



Astronomy News

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JIM FAIRLES

How many satellites are orbiting Earth?

- ▶ <https://astronomy.com/news/2021/09/how-many-satellites-are-orbiting-earth>
- ▶ In the past decade, the number of satellites in orbit has skyrocketed thanks to tiny electronics and cheap launches. The crowded night sky is posing problems for astronomers and astronauts.
- ▶ It seems like every week, another rocket is launched into space carrying rovers to Mars, tourists or, most commonly, satellites. The idea that “space is getting crowded” has been around for a few years now, but just how crowded is it? And how crowded is it going to get?
- ▶ With the huge growth in satellites, fears of a crowded sky are starting to come true. A day after SpaceX launched its first 60 Starlink satellites, astronomers began to see them blocking out the stars. While the impact on visible astronomy is easy to understand, radio astronomers fear they may lose 70% sensitivity in certain frequencies due to interference from satellite megaconstellations like Starlink.



Court filing outlines Blue Origin's case against NASA SpaceX lunar lander award

- ▶ <https://spacenews.com/court-filing-outlines-blue-origins-case-against-nasa-spacex-lunar-lander-award/>
- ▶ Blue Origin is seeking to overturn NASA's award of a lunar lander contract to SpaceX by arguing that SpaceX's proposal failed to meet requirements for reviews that made it "unawardable."
- ▶ The U.S. Court of Federal Claims released Sept. 22 a significantly redacted version of Blue Origin's complaint filed with the court Aug. 13. The complaint is effectively an appeal of the company's protest of the Human Landing System (HLS) award to SpaceX that the Government Accountability Office rejected July 30.
- ▶ The core of Blue Origin's argument is that NASA ignored a requirement that bidders include a flight readiness review (FRR) before the launch of each element of the lander systems.



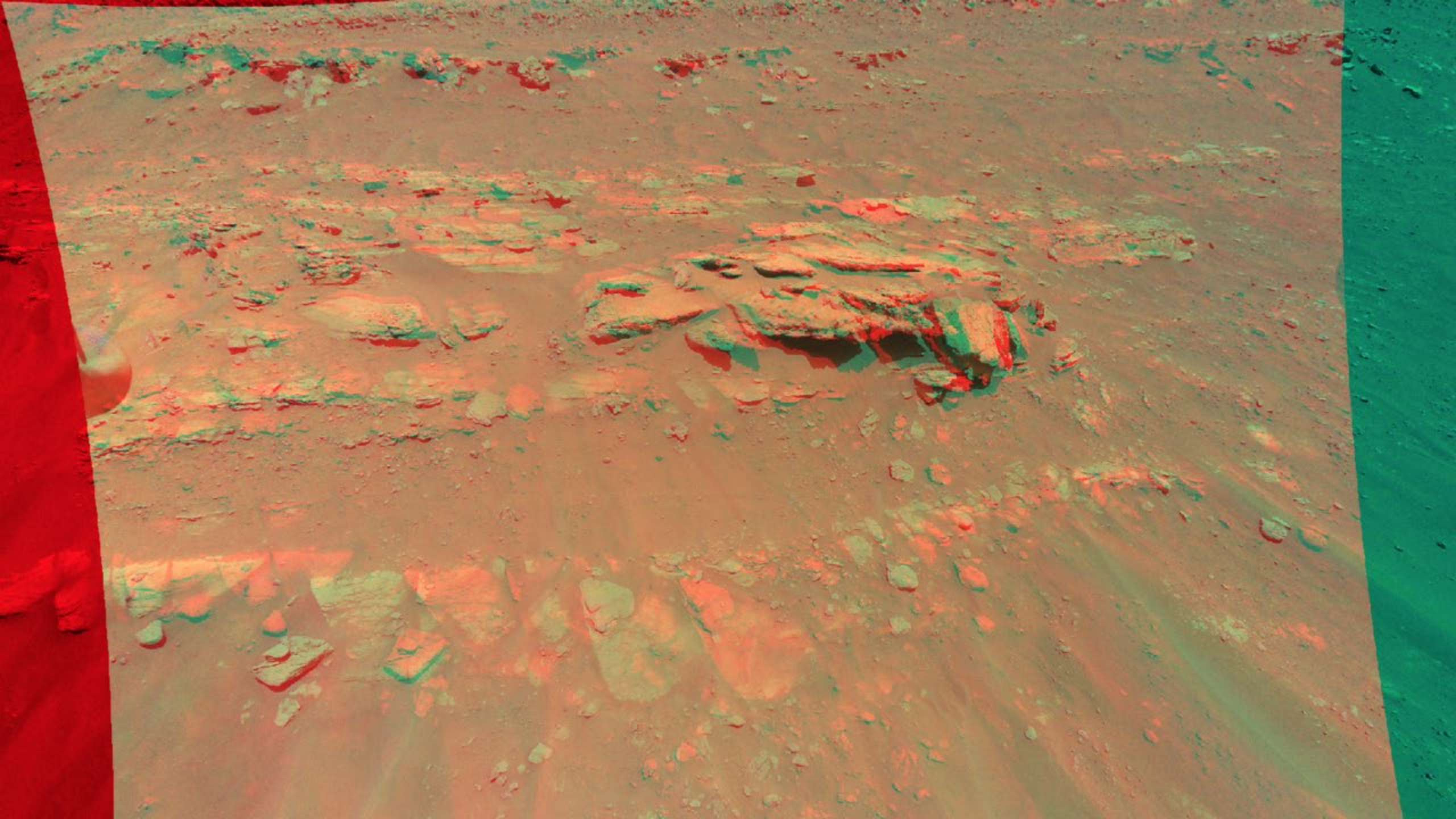
3,600 Years ago, a 50-Meter-Wide Meteor Exploded in the Sky and Destroyed a City Near the Dead Sea

- ▶ <https://www.universetoday.com/152645/3600-years-ago-a-50-meter-wide-meteor-exploded-in-the-sky-and-destroyed-a-city-near-the-dead-sea/>
- ▶ An archeological dig has uncovered evidence of a massive cosmic airburst event approximately 3,600 years ago that destroyed an entire city near the Dead Sea in the Middle East. The event was larger than the famous Tunguska airburst event in Russia in 1908, with a blast 1,000 times more powerful than the Hiroshima atomic bomb. The event flattened the thriving city of Tall el-Hammam, located in what is now Jordan.
- ▶ Using evidence unearthed in the dig along with an online impact calculator, the researchers estimate a space rock approximately 50 meters wide exploded about 4 km (2.5 miles) above the Earth, sending a blinding flash and a wave of heat at 2,000 degrees (3,600 F). This would have immediately incinerated wood structures and bodies, and melted any metal objects like swords or spears, and even pottery and mudbrick structures.
- ▶ But the destruction wasn't over. A few seconds later, a massive shockwave leveled everything, including a 4-to-5-story palace complex and a large 4-m-thick mudbrick fortification wall.



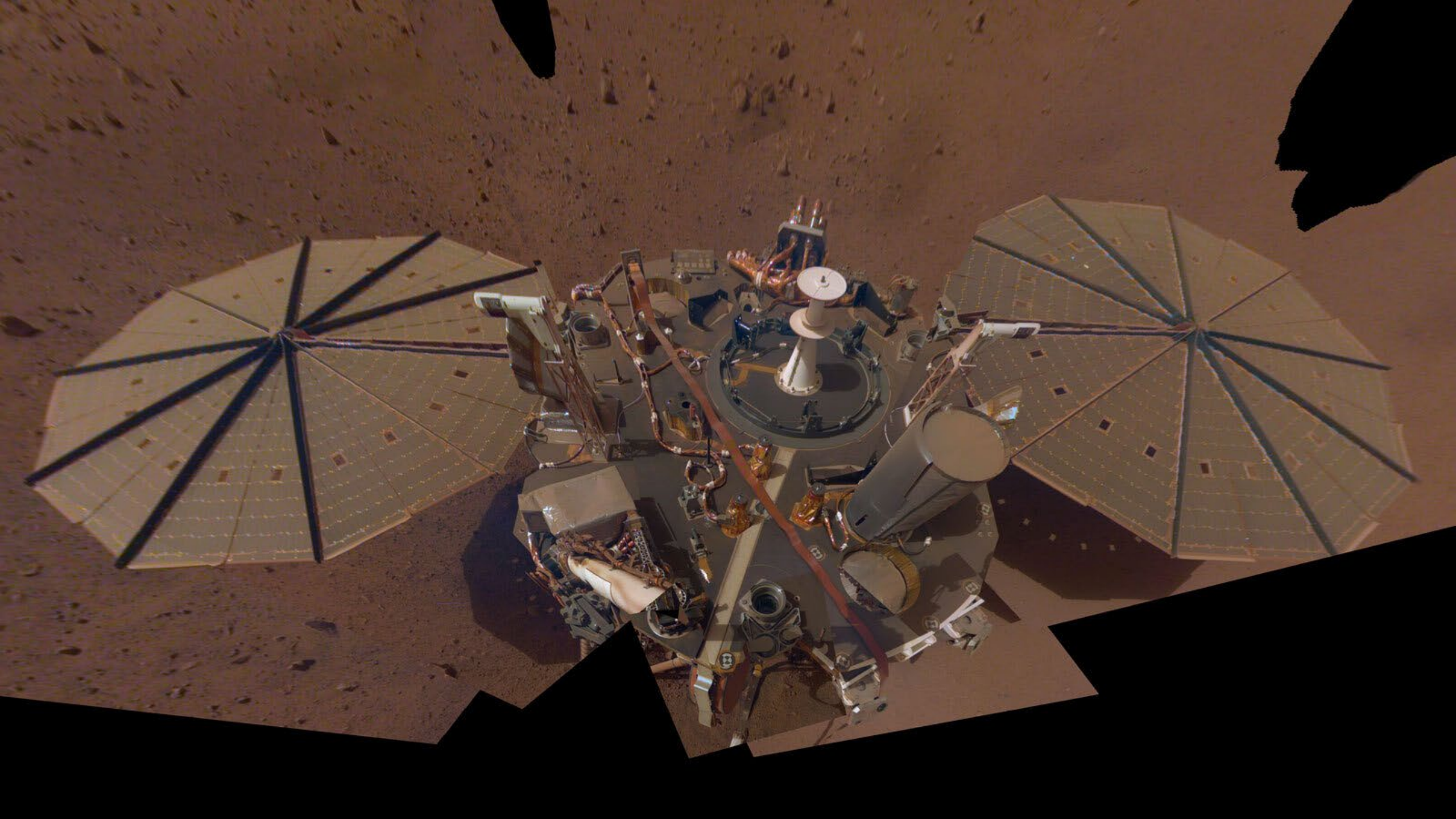
By Using Dashcams and Security Cameras, Astronomers Were Able to Track Down the Location of a Meteorite

- ▶ <https://www.universetoday.com/152640/by-using-dashcams-and-security-cameras-astronomers-were-able-to-track-down-the-location-of-a-meteorite/>
- ▶ OK, all you meteorites that are falling to Earth ... You are being watched!
- ▶ The ever-expanding use of security cameras, doorbell cams and vehicle dashcams have increased the number of fireballs that have been spotted streaking across the skies. And sometimes, all that visual data provides the side benefit of allowing rocks from space to be tracked and found.
- ▶ Back in February of 2020, hundreds of people across Slovenia, Croatia, Italy, Austria and Hungary reported seeing a bright ball of light hurtling across the morning sky, along with a loud explosion and a visible trail of dust in the sky. The event was captured by several cameras, including one that was on a cyclist's helmet.



Mars Mound From Ingenuity Helicopter's Perspective in 3D:

- ▶ <https://mars.nasa.gov/news/9043/nasas-ingenuity-helicopter-captures-a-mars-rock-feature-in-3d/>
- ▶ NASA's Ingenuity Mars Helicopter provided a 3D view of a rock-covered mound during its 13th flight on Sept. 4. The plan for this reconnaissance mission into the "South Seítah" region of Mars' Jezero Crater was to capture images of this geologic target – nicknamed "Faillefeu" (after a medieval abbey in the French Alps) by the agency's Perseverance rover team – and to obtain the color pictures from a lower altitude than ever before: 26 feet (8 meters).
- ▶ About 33 feet (10 meters) wide, the mound is visible just north of the center of the image, with some large rocks casting shadows. Stretching across the top of the image is a portion of "Artuby," a ridgeline more than half a mile (900 meters) wide. At the bottom of the image, and running vertically up into the middle, are a few of the many sand ripples that populate South Seítah.
- ▶ Best viewed with red-blue glasses, this stereo, or 3D, view (also called an anaglyph) was created by combining data from two images taken 16 feet (5 meters) apart by the color camera aboard Ingenuity.

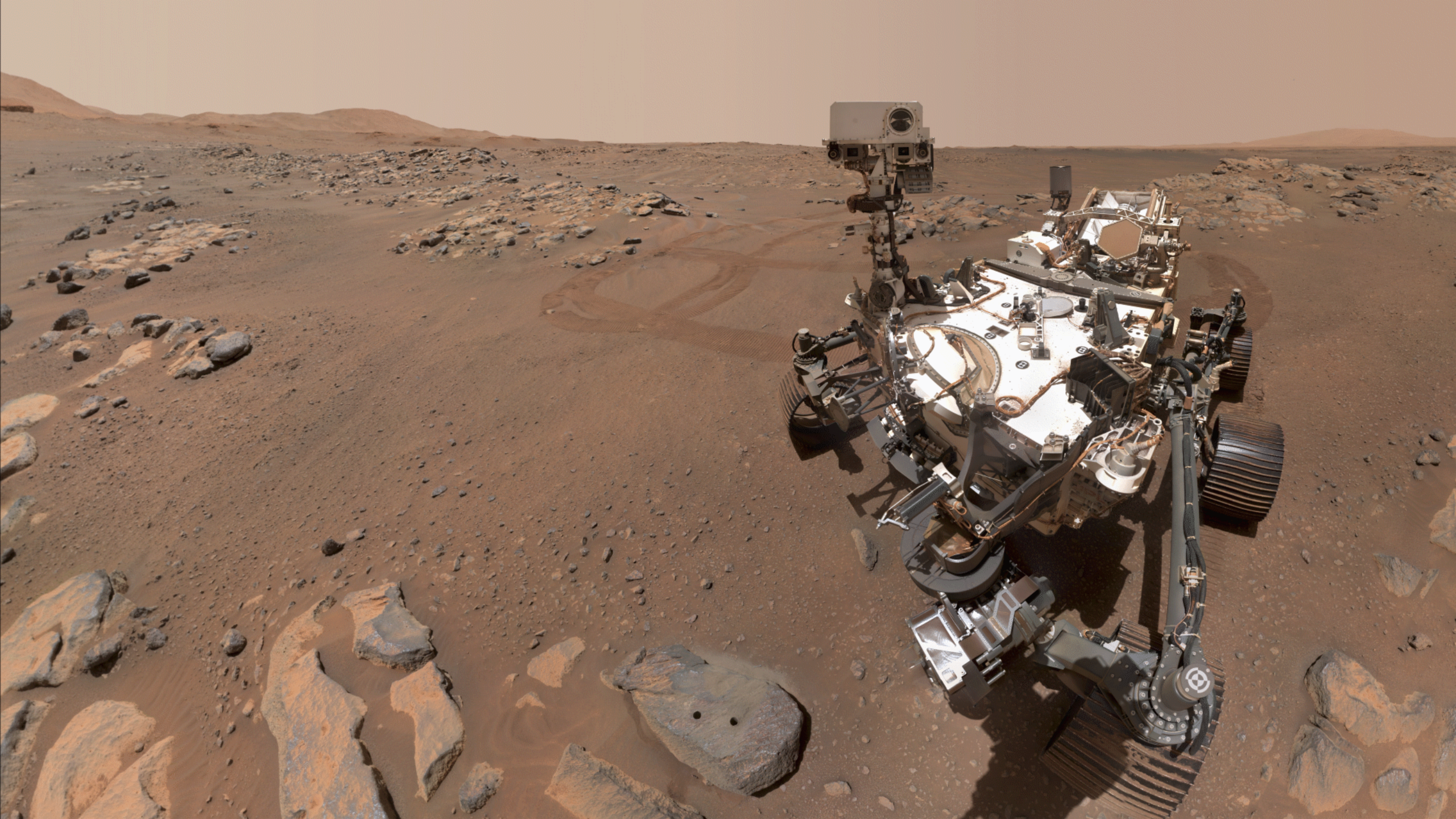


NASA's InSight Finds Three Big Marsquakes, Thanks to Solar-Panel Dusting

- ▶ <https://mars.nasa.gov/news/9046/nasas-insight-finds-three-big-marsquakes-thanks-to-solar-panel-dusting/>
- ▶ On Sept. 18, NASA's InSight lander celebrated its 1,000th Martian day, or sol, by measuring one of the biggest, longest-lasting marsquakes the mission has ever detected. The temblor is estimated to be about a magnitude 4.2 and shook for nearly an hour-and-a-half.
- ▶ This is the third major quake InSight has detected in a month: On Aug. 25, the mission's seismometer detected two quakes of magnitudes 4.2 and 4.1. For comparison, a magnitude 4.2 quake has five times the energy of the mission's previous record holder, a magnitude 3.7 quake detected in 2019.

NASA's InSight Finds Three Big Marsquakes, Thanks to Solar-Panel Dusting

- ▶ The quakes might not have been detected at all had the mission not taken action earlier in the year, as Mars' highly elliptical orbit took it farther from the Sun. Lower temperatures required the spacecraft to rely more on its heaters to keep warm; that, plus dust buildup on InSight's solar panels, has reduced the lander's power levels, requiring the mission to conserve energy by temporarily turning off certain instruments.
- ▶ The team managed to keep the seismometer on by taking a counterintuitive approach: They used InSight's robotic arm to trickle sand near one solar panel in the hopes that, as wind gusts carried it across the panel, the granules would sweep off some of the dust. The plan worked, and over several dust-clearing activities, the team saw power levels remain fairly steady. Now that Mars is approaching the Sun once again, power is starting to inch back up.



NASA's Perseverance Rover Cameras Capture Mars Like Never Before

- ▶ <https://mars.nasa.gov/news/9048/nasas-perseverance-rover-cameras-capture-mars-like-never-before/>
- ▶ NASA's Perseverance rover has been exploring Jezero Crater for more than 217 Earth days (211 Martian days, or sols), and the dusty rocks there are beginning to tell their story – about a volatile young Mars flowing with lava and water.
- ▶ That story, stretching billions of years into the past, is unfolding thanks in large part to the seven powerful science cameras aboard Perseverance. Able to home in on small features from great distances, take in vast sweeps of Martian landscape, and magnify tiny rock granules, these specialized cameras also help the rover team determine which rock samples offer the best chance to learn whether microscopic life ever existed on the Red Planet.
- ▶ Altogether, some 800 scientists and engineers around the world make up the larger Perseverance team. That includes smaller teams, from a few dozen to as many as 100, for each of the rover's cameras and instruments. And the teams behind the cameras must coordinate each decision about what to image.



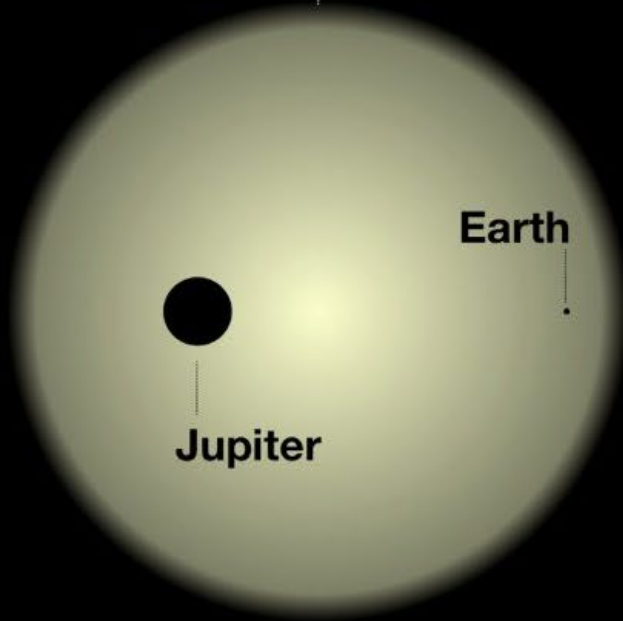
Telescope in Chile captures a doomed galaxy falling into the heart of the Fornax Cluster

- ▶ <https://phys.org/news/2021-09-telescope-chile-captures-doomed-galaxy.html>
- ▶ The Fornax Cluster—which, as the name suggests, lies primarily in the constellation Fornax (the Furnace)—is a relatively nearby galaxy cluster, only about 60 million light-years from Earth. This means that it looms large in the night sky, stretching across an area more than 100 times larger than the full moon. With over 600 member galaxies, the Fornax Cluster is the second "richest" (most populous) galaxy cluster within 100 million light-years of our galaxy (after the much larger Virgo Cluster).
- ▶ Two elliptical galaxies dominate the center of this image—visible as the two large patches of diffuse light with bright cores. Such galaxies usually contain much older stars than the more picturesque spiral galaxies, and they tend to be found in galaxy clusters such as the Fornax Cluster. These elliptical galaxies—which are named NGC 1399 and NGC 1404—are among the brightest members of the Fornax Cluster and are inexorably being drawn together by the force of gravity. This interaction is stripping gas from NGC 1404, the lower elliptical galaxy in this image.

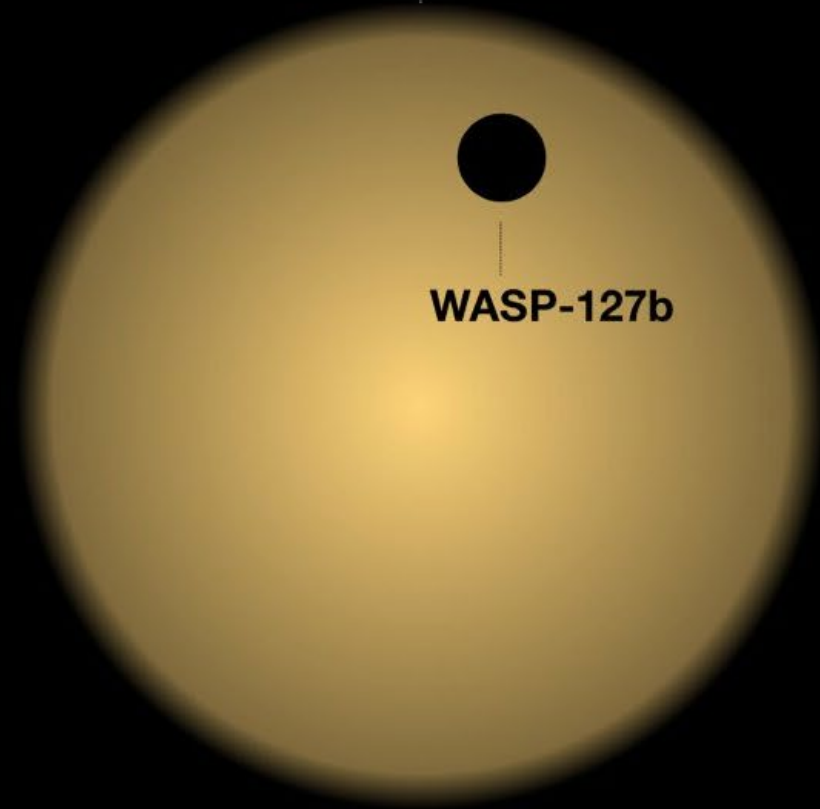
Telescope in Chile captures a doomed galaxy falling into the heart of the Fornax Cluster

- ▶ In the bottom left corner of the image appears the irregular galaxy NGC 1427A. This ragged patch of light is a small, irregular collection of stars similar to the Large Magellanic Cloud. Similarly to NGC 1404, NGC 1427A is plunging toward the heart of the cluster at roughly 2.2 million kilometers (or 1.3 million miles) per hour. This headlong rush to destruction will eventually result in the galaxy being disrupted—pulled apart by gravitational interactions with other galaxies.

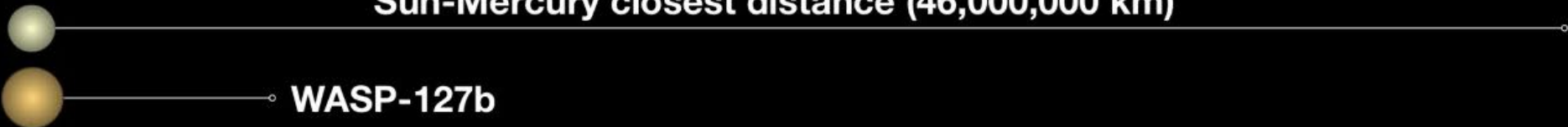
The Sun



WASP-127




Sun-Mercury closest distance (46,000,000 km)



Cloud-spotting on a distant exoplanet

- ▶ <https://phys.org/news/2021-09-cloud-spotting-distant-exoplanet.html>
- ▶ An international team of astronomers has not only detected clouds on the distant exoplanet WASP-127b, but also measured their altitude with unprecedented precision. A presentation by Dr. Romain Allart at the Europlanet Science Congress (EPSC) 2021 shows how, by combining data from a space- and a ground-based telescope, the team has been able to reveal the upper structure of the planet's atmosphere. This paves the way for similar studies of many other faraway worlds.

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- ▶ WASP-127b, located more than 525 light-years away, is a "hot Saturn"—a giant planet similar in mass to Saturn that orbits very close to its sun. The team observed the planet passing in front of its host star to detect patterns that become embedded in the starlight as it is filtered through the planet's atmosphere and altered by the chemical constituents. By combining infrared observations from the ESA/NASA Hubble Space Telescope (HST) and visible light measurements from the ESPRESSO spectrograph at the European Southern Observatory's Very Large Telescope in Chile, the researchers were able to probe different regions of the atmosphere. The results brought a few surprises.

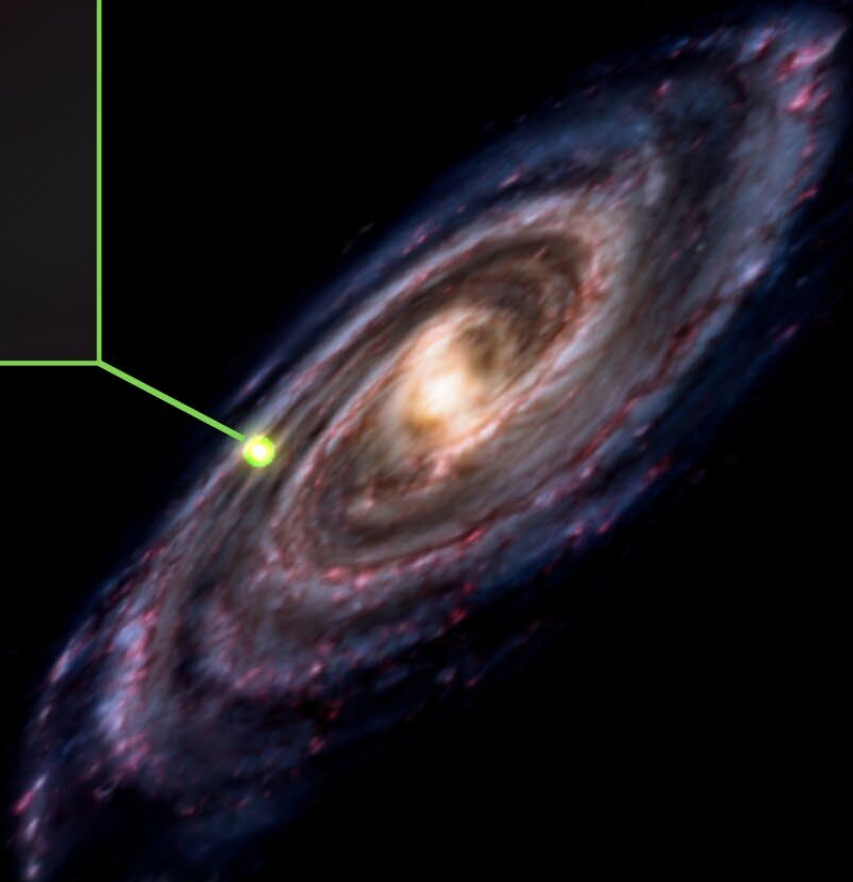
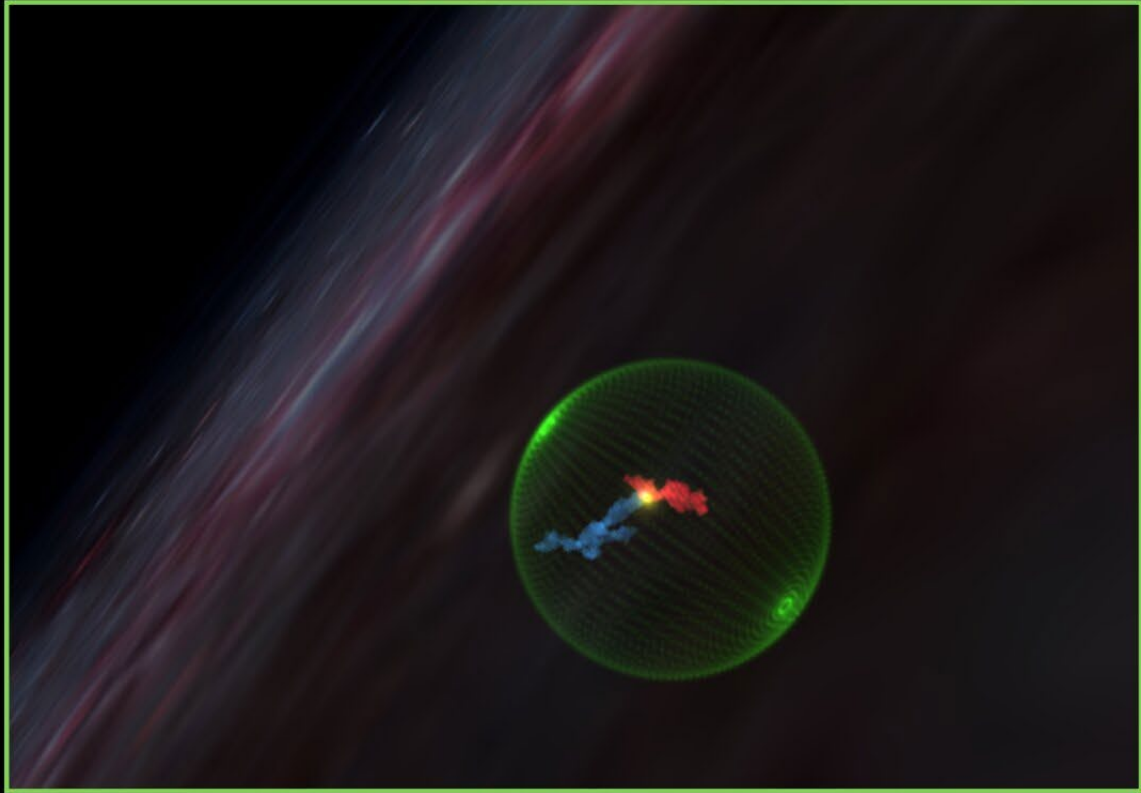
Cloud-spotting on a distant exoplanet

- ▶ First, as found before in this type of planet, we detected the presence of sodium, but at a much lower altitude than we were expecting. Second, there were strong water vapor signals in the infrared but none at all at visible wavelengths. This implies that water-vapor at lower levels is being screened by clouds that are opaque at visible wavelengths but transparent in the infrared,' said Allart, of the iREx/Université de Montréal and Université de Genève, who led the study.
- ▶ We don't yet know the composition of the clouds, except that they are not composed of water droplets like on Earth,' said Allart. 'We are also puzzled about why the sodium is found in an unexpected place on this planet. Future studies will help us understand not only more about the atmospheric structure, but about WASP-127b, which is proving to be a fascinating place.'



Elon Musk says Inspiration4 crew had 'challenges' with toilet, vows for bathroom upgrades

- ▶ <https://phys.org/news/2021-09-elon-musk-inspiration4-crew-toilet.html>
- ▶ The private space flight, SpaceX, completed a historic mission with the first all-civilian flight crew last weekend. The four members of the Inspiration4 crew raised \$200 million for St. Jude Children's Research Hospital, and helped prove SpaceX founder Elon Musk's belief that non-professional astronauts can venture into space in regularity.
- ▶ Every successful mission has its learning moments, however. One key takeaway from a three-day trip in space: Spacecraft bathrooms aren't ideal whatsoever.
- ▶ In responding to followers asking about the mission, Musk tweeted Monday night that the Inspiration4 crew had some difficulties with the bathroom and promised upgrades for future missions.



Gigantic cavity in space sheds new light on how stars form

- ▶ <https://phys.org/news/2021-09-gigantic-cavity-space-stars.html>
- ▶ Astronomers analyzing 3D maps of the shapes and sizes of nearby molecular clouds have discovered a gigantic cavity in space.
- ▶ The sphere-shaped void, described today in the *Astrophysical Journal Letters*, spans about 150 parsecs—nearly 500 light years—and is located on the sky among the constellations Perseus and Taurus. The research team, which is based at the Center for Astrophysics | Harvard & Smithsonian, believes the cavity was formed by ancient supernovae that went off some 10 million years ago.

Gigantic cavity in space sheds new light on how stars form

- ▶ The mysterious cavity is surrounded by the Perseus and Taurus molecular clouds—regions in space where stars form.
- ▶ "Hundreds of stars are forming or exist already at the surface of this giant bubble," says Shmuel Bialy, a postdoctoral researcher at the Institute for Theory and Computation (ITC) at the Center for Astrophysics (CfA) who led the study. "We have two theories—either one supernova went off at the core of this bubble and pushed gas outward forming what we now call the 'Perseus-Taurus Supershell,' or a series of supernovae occurring over millions of years created it over time."

Questions?

