# Repaired Hubble Finds Giant Black Hole

After years of hunting for black holes, astronomers say they have found the first convincing proof that one exists at the center of a galaxy.

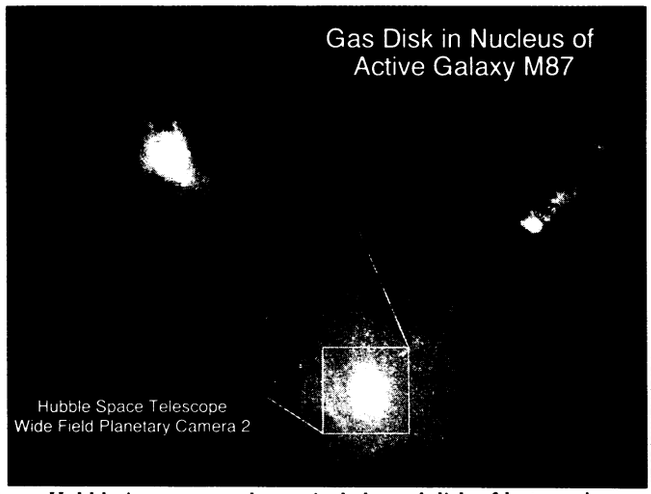
To find their quarry, the researchers used the repaired Hubble Space Telescope to peer closer than ever before into the core of the giant elliptical galaxy M87, which lies 50 million light-years from Earth. Scientists have long suspected that M87, a powerful radio-wave emitter that has a jet of high-speed electrons squirting from its center, harbors a supermassive black hole. But they lacked conclusive proof.

The U.S. team announced last week that several lines of new evidence now confirm that a black hole, with a mass of 2.5 billion to 3.5 billion times that of the sun, lurks at the heart of M87, occupying a space no larger than the solar system.

According to several scientists, the new report apparently confirms the existence of one of the most enigmatic of astrophysical entities — a body whose gravitational pull is so strong that nothing, not even light, can escape its grasp. If astronomers have indeed found the true fingerprints of a supermassive black hole, they may have identified the hidden engine that fuels a stunning array of fireworks at some galactic centers.

Holland C. Ford of the Space Telescope Science Institute and Johns Hopkins University in Baltimore and Richard J. Harms of the Applied Research Corp. in Landover, Md., announced the findings last week at a press conference in Washington, D.C. Ford provided new details this week at a meeting of the American Astronomical Society in Minneapolis.

By definition, a black hole can't be seen. But astronomers can infer its presence by studying how it affects its surroundings. The gravitational tug of a black hole at the core of a galaxy should pack stars so densely that the intensity of starlight would rise steeply closer to the center. And stars and gas orbiting the core would whip around so rapidly that the tug from visible matter alone couldn't account for their motion.




Ford, Harms, *et al.*

*Hubble image reveals a spiral-shaped disk of hot gas in galaxy M87. Previously known jet of high-speed electrons appears to emanate from the disk's center.*

Using such criteria, astronomers for more than a decade have tried to determine whether M87 contains a black hole. But the limitations of ground-based telescopes and the flawed Hubble mirror prevented them from measuring the intensity of starlight or the velocity of stars close enough to the galactic center. When Hubble received corrective optics to compensate for its misshapen mirror last December, a team led by Ford and Harms resumed the search for a black hole.

The team had intended to follow in the footsteps of previous researchers, examining starlight at the galaxy's core (SN: 1/25/92, p.52). But an image taken by Hubble's new wide-field and planetary camera in February changed that strategy. The camera, which resolved regions four times closer to the galaxy's heart than the old camera, revealed a central disk of gas trailed by spiral arms.

It is usually easier to obtain spectra of gas than of stars, Ford notes, because gas concentrates the light it emits into a few

## Study reaffirms tamoxifen's dark side

Tamoxifen, a synthetic hormone often prescribed to treat breast cancer, can cause potentially malignant changes in the endometrium, or uterine membrane, of healthy postmenopausal women, researchers confirm in a new study.

Other studies have linked tamoxifen to increased risk of endometrial cancer (SN: 4/16/94, p.247). However, this is the first randomized, placebo-controlled trial of tamoxifen's effects on the uterus and ovaries of this group of women, Rajendra P. Kedar of King's College School of Medicine and Dentistry in London and his colleagues assert.

"They are the first," agrees Urania Magriples of Yale University School of Medicine. "It's amazing someone hasn't done something like this before." Sohaib Khan of the University of Cincinnati College of Medicine says the study is more carefully done than others, but "I don't think they really reached anything new."

Several ongoing studies are examining whether tamoxifen might help prevent breast cancer in healthy women with a family history of the illness. To see if the drug causes endometrial changes, Kedar and his colleagues studied 111 women age 45 to 71 who took either tamoxifen or a placebo as part of one of these trials, they report in the May 28 LANCET.

Using a vaginal ultrasound probe, they measured the size of each woman's uterus and the thickness of her endometrium. The scientists also biopsied the endometrium and measured blood flow to the tissue, which if elevated may indicate an increased risk of cancer.

"Our study detected endometrial abnormalities at various times from the first tablet of tamoxifen," Kedar and his colleagues state. Kahn, however, questions whether the drug can cause such rapid changes.

The endometrium appeared abnormally thick in 24 of 61 women taking tamoxifen; in 10 of these 24 women, endometrial cells underwent potentially precancerous changes. Only 5 of the 50 women given a placebo had an abnormal endometrium and none showed the cell changes. Five women taking the drug and one volunteer on placebo developed a polyp; the significance of this is not clear. Overall, women taking tamoxifen had a larger uterus and higher blood flow to that organ than those not taking the drug.

Researchers now understand better how tamoxifen helps prevent breast cancer. Investigators have known that the drug binds to estrogen receptors. Normally, estrogen turns on these receptors, which activate the genes important in events that can lead to cancer.

Tamoxifen, however, fails to turn on the receptors, and the new study, in the June 3 SCIENCE, suggests why. The drug keeps the receptors from hooking up with a protein, ERAP160, that they need to function, report Myles Brown of the Dana-Farber Cancer Institute in Boston and his colleagues. — *T. Adler*