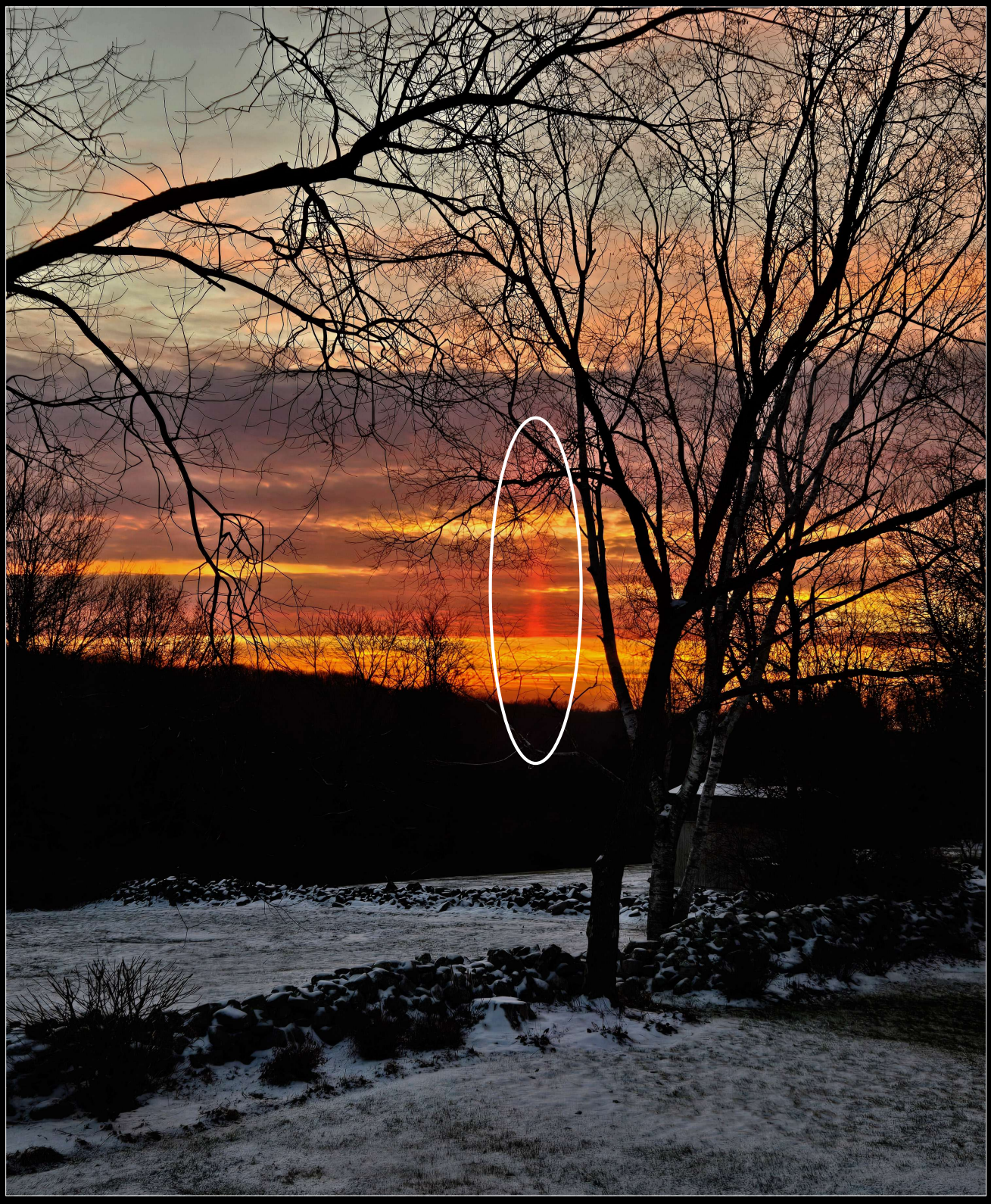
John J. McCarthy Observatory

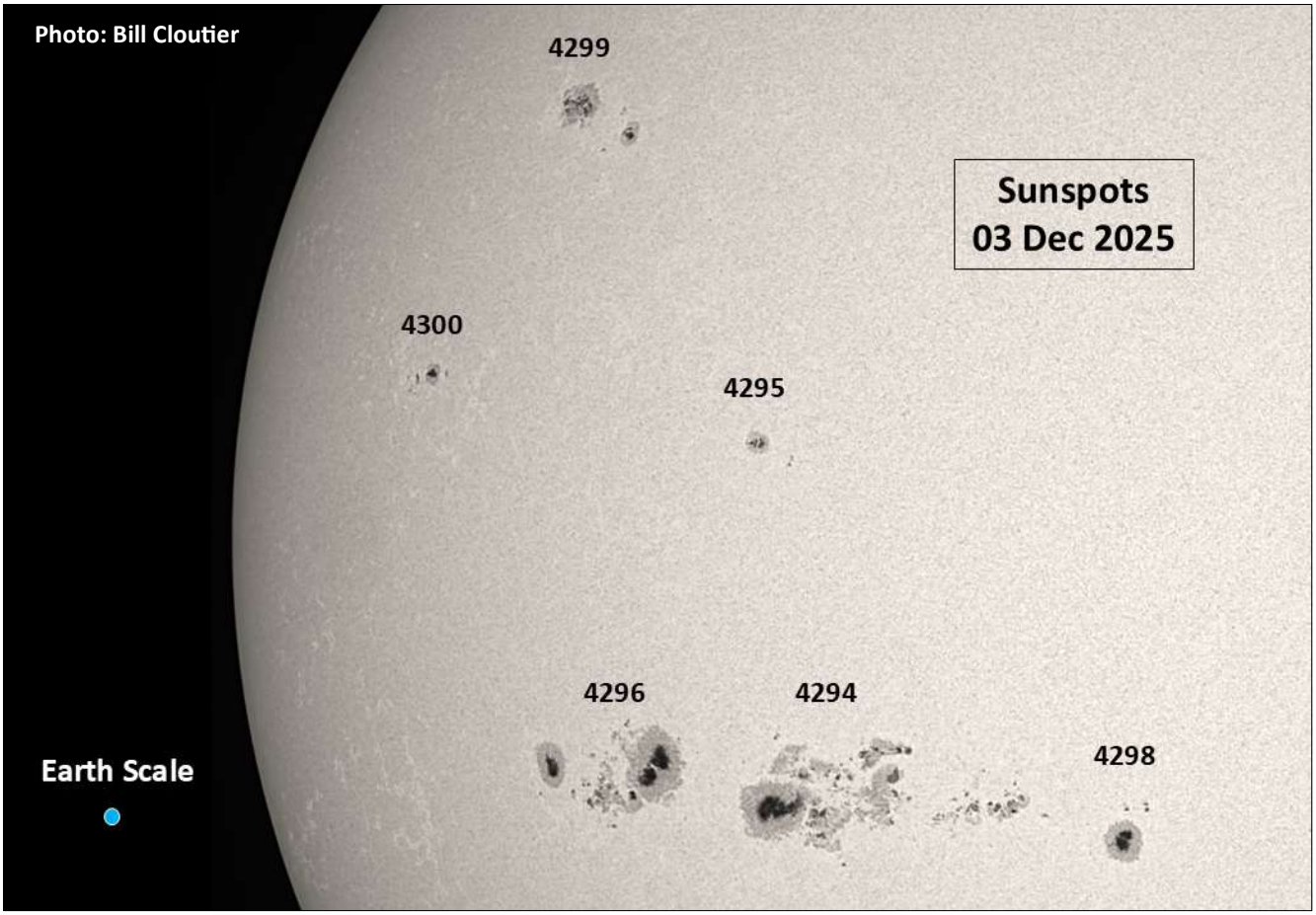
January 2026 Newsburst



A rare sun pillar appeared just before sunrise on a cold December morning. The phenomenon is caused by the reflection of sunlight off hexagonal-shaped ice crystals, with a horizontal orientation, falling from high level clouds.

Photo: Bill Cloutier

Early Martian Warning System



Mars reached opposition on January 16, 2025, when the planet was on the opposite side of our sky from the Sun and closest to Earth. Over the past year, Mars has been moving west in our nighttime sky as the Earth, traveling closer to the Sun, moves ahead of the Red Planet in its orbit. Mars will pass behind the Sun, from our vantage point, on January 9, 2026. As the two planets have moved further apart, their view of the Sun has changed, with Mars seeing more of the far side, giving it a preview of active regions before they rotate around to face the Earth.

While NASA's Perseverance rover wasn't designed for solar observing, it does image the Sun about once a day as a means of assessing the amount of dust in the Martian atmosphere. Its stereo mast-mounted camera doesn't have the ability to resolve individual sunspots, unless they are very large.

On November 25th, Perseverance's solar image from Jezero crater included a large sunspot cluster, estimated at 15 Earth-diameters in width. A week later, the cluster had rounded the eastern limb to became visible to Earth-based observers. While the sunspots had unleashed a M6-class flare while on the far side, and had 'beta-gamma-delta' magnetic fields that harbored energy for X-class solar flares, the transit across the Earth-facing solar disk was unusually quiet. Several smaller sunspots, however, were very active with Sunspot 4300 erupting on the 4th with a strong M6-class solar flare, Sunspot 4299 on 6th with M8-class solar flare, and Sunspot 4298 on the 8th with an X1-class solar flare.

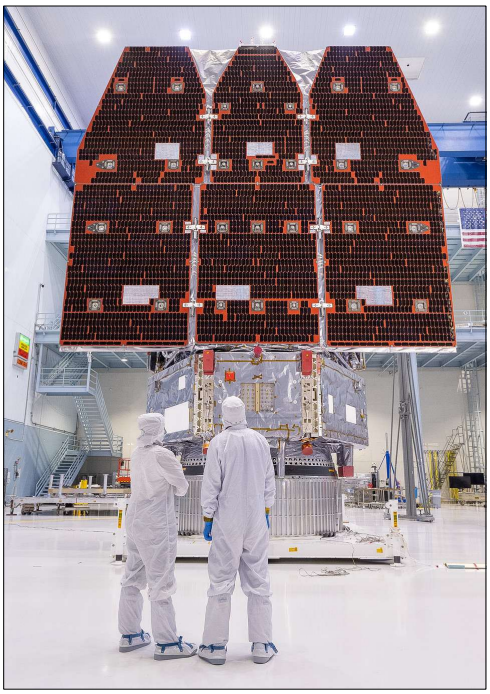
Sunspot complex 4294-4296 as seen from Mars on November 25th

Image: NASA/JPL-Caltech/ASU

Roman Telescope Complete

Construction of NASA's Nancy Grace Roman Space Telescope is now complete as the inner and outer portions of the telescope were recently joined together at the Goddard Space Flight Center in Maryland. The telescope will now go through final testing and launch preparations. Originally scheduled for launch in May 2027, the now completed assembly could accelerate the launch date by six months or more.

The telescope, named for NASA's first Chief of Astronomy, will be placed in a halo orbit at the Sun-Earth Lagrange point 2 (L2), located about 930,000 miles (1,500,000 km) directly behind the Earth as viewed from the Sun. It will carry two instruments - a 288-megapixel wide field camera, with a field of view 100+ times larger than Hubble's, and a special coronagraph. The coronagraph has been designed, as a technology demonstration, to directly image exoplanets by blocking the light from the stars that they orbit. If successful, the technology could be integrated into a future mission like the Habitable Worlds Observatory.



The fully assembled Nancy Grace Roman Space Telescope the Goddard Space Flight Center

Credit: NASA/Jolearra Tshiteya

Space Rescue

The orbit of NASA's Neil Gehrels Swift Observatory is quickly decaying due to atmospheric drag with a 50% chance of uncontrolled reentry by mid-2026, increasing to 90% by the end of the year. The telescope is not equipped with thrusters nor was it designed for in-orbit servicing.

In a last ditch effort to save the telescope launched in 2004 to study gamma-ray bursts, NASA has contracted with a private company, Katalyst Space Technologies, to boost the observatory from its current altitude of 249 miles (400 km) up to its original orbit of 373 miles (600 km). If successful, the boost would extend its operating life by ten years.

Katalyst, based in Arizona, plans to use a Pegasus XL rocket, which is air-launched from a modified Lockheed L-1011 Stargazer aircraft, to send a robotic spacecraft into orbit. After rendezvousing with the telescope, three robotic arms would capture and secure the telescope to the boost spacecraft.

Boost spacecraft on approach to NASA's Neil Gehrels Swift Observatory

Credit: Katalyst Space Technologies

Space Agriculture

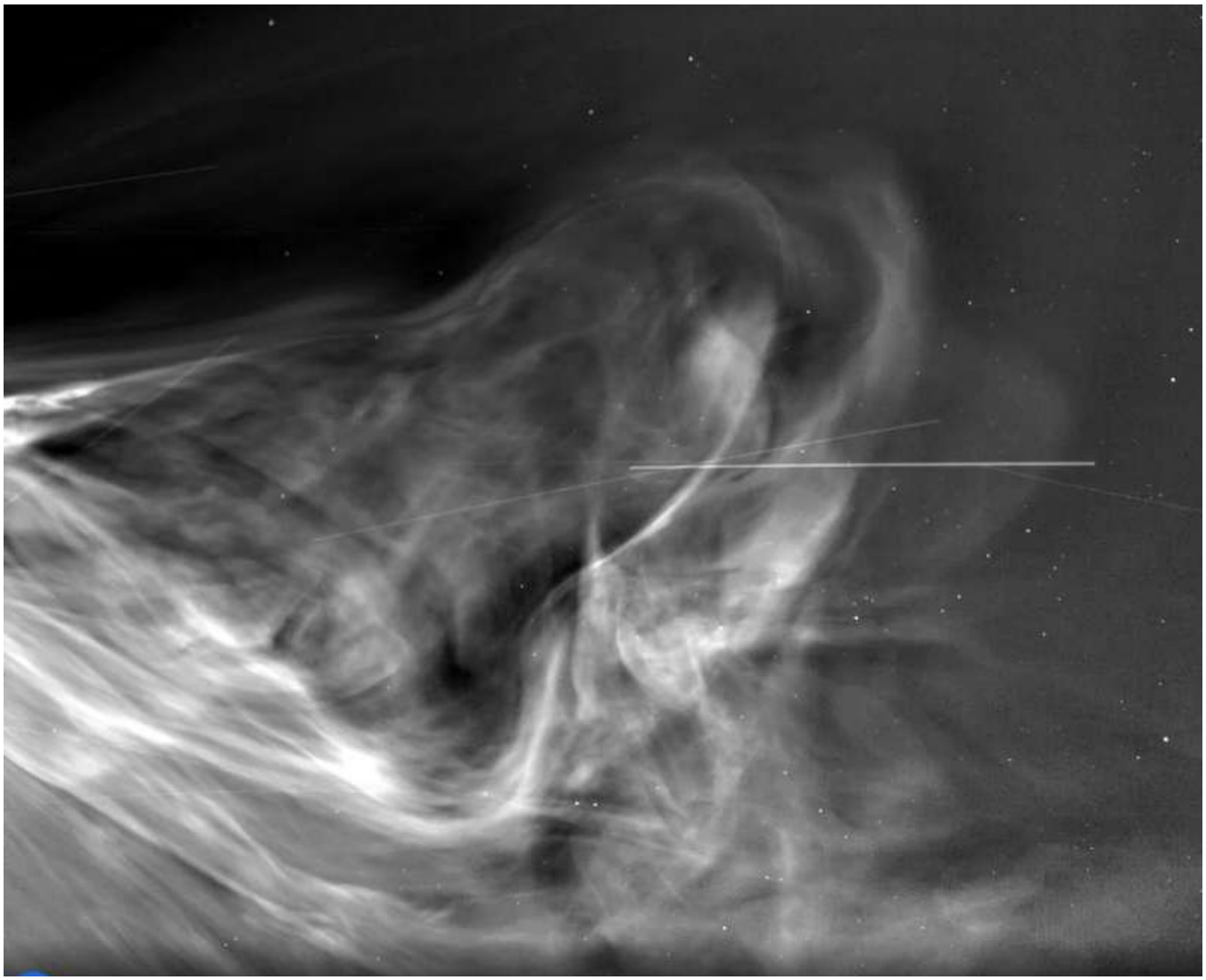
Spores (sporophytes) of the moss Physcomitrium patens spent roughly nine months in space. Upon their return to Earth, the moss spores showed an 86% germination rate (compared to 97% for the control moss samples kept on Earth). The spores were mounted on the exterior of Japan's Kibo module and were exposed to intense UV radiation, as well as the vacuum of space, experienced drastic temperature shifts and a microgravity environment. Researchers identified UV radiation as the most significant threat to germination.

Organisms, like mosses, are considered "pioneer" species in that they help condition the soil for more complex life forms. Its ability to survive in extreme conditions, as well as a capacity to remove carbon dioxide from the environment and produce oxygen, make them good candidates for off-Earth colonies.

Moss spore exposed to space

Credit: NASA/Tomomichi Fujita

Parker Solar Probe Enters Extended Mission



The solar wind billowing out from the Sun's outer atmosphere captured by Parker Solar Probe's WISPR instrument
Credit: NASA/John Hopkins APL/Naval Research Lab

The solar wind, a stream of charged particles with an embedded magnetic field originating from the Sun's outer atmosphere or corona, is relatively uniform by the time it reaches Earth. Its genesis, however, is chaotic and explosive. NASA's Parker Solar Probe mission was designed to trace the flow of energy of this plasma stream, study the heating of the solar corona, uncover the means by which the solar wind is accelerated to over a million miles per hour, and determine how it manages to escape the Sun's massive gravitational force.

The spacecraft was launched on August 12, 2018 and, using Venus' gravity, moved progressively closer to the Sun throughout its prime mission. Protected from the searing heat of the Sun by a 4.5-inch-thick (11.43 cm) carbon-composite shield, the spacecraft first flew through the Sun's upper atmosphere in December 2021. The Parker Solar Probe completed its 24th close approach to the Sun, and last one of its 7-year prime mission, in June 2025. The flyby was performed at its record closest distance of 3.8 million miles (6.2 million km) from the solar surface, and at its record speed of 430,000 mph (690,000 km/h).

The latest pass on December 13th was its 26th. Since the end of the baseline mission, the probe has continued to orbit the Sun while making observations. The future of the mission is currently under review but will likely continue to return scientific data until the spacecraft's propellant is exhausted.

Mars Lightning

NASA's Perseverance rover has confirmed what scientists have long speculated – Mars' dust storms can generate mini lightning. Small electrical bursts were detected by Perseverance's microphone as the rover watched a dust devil develop and pass by in Jezero crater. Researchers have identified 55 brief discharges over a two year period. The electrical sparks were usually associated with a passing dust devil or leading edge of a dust storm.

Dust devils are whirlwinds that form from rising and rotating columns of warm air. While researchers have found that specific wind speeds and temperature gradients are required for the formation of a dust devil, these phenomena have been seen by rovers, as well as orbiting spacecraft. NASA's rover Spirit first spotted, and photographed, dust devils in action in 2005, while in 2012, NASA's Mars Reconnaissance Orbiter caught sight of a dust devil with a plume reaching 12 miles (20 km) into the sky.

Electrified dust devil swirling across Jezero Crater

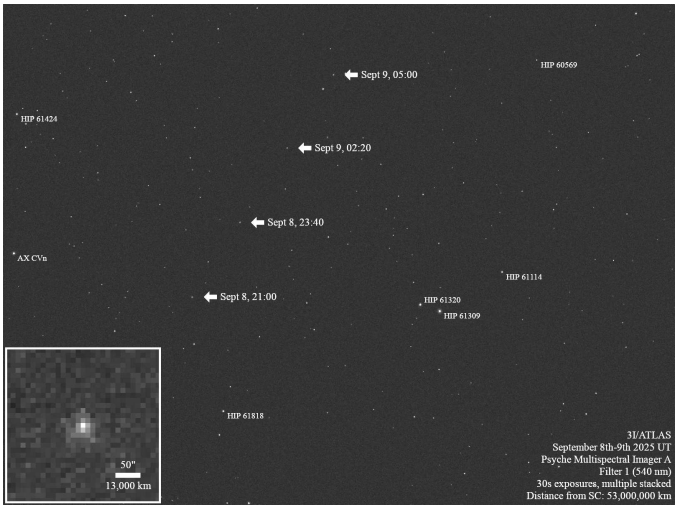
Image credit: NASA/JPL-Caltech/SSI

Non-Gravitational Acceleration

Interstellar visitor 3I/ATLAS has been the subject of many outlandish and unsubstantiated theories, one of which is that the object's non-gravitational acceleration is being produced by artificial means (characteristic of a spacecraft). A new paper published in Research Notes of the American Astronomical Society offers a more lucid explanation for what is commonly seen in all active comets.

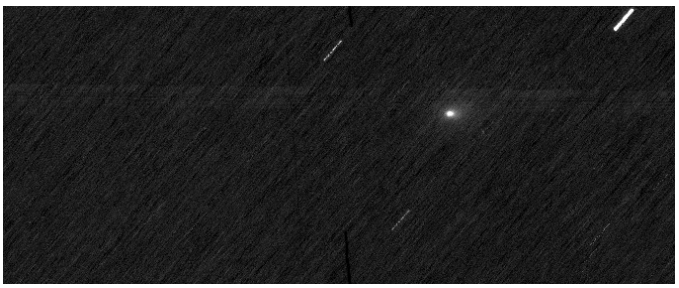
Comets out-gas as their surfaces are heated by the Sun and frozen volatiles sublimate from a solid to a gas. Jets of sublimating material provides a small, but measurable nudge – changing the velocity and sometimes the direction of the nucleus from the trajectory dictated by gravity alone. Researchers measured the non-gravitational acceleration of 3I/ATLAS using long-baseline astrometry from NASA's Psyche spacecraft and ESA's Mars Trace Gas Orbiter (which they hope to refine further with the additional data from five additional spacecraft).

Their finding show that the acceleration caused by the out-gassing is comparable to many other solar system comets. From the rate of out-gassing, along with measurements of carbon dioxide production, the mass of the dirty snowball was estimated at about 44 million metric tons with a radius between 260 and 374 meters. These values are typical with what would be expected of a comet and consistent with the previous interstellar comet 2I/Borisov.



NASA's Psyche mission acquired four observations of 3I/ATLAS on September 8th and 9th when the comet was about 33 million miles (53 million km) from the spacecraft

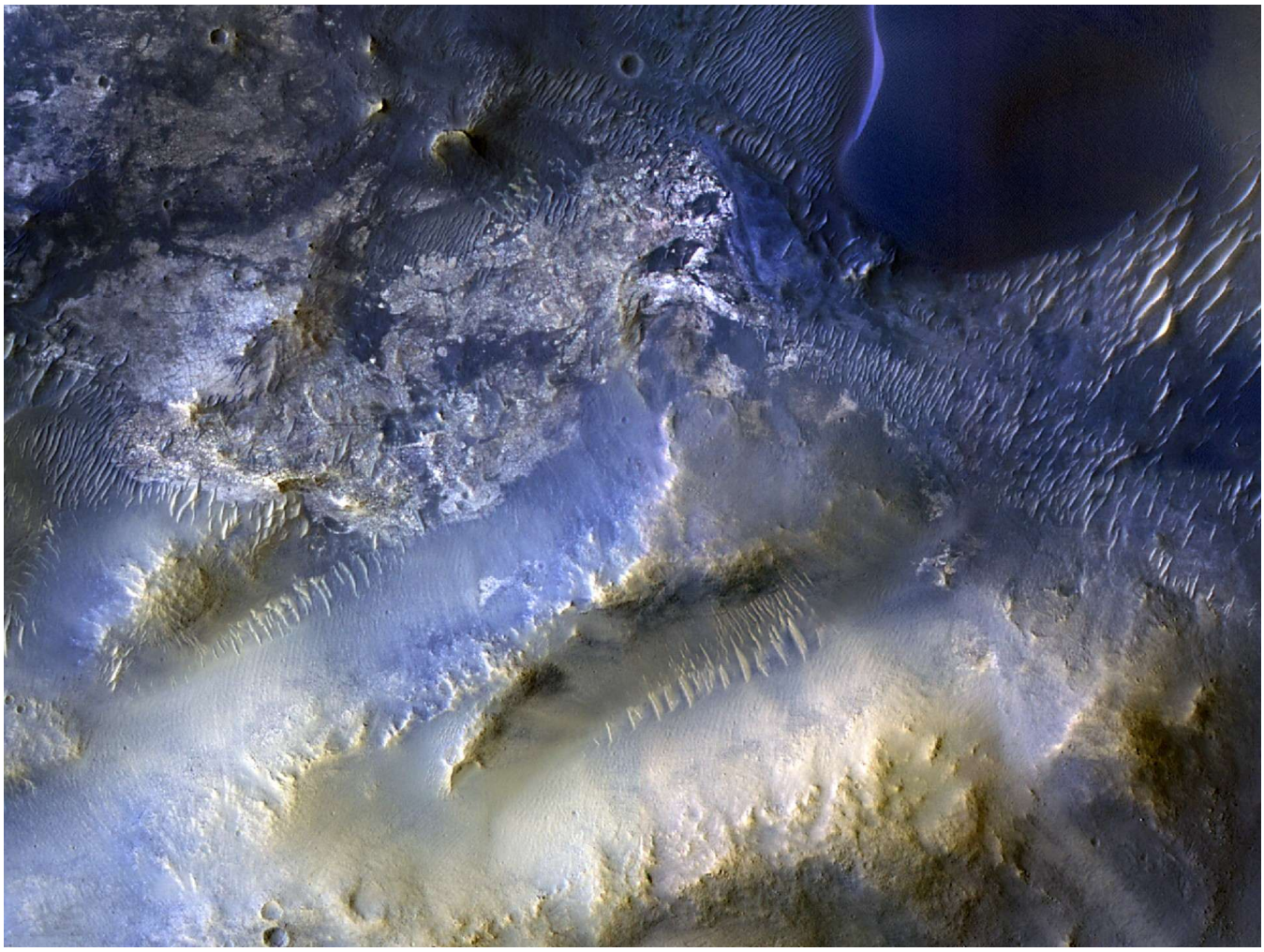
Credit: NASA/JPL-Caltech/ASU



ESA's ExoMars Trace Gas Orbiter (TGO) captured the on October 3rd, as 3I/ATLAS passed within 19 million miles (30 million km) of the Red Planet.

Credit: ESA/TGO/CaSSIS

100,000th Image



Syrtis Major from NASA's Mars Reconnaissance Orbiter HiRISE
NASA/JPL-Caltech/University of Arizona

After nineteen years in orbit, NASA's Mars Reconnaissance Orbiter captured its 100,000 image of the Martian surface with its High Resolution Imaging Science Experiment (HiRISE) camera. The camera has recorded changes on the surface over almost two decades, including wind driven marching dunes, avalanches, transitory ice fields, and, occasionally, a new crater.

The target selected for the milestone image was a rugged and mountainous area with mesas and dunes within Syrtis Major, a region about 50 miles (80 km) southeast of Jezero Crater (and home to the Perseverance rover).

From an altitude that varies from about 125 to 250 miles (200 to 400 kms) above Mars, HiRISE's telescopic lens and CCD camera can resolve objects about 3 feet (1 meter) across. HiRISE has also been used to snap images of NASA's landers and rovers on the Martian surface.

As an example, NASA's InSight lander has a wingspan of about 19 feet with its solar arrays deployed. The arrays on either site of the lander are discernible in the HiRISE camera image on the right.

HiRISE Telescopic Camera
NASA/JPL-Caltech/Ball Aerospace

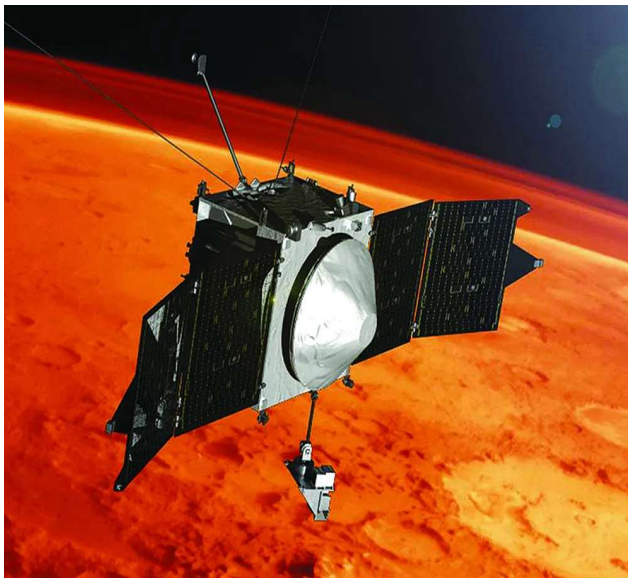
NASA/JPL-Caltech/University of Arizona

Maven Mystery

NASA has lost contact with its MAVEN (Mars Atmosphere and Volatile EvolutioN) spacecraft. A fragment of telemetry data received on December 6th, the day contact was lost as MAVEN came out from behind Mars, suggests that the spacecraft is rotating in an uncontrolled manner and has deviated from its nominal trajectory. Evidence points to an energetic event as the root cause (for example, a ruptured fuel tank or propellant line) for both the spin and orbit deviation.

MAVEN was launched in November 2013, entering orbit around Mars ten months later. Its science mission is to study the planet's upper atmosphere and investigate the role that the solar wind plays in its depletion. The orbiter also serves as a communication link between Mars and Earth for the two NASA rovers currently operating on the surface - Curiosity and Perseverance. In the interim, NASA's Mars Odyssey, Mars Reconnaissance Orbiter and the European Space Agency's ExoMars Trace Gas Orbiter will provide relay services.

The investigation, and any recovery efforts, will be hindered by an upcoming solar conjunction (when Mars passes behind the Sun as viewed from Earth) in the weeks around January 9th. During that period of time, radio communications with all spacecraft and rovers on Mars are briefly suspended due to the proximity of the planet to the Sun in our sky and risk of data corruption.



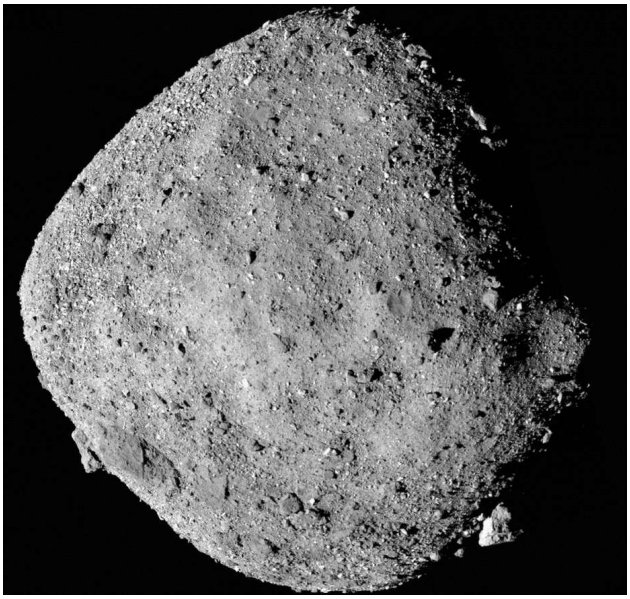
Artist concept of the MAVEN spacecraft in orbit around Mars

Credit: NASA Goddard Space Flight Center

Ingredients of Life

Samples returned from the asteroid Bennu continue to provide new clues as to the origin of life. Collected by the OSIRIS-Rex spacecraft in October 2020, and delivered to Earth three years later, the rocks and dust from a relatively young crater on the asteroid reveal a complex history. Bennu formed from materials in the solar nebula and, at one time, was likely part of a larger body. The samples returned include pre-solar material that contains a high percentage of supernova dust, suggesting that its parent accreted in a region rich in supernova remnant material. Scientists also found the residue of briny water deposits suggesting that, at one time, liquids interacted with the rocky world before it broke up. While not considered an ocean world, it likely had large deposits of slushy salt water and was warm enough for long enough to create a favorable environment to jump start a complex chemistry.

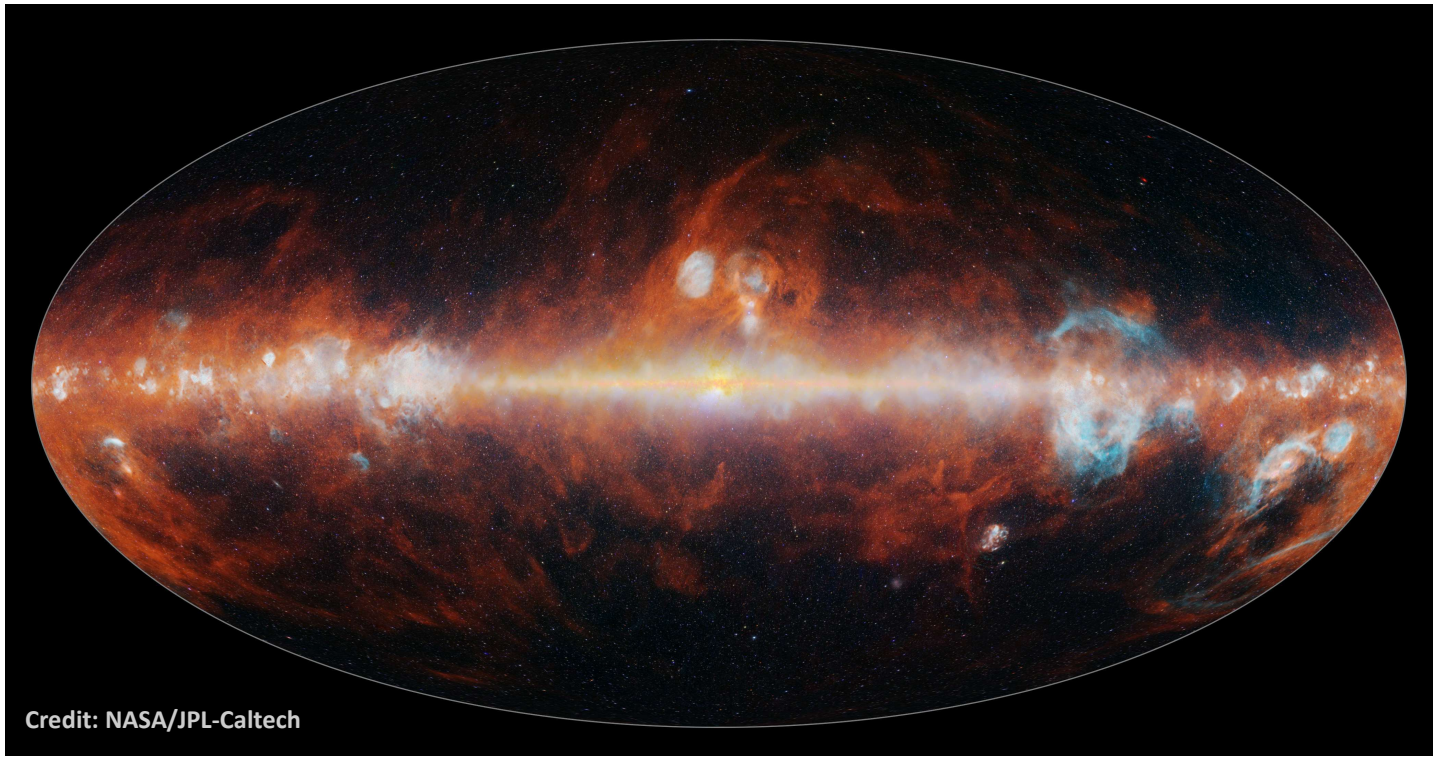
Researchers have also found the chemical ingredients needed to create precursor molecules (to life), including polymer-like materials extremely rich in nitrogen and oxygen (minerals not seen before in meteorites), and the sugars ribose and glucose (an energy source for life). The analyses suggests that the molecular ingredients for life could have been delivered to Earth by asteroids.



This mosaic image of asteroid Bennu taken by the OSIRIS-REx spacecraft from a distance of 15 miles (24 km)

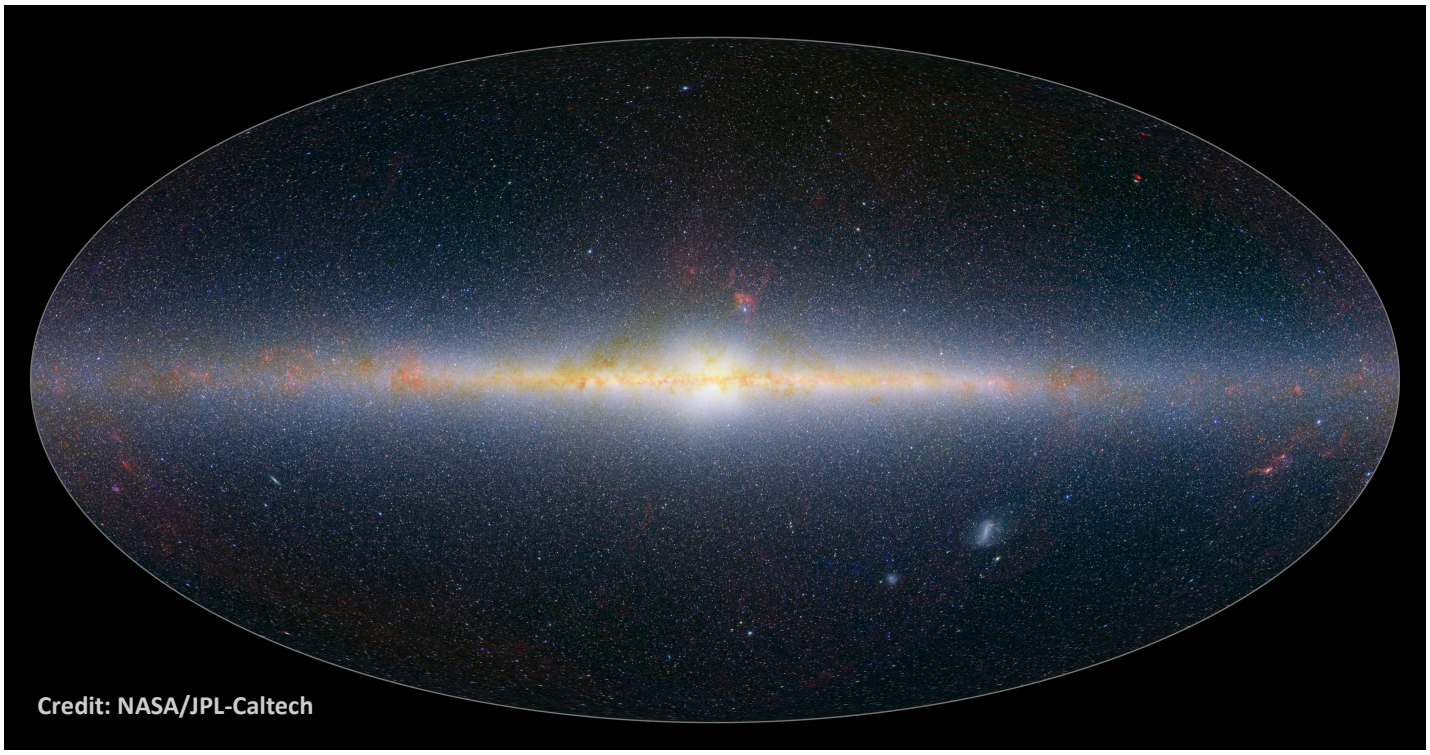
Credits: NASA/Goddard/University of Arizona

102 Wavelengths of Infrared Light



NASA's Sphere space telescope has completed its first infrared map of the entire sky in 102 infrared wavelengths. The map was assembled from observations made between May and December 2025. Since infrared light is invisible to the human eye, the infrared "colors" are represented by visible light colors.

In the upper image, hot hydrogen gas is depicted by the color blue, while red denotes the presence of cosmic dust. Stars are blue, green and white. In the lower image, the wavelengths emitted by the dust and hot gas have been removed to make the stars and galaxies more visible. While our Milky Way galaxy dominates the image, points of light above and below the galactic plane are other galaxies.



Second Saturday Stars

FREE EVENT

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

January 10th

7:00 - 9:00 pm

Free Star Party

AstroFun 102: The Inner Planets

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

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