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"Be brave to stand for what you believe in even if you stand alone."

— Roy T. Bennett

NASA Testing Advanced Capabilities for Moon, Mars Rovers

Developed at NASA's Jet Propulsion Laboratory, ERNEST (Exploration Rover for Navigating Extreme Sloped Terrain) is used in a desert field test to help refine mobility hardware and autonomy software that could be used for a potential future long-range lunar rover mission. During the field test, which took place in March 2026 in the Colorado Desert of Southern California, the JPL team deployed ERNEST at all times of the day — including dusk, dawn, and nighttime, when lighting conditions create long shadows like those seen on the Moon's polar regions. On a bleak stretch of the Colorado Desert in Southern California, a compact four-wheeled rover recently trundled about 16 miles (26 kilometers) with minimal intervention from the team of engineers trailing it. Called ERNEST (Exploration Rover for Navigating Extreme Sloped Terrain), this prototype is being used by NASA to advance both robotic autonomy and the ability to traverse challenging landscapes. Developed at NASA's Jet Propulsion Laboratory in Southern California, ERNEST is 4 feet (1.2 meters) long. Not only can it lift each of its mesh wheels to get past obstacles that would stymie Curiosity and Perseverance, NASA's six-wheeled Mars rovers, but the prototype also has enhanced independent decision-making capabilities. These mobility and autonomy advances could be infused into future missions that will venture to previously inaccessible areas of the Red Planet or the Moon. ERNEST serves as a testbed for a potential future

lunar rover mission requiring high speeds and extreme distances. In a recent field test, the prototype traveled 16 miles over the course of 37 hours, going an order of magnitude above the top speed at which NASA's current Mars rovers can navigate. Credit: NASA/JPL-Caltech In the field, ERNEST served as a testbed for a potential future lunar mission requiring higher speeds and much greater mileage than can be accomplished by current rovers. This technology could be used to inform future designs for exploration efforts on the Moon and beyond. "This testing is helping us refine the mobility hardware and autonomy software to navigate extreme distances across a wide range of terrain and lighting conditions anticipated on the Moon," said Issa Nesnas, a principal technologist at JPL who led the recent testing as head of autonomy for a NASA mission concept for a potential future long-range lunar rover. Engineers from JPL set up illuminators after transporting ERNEST for a pre-sunrise test during a seven-day desert field campaign. NASA/JPL-Caltech Nesnas' team is using ERNEST to demonstrate it is possible to build a rover that's twice as big as the prototype and capable of a long-distance Moon mission. During the recent campaign, ERNEST traveled at speeds up to 0.6 mph (1 kph) over 37 hours of driving, across seven days of intermittent testing. That's an order of magnitude above the top speed Perseverance and Curiosity can navigate. "You could do a science road trip across the Moon — or Mars — with this vehicle," said James Keane, a JPL planetary scientist working on lunar missions. The initial goal of the team that developed ERNEST was mechanical: to design a relatively simple, low-cost rover that advances the

trusted rocker-bogie suspension system featured on every Mars rover since NASA's Sojourner. This passive system keeps relatively constant weight on all six wheels, thanks to pivot points and struts that enable each one to adapt to the changing surface. The mobility and autonomy advances developed at JPL for the ERNEST prototype rover could be infused into future NASA missions to previously inaccessible areas of the Red Planet or the Moon. Credit: NASA/JPL-Caltech

On ERNEST, the active suspension lets the rover manage weight distribution among its wheels. Two powered joints in front articulate a gimbal that allows the rover to drive using different gaits like squirming, wheel-walking, and obstacle-climbing. With a clutch mechanism, it can switch between active and passive suspension, which is less terrain capable but more energy efficient. With four steerable wheels, it can drive in any direction, including sideways. "We started by postulating that we could do better in designing a planetary surface robotic mobility system," said Hari Nayar, a JPL principal technologist leading the ERNEST team. "While the rocker-bogie system has been very successful over the past 30 years, there's been a lot of research in that time on mobility and understanding terrain interaction." Before arriving at today's version of ERNEST, the team built two earlier prototypes , each about 2 feet (0.6 meters) long, to test 11 active suspension configurations. In a trailer filled with lunar regolith simulant, they ran experiments at different slope angles over several months before landing on a final design. Then the team scaled up, including adding a rectangular head mounted on a 4.5-foot-tall (1.4-meter-tall) mast. The

hardware was completed in September 2024, but the rover still needed a human operator to joystick it, sending commands to instruct the rover on how to move over obstacles. In order to train the rover to think on its own, the ERNEST team turned to reinforcement learning, a type of artificial intelligence where the robot learns by interacting with its environment. The Dynamics and Real-Time Simulation Laboratory at JPL developed a high-fidelity virtual testing environment that replicates the rover's behavior. The team fed the simulator data collected by engineers who documented the response of the actual rover hardware to a variety of terrain types. On a high-performance computing cluster, the team ran many simulations at once, sometimes completing thousands of hours of tests over a single weekend. After months of virtual training, the ERNEST team was ready to see if the rover could use its new autonomous algorithms to figure out how to drive over terrain features that would halt a passive-suspension rover. They set up an obstacle course with sand ripples, rubble piles, steps, and steep slopes in JPL's Mars Yard, an outdoor terrain proving ground. Then they watched as the rover maneuvered the terrain on its own. Since then, ERNEST has completed many such courses. Nayar's team is starting a new autonomy project which involves integrating the rover's ability to determine when and how to use its active suspension with longer-range intelligent navigation. The goal is to enable ERNEST to plan an efficient path so that it can tackle surmountable obstacles and circumnavigate hazardous ones. These capabilities could contribute to potential future rover missions encountering

formidable landscapes on Mars or more rugged areas of the Moon. Work on ERNEST began in 2022 was initially supported by JPL internal research and development funds. It is currently funded by NASA's Mars Exploration Program and the agency's Exploration Science Strategy and Integration Office in its Science Mission Directorate at NASA Headquarters in Washington. Caltech in Pasadena, California, manages JPL for NASA. Media Contacts Karen Fox / Molly Wasser NASA Headquarters, Washington 240-285-5155 / 240-419-1732 karen.c.fox@nasa.gov / molly.l.wasser@nasa.gov Melissa Pamer Jet Propulsion Laboratory, Pasadena, Calif. 626-314-4928 melissa.pamer@jpl.nasa.gov 2026-040 Explore More 4 min read El Niño Is Underway Satellite observations of sea surface height indicated that the 2026 event continued to strengthen in... Article 3 days ago 5 min read NASA's Quantum Lab Aboard Space Station Gets Chilly Upgrade Article 5 days ago 3 min read Explore JPL to Take Place Oct. 10, 11 Article 5 days ago Keep Exploring Discover More Topics From NASA Earth's Moon The Moon makes Earth more livable, sets the rhythm of ocean tides, and keeps a record of our solar system's... Robotics Jet Propulsion Laboratory Solar System Exploration Program

Magnitude-4.5 Earthquake Information Statement

Magnitude-4.5 Earthquake Information Statement By Hawaiian Volcano Observatory June 17, 2026 On Wednesday, June 17, 2:14 a.m. HST, a magnitude-4.5 earthquake occurred 11 mi (17 km) southeast of Pāhala on the Island of Hawai‘i at a depth of 21 mi (33 km) below sea level. The earthquake had no apparent impact on either Mauna Loa or Kīlauea volcanoes. HAWAIIAN VOLCANO OBSERVATORY INFORMATION STATEMENT U.S. Geological Survey Wednesday, June 17, 2026, 2:50 AM HST (Wednesday, June 17, 2026, 12:50 UTC) Hawaiian Volcano Observatory Volcano Observatory Summary: Magnitude-4.5 earthquake near Pahala, Island of Hawai‘i HAWAIIAN VOLCANO OBSERVATORY INFORMATION STATEMENT On Wednesday, June 17, 2:14 a.m. HST, a magnitude-4.5 earthquake occurred 11 mi (17 km) southeast of Pāhala on the Island of Hawai‘i at a depth of 21 mi (33 km) below sea level. The earthquake had no apparent impact on either Mauna Loa or Kīlauea volcanoes. This earthquake is part of the seismic swarm under the Pāhala area, which has been going on since 2019. Earthquakes in this region have been observed at least as far back as the 1960s. See <https://www.usgs.gov/news/volcano-watch-why-do-so-many-deep-earthquakes-happen-around-pahala> for more information. The USGS Hawaiian Volcano Observatory continues to monitor Hawaiian volcanoes for any changes. EARTHQUAKE DESCRIPTION Magnitude: 4.5 Date and Time: June 17, 2026,

at 2:14 a.m. HST Location: 11 mi (17 km) SE of Pāhala Depth: 21 mi (33 km) below sea level Aftershocks are possible in the coming days to weeks

EARTHQUAKE INTENSITY AND AFFECTED AREA Potential Damage: No damage to buildings or infrastructure expected based on earthquake intensity Maximum Intensity, Modified Mercalli Scale (<https://www.usgs.gov/natural-hazards/earthquake-hazards/science/modifie...>)

Community-reported: IV - light shaking Instrument-derived: IV - light shaking Felt Reports: More than 169 within the first hour (<https://earthquake.usgs.gov/dyfi/>) Felt Area: Widely across the Island of Hawai‘i Visit NOAA’s Tsunami Warning Center website for updated information: <https://www.tsunami.gov/> ; **EARTHQUAKE MAPS AND ADDITIONAL INFORMATION** USGS National Earthquake Information Center Maps and Reports for this Event: <https://earthquake.usgs.gov/earthquakes/eventpage/hv74984492> ; USGS-HVO Interactive Earthquake Map of Hawai‘i: <https://www.usgs.gov/observatories/hawaiian-volcano-observatory/earthquakes> The Hawaiian Volcano Observatory is one of five volcano observatories within the U.S. Geological Survey and is responsible for monitoring volcanoes and earthquakes in Hawai‘i and American Samoa.

CONTACT INFORMATION: askHVO@usgs.gov Subscribe to these messages: <https://volcanoes.usgs.gov/vns2/> Summary of volcanic hazards from eruptions: <https://www.usgs.gov/observatories/hvo/hazards> Recent earthquakes in Hawai‘i (map and list): <https://www.usgs.gov/observatories/hvo> Explanation of Volcano Alert Levels and Aviation Color Codes:

<https://www.usgs.gov/programs/VHP/volcanic-alert-levels-characterize-conditions-us-volcanoes>

Technology & Innovation

In the Mountain West, a quantum computing collaboration announces major results

Sandia National Laboratories photonics researcher Forrest Hubert aligns an experimental chip with an optical waveguide carrying laser light. Sandia collaborates with quantum computing company Quantinuum to develop and test similar technologies. (Photo by Craig Fritz) Click on the thumbnail for a high-resolution image. ALBUQUERQUE, N.M. — A public-private partnership in the Mountain West announced today new results that mark steady progress toward the Department of Energy’s goal of fault-tolerant quantum computing, systems large and reliable enough to solve complex problems. Sandia National Laboratories, home to the DOE’s longest running quantum computing program, and tech company Quantinuum published a paper today in the scientific journal Nature that reports the performance of the company’s 98-qubit commercial system, Helios, which debuted last year. In operations that involved only one or two qubits, or quantum bits, the system demonstrated very high fidelity — 99.9975% and 99.921%, respectively. The results establish Helios as the company’s largest and most reliable quantum computer to date. Sandia senior manager Mike Descour lauded the findings as a success for the laboratory’s collaboration efforts within the quantum computing sector. “As a national resource, we are committed to accelerating quantum computing technology in support of economic and national security,” he

said. Sandia, the nation's premier engineering laboratory, assesses emerging opportunities and threats stemming from quantum information science for the U.S. government. These areas include cryptography, pharmaceutical research, energy science, advanced sensing and communications, all of which are key to national security. The paper was previously posted to the pre-print website arXiv . The new version in Nature has been peer reviewed, meaning the findings now have been scrutinized by third-party experts. Ongoing partnership advancing scalable hardware For more than 20 years, Sandia's quantum computing research and development program has combined the labs' engineering forte with expertise in computer modeling and world-class microelectronics and nanotechnology facilities to build, characterize and share working quantum devices on a variety of technology platforms. A laser illuminates the surface of a photonic integrated circuit at Sandia National Laboratories. (Photo by Craig Fritz) Click on the thumbnail for a high-resolution image. Throughout this time, Sandia has grown its portfolio of industry partnerships. The labs and Quantinuum have been working together for four years under a Cooperative Research and Development Agreement , which was renewed in May. Similar agreements are in place with several other quantum computing companies. "We welcome collaboration with any interested partner including universities, industry and other national laboratories," said Sandia photonics manager Chris DeRose. The partnership initially formed a few years after Sandia researchers had started developing foundational technologies in integrated photonics for trapped

ion quantum computers, the same style as Helios, at Sandia's Microsystems Engineering, Science and Applications complex. Integrated photonics are energy-efficient chips that carry information at the speed of light through microscopic optical channels. They promise to reduce the risks of quantum technology by lowering energy costs and improving scalability, which is key to building large, useful computers. Now, Sandia helps Quantinuum design and test these kinds of components for possible inclusion in future platforms. Quantinuum, which has its corporate headquarters located in Colorado, operates a research and development site in New Mexico, close to Sandia's main campus. Sandia conducted Helios assessment In the Nature paper, Sandia evaluated and certified the performance of the Helios system. The national laboratory has pioneered ways to debug quantum computers and used a variety of tests, including some of its own inventions, to assess Helios. Its researchers supplied a new benchmarking methodology to measure the performance of non-destructive readout operations, called mid-circuit measurements, that are essential for correcting quantum computing errors. "The most important aspect of today's quantum computers is not speed, but reliability," said Sandia's Robin Blume-Kohout, a co-author on the paper. Quantum computers use complex, experimental technologies that can fail in dozens of subtle ways, he explained, from an out-of-tune laser giving bad instructions to a single atom jiggling out of place. These problems degrade fidelity and limit performance. In the long term, Blume-Kohout said, helping companies solve these issues will help bring about quantum

computers that can tackle unsolved scientific problems. “We evaluate every aspect of quantum computer performance with our commercial partners to accelerate the advent of quantum supercomputing,” he said. In the near term, the new research results show the nation is reaching significant milestones along that path. “Helios operates beyond the capabilities of classical simulation alone and established a new benchmark of fidelity and complexity for quantum computers,” said Quantinuum’s Tony Ransford, Helios lead architect. Please visit our website for more information about how Sandia partners with quantum computing companies.

Mid-Atlantic Fishery Management: Science, Stewardship, and Shared Successes

One of the most innovative aspects of the Magnuson-Stevens Act was the establishment of eight regional councils to manage fisheries. Across the country, regional councils are tackling their own unique challenges, each shaped by their local coastal communities and united under a shared framework. In celebration of 50 years of the Act , we're presenting this eight-part series to highlight the landmark work of each region. Fisheries management decisions often involve difficult tradeoffs between conservation goals, economic pressures, and the needs of fishing communities. The Mid-Atlantic region became an early example of how collaborative, science-based management could work across state and federal waters. That commitment to collaboration helped shape early approaches to fisheries management that evolved into today's continued efforts. After Congress passed the Magnuson-Stevens Act in 1976 , eight newly formed regional councils became the foundation for fisheries management in the United States. In 1977, the Mid-Atlantic Fishery Management Council was one of the first councils to implement science-based fishery management plans in partnership with NOAA Fisheries, state agencies, fishermen, and scientists. Their first fishery management plan—covering both Atlantic surfclam and ocean quahog —marked the beginning of decades of innovation in fisheries science and management in the region.

Building a Foundation for Sustainable Fisheries Management Today, the Mid-Atlantic Council manages fisheries for 15 species under seven fishery management plans. The Council's fishery management plans designate more than 50 forage species and species groups as "ecosystem components." The Council works closely with NOAA Fisheries, the Atlantic States Marine Fisheries Commission , the New England Fishery Management Council , fishermen, researchers, coastal communities, and others to balance conservation goals with economic opportunities. "Industry are the ones who are on the water day in and day out. They have real-world experience and knowledge that complements any science. By listening and responding to industry feedback, we're able to continue to develop trust and confidence in the work being done." — Scott Curatolo-Wagemann, Senior Educator, Cornell Cooperative Extension A hallmark of the Mid-Atlantic region is its collaborative approach between federal and state managers. The Council and the Commission jointly manage several important fisheries across state and federal waters, including commercial and recreational fisheries for summer flounder , scup , black sea bass , and bluefish . This level of coordination across jurisdictions is relatively uncommon nationally, and has been an effective approach for cooperative fisheries management of interconnected resources. More on cooperative research efforts with the fishing industry Summer Flounder Summer flounder, also known as fluke, is one of the most valuable commercial and recreational flatfish fisheries along the Atlantic coast. In 2024, recreational and commercial landings totaled 5.5 million and 8.9 million pounds,

respectively, with the commercial harvest valued over \$28 million. But in the mid-1980s, the stock had become overfished. Managers were concerned fishing pressure would continue to increase as fishermen sought alternatives to depleted groundfish fisheries in New England. Given fluke's distribution across both inshore and offshore habitats, the Council and the Commission recognized the need for coordinated management across state and federal waters. They developed a joint management plan that was implemented in 1988. The plan implemented science-based catch limits, rebuilding schedules, size limits, reporting requirements, and other measures. Over time, those measures helped rebuild the stock and created a coordinated management system between state and federal partners. In 1996, the plan was amended to include black sea bass and scup, and in 2012 NOAA Fisheries formally declared summer flounder rebuilt. Management of the fishery remains challenging today, as environmental conditions, species distribution ranges, and harvesting methods continue to evolve. But the fishery is often cited as an important example of successful, long-term rebuilding of a stock through cooperative management. "The future needs mutual trust. Both fishermen and managers can fall into rigid ways of thinking, and having an open mind is important for fostering collaboration." — Captain Mark Phillips, F/V Prevail, New York

Video: Summer flounder resting on an oyster cage Atlantic Surfclam and Ocean Quahog One of the region's most influential management efforts stemmed from Atlantic surfclam and ocean quahog fisheries. By the late 1980s, managers had implemented strict controls to prevent overfishing.

Those measures—including permit limits, harvest quotas, and trip restrictions—protected the shellfish, but they also created a highly competitive system for fishermen. Vessels raced to catch as much as possible before quotas were met, flooding markets with product, reducing profitability, and encouraging unsafe fishing practices. In 1990, the Mid-Atlantic Council implemented the nation’s first Individual Transferable Quota program—also known as a catch share system—for surfclams and ocean quahogs. Under the program, fishermen receive a share of the annual quota that they can harvest, lease, or sell. The system allows fishermen greater flexibility in deciding when and how to fish while keeping total harvest within scientifically-established limits. Supporters of catch share programs highlight improvements in safety, efficiency, profitability, and long-term business stability. By reducing competitive pressure, fishermen can operate in safer conditions and better match supply with market demand. However, critics have raised concerns that quota ownership can consolidate over time, potentially making it harder for smaller operators or new fishermen to enter the fishery. The council plans to work with the industry over the next several years to address these concerns. Today, catch share systems are used in nearly every U.S. fishery region. The surfclam and ocean quahog program helped demonstrate how science-based catch limits and industry flexibility could work together to support both conservation and economic stability. NOAA and partners conduct Atlantic surfclam research An Ecosystem Approach to Fisheries Management As scientists and managers learned more about how species

and their habitats are connected, the Mid-Atlantic Council has worked to transition beyond managing fisheries one species at a time. They are moving toward an approach that manages fisheries within a broader ecosystem context. In 2015, the Council became the first in the nation to exercise new authority —granted under the Magnuson-Stevens Act—to protect deep-sea coral habitat from fishing impacts. Using NOAA coral exploration data , the Council designated more than 41,000 square miles of federal waters as the Frank R. Lautenberg Deep-Sea Coral Protection Area . The specific boundaries of the deep-sea coral protection area were developed cooperatively by members of the Council’s advisory panels, deep-sea coral experts, fishing industry members, and other stakeholders, resulting in a broad consensus. The protections limit the use of bottom-tending fishing gear in sensitive coral habitats that support marine biodiversity and ecosystem health. In 2016, the Council expanded its ecosystem approach by designating more than 50 unmanaged forage species as “ecosystem components.” This allows them to establish possession and landing limits to prevent new directed fisheries for those species in the region. Foragespecies—which tend to be small, short-lived fish and invertebrate species—play a critical role in the marine food web. They are prey for larger fish, seabirds, marine mammals, and other predators. Previously, many forage species were not actively managed or monitored. The Council’s Forage Amendment took steps to protect these species and the broader ecosystem as scientists continue to work to improve our understanding of their role in ecosystem health. Together,

these efforts are part of a shift toward managing fisheries as interconnected parts to a whole, rather than focusing on individual species. Learn more about the Council’s ecosystem approach to fisheries management

Looking Ahead

The Mid-Atlantic region continues to face new challenges linked to shifting ocean conditions, evolving fisheries practices, and the economic realities facing fishing communities. To adapt, NOAA Fisheries, the Council, and regional partners are working together to:

- Modernize electronic reporting
- Update the process for setting recreational management measures
- Expand cooperative research with fishermen

One recent project partnered with the F/V Seacapture and TeemFish to collect video-based length data for golden tilefish , a species that is difficult to monitor through traditional surveys. The project has already generated more than 7,000 length estimates to support future stock assessments.

“The next 50 years of fisheries management will certainly look different from the last 50. New technologies, changing ocean conditions, and evolving fisheries will require us to continue to learn and adapt. The Mid-Atlantic Council is well positioned for that future as innovation and collaboration have always been at the core of how we approach our work. These principles will be critical as we prepare for and address the challenges and opportunities ahead.” — Dr. Christopher Moore, Executive Director, Mid-Atlantic Fishery Management Council

Looking ahead, long-term science, habitat protections, and collaboration will remain central to sustaining fisheries for future generations in the Mid-Atlantic.

Hiding who you are can have real effects on your mental health

The decision to reveal or conceal a core part of one's identity may seem like a small, everyday choice, but new research suggests those moments can have meaningful consequences for emotional well-being. The study found that sexual and gender minority (SGM) young adults who felt compelled to hide their identities were more likely to experience emotional distress and uncertainty about themselves. In contrast, participants who felt able to be open about who they are reported greater confidence, self-understanding, and positivity. The findings offer a rare glimpse into the day-to-day experiences that shape mental health among sexual and gender minority individuals—a population that experiences higher rates of depression than their non-SGM peers. The research adds to growing empirical evidence for something many of us intuitively understand: Social norms and institutional policies that limit identity expression have a very real negative mental health impact, not just in the long term but in each moment that someone feels pressure to hide an important piece of themselves, says Sienna Nielsen, a University of Michigan psychology graduate student and study lead author. According to Nielsen and colleagues, building a strong queer community to resist this effect is crucial in a period of intense anti-LGBTQ+ attitudes and legislation. Many studies have documented mental health disparities among sexual and gender minority populations, but we know much less about how those

challenges unfold in everyday life. “Our findings suggest that daily experiences related to identity visibility may play an important role in emotional well-being,” Nielsen says. The researchers followed 252 SGM young adults over eight days, collecting more than 4,300 real-time reports about participants’ emotions, identity experiences and social interactions. The study primarily included bi+ cisgender women and nonbinary individuals assigned female at birth. The researchers examined how participants felt when they concealed or openly expressed their sexual or gender identities. They found that moments of concealment were associated with greater emotional strain and lower confidence in one’s sense of self. Conversely, being open about one’s identity was linked to stronger feelings of self-clarity and identity positivity. While the researchers did not find a direct link between these day-to-day experiences and depression symptoms during the study period, negative emotions appeared to play an important indirect role, particularly when participants felt pressure to hide aspects of who they were. The findings highlight how seemingly ordinary interactions can accumulate over time and influence emotional health. “Being able to live authentically may help reinforce a stronger sense of self, while concealing important aspects of identity can create emotional challenges that affect daily well-being,” Nielsen says. The researchers say the study provides an important foundation for future work aimed at understanding and reducing mental health disparities among sexual and gender minority populations. The study appears in *Clinical Psychological Science* . Additional coauthors are from UM and the University of

Pittsburgh. The research was supported by the University of Pittsburgh Clinical and Translational Science Institute. Source: University of Michigan The post Hiding who you are can have real effects on your mental health appeared first on Futurity .

Activity Time - Word Search

Find the words below in the puzzle. Words go across or down only.

Words to Find:

