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Oldest Known Black Hole Discovered, Dating Back Over 13 Billion Years

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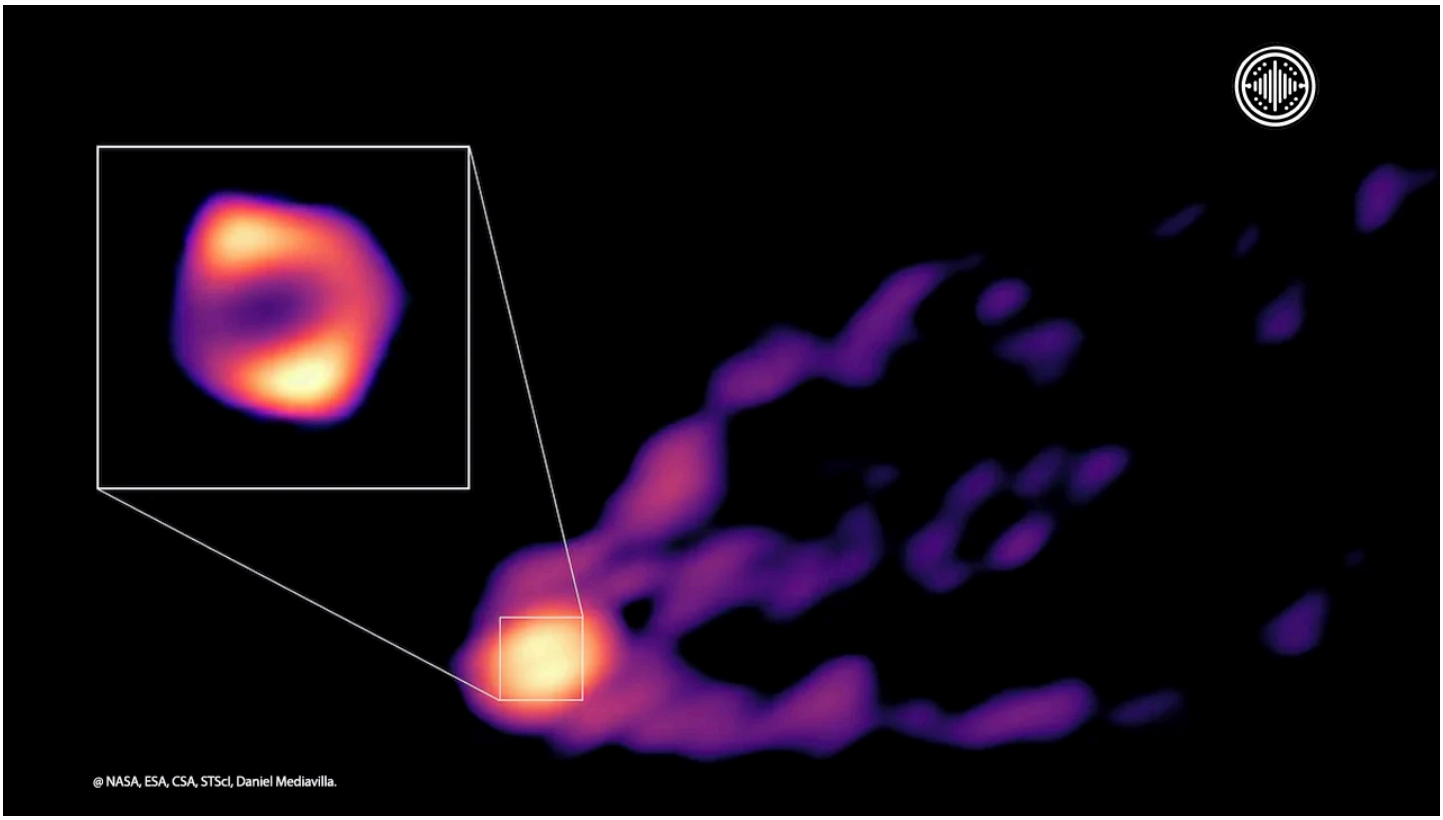

Astronomers have identified the oldest and most distant black hole ever confirmed, a colossal formation believed to have taken shape just 500 million years after the Big Bang. Estimated to be 300 million times the mass of the Sun, the discovery offers a rare glimpse into the earliest stages of the universe's history.

The black hole sits at the heart of a galaxy named CAPERS-LRD-z9, with both believed to have formed around 13.3 billion years ago. The finding, published in *The Astrophysical Journal Letters*, provides valuable insight into how black holes and galaxies evolved shortly after the universe's creation. The Big Bang theory holds that the universe began roughly 13.8 billion years ago as a highly dense and extremely hot point that rapidly expanded in all directions.

Because light takes billions of years to travel across space, observing distant cosmic objects is akin to looking back in time. Lead researcher Dr Anthony Taylor, a postdoctoral scientist at the University of Texas at Austin, explained, “When we look at objects that are very, very far away, it has taken that light billions upon billions of years to reach us. So in reality, we’re seeing these objects as they were in the early universe.”

This newly discovered black hole is about 10 times more massive than the supermassive black hole found at the centre of the Milky Way galaxy. Its enormous size, equivalent to the combined mass of half the stars in its own galaxy, raises questions about how such massive black holes could have formed so soon after the Big Bang.

The research team made the discovery using data from the James Webb Space Telescope (JWST), a state-of-the-art observatory operated by the United States’ National Aeronautics and Space Administration (NASA). They employed a technique called spectroscopy, which separates light into different wavelengths and colours, enabling astronomers to detect unique signatures from stars, galaxies and other celestial bodies.

Professor Steven Finkelstein, also from the University of Texas at Austin and a co-author of the study, noted that black holes consume surrounding dust and matter, producing visible patterns in the data. “We look for these signatures of very fast-moving gas,” he said. “We’re talking about velocities of 1,000, 2,000, sometimes even 3,000 kilometres per second. Nothing else in the universe moves that fast, so we know it has to be gas around a black hole.”

The galaxy hosting this black hole belongs to a category known as “Little Red Dots”, which are small, compact galaxies that shine brightly in red wavelengths. Discovered by the JWST, these galaxies are thought to have been more common in the early universe, though their origins and distinctive colour remain under study.

Researchers hope further investigations of CAPERS-LRD-z9 will shed light on both the formation of Little Red Dots and the rapid growth of ancient black holes. As Professor Finkelstein observed, “We only ever survey very tiny areas of the sky with the James Webb Space Telescope. So, if we find one thing, there’s got to be a lot more out there.”