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"If you ask me what I came to do in this world, I, an artist, will answer you: I am here to live out loud."

— Émile Zola

NASA's Hubble Discovers First of Star Cluster's Missing Black Holes

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scarce. Now, astronomers using archival data from NASA's Hubble Space Telescope and supportive observations from NASA's James Webb Space Telescope have finally located their first stellar-mass black hole in this cluster. Discovering the first of this missing black hole population will help refine current theories on black hole formation within environments such as Omega Centauri. The team's findings published Monday in *The Astrophysical Journal Letters*. Omega Centauri is composed of 10 million gravitationally bound stars. Though the astronomical community previously found evidence with Hubble that an intermediate-mass black hole lurks at its center, models suggest this star cluster should also contain about 10,000 smaller, stellar-mass black holes. This notable population of black holes evaded detection in previous observational studies, which used the radial velocity method or looked for radio and X-ray emission from material falling onto black holes. This new discovery features a different approach, known as astrometry, to measure very small movements of stars over time. By sifting through more than 20 years of Hubble archival data and pulling in recent Webb data to further refine their astrometric measurements, the team located a star orbiting an invisible object so hefty that it has to be a black hole. Dubbed oMEGACat BH-2, it is the first stellar-mass black hole detected in Omega Centauri, and it has some surprising qualities. oMEGACat BH-2 has a lower-than-expected mass and, with its visible star companion, the black hole-star duo has the longest orbital period of any black hole binary system known to date. "With Hubble and Webb data, we were able to see the motion of the

visible main sequence star that is part of this binary, which is about 18,000 light-years away in the dense environment of Omega Centauri,” said Matthew Whitaker of the University of Utah, Salt Lake City, lead author of the paper. “The precision of these measurements is incredible, down to a fraction of a pixel on Hubble and Webb’s detectors. It would not have been possible to find this black hole without these two space telescopes.” Astronomers found Omega Centauri’s first stellar-mass black hole, which has a visible star companion that is shown in greater detail. They used 20-plus years of data from NASA’s Hubble Space Telescope and recent data from NASA’s James Webb Space Telescope to make the discovery. Image: ESA, NASA, Maximilian Häberle (MPIA), Joseph DePasquale (STScI)

The team’s findings refine a past study by a different group of scientists that suggested this binary system included a neutron star. By expanding Hubble data from the earlier investigation with archival Hubble astrometric measurements from 2002 to 2023, and pulling in Webb near-infrared data to improve precision, the University of Utah-led team was able to better constrain the mass of the visible star’s dark companion, ruling out the neutron star possibility. “While we already knew that the star was 0.78 solar masses, we can now calculate the black hole’s mass, which is 4.46 solar masses and therefore too heavy to be a neutron star. However, its mass is much lower than would be expected in a metal-poor environment like Omega Centauri. This is surprising and exciting,” said Anil Seth of the University of Utah, a coauthor of the study. “We now know that a metal-poor star is able to form a black hole like this, and we need to figure

out how that happens. This detection is providing some data to those who do that kind of modeling.” Long time coming Based on the precise data from Hubble and Webb, the team could chart the star’s path over 20-plus years, during its closest approach to its black hole companion when it moved the fastest across the sky. From the extensive data, the team determined that the visible star orbits oMEGACat BH-2 once every 94 years, making it the longest-period black hole binary ever known. Its long orbital period also gives a clue to the origin of this binary system. It was probably dynamically formed, meaning the star and its black hole companion did not start out together but rather found each other in this cluster. The researchers calculated that a system like oMEGACat BH-2 will survive for less than a billion years before it is torn apart by encounters with nearby stars, a much shorter span than the age of the cluster (approximately 12 billion years old). “It’s important to understand black hole populations in globular clusters because there’s uncertainty about their physics and formation,” said Seth. “More specifically, understanding the process of forming black holes and then dynamically forming binaries is vital, because it affects our ability to interpret and understand gravitational wave events . Environments like Omega Centauri are the primary places where we think binaries are merging and creating these waves.” The team’s discovery of stellar-mass black hole oMEGACat BH-2 with the Hubble-Webb dataset is just the start of finding these evasive black hole populations in globular star clusters. “With Hubble and Webb, we can continue to look at Omega Centauri and expand our search

for similar systems within other clusters,” said Whitaker. “We’re also very excited for the launch of NASA’s Nancy Grace Roman Space Telescope because it will image the crowded galactic bulge, including the galactic center , very regularly with Hubble-like resolution and with a much wider field of view. We’re hoping we’ll be able to find black hole binary systems like this one because of the regular cadence of Roman’s observations.”

The Hubble Space Telescope has been operating for over three decades and continues to make ground-breaking discoveries that shape our fundamental understanding of the universe. Hubble is a project of international cooperation between NASA and ESA (European Space Agency). NASA’s Goddard Space Flight Center in Greenbelt, Maryland, manages the telescope and mission operations. Lockheed Martin Space, based in Denver, also supports mission operations at Goddard. The Space Telescope Science Institute in Baltimore, which is operated by the Association of Universities for Research in Astronomy, conducts Hubble science operations for NASA.

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Related Images & Videos
Omega Centauri Context Image
Astronomers found Omega Centauri’s first stellar-mass black hole, which has a visible star companion that is shown in greater detail. They used 20-plus years of data from NASA’s Hubble Space Telescope and recent data from NASA’s James Webb Space Telescope to make the discovery.

Star Orbiting Black Hole Animation
The precise data collected by NASA’s Hubble and James Webb space telescopes enabled a team of astronomers to chart the visible star’s

orbital path over a 20 year-plus period. Share Details Last Updated Jul 13, 2026 Editor Andrea Gianopoulos Location NASA Goddard Space Flight Center Contact Media Claire Andreoli NASA's Goddard Space Flight Center Greenbelt, Maryland claire.andreoli@nasa.gov Related Terms Hubble Space Telescope Astrophysics Astrophysics Division Black Holes Globular Clusters Goddard Space Flight Center James Webb Space Telescope (JWST) Stars Related Links and Documents Academic Paper: A Long Period Stellar-mass Black Hole Binary in Omega Centauri This release on the ESA/Hubble website. Keep Exploring Discover More Topics From Hubble Hubble Space Telescope Since its 1990 launch, the Hubble Space Telescope has changed our fundamental understanding of the universe. Hubble Science Highlights Hubble's most notable scientific discoveries reflect the broad range of research and the breakthroughs it has achieved. Hubble Images Explore Hubble's iconic images of the universe, and view photos of mission operations and astronauts servicing Hubble in space. Caldwell 80 Better known as Omega Centauri, Caldwell 80 is home to around 10 million stars.

Magnitude-4.5 Earthquake Information Statement

Magnitude-4.5 Earthquake Information Statement By Hawaiian Volcano Observatory July 13, 2026 On Thursday, July 9, 8:17 p.m. HST, a magnitude-4.5 earthquake occurred 34 mi (54 km) west-southwest of Captain Cook on the Island of Hawai‘i at a depth of 24 mi (39 km) below sea level. HAWAIIAN VOLCANO OBSERVATORY INFORMATION STATEMENT U.S. Geological Survey Thursday, July 9, 2026, 9:30 PM HST (Friday, July 10, 2026, 07:30 UTC) Hawaiian Volcano Observatory Volcano Observatory Summary: On Thursday, July 9, 8:17 p.m. HST, a magnitude-4.5 earthquake occurred 34 mi (54 km) west-southwest of Captain Cook on the Island of Hawai‘i at a depth of 24 mi (39 km) below sea level. HAWAIIAN VOLCANO OBSERVATORY INFORMATION STATEMENT On Thursday, July 9, 8:17 p.m. HST, a magnitude-4.5 earthquake occurred 34 mi (54 km) west-southwest of Captain Cook on the Island of Hawai‘i at a depth of 24 mi (39 km) below sea level. The earthquake had no apparent impact on either Mauna Loa or Kīlauea volcanoes. The depth and location of this earthquake indicate it is another lithospheric flexure earthquake related to bending of the ocean crust and upper brittle mantle (the lithosphere) by the weight of the islands. No impact to the ongoing eruption of Kīlauea volcano is expected. The USGS Hawaiian Volcano Observatory continues to monitor Hawaiian volcanoes for any changes. EARTHQUAKE DESCRIPTION Magnitude: 4.5 Date

and Time: July 9, 2026, at 8:17 p.m. HST Location: 34 mi (54 km) WSW of Captain Cook Depth: 24 mi (39 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/modified-mercalli-intensity-scale>) Community-reported: IV - light shaking Instrument-derived: III - light shaking Felt Reports: There were 275 within the first hour (<https://earthquake.usgs.gov/dyfi/>) Felt Area: Across the Island of Hawai‘i, and as far as O‘ahu 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/hv75000056> 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>

U.S. Fish and Wildlife Service Completes 90-day Finding for Diamondback Terrapin

Press Release U.S. Fish and Wildlife Service Completes 90-day Finding for Diamondback Terrapin Jul 13, 2026 The U.S. Fish and Wildlife Service has completed the 90-day finding on a petition to list the diamondback terrapin under the Endangered Species Act. The petition presented substantial new information, and the Service will initiate a 12-month review of the species to determine if listing is warranted. The diamondback terrapin is found along the Atlantic and Gulf coasts in 16 states from Massachusetts to Florida and west to Texas. It is the only turtle species in North America that lives in brackish coastal waters, which are saltier than fresh water but less salty than sea water. The next step is to begin a status review of this species. During the status review, the Service will fully evaluate potential threats to the species and review the best scientific and commercial information available. This review will determine whether listing the species under the Endangered Species Act is warranted, not warranted, or warranted but precluded. The Service invites anyone with scientific and commercial data or other information regarding the species and factors that may affect its status to submit that to the Service to inform this review. If the Service determines that listing the diamondback terrapin as a threatened or endangered species is warranted, the agency will publish a proposed rule in the Federal Register and

provide the public with an opportunity to comment on the proposed listing. While the status review is underway, the Service will continue working with partners to conserve this species and its habitat. The 90-day finding will be published in the Federal Register on Tuesday, July 14. The documents are available for public viewing today in the Federal Register Reading Room . Contact: U.S. Fish and Wildlife Service Northeast Region Public Affairs: fws_press_r5@ios.doi.gov Photos for media use: Diamondback terrapin on beach Diamondback terrapin basking on a log Press Release Published Jul 13, 2026 Endangered Species Act Latest Press Releases Endangered Species Act 90-day Finding for Plains Spotted Skunk Jul 13, 2026 Endangered Species Act Department of the Interior Restores Clear ESA Enforcement by Rescinding Misguided "Harm" Definition Jul 10, 2026 Feral Swine Control at Wichita Mountains Jul 5, 2026

Australia's Brewarrina fish traps may be the oldest human construction in the world

Pre-colonial aquaculture system a spectacular example of Indigenous innovation and social complexity Originally published on Global Voices Brewarrina Fish Traps October 2025 – author's photo Australia has two of the world's oldest aquaculture sites, where fish and eels were farmed by Indigenous people for thousands of years. The Brewarrina fish traps are located on the Barwon River in northern New South Wales. They are also called Baiame's Ngunnhu, Nonah, or Nyemba Fish Traps. The site was included on the Places in the National Heritage list in 2005. It was a gathering place for eight different tribes, with up to 3,000 people living in the area before colonisation. The Ngemba people are the traditional custodians of this important site. The Ngemba believe that: The ancestral being Baiame revealed the innovative design of the traps by throwing his net over the river. With the help of his two sons, Baiame built the fishtraps in the shape of this net. Flinders University's Claire Smith, Gary Jackson and Jordan Ralph, included the traps in their discussion of potential Indigenous World Heritage sites at The Conversation : Nearly half a kilometre long, the fishtraps' design and complexity is extraordinary. Dry-stone weirs and ponds were designed to take advantage of the specific configuration of the landscape and seasonal changes in river flows. The pond gates are strategically located to trap fish as they migrate both

upstream and downstream. For thousands of years, these distinctive traps have been used to catch fresh water fish. Controversial former Vice-Chancellor of the Australian National University, anthropologist Genevieve Bell, touched on the importance of Brewarrina in a 2020 seminar: First-time visitor TikTok user JAGS.global posted this birdseye view of the traps, commenting: @jags.global First time visiting the fish traps at Brewarrina, and I am honestly blown away. It is such a stunning, deeply powerful place. It wasn't just a local fishing spot; it was a major meeting ground for so many different First Nations. The Ualarai, Morowari, Koamu, Kamilaroi, Weilwan, Baranbinja, and Kula peoples all connecting right here along the river systems. Nations from all over the region would travel down the Darling, Warrego, Culgoa, and Bogan rivers to gather, trade, and share culture at these incredible stone traps. Standing here and realising the sheer scale of the history and connection to that Country is unforgettable. Highly recommend making the trip if you ever get the chance. Respect to the Ngemba people, the mob who belong to that land. #Brewarrina #IndigenousHistory #AboriginalAustralia #FishTraps #TravelAU 🎵 origineel geluid – ReturntoPeace | Healing Music It wasn't just a local fishing spot; it was a major meeting ground for so many different First Nations. The Ualarai, Morowari, Koamu, Kamilaroi, Weilwan, Baranbinja, and Kula peoples all connecting right here along the river systems. This video from The Fishing Shed Bathurst is just one of many on YouTube: It has been suggested that these fish traps may be the oldest human construction in the world, dating back thousands of years.

There are even claims that they are 40,000 years old. Some research suggests that they may be only 1,000 years old. However, their age has not been scientifically verified. Archaeologist Duncan Wright pointed out in 2015 that: Even if the traps are only 1,000 years old, it doesn't detract from their importance... They remain a remarkable example of Aboriginal innovation, an ability to understand and exploit the natural landscape and form one part of a growing body of work that challenges how hunter-gatherer Australian societies have long been perceived. There has been much debate about Bruce Pascoe's best-selling book, *Dark Emu*. He cites Brewarrina fish traps as "an example of evidence of pre-colonial agriculture and building construction by Aboriginal and Torres Strait Islander peoples". Read more: [Australia's Budj Bim features one of the world's oldest aquaculture systems](#) This sketch was published in 1983 by Lindsay G. Thompson for the World Columbian Exposition in Chicago. However, considerable damage was caused by construction works on the river both before and after the sketch was made. [Sketch of Brewarrina Fishery 1893](#) – Courtesy Freshwater and Marine Image Bank, University of Washington, Public domain, via Wikimedia Commons, Public domain Anna Clark, Professor in Public History at the University of Technology Sydney, has a wide-ranging discussion of Indigenous fishing practices at [The Conversation](#) in "Friday essay: traps, rites and kurrajong twine — the incredible ingenuity of Indigenous fishing knowledge". She points out that: There were even more Ngunnahu once, until they were pushed aside to make way for paddle-steamers taking the wool clip down to Adelaide in

the late 19th century. According to the peak indigenous body for western New South Wales, the Murdi Paaki Regional Assembly (MPRA), The creation of the fish traps, and the Aboriginal Lore governing their use, helped shape the spiritual, political, social, ceremonial, and trade relationships between Aboriginal groups from across the greater landscape. The fish traps were an important site of food production, work, trade and consumption. Brewarrina Aboriginal Cultural Museum is popular with tourists. Its Facebook page records many of their visits and posts numerous videos of the traps. Its manager, Bradley Hardy, is an enthusiastic advocate for this remarkable example of Indigenous heritage: Written by Kevin Rennie

A COMPASS for driving faster commercialization of lab technology

Sandia National Laboratories' material scientist Dorina Sava Gallis holds an optical tag containing printable security ink designed to detect counterfeit goods . (Photo by Craig Fritz) Click on the thumbnail for a high-resolution image or video . ALBUQUERQUE, N.M. — America's national labs produce some of the most advanced science in the world, but turning discoveries into commercialized technologies can be a challenge. That's where COMPASS , a new program spearheaded by Sandia National Laboratories and SLAC National Accelerator Laboratory, comes in. "Sandia creates technologies. We don't create companies, so there's a gap," said David Kistin, Sandia's manager of technology and economic development. Sandia's technology transfer team saw an opportunity to fill that gap. With help from SLAC and the Department of Energy's Office of Technology Commercialization , COMPASS was born. "Venture capital is increasingly shaping how emerging technologies move from early discovery to real-world impact," said Mary Monson, Sandia's senior manager of Technology Partnerships and Business Development. "If we want Sandia technologies to reach new markets and scale, we need to be part of that ecosystem and build partnerships with non-traditional collaborators." Traditionally, national labs have advanced technology through licensing, university and industry collaborations, cooperative research agreements and strategic partnership projects. COMPASS builds on those pathways by

more directly engaging venture capital, entrepreneurs and startup networks. COMPASS stands for Commercialization Pathways for Accelerating Scientific Solutions. The program focuses on bringing new technologies to the marketplace by building businesses around those technologies. “Venture capitalists don’t invest in technology alone; they invest in companies,” Kistin said. “The goal is to get investor participation and feedback from the beginning. They bring experience working with founders and building companies along with the networks needed to help new ventures take shape.” Successful commercialization often requires the right investor at the right time. The goal is to develop six venture-capital ready companies from the most impactful technologies across the national labs and sites, to include Sandia, SLAC, National Laboratory of the Rockies, Kansas City National Security Campus, and Los Alamos, Lawrence Berkeley, Brookhaven, and Savannah River National Laboratories. To launch COMPASS, the team identified 30 promising technologies to present to investors. The investors will be actively involved in which technologies are developed, setting road maps and funding the technologies’ development. Amir Borna, standing, and Peter Schwindt demonstrate their quantum-sensor based magnetoencephalography system created at Sandia National Laboratories, designed to monitor brain activity in real time. (Photo by Randy Montoya) Click on the thumbnail for a high-resolution image Projects from Sandia include: AIMs , a printable security ink designed to detect counterfeit drugs. Aleph Semiconductor, a memory and switching layer designed to address a gap in quantum computers.

Alethia materials, which reveal if a container has been tampered with without opening it. Strand , a re-shaped more affordable carbon fiber. OPM Brain Imaging, which monitors brain activity in real time. Ohmic AI, an advanced AI interference detector. “More than ever investors want to take a role in building the companies, not just a stake in the outcome,” said Alex Rousina-Webb, manager of technology transfer at SLAC National Accelerator Laboratory and co-lead of COMPASS. “We select technologies that can scale in markets that investors have identified as dynamic, build strong teams around these technologies, and run a level of due diligence you don’t usually see in programs like this. Sandia co-founded COMPASS with SLAC. Like Sandia, SLAC creates new technologies and its location in California, Silicon Valley positions it well to connect with investors. “Too many breakthrough technologies developed at national labs fail to reach the market because the bridge from invention to capital has not been built,” Rousina-Webb said. “We think a more curated approach can help the most impactful technologies leave the labs and reach the markets that need them.” Three-lobe carbon fiber geometries identified by researchers at Sandia National Laboratories and produced by Oak Ridge National Laboratory, improve carbon fiber performance for cost-driven applications. (Photo courtesy of Sandia National Laboratories) Click on thumbnail for a high-resolution image or video explaining the technology. Sandia is also well-positioned to engage venture capital funds because of its relationship with the New Mexico State Investment Council, or SIC, which is tasked with growing the state’s permanent fund.

According to the SIC, its venture arm has committed more than \$2 billion to 30 top-tier venture capital firms over the past three years and in 2025 alone generated more than \$2.6 billion in projected economic impact in New Mexico. “New Mexico has a prolific history of innovation, and the SIC’s Strategic Venture Capital Program is designed to amplify the state’s strengths, including technology and talent from our national laboratories,” said Chris Cassidy, the council’s director of private equity and venture capital. “Our program has already supported the creation of hundreds of high-wage permanent jobs for New Mexicans. COMPASS should bring even more.” COMPASS also has the support of the Department of Energy’s Office of Technology Commercialization, which has awarded the program \$8.4 million in funding over three years. “The Energy Department’s National Laboratories are generating technologies with enormous commercial potential, but technical excellence alone is not enough to bring those innovations to market,” said DOE’s Chief Commercialization Officer and Director of the Office of Technology Commercialization Anthony Pugliese. “COMPASS is testing a unique commercialization model designed to strengthen the pathway from laboratory innovation to market adoption. We supported this effort because it has the potential to accelerate the formation of high-impact companies around DOE technologies, and we’re excited to see what this approach can deliver.” As a federally funded research and development center, Sandia develops technologies to strengthen the nation’s technological superiority. To fully deliver on that mission, those innovations must reach the marketplace. The

COMPASS team believes this program is uniquely positioned to help. “These startups bring innovative thinking. They are agile and move quickly, but they lack the deep national security experience and the large-scale facilities that we have,” Monson said. “It’s a good match-up because they bring things that we need and we bring things that they need.” “We’re hoping that the impact of these companies will get really big,” Kistin said. “We are looking for home runs, not base hits.”

Activity Time - Word Search

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

Words to Find:

X	Q	O	O	J	V	Y	D	L	E	I
Q	D	E	G	M	W	N	Z	M	V	E
B	N	A	Z	V	A	D	C	L	D	M
O	G	G	S	P	W	P	R	O	O	O
V	V	F	V	Y	C	Z	J	Z	Q	B
B	Q	M	J	S	E	U	S	X	X	Q
N	Z	V	V	Y	M	S	U	L	C	P
J	W	X	A	Q	U	W	A	L	J	H
N	O	T	H	M	J	I	P	S	M	U
L	K	J	N	X	P	O	W	Z	I	C
N	Q	L	K	R	V	U	G	O	D	N