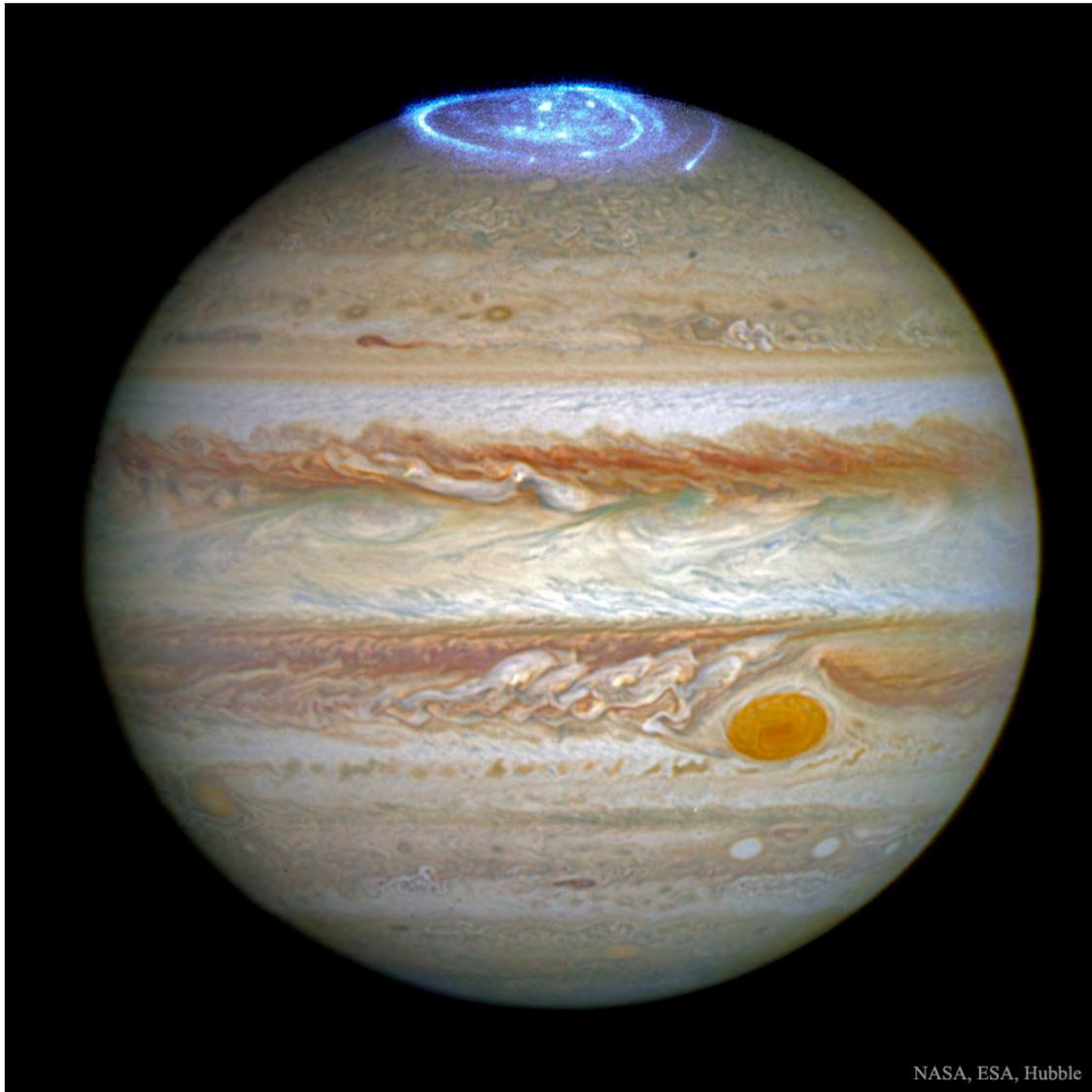
Astronomical League Coordinator: Pat Birck
Facebook: John Carter & Pam Shivak
Highland Center Coordinator: David Viscio
Hospitality: Corinne Shaw & Dick Lewis
Magazine Subscriptions: Stephen Eubanks
METASIG: Marilyn Unruh
PAC Affiliate Partner w/ NAU Space Grant Program – Jerry & Corinne Shaw
PAC Store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

Membership: Stephen Eubanks
Newsletter: David Viscio
Refreshments: Janie Thompson
Publicity Coordinator: John Carter
Starry Nights Coordinator: Open



AURORAE ON JUPITER

NASA, ESA, Hubble



Jupiter has aurorae. Like Earth, the magnetic field of the gas giant funnels charged particles released from the Sun onto the poles. As these particles strike the atmosphere, electrons are temporarily knocked away from existing gas molecules. Electric force attracts these electrons back. As the electrons recombine to remake neutral molecules, auroral light is emitted. In the featured recently released composite image by the Hubble Space Telescope taken in ultraviolet light, the aurorae appear as annular sheets around the pole. Unlike Earth's aurorae, Jupiter's aurorae include several bright streaks and dots. Jupiter's Great Red Spot is visible on the lower right. Recent aurorae on Jupiter have been particularly strong -- a fortunate coincidence with the arrival of NASA's Juno spacecraft at Jupiter last week. Juno was able to monitor the Solar Wind as it approached Jupiter, enabling a better understanding of aurorae in general, including on Earth.

The 3rd Annual Flagstaff Star Party September 22 - 24, 2016

The event is hosted by the Flagstaff Dark Skies Coalition, the Coconino Astronomical Society, the Northern Arizona University Department of Physics and Astronomy, the Flagstaff Unified School District, Lowell Observatory, and the U.S. Naval Observatory.

Astronomy Club members throughout Arizona are invited to bring their scopes and share the wonders of the universe with the public.

Telescope hosts will receive discounted motel rooms; and may sign up for a presentation on the Lowell Amateur Research Initiative and/or a special eyepiece-observing session on the Kaj Strand 61-inch astrometric telescope of the Naval Observatory.

If you would like to volunteer to be a telescope host, please visit the Flagstaff Star Party Website (flagstaffstarparty.org) and look for the Telescope Hosts link to get more information.

Background Photo: Site for the 2015 Flagstaff Star Party, Flagstaff's Buffalo Park —stars like no-one would imagine in the middle of a town of 65,000