

# Astro Eyes New Signs of Black Holes

Overcoming a series of technical calamities that threatened to dim its view of the X-ray and ultraviolet universe, the Astro Observatory aboard the space shuttle Columbia last week found new evidence suggesting that black holes lurk at the centers of quasars and certain bright galaxies. The observatory returned to Earth Monday after weather conditions forced NASA to shorten the problem-plagued mission from 10 days to nine.

Using diffraction gratings and solid-state detectors to separate light into its component wavelengths, two of the observatory's four telescopes found similar, telltale "fingerprints" indicating black holes: dramatically higher than normal low-energy, X-ray and extreme-ultraviolet emissions from galaxies and quasars with compact, luminous centers.

Take Markarian 335, a Seyfert Type I galaxy. Scientists at the NASA Goddard Space Flight Center in Greenbelt, Md., found that its increased X-ray intensity closely matches the spectral distribution of light that would be expected from a disk of swirling material spiraling into a supermassive object — possibly a black hole — at the galaxy's center.

With "clear evidence of [such a] spectrum in the X-rays," says Peter J. Serlemitsos, a Goddard scientist who oversaw observations with Astro's Broad Band X-ray Telescope, "there's a good case for

[a black hole] in Markarian."

Even more convincing evidence for black holes may arise when researchers compare the extreme-ultraviolet spectra of galaxies and quasars with Astro's X-ray spectra of the same objects, notes Arthur F. Davidsen, an astronomer from Johns Hopkins University in Baltimore and the chief researcher on Astro's Hopkins Ultraviolet Telescope. The ability to span both ultraviolet and X-ray wavelengths will likely reveal more fully whether light emitted from a galactic center or quasar resembles the spectrum of matter falling into a black hole, he says.

By observing precisely how gravitational effects alter this spectrum, known as a "blackbody" spectrum, researchers may determine the mass of a candidate black hole inside a galaxy or quasar, Davidsen explains.

Davidsen told SCIENCE NEWS that his group also envisions other tantalizing discoveries. Using the Hopkins telescope to measure the absorption of light from the faint quasar HS 1700+64 — some 8 to 10 billion light-years away — he says that his team can begin to determine the amount of gas and dust between galaxies, particularly the abundance of primordial helium.

However, Davidsen notes, results may not be definitive because scheduling delays aboard Astro prevented his team

from observing the faint target for the full 2.7 to 3.3 hours required for a detailed analysis.

Indeed, a myriad of computer and mechanical problems limited astronomers to observing only about 135 of the up to 250 targets originally in Astro's mission plan (SN: 12/8/90, p.356). For example, the Ultraviolet Imaging Telescope — which includes the single camera on board — exposed only half of its 2,000 frames of film. Mission scientist Ted Gull called Astro a success nonetheless. Others expressed amazement that, like a cat with nine lives, the mission continued to bounce back after suffering a series of daily mishaps.

"This mission is beginning to remind me of one of those Chuck Norris movies," says Christopher M. Anderson of the University of Wisconsin-Madison. "Every 15 minutes he's down on the deck, battered and bleeding, a goner for sure; five minutes later he's back up fighting the bad guys."

No sooner had researchers perfected operation of a manual pointing system for Astro's three ultraviolet instruments — after their automatic star-guiding system failed — than the second of two computer terminals on board overheated, leaving the shuttle crew unable to command the telescopes.

"We had our own Astro crew on the ground," says Davidsen, referring to scientists in the control room at NASA's Marshall Space Flight Center in Huntsville, Ala., who quickly learned to operate the telescopes from Earth.

Later, a clogged urine storage container almost forced an early return of Columbia. Ultimately, a forecast of bad weather moving across the shuttle's landing site prompted NASA to end the mission a day earlier than planned.

Astronomers expressed anger and frustration that NASA's latest flight schedule, released last week, included no plans for another mission of the \$150-million observatory. Especially in light of the provocative new views of the universe that Astro has glimpsed, "it's terribly inefficient to fly this mission only once," says Serlemitsos. "It doesn't take much imagination to know that we will be more efficient next time."

In the meantime, scientists expect that the next six months to a year will bring a flurry of new findings as they analyze their spectra in detail. Next month, Goddard astronomer Theodore P. Stecher expects to release the first images from the high-resolution ultraviolet camera. The instrument recorded such diverse objects as supernova 1987A and several elliptical galaxies.

— R. Cowen

## Milk from engineered hormone: Udderly safe

Milk from cows treated with a drug that increases milk production is safe for consumption, a panel of scientists and physicians assembled by the National Institutes of Health unanimously concluded last week. The panel's report rejected arguments by some consumer groups that the drug could harm people and affirmed an earlier Food and Drug Administration finding that the substance presents no health risk to consumers (SN: 8/25/90, p.116).

When injected into cows, recombinant bovine somatotropin (rBST), sometimes called bovine growth hormone, increases milk production by at least 10 percent. Though the controversial drug — a genetically engineered version of a hormone occurring naturally in cows — has not yet won FDA approval for routine use, milk from experimentally treated cows has been sold legally in some states.

"The evidence clearly indicates that overall composition and nutritional quality of milk and meat from rBST-treated cows is equal to that from untreated cows," says panel chairman Melvin M. Grumbach, a pediatrician at the Univer-

sity of California, San Francisco.

Consisting mainly of pediatricians, veterinarians and food scientists, the panel heard three days of testimony from rBST researchers, and sometimes heated objections from drug opponents — particularly Samuel S. Epstein, a public health professor at the University of Illinois at Chicago, who claimed that companies developing the drug had avoided publishing unfavorable results.

The panel found no evidence of scientific misconduct, and few data to suggest the drug harms cows. However, it admitted a lack of sufficient data to know whether the hormone increased the incidence of mastitis, a common infection of the udder.

The report also calls for more research to determine whether high doses of IGF-I — a hormone present at elevated levels in milk from rBST-treated cows — alters laboratory animal growth. However, panelists found it unlikely that the IGF-I levels in milk would pose a threat to humans, whose saliva already contains comparable concentrations of IGF-I.

— R.N. Langreth