

## Galaxies that feed on other galaxies

One of the intriguing questions in astrophysics is what powers the highly active and energetic nuclei of certain radio galaxies. For example, one might consider the radio galaxy NGC 1316 (Fornax A), which has had at least one sharp radio outburst. As F. Schweizer of the Cerro Tololo Inter-American Observatory told the recent meeting in Rohnert Park, Calif., of the Astronomical Society of the Pacific, when he and his colleagues did, they found other weird phenomena that convinced them that NGC 1316 is a cannibal, feeding on its own kind.

NGC 1316 appears first of all somewhat disturbed in shape. It is "rippled." Customarily, misshapings of galaxies are attributed to tidal disturbances caused by the gravitational pull of a nearby "companion" galaxy. NGC 1316 has such a companion, and astrophysicists have attributed the misshapeness of the main galaxy to the companion. In this case it won't do, says Schweizer. The companion itself is an undisturbed-looking spiral. If there were a reciprocal tidal interaction strong enough to deform NGC 1316, it would also deform the companion.

Radio observations reveal another curious circumstance. Inside NGC 1316 there is a cloud of ionized hydrogen that rotates. The whole galaxy does not rotate, just this one cloud. It is hard to imagine how such a cloud could start rotating inside the confines of a nonrotating galaxy, so astrophysicists would assume that it was rotating already when it got there. That is, a cloud of gas that was moving through space,

rotating as it went, happened to fall into NGC 1316.

That idea is plausible, but it begins to lose its attraction, Schweizer says, when you consider the mass associated with the rotation. It's too much for a simple gas cloud. It must include other things. It is in fact about the mass of a small galaxy or 100 million times the sun's mass. So Schweizer proposes that not a simple wandering gas cloud, but a whole galaxy or maybe two fell into NGC 1316 rather recently as astronomical time scales go. The gas from these infalls is what fuels the active radio nucleus of NGC 1316 and triggers its outbursts. Thus the cannibal hypothesis. The shape disturbances in NGC 1316 result from the crash.

If such cannibalism is common among radio galaxies, we should find similar ripples in many of them, says Schweizer. And, answering his own rhetorical question, he says we do. And many of these have no companion galaxies, so the tidal argument can't explain their disturbances.

Widespread galactic cannibalism means a large number of close encounters of the galactic kind over history. The usual statistics of galaxies will simply not allow such a supposition. That leads Schweizer to what is perhaps his most radical suggestion of all: Galaxies were formed, not singly as astronomers have generally assumed, but in binary or multiple systems as stars are — two or more galaxies being born close together and bound by gravity. Dynamics predicts that the orbit of such a system will decay, and the members will coalesce. For most binary stars that has not yet happened, but the reason we don't see many binary galaxies now, Schweizer proposes, is that most of them have already decayed and crashed. □

## Explosion 1, black hole 0

Seyfert galaxies, named after discoverer Carl Seyfert, are rare but intriguing celestial objects noted for their especially bright nuclei that emit more energy than hundreds of billions of stars. Broad emission lines in Seyfert spectra indicate the presence of hot gas heated by violent activity in the galactic core. And the most popular theory to explain such tremendous generation of energy is that the cores of Seyfert galaxies contain black holes. As matter is pulled toward the galactic center and into the hole, enormous amounts of radiation are given off. It could be, however, that the cores of Seyfert galaxies are inhabited not by black holes but by supermassive objects that fling out matter in gigantic, recurring explosions every million years or so.

This alternative to the black hole theory is suggested by three Ohio State University astronomers in the June 15 *ASTROPHYSICAL JOURNAL*. Eugene Capriotti, Craig Foltz and Paul Byard set up a computer model to predict the type of spectral

features that clouds of dust and gas near the core should have if they were either moving toward the center, moving away from it, or simply rotating around it. When compared with the spectra actually observed for several Seyfert galaxies, the best fit occurred when the clouds were expanding away from the core at 3,500 to 5,500 kilometers per second. This is not the look of a black hole at work.

"If it's a constant flow of gas coming out, it's hard to understand where it would be coming from," says Capriotti. Instead, he believes it's more logical to assume that the explosive expansion of gas is part of a cyclic process. Perhaps there is a recurring explosion about every million years. As the expansion dies out, the material would be slowly redrawn back into the center to repeat the cycle.

Capriotti is now considering whether supermassive objects millions of times heavier than our sun could grow in the middle of Seyfert galaxies and be the source of that explosion. □

## World's largest windmill



High atop Howard's Knob, near Boone, N.C., this wind turbine began operation on July 11. Installed for \$6 million by the Department of Energy, it can generate 2,000 kilowatts of electric power in winds of 25 mph — ten times the power generated by any other windmill. Its blades are 200 feet in diameter and set on a tower 140 feet tall. The blades pitch to regulate power output and pivot to align with the wind. The system shuts down at wind speeds greater than 35 mph. DOE says it can provide enough energy for 500 "average" homes and plenty of important test data for DOE.

## Cervical cancer and vasectomies

The theory that cervical cancer may be caused by a sperm-carried virus recently gained support from a preliminary study indicating that the risk of that cancer may be four times lower in women whose sexual partners have had vasectomies.

"The results are consistent with other studies that show a venereal-type epidemiology for cervical cancer" and with studies indicating that men might be carriers of a cancer-causing virus, co-author Shanna H. Swan told *SCIENCE NEWS*. Vasectomized men, by definition, could not be carriers of a sperm-related virus. "What we have are isolated parts of the picture, but they are consistent," she said.

The study — actually a serendipitous offspring of research at Kaiser-Permanente Medical Center in California on oral contraceptives, sexual factors and cervical cancer — compared 69 women with cervical cancer to 216 controls matched for socioeconomic and physical factors. Of the cancer patients, report Swan, now at the University of California at Berkeley, and Williard L. Brown in a letter in the July 5 *NEW ENGLAND JOURNAL OF MEDICINE*, 4.3 percent had vasectomized sexual partners. Of the control group's partners, however, 19.4 percent had had vasectomies. Combining these observations with other factors accounting for sexual habits, the researchers calculated a risk 4.29 times higher for women whose partners were not sterilized. The researchers plan a study to test the possible relationship. □