



A jet of gas streams from the center of the galaxy M87. Gas that lies about 900 light-years from the galaxy's center gives the illusion of moving at 2.5 times the speed of light.

light to the distant observer, even though nothing moves that fast in the object's own frame of reference. After correcting for this relativistic effect, Mirabel and Rodriguez calculate that the blobs in their study actually move at 92 percent of the speed of light.

John A. Biretta of the Space Telescope Science Institute in Baltimore cautions that the researchers haven't pinned down the distance to the object ejecting the gas, thought to be a neutron star or black hole that steals matter from a less-dense companion. If this binary star lies much closer to Earth than the 40,000 light-years they estimate, the blobs would still be cruising, but not at a superluminal speed, he says.

Nonetheless, Biretta adds, the new study may shed light on the dynamics of larger and more distant systems that also spew matter at high speed. Last June, at a meeting of the American Astronomical Society in Minneapolis, he and his colleagues reported their recent observations of superluminal motion in a jet of gas at the center of the galaxy M87.

— R. Cowen

## Test landfills percolate as bioreactors

On the outskirts of urban centers grow great manmade mountains of trash. Piled high, packed, and buried, these landfills — which hold 70 percent of domestic refuse — typically take years to amass and decades to decompose.

To manage the solid-waste stream responsibly, scientists seek speedier ways to break down garbage into useful components, extract energy-rich fuel, and recycle the remnants. Toward that end, Frederick G. Pohland and Robert E. Landreth, environmental engineers at, respectively, the University of Pittsburgh and the Environmental Protection Agency in Cincinnati, Ohio, describe a faster way to decompose rubbish using "landfill bioreactors."

Speaking at last week's meeting of the American Chemical Society in Washington, D.C., they explained that by recirculating leachates — the liquid brew of decomposing wastes — in a landfill, biological breakdown occurs up to 10 times faster than usual. "Normally, a landfill takes 20 to 30 years to decompose," says Pohland. "But using this method, it may only take 2 to 3 years."

Rain soaks and the sun bakes decaying rubbish, creating a great compost pile, says Pohland. Already rich in nutrients and microbes, the fermenting heap mostly requires nurturing to make methane gas, wastewater, and reclaim-

able solids. So engineers are testing landfill designs that mix wastes with leachates. Almost like an oven that bastes a roast, the new landfills use liners and collection systems whose pipes and pumps recirculate liquids and extract methane gas.

"We don't even have to add bacteria or chemicals," Pohland says. "The landfill is biologically active and nutrient rich. This process simply accelerates natural decomposition." Municipalities can later irrigate land with treated leachate waters, generate power from methane, and mine what remains for metals, plastics, and other recyclables.

Scientists are testing 20 landfill bioreactors, each site varying slightly in design, Landreth says. The EPA supports three of these sites: in Monroe County, N.Y., Gainesville, Fla., and Dover, Del. In Dover, the most advanced site, two 1-acre cells will soon give rise to a full-size 20-acre pilot site, Pohland says.

Landreth sees the possibility of "round robin" landfills serving communities and industrial parks. "Fill one up, move to the next. Fill that one up, then move to a third," Landreth says. "Keep going around, filling up sites and pumping out gas until the first one is fully cooked. Then dig up the first one, mine it for materials, and fill it again. You can go in a circle."

— R. Lipkin

## Family planning gets a shot in the arm

A controversial vaccine designed to halt pregnancy did just that with no significant side effects for a small group of women, researchers in India reported this week. The vaccine appears to prevent implantation of fertilized eggs by inducing the body to produce antibodies to human chorionic gonadotropin (hCG), a hormone critical to pregnancy, scientists say.

Birth control vaccines have been in the works for many years (SN: 6/25/88, p.407), but this is the first to undergo efficacy testing in humans, says Nancy J. Alexander, chief of the contraceptive branch at the National Institute of Child Health and Human Development in Bethesda, Md.

"There are lots of things that are really exciting about [this vaccine]," she says. It appears effective, yet when women stopped using it, they became pregnant quickly. Also, the vaccine did not disrupt menstrual cycles.

However, "there are still a lot of problems," Alexander notes. For one, women require booster shots. And the question of side effects won't become clear until many women use it. In addition, "a lot of

women feel [birth control vaccines] would have tremendous potential for abuse," Alexander says.

Some women's groups oppose development of a birth control vaccine. Among other concerns, they worry women will be vaccinated without their consent or knowledge.

The study included 148 women, age 20 to 35, with at least two children, an active sex life, and regular menstrual cycles, report G. Pran Talwar of the National Institute of Immunology in New Delhi and his colleagues. The women enrolled after "providing informed, written consent," the team notes.

In 112 of the women, the three initial shots boosted the concentration of hCG antibody in the blood to 50 nanograms per milliliter. That's enough to stop pregnancy, the study confirmed. During the first and third week of each cycle, the women had the amount of antibody to hCG measured. If this fell below 50 ng/ml, they received a booster shot, the team explains in the Aug. 30 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

The researchers stopped enrolling new participants in March 1992, and by

August 1993 only one woman who had antibody concentrations greater than 50 ng/ml had become pregnant. Eight women completed over 30 menstrual cycles without becoming pregnant; 36 had between 12 and 29 pregnancy-free cycles; and another 21 had between 6 and 11 cycles without a pregnancy.

However, 26 of the women whose antibody concentrations dropped or stayed below 50 ng/ml became pregnant. The researchers offered alternative forms of contraception for women with low antibody readings.

"Further work is necessary to make this vaccine workable as a general method for family planning," the investigators acknowledge. For example, researchers may want to modify the vaccine so that women don't need as many injections.

The vaccine, HSD, contains a key portion of the hCG molecule. This is combined with part of the luteinizing hormone found in sheep and either the tetanus or diphtheria toxin, which boost the body's immune response. The researchers also added a derivative of lipopolysaccharide, a molecule consisting of lipids and sugars, to the initial injections.

— T. Adler