Webb Telescope Discovers Oldest Black Hole, Breaking Cosmic Record

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Astronomers have confirmed the existence of the most distant black hole ever observed, hidden in a rare galaxy called the 'Little Red Dot'. Its enormous size and surprisingly early appearance are challenging current theories of how galaxies and black holes form in the young universe.

The discovery was made by an international team led by the Cosmic Frontier Center at the University of Texas at Austin. They found the black hole in the galaxy CAPERS-LRD-z9, which formed just 500 million years after the Big Bang. This means the light we see today took 13.3 billion years to reach Earth, revealing what the universe looked like when it was just 3% of its current age.

' *This is the furthest we can actually look for black holes with current technology. It pushes things to the very edge of observability,* ' said Anthony Taylor, a postdoctoral researcher at the Cosmic Frontier Center and lead author of the discovery.

The key to confirming that this is indeed a black hole lies in its distinctive spectral signature – the result of extremely fast-moving gas falling into the black hole. Light from gas moving away is stretched to redder wavelengths, while light from gas moving closer is compressed to bluer wavelengths.

The data for the study came from the James Webb Space Telescope (JWST) CAPERS mission. CAPERS aims to find and analyze the most distant galaxies, and thanks to JWST's advanced spectroscopic capabilities, the team was able to confirm the distance and physical properties of CAPERS-LRD-z9.

The galaxy belongs to a new class of galaxies called 'Little Red Dots', which only existed during the first 1.5 billion years of the universe. They are compact, red in colour and unusually bright compared to anything Hubble has ever recorded. Scientists believe that the brilliance is not due to too many stars, but rather the energy emitted by the supermassive black holes inside.

In particular, the black hole in CAPERS-LRD-z9 has an estimated mass of up to 300 million times that of the Sun, which is half the mass of all the stars in this galaxy. This is a huge number even when compared to normal supermassive black holes. Its existence at such an early stage has scientists wondering: Did early black holes grow faster than we thought, or were they 'born' with huge masses from the start?

In the coming months, the team hopes to have more detailed data from JWST to continue monitoring CAPERS-LRD-z9. This discovery promises to bring new insights into the role of black holes in the evolution of ancient galaxies and how the early universe formed its first structures.