MONSTER BLACK HOLE AT COSMIC DAWN

Artist's impression of a quasar with a supermassive black hole in the distant and early universe.

A black hole 12 billion times more massive than our sun – at the heart of the brightest quasar in the early universe – as the dark ages of the universe were just ending.

The farther away we look in space, the deeper we are looking into the past. Astronomers looked 12.8 billion light-years from Earth – to a time only 900 million years after the Big Bang – to see what is currently the brightest quasar known in the early universe. They say it's seven times brighter than the most distant quasar known. What's more, it harbors a **black hole with mass of 12 billion suns**. By comparison, our own Milky Way galaxy has a black hole with a mass of only 4 million solar masses at its centre; the black hole that powers this new quasar is 3,000 time heavier and shines with the equivalent of 420 trillion suns. So it's the most luminous quasar, with the most massive black hole, among all the known very distant quasars. As if that weren't enough, this quasar and its monster black hole are located at a special place and time in our universe, at what's sometimes called the cosmic dawn. An international team led by astronomers from Peking University in China and the University of Arizona announced these findings February 26, 2015 in the journal Nature.

The quasar is called SDSS J0100+2802 by astronomers. The monster black hole at its heart powers this quasar's luminosity of 420 trillion suns. The very existence of these objects puzzles astronomers. **How can a quasar so luminous, and a black hole so massive, form so early in the history of the universe, at an era soon after the earliest stars and galaxies have just emerged?**

And what is the relationship between this monster black hole and its surrounding environment, including its host galaxy?

This quasar and its super-supermassive black hole are in a place and time that astronomers call epoch of reionization – when the so-called dark ages of our universe ended. It's literally a cosmic dawn, the point at which light from the earliest generations of galaxies and quasars filled the universe and transformed it into the sort of universe we see today. Prior to this time, the universe was opaque or "foggy," astronomers say. There was light but not the same light we can now observe through telescopes.

This very early era in the history of our universe is not easy to study, but quasars, first discovered in 1963, are the key to understanding it. Quasars (quasi-stellar radio sources) are the most energetic and distant members of a class of objects called active galactic nuclei (AGN). While the nature of these objects was controversial until the early 1980s, there is now a scientific consensus that a quasar is a compact region in the centre of a massive galaxy surrounding a central supermassive black hole. Astronomers have discovered more than 200,000 quasars, with ages ranging from 0.7 billion years after the Big Bang to today. This quasar and its monster black hole will provide a unique laboratory to the study of the mass assembly and galaxy formation around the most massive black holes in the early universe. Astronomers say the discovery marks an important step in understanding how quasars have evolved from the earliest epoch, only 900 million years after the Big Bang, which is thought to have happened 13.7 billion years ago.

FACTS AND FIGURES

SDSS J0100+2802 is a hyperluminous quasar located near the border of the constellations Pisces and Andromeda. It has a redshift of 6.30, which corresponds to a distance of 12.8 billion light years from Earth and was formed 900 million years after the Big Bang. It unleashes power equivalent to 3×10^{41} watts, which corresponds to a magnitude of -31.7 (40,000 times as luminous as all of the 400 billion stars of the Milky Way galaxy combined, including our Sun). The diameter of this black hole is about 70.9 billion kilometres, seven times the diameter of Pluto's orbit.

Following the initial discovery, two telescopes in southern Arizona did the heavy lifting in determining the distance and mass of the black hole: the 8.4-metre Large Binocular Telescope, or LBT, on Mount Graham and the 6.5-metre Multiple Mirror Telescope, or MMT, on Mount Hopkins. Additional observations with the 6.5-metre Magellan Telescope in Las Campanas Observatory, Chile, and the 8.2-metre Gemini North Telescope in Mauna Kea, Hawaii, confirmed the results.

AK from Wikipedia