

Some Pictures:

Don and I were at an Adult Astronomy Camp in the middle of May. Here are some pictures.



One of the staff, Lorelei St. Clair, owns a Seestar telescope. On the left above is a picture (I do not know the exposure time) of M81, Bode's Galaxy, and M82, the Cigar Galaxy. They are in the same galaxy cluster and are 12 million light-years from us. M81 is a "Grand Design Spiral Galaxy" and M82 is a starburst galaxy seen edge-on. On the right above is a camera picture that she took of the Big Dipper over the 61" telescope.

On the right is an image of the Sun taken by staffer Adi Khandelwal. Note the sunspots.

On the next page on the upper left is one of the pictures that Lorelei took of the Milky Way. On the upper right is my picture of the Milky Way. Hers was taken earlier in the evening. In mine, you can make out Scorpius just to the right of center and much of Sagittarius on the left of the picture.





On the lower left is Lorelei's picture of the 1.25-day old Moon along with Jupiter (upper left) and the brighter Venus. My picture on the right was taken the next night when the Moon was close to Venus. Jupiter is above the saguaro arm and Pollux (left) and Castor (right), the two brightest stars in Gemini, bracket the saguaro.

Faith and Astronomy:

In early May, the Board of the Vatican Observatory Foundation had an audience with Pope Leo XIV and the next week, the entire Vatican Observatory Research Group had another audience with the Pope. Here is some of what he said to the Board: "The night sky is a treasury of beauty open to all – rich and poor alike – and in a world so painfully divided, it remains one of the last truly universal sources of joy." A link to what the Pope said is below. Br. Guy Consolmagno, S. J. commented on the second meeting "...what I found fascinating was that in both statements he echoed the same points: the need to confront light pollution; the important role of the Church in supporting science at a time when not only science but the very idea of truth itself is under attack; and above all the joy of experiencing the Creator in Creation."

<https://www.vaticannews.va/en/pope/news/2026-05/pope-leo-xiv-vatican-observatory-foundation-science-faith.html>



Pope Leo XIV meets with the Board of the Vatican Observatory Foundation (©Vatican Media)

Pictures in the News:

Artemis 2 Photo Release:

NASA has released over 12,000 images taken by the Artemis 2 astronauts. They are divided into images of the Earth, Moon, and eclipse images. I do not think they left out any (including ones that are not of the best quality, given they are all hand-held). None of them seem to be annotated, unfortunately, though you can get details about the image itself (date, time, camera lens, etc.). I have included a link to the NASA site.

<https://www.space.com/space-exploration/artemis/nasa-just-released-12-000-photos-from-artemis-2-here-are-our-top-picks>

<https://eol.jsc.nasa.gov/Collections/Artemis/Artemis2/>

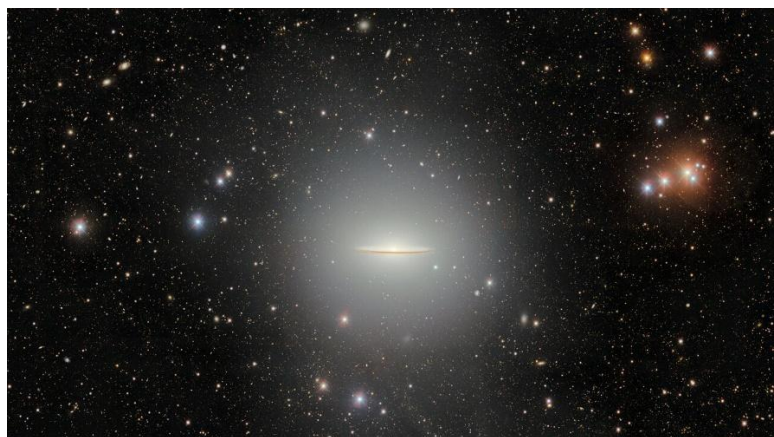


Solar Eclipse from Artemis 2 showing four planets: Venus, Saturn, Mars, and Mercury

Sombrero Galaxy:

This is a space image of the week, taken by the Dark Energy Camera in Chile. The M104, the Sombrero Galaxy, is about 31 million light-years from us. It is about 100,000 light-years across, slightly larger than the Milky Way galaxy. It is estimated to be about 800 billion solar masses vs 1,100 billion solar masses for the Sun. M104 has an estimated 1,000 to 2,000 globular clusters around it, vs. 150 known for the Milky Way. Its central black hole is more than 200 times the mass of the Milky Way black hole. In the image on the right, the Dark Energy Camera imaged an extended halo around it, similar to the one surrounding the Milky Way.

<https://www.livescience.com/space/scientists-detect-an-enormous-halo-around-the-iconic-sombrero-galaxy-space-photo-of-the-week>



"An extended halo around the Sombrero Galaxy (M104). (Image credit: CTIO/NOIRLab/DOE/NSF/AURA Image Processing: T.A. Rector (U. Alaska Anchorage/NSF NOIRLab), D. de Martin & M. Zamani (NSF NOIRLab))"

Astronomy in the News

Where Comet 3I/ATLAS Formed:

Most of the water on Earth is H₂O, but about 1 in 6,000 water molecules is HDO, “heavy water.” The “D” stands for deuterium, a hydrogen atom containing a proton and a neutron, not just a proton. Theoretical models predict that comets formed in the outer reaches of the Solar System, where it is colder, should contain more deuterium. While there is some uncertainty what the exact “D to H ratio” is in the few comets where HDO has been observed, it does appear that comets formed in the outer Solar System do contain 2 or 3 times as much heavy water as is seen on Earth. Measurements made by the ALMA millimeter array in Chile, have found that interstellar comet 3I/ATLAS has about thirty times as much heavy water relative to normal water than has been seen in Solar System comets. This would imply that 3I/ATLAS formed in a region much colder than the comets that have been observed previously.

<https://www.space.com/astronomy/comets/interstellar-invader-comet-3i-atlas-formed-in-a-world-much-colder-than-the-solar-system>

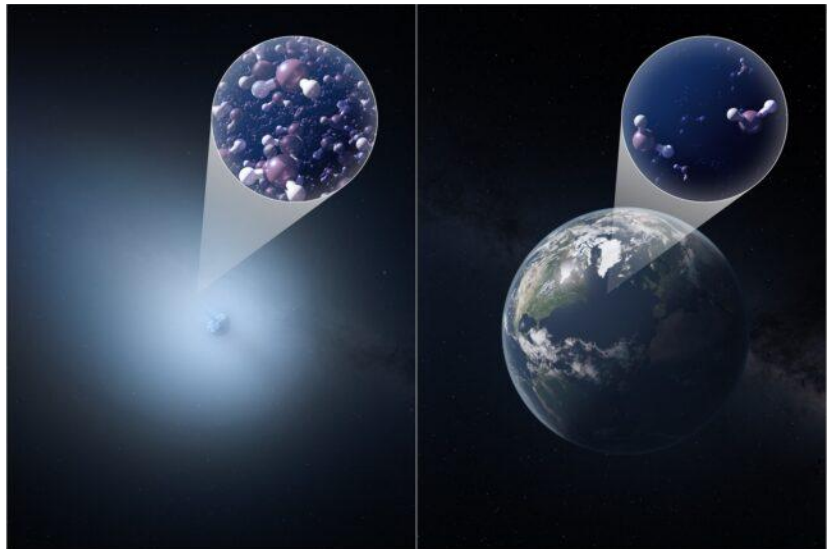
<https://earthsky.org/space/interstellar-comet-3i-atlas-born-in-a-cold-environment>

<https://www.sciencealert.com/scientists-traced-interstellar-comet-3i-atlas-to-an-extremely-cold-origin>

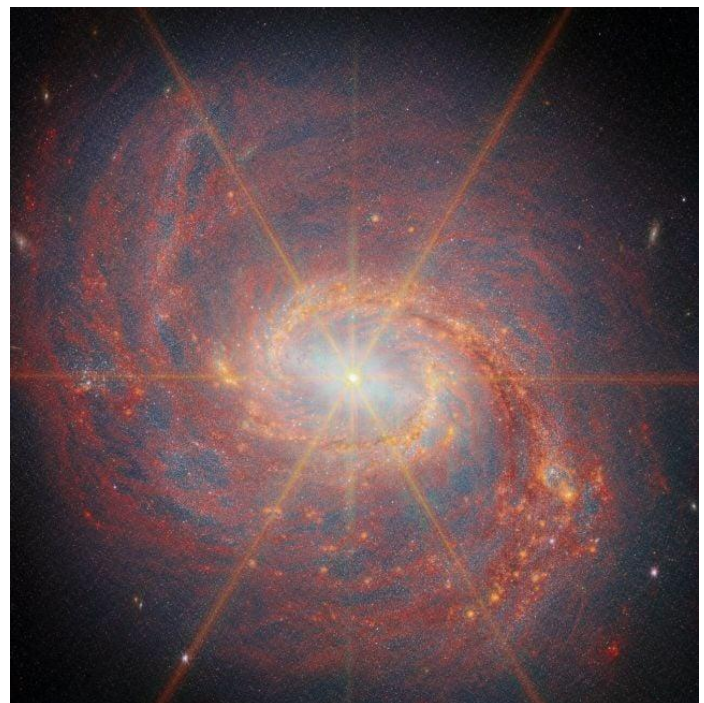
JWST, M77:

M77, the Squid Galaxy is about 35 million light-years from us. It is about 90,000 light-years in diameter, again about the size of the Milky Way Galaxy. It is classified as a spiral galaxy. However, it is also classified as a Seyfert Galaxy, an active galaxy with an active galactic nucleus. While the central mass is bright at radio wavelengths, it is obscured by dust, first detected in 2022.

Astronomers have used both NIRCam and MIRI to penetrate the dust obscuring the central mass (image on the right). I have included an HST image for comparison. As the articles mention, the spikes are from secondary support of JWST, but the observations reveal that M77 does have a barred structure not seen before. With these and previous observations, it is estimated that the central mass is about 13 million times the mass of the Sun, about 3 or 4 times the mass of the black hole at the center of the Milk Way. The NIRCam and MIRI instruments cannot resolve the central mass, but it is theorized that the active nucleus is two closely-orbiting supermassive black holes. 4



“An artist's impression compares the semi-heavy water content of interstellar comet 3I/ATLAS (left) and Earth (right). Insets illustrate the relative abundance of deuterated water (HDO) molecules. 3I/ATLAS contains over 30 times more HDO than is found in Earth's oceans. (NSF/AUI/NSF NRAO/M. Weiss)”

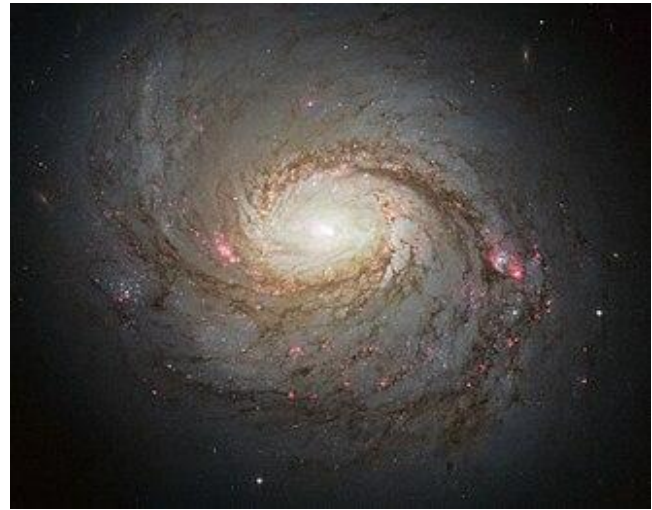


A composite of JWST's near- and mid-infrared images of M77. (ESA/Webb, NASA & CSA, A. Leroy)

<https://www.sciencealert.com/jwst-reveals-a-hidden-structure-in-the-heart-of-the-squid-galaxy>

<https://www.space.com/astronomy/galactic-starlight-will-take-your-breath-away-space-photo-of-the-day-for-may-19-2026>

https://en.wikipedia.org/wiki/Messier_77



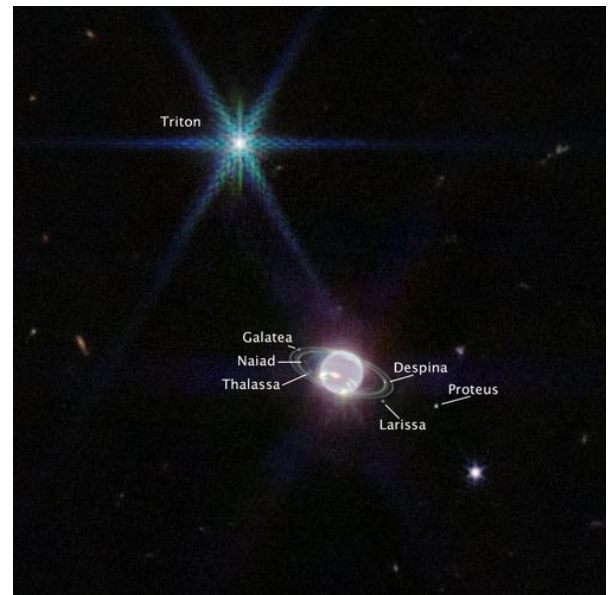
HST Image

JWST, Origin of Neptune's Moon Nereid:

Nereid is the third largest moon of Neptune, a little smaller than Proteus (an inner moon) and Triton (7.5 times the diameter of Nereid). Nereid orbits Neptune at a distance of 5.5 million km compared to 355,000 km for Triton, which is why Nereid is not seen in the image on the right. Previous research has assumed that, like Triton, Nereid is a captured Kuiper belt object. However, in the present research, Nereid is shown to be compositionally different from Kuiper belt objects. Its surface composition appears to be more water ice rich than Kuiper belt objects. Also, the authors have modeled the capture of Triton and have concluded that Nereid may be the only moon of Neptune that has not been captured or greatly altered by the capture on Triton. **Note:** the NIRCam observations only tell us what is on the surface of Nereid. The authors note the high reflectance (25%) and surface water ice to conclude it did not originate in the Kuiper belt where reflectances are generally much lower. However, Triton is a captured KBO, has water ice on its surface, and has a reflectance of about 75%, because of resurfacing by ice volcanism. Can that be ruled out for Nereid?

<https://www.space.com/astronomy/neptune/where-did-neptunes-mysterious-moon-nereid-come-from-it-may-be-the-only-survivor-of-the-planets-violent-history>

<https://www.livescience.com/space/neptune/one-of-neptunes-16-moons-is-not-like-the-others-james-webb-telescope-finds-and-it-could-be-key-to-fully-understanding-the-solar-system>



JWST, Exoplanet Surface:

LHS 3844, Batsù, is a red dwarf star that is 48.5 light-years from us. It is 0.003 times as luminous as the Sun with a surface temperature of about 3,000 K. It is orbited by one confirmed and one unconfirmed exoplanet. JWST, in the research reported here, has made observations of the surface of the confirmed exoplanet, LHS 3844 b, Kua'kua. LHS 3844 b is a super-Earth that is 1.3 times the diameter of the Earth, 2.3 times Earth's mass, and orbits 0.006 AU from the star with an orbital period of 0.46 days. It has a low reflectance, similar to that of the Moon or Mercury. The temperature of its star-facing side is about 1,000 K (Mercury's maximum temperature is about 700 K or 800°F). Its density is about 6 g/cm³ (Mercury is 5.6 g/cm³ and Earth is 5.5 g/cm³). Compositionally, it is probably similar to Earth (more massive bodies compress more, so have a higher density). Transit observations have not detected any atmosphere. The researchers observed three secondary eclipses. They measure the combined light of the star plus exoplanet before and after the exoplanet goes behind the star and then measure the light from just the star when the exoplanet is behind the

star. Subtracting the star spectrum from the combined spectrum gives you the spectrum of the exoplanet. To quote the authors: "...the data point to a surface dominated by basalt, a dark volcanic rock rich in iron and magnesium commonly found on the Moon and Mercury, the researchers say."

Note: Many years ago, I was on two papers where we made similar observations of Pluto and its largest moon Charon in visible light. We were able to report on the detection of water ice on the surface of Charon.

<https://www.space.com/astronomy/james-webb-space-telescope/james-webb-space-telescope-directly-studies-an-exoplanets-surface-for-the-1st-time-we-see-a-dark-hot-barren-rock>

<https://earthsky.org/space/nearby-super-earth-lhs-3844-b-hot-airless-close-to-star/>

JWST, Cloudy Exoplanet:

WASP-94 is a binary star system where both stars are F-type stars, so a little hotter than the Sun. They have diameters about 1.5 and 1.4 times that of the Sun (A and B respectively) and masses 1.4 and 1.2 times the mass of the Sun, respectively. So, as opposed to what the Nature article says, WASP-94B revolves around 95A (though they more accurately revolve around a center of mass slightly closer to A than B). They are about 3,000 AU apart and the system is about 690 light-years from us. Both stars are orbited by exoplanets. WASP-94A b transits the star, so astronomers have both a size from the transit and a mass from confirming radial velocity measurements. In the case of WASP-94B b, there are only radial velocity measurements which give a minimum mass and no size (diameter) information.

Previous transit observations have shown that WASP-94A b is a "hot Jupiter" with an inflated atmosphere, but few, if any clouds. The exoplanet is tidally locked, but there is atmospheric circulation. On the cool dawn side of the exoplanet has magnesium silicate clouds that dissipate as the atmospheric wind moves toward the warmer side of the exoplanet. This may be similar to the dissipation of morning fog as cold night air warms up later in the morning. The researchers have investigated nine more exoplanet transits and have found similar morning clouds on two of them.

Note: I am often critical of "artist's representations. In this case, even though the atmosphere is supposed to be clear, the upper image appears to show colorful clouds similar to those seen on Jupiter. Also, I doubt that the morning clouds would billow thousands or tens of thousands of kilometers into the skies as these seem to do. For comparison, Jupiter cloud layers are only about 50 km thick.

<https://www.nature.com/articles/d41586-026-01608-3>

<https://www.bioscience.com.pk/en/subject/space-science/james-webb-captures-first-daily-weather-cycle-on-a-planet-690-light-years-away>



"An artist's representation of the exoplanet WASP-94 A b, showing clouds building up on the night side of the planet. Credit: Hannah Robbins, Johns Hopkins University"

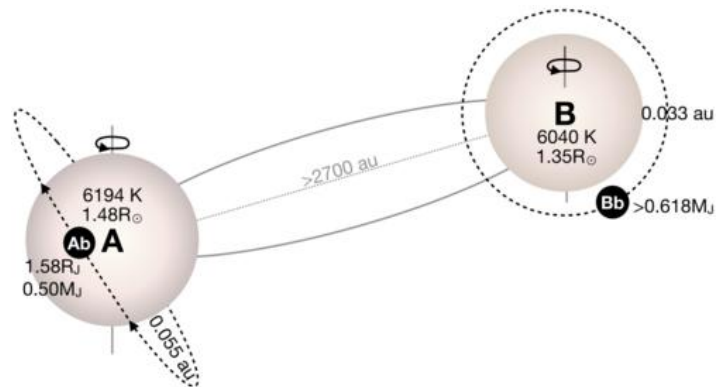


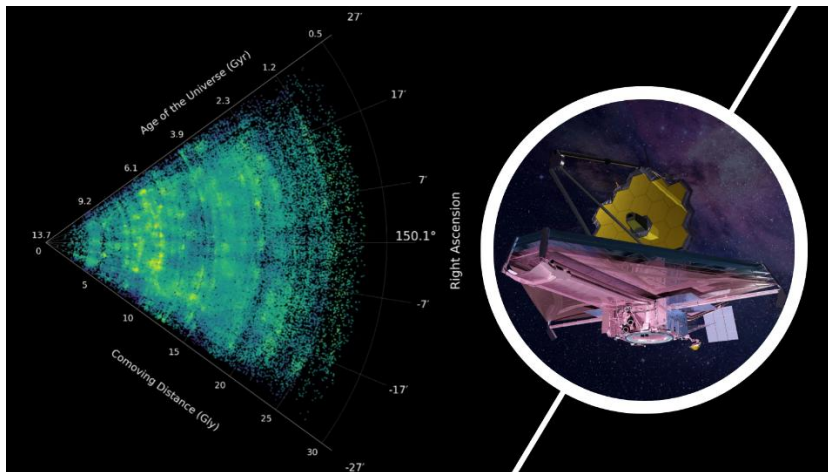
Diagram of the WASP-94 system. [The orbits are not to scale, my estimate is that they should be about five times the radius shown in the diagram. WASP-94 should be 0.013 AU in diameter.

JWST, Mapping Universe's Largest Structure:

The distribution of galaxies is not uniform. I am not sure that I can say it better, so here is a quote from the article linked below.

“The cosmic web is the term scientists use to describe a skeleton-like framework of filaments and sheets of dark matter and gas along which galaxies gathered and evolved over time, which is punctuated by nearly empty voids. Thus, the cosmic web forms the architecture of the universe — it's a singular, intricate, far-reaching structure that traps galaxies and galactic clusters like flies strung along the sticky silk web of a greedy spider.”

JWST's COSMOS-Web survey has mapped the cosmic web in much greater detail than was done previously by HST.



“A slice of the COSMOS-Web cosmic-web map, created with JWST data, showing galaxies across nearly 14 billion years of cosmic history. (Image credit: UCR/Hossein Hatamnia)”

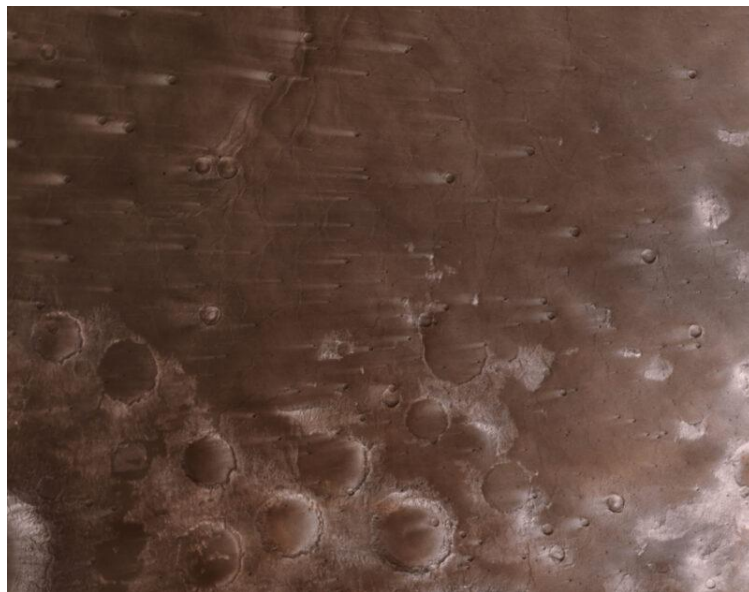
<https://www.space.com/astronomy/james-webb-space-telescope/james-webb-space-telescope-maps-our-universes-largest-structure-in-unprecedented-detail>

Psyche, Mars Flyby:

The Psyche spacecraft was launched in 2023 and will get to the iron-rich asteroid 16 Psyche in 2029. On its way Psyche needed a gravity assist (its only one) by Mars. The spacecraft flew by Mars at a distance of 4,500 km (2,800 miles), at a speed of about 20,000 kilometers per hour (12,300 miles per hour). The gravity assist added about 1,000 kilometers per hour to this speed and altered the trajectory (its orbital plane) by about a degree. The spacecraft is now on its way to its prime target. It will orbit and study 16 Psyche for at least two years. One of the goals of the flyby was to look back at Mars and try to image any ring material around Mars, created by dust knocked off Mars' moon Deimos and Phobos by impacts. There have been no announcements about any detections.

The science goals of Psyche are:

- Understand a previously unexplored building block of planet formation: iron cores.
- Look inside terrestrial planets, including Earth, by directly examining the interior of a differentiated body, which otherwise could not be seen.
- Explore a new type of world, made of metal.



“Psyche’s view of the Martian surface shows streaks from wind blowing over impact craters in the Syrtis Major region. The wind streaks extend to about 30 miles (50 km) long. And the large craters near center-bottom of the scene are around 30 miles in diameter. Image via NASA/JPL-Caltech/ ASU.”

Note: As I mentioned in the last Newsletter, when the Psyche mission was first proposed, it was thought by some that the asteroid was the iron-nickel core of a larger, differentiated, asteroid. There was already evidence that this was not true and more observations from Earth confirm that 16 Psyche is iron-rich, but not solid iron.

<https://earthsky.org/space/psyche-mission-fly-by-mars-may-15-2026-pics/>

Meteors, Meteorites, Asteroids, and Comets:

As of May 28, 2026, there are 1,543,371 known minor planets (23,041 added since April 16; Ruben Observatory contributed to this). Of these, 887,103 are numbered (no more). There are 4,634 known comets (same). There are 41,909 (243 more) Near-Earth Objects (NEOs). There are 878 NEOs larger than a kilometer (0.6 miles) in diameter (1 less, better diameter measurements or better orbits?). There are 11,637 NEOs larger than 140 meters (460 ft) in diameter (32 more). 1,201 NEOs have been discovered since the beginning of the year. A potentially hazardous asteroid is an asteroid whose orbit could bring it with 0.05 AU of Earth and is estimated to be at least 140 meters in diameter. However, many of these have orbits that are fairly-well characterized so there is little to no risk of their hitting Earth in the near future. ESA lists just those that have some potential chance of hitting Earth, usually due to orbital uncertainties. This is why my team observes them on the VATT so that we can reduce these uncertainties. ESA's "At Risk" list as of May 27, 2026, is 1,983 Near-Earth Objects (32 more).

Asteroid Close Approaches:

In the last 30 days, 23 asteroids have been **observed** to have come closer to the Earth than the distance to the Moon (LD) with estimated diameters from about 0.7 meters in diameter to about 32 meters in diameter (if high or low reflectivity, respectively). This is about twice the usual number. There were 10 additional asteroids observed that came as close as 1.0 to 2.0 times the distance of the Moon, with estimated diameters between 3 and 110(!) meters. In the next 60 days, no asteroid is **predicted** to come closer to us than the Moon and none between 1.0 and 2.0 times the distance to the Moon.

Between April 28 (observed) and July 4 (predicted in the next 60 days), six asteroids with estimated diameters between about 90 meters and 1,600 meters in diameter have passed/will pass between 6.7 and 17.6 lunar distances (LD) of the Earth. No large asteroids have been observed in the last 30 days (unusual). Of the six asteroids that are **predicted** to pass within 20 LD (0.05 AU) of the Earth between May 28 and July 4, 2026, one was discovered in 1997, one was discovered in 2007, one was discovered in 2011, one was discovered in 2025, and two were discovered in 2026, one at the end of April and the other in mid-May. There are 159 asteroids that were seen or are predicted to come within 20 lunar distances of the Earth (about 0.05 AU) between April 28, 2026, and July 26, 2026 (last 30 days to next 60 days). Of these, 134 have been observed (through the morning of May 28) and 25 are predicted (starting the evening of May 28). Of the 25 predicted close approaching asteroids, 9 were discovered this year. This will give you an idea of how many close approaching asteroids are likely to be discovered in the next month! After our only partially successful April run, our May run was completely clouded out. We await news of our requests for the remainder of the observing year, through January. Don and I had a good Adult Astronomy Camp, though it was very windy on two of the nights.

Asteroid Close Approach:

The Virtual Telescope Project (Italy and Chile, I think) is a very active program of science and science education. Every so often, they announce that they will be having live coverage of a Near-Earth Asteroid. This time it was newly discovered asteroid 2026 JH2 that came within about 0.25 the distance to the Moon and was estimated to be between 14 and 32 meters in diameter (50 and 100 feet), "the size of a blue whale." While there are other close approaching asteroids of similar size, they only highlight the ones that they are observing and, unfortunately, give the impression that this is unique or unusual. While the asteroid is unusual, it is not unique. On May 1, the asteroid 2026 JB2 came almost as close and is estimated to be only about 10% smaller in diameter. However, it was too close to the Sun in the sky and so was only observable for a short period of time. They do a lot of outreach and I do not think that they charge for using their telescopes (under 20 inches), so they may be worth using as a resource.

<https://www.space.com/astronomy/asteroids/watch-an-asteroid-the-size-of-a-blue-whale-hurtle-towards-earth-live-online-may-18>

<https://www.livescience.com/space/asteroids/asteroid-2026-jh2>

Real Close Approach Asteroid:

Around the same time, another asteroid made a close approach to the Earth. It never made the news (discussions were only online) and there were only a few observations. On May 15 (the day we were going up to Astronomy Camp) a small asteroid, 2026 JN4 was discovered by a telescope in California. It was estimated to be only about a meter in diameter (3 feet). There were only a few follow-up observations, but, because of its location, the only other possible observations would have been as a fireball over the South Pacific! No one was there to see it and there were only a few possible detections of atmospheric shock waves. Its closest approach to Earth was about 2,000 km (from the center of the Earth) and I will remind you that the radius of the Earth is 6,400 km. Even if it were seen, it would have been at most a fireball. It was too small to have fallen as a meteorite.

One downside was that I had to make a change to my presentation the next day, adding one more asteroid that was discovered just before entering Earth's atmosphere.

Moons and Rings:

As of May 24, 2026 (last update), there are 455 moons (satellites) orbiting six planets (no change). As of May 27, 2026 (last update), there are 625 asteroids, dwarf planets, Centaurs, and Trans-Neptunian Objects with companions (13 added since April 12). There are 606 binary systems (13 more), 17 triple systems (same), 1 quadruple (130 Elektra), and 1 sextuple system (Pluto), for a total of 648 companions (13 more). To break this down, 111 Near-Earth Objects (1 more) have companion moons (5 have 2 moons, same), 36 Mars-Crossing Asteroids (same) have companion moons (1 with 2 moons), 321 Main Belt Asteroids (8 more) have companion moons (1 with 3 moons, 8 with two moons, and 1 with 1 moon and rings; 1 also has dual asteroid/comet designation), 8 Trojan Asteroids have companion moons (same), and 149 Outer Solar System Objects (dwarf planets, Centaurs, and Trans-Neptunian Objects) (5 more) have companion moons (2 with 2 moons, 1 with 5 moons). There are 5 TNOs and Centaurs with moons that have or are suspected to have rings (one more) and 1 with rings but no moons. For those of you doing the Solar System Classification activity, this is a good example of how there is overlap among planets, dwarf planets, and asteroids as to how we classify them based on characteristics (moons and rings in this case. There are more satellites/moons of asteroids than there are of planets, 648 vs. 455. There are also more asteroids with rings than planetary ring systems.

Origin of the Moon:

There is nothing new in this article/interview, but it is a good summary about what we know and what we still do not completely understand about the formation of the Moon. There is general consensus that the Moon was formed by a giant impact. However, was it a head-on collision or a glancing blow? How big was the impactor, called Theia? Why is the composition of the Moon so similar to that of the Earth?

<https://www.universetoday.com/articles/moons-formation-in-many-ways-still-remains-a-mystery>

Full Moon photograph taken 10-22-2010 from Madison, Alabama, USA. Photographed with a Celestron 9.25 Schmidt-Cassegrain telescope. Credit: Gregory H. Revera/via Wikipedia



Ice Volcanoes on Ganymede?:

Ganymede is Jupiter's largest moon, the largest moon in the Solar System, and larger than the planet Mercury. However, it is only half the mass of Mercury. Both objects were large enough to differentiate, creating iron cores. Mercury is rocky with a large iron core. While it has an iron core, Ganymede is about half water ice and rock. The internal structure of Ganymede (the middle image, layers to scale) by the fact that it is the only natural satellite in the Solar System to have an internally generated magnetic field. Ganymede also has a thin water vapor atmosphere. It is only between 10^{-12} and 10^{-11} times Earth's atmosphere, but this is 100 to 1,000 times Mercury's atmosphere. Scientists estimate that Ganymede has a icy crust that is about 150 km (90 miles) thick above its 100-km (60 mile) deep subsurface ocean. While water ice was detected on Ganymede long ago, recent observations have found the presence of salts and organics, evidence of material coming up from Ganymede's subsurface ocean.

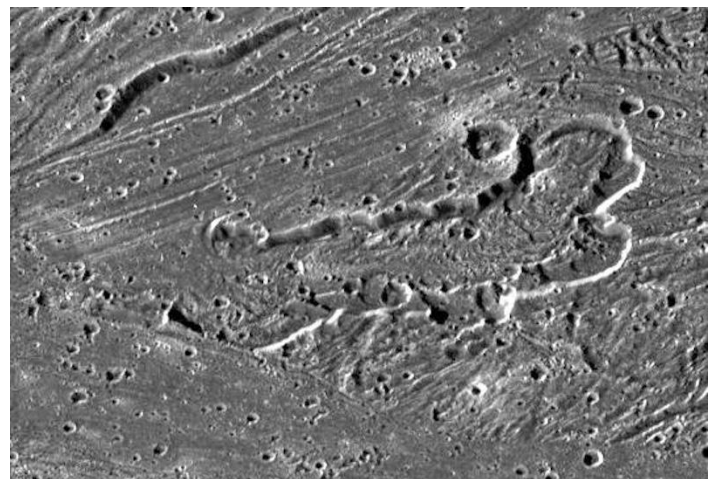
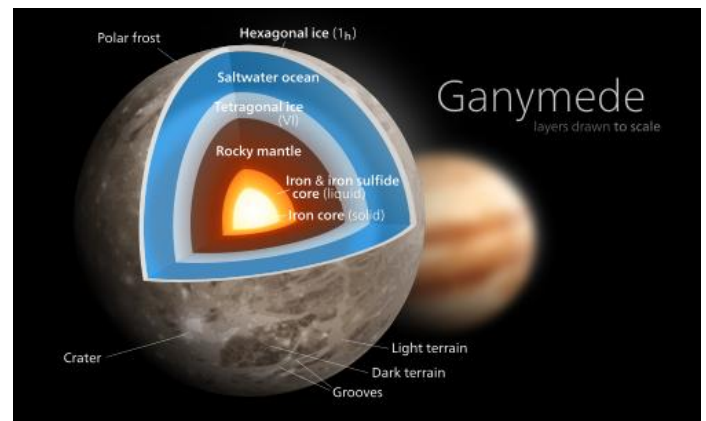
In the research reported below, planetary scientists have identified four unusual depressions, paterae (dish-like forms) on the surface of Ganymede. Surrounding this features are flow-like structures. The authors propose that these are possibly ice volcanoes, regions where water or brine has seeped up through the thick ice crust from the subsurface ocean.

<https://earthsky.org/space/ice-volcanoes-on-ganymede-jupiter-juice/>

Musa Patera, a depression on Ganymede some 43 miles (69 km) across. Scientists think it could have been left by an erupting ice volcano. NASA's Galileo spacecraft captured this view on May 7, 1997. Image via NASA/ JPL/ Wikipedia.



“Jupiter’s moon Ganymede is the largest moon in our solar system. Are there ice volcanoes on Ganymede? It’s possible, and now a new study has identified several good candidates. NASA’s Juno spacecraft captured this view of Ganymede on June 7, 2021. Image via NASA/ JPL-Caltech/ SwRI/ MSSS/ Kalleheikki Kannisto.”



Planets and Dwarf Planets:

TNO Atmosphere:

I am including three links as each article has information not in the others. 612533 2002 XV93 is a Trans-Neptunian Object that orbits at a mean distance of 39.3 AU (Pluto is 39.5 AU). Its orbit is not as elliptical as Pluto's orbit and its orbit is not as inclined to the ecliptic as Pluto's orbit. However, given its mean distance from the Sun, XV93 qualifies as a Kuiper belt object as well as a Plutino, a TNO in a 2:3 resonance with Neptune (it goes around the Sun twice in the same time that Neptune goes around the Sun three times), so it never gets close to Neptune and is in a stable orbit. 612533 2002 XV93 is estimated to be about 430 to 510 km (270 to 320 miles) in diameter, about 1/5 the diameter of Pluto. This implies that it is a dark object with an albedo (reflectance) of about 0.04, not unusual for a TNO that is exposed to solar wind and cosmic rays.

This is why, as noted in the articles, it was unexpected that a thin atmosphere was detected during a stellar occultation. The atmosphere is 5 to 10 million times thinner than Earth's atmosphere, which is 50 to 100 times thinner than Pluto's atmosphere. Two other dwarf planets may have thin atmospheres. Makemake is a Kuiper belt object that may have some regional atmosphere due to cryovolcanism, and Eris, which orbits beyond the Kuiper belt is thought to have a seasonal atmosphere. All three have high reflectance (albedos) in excess 50% to over 90%, consistent with ice resurfacing. Again, this is why it is surprising that 2002 XV93 has such a low reflectance.

<https://www.sciencealert.com/scientists-found-an-impossible-atmosphere-on-a-tiny-world-beyond-neptune>

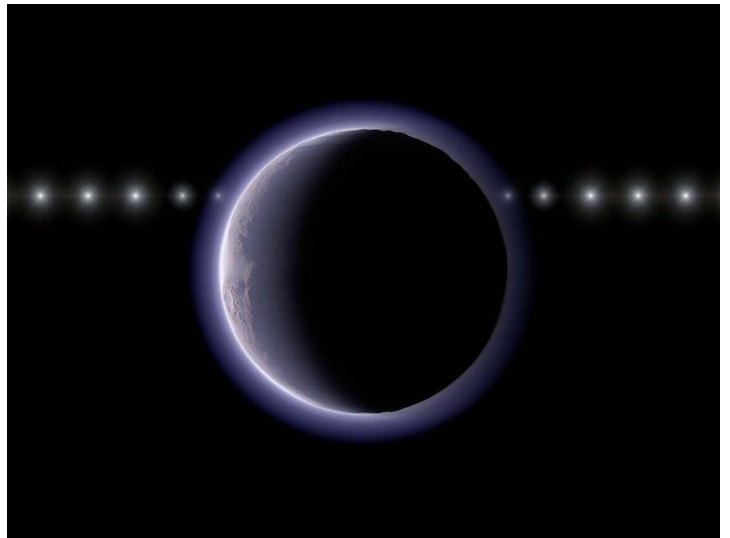
<https://www.space.com/astronomy/solar-system/scientists-find-tiny-object-in-our-solar-system-with-a-mysterious-atmosphere-that-shouldnt-exist>

<https://earthsky.org/space/tiny-world-with-an-atmosphere-outer-solar-system-tno-2002-xv93/>

Ancient Mars Ocean Shoreline:

Back in January I talked about evidence for a global ocean on Mars that could have covered up to half the planet. This was based on the presence of features similar to river deltas on Earth. In this article, the authors have looked for a different feature. On Earth, while shorelines vary over time, below the surface of the ocean are continental shelves. They are better indications of long-term ocean levels and, around islands, are called insular shelves. The authors of this paper looked for indications of similar features on Mars which would be, they propose, a better indicator of a global martian ocean, one that would have had to exist for more than a million years to allow the shelves to form. They report on finding such a shelf, about 1,800 to 3,800 meters (6,000 to 12,500 feet) below what is called "sea level" on Mars. This shelf covers about one-third of Mars' northern hemisphere and is consistent with other proposed martian oceans.

<https://www.space.com/astronomy/mars/scientists-found-a-bathtub-ring-on-mars-could-it-be-evidence-of-an-ancient-red-planet-ocean>



“Artist’s illustration of a small world passing front of a background star. When astronomers in Japan recently observed the small outer solar system object 2002 XV93, the light from the star gradually faded, indicating that this is a tiny world with an atmosphere. That’s a big surprise, because this object seemed too small for an atmosphere. Image via NAOJ.”



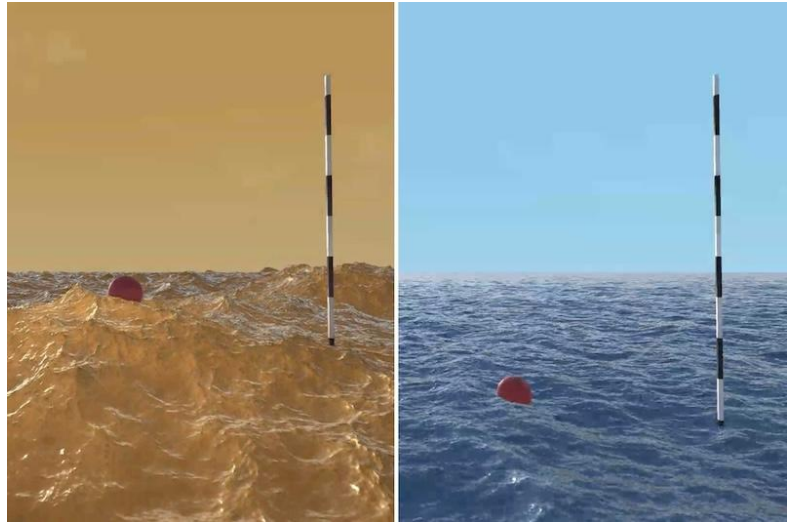
Image credit: NASA/JPL-Caltech

Making Waves:

We know what waves look like on Earth. But what would one expect on another world where the gravity would be different, the density of the air would be different, the wind velocity would be different, and the composition of the lake/ocean might be different? The authors have modeled this for moons, planets, and exoplanets. They provide a short clip, comparing waves on Saturn's moon Titan as well as on Earth. They have not posted any more video clips, unfortunately.

<https://earthsky.org/space/waves-on-other-planets-titan-exoplanets-mit/>

<https://news.mit.edu/2026/waves-hit-different-on-other-planets-0416>



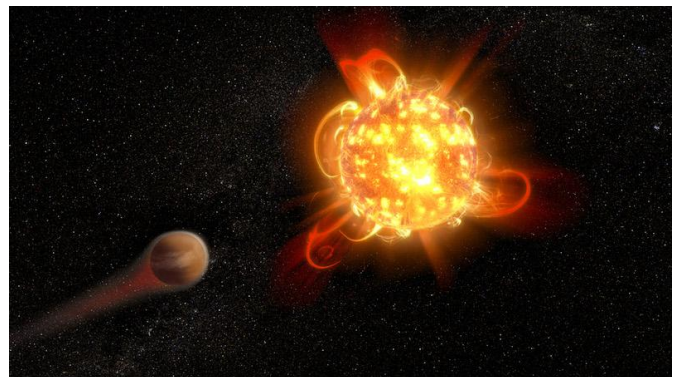
“This simulation compares possible waves on Titan (left) and Earth (right). Image via Schneck et al./ MIT.”

Exoplanet Update:

As of May 27, 2026, there are 8,225 confirmed extra-solar planets (45 more since April 16, my last update) orbiting 5,586 stars (16 more), with 1,130 star systems (2 more) having more than one exoplanet orbiting them. In addition, there are 2,748 candidate exoplanets (1 more) orbiting 2,417 stars (3 more), with 157 stars (4 more) having more than one exoplanet orbiting them. Most of these candidate exoplanets are likely to be real but need to be confirmed by more detailed ground-based observations or other techniques. I have always used the complete list from the Catalogue of Exoplanets. This includes “exoplanets” with masses greater than 13 times the mass of Jupiter which are more likely to be brown dwarfs. If I limit my list to exoplanets having a mass less than 13 times the mass of Jupiter, the total number is obviously less. Here are the revised statistics: 6,434 confirmed exoplanets (22 more) orbiting 4,824 stars (16 more), with 1,066 star systems (4 more) having more than one exoplanet orbiting it. In addition, there are 2,270 candidates (unconfirmed) orbiting 2,103 stars, with 137 having more than one exoplanet. There are 846 binary star systems (83 of these are triple or quadruple star systems) with about 1,111 exoplanets orbiting one of the stars (5 more since last month) and there are 38 star systems with 47 exoplanets orbiting both stars in the binary system (one more). Three binary star systems have two exoplanets orbiting both stars. Three binary star systems have three exoplanets orbiting both stars.

Life on Exoplanets around Red Dwarfs:

For years, there have been numerous articles about the habitable zones around stars and discussing that these zones are meaningless around M-type, red dwarf, stars because most red dwarfs flare frequently and that could lead to harsh conditions for any planetary lifeforms. The researchers looked at nine exoplanets orbiting K- and M-type stars. They investigated their *ultraviolet habitable zones*. This zone is “the region around a star where there’s enough ultraviolet radiation to potentially kick-start life-forming chemical reactions, but not so much that it will destroy any DNA.” For three of the stars and their exoplanets, there was an overlap between the ultraviolet habitable and the traditional habitable zone where the temperature is just right for liquid water. This is significant since 70% of all stars in the galaxy are M-type stars and many of them are known to have planetary systems.



“Artist’s illustration depicts a highly active red dwarf firing off such intense solar flares that it’s stripping the atmosphere from a nearby planet. It seems unlikely life could form on such a world. But a new study says violent stellar flares could sometimes improve the habitability of nearby worlds. Image via Wikipedia/ NASA/ ESA/ D. Player (STScI).”

<https://earthsky.org/space/stellar-flares-extend-ultraviolet-habitable-zones/>

10,000 Candidate Exoplanets:

The initial TESS (Transiting Exoplanet Survey Satellite) looked for exoplanets orbiting stars brighter than magnitude 12. In the research reported here, researchers used AI to exam 84 million stars observed by TESS down to magnitude 16, 40 times fainter. The title of the link below is very misleading. With AI they were able to “detect” just over 10,000 transiting exoplanet candidates with at least two detections of periods ranging from 0.5 to 27 days. They confirmed one of these and the rest await confirmation by other telescopes. They used an improved detection method, but I suspect that many of the detections are at a very low sign-to-noise ratio and may be false detections. This is beyond my pay grade. At the moment there are over 6,400 confirmed exoplanets and over 2,000 candidate exoplanets, so they have more than doubled the possible number of exoplanets (with only one confirmed). It may be some time before most of these are investigated by other telescopes/techniques. As of this writing, none of these candidates have made it into the Catalogue of Exoplanets.

<https://www.livescience.com/space/exoplanets/scientists-identify-10-000-impossible-exoplanet-candidates-potentially-tripling-the-number-of-known-alien-worlds>

Stars:

Low-Orbit Satellites and the Solar Cycle:

It has long been known that when there is higher solar activity, the Earth’s upper atmosphere expands and this can affect the lifetime of satellites in low Earth orbit, about 400 km to 500 km. Back in 2022, SpaceX launched 49 Starlink satellites. Of these, 38 unexpectedly deorbited. It was thought that solar activity was responsible for this. Presently, there are more than 10,000 Starlink satellites in orbit as well as lots of other satellites and space junk. It is estimated that SpaceX deorbits one to two satellites a day, but I do not know if any of these are being deorbited because they are getting too low in the atmosphere or if they have just reached their life expectancy of 5 to 6 years.

In the research conducted here, scientists looked at the rate of satellite reentries due to atmospheric drag vs. the solar cycle of over four 11-year solar cycles. Not surprisingly, they found a good correlation between orbital decay and solar activity. There appears to be a threshold when Extreme Ultraviolet Radiation reaches a point when atmospheric drag is increased, affecting low-Earth orbiting satellites.

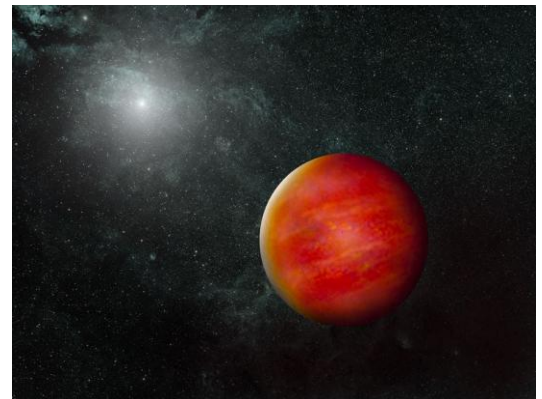
<https://www.universetoday.com/articles/study-shows-how-sunspot-activity-speeds-up-reentries>

<https://www.space.com/space-exploration/satellites/solar-activity-space-junk-crash-earth-faster>

3,000 Candidate Brown Dwarfs:

As I have mentioned in the past, a brown dwarf is a sub-stellar object with a mass between 13 and about 80 times the mass of Jupiter. They can only fuse deuterium to helium. While they are more massive than Jupiter, gravity compresses them so that they are about the same diameter as Jupiter. NASA’s Backyard Worlds used citizen scientists to examine 10 years’ worth of images from the Wide-field Infrared Survey Explorer (WISE), looking for objects with the cool temperatures of brown dwarfs. In the research paper, the citizen scientists found about 3,000 candidate brown dwarfs that now need to be confirmed.

<https://www.universetoday.com/articles/citizen-scientists-may-have-just-doubled-the-number-of-known-brown-dwarfs>



Artist's impression of a brown dwarf, from one of the Backyard Worlds: Planet 9 volunteers. Credit - William Pendril