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ASTRONOMICAL SOCIETY**

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The *Heavenly Herald* is produced quarterly for the membership of the Morris Museum Astronomical Society

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Message from the President

Anthony Pisano, President

Welcome to fall. Unfortunately, the summer of 2018 will be remembered as a hot/humid and an incredibly rainy one. According to the NWS out of 90 day of summer 51 were reported with some kind of precipitation in northern NJ. This did not bode well for either solar or celestial observing. In fact, many of the summer night sky events were rained out or cloudy and a vast majority of our outreach observing sessions had to be postponed or canceled outright due to unfavorable weather. Our own picnic with our sister clubs the Skyland Stargazers and North Jersey Astronomical Group at UACNJ had to be rescheduled for Sept. 15th due to heavy rains and thunder storms on the original date in August. Please be sure to plan on attending this annual activity and share some time with your fellow friends and amateur observers.

As we enter our fall season we have

some exciting speakers lined up (see below) and we have been asked to participate in the museum's "National Chemistry Week : Science is Out of this World" on the 22nd of September. We will be hosing solar observing (weather permitting) and our own Joe Molnar will be giving a Night Sky Network talk on Chemistry of the Universe. Please be sure to stop by that day and say hi.

Some of our members recently received training on the use and setup of the museum's inflatable planetarium. This will allow our club greater access to this unique tool to teach astronomy to the masses and also give the museum alternative personnel to run it when the staff is unavailable. We hope to have more news on the use of the planetarium in the near future.

I hope you all had an enjoyable summer and I look forward to seeing you at our meetings this fall.

Club Meetings

- Sept. 13 - Ron Furia "Exoplanets"
- Sept. 15 - MMAS / NNJAG / SSG picnic at UACNJ - 3PM
- Sept 22 - National Chemistry Week : Science is Out of this World
(MMAS Participation at the Morris Museum)
- October 11 - Krishnadas Kootale "Everything You Need for a Trip to Mars"
- November 8 - Lonny Buinis "Is the Universe Curved?"

**Monthly Meetings are the second Thursday of each month at 7:00PM.
 No meetings Jan., Feb., Jul., & Aug. check the website for specific information.**

Pluto Should be Reclassified As a Planet, Experts Say

By: Robert H. Wells & University of Central Florida

In 2006, the International Astronomical Union, a global group of astronomy experts, established a definition of a planet that required it to "clear" its orbit, or in other words, be the largest gravitational force in its orbit.

Since Neptune's gravity influences its neighboring planet Pluto, and Pluto shares its orbit with frozen gases and objects in the Kuiper belt, that meant Pluto was out of planet status. However, in a new study published online Wednesday in the journal *Icarus*, UCF planetary scientist Philip Metzger, who is with the university's Florida Space Institute, reported that this standard for classifying planets is not supported in the research literature.

Metzger, who is lead author on the study, reviewed scientific literature from the past 200 years and found only one publication -- from 1802 -- that used the clearing-orbit requirement to classify planets, and it was based on since-disproven reasoning.

He said moons such as Saturn's Titan and Jupiter's Europa have been routinely called planets by planetary scientists since the time of Galileo.

"The IAU definition would say that the fundamental object of planetary science, the planet, is supposed to be a defined on the basis of a concept that nobody uses in their research," Metzger said. "And it would leave out the second-most complex, interesting planet in our solar system." "We now have a list of well over 100 recent examples of planetary scientists using the word planet in a way that violates the IAU definition, but they are doing it because it's functionally useful," he said. "It's a sloppy definition," Metzger said of the IAU's definition. "They didn't say what they meant by clearing their orbit. If you take that literally, then there are no planets, because no planet clears its orbit."

The planetary scientist said that the literature review showed that the real division between planets and other celestial bodies, such as asteroids, oc-

curred in the early 1950s when Gerard Kuiper published a paper that made the distinction based on how they were formed.

However, even this reason is no longer considered a factor that determines if a celestial body is a planet, Metzger said.

Study co-author Kirby Runyon, with Johns Hopkins University Applied Physics Laboratory in Laurel, Maryland, said the IAU's definition was erroneous since the literature review showed that clearing orbit is not a standard that is used for distinguishing asteroids from planets, as the IAU claimed when crafting the 2006 definition of planets.



"We showed that this is a false historical claim," Runyon said. "It is therefore fallacious to apply the same reasoning to Pluto," he said. Metzger said that the definition of a planet should be based on its intrinsic properties, rather than ones that can change, such as the dynamics of a planet's orbit.

"Dynamics are not constant, they are constantly changing," Metzger said. "So, they are not the fundamental description of a body, they are just the occupation of a body at a current era."

Instead, Metzger recommends classifying a planet based on if it is large enough that its gravity allows it to become spherical in shape.

"And that's not just an arbitrary definition, Metzger said. "It turns out this is an important milestone in the evolution of a planetary body, because apparently when it happens, it initiates active geology in the body."

Pluto, for instance, has an underground ocean, a multilayer atmosphere, organic compounds, evidence of ancient lakes and multiple moons, he said.

"It's more dynamic and alive than Mars," Metzger said. "The only planet that has more complex geology is the Earth."

Hole That Caused Leak in Russian Spacecraft Possibly Traced to Assembly or Testing

By: Mike Wall, Space.com Senior Writer

ISS controllers noticed a slight pressure drop on the night of Aug. 29 and alerted crewmembers about it the next day.

The astronauts traced the issue to a 2-millimeter (0.08 inches) hole in the upper "orbital module" of the crew-carrying Soyuz, which arrived at the station in June.

Cosmonaut Sergey Prokopyev, the Soyuz commander, soon patched the hole with epoxy, apparently solving the problem. Pressure levels have been steady ever since, NASA officials have said. (The leak never put crewmembers in any serious danger, officials have stressed.)

The cause of the hole remains under investigation, however. Early speculation centered on a possible micrometeoroid strike, but now human error is strongly suspected. Indeed, the hole's circular shape suggests a drilling mishap, as do nearby marks on the module wall.

The incident may have occurred during the final assembly or testing of the Soyuz, according to the new report, published today (Sept. 6) by the Russian news agency TASS. Both of these activities take place at facilities run by the Soyuz's builder, Russian aerospace company Energia, in the city of Korolyov, near Moscow.

"One of the possibilities is the spacecraft might have been damaged in the final assembly hangar. Or it could happen at the control

and testing station, which carried out the final workmanship tests before the spacecraft was sent to Baikonur," an unnamed source in the aerospace industry told TASS, which stressed that it has not confirmed such suspicions.



Space station astronauts patched a small hole in the upper orbital module of the Soyuz MS-09 spacecraft (left) on Aug. 30, 2018. Russian space officials have said that hole was likely caused by a drill here on Earth; investigators are currently trying to figure out exactly what happened.

Soyuz spacecraft — which have been astronauts' only ride to and from the ISS since NASA's space shuttle program retired in 2011 — launch from Baikonur Cosmodrome, in Kazakhstan.

The Soyuz passed pressure-chamber tests before going to Energia's final-assembly hangar, the source told TASS. And the assembly and testing

facilities are tightly controlled spaces, he added. (TASS referred to the source as a "he.")

"Only those with proper security clearance are allowed to enter," the source said. "Also, at the entrance to the hangar and the control and measurement station there are security guards checking all those who come and go."

Energia is conducting an investigation into the Soyuz incident. And Dmitry Rogozin, the head of Russia's federal space agency, Roscosmos, has vowed to find the person or persons responsible.

The orbital module is a spherical portion of the Soyuz that allows more gear to go up with the spacecraft. Unlike the lower crew capsule, the orbital module does not survive re-entry into Earth's atmosphere.

Night Sky Network

Astronomy Clubs bringing the wonders of the universe to the public



The Moon

OCT. 2018

	Last Quarter	02
	New Moon	08
	First Quarter	16
	Full Moon	24
	Last Quarter	31

Nov. 2018

	New Moon	07
	First Quarter	15
	Full Moon	23
	Last Quarter	29

DEC. 2018

	New Moon	07
	First Quarter	15
	Full Moon	22
	Last Quarter	29

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Alien Life Could Exist on Worlds Overflowing with Water, New Research Suggests

Even on alien worlds covered by water, a new study shows that there's a chance for life to survive for a long time — despite previous research showing that's unlikely.

Past research has said that these so-called "water worlds" could be unfriendly to life because they would not allow for mineral and gas cycling that stabilizes the climate on Earth. A new study, however, counters that ocean planets could sustain habitability for quite a long time after formation, although how long depends on the individual planet. Scientists have found thousands of exoplanets in the past two decades, with a good percentage of them being rocky and in the "habitable zone" of their parent stars — where water could exist on the planet's surface. However, scientists still aren't sure about all the conditions for habitability, because so far we know of only a single world with life: Earth.

On Earth, scientists often look to our own climate to better understand how planets in general could keep their conditions steady for millions or billions of years, long enough for life to get a toehold, according to a statement on the new work. Our planet warms up by releasing greenhouse gases into the atmosphere, through volcanoes, and then cools down by dissolving those gases into minerals in the crust.

The new research, based on more than 1,000 simulations of exoplanets under formation, suggests that water worlds could be habitable if they meet certain conditions, researchers said in the statement. Specifically, these planets would need to have a certain amount of carbon — the element on which Earth's life is based. The exoplanet would need a lot of water early in its formation, and the ability to cycle carbon between the atmosphere and the ocean to stabilize the system.

Also, the exoplanet crust would need to maintain its original elements and minerals, instead of having those minerals and elements dissolve in the ocean and pull out the carbon in the atmosphere.

"This really pushes back against the idea you need an Earth clone — that is, a planet with some land and a shallow ocean," lead author Edwin Kite, a geophysicist at the University of Chicago, said in the statement.

While they ran simulations for planets around stars that are similar to the sun, Kite said the research also leads to optimism for red dwarf stars — another hotspot to search for life. That's because the simulation only assumed steady light from a star, which, in theory, a red dwarf would also provide.

Red dwarfs are dimmer than our own sun, but if planets are close enough to the star, they could, theoretically, have water on their surfaces and meet the conditions for habitability. However, these stars are also extremely variable and could send out life-killing radiation to their planets.

The new research was detailed Aug. 31 in *The Astrophysical Journal*.