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Hubble Provides Multiple Views of How to Feed a

From: NASANews@hq.nasa.gov
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RELEASE: 98-71

HUBBLE PROVIDES MULTIPLE VIEWS OF HOW TO FEED A BLACK HOLE

Astronomers have obtained an unprecedented look at the nearest example of galactic cannibalism -- a massive black hole hidden at the center of a nearby giant galaxy that is feeding on a smaller galaxy in a spectacular collision. Such fireworks were common in the early universe, as galaxies formed and evolved, but are rare today.

Although the cause-and-effect relationships are not yet clear, the views provided by complementary images from two instruments aboard NASA's Hubble Space Telescope are giving astronomers new insights into the powerful forces being exerted in this complex maelstrom. Researchers believe these forces may even have shifted the axis of the massive black hole from its expected orientation.

The Hubble wide-field camera visible image of the merged Centaurus A galaxy, also called NGC 5128, shows in sharp clarity a dramatic dark lane of dust girdling the galaxy. Blue clusters of newborn stars are clearly resolved, and silhouettes of dust filaments are interspersed with blazing orange-glowing gas. Located only 10 million light-years away, this peculiar-looking galaxy contains the closest active galactic nucleus to Earth and has long been considered an example of an elliptical galaxy disrupted by a recent collision with a smaller companion spiral galaxy.

Using the infrared vision of Hubble, astronomers have penetrated this wall of dust for the first time to see a twisted disk of hot gas swept up in the black hole's gravitational whirlpool. The suspected black hole is so dense it contains the mass of perhaps a billion stars, compacted into a small region of space not much larger than our Solar System.

Resolving features as small as seven light-years across, Hubble has shown astronomers that the hot gas disk is tilted in a different direction from the black hole's axis -- like a wobbly wheel around an axle. The black hole's axis is identified by the orientation of a high-speed jet of material, glowing in X-rays and radio frequencies, blasted from the black hole at 1/100th the

speed of light.

This gas disk presumably fueling the black hole may have formed so recently it is not yet aligned to the black hole's spin axis, or it may simply be influenced more by the galaxy's gravitational tug than by the black hole's.

"This black hole is doing its own thing. Aside from receiving fresh fuel from a devoured galaxy, it may be oblivious to the rest of the galaxy and the collision," said Ethan Schreier of the Space Telescope Science Institute, Baltimore, MD. Schreier and an international team of co-investigators used Hubble's Near Infrared Camera and Multi-Object Spectrometer to probe deeper into the galaxy's mysterious heart than anyone has before.

The hot gas disk viewed by Hubble investigators is perpendicular to the galaxy's outer dust belt, while the black hole's own internal accretion disk of superhot gas falling into it is tilted approximately diagonally to these axes.

"We have found a complicated situation of a disk within a disk, all pointing in different directions," Schreier said. It is not clear if the black hole was always present in the host galaxy or belonged to the spiral galaxy that fell into the core, or if it is the product of the merger of a pair of smaller black holes that lived in the two once-separate galaxies.

Having an active galaxy just 10 million light-years away from Earth rather than hundreds of millions or billions of light-years distant offers astronomers a unique laboratory for understanding the elusive details of the behavior of supermassive black holes as fueled by galaxy collisions.

"Though Hubble has seen hot gas disks around black holes in other galaxies, the infrared camera has for the first time allowed us to peer at this relatively nearby, very active, but obscured black hole region," Schreier added.

The team of astronomers is awaiting further Hubble data to continue its study of the disk, as well as ground-based spectroscopic observations to measure the velocity of entrapped material around the black hole. This will allow the astronomers to better calculate the black hole's mass. The current results are scheduled to appear in the June 1, 1998 issue of Astrophysical Journal Letters.

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EDITORS NOTE: Images and further information related to these results are available on the Internet at the following URLs:

<http://oposite.stsci.edu/1998/14>
<http://oposite.stsci.edu/pubinfo/latest.html> or
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Images to accompany this release are available to news media representatives by calling the Headquarters Imaging Branch on 202/358-1900. NASA photo numbers are:

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