

# Astronomy News

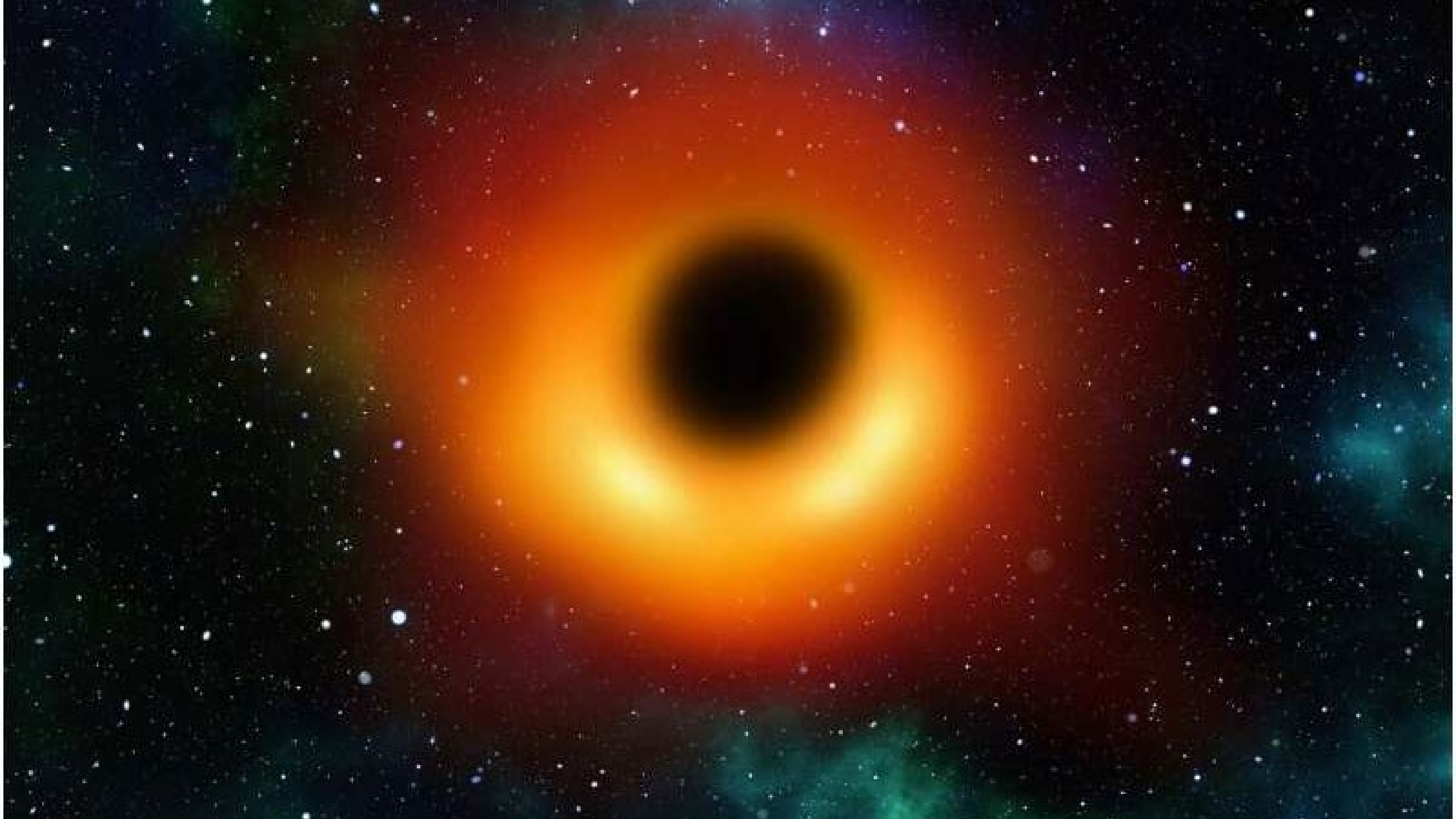
KW RASC FRIDAY SEPTEMBER  
10<sup>TH</sup> 2021

JIM FAIRLES

# Largest virtual universe free for anyone to explore

- ▶ <https://www.youtube.com/watch?v=R7nV6JEMGAo&t=25s>
- ▶ <https://phys.org/news/2021-09-largest-virtual-universe-free-explore.html>
- ▶ Forget about online games that promise you a "whole world" to explore. An international team of researchers has generated an entire virtual universe, and made it freely available on the cloud to everyone
- ▶ Uchuu (meaning "outer space" in Japanese) is the largest and most realistic simulation of the universe to date. The Uchuu simulation consists of 2.1 trillion particles in a computational cube an unprecedented 9.63 billion light-years to a side. For comparison, that's about three-quarters the distance between Earth and the most distant observed galaxies. Uchuu reveals the evolution of the universe on a level of both size and detail inconceivable until now.
- ▶ These results appeared as Ishiyama et al. "The Uchuu simulations: Data Release 1 and dark matter halo concentrations" in the September 2021 issue of Monthly Notices of the Royal Astronomical Society.





# Black holes found to exert a pressure on their environment

- ▶ <https://phys.org/news/2021-09-black-holes-exert-pressure-environment.html>
- ▶ Physicists at the University of Sussex have discovered that black holes exert a pressure on their environment, in a scientific first.
- ▶ In 1974 Stephen Hawking made the seminal discovery that black holes emit thermal radiation. Previous to that, black holes were believed to be inert, the final stages of a dying heavy star.
- ▶ The University of Sussex scientists have shown that they are in fact even more complex thermodynamic systems, with not only a temperature but also a pressure.
- ▶ The serendipitous discovery was made by Professor Xavier Calmet and Folkert Kuipers in the Department of Physics and Astronomy at the University of Sussex, and is published today in Physical Review D.

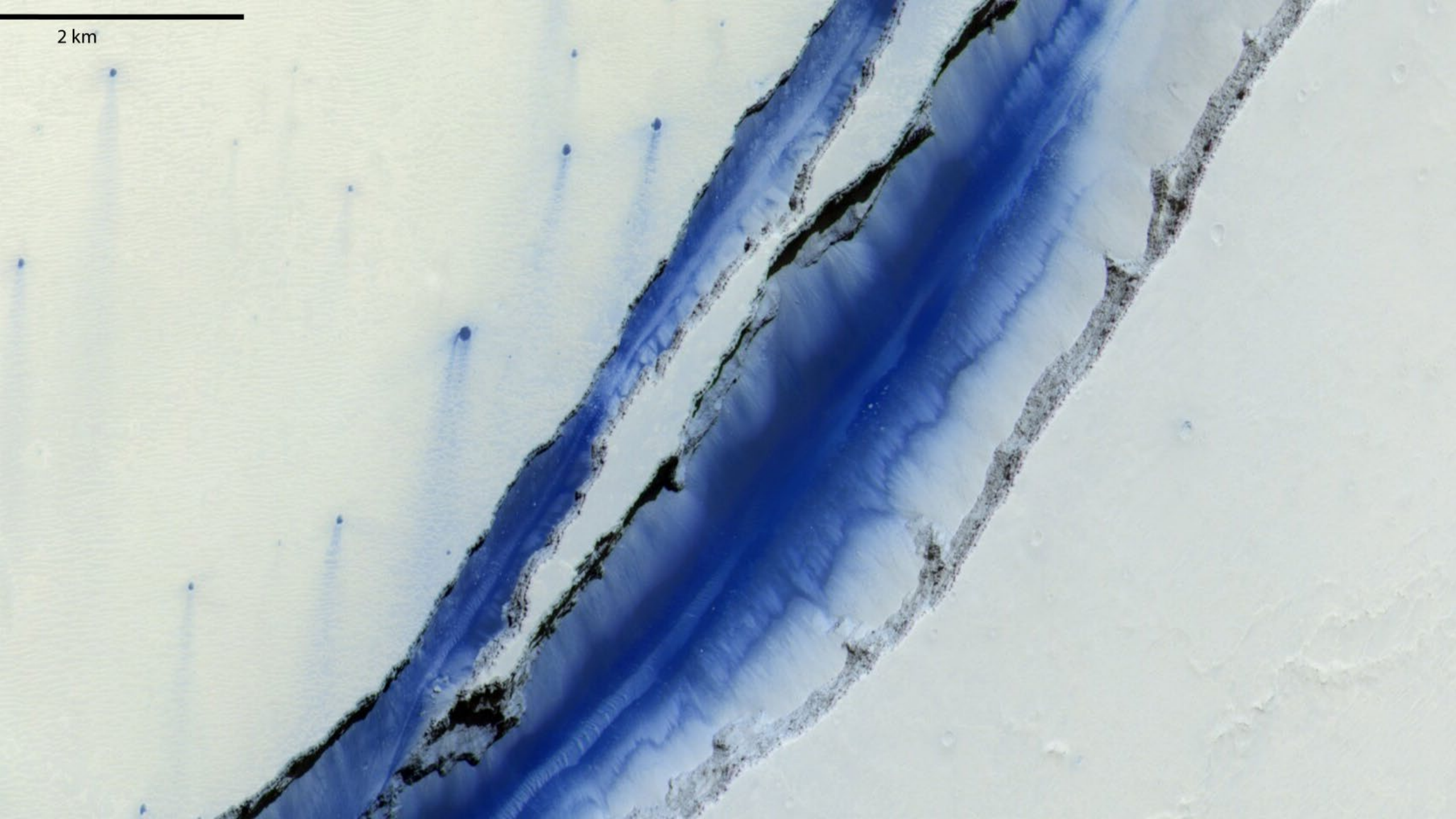


# Black holes found to exert a pressure on their environment

- ▶ Xavier Calmet, Professor of Physics at the University of Sussex, said: "Our finding that Schwarzschild black holes have a pressure as well as a temperature is even more exciting given that it was a total surprise. I'm delighted that the research that we are undertaking at the University of Sussex into quantum gravity has furthered the scientific communities' wider understanding of the nature of black holes.
- ▶ "Hawking's landmark intuition that black holes are not black but have a radiation spectrum that is very similar to that of a black body makes black holes an ideal laboratory to investigate the interplay between quantum mechanics, gravity and thermodynamics.
- ▶ "If you consider black holes within only general relativity, one can show that they have a singularity in their centers where the laws of physics as we know them must breakdown. It is hoped that when quantum field theory is incorporated into general relativity, we might be able to find a new description of black holes.



2 km





# Image: Volcanic trenches on Mars

- ▶ <https://phys.org/news/2021-09-image-volcanic-trenches-mars.html>
- ▶ This image of the young volcanic region of Elysium Planitia on Mars [10.3°N, 159.5°E] was taken on 14 April 2021 by the CaSSIS camera on the ESA-Roscosmos ExoMars Trace Gas Orbiter (TGO).
- ▶ The two blue parallel trenches in this image, called Cerberus Fossae, were thought to have formed by tectonic processes. They run for almost one thousand km over the volcanic region. In this image, CaSSIS is looking straight down into one of these 2 km-wide fissures.
- ▶ The floor here is a few hundred meters deep and is filled with coarse-grained sand, likely basaltic in composition, which appears blue in the CaSSIS false-color composite image. The flat volcanic plains nearby are punctured by small impact craters, which expose possibly the same basaltic materials that we see within Cerberus Fossae.
- ▶ TGO arrived at Mars in 2016 and began its full science mission in 2018.





# Video: We asked a NASA scientist— do aliens exist?

- ▶ <https://www.youtube.com/watch?v=xRbE4Dr0zKc>
- ▶ <https://phys.org/news/2021-09-video-nasa-scientistdo-aliens.html>
- ▶ Do aliens exist? Extraterrestrial life has never been discovered. However, that doesn't mean it doesn't exist.
- ▶ At NASA, astrobiologists like Dr. Lindsay Hays are trying to answer one of the most profound questions ever: Is there life beyond Earth?







# Astronauts smell smoke, burning on Russia's ISS module

- ▶ <https://phys.org/news/2021-09-astronauts-russia-iss-module.html>
- ▶ A smoke alarm sounded Thursday in Russia's segment of the International Space Station (ISS) and astronauts smelled "burning" on board, Russia's space agency and NASA said.
- ▶ The incident, which the Russian space agency Roscosmos said happened at 01:55 GMT ahead of a scheduled spacewalk, is the latest in a string of problems to spur safety concerns over conditions on the Russian segment.
- ▶ "A smoke detector was triggered in the Zvezda service module of the Russian segment of the International Space Station during automatic battery charging, and an alarm went off," Roscosmos said in a statement.



# Astronauts smell smoke, burning on Russia's ISS module

- ▶ French astronaut Thomas Pesquet said "the smell of burning plastic or electronic equipment" wafted to the US segment of the station, Russian state news agency RIA Novosti reported, citing a NASA broadcast.
- ▶ The Russian crew turned on a filter and after the air was cleaned up the astronauts went back to sleep, Roscosmos said.
- ▶ The space agency said that a planned spacewalk would go ahead as scheduled.
- ▶ Russia's Oleg Novitsky and Pyotr Dubrov are scheduled to leave the station to continue work on the Nauka science module that docked in July.





# Russia's Nauka science module docks with ISS

- ▶ <https://phys.org/news/2021-07-russian-lab-module-docks-space.html>
- ▶ Russia said it successfully docked the Nauka laboratory module with the International Space Station on Thursday—though the troubled unit caused yet another fright after accidentally firing and briefly throwing the entire station out of position.
- ▶ The mission comes after more than a decade of delays and as Russia seeks to boost its space industry, which has fallen behind since the collapse of the Soviet Union and struggles to keep up with competition from the United States.
- ▶ A few hours after docking, Nauka's propulsive devices unexpectedly fired, forcing personnel aboard the multinational manned orbital platform to fire thrusters on the Russian segment of the station to counter the effect.
- ▶ The module started firing "inadvertently and unexpectedly, moving the station 45 degrees out of attitude," NASA said on Twitter. "Recovery operations have regained attitude and the crew is in no danger," it added.





# Boeing Starliner launch delayed indefinitely

- ▶ <https://phys.org/news/2021-08-boeing-starliner-indefinitely.html>
- ▶ Boeing's Starliner won't launch Wednesday as had been planned following problems with its propulsion system that prevented a key uncrewed test flight to the international space station a day earlier—and it's not clear when the troubled spaceship will fly next.
- ▶ The aerospace giant said in a statement that valves in Starliner's engine were in "unexpected" positions, forcing the mission team to halt the countdown.
- ▶ NASA added that engineering teams have ruled out several potential causes, including a software glitch, but need more time to understand the issue.
- ▶ "We're going to let the data lead our work," said John Vollmer, vice president and program manager of Boeing's Commercial Crew Program.





# US grounds Virgin Galactic after space flight 'mishap'

- ▶ <https://phys.org/news/2021-09-faa-virgin-galactic-probing-branson.html>
- ▶ The US Federal Aviation Administration (FAA) on Thursday said it was grounding space flights by Virgin Galactic while it investigates why the company's July mission carrying Richard Branson deviated from its planned trajectory.
- ▶ The move represents a blow to the space tourism firm as it prepares to carry paying customers following its first fully-crewed test flight.
- ▶ "The FAA is overseeing the Virgin Galactic investigation of its July 11 SpaceShipTwo mishap that occurred over Spaceport America, New Mexico," the agency said in a short statement.
- ▶ "Virgin Galactic may not return the SpaceShipTwo vehicle to flight until the FAA approves the final mishap investigation report or determines the issues related to the mishap do not affect public safety," it added.





MISSION ANALYSIS

MISSION ANALYSIS

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NEW SHEPARD  
VELOCITY

328 MPH

NEW SHEPARD  
ALTITUDE

5,945 FT

T+ 00:33

# World's richest man Jeff Bezos blasts into space

- ▶ <https://phys.org/news/2021-07-world-richest-jeff-bezos-blasts.html>
- ▶ Earth's wealthiest man Jeff Bezos spent a few minutes outside the planet's atmosphere Tuesday on Blue Origin's first crewed space mission—a breakthrough moment for the space tourism sector that after years of delays is now poised for liftoff.
- ▶ The flawless 10-minute hop from a west Texas base to beyond the Karman line—the internationally recognized boundary marking the start of space—and back again to the surface for a gentle desert landing minted four new astronauts, including the oldest and youngest ever.
- ▶ Bezos said afterwards that like those who had gone before him, he was "amazed and awestruck by the Earth and its beauty, but also its fragility."





# NASA's next space telescope to launch in December

- ▶ <https://phys.org/news/2021-09-nasa-space-telescope-december.html>
- ▶ The James Webb Space Telescope, which astronomers hope will herald a new era of discovery, will launch on December 18, NASA said Wednesday.
- ▶ The \$10 billion observatory, which is a joint project by NASA, the European Space Agency and the Canadian Space Agency, will blast off on an Ariane 5 rocket from Spaceport in French Guiana.
- ▶ It is currently stowed at contractor Northrop Grumman's facilities in Redondo Beach, California, where it is awaiting shipping.
- ▶ "Webb is an exemplary mission that signifies the epitome of perseverance," said Webb's NASA program director Gregory Robinson in a statement.
- ▶ "We are extremely honored to orbit NASA's James Webb Space Telescope with Ariane, a first for Arianespace and the European space team," added Stephane Israel, CEO of Arianespace.
- ▶ Researchers want to use the space telescope, the largest and most powerful ever built, to look back in time over 13.5 billion years to see the first stars and galaxies that formed, a few hundred million years after the Big Bang.





# Untangling the Tarantula Nebula the sky's largest stellar nursery

- ▶ <https://astronomy.com/magazine/news/2021/09/untangling-the-tarantula-nebula-the-sky-s-largest-stellar-nursery>
- ▶ This vast cosmic cloud gives us a spectacular close-up view of stars bursting into life.
- ▶ Some 50 years before Napoleon's troops found the Rosetta Stone buried in the ground, another French explorer made an equally stunning discovery not beneath their feet, but above their heads. In 1751, astronomer Nicolas-Louis de Lacaille was surveying the deep southern sky from the Cape of Good Hope through his 1/2-inch refractor when he stumbled upon a small nebula. The object resided near the northeastern edge of the Large Magellanic Cloud (LMC), the immense nebulous region that astronomers now recognize as a satellite galaxy to the Milky Way.










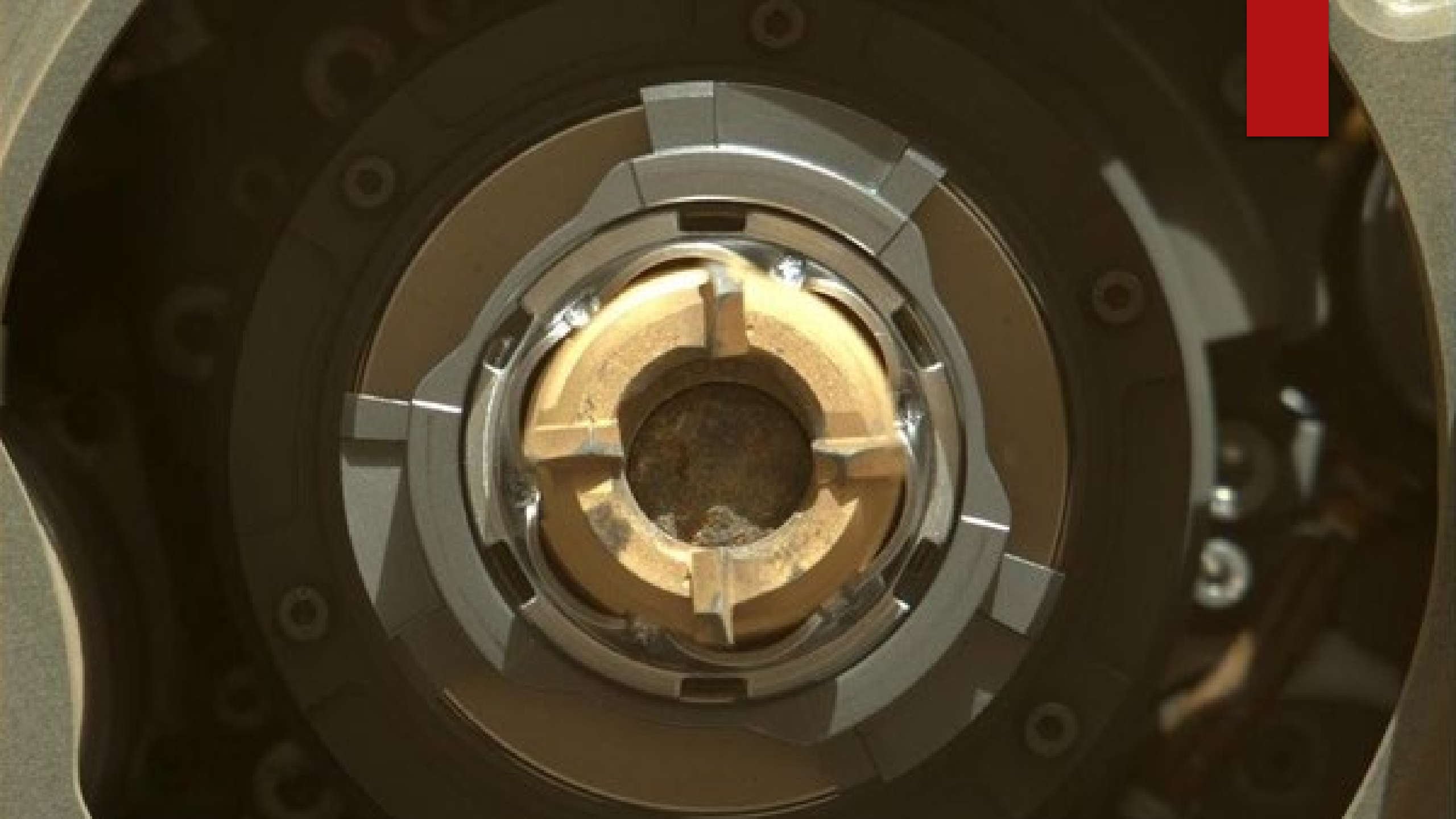
# Perseverance samples its first (two) rocks

- ▶ <https://astronomy.com/news/2021/09/perseverance-samples-its-first-two-rocks>
- ▶ Sometimes, the rocks fail you. That's what happened to the Perseverance rover during its first attempted sample collection in Jezero Crater.  
NASA's newest rover is on a mission to not only explore Mars but collect samples for future study on Earth. Perseverance is carrying 43 sample tubes, inside which it will store drilled samples of rock for later collection. The first step in this process, naturally, is storing each sample in a tube.
- ▶ But on Aug. 6, NASA announced that the rover's first collection attempt had turned up empty. The autonomous sample collection process saw the rover successfully drill into the rock and place the result into a tube. But a subsequent step — using a probe to measure the volume of the sample in the tube — indicated nothing was inside.





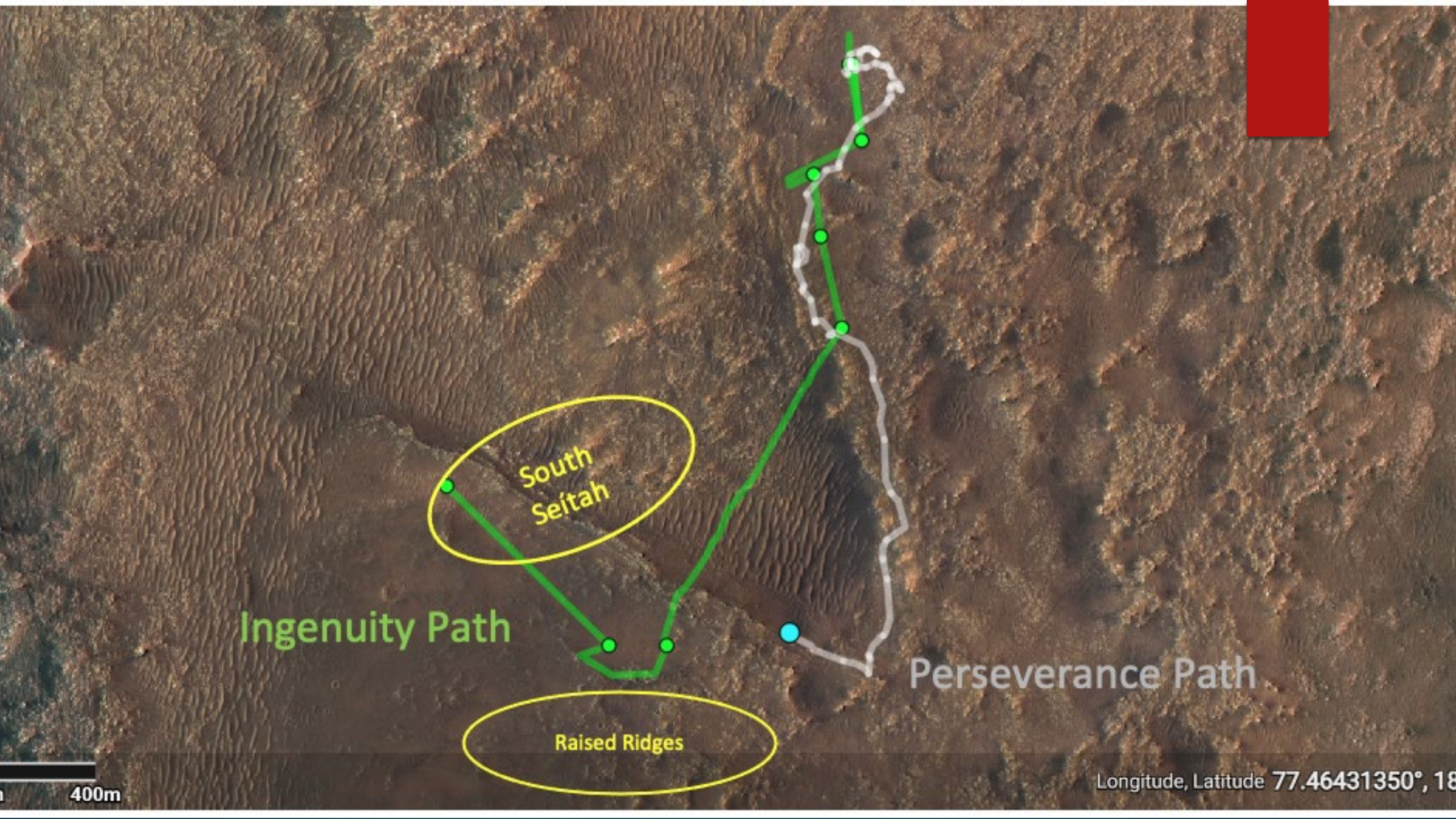
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- ▶ Mission controllers were confident the rover's drill and coring bit had operated properly. So, they concluded, it was the rock that had misbehaved. Called Roubion, this first target is what researchers call a paver stone — flat, polygonal rocks they believe are some of the oldest in the crater. But such rocks are so old and weathered that their crumbly texture thwarted sampling attempts.
  - ▶ To find a better target, controllers drove to a ridge called Citadelle, with outcroppings of rocks very different from the paver stones. And on Sept. 2, Perseverance successfully completed its first sample collection. This time, images from the rover showed the rock core, a bit wider than a pencil, snug in its sample tube.











Ingenuity Path

South Seifah

Raised Ridges

Perseverance Path

400m

Longitude, Latitude 77.46431350°, 18



# Lucky 13 – Ingenuity to Get Lower for More Detailed Images During Next Flight

▶ <https://mars.nasa.gov/technology/helicopter/status/>

- ▶ “The longer you look back, the farther you can look forward.” –Winston Churchill
- ▶ Following Flight 12’s scouting images of “South Séítah,” which were the most valuable Ingenuity has taken to date, we are taking Winston’s advice for Ingenuity’s 13th flight. We will again be venturing across into Séítah to scout an area of outcrops glimpsed in Flight 12 imagery – but we’re taking these new pictures while looking back, pointing in the opposite direction.
- ▶ Taking place no earlier than Saturday, Sept. 4 at 5:08 p.m. PDT, or 12:04 LMST (local Mars time), the 193rd sol (Martian day) of the Perseverance mission, the flight will again journey into the geologically intriguing South Séítah region. However, instead of probing further into Séítah and taking pictures of multiple ridgelines and outcrops (which we did on 12), we’ll be concentrating on one particular ridgeline and its outcrops during Flight 13. We’ll also be flying at a lower altitude – 26 feet (8 meters), as opposed to the 33 feet (10 meters) during 12.



**55**  
YEARS





Star Trek's 55<sup>th</sup>  
Anniversary  
September 8<sup>th</sup>  
1966



Questions?