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IS THE MILKY WAY A STRANGE GALAXY?

NEW CLUES ABOUT OUR OWN HOME

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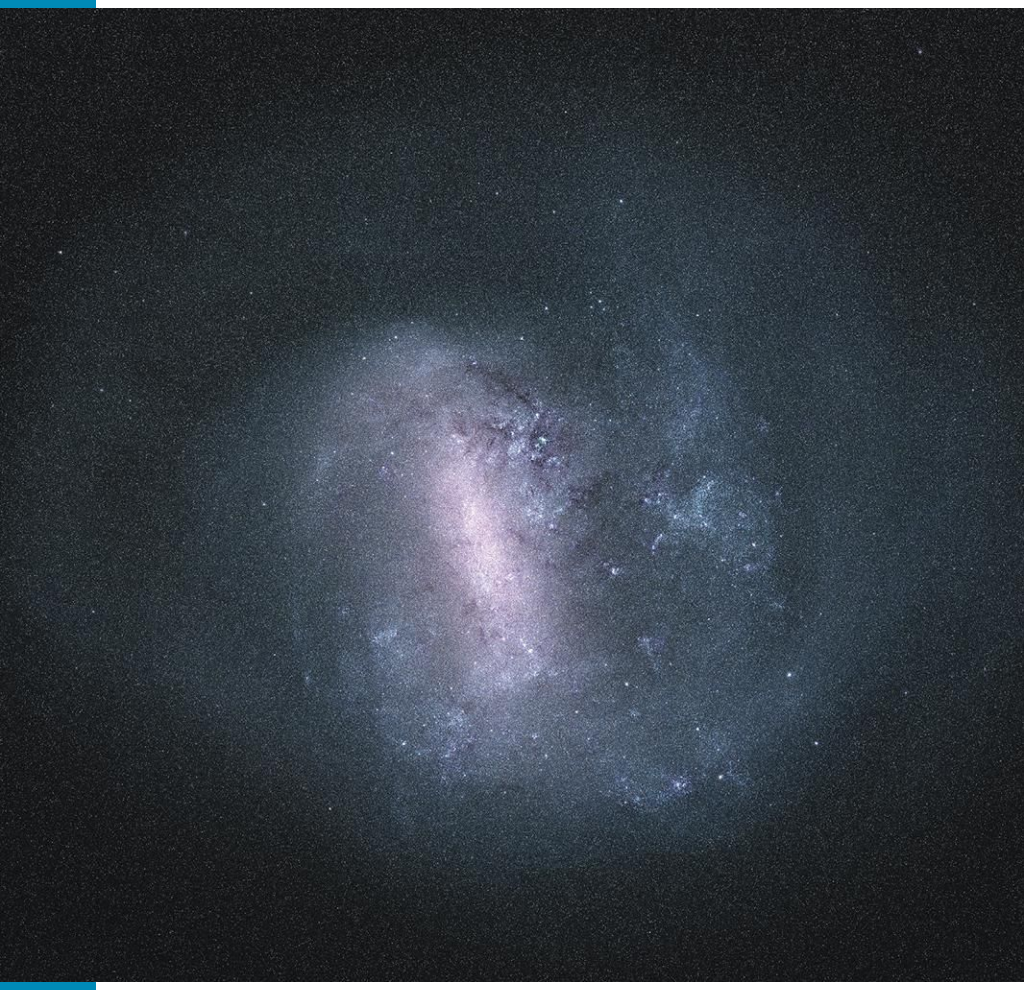
THE LMC MIGHT HAVE A SUPERMASSIVE BLACK HOLE

Fast-moving stars in the Milky Way originated in the Large Magellanic Cloud, where a central black hole may have kicked them out.



NEAR NEIGHBOR. The Large Magellanic Cloud is a dwarf galaxy gravitationally bound to the Milky Way. Astronomers have now uncovered strong evidence that it hosts a 600,000-solar-mass black hole. ESA/GAIA/DPAC

The Large Magellanic Cloud (LMC) is one of the Milky Way's closest neighbors. It's also one of the only galaxies outside our own where telescopes can resolve individual stars and small-scale structure.

While large galaxies host central supermassive black holes (SMBH) as a rule, dwarf galaxies like the LMC are more mixed. But a new analysis of data from the European Space Agency's Gaia space telescope indicates the LMC may indeed have a central black hole weighing 600,000 times as much as the Sun. The research, led by Jiwon Jesse Han of the Harvard-Smithsonian Center for Astrophysics, has been accepted for publication in *The Astrophysical Journal*.

SPEEDY STARS

The discovery comes from studying hypervelocity stars in the Milky Way. These stars are moving rapidly — up to 2.2 million mph (3.6 million km/h), instead of cruising along with the stars around them.

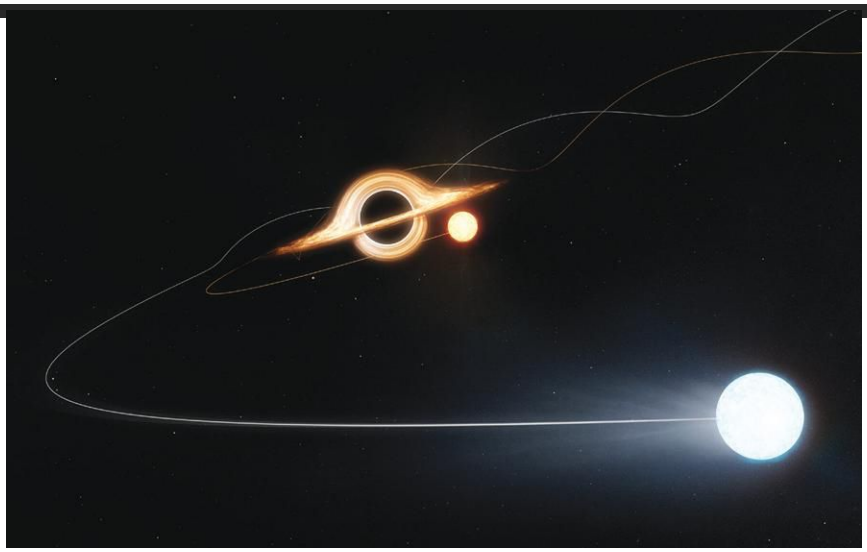
Astronomers thought that most hypervelocity stars resulted from an encounter with the Milky Way's SMBH, as black holes can "kick" a star to higher speeds than supernovae or interactions with other stars. But when Han, a graduate student at Harvard University, looked at a batch of hypervelocity stars in the Gaia data, he tracked their path back not to the Milky Way's core, but to the LMC.

Han's team found these stars clustered on the sky in a tight group, dubbed the Leo Overdensity. That gave a big clue to their origin. If the stars had come from the Milky Way's disk, they would be more spread out on the sky. "Only an ejection from the center of the LMC can produce an overdensity as tight as the Leo Overdensity," Han tells *Astronomy*.

In 2016, astronomers Douglas Boubert and Wyn Evans from the University of Cambridge proposed an SMBH in the LMC as the culprit for the Leo Overdensity. But more precise data was needed. "Using the latest data from Gaia, Jesse and his stellar team of co-authors have proven [our] outlandish theory," says Boubert.

FITTING IN

Every large galaxy contains an SMBH, whose size scales with the size of the



GAINING SPEED. One way astronomers think hypervelocity stars gain their speed is through interactions with a black hole, as in this artist's concept. Here, a binary system that came too close to a black hole is torn apart, with one star (orange) remaining in orbit around the black hole and the other (blue-white) flung away as a hypervelocity star. CFA/MELISSA WEISS

galaxy. But dwarf galaxies don't always follow this rule.

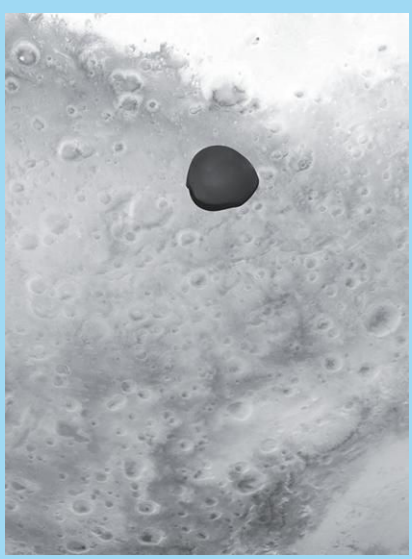
Han's team calculated the black hole mass needed to eject stars at the measured velocities, and found it should be roughly 600,000 solar masses. That turns out to be an excellent fit to the expected mass of an SMBH in the LMC, based on the known galaxy-black hole mass relationship.

"So, while it's rather surprising how we found evidence for the SMBH, the actual mass of the SMBH is totally within reason, and should've been somewhat expected," Han says.

Astronomers will seek to confirm the existence of the LMC's SMBH through additional observations. Promisingly, the data Han used is from only the first three years of Gaia's mission; more data will come in 2026 and at the end of the decade. That will let astronomers better pin down how stars move, both in our galaxy and in the LMC, more clearly illuminating their shared history. – KOREY HAYNES

A quick peek at Deimos

AS IT FLEW BY MARS March 12, the European Space Agency's flagship planetary defense mission Hera snapped pictures of the moon Deimos. The flyby was a gravity assist to the mission's final destination: the binary asteroid system Dimorphos and Didymos. But the mission also took the flyby as an opportunity to test some of its scientific equipment. Hera's vantage point allowed it to survey the little-studied farside of the tidally locked 7.7-mile-wide (12.4 kilometers) moon. This black-and-white image was taken by Hera's Asteroid Framing Camera. Once Hera arrives at its destination, the camera will image the impact crater left in 2022 by NASA's Double Asteroid Redirection Test. – SAMANTHA HILL



ESA

QUICK TAKES

GALACTIC DISCO BALL

The disk of gas and dust surrounding the Milky Way's central black hole lights up with continuous flares, finds JWST in research published Feb. 18. The bursts of light are thought to be analogous in nature to solar flares.

ANCIENT IMPACT

Researchers have discovered what could be Earth's oldest known impact crater, in Western Australia's Pilbara region. The over-60-mile-wide (100 km) feature is an estimated 3.5 billion years old, predating the previous record-holder by 1.3 billion years.

LIFE'S TINY SPARK

A Stanford University team has found that when sprayed, water droplets collide and produce electrical charges that cause "microlightning," which forms organic molecules essential for life. This suggests life could have formed on early Earth through crashing waves, not lighting strikes, as previously proposed.

CHINA'S PLANETARY PLANS

China aims to launch a mission in 2033 to return samples from Venus' atmosphere and send a probe in 2039 to study Neptune and Triton, according to an ambitious roadmap unveiled in March. Other targets include Mars sample return (2028 launch) and Jupiter's moon Callisto (2029 launch).

LONG ROAD HOME

A SpaceX Dragon Freedom capsule returned NASA astronauts Butch Wilmore and Suni Williams to Earth March 18 after 286 days on the International Space Station. The extended stay resulted from issues on last year's test flight of Boeing's Starliner, which returned uncrewed in September.

SNEAK PREVIEW?

A spiral galaxy a billion light-years away has been found sporting radio jets that span 6 million light-years, a feature typically seen only in elliptical galaxies. The finding suggests our Milky Way could develop similar jets, whose radiation could cause mass extinctions on Earth, in the future. – MARK ZASTROW