John J. McCarthy Observatory

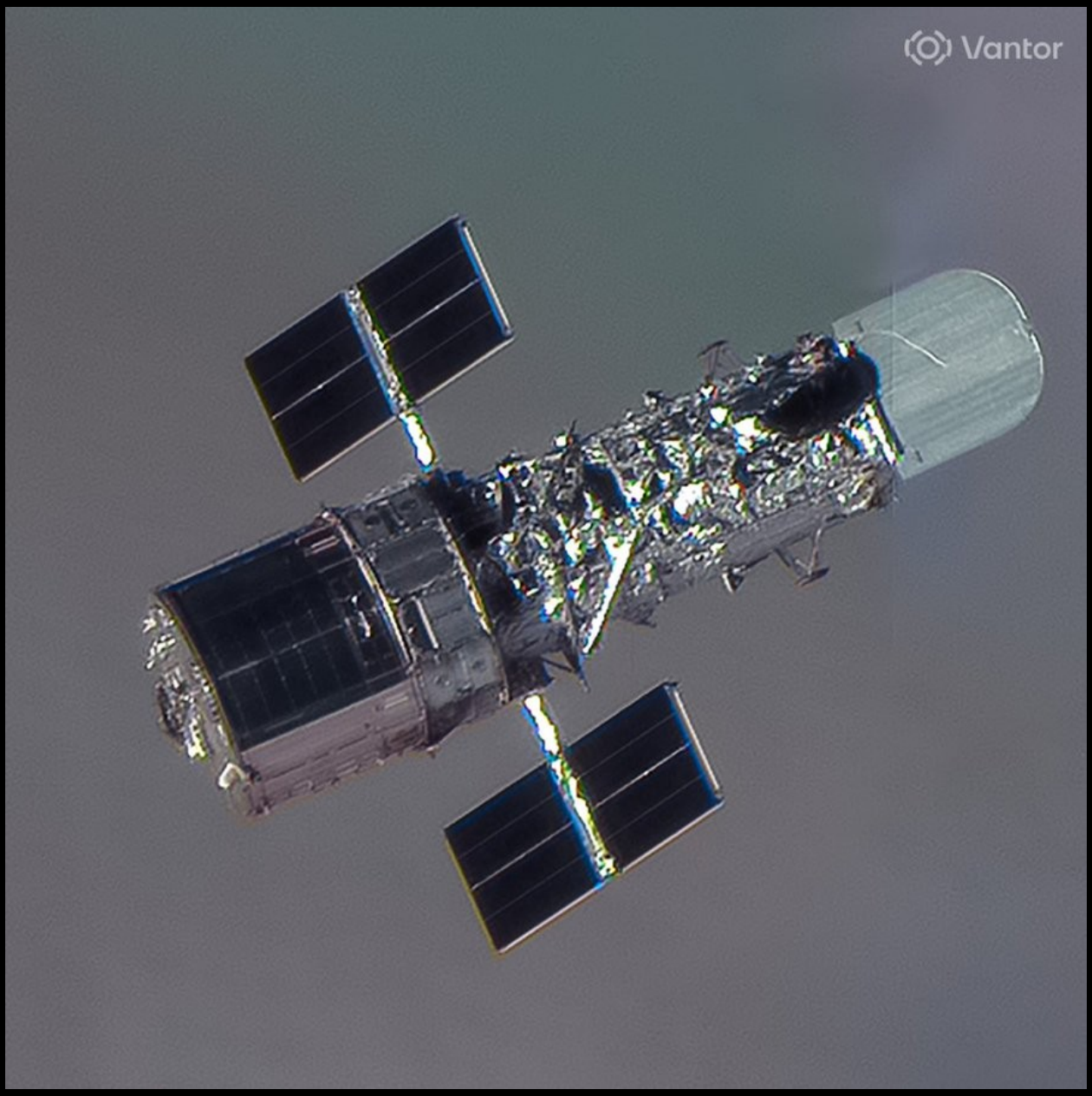
June 2026 Newsburst

A waxing crescent moon joined up with a waning gibbous planet Venus in the western sky shortly after sunset on May 18th. Seven percent of the Moon was illuminated by the Sun (from our vantage point), the remainder by light reflected off the Earth ("Earthlight"). At the time, the Moon was 222,500 miles (358,100 km) from Earth.

Venus was 83% illuminated by the Sun at a distance of 124.344 million miles (200.113 million km) from the Earth that night. Venus will reach peak brilliance in the evening sky in mid-September as the distance between the two planets continues to decrease. Venus passes between Earth and the Sun on October 24th. At its closest (referred to as Inferior Conjunction), Venus will be approximately 25 million miles (40 million km) from Earth.

Image credit: Bill Cloutier

Birthday Snapshot

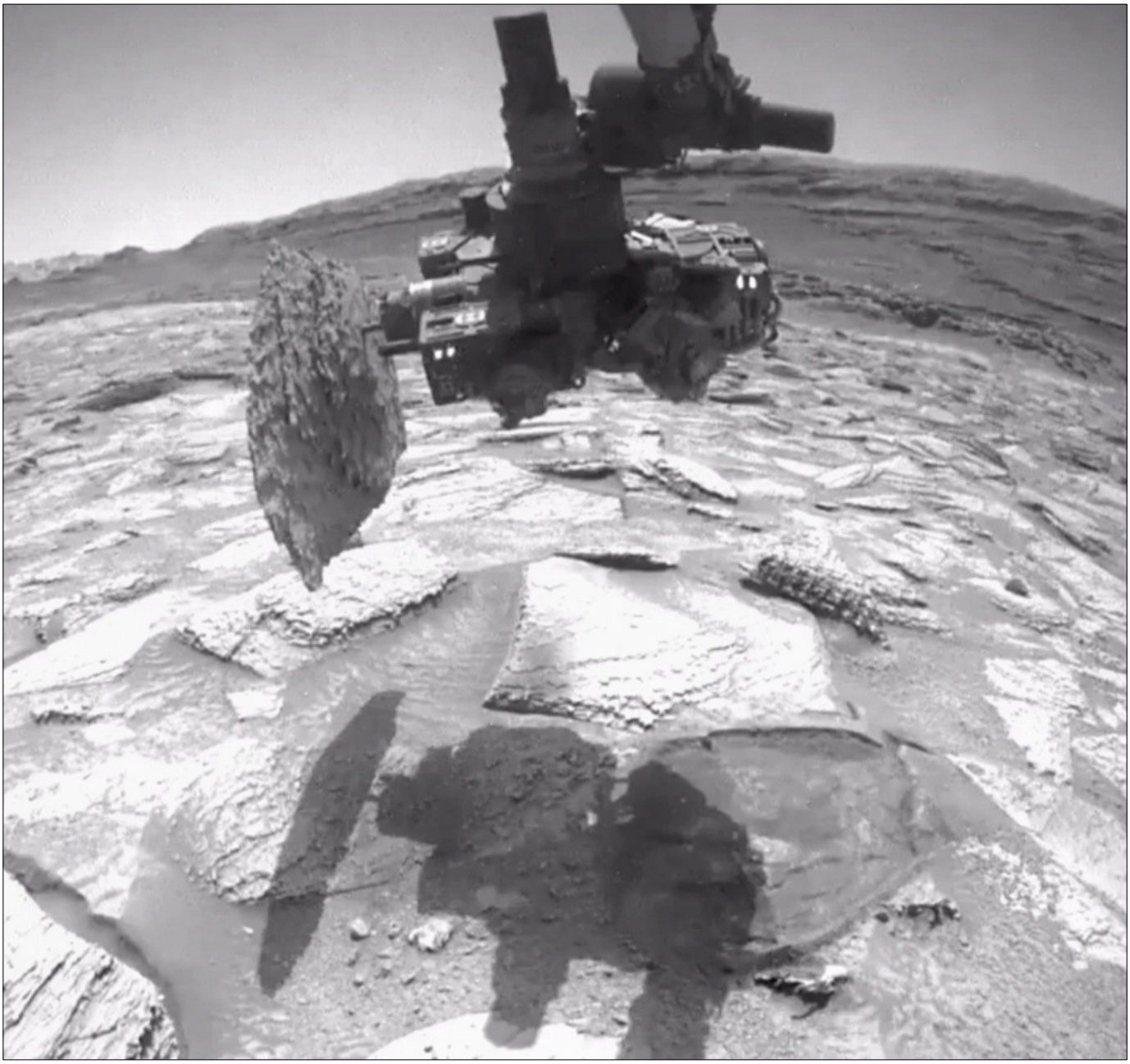


Vantor's WorldView Legion 4, a high-resolution Earth observation satellite, photographed the Hubble Space Telescope on April 23, 2026 (Hubble's 36th birthday) from a distance of 38.4 miles (61.8 km).

Even at that distance, the orbiting observatory is resolved in remarkable detail, including the solar arrays, the Soft Capture and Rendezvous System that was installed at the rear of the telescope as part of Servicing Mission 4, which will enable a future rendezvous, capture, and safe disposal of the telescope, as well as the open aperture door at the front of the telescope.

Image credit: Vantor

Like Gum on A Shoe



A Martian rock hanging off the drill sleeve at the end of the Curiosity rover's arm

NASA/JPL-Caltech/MSSS

NASA's Curiosity rover has been working its way up the central peak in Gale Crater since 2014 – recently exploring a region crisscrossed with low ridges that were likely formed by deposits left behind by groundwater as it moved through the area. On April 25th, the rover drilled into a rock named Atacama. The rock, approximately 1.5 feet (0.5 meters) in diameter and 6 inches (15 centimeters) thick, was estimated to weigh 28.6 pounds or 13 kilograms. After almost 14 years on the surface of Mars, the operations team at the Jet Propulsion Laboratory (JPL) was likely a bit surprised when the images came down from the rover from the scripted activity (at 210 million miles or 337 million km, the downlink time is almost 19 minutes). Instead of seeing a cleanly drilled hole, the images showed the drill stuck in the rock. When the rover attempted to withdraw the drill, the rock came with it (this is the first time this had occurred).

The first two attempts, on April 25th and 29th, to release the rock by vibrating the drill were unsuccessful. On May 1st, JPL engineers commanded the rover to vibrate and spin the drill bit while the arm tilted the rock. The rock released on the first try, breaking apart as it fell to the ground – a successful, long-distance and remote recovery to a sticky situation.

Daring Space Rescue Planned

The LINK robotic spacecraft being readied for thermal vacuum testing at NASA's Goddard Space Flight Center in Greenbelt, Md.
Image: NASA/Sophia Roberts

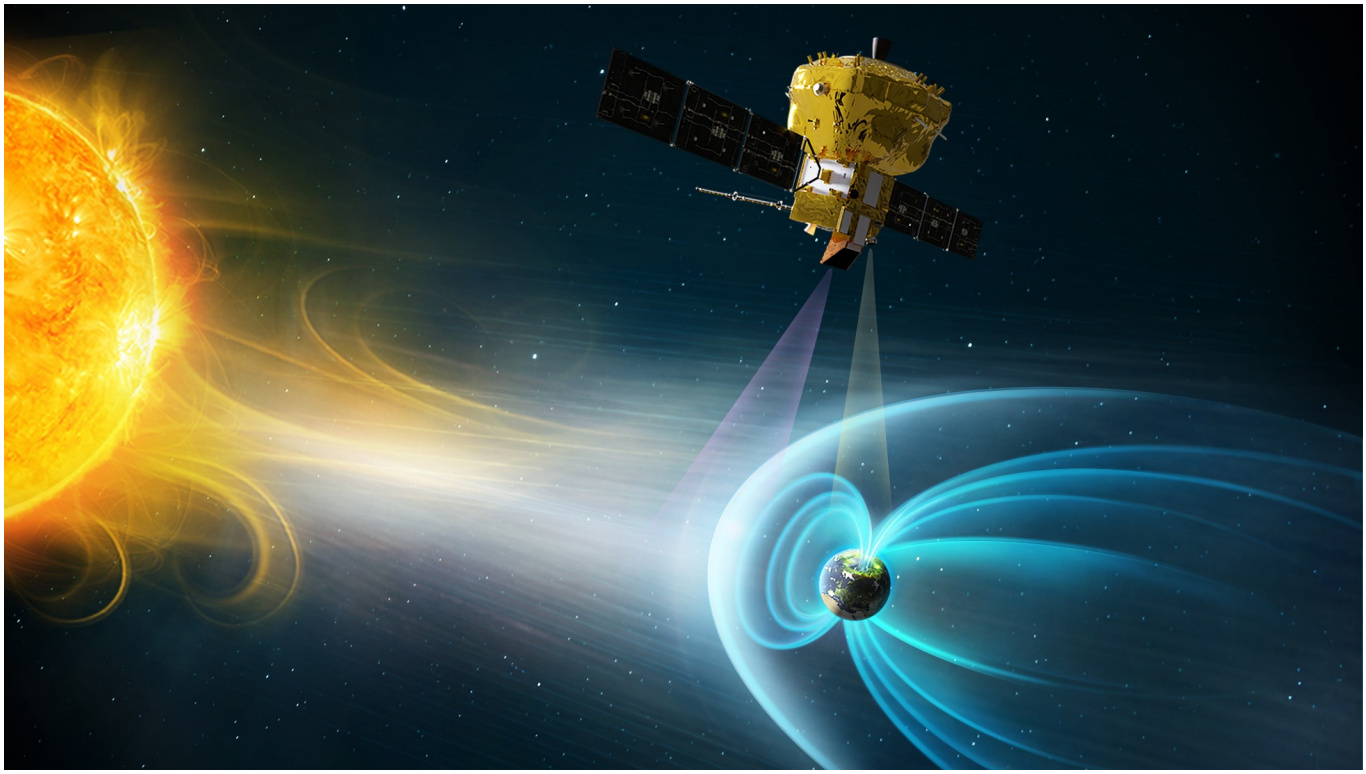
NASA's Neil Gehrels Swift Observatory, launched in 2004, is rapidly losing altitude exacerbated by a high level of solar activity (powerful ultraviolet and X-ray radiation from the Sun heat Earth's upper atmosphere causing it to expand). This increases the drag on satellites and spacecraft in low-Earth orbit.

The Swift observatory uses three instruments to study gamma-ray bursts from cataclysmic events in our universe, such as the death of massive stars. The instruments record these happenings in multiple wavelengths - gamma-ray, X-ray, ultraviolet, and visible light. With no onboard means of propulsion, and with an accelerated orbital decay, it is likely (90% probability) that the observatory will undergo an uncontrolled reentry, burning up in the atmosphere, before the end of 2026. To buy time, NASA has suspended science operations and positioned the spacecraft to minimize drag.

In an attempt to save this unique asset, NASA contracted with Katalyst Space Technologies of Flagstaff, Arizona, to boost the observatory into a higher orbit. Katalyst's "LINK" spacecraft will launch on a Northrop Grumman Pegasus XL rocket. The three stage rocket is carried aloft by a L-1011 aircraft and launched from an altitude of approximately 40,000 feet (12 km). Pegasus is capable of deploying small satellites weighing up to 1,000 pounds (453.59 kg) into low-Earth orbit in a little over ten minutes.

LINK will use its three robotic arms to grapple the observatory and its ion thrusters to gently move Swift into a higher, more stable orbit. The mission contract was only issued last September when NASA decided to make a last ditch effect to save the observatory. A June launch is targeted.

New Space Weather Sentinel



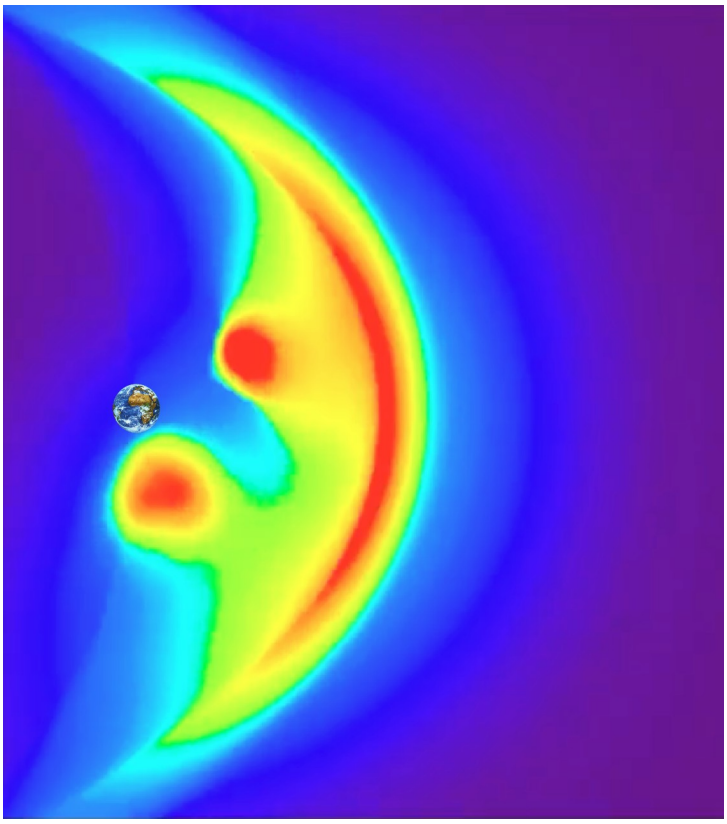
Smile's vantage point that will enable the spacecraft to continuously monitor the affects of solar activity on Earth's magnetic field.

CREDIT: ESA

A Vega-C rocket, launched from the Kourou, French Guiana spaceport on May 19th, successfully deployed the Smile (Solar wind Magnetosphere Ionosphere Link Explorer) spacecraft into a highly elliptical polar orbit. The mission is a collaboration between the European Space Agency (ESA) and the Chinese Academy of Sciences (CAS).

Smile's instruments will measure the response of the Earth's magnetic field to the solar wind, as well as to solar and geomagnetic storms. From its vantage point, (with an apogee almost one-third the distance to the Moon), the spacecraft will be able to maintain a near-constant vigil of the Sun-facing edge of Earth's magnetic field.

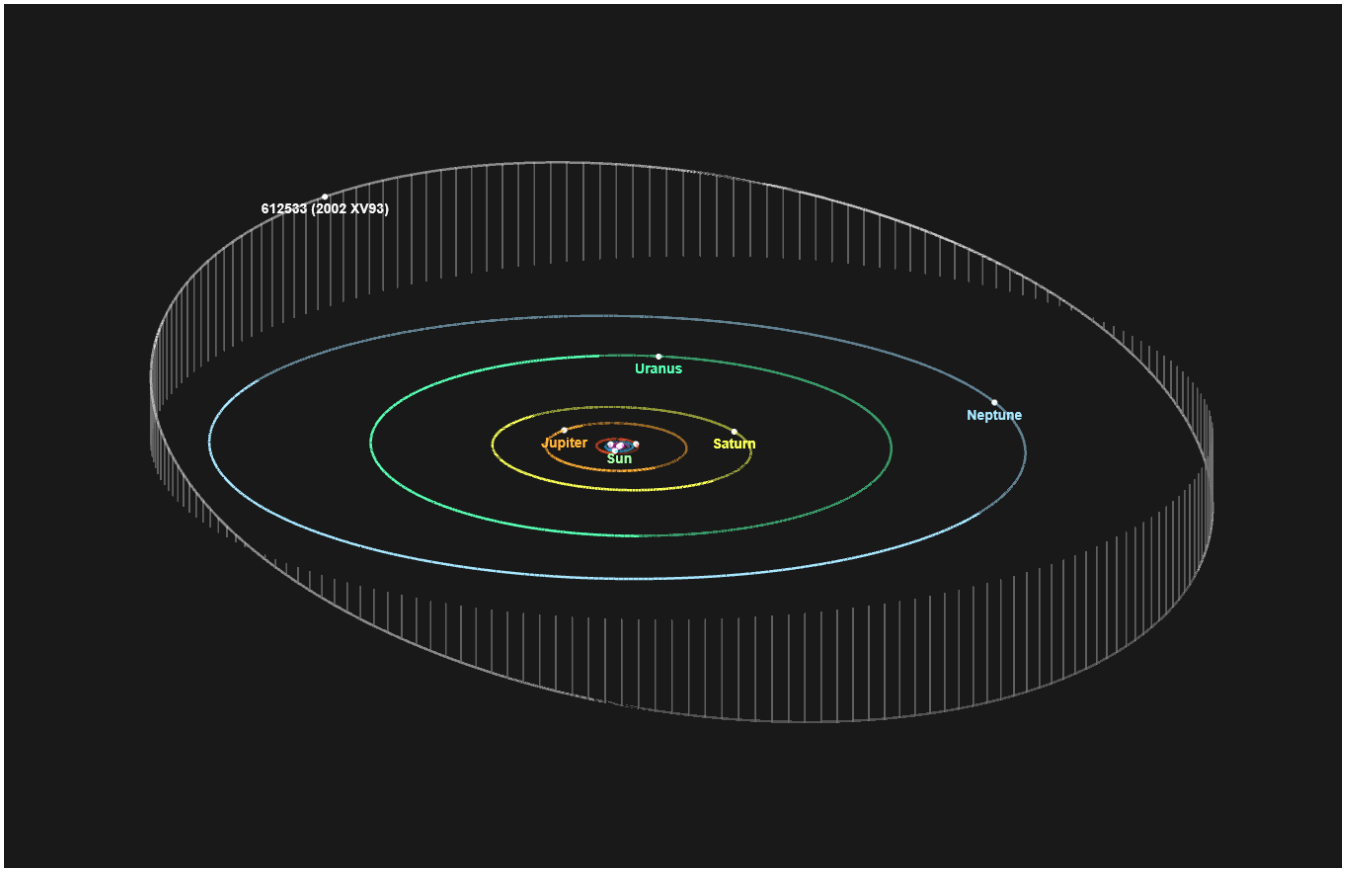
The spacecraft's science instruments include an X-ray camera and a UV camera that can monitor the aurora for 45 hours at a time. While "Smile" is an acronym descriptive of the mission, it is also a visual representation of what scientists are expecting the see from the soft X-ray imagery – a smiley face!



The image shows expected X-ray emissions from the front of Earth's magnetic field. The edge of the magnetic field is visible as a bright red bow shape. The two red spots indicate the magnetic holes around Earth's north and south poles, where particles are let in and form the auroras.

CREDIT: T. Sun, NSSC/CAS, China

Deep Space Conundrum:
A Tiny World with an Atmosphere?



Orbit of 2002 XV93 showing its position relative to the plane of the solar system

Source: JPL's Small Body Database

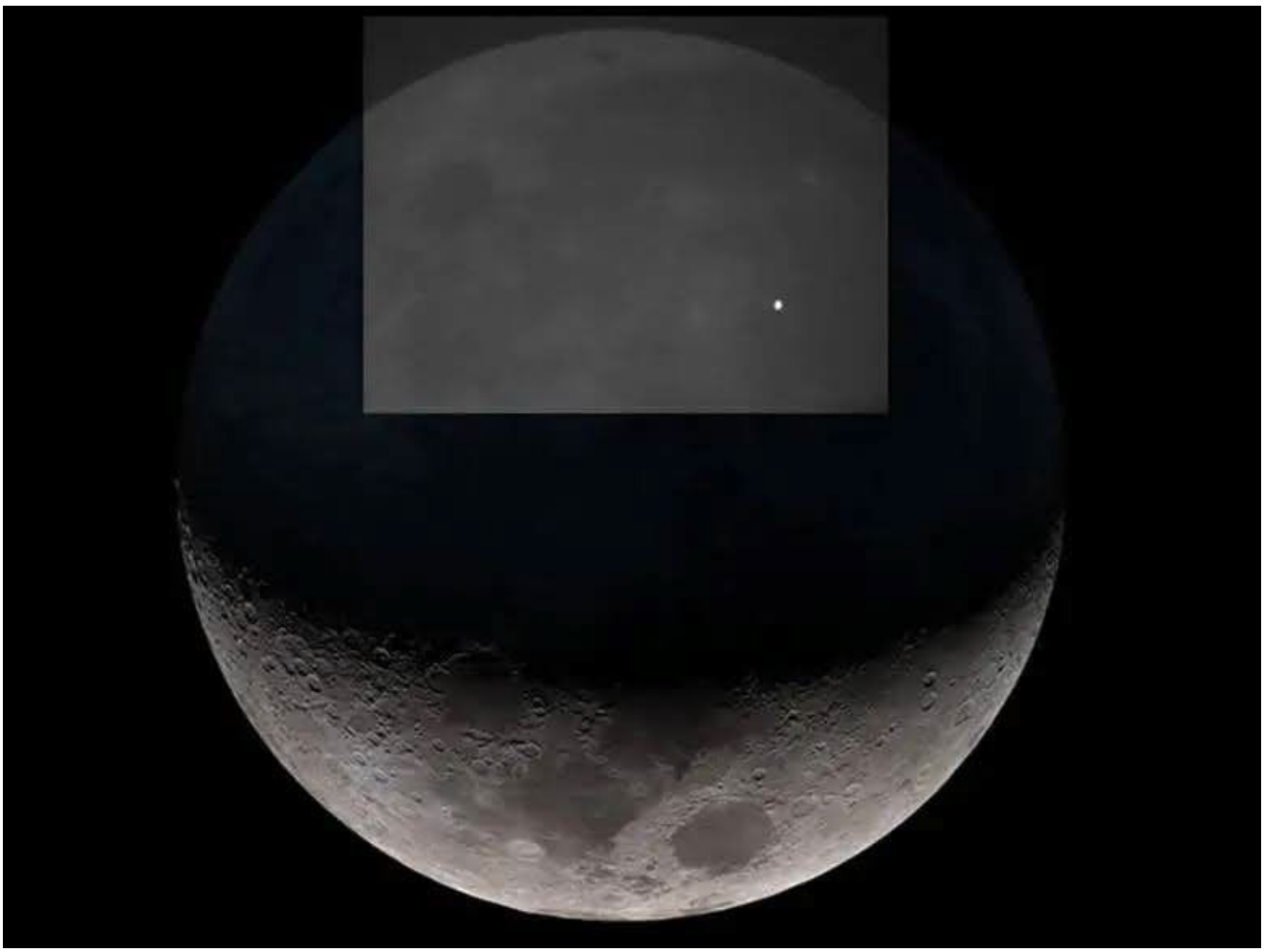
A mystery has emerged in the far reaches of our solar system. A trace of an atmosphere has been detected on a world long thought to be too small to hold onto one.

The minor planet, formally known as (612533) 2002 XV93, is classified as a trans-Neptunian object (TNO). It is located about 40 times Earth's distance from the Sun and is in resonance with Neptune's orbit (like Pluto, 2002 XV93 circles the Sun twice in the time it takes Neptune to complete three circuits).

To date, Pluto is the only known TNO with an atmosphere. 2002 XV93 is about 310 miles (500 km) across, one-fifth the size of Pluto. That the gravity of such a diminutive world can support an atmosphere challenges conventional atmospheric retention scenarios. However, during a recent stellar occultation campaign (where an object such as a TNO passes in front of a star), indications of a tenuous atmosphere were detected (estimated to be 50 to 100 times less dense than even Pluto's wispy veil). Pluto's atmosphere is comprised of mostly nitrogen, methane, and carbon monoxide from the sublimation of its icy surface. Astronomers may have to wait for observations by the James Webb, with its increased sensitivity, to tease out the constituents of the haze surrounding 2002 XV93, although at only 40 to 50 degrees above absolute zero, it is far too cold for water-ice and carbon-dioxide ice to sublimate into a vapor.

At this time, researchers can only speculate as to the origin of the atmosphere. If 2002 XV93 was hit by an icy body, the atmosphere might be short-lived, eventually to be lost to space. Cryovolcanism, or ice volcanoes, could continue to recharge the atmosphere, but an internal heat source would be needed. Confirmation of 2002 XV93's atmosphere could initiated a search for similar worlds in the distant Kuiper Belt.

Lunar Hazard Assessment



Lunar impact flash image shown superimposed on the Moon

Credit: NASA

With NASA preparing to return to the Moon, this time to establish a long-term presence, there is renewed interest in the dangers that the astronauts will encounter living and working on the surface.

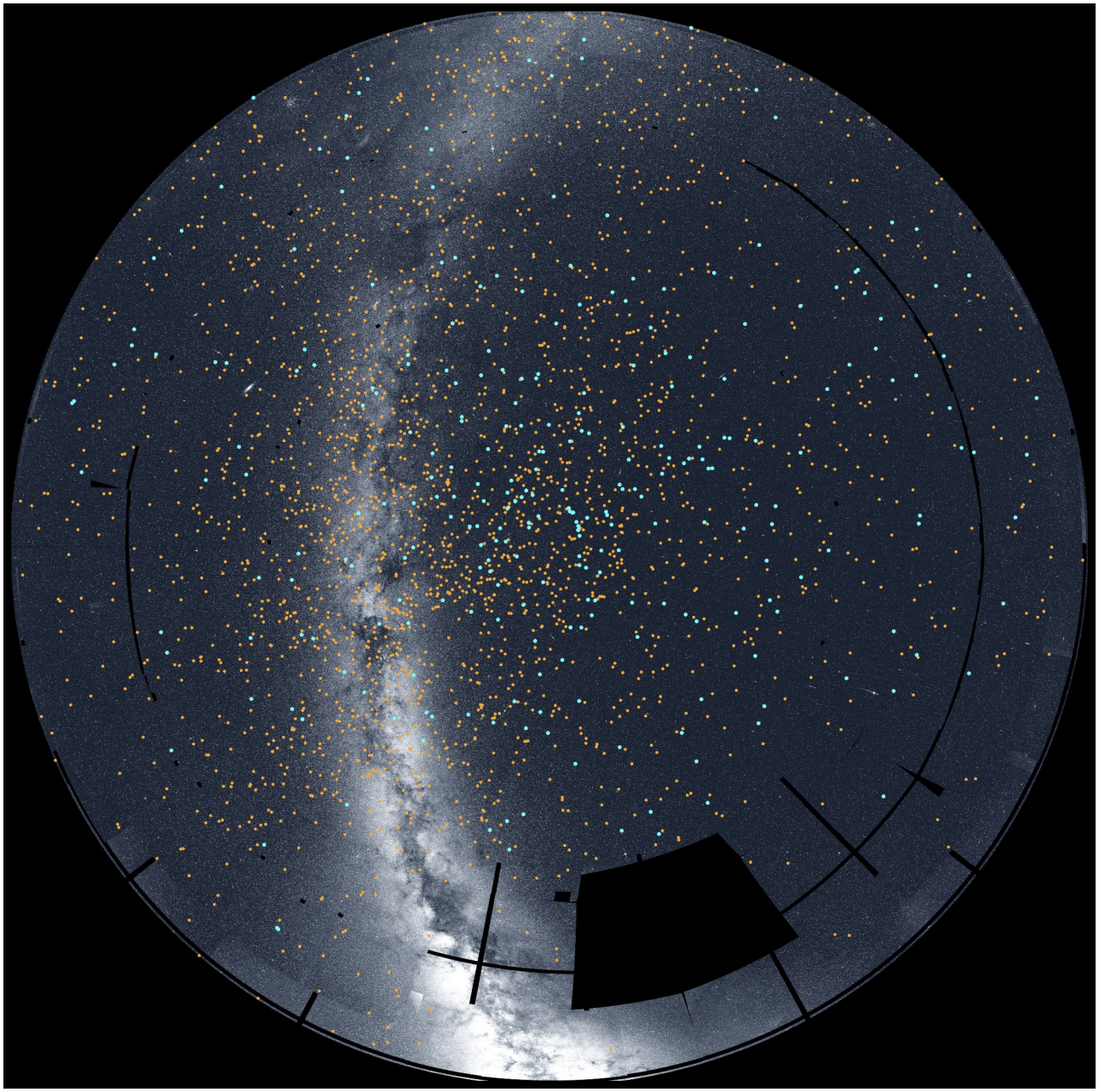
Scientists estimate that, on average, 73,000 pounds (33 metric tons) of meteoric material hit the Earth every day, ranging in size from dust grains to small asteroids. With Earth's thick atmosphere, almost all of this material is vaporized before reaching the surface. The Moon is different with no atmosphere to provide resistance. At a minimum impact velocity of 45,000 mph (20 km/sec), the vaporization of gram size or larger particles can produce a pinpoint flash of light upon impact. If the event happens on the unlit portion of the near-side (facing Earth), these flashes can provide scientists with a better understanding of the hazards posed by meteoritic rain for exposed astronauts.

During the Artemis II mission, the crew was instructed to be on the lookout for such flashes as they traveled behind the Moon and into darkness – recording six distinct events. Back on Earth, there are several organizations, including NASA's Meteoroid Environment Office, the British Astronomical Association, and the Impact Flash! Initiative, recruiting citizens for observing campaigns to document the frequency and intensity of such lunar impacts.

The recommended requirements for participation in a monitoring program include a telescope with a minimum of 4 inch (10 cm) aperture (ideally with tracking capability), a focal ratio of f/6 or smaller (for a wide field view), a camera recording at least 25-30 frames per second (with precision timestamps), and the ability to accurately report your location.

Your telescope needs to be pointed at the unlit portion of the orb, when the Moon is between 10% and 55% illumination. Recordings in the duration of 5 to 10 minutes are recommended for software analysis. Rather than examining your video frame by frame, freeware, such as Automated Lunar Flash Investigation (ALFI), can do the search for possible flashes for you (once the files are in a compatible format).

Prolific Exoplanet Hunter



TESS's view of the northern sky with the galactic plane of the Milky Way. Blue dots indicate confirmed exoplanets and orange dots show candidates. Black areas within the map indicate regions TESS has not yet imaged.

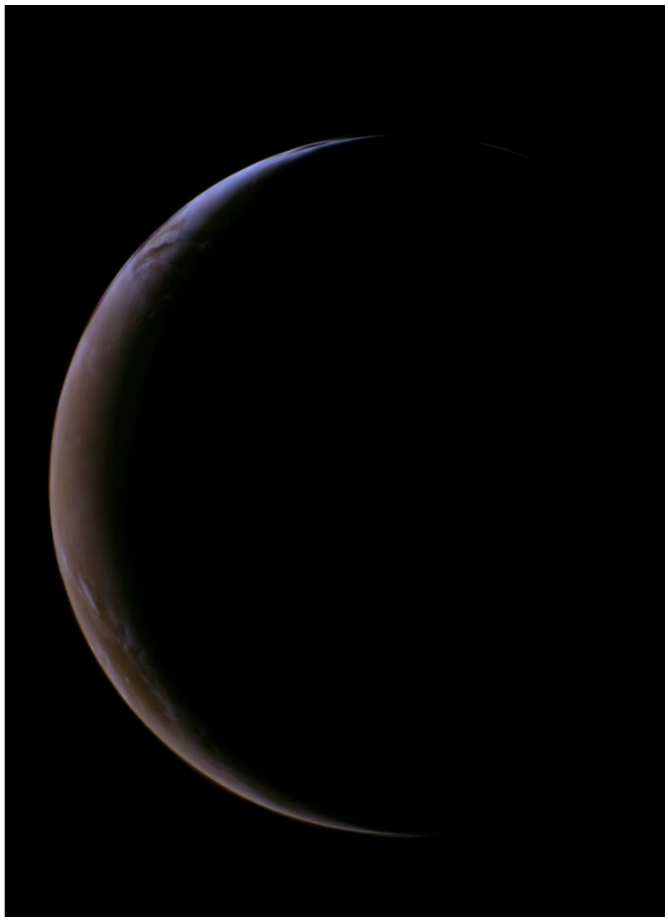
Credit: NASA/MIT/TESS and Veselin Kostov (University of Maryland College Park)

The Transiting Exoplanet Survey Satellite (TESS) is an MIT-led NASA mission launched in April 2018. Its four identical, highly optimized, red-sensitive, wide-field cameras (each camera has an effective aperture size of about 4 inches or 10 centimeters in diameter) monitor a 24 degree by 90 degree strip of the sky for 27 straight days, recording any dips in star brightness that might indicate a transiting planet. Over time, those strips are combined to create an all-sky map of discovery.

TESS is optimized to detect exoplanets 1.5 to 2 times Earth's radius with masses 2 to 10 times that of Earth (categorized as “super Earths”) around nearby bright stars. Since its launch, TESS it has monitored millions of stars and discovered 890 confirmed planets with nearly 8,000 candidates awaiting validation (current as of May 2026).

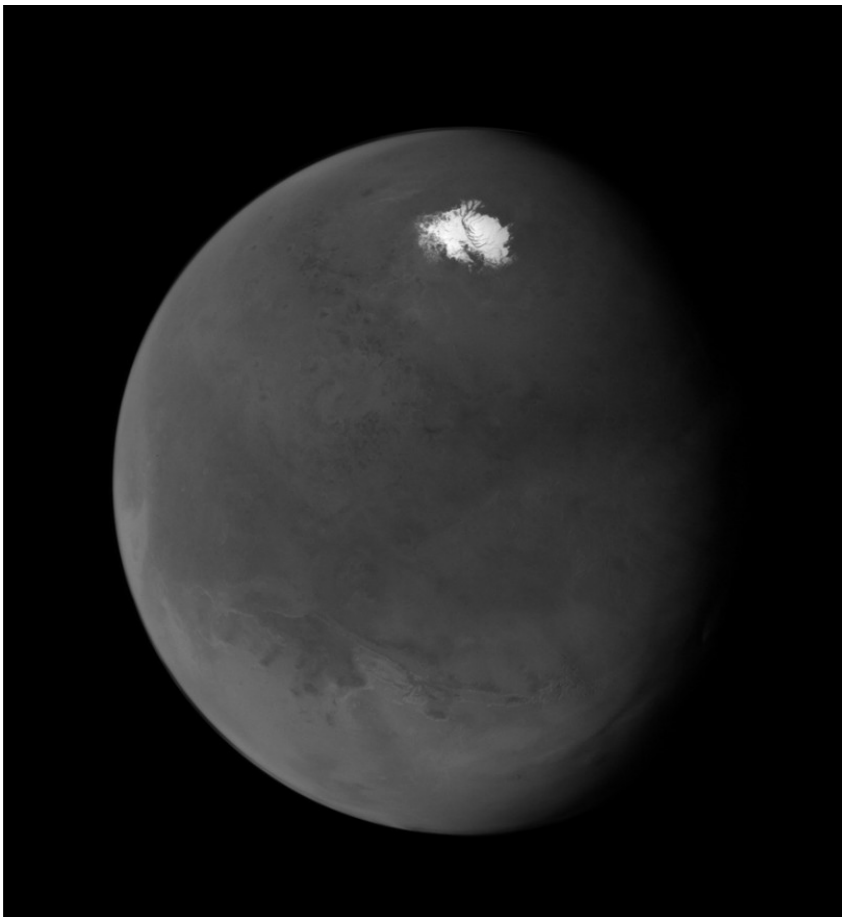
To survey both celestial hemispheres, TESS was placed in a never-before-used lunar-resonant orbit. The spacecraft has an orbital period of 13.7 days, completing two orbits for every one completed by the Moon (2:1 resonance). This allows the spacecraft to maintain a stable position while expending very little energy over a long period of time.

An Assist from Mars



This view of a crescent Mars was captured on May 15th, at about 5:03 A.M. PDT by NASA's Psyche spacecraft as it approached the planet for a gravity assist. The image has been processed into a natural-color view using red, green, and blue data from the multi spectral imager instrument.

Credit: NASA/JPL-Caltech/ASU



This is the first view of a nearly "full Mars" as seen by NASA's Psyche spacecraft shortly after its closest approach to the planet. The view extends from the south polar cap (at the top of the image) down through the Valles Marineris canyon system and to the north.

Credit: NASA/JPL-Caltech/ASU

On May 15th, NASA's Psyche spacecraft received a gravity assist from Mars by passing just 2,800 miles (4,500 km) above the planet's surface. The flyby not only increased the spacecraft's velocity; it altered its trajectory, placing it on a course towards the asteroid Psyche.

The Psyche spacecraft relies on solar-electric ion thrusters for its six-year cruise that will take it through the asteroid belt. While an efficient means of propulsion, the Mars gravity assist provides a savings in its limited reserve of xenon fuel for future operations.

The spacecraft is scheduled to enter orbit around the asteroid Psyche in August 2029 for a planned 26-month science campaign. The Mars flyby provided mission planners an opportunity to calibrate their instruments ahead of the arrival.

The spacecraft approached the Red Planet from the night side. Sunlight reflected and light scattered by dust in the planet's atmosphere created the extended illuminated crescent. Relative to the Sun, the spacecraft was traveling at about 45,600 mph (102,800 kph) five days before the flyby. It's velocity increased to about 52,200 mph (104,900 kph) after the close encounter

Engineers had turned off the spacecraft's thrusters, allowing it to coast through the flyby. The thrusters have since been reactivated and will continue to operate until Psyche reaches its final destination.

Breakthrough in Rotor Technology for Mars Operations

A next-generation Mars helicopter rotor blade prior to testing at supersonic speeds at NASA's Jet Propulsion Laboratory.

Credit: NASA/JPL-Caltech

When the Mars 2020 mission arrived on the Red Planet in February 2021, it consisted of the nuclear-powered rover named Perseverance and a helicopter demonstration vehicle called Ingenuity. Once the rover had found a suitable location for flight testing, it released Ingenuity from its undercarriage. Engineers at NASA's Jet Propulsion Laboratory (JPL) had hoped to squeeze in five short hops over the 30-day test window before the rover had to move on with its mission of exploring Jezero crater. However, with Ingenuity exceeding all expectations in its first few attempts, a decision was made to put Ingenuity to use as a forward scout for the rover. Five flights and 30 days turned into 72 flights and 1,004 Martian days.

Ingenuity's success proved that flight was not only possible in the rarefied atmosphere of the Mars, but that helicopters could play a vital role in exploring areas not accessible by other means. From lessons-learned from Ingenuity, JPL engineers wasted no time developing the next generation of rotor craft - ones that could carry more payload, fly further and, most importantly, operate independently.

Martian helicopters need to spin their rotors faster (Ingenuity's rotors spun 10 time faster), because of the thin atmosphere, to generate the same lift as on Earth. However, as with its Earthly counterparts, engineers were careful that the tips of the rotors did not exceed the speed of sound (approximately 540 mph or 870 kph on Mars) where vibration, structural loads and fatigue rapidly increase and can lead to cataclysmic failure.

With NASA announcing their intention to send three helicopters to Mars (the SkyFall mission), as soon as late 2028, as the payload for their nuclear rocket demonstration, design work has accelerated on a larger version of Ingenuity, for example, one that can carry ground penetrating radar to search for buried ice.

The SkyFall helicopters will use a large, two-bladed design. In a recent test, JPL engineer were able to push the speed of the rotor tips past the speed of sound (to Mach 1.08) without damage. Rotor rpm reached as high as 3,750 in the test chamber with a simulated Martian atmosphere. The increase translates into a 30 percent boost in lift capability.

Starship, Version 3, Takes Flight

Upper Image:Launch of the 407 foot (124 m) Super Heavy-Starship rocket with 18 million pounds of thrust

Credit: SpaceX Video

Lower Image: Starship on landing approach over the Indian Ocean

Credit: SpaceX Video

SpaceX launched their latest iteration of their Super Heavy-Starship rocket on May 22nd for a suborbital test flight. The rocket took off from SpaceX's launch facility on the Texas Gulf Coast, powered by the company's new Raptor 3 methane-fueled engine. Despite an early shutdown of one of the 33 engines, the booster performed as expected through stage separation and the release of Starship. Starship also experienced an engine issue with one of its three vacuum-optimized Raptors failing to light. The power loss was offset by a longer burn by the vehicle's other engines.

Once in orbit, Starship deployed 22 simulated Starlink satellites, two of which were equipped with cameras that provided a unique view of the ship in space. Reentry occurred over the Indian Ocean with the vehicle performing a series of maneuvers designed to stress-test the rear fins and replicate the bank/flip sequence that Starship will exploit for future landings. The vehicle appeared to survive its 66 minute flight in good shape before falling into the ocean and exploding.

Second Saturday Stars

FREE EVENT

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

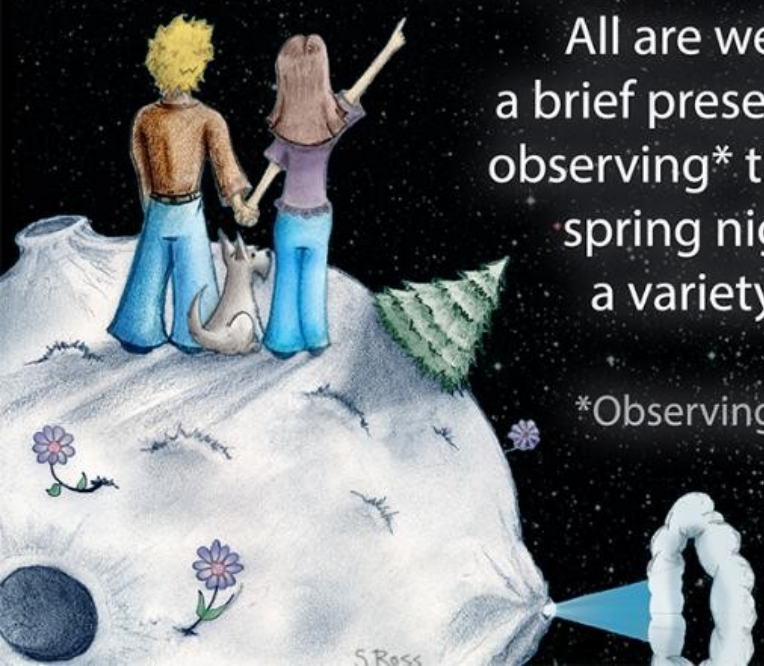
June 13th

8:00 - 10:00 pm

Free Star Party

Featuring:

AstroFun 103: The Gas Giants, Jupiter & Saturn



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

*Observing if weather permits

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