



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

JUNE 2017

UPCOMING EVENTS



Saturday, June 3 - Sunny Day & Starry Night @ 5:30 PM at Pronghorn Park, Prescott Valley. The public star party will begin with solar viewing followed by the usual night sky viewing.

Wednesday, June 7 - Regular PAC meeting @ 6:30 PM in Davis Learning Center, Bldg 20, Embry-Riddle Aeronautical University. The January Third Thursday presentation, postponed due to weather, will be done. Robert Ward will present "Planetary Science Field Researcher" describing his work about meteorites. Robert Ward has a profound passion for science. Seeing meteorites he has personally recovered being used to advance scientific research, knowledge, and understanding is one of his greatest joys. Rarely seen without his cowboy boots and black Stetson hat, Robert is often referred to as the "Space Cowboy." His private collection features specimens of virtually every known meteorite composition from all over the world.

Monday, June 12 - Camp Wamatochick for 34 members of the Phoenix Creighton School District Leadership Team. Sign up at June 7 meeting.

Wednesday, June 14 - METASIG @ 5:00 PM at local restaurant. Sign up at June 7 meeting.

Thursday, June 15 - Third Thursday Presentation @ 6:00 PM in the Founder's Suite, Prescott Public Library. Dolores Hill, Senior Research Specialist, ASU, will present "OSIRIS-REx Gets a Big Boost to Bennu". The University of Arizona's Launch and Planetary Lab is the home for the OSIRIS-REx Asteroid Sample Return Mission that launched on Sept. 8, 2016. Dolores will review the spectacular launch and research of this exciting mission.

Wednesday, June 21 - Board meeting @ 6:30 PM.

Friday, June 23 - US Vets in Prescott. Sign up at June 7 meeting.

Monday, June 26 - Orchard Ranch residents in Mayer. Sign up at June 7 meeting.

USGS TOUR - JUNE 13

PAC members will be touring the USGS location in Flagstaff on Tuesday, June 13th, beginning at 1:00 PM. The 1.5-hour event will include a tour of the facility and a talk by one of the USGS scientists. If you did not sign up at the last club meeting, please send an email to cmshaw0430@aol.com. or plan to be at the June 7 regular meeting where we will finalize the details.

DONATION TO NAU SPACE GRANT PROGRAM

The Prescott Astronomy Club is a partner of the Northern Arizona University Space Grant Program. The PAC club members approved a donation of \$250 to the program at the regular meeting on May 3.

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).

OUTREACH REPORT

By Pat Birck

In May there were 3 very successful PAC star parties. The first 2 were at Camp Wamatochick for the Camelback Kiwanis Kids Kamp. The first was for 80 kids from Phoenix and the second was for 90 girls from central Phoenix. The third on May 20 was the year's first public star party at ERAU attended by about 30 girl scouts and their families in addition to other members of the public.

Jerry Shaw attended all three star parties; Donald Beaman, Dennis and Kathy Eaton and John Baesemann were at two of the three; Carl Brehmer, Doug Tilley, Joel Cohen, Fred Arndt, Sam Mitchell, Greg Lutes, Sal Jordano, Fulton Wright, Jim McDowell and Leah Cole, Neil Stockton, David Viscio and Pat Birck were at one of the star parties. Many hands make the task easy.

THE FIZZY SEAS OF TITAN

By Marcus Woo



With clouds, rain, seas, lakes and a nitrogen-filled atmosphere, Saturn's moon Titan appears to be one of the worlds most similar to Earth in the solar system. But it's still alien; its seas and lakes are full not of water but liquid methane and ethane.

At the temperatures and pressures found on Titan's surface, methane can evaporate and fall back down as rain, just like water on Earth. The methane rain flows into rivers and channels, filling lakes and seas.

Nitrogen makes up a larger portion of the atmosphere on Titan than on Earth. The gas also dissolves in methane, just like carbon dioxide in soda. And similar to when you shake an open soda bottle, disturbing a Titan lake can make the nitrogen bubble out.

But now it turns out the seas and lakes might be fizzier than previously thought. Researchers at NASA's Jet Propulsion Laboratory recently experimented with dissolved nitrogen in mixtures of liquid methane and ethane under a variety of temperatures and pressures that would exist on Titan. They measured how different conditions would trigger nitrogen bubbles. A fizzy lake, they found, would be a common sight.

On Titan, the liquid methane always contains dissolved nitrogen. So when it rains, a methane-nitrogen solution pours into the seas and lakes, either directly from rain or via stream runoff. But if the lake also contains some ethane—which doesn't dissolve nitrogen as well as methane does—mixing the liquids will force some of the nitrogen out of solution, and the lake will effervesce.

"It will be a big frothy mess," says Michael Malaska of JPL. "It's neat because it makes Earth look really boring by comparison."

Bubbles could also arise from a lake that contains more ethane than methane. The two will normally mix, but a less-dense layer of methane with dissolved nitrogen—from a gentle rain, for example—could settle on top of an ethane layer.

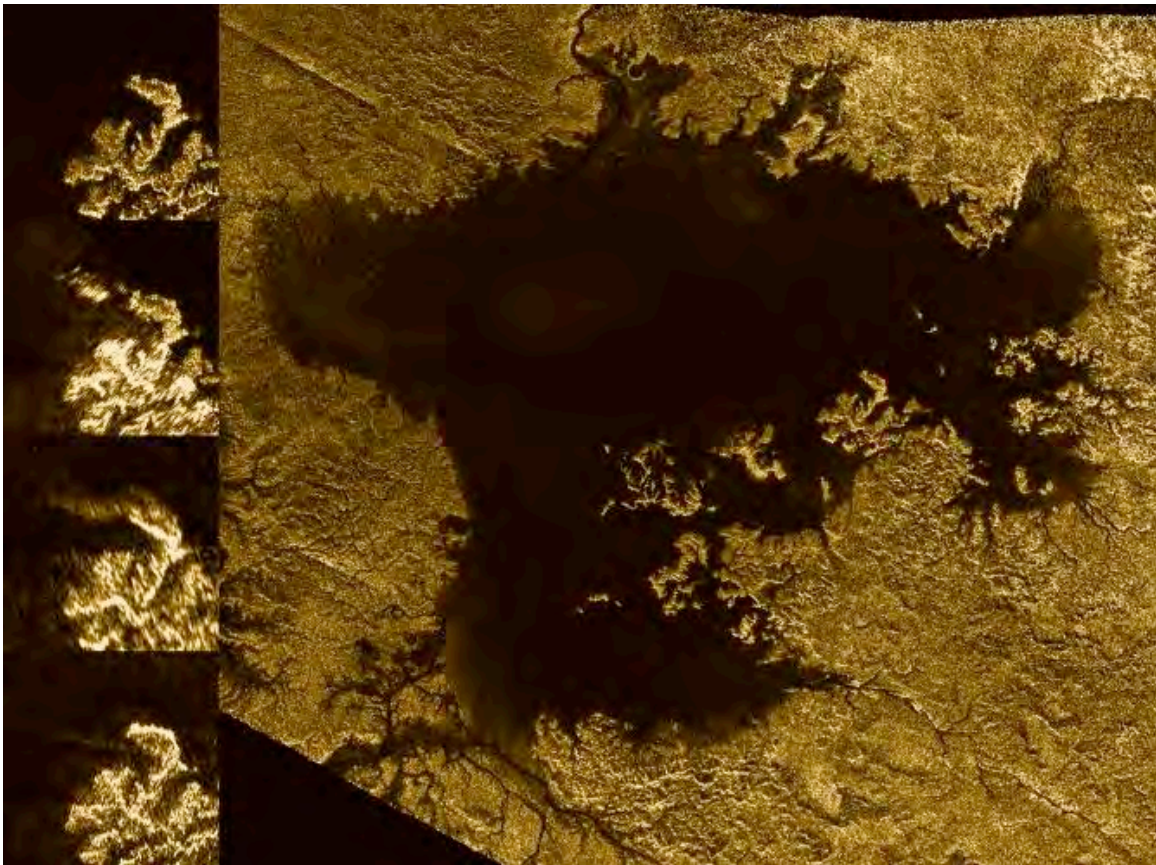
In this case, any disturbance—even a breeze—could mix the methane with dissolved nitrogen and the ethane below. The nitrogen would become less soluble and bubbles of gas would fizz out.

Heat, the researchers found, can also cause nitrogen to bubble out of solution while cold will coax more nitrogen to dissolve. As the seasons and climate change on Titan, the seas and lakes will inhale and exhale nitrogen.

But such warmth-induced bubbles could pose a challenge for future sea-faring spacecraft, which will have an energy source, and thus heat. "You may have this spacecraft sitting there, and it's just going to be fizzing the whole time," Malaska says. "That may actually be a problem for stability control or sampling."

Bubbles might also explain the so-called magic islands discovered by NASA's Cassini spacecraft in the last few years. Radar images revealed island-like features that appear and disappear over time. Scientists still aren't sure what the islands are, but nitrogen bubbles seem increasingly likely.

To know for sure, though, there will have to be a new mission. Cassini is entering its final phase, having finished its last flyby of Titan on April 21. Scientists are already sketching out potential spacecraft—maybe a buoy or even a submarine—to explore Titan's seas, bubbles and all.



Radar images from Cassini showed a strange island-like feature in one of Titan's hydrocarbon seas that appeared to change over time. One possible explanation for this "magic island" is bubbles. Image credits: NASA/JPL-Caltech/ASI/Cornell

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.



For the comet hunters among you, check out the article in the June 2017 issue of Astronomy Magazine, p. 42. Also check out the June 13 entry in this article.

On Thursday, June 1, at 8:00 PM the Moon just misses Roe Leonis. Starting at 10:16 PM, you can observe a double shadow transit on Jupiter. Here is the schedule:

- 10:16 PM Europa moves in front of the planet.
- 11:38 PM Io moves in front of the planet.
- 12:29 AM (Friday) Europa's shadow falls on the planet (1 shadow).
- 12:42 AM Io's shadow falls on the planet (2 shadows).
- 12:44 AM Europa appears at the edge of the planet.
- 01:48 AM Io appears at the edge of the planet.
- 02:29 AM Jupiter sets (with both shadows on it).

On Saturday, June 3, you can observe a double shadow transit on Jupiter. Io is already in front of the planet. Ganymede has already passed the planet. The Moon is near Jupiter while all this is happening. Here is the schedule:

- 07:10 PM Io's shadow falls on the planet (1 shadow).
- 07:16 PM Ganymede's shadow falls on the planet (2 shadows).
- 07:39 PM Sunset.
- 08:10 PM You might be able to spot the planet.
- 08:16 PM Io appears at the edge of the planet.
- 09:18 PM Io's shadow leaves the planet (1 shadow).
- 09:29 PM Ganymede's shadow leaves the planet.
- 09:55 PM The red spot transits (crosses the meridian of) the planet.

On Thursday, June 8, the full Moon rises at 7:01 PM, spoiling the whole night for faint fuzzy observation.

On Saturday, June 10, at 11:18 PM we almost have a double shadow transit on Jupiter as Io's shadow leaves at the same time that Ganymede's falls on the planet.

On the night of Sunday, June 11, all of Saturn's bright moons are on the west (IAU, terrestrial) side of the planet.

On Tuesday, June 13, at 11:10 PM, The 6.7 magnitude comet, C/2015 V2 (Johnson), passes within 20 arc-seconds of the 6.2 magnitude star, HR 5394 (SAO 120436). (Remember, estimates of comet brightness are just guesses.) You should be able to detect motion of the comet in just a few minutes.

On Wednesday, June 14, Saturn reaches opposition, which means it will be visible all night.

On Friday night, June 16, the third quarter phase Moon rises at 12:43 AM (Saturday).

On Saturday, June 17, you can see a number of events with Jupiter's moons. Here is the schedule:

09:48 PM Io moves in front of the planet.

09:53 PM Europa moves behind the planet.

10:17 PM Ganymede moves in front of the planet.

11:00 PM Io's shadow falls on the planet.

11:58 PM Io moves from in front of the planet.

12:45 AM (Sunday) Ganymede moves from in front of the planet.

01:07 AM Io's shadow leaves the planet.

01:26 AM Jupiter sets.

On Wednesday, June 21, the Sun reaches the Summer Solstice (in the Northern hemisphere), so we have shortest (but perhaps the warmest) night of the year.

On Friday, June 23, it is new Moon, and you have all night to hunt for faint fuzzies.

On Saturday, June 24, at 8:19 PM, just when you can find Jupiter in the twilight, Io emerges from the face of Jupiter. Io's shadow is in the middle of Jupiter, and the satellite Europa is North (right above) it. They both exit about 9:30 PM. Europa's shadow lands on the planet about 10 minutes later. It's on the planet till midnight.

On Friday night, June 30, At 7:45 PM the Moon just misses Porrima (Gamma Virginis). The first quarter Moon sets at 12:40 AM (Saturday).

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

Joel Cohen - Beginner's Astronomy: Selecting & Using a Telescope - (856) 889-6496



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>

Astrophotography special interest group:

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



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APOD MAY 18, 2017
Simeis 147: Supernova Remnant
Image Credit & Copyright: Daniel Lopez/IAC



It's easy to get lost following intricate filaments in this detailed image of faint supernova remnant Simeis 147. Also cataloged as Sharpless 2-240 it goes by the popular nickname, the Spaghetti Nebula. Seen toward the boundary of the constellations Taurus and Auriga, it covers nearly 3 degrees or 6 full moons on the sky. That's about 150 light-years at the stellar debris cloud's estimated distance of 3,000 light-years. This composite includes image data taken through narrow-band filters, enhancing the reddish emission from ionized hydrogen atoms to trace the shocked, glowing gas. The supernova remnant has an estimated age of about 40,000 years, meaning light from the massive stellar explosion first reached Earth 40,000 years ago. But the expanding remnant is not the only aftermath. The cosmic catastrophe also left behind a spinning neutron star or pulsar; all that remains of the original star's core.