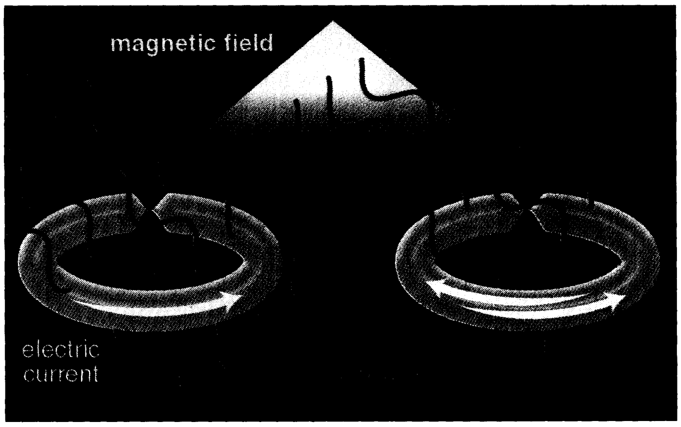
so, the gamma rays should come in periodic bursts, but current instruments cannot tell whether they do.) The galactic-plane sources might be "microblazars," black holes that are spitting jets of mass and energy directly at us, or high-velocity gas clouds emitting gamma rays as they slam into massive stars.

Until new gamma ray observatories, such as NASA's Gamma Ray Large Area Space Telescope (GLAST), start to go into orbit in 2005, astronomers will have to try to solve the puzzle by finding and studying the sources using other kinds of radiation, chiefly x-rays. But if the gamma ray sources are invisible in those frequencies, Grenier says, the mystery will remain unsolved: "If we do not find counterparts, we are forced to wait for GLAST." —CHARLES SEIFE

QUANTUM MECHANICS

Physicists Unveil Schrödinger's SQUID

MINNEAPOLIS—It doesn't purr, but a tiny superconducting ring is the closest thing yet to Erwin Schrödinger's famous dead-and-alive cat. At last week's meeting here of the American Physical Society,* physicists announced that, under the right conditions, such rings can carry current in opposite directions at the same time—a feat never before performed in an object so big.



Strange appetite. A SQUID with two-way currents absorbs microwaves that a SQUID with one-way currents can't.

For decades, Schrödinger's cat has been the stock example of a paradoxical but fundamental property of quantum mechanics: that an object can be in two or more states at the same time. But physicists' favorite feline remains purely hypothetical, because objects much bigger than individual atoms, photons, and molecules generally interact strongly with their surroundings, which force them to choose one state or another. Now two teams of researchers have induced millions of electrons to flow simultaneously both ways around a small superconducting ring with a nonsuperconducting notch in it, a gizmo known as a superconducting quantum interference device, or SQUID.

A SQUID prefers the total amount of magnetic field passing through it to equal an exact multiple of a fundamental constant known as the flux quantum. Add or subtract a fraction of a flux quantum by changing the field the SQUID sits in, and the ring tries to round off to the nearest whole value by creating an electric current that adds or subtracts from the imposed magnetic field. Because SQUID can round up or down, the current can flow in either direction.

It's when the SQUID tries to polish off exactly half a flux quantum that quantum oddities begin. In that case, the energy in the ring is equal for current flowing either way, clockwise or counterclockwise, and the SQUID cannot absorb energy by jumping between the two. However, the both-ways-at-once case is different. Such mixed quantum states come in pairs, one with slightly higher energy than the other. As a result, a SQUID can consume energy by hopping from one mixed state to the other.

To test whether they had really achieved a two-way flow, the two teams of researchers fed their SQUIDs energy by shining microwaves on them. Physicists Hans Mooij, Caspar van der Wal, and their colleagues at Delft University of Technology in the Netherlands used microwaves with just enough energy to make their SQUID jump between one mixed state and its partner and took the absorption as evidence that the mixed states were there. In contrast, physicists James Lukens, Jonathan Friedman, and colleagues at the State University of New York, Stony Brook, gave their SQUIDs microwaves with an even bigger energy boost. The SQUID absorbed at two nearly equal frequencies, revealing a pair of mixed states well above the energy of the initial state. Without mixed states, it would have absorbed only one frequency. Both teams concluded that their SQUIDs had achieved the mixed state of two-way flow.

Their both-ways-at-once currents may earn SQUIDs a starring role in the processors of quantum computers. Whereas ordinary computers use bits that can be either 0 or 1, quantum computers require "qubits" which can be 0, 1, or 0-and-1. Researchers have fashioned handfuls of qubits out of individual atoms, molecules, and photons. But SQUIDs should be easier to manipulate, Friedman says, because they can be a million times bigger than an atom and mass-produced on silicon chips. Still, Eli Yablonovich, an electrical engineer at the University of California, Los Angeles, says SQUID researchers face the same daunting challenge as others trying to develop practical qubits: preserving the mixed quantum states in a hostile world. "They've got to get down in the trenches with the rest of us to solve that problem." —ADRIAN CHO

* APS March Meeting, 20 to 24 March.

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SPACE SCIENCE

Lab Accident Damages Solar Flare Satellite

A NASA mission to study solar flares has suffered a rough ride even before it leaves the ground. A vibration test of the High Energy Solar Spectroscopic Imager (HESSI) went mysteriously awry on 21 March, damaging the spacecraft's solar panels and possibly other components and forcing NASA to postpone its launch from July to next January. "It's devastating," says principal investigator Robert Lin, a physicist at the University of California, Berkeley.

The unusual incident also was bad news for NASA managers, who last week were busy on Capitol Hill answering questions about a spate of recent agency failures and snafus. The HESSI program to date has been a model of NASA Administrator Dan Goldin's faster, cheaper, better approach to science, say program officials. The $70 million mission to explore the physics of particle acceleration and energy releases in solar flares was conceived and executed in 3 years, and the spacecraft was slated to go up this summer, in time to monitor the solar maximum later this year.

It's not known what went wrong, says Lin. He and his team contracted with the Jet Propulsion Laboratory in Pasadena, California, to conduct various tests at the lab's sophisticated facilities. During a vibration test, a standard procedure to mimic the stresses and strains encountered during launch, HESSI was mistakenly subjected to forces more than 10 times the appropriate level. Before the test could be halted, the solar panels cracked and the structure was damaged. "We still don't know what's been damaged," says Lin, or how severely. "We'll have to take everything apart."

A January launch will still give researchers good data on the nature of solar flares, he says, as some of the most violent typically occur shortly after the peak of solar activity. "But we wanted to get the maximum of flares," he adds. NASA has asked a team of investigators to report by May on what went wrong. —ANDREW LAWLER