

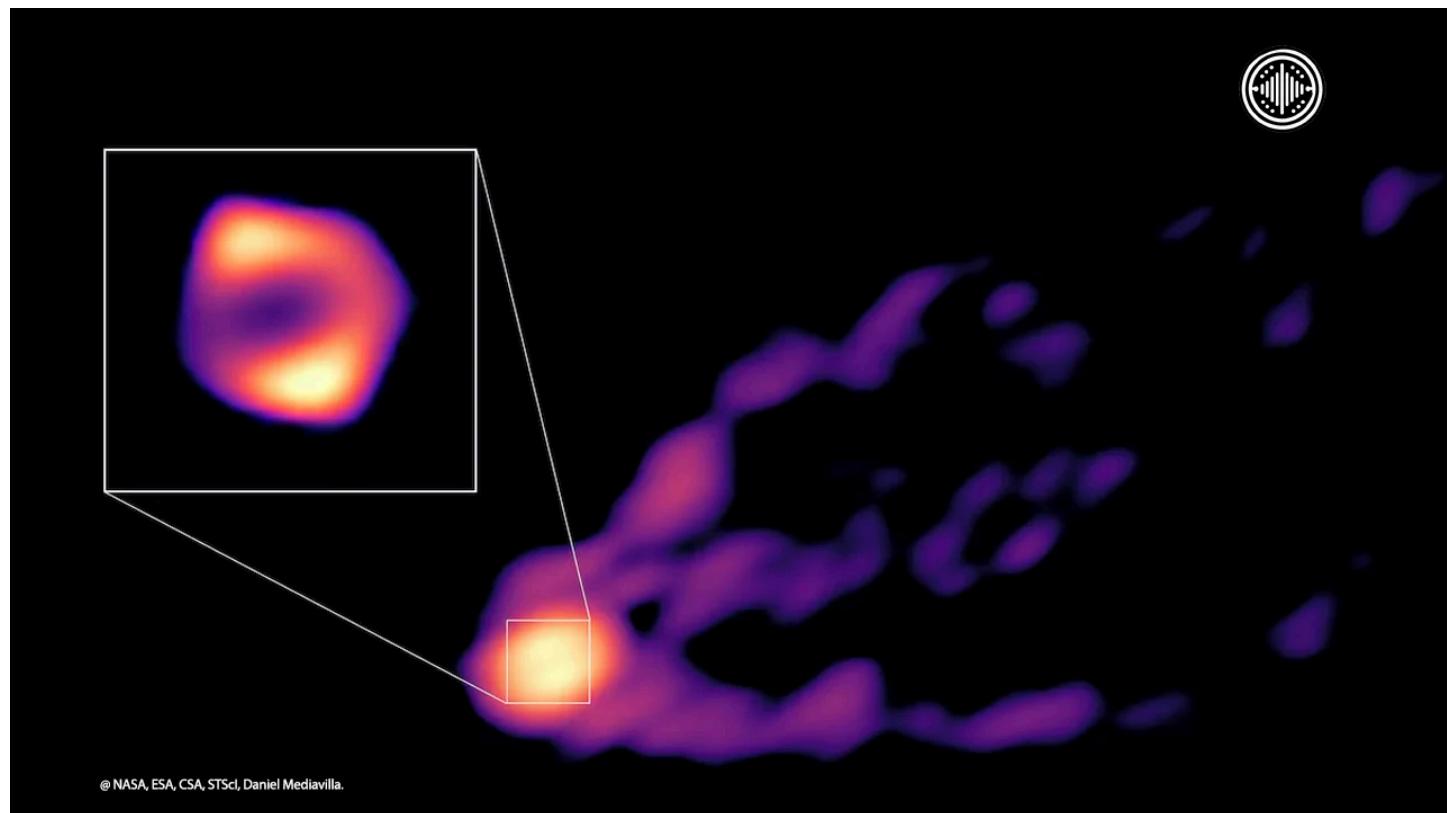
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Oldest Known Black Hole Discovered, Offering Glimpse Into Universe's Earliest Days

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Astronomers have identified the oldest confirmed black hole ever found, dating back more than 13 billion years. The discovery provides scientists with an extraordinary opportunity to study the universe's early history and the development of massive cosmic structures shortly after the Big Bang.

The black hole, located at the center of a distant galaxy named CAPERS-LRD-z9, is estimated to have formed roughly 500 million years after the Big Bang, a cosmic event believed to have occurred 13.8 billion years ago. According to the research team, the

galaxy and its central black hole both date back approximately 13.3 billion years. The finding was detailed in a study published in *The Astrophysical Journal Letters*.

Led by Anthony Taylor, a postdoctoral researcher at the University of Texas at Austin, the international team used data from the National Aeronautics and Space Administration's (NASA) James Webb Space Telescope. They employed a method called spectroscopy, which breaks down light into its component wavelengths, allowing astronomers to identify distinct signatures of stars, galaxies, and other celestial bodies. This technique is particularly useful for detecting the movement of gases around black holes, which can reach extreme speeds of up to 3,000 kilometers per second.

The black hole is a true cosmic giant, estimated at up to 300 million times the mass of the sun. For comparison, it is about 10 times more massive than the supermassive black hole at the center of the Milky Way galaxy. Taylor explained that because light takes billions of years to travel across space, viewing such distant objects is effectively like looking back in time. "When we look at objects that are very, very far away, it has taken that light billions upon billions of years to reach us," he said. "So in reality, we're seeing these objects as they were in the early universe."

The galaxy hosting the black hole is part of a category known as "Little Red Dots." These galaxies, first observed by the James Webb Space Telescope, are small yet unexpectedly bright and emit light predominantly in red wavelengths. While some Little Red Dots exist in the nearby universe, scientists believe they were more common in the early cosmic era.

Steven Finkelstein, a co-author of the study and professor of astronomy at the University of Texas at Austin, noted that studying CAPERS-LRD-z9 could reveal why these galaxies appear so bright and compact, as well as how their red coloration occurs. The discovery also raises questions about how such a massive black hole could form so quickly in the universe's timeline.

Future research will focus on identifying other black holes from the same period or even earlier. Finkelstein pointed out that the James Webb Space Telescope surveys only a small portion of the sky, suggesting that many more ancient black holes remain undiscovered. "If we find one thing, there's got to be a lot more out there," he said.

This record-breaking discovery not only marks a milestone in astronomy but also opens the door to deeper understanding of how the first massive cosmic structures emerged in the universe.