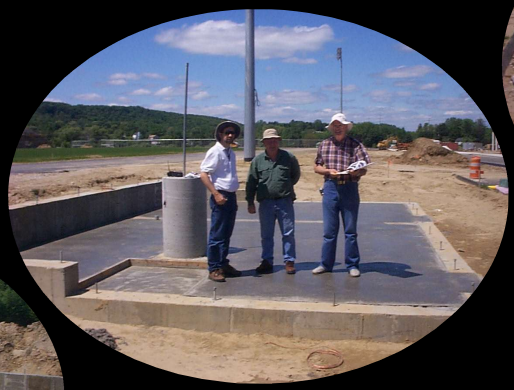
John J. McCarthy Observatory

May 2025 Newsburst

May 31, 2000

Framing needed to be in place prior to the delivery of the observatory dome on June 7th

Construction cost funded primarily by donations



Volunteers supplied the labor with several local merchants discounting construction materials

Second pour of the 20,000 pound telescope pier on May 10th brought the top to ground level

Groundbreaking on May 6, 2000

Twenty five years ago, after almost two years of planning and fundraising, the Western Connecticut Chapter of the Society for Amateur Scientists began the construction of a world-class, community science center. Designed to leverage astronomy to further science literacy, foster scientific curiosity, and reinforce interest and skills in science, the all-volunteer organization was able to complete the facility by early fall, with a formal dedication on December 2nd.

Disappearing Ice

The maximum winter sea ice cover in the Arctic, as measured on March 22nd, was the lowest it has ever been according to NASA and the National Snow and Ice Data Center at the University of Colorado, Boulder. In the southern hemisphere, where the summer season was coming to an end, satellite data confirmed that the sea ice extent was tied for the second-lowest minimum in nearly half a century, as measured on March 1st.

Images: NASA Scientific Visualization Studio

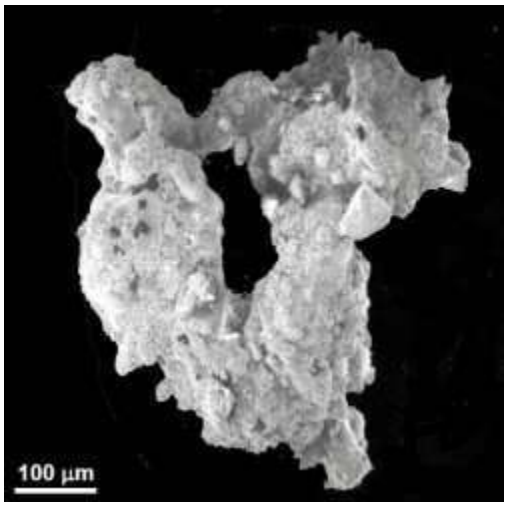
An Extraterrestrial Dust Problem

Dust-covered Apollo 17 astronaut Harrison Schmitt collects soil from the Moon's Taurus-Littrow valley in 1972
Image Credit: NASA

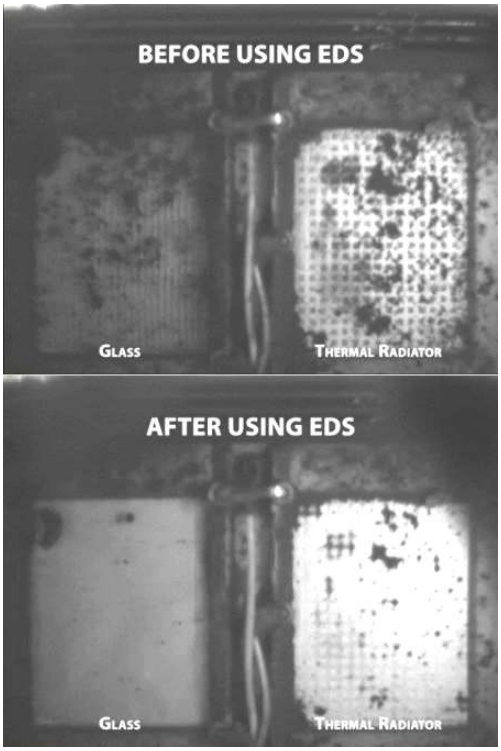
The Apollo astronauts experienced sneezing, sore throats, watery eyes and nasal congestion, or "lunar hay fever," from the exposure to dust during their short time on the Moon. The silicate-containing dust is not only a health hazard due to its properties and small grain size, the grains are also very jagged and abrasive like glass from the lack of weathering.

The lunar regolith is electrostatically charged from the constant bombardment by solar radiation. In the Moon's low surface gravity, this can cause the dust to levitate, increasing the likelihood of inhalation and migration into sensitive equipment and electronics.

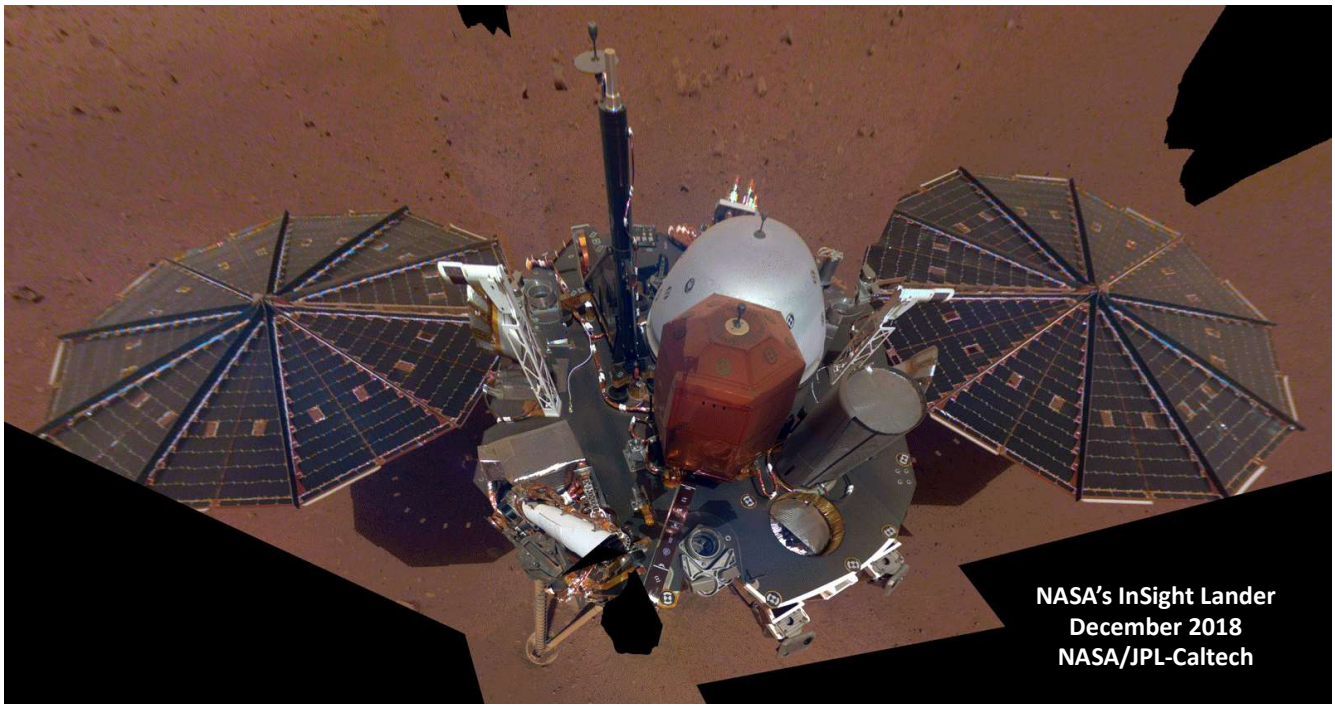
One of the experiments that flew on Firefly Aerospace's recently completed Blue Ghost Mission was NASA's Electrodynamic Dust Shield (EDS). The experiment demonstrated that electrodynamic forces had the potential to lift and remove lunar dust from various types of surfaces.

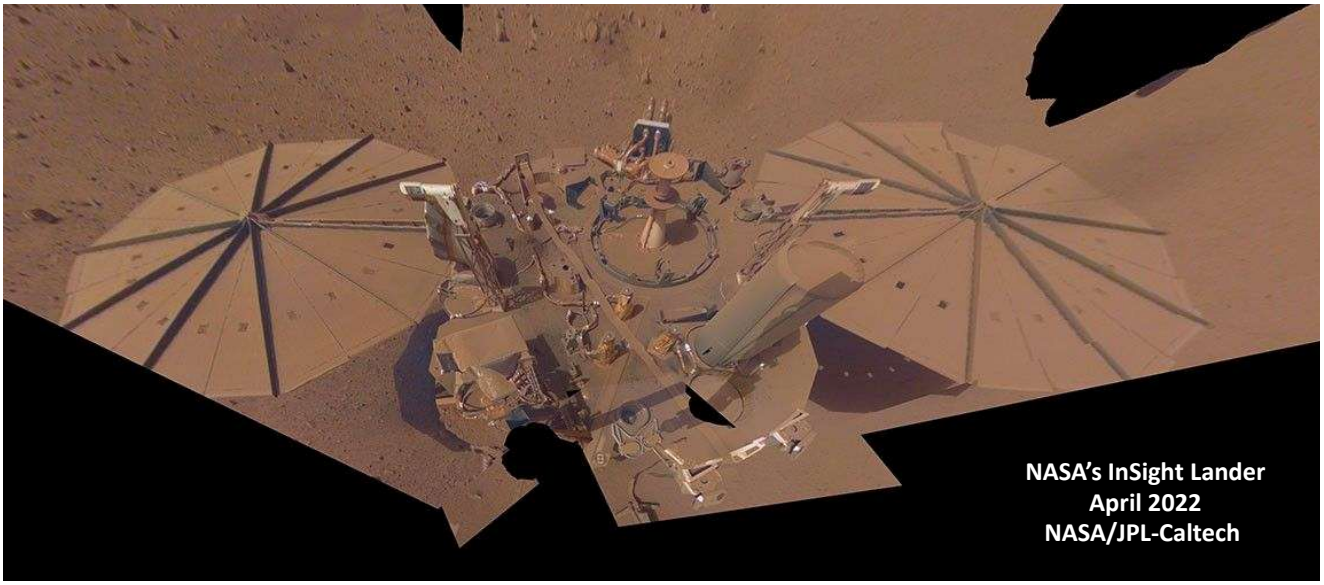


Lunar Dust Particle
Credit: NASA/JSC



Results from NASA's EDS technology demonstration. The agency deemed the experiment a success, although the cleaning was not complete.
Image Credit: NASA/Firefly Aerospace





Martian dust, while different in composition and less abrasive than its lunar counterpart, has its own hazards. Suspended in the atmosphere, the small grain size (Martian dust is only 3 microns in diameter) will not only irritate astronaut's lungs, but is more easily absorbed into the bloodstream. Prolonged exposure can increase the risk of lung diseases and cancers

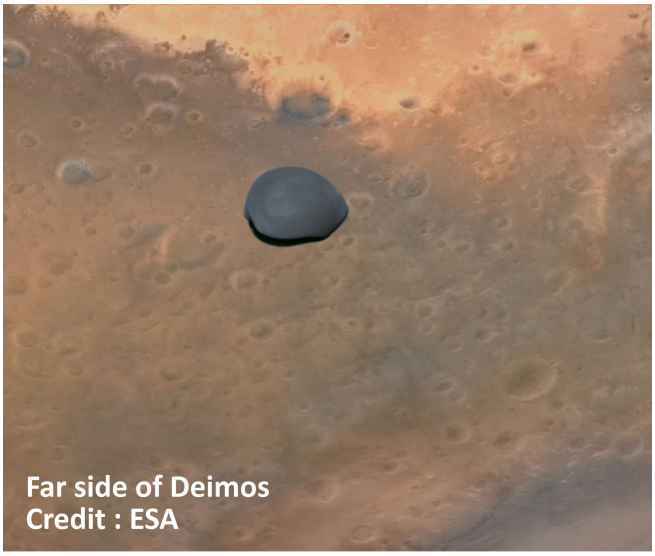
The dust on Mars contains toxic components including perchlorates, silica, nanophase iron oxides, and gypsum, in addition to trace amounts of toxic metals like chromium, beryllium, arsenic, and cadmium. Iron oxides give the dust magnetic and electrostatic properties, which can cause the particles to adhere to space suits and other surfaces much like lunar dust.

Unlike lunar missions, where medical facilities are only days away, Mars' explorers will need to be self reliant. Limiting exposure to dust, either through filtration or cleaning, will be necessary to decrease the likelihood of severe health issues, at least from this hazard.

Deimos from Hera

ESA's Hera spacecraft, on its way to the asteroid Didymos and its moon Dimorphos, took advantage of a close encounter with Mars for a gravity assist. The planned maneuver was used to accelerate and fine-tune Hera's trajectory. During the brief encounter, Hera passed within 190 miles (300 km) of Mars' smaller moon Deimos, imaging the side that always faces away from the Martian surface. Hera is a follow-on to NASA's DART mission.

In September 2022, the DART spacecraft collided with Dimorphos to test a kinetic means of deflecting an asteroid. Hera will study the after effects from the collision when it arrives in the Didymos system in October 2026.

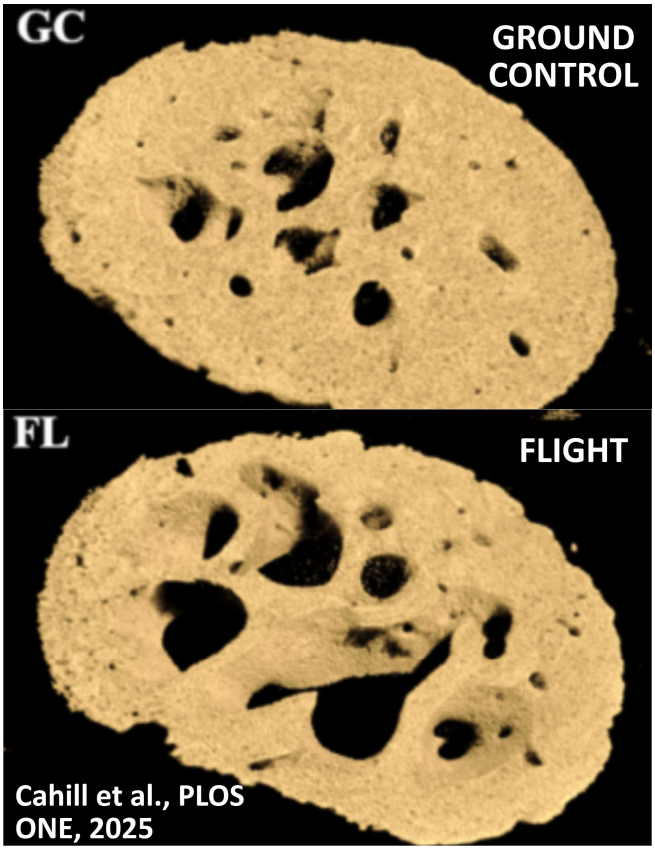


Far side of Deimos
Credit : ESA

Bone Density in Microgravity

One of the perils of living and working in a microgravity environment is an accelerated weakening of the muscles and bones. Without countermeasures, astronauts lose 1 percent, or more, of their bone density each month. As such, astronauts on the ISS exercise for about two hours per day to negate the harmful effects.

Research is being conducted on why some parts of the skeleton are more susceptible to bone loss than others. For example, the image on the right shows bone loss in a mouse femoral head after just 37 days in microgravity. By contrast, the lumbar part of mice's spine remained surprisingly intact. While there is much more to learn, weight-bearing bones appear to be most affected by the absence of gravity.

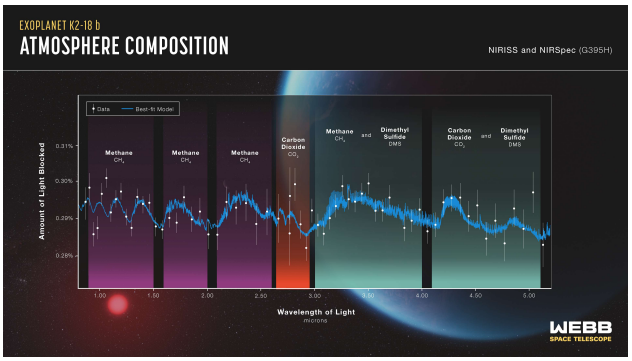


Cahill et al., PLOS ONE, 2025

Hycean World

Hycean worlds are a class of temperate ocean-covered exoplanets with hydrogen-rich atmospheres. Orbiting a red dwarf star, approximately 120 light-years from Earth, is exoplanet K2-18b. The super-Earth world (8.6 time the mass of Earth) orbits within the habitable zone of its star.

Spectral data obtained from the James Webb Space Telescope has detected methane and carbon dioxide in the atmosphere of exoplanet K2-18b, along with evidence of dimethyl sulfide, a compound on Earth produced almost exclusively by life. The findings, along with the non-detection of ammonia, suggests that the water-covered surface may be at habitable temperatures and pressures. Whether is hosts life remains to be seen.

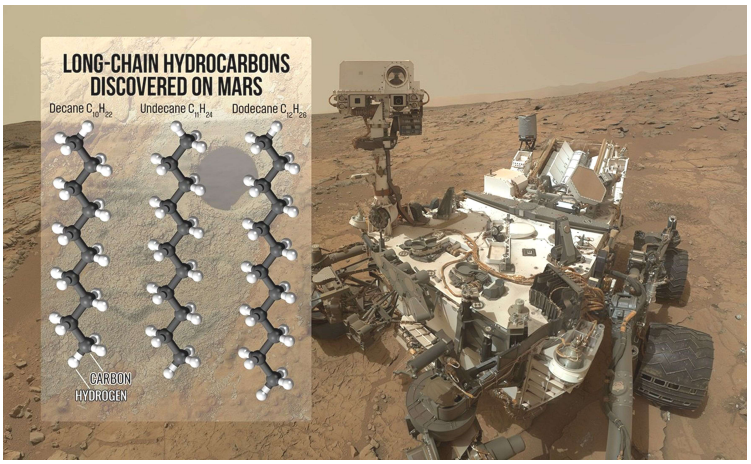


Credit: NASA / CSA / ESA / J. Olmsted (STScI) / N. Madhusudhan (Cambridge University)

Martian Biosignatures

While NASA's Curiosity rover had previously discovered small, simple organic molecules on Mars, scientists have recently found the largest organic compounds to date in a reanalysis of a sample that was acquired during the rover's first year of exploration.

The discovery was made during an unrelated experiment to look for amino acids in a sample from the "Cumberland mudstone" in the ancient lake bed at the bottom of Gale Crater. No amino acids were found, but heating the sample released small amounts of decane, undecane, and dodecane which are thought to be the fragments of fatty acids - organic molecules that on Earth are chemical building blocks of life.

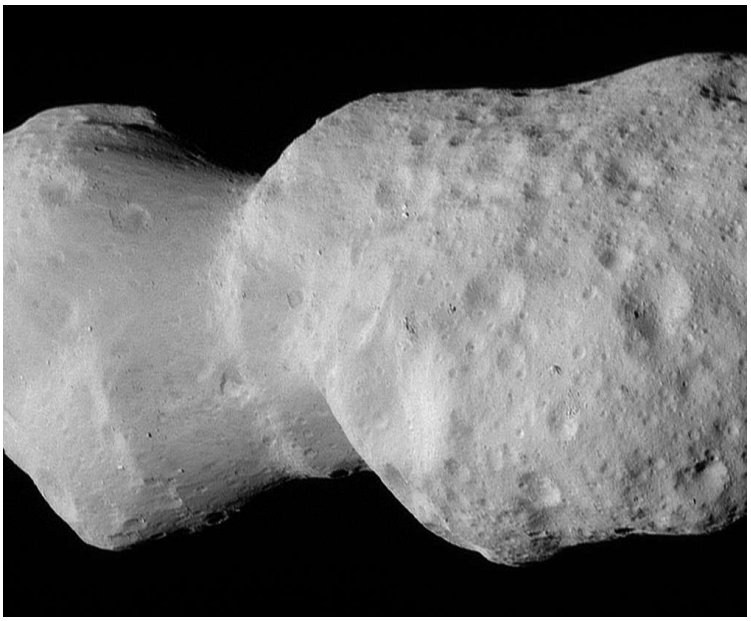


Credit: NASA/Dan Gallagher

Donaldjohansen

Following a gravity assist from a flyby of Earth on December 13th, NASA's Lucy spacecraft is traveling through the main asteroid belt and to the first of eight Trojan asteroid encounters. Scheduled to arrive in 2027, Lucy will visit Eurybates and its moon Queta, located in an asteroid swarm at the Lagrange 4 position (60° ahead of Jupiter in its orbit around the Sun).

Along the way, the spacecraft flew by the main belt asteroid (52246) Donaldjohansen on April 20th. The image (right) was captured from a distance of approximately 660 miles (1,100 km) and shortly before closest approach.

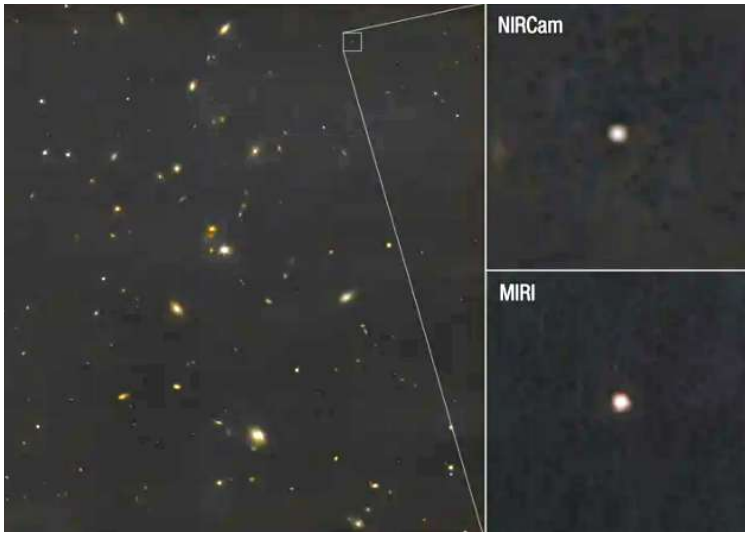


Credit: NASA/Goddard/SwRI/Johns Hopkins APL

2024 YR4

NASA's James Webb Space Telescope has imaged the asteroid 2024 YR4, the near-Earth object that, when discovered, had a non-zero probability of striking Earth in 2032. While further observations reduced that chance to near zero, the probably of 2024 YR4 striking the Moon has risen to almost 4 percent.

This is the smallest object observed by Webb to date, and one of the smallest objects to have its size directly measured. Using its NIRCam (Near-Infrared Camera), which records reflected light, and MIRI (Mid-Infrared Instrument) that records thermal light, the space telescope's data indicates that the asteroid is between 174 and 220 feet (53-67 meters) in size.

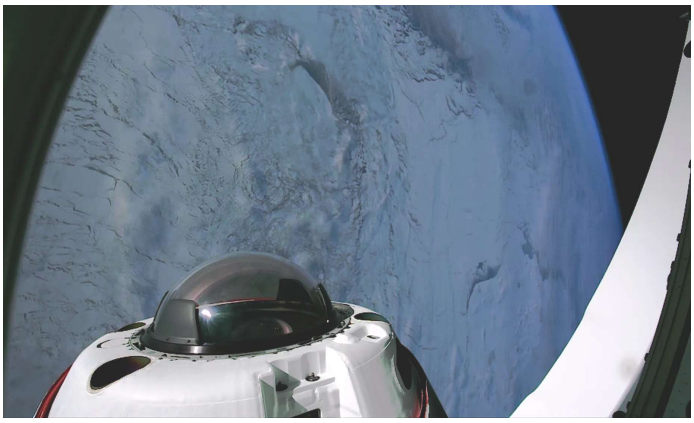


Credit: NASA, ESA, CSA, STScI, A. Rivkin (JHU APL)

Polar Orbit

For the first time in 64 years of human spaceflight, a crew has conducted a mission in polar orbit. The Fram 2 astronauts, named after the 19th century Norwegian ship built specifically for polar expeditions, flew the commercial mission aboard SpaceX's Crew Dragon "Resilience," with a cupola window attached to its forward hatch rather than a docking point.

The crew conducted 22 research projects, including taking the first X-rays of the human body in space, as well as coordinating aurora imaging with Earth-bound observers.

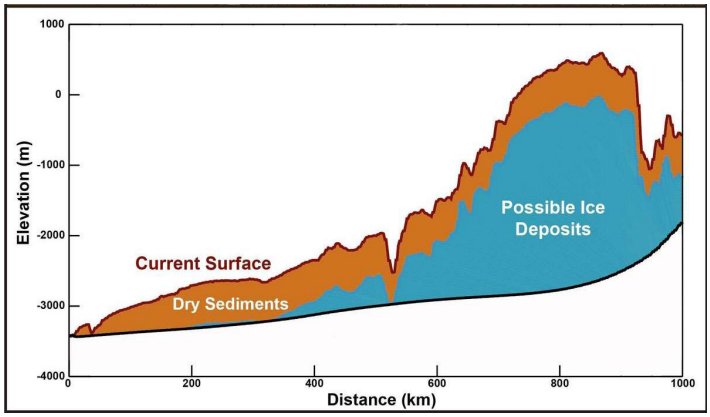


Polar View
Credit: SpaceX

Equatorial Martian Ice

New radar data suggests that the Medusae Fossae Formation, located near the equator of Mars, is comprised of layers of dust and ice hundreds of meters thick and capped by a protective layer of dry dust or ash. The discovery was made with the subsurface radar sounder MARSIS on ESA's Mars Express orbiter.

MARSIS is used to conduct ground-penetrating studies and is able to search for water down to a depth of about 3 miles (5 km). The radar signals from this equatorial region are similar to those seen from the ice-rich polar caps. The deposits may be up to 2.2 miles (3.7 km) thick, and if ice, could cover the Martian surface with water, if melted.

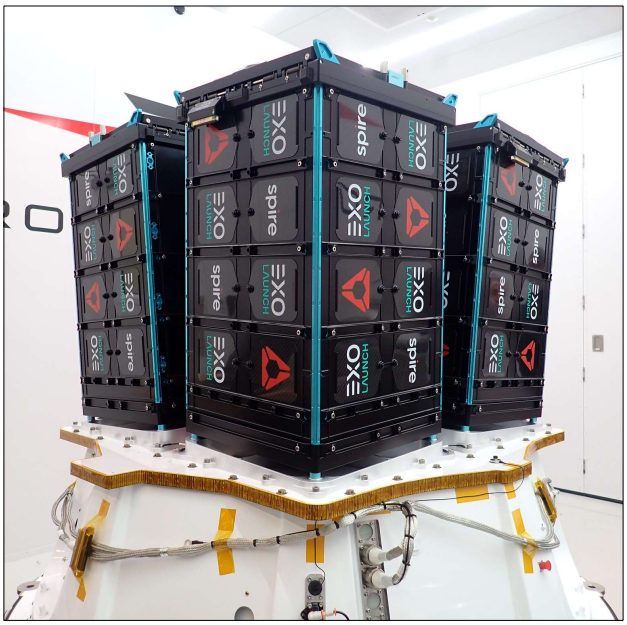


Credit: CReSIS/KU/Smithsonian Institution

Wild Fire Monitoring

A Rocket Lab launch on March 26th added eight wildfire detection satellites to OroraTech's existing global constellation. The satellites monitor the planet from a 340-mile (550-km) circular orbit.

The German company's satellites provide customers early detection, near-real-time monitoring of fires, including precise locations, intensity, spread simulations using weather, topography and fuel availability, and high-resolution images of burnt areas. The information is used to support first responders and for disaster management and recovery planning.



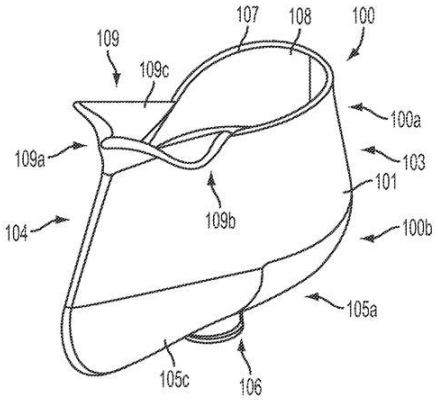
OroraTech's Satellites
Credit: Rocket Lab

Coffee Break

Don Pettit was selected to be an astronaut by NASA in 1996. A veteran of four spaceflights, Pettit just completed a six-month mission aboard the International Space Station as a flight engineer and member of the Expedition 72 crew, conducting science experiments and maintaining the space station before returning to Earth on March 18th. The chemical engineer is best known for his orbital astrophotography and for the first patent for an object invented in space.

The invention of a Zero G Cup was motivated by Petitt's love of coffee and aversion of having to drink the aromatic liquid out of a bag with a straw. The oddly shaped cup is designed to control the movement of the liquid using a capillary channel, much like a wick, to guide the coffee towards the lips for sipping without spilling.

His original cup was redesigned by Mark Weislogel and his students at Portland State University.



Drawing from US Patent 9962024B2 of a capillary beverage cup (right), and astronaut Pettit drinking out of the Zero G Cup on the ISS (below) Credit: NASA

Second Saturday Stars

FREE EVENT

John J. McCarthy Observatory
Behind the New Milford High School
860.946.0312
www.mccarthyobservatory.org

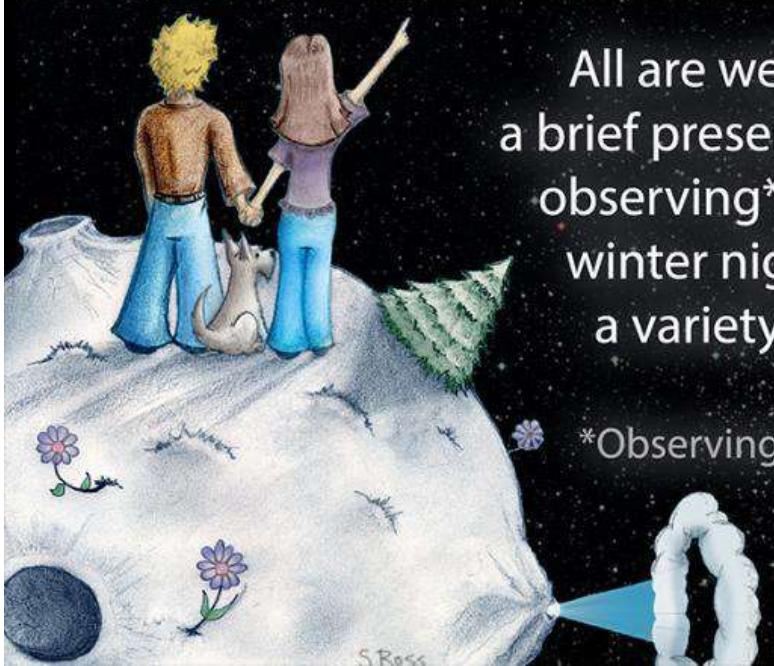
May 10th

8:00 - 10:00 pm

Free Star Party

Featuring:

Is There Space for NASA?



All are welcome to enjoy
a brief presentation along with
observing* the sights of the
winter night sky through
a variety of telescopes!

*Observing if weather permits

Contact Information

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