UCSD Astronomer, Margaret Burbidge, identifies two quasars associated with neighboring galaxy

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UCSD ASTRONOMER IDENTIFIES TWO QUASARS ASSOCIATED WITH NEIGHBORING GALAXY

An astronomer from the University of California, San Diego has identified a pair of highly energetic X-ray emitting objects associated with a neighboring galaxy as quasars probably ejected from a central black hole. The finding represents the first firm evidence that these celestial beacons can exist in regions relatively close to Earth.

The report was presented today by Margaret Burbidge, research professor with UCSD's Center for Astrophysics and Space Sciences, at the American Astronomical Society meeting in Pittsburgh, PA.

Burbidge said that although the finding appears to contradict the general assumption that quasars exist only at great distances from us, near the edge of the universe, it shouldn't undermine the notion that the universe is expanding as a result of an initial Big Bang--the explosion that most astronomers believe gave birth to the cosmos.

"For nearly 25 years the possibility that some quasars have been ejected from nearby active galaxies has intrigued a few astronomers, but horrified the majority, who see it as an attack on the Hubble expanding universe," she said. "This is not the case.

"What the observations show is that some galaxies, usually nearby ones with unusual properties in their central nuclear region, have more quasars lying close by than would be expected from the overall statistical distribution of quasars."

The newly identified quasars are located in the field of a galaxy called NGC 4258 located about 21 million light years away from Earth--a mere stone's throw by celestial standards.

NGC 4258, classified as a spiral galaxy some 90,000 light years across, is known to have twisted, helically shaped jets of gas emerging from its center.

Last year, in a detailed X-ray survey of the sky using ROSAT-- a European-U.S. X-ray satellite--radio astronomers Wolfgang Pietsch of the Max Planck Institute for Extraterrestrial Physics and colleagues detected two highly compact objects located roughly equal in distance on either side of the galaxy. The objects appeared to have been ejected from its core.

In January, an international team of Japanese and American astronomers--using a continent-wide radio telescope funded by the National Science Foundation--confirmed that the core was a powerful black hole equivalent to the mass of 40 million suns. Black holes, so dense that light cannot escape their gravitational pull,

have long been thought to be present in the center of active galaxies, where they would act as central engines driving a variety of exotic phenomena.

Burbidge subsequently conducted a spectral analysis of the objects identified earlier by Pietsch and colleagues, with the aid of the Kast double spectrograph on the 3-meter Shane telescope at the Lick Observatory atop Mount Hamilton, California.

Her analysis, reported today, concludes that both objects are faint quasars belonging to a galaxy that is moving away from Earth at a meager 465 kilometers per second (about 280 miles per second).

By contrast, all other quasars discovered to date appear as highly luminous objects moving away from Earth at extraordinary velocities ranging anywhere from 30,000 kilometers per second (about 19,000 miles per second) to 283,000 kilometers per second (about 176,000 miles per second).

"The spectra of these new quasars were just like all quasar spectra that you would normally see at their red shifts," Burbidge said. "But since they appear to be associated with a nearby galaxy, they are not out close to the edge of the Universe."

To determine the speed of distant, luminous objects in space, astronomers spread out their light through a prism or other device to separate out the rainbow colors that make up white light.

This produces a spectrum containing characteristic lines of much brighter light. Created by gases in the stars that emit light of particular colors, these lines exhibit distinctive spacings somewhat like the bar codes on supermarket products.

If the objects producing the light are moving away from us, the lines are shifted toward the red end of the spectrum. The distinctive spacing of lines stays the same, but their positions relative to the rainbow of colors is changed.

This "red shift" is produced by the same effect as the Doppler effect, a property demonstrated by the pitch of a train whistle that lowers as it moves away from an observer. Thus, large red shifts are thought to signify objects such as galaxies that are moving at high speeds at great distances away from Earth--a theory that represents the underlying principle of Hubble's law.

For this reason, most astronomers have viewed quasars as extremely bright objects many billions of light years from us. The new quasars (with red shifts of .4 and .65) discovered by Burbidge prove that at least some of these objects come from other sources.

"The implication that follows is that the red shifts of quasars can have a component that is intrinsic, due to their inner properties, besides the component due to the expansion of the Universe," said Burbidge. "And they can be ejected from active galactic nuclei."

From a cosmological viewpoint, Burbidge said the findings could fit in with the Big Bang theory, "except you have to explain the extra red shifts.

"I'm not a theoretician," she added. "I have to stick to the observations and let others work it out.

"But I have ceased sitting on the fence as to whether there are non-cosmological red shifts. I've come down on the side of non- cosmological red shifts."

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