became ionized. It was formed by detonating two barium-filled canisters released from the IRM satellite. The expanding cloud of barium ions, as expected, pushed out the earth's magnetic field lines to create a "cavity" that ultimately reached a diameter of about 560 kilometers, according to Haerendel. The IRM's instruments detected the cavity's presence for about 7 minutes, until the field lines returned to their undisturbed position and essentially flattened it out of existence. After the first couple of minutes or so, the photos show the expanding cloud developing a diffuse outer portion that lasted for about 35 minutes, well after the cavity was gone. This outer portion was made of barium ions too, so why did it keep growing even as the cavity shrank? "If I knew the answer to that," says Paul Bernhardt of Los Alamos (N.M.) National Laboratory, "I'd write a paper."

Also, Haerendel notes, the cavity's appearance developed a pattern of small, cellular features similar to the "granularity" seen in some images of the sun. "I think," he says of the earth's-tail version, "that nobody has ever seen such a thing," suggesting that AMPTE's data could aid studies of the solar corona and photosphere. The barium cloud also showed an irregular "edge," possibly indicating where it was pushed in and pulled out by "flux tubes" of the magnetic field.

Additional "clouds" in earth's magnetic tail may be attempted late this month. And in June, another artificial comet.

—J. Eberhart

Moving closer to a vaccine for cancer

In cancer, the immune system fails to protect the body. The goal of a cancer vaccine is basically to prod the system into marshaling a successful attack against tumor cells it might otherwise tolerate. That promise appears to be nearing reality. Researchers this week announced advances in two types of vaccines, one of which has already been used successfully in human trials. Their results were reported at an American Cancer Society seminar in San Diego.

Michael G. Hanna Jr. of Litton Bionetics, Inc., in Rockville, Md., has been working on a vaccine that uses a cancer patient's own tumor cells to prevent recurrence. Hanna, with H.C. Hoover Jr., now at the State University of New York at Stony Brook, and others, began a trial on colorectal cancer victims in 1981, and the results from the ongoing study are encouraging. Twenty patients whose tumors were surgically removed were given three vaccinations of their own tumor cells, which had been irradiated so they wouldn't reproduce. The first two shots were combined with an immune system booster. To date, none of the 20 has died and only four have had recurrences, whereas of 20 colorectal cancer patients undergoing surgery around the same time, four have died and another five have suffered recurrences.

To check for a true immune response the researchers inoculated the skin with weakened tumor cells. All of the vaccinated patients reacted to it, while none of the nonvaccinated patients did. "We were indeed getting biological modifications," says Hanna.

Several medical centers in the United States are now conducting a larger trial, the results of which should be available within three years. If the tests are successful, Hanna says, the vaccine should be available for clinical use as soon as it can be produced on a large scale. Meanwhile, he and others are working on improving the procedure. "While [the technique is] important, I don't think it is sufficient for complete control of solid tumors," he says. The key may be in combining vaccination with chemotherapy. Hanna and his coworkers have found that the initial immune response following vaccination opens up the tumor so that more chemotherapy can reach it. "In this situation, when we give chemotherapy, there is a greater effect," he says.

Other vaccine approaches are also being tried. Heinz Kohler and his colleagues at Roswell Park Memorial Institute in Buffalo are working on something called an anti-idiotype vaccine. By presenting tumor antigens to the body in a new way, the vaccine breaks the body's preexisting tolerance to the tumor.

To get an anti-idiotype vaccine, researchers inject human tumor cells into a mouse, which responds by making antibody-producing cells. These cells can be harvested and fused with an immortal cell line, so that a good supply of antibody can be collected. This antibody is in turn injected into another mouse, where the procedure is repeated and a second antibody is collected.

The second antibody approximates the shape of the antigen that induced the first antibody. The procedure works something like a hall of mirrors — the reflection of a man raising his right hand will be raising its left hand, but a reflection of *that* image will be raising its right hand.

"The 'idiotype' cascade provides an antibody that could be a substitute for the original antigen," Kohler says. "The immune system sees shapes, and doesn't care what is behind those shapes."

While an anti-idiopathic cancer vaccine has yet to reach the animal-testing stage, according to Kohler this type of vaccine has proved successful against viruses, bacteria and parasites. "I think within a year we'll have an anti-idiotype [cancer] vaccine that will work in an animal model," he says. Human trials, he estimates, are two to three years away.

— J. Silberner

Perils of fat: Cancer role assayed

Among the illnesses linked to obesity are breast and colorectal cancers. At a science writers' seminar sponsored by the American Cancer Society this week in San Diego, researchers described studies aimed at determining the role of fat in cancer, and whether reducing fat can have a protective effect.

About 40 percent of the calories in the average U.S. citizen's diet come from fat. Based on epidemiological data and animal studies, anticancer diets (SN: 10/1/83, p. 217) recommend a level of no more than 30 percent. But the effect of lowering fat intake awaits proof.

So the National Cancer Institute (NCI) in Bethesda, Md., has just kicked off a 10-year, $30 million trial. According to NCI's Peter Greenwald, 12,000 women at high risk of breast cancer will be enrolled.

Half the women will be encouraged to reduce their fat intake to 20 percent of total calories by such dietary changes as switching from whole milk to skim milk products, trimming fat from meat and avoiding fried foods. Because the reduction is a dramatic one and might not be easy to achieve, Greenwald notes, the early part of the study will be devoted to determining its feasibility.

A second study, also just begun, will involve 2,000 women who have had mastectomies; researchers want to see if the 20 percent fat diets will reduce the risk of recurrence.

The role of obesity in breast and colorectal cancer shows up clearly in animal studies by David Kritchevsky of the Wistar Institute in Philadelphia. In one experiment he allowed 24 female rats to eat as much as they wanted; 14 of those developed breast cancer after being given a carcinogenic chemical. But none of the 24 rats that received the same chemical and were fed only 60 percent of the calories consumed by the first group developed mammary tumors.

In a colon cancer experiment, 19 male rats eating as much as they wanted got chemically induced cancer, while only 53 percent — 10 of 19 — eating 60 percent of the calories got cancer.

Is it the reduction of fat, or of calories? Kritchevsky says both may play a role. "Maybe this will give a little more latitude in preparing a diet," he says.

Just how fat intake or obesity aids in promoting cancer isn't known. Greenwald suspects that the way fat alters the level of certain hormones may be a factor in some aspects of the development of cancer, while Kritchevsky suggests that low caloric intake may starve out tumors.

Meanwhile, what's a person to eat? "My only dietary recommendation is two words," says Kritchevsky. "Eat less."

— J. Silberner