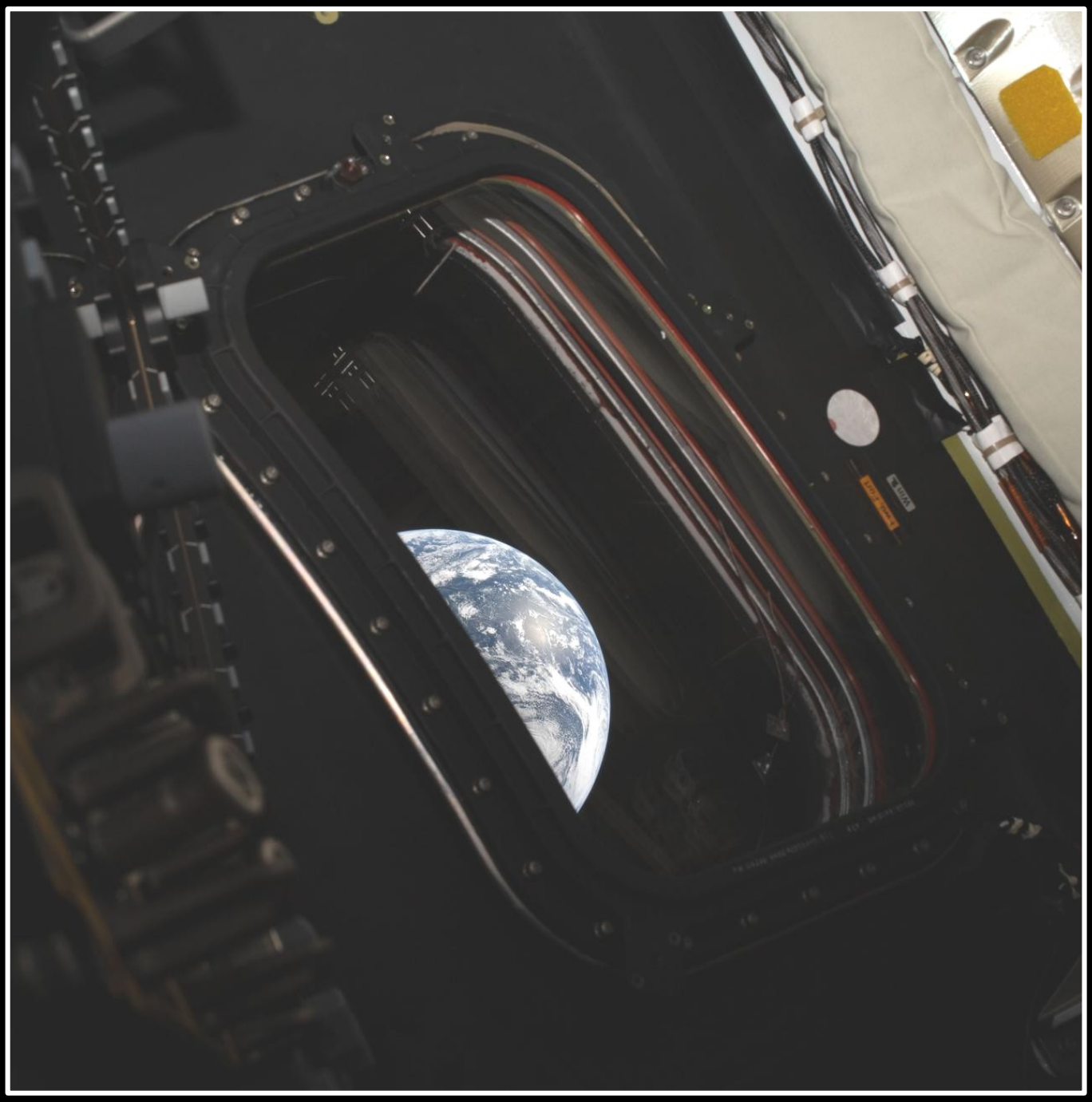
John J. McCarthy Observatory

May 2026 Newsburst



Our home world captured by NASA astronaut and Artemis II commander Reid Wiseman from one of the Orion spacecraft's windows after completing the trans-lunar injection burn on April 2nd. The engine burn sent Orion out of Earth orbit and on a trajectory toward the Moon.

Credit: NASA

Artemis II – Lift Off

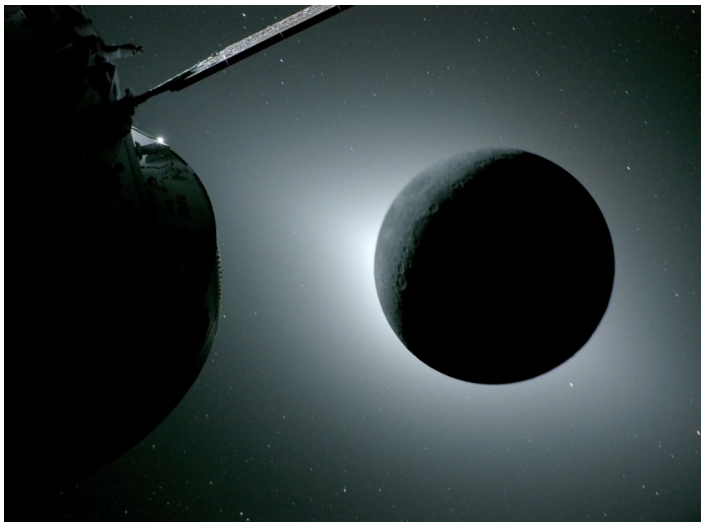
NASA's Space Launch System rocket rises from the launch pad for the Artemis II mission

NASA/Bill Ingalls

NASA's second Artemis program flight, and the first crewed, lifted off from Launch Pad 39B at the Kennedy Space Center in Florida on April 1st. The flight was a "shake-down cruise"- a rigorous test of NASA's Orion spacecraft in a deep space environment. Over the next ten days, NASA astronauts Reid Wiseman, Victor Glover, Christina Koch, and Canadian Space Agency astronaut Jeremy Hansen traveled deeper into space than anyone previously. Leaving Earth orbit, the main engine on the European Service Module, a repurposed Aerojet Rocketdyne Orbital Maneuvering System engine from the Space Shuttle program, placed the spacecraft on a free-return trajectory around the Moon (which would use lunar gravity to send them home).

Five days into the mission, the Artemis II astronauts surpassed the record for human spaceflight's farthest distance from Earth previously held by the Apollo 13 crew in 1970. The spacecraft traveled out 252,760 miles (406,773 km) before looping around the Moon and returning back to Earth.

Artemis II – Lunar Encounter



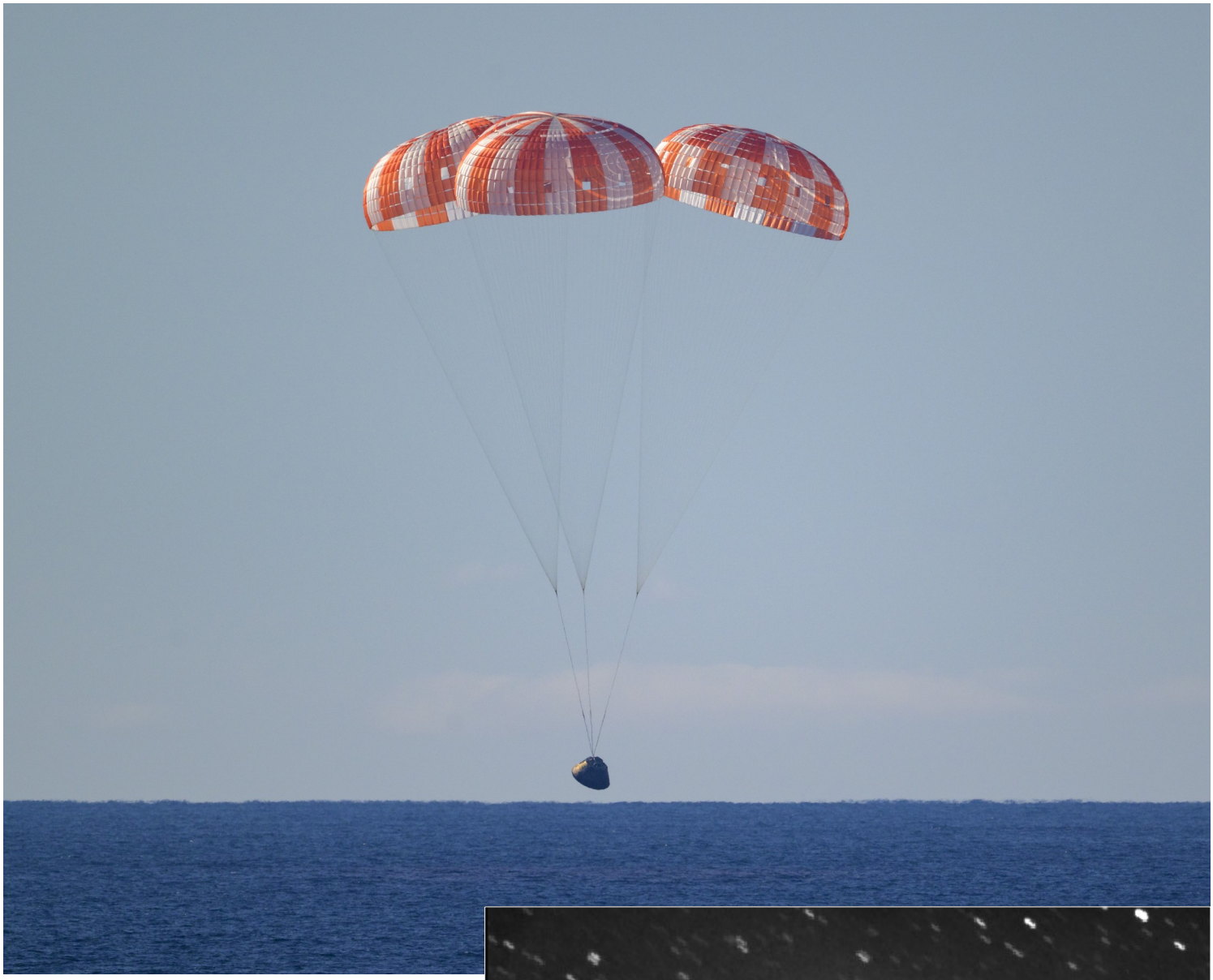
Above: the illusion of the Earth setting behind the Moon as the Orion spacecraft traveled into the Moon's shadow. Lower Left: captured by a camera on one of the Orion spacecraft's solar arrays, the astronauts experienced a solar eclipse when the Moon blocked the light from the solar disk. Lower Right: the young impact basin, Mare Orientale, which is located just beyond the western limb for Earth observers, is conspicuous in this image (lower center) along with its well-preserved impact features

Image Credits: NASA

On day six of the mission, the Orion spacecraft passed approximately 4,067 miles (roughly 6,545 km) above the lunar surface – its closest approach. At the time, about 20% of the Moon's far-side was illuminated. During the flyby the Moon fully blocked the Sun, creating a 54-minutes total solar eclipse during which only the Sun's outer atmosphere was visible.

With the timing of the Apollo surface missions dictated by the illumination of the near-side, equatorial landing sites, many far-side features remained in darkness during their short stays. By comparison, Artemis , at its closest, was almost 60 times further away from the Moon's surface than the average Apollo orbiting spacecraft, giving the Artemis astronauts a much more all-inclusive view of Moon. Since surface illumination was a function of the launch schedule, the degree of far-side illumination was happenstance.

Artemis II – Splashdown



Above: The Orion capsule descending to an ocean landing under its three orange and white main chutes

Image Credit: NASA/Bill Ingalls

Right: The Orion spacecraft seen moving through a star field on its return to Earth. Images captured from the Robson Center for NEO Studies (IAU W27)

Image Credit: Mark Polansky

About 20 minutes prior to Orion entering Earth's atmosphere, the capsule separated from the service module. Shortly thereafter, Orion attained its maximum velocity (approximately 23,840 mph or 38,367 kph). During reentry, the capsule's heat shield experienced temperatures around 5,000 °F or 3,000 °C. At peak heating, a shell of plasma engulfed Orion, preventing communications with the ground for about six minutes.

Exiting the blackout period, parachutes were deployed to slow the spacecraft to a gentle splashdown in the Pacific Ocean off the coast of Southern California. The landing was within 3 miles of the targeted location.

Does AAA Serve Mars?

Damaged wheel on the Curiosity rover
Image credit: NASA/JPL-Caltech/MSSS

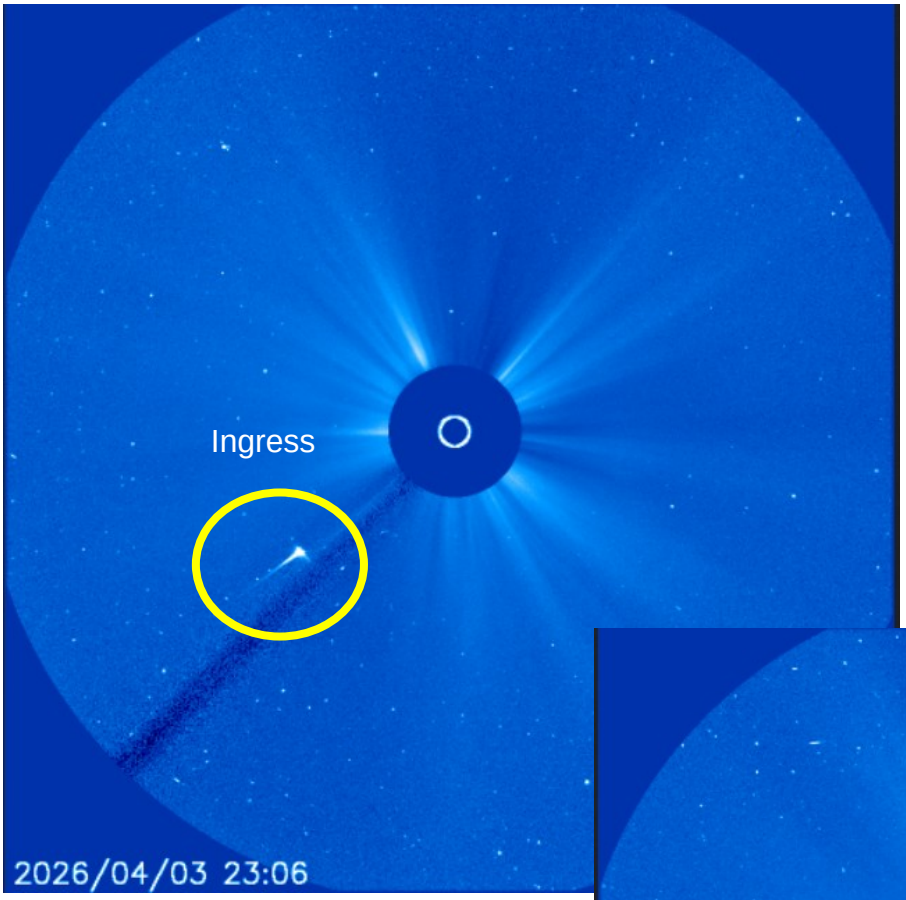
NASA's Mars Science Laboratory, the Curiosity rover, has been exploring Gale Crater and making its way up the central peak since landing in August 2012. The rover's rocker-bogie suspension allows Curiosity to traverse the rugged terrain while keeping its six wheels on the ground. The wheels are machined aluminum with titanium spokes. While the wheels have stiffening rings for strength and chevron-shaped treads, the membrane thickness is only 1/32 inch (.75 mm).

The rover has driven almost 23 miles (37 km) and climbed over 2,400 feet (740 meters), and after almost 14 years, the rock-strewn surface has taken a toll on the wheels. While NASA has updated Curiosity's software to determine the optimum speed to avoid wheel slippage and improve traction, further damage, from even small pebbles, is unavoidable.

Curiosity periodically photographs its wheels to document condition. While all show some sign of wear, the damage to the middle right wheel is the most severe. The extent of the damage is such that engineers at NASA's Jet Propulsion Laboratory (JPL) have been working on a worst-case scenario where the wheel would need to be removed so as not to entangle the rovers cables in the twisted metal. Several scenarios are in the works, but most trap the damaged wheel in a rock formation while using the remaining wheels to apply pressure until the damaged wheel snaps off.

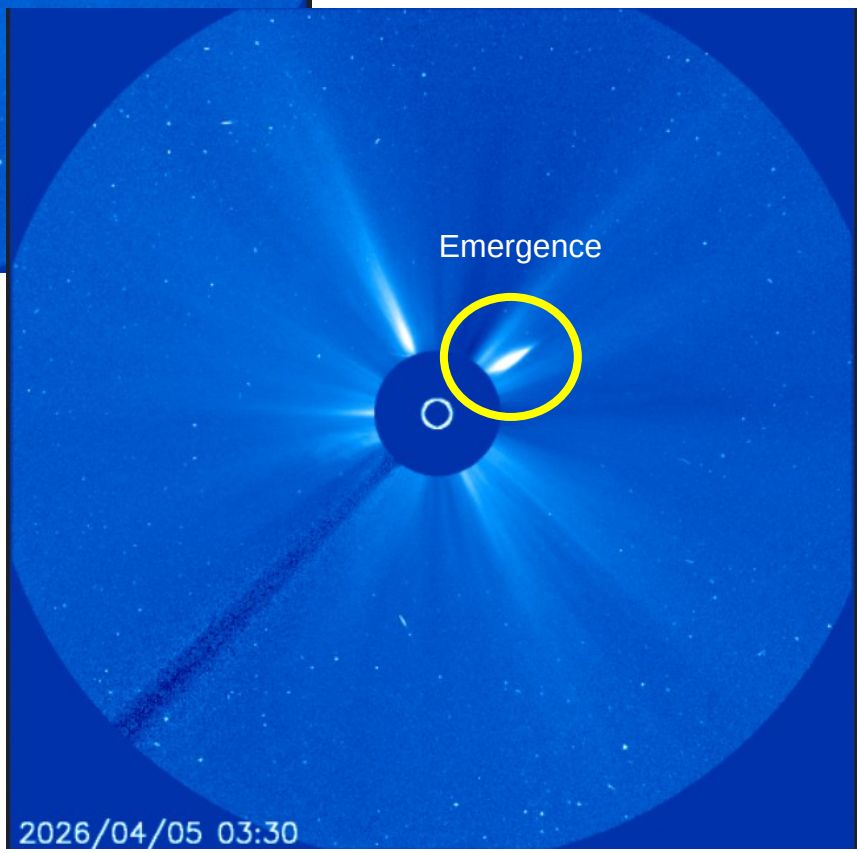
Rover wheels in JPL's Mars Yard test bed
Photo: Bill Cloutier

One Less Comet



The Solar & Heliospheric Observatory (SOHO), is a collaboration between ESA and NASA to study our Sun. Launched in 1995, the observatory's twelve instruments monitor our star from its core to the outer corona and the solar wind.

Positioned at the L1 Lagrangian Point, approximately 932,000 miles from Earth, or 1.5 million kilometers, in the direction of the Sun, it has an uninterrupted view.



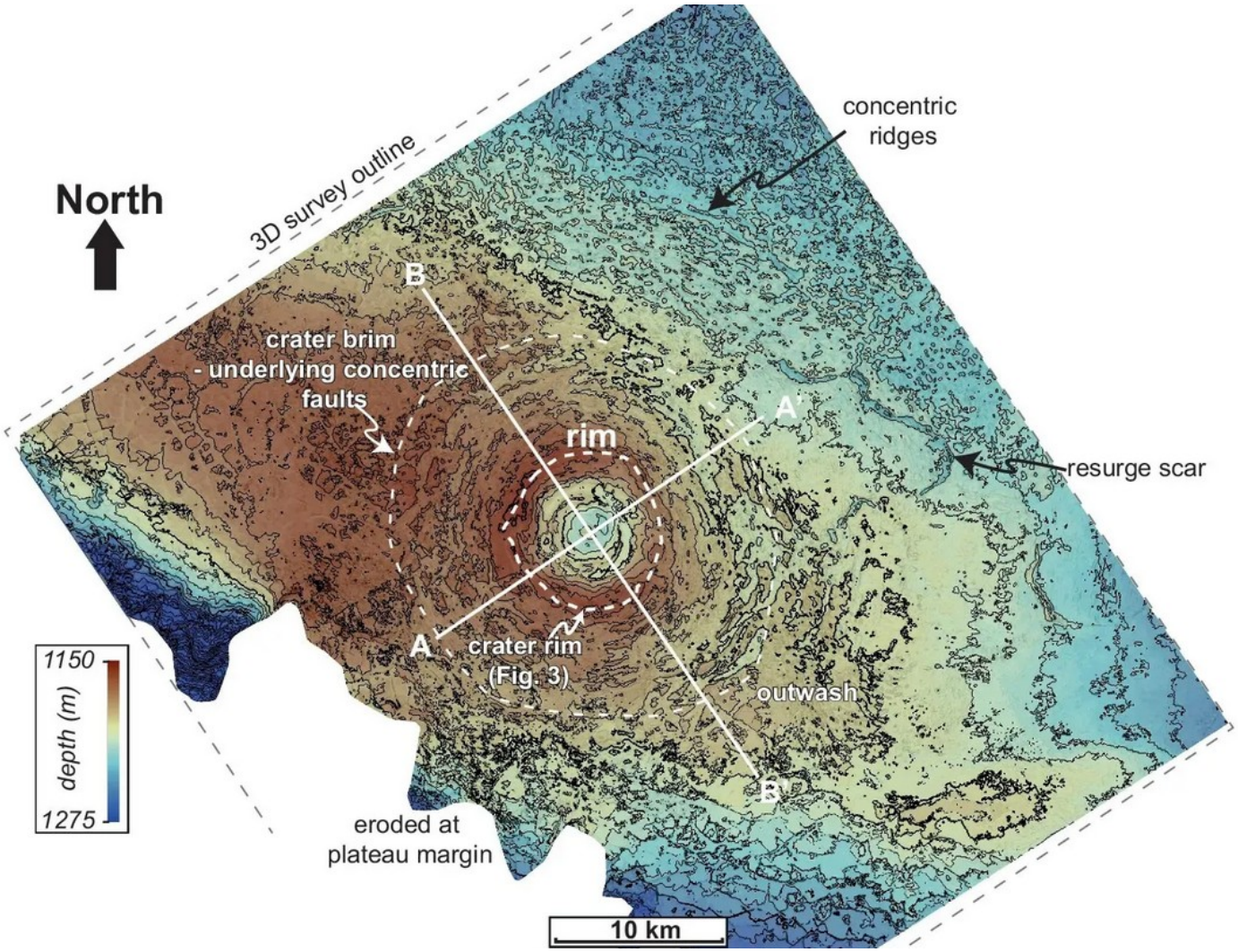
These images were acquired by SOHO's Large Angle and Spectrometric Coronograph (LASCO). This particular coronograph (C3) provides a wide angle view of the Sun's outer atmosphere to a distance of 30 solar radii, allowing it to track the progression of Coronal Mass Ejections (CMEs).

A disk or mask is positioned in the telescope's optical path to hide the intense light from the Sun's photosphere, allowing study of Sun's fainter outer atmosphere or Corona, as well as surrounding region.

The promise of a bright comet appearing in Earth's April evening sky was vaporized in an "Icarus moment." On April 4th, Comet MAPS (C/2026 A1) flew through the Sun's atmosphere, only 100,000 miles (160,000 km) above the Sun's visual surface or photosphere. Its progress was followed by the SOHO from its orbit around L1.

While the comet can be seen entering the region blocked by the occulting disk, only a cloud of debris emerges. Likely the comet's nucleus underwent explosive disassembly from the intense heat and thermal stress during close approach.

Another Cretaceous Catastrophe



Nadir Crater Anatomy

Nicholson, U., Powell, W., Gulick, S. et al. 3D anatomy of the Cretaceous–Paleogene age Nadir Crater. Commun Earth Environ 5, 547 (2024). https://doi.org/10.1038/s43247-024-01700-4

While impact craters are a common feature on every world, large and small, with a solid surface across the solar system, very few can be found on Earth. On Earth, tectonic activity, volcanism, glaciers, wind and flowing water erase all but the most recent impact events. And, with more than 70% of the Earth covered by water, many impact features that do remain are hidden from our view.

The most famous impact feature, the Chicxulub crater (from the impact the sparked the demise of the dinosaur), was discovered quite by accident by geologists surveying the ocean floor for oil exploration just off the Yucatan peninsula. The impact that created the 125 mile (200 km) diameter crater was determined to have occurred 66 million years ago.

Researchers have now found another crater beneath the Atlantic that was created around the same time as Chicxulub. The Nadir crater is 5.6 miles (9 km) wide and located on the seabed off the coast of Guinea in West Africa. From the high-resolution, three-dimensional seismic data gathered, scientists have been able to recreate the circumstances as to how the event unfolded.

The asteroid was between 1,475 to 1,640 feet (450-500 meters) in size and, based on the striations surrounding the central peak of the crater, came in at a low angle (20°-40°). Current modeling suggests an impact velocity of 44,700 mph or 72,000 kph. A tsunami more than 2,600 feet (800 meters) high would have been created by the upheaval.

Personal Spaceships

Above: Artemis II NASA astronauts (left to right) Reid Wiseman, Victor Glover, and Christina Koch, and Canadian Space Agency astronaut Jeremy Hansen stand in the white room on the crew access arm of the mobile launcher at Launch Pad 39B.

NASA/Frank Michaux

Right: Commander Neil Armstrong (right) and pilot David Scott prepare to board the Gemini-Titan VIII in March 1966.

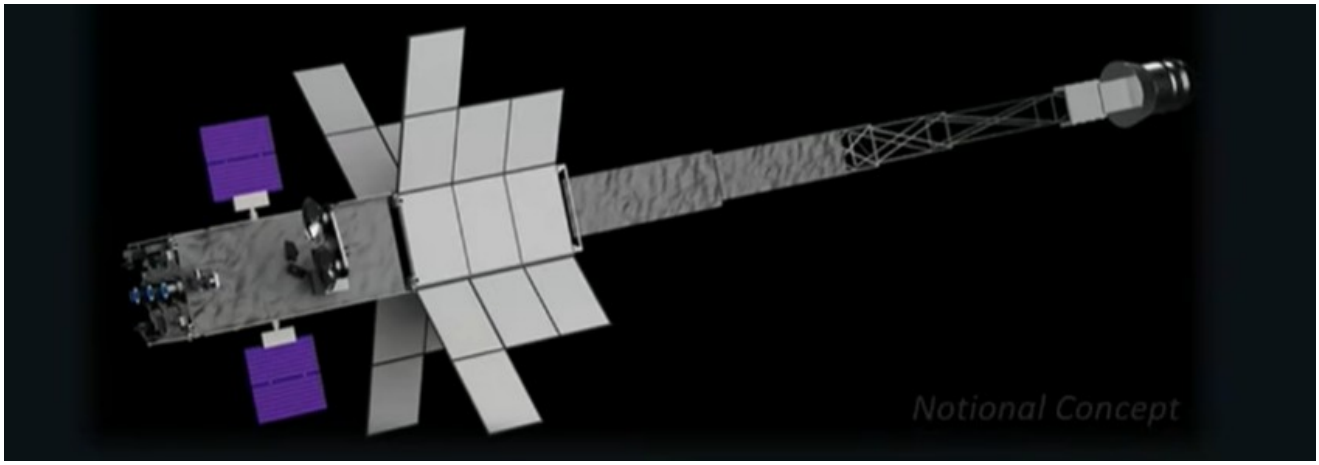
Photo: NASA

Project Gemini was an important forerunner to NASA's Apollo moon initiative, testing equipment and space-travel techniques in low-Earth orbit. Now, with NASA preparing to return to the Moon' surface, Artemis and Gemini have something else in common.

The David Clark Company, located in Worcester, Massachusetts, developed the space suits for both the Gemini and Artemis astronauts. While the Artemis suits are a more advanced design, Clark's Gemini suits performed well in ten crewed missions, which included long-duration stays in orbit and spacewalks.

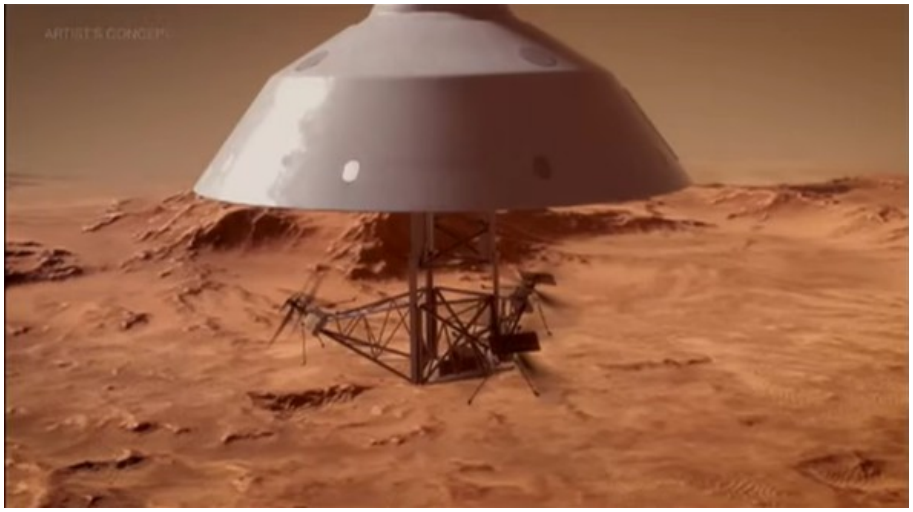
The Artemis spacesuits are described by the company as a "personal human-shaped spacecraft." Not only do the spacesuits protect the astronauts in the unlikely event of the loss of cabin pressure, they can, in the event of an "Apollo 13 emergency," sustain the astronaut for up to six days with oxygen, carbon dioxide removal and a waste management system.

Freedom SR-1 and Skyfall



Top: Artist concept of the SR-1 Freedom spacecraft with the reactor and power conversion system located at the front of the spacecraft, the propulsion unit in the rear, and the gray, titanium radiator for heat rejection.

Credit: NASA



Right: Artist concept of the Skyfall atmospheric descent module with helicopters ready to deploy prior to reaching the surface of Mars.

Credit: NASA

It has been over 50 years since the United States effort to develop a nuclear powered rocket for space travel was canceled. The NERVA program (Nuclear Engine for Rocket Vehicle Applications) was active in the early 1960s integrating various reactor designs with a rocket engine. While NASA recognized the need for nuclear powered spacecraft for travel beyond the Moon the program withered from the attrition of funding until it was formally shut down.

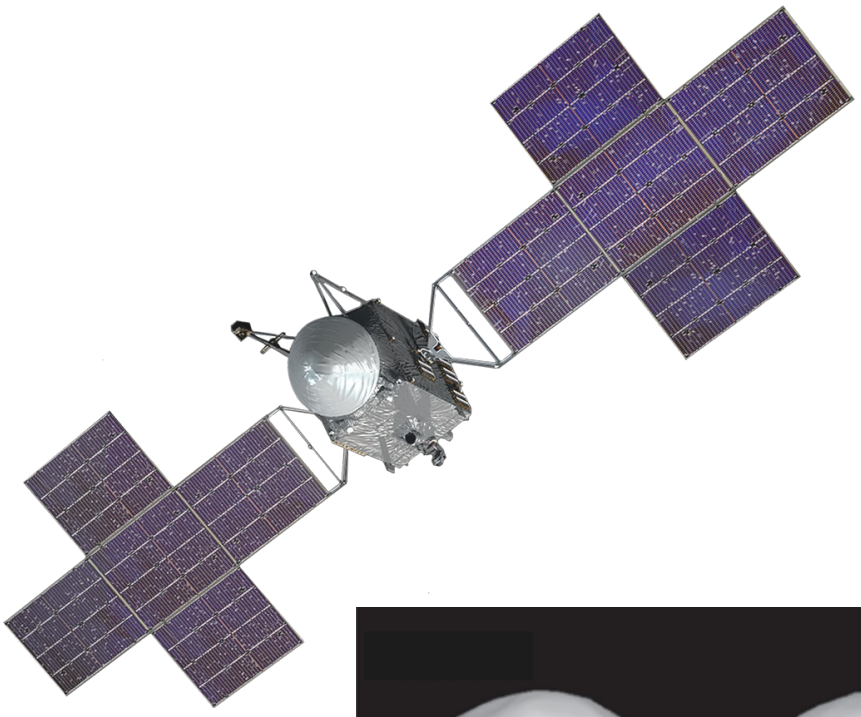
Now with a renewed interest in sending humans to Mars, nuclear-powered spacecraft are once again being considered as a means of reducing transit times and all the associated negative effects of space travel on the human body. In March, NASA announced an initiative to spur innovation and reintroduce the concept of nuclear propulsion. NASA intends to launch an advanced nuclear electric powered spacecraft to Mars before the end of 2028, in time for the next Opposition in March 2029.

Space Reactor-1 (SR-1) Freedom will turn on its nuclear fission reactor after launch to power its electric thrusters. The spacecraft will carry the Skyfall scientific payload. Comprised of three Ingenuity-class helicopters, the rotorcraft will be released in a radical mid-air deployment. Equipped with cameras and ground-penetrating radar (to search for subsurface water), each helicopter will be able to operate independently.

The SR-1 project will leverage mature technology and existing hardware to meet the aggressive schedule and launch window. High-Assay Low-Enriched Uranium (HALEU) fuel will power the 20 kilowatt fission reactor.

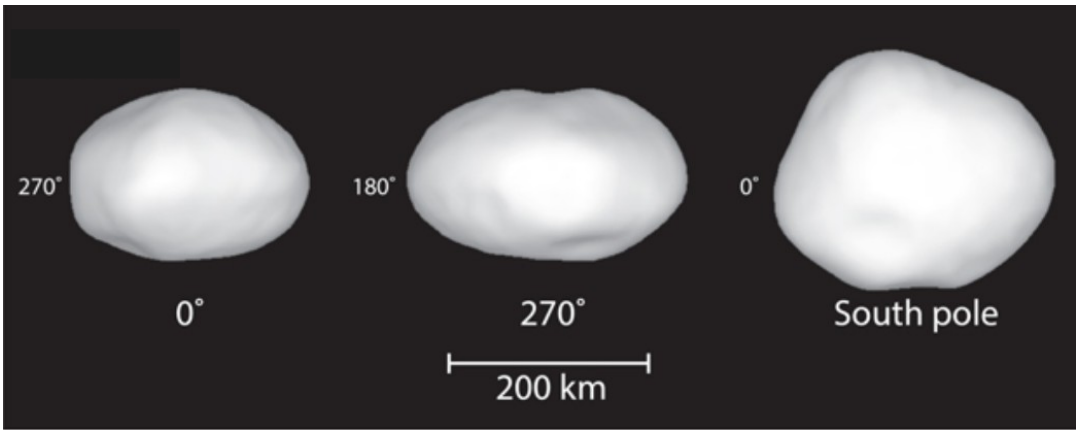
Lessons learned from SR-1 will support the development of Lunar Reactor-1 (LR-1). The surface version will supply power to a future Moon Base during times when solar power is not available or off-line.

Psyche News



Artist's concept of the Psyche spacecraft in flight

NASA/JPL-Caltech



Asteroid 16 Psyche: Shape, Features, and Global Map

Michael K. Shepard et al 2021 Planet. Sci. J. 2 125

NASA's Psyche spacecraft is in its third year of a six year cruise to the asteroid 16 Psyche. On May 15th, the spacecraft will receive a boost (gravity assist) when it passes by Mars, which will send it on its way through the asteroid belt. It is scheduled to arrive at the large M-type (metallic) asteroid in August 2029 to begin a 26-month science campaign.

The Psyche asteroid orbits the Sun between Mars and Jupiter at a distance ranging from 235 million to 309 million miles (378 million to 497 million km) from the Sun. Originally thought to be comprised of mostly metal, subsequent thermal analyses suggest a mixture of rock and metal, with metal composing an estimated 30% to 60% of its volume.

Until the spacecraft arrives, Psyche's formation will remain a mystery. It may have once been the metallic core of a protoplanet, or a homogeneous mixture of iron and rock reformed from impacts of a larger parent, or possibly a primitive unmelted body. That hasn't stopped scientists from attempting to tease out as much information about this minor planet while they wait. The asteroid has been modeled with observations by the Arecibo (when it was operational) and ALMA radio telescopes, with the Keck and ESO's Very Large Telescope, and with stellar occultations.

The results show a potato-shape world with a number of possible impact features (at least five surface depressions including one at the north pole). These "craters" could provide a glimpse into Psyche's interior depending upon the composition of the asteroid. Crater geomorphology would also be an indicator of the asteroid's surface composition and strength.

Second Saturday Stars

FREE EVENT

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

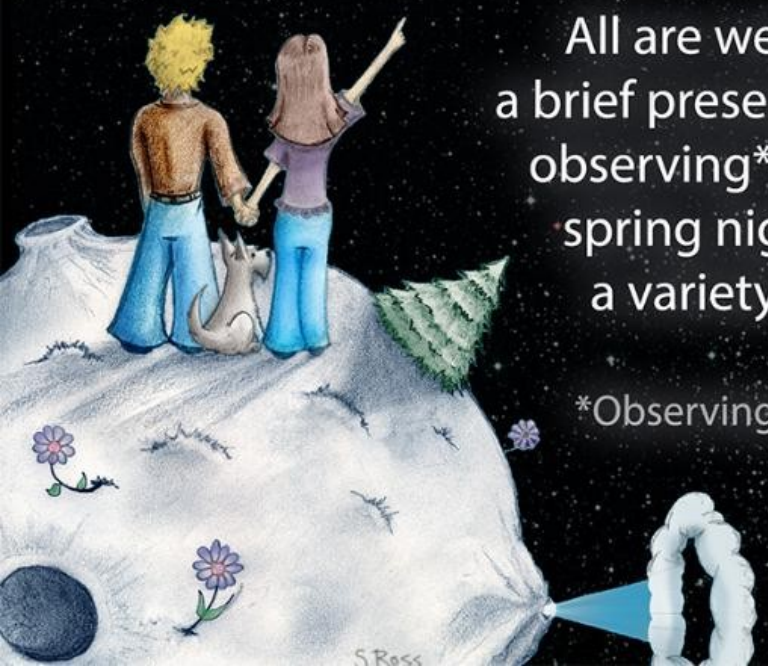
May 9th

8:00 - 10:00 pm

Free Star Party

Featuring:

Artemis Revisited



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

*Observing if weather permits

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