

"Anyone who has never made a mistake has never tried anything new." Albert Einstein



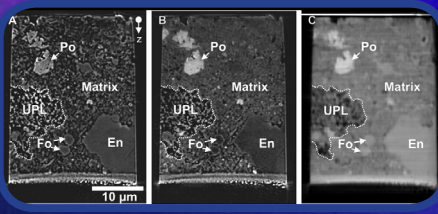
Astro

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Ice Fossils Found in Meteorite

A team of researchers from Japan, China and the U.K. has found evidence of ice fossils on the surface of a meteorite. In their paper published in the journal *Science Advances*, the group describes their close-up study of the Acfer 094 meteorite and what they found.

The researchers report that they also found evidence of mineral formation in the pores—the result of interactions between water and materials in the rock that make up the meteorite. But posed even more questions—the researchers note that there could not have been enough water in the pores to produce the amounts of minerals they found.

Phys.org

Scientists Confirm Europa's Water Vapor Geysers

Jupiter's large moon Europa is one of the most intriguing places in the solar system, an ocean world that might support life of some kind. As well as a subsurface ocean, it might also share another characteristic of Saturn's moon Enceladus: geyser-like water vapor plumes bursting through its icy surface. The evidence for geysers on Europa has been tentative up to now, but last month (November 18, 2019) scientists said they've found what might be new confirmation: they reported the direct detection of water vapor above the moon's surface.

Like Enceladus, Europa has a deep ocean below the outer ice crust. On Enceladus, water percolates up to the surface from the ocean below, erupting into space through cracks in the ice as water vapor.

EarthSky.org

Astronomers Find Three Supermassive Black Holes



Astronomers Find Three Supermassive Black Holes near the Centre of a Single Galaxy

The extensively studied galaxy NGC 6240 – located about 300 million light-years away from Earth – was previously thought to have acquired its odd shape in the process whereby two distinct galaxies merged into one, leaving two supermassive black holes at the place of collision.

This, however, had recently turned out to be wrong. Although not completely wrong, and certainly wrong in an exciting way – NGC 6240 was found to actually contain as many as three supermassive black holes fighting for position near its centre.

“Through our observations with extremely high spatial resolution we were able to show that the interacting galaxy system NGC 6240 hosts not two – as previously assumed – but three supermassive black holes in its centre,” said lead author Professor Wolfram Kollatschny from the University of Göttingen.

The discovery was made using European Southern Observatory’s (ESO) Very Large Telescope (VLT) and 3D-mapping techniques, suggesting that each of the black holes has a weight of roughly 90 million Suns (as compared to the 4 million solar mass equivalents of Milky Way’s own supermassive black hole Sagittarius A*).



India Launches Advanced Earth-Mapping Satellite and 13 US Cubesats

An Indian Space Research Organisation (ISRO) rocket delivered 14 satellites to orbit tonight (Nov. 26), including 12 for U.S. Earth-imaging company Planet and a prototype for Analytical Space. The ISRO’s Polar Satellite Launch Vehicle (PSLV) launched from Satish Dhawan Space Centre on time at 10:58 p.m. EST (9:28 a.m. on Nov. 27 local Indian time). About 18 minutes after liftoff, the primary payload — India’s Cartosat-3 Earth-observation satellite — deployed as planned from the PSLV’s fourth stage. The 13 other spacecraft, all of them tiny cubesats, followed suit over the next 10 minutes.

The 3,580-lb. (1,625 kilograms) Cartosat-3 is “a third-generation agile, advanced Earth-observation satellite having high-resolution imaging capability,” ISRO officials wrote in the mission’s press kit. The spacecraft is designed to study our planet from low-Earth orbit for at least the next five years, gathering data that will aid urban planning and resource and infrastructure development, among other endeavors.

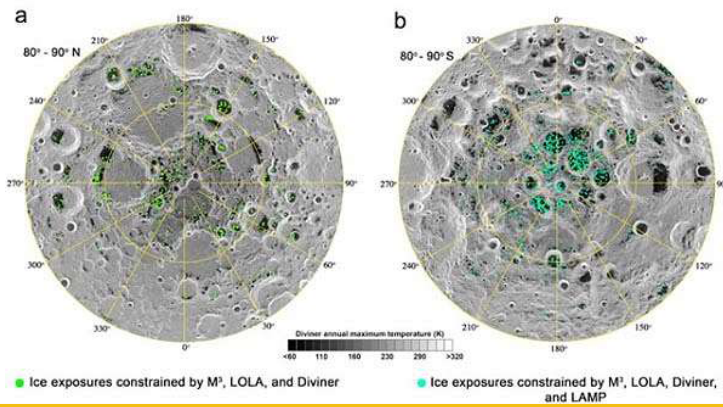
The 12 cubesats from San Francisco-based company Planet are “SuperDoves,” the company’s latest iteration of

tiny Earth-observing spacecraft. The SuperDove line, which includes 26 prototypes that were already in orbit, “features increased spectral bands and major improvements in satellite performance,” Planet representatives wrote in a recent blog post.

Rounding out the payloads lofted tonight is “Meshbed,” a cubesat provided by Massachusetts-based company Analytical Space.

Meshbed is “a technology demonstration spacecraft intended to pave the way for users on the ground to gain faster access to satellite data,” Analytical Space representatives wrote in a description of the satellite. “The spacecraft features a patented MITRE antenna that could help enable that application, as well as government missions including tactical communications and intelligence, surveillance and reconnaissance.”

The PSLV flew tonight in the “XL” configuration, meaning it featured six strap-on solid rocket motors. This launch was the 21st PSLV XL mission and the 49th overall for the Indian rocket, which debuted in 1993.



Small Satellites Key to NASA's Lunar Search for Water

Can shrinking satellites grow planetary science? NASA thinks so. With a handful of CubeSat and small satellite science and space exploration missions already under its belt - a couple even successfully having made the trip to Mars - NASA is enlisting several new small satellites to study the moon.

Often, rockets carrying larger payloads into space aren't at maximum capacity. Until fairly recently, that extra capacity went wasted. But over the last two decades, engineers and scientists have been able to miniaturize satellite technology, as well as the instrumentation that helps scientists observe the solar system's many objects.

Currently, the SIMPLEx program has two lunar science missions in the works: LunaH-Map, a CubeSat mission to measure hydrogen concentrations on the lunar surface, and Lunar Trailblazer, a small orbiter that will map water ice deposits by using infrared instruments. As part of the Artemis program, NASA officials are aiming to establish a permanent base on the moon - an outpost for future deep space exploration missions like a mission to Mars. Naturally, those in charge of NASA's space exploration missions want

to know where the moon's resources are, too. Instead of carrying a bunch of extra fuel on its initial launch from Earth, an expensive endeavor, a spacecraft headed for a deep space target could refuel on the surface of the moon, where gravity is much weaker.

LunaH-Map is scheduled to be carried into space by the Space Launch System Artemis-1 mission, with liftoff scheduled for sometime in the middle of next year. The CubeSat will be joined by several other secondary payloads, including IceCube, another small satellite dedicated to studying the distribution and movement of water on the moon's surface.

Several scientific surveys have confirmed the presence of water on the moon. Most of the lunar water deposits are found on the moon's poles, and yet, scientists suspect the only way water gets to the moon is via meteorites, which mostly strike near its equator.

Interferometry involves the measurement of wave interference between multiple wave sources, like radio waves from multiple members of a satellite constellation.



Earth May Have Recently Destroyed One of Its Own Minimoons

The Moon is probably not Earth's only natural satellite right now. Our planet's gravity regularly captures small space rocks and pulls them into orbit. Astronomers estimate that there's probably a 1-yard-wide "minimoon" orbiting Earth at any given time.

And now, a team of researchers in Australia think they actually spotted one burning up in Earth's atmosphere in 2016 as a particularly bright meteor, or fireball. It's only the second fireball that scientists suspect came from a minimoon. The team presented their findings in a recent paper published in *The Astronomical Journal*.

The minimoons next door

Astronomers haven't had much more luck finding minimoons in orbit, either. So far, scientists have just spotted one while it was still circling Earth. Starting in 2006, a tiny asteroid called 2006 RH120 stuck around for about 11 months before leaving the Earth-moon system.

However, researchers expect they'll find more of these temporary moons in the coming years. The upcoming Large Synoptic Survey Telescope (LSST) will create regular maps of the night sky, turning up faint and transient events in its surveys. Though rare, minimoons are so appealing to researchers because they are the closest space rocks to Earth.



Global Friendship Through Space Education

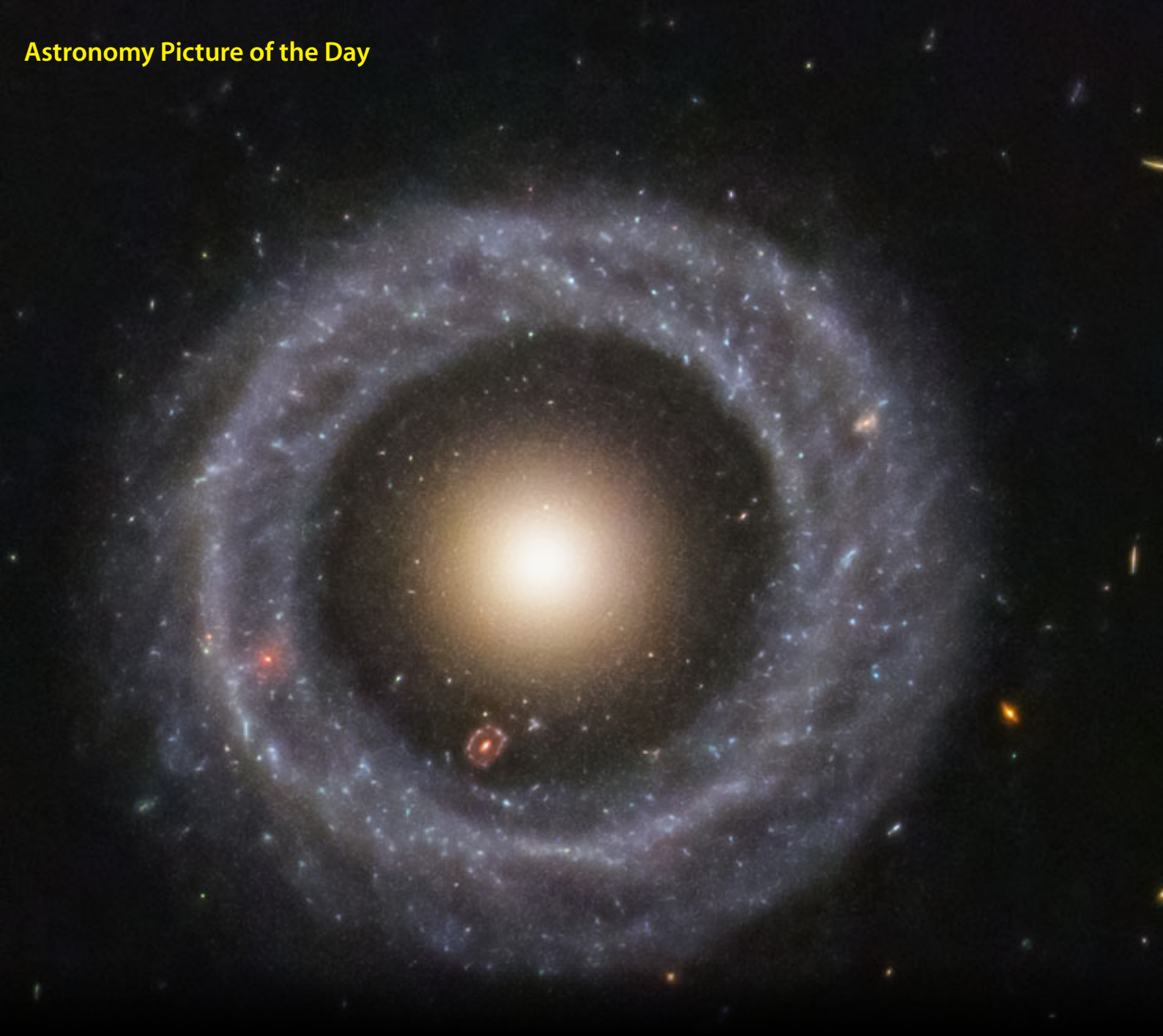
SCHOOLS In ACTION!

Dear followers,

The photographs, which you can see below, are the ones that were taken during the projects and presentations of the students that participated in PSSP (Partner School Science Program) and FEP (Future Explorers Program). We are happy and proud to share the projects that were created with brilliant ideas.



1- RoboLabas (FEP), LITHUANIA 2- Halkali Bahcesehir Schools (FEP), ISTANBUL 3- ZNP Primary School (PSSP), POLAND
4- ITK Bornova Campus (FEP), IZMIR 5- ITK Marmaris Campus (FEP), MUGLA



Astronomy Picture of the Day

Hoag's Object: A Nearly Perfect Ring Galaxy

Image Credit & Copyright: NASA, ESA, Hubble; **Processing:** Benoit Blanco

Is this one galaxy or two? This question came to light in 1950 when astronomer Arthur Hoag chanced upon this unusual extragalactic object. On the outside is a ring dominated by bright blue stars, while near the center lies a ball of much redder stars that are likely much older. Between the two is a gap that appears almost completely dark. How Hoag's Object formed, including its nearly perfectly round ring of stars and gas, remains unknown. Genesis hypotheses include a galaxy collision billions of years ago and the gravitational effect of a central bar that has since vanished. The featured photo was taken by the Hubble Space Telescope and recently reprocessed using an artificially intelligent de-noising algorithm. Observations in radio waves indicate that Hoag's Object has not accreted a smaller galaxy in the past billion years. Hoag's Object spans about 100,000 light years and lies about 600 million light years away toward the constellation of the Snake (Serpens). Many galaxies far in the distance are visible toward the right, while coincidentally, visible in the gap at about seven o'clock, is another but more distant ring galaxy.

apod.nasa.gov



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