arteries to thicken, thus reducing blood flow to the brain. With less blood getting through, some neurons die, causing portions of the brain to die. Some researchers believe that although it may take years, such a process eventually leads to a type of dementia characterized by problems with memory, arithmetic, and spatial tasks.

On the other hand, the high pressure may simply lead to compression of the brain and swelling of the ventricles, a process that doesn't necessarily impair the brain's function, says Vladimir Hachinski of the University of Western Ontario in London.

Hachinski calls the team's findings "intriguing" but says further research must determine whether hypertension causes brain atrophy. "It was an in-depth study of a small number of patients; I'd like to see it confirmed," agrees Salerno.

Despite the small sample size, Hachinski says the study was well conducted. "I think it's a good beginning," he says.

A multicenter study of 5,000 men and women age 65 and older may soon provide scientists with more definitive data regarding hypertension's effect on the brain. Timothy J. Miller, a neuroradiologist at Johns Hopkins Hospital in Baltimore, and his colleagues will look for signs of brain atrophy and enlarged ventricles in the MRI scans taken from otherwise healthy hypertensive volunteers. Miller says he expects to get preliminary results from that study within the next two years. —*K.A. Fackelmann*

Major Japanese jolt may be on its way

A minor earthquake that struck southwest of Tokyo in 1990 may herald the arrival of a much stronger shock in the near future, report two Japanese seismologists.

Earthquake experts in Japan have long recognized the potential for a major quake emanating from the Odawara region, located 80 kilometers southwest of Tokyo. Over the last 400 years, five very strong earthquakes have rocked this area with remarkable regularity, roughly every 73 years. The last major jolt, the Great Kanto Earthquake of 1923, measured magnitude 7.9 on the Richter scale and destroyed much of nearby Tokyo and Yokohama. Simple arithmetic would suggest the next quake is due sometime around the year 1996.

Mizuho Ishida and Masayuki Kikuchi think the Earth may now be sending warnings of that impending disaster. While studying a magnitude 5.1 quake that shook the Odawara area in August 1990, they found this tremor exhibited several unusual signs previously associated with so-called preshocks.

Most noticeably, the 1990 jolt occurred in a seismically quiescent area — one that had passed 57 years free of earthquakes larger than magnitude 4.6.

Taking a closer look, Ishida and Kikuchi observed that the 1990 shock packed an unusually concentrated punch. Calculations suggest that the Odawara quake relieved much more stress than an average earthquake of similar magnitude. What's more, the 1990 shock began and finished in about one-third the average time, the researchers say. Ishida, who works at the National Research Institute for Earth Science and Disaster Prevention in Tsukuba, and Kikuchi, a researcher at Yokohama City University, discuss their data in the Aug. 21 GEOPHYSICAL RESEARCH LETTERS.

In the late 1970s, Ishida recognized similar unusual characteristics in small shocks that preceded California's 1971 San Fernando earthquake and the 1952 Kern County earthquake. In these cases, small power-packed quakes occurred in seismically quiet regions a few years prior to the large shocks. Because of the similarity in circumstances, she and Kikuchi suggest that the 1990 earthquake may foreshadow the larger Odawara quake, expected to measure magnitude 7 or stronger.

Thomas H. Heaton, a seismologist at the U.S. Geological Survey in Pasadena, Calif., cautions that the case may not be so clear. Geophysicists have not yet demonstrated that they can distinguish preshocks from ordinary earthquakes on the basis of the amount of stress they relieve, he says. —*R. Monastersky*

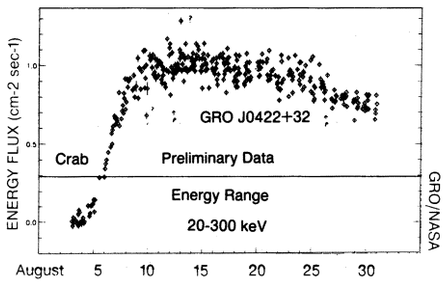
X-rays from dim space hint at a black hole

Last month an object in the constellation Perseus that had been so dim no one had ever detected it began spewing out a barrage of X-rays and gamma rays. NASA's Compton Gamma Ray Observatory (GRO) found that the puzzling source had become the most powerful radiator detected at the X-ray energy of 100,000 electron-volts.

Preliminary evidence now suggests that the object belongs to a special class of binary stars likely to contain a small black hole. Variously dubbed Nova Persei 1992 or GRO J0422+32 for its location in the sky or the observatory that discovered it, the object has X-ray and ultraviolet spectra resembling those of other candidate black holes that have literally burst on the scene in the past 20 months. Researchers reported some of their findings last week at the World Space Congress in Washington, D.C.

Nova Persei 1992 appears to belong to a subtype of a general class of X-ray-emitting stars called low-mass X-ray binaries. Low-mass binaries typically feature a dwarf star closely orbiting a highly compact object, either a neutron star or a black hole. (A black hole is a collapsed star theorized to have such a strong gravitational field that not even light can escape it.) Matter from the dwarf star falls directly onto its compact partner or onto a disk of matter surrounding that partner, emitting intense radiation in the process. Many binaries emit light continuously, masking the faint glow of the dwarf star. But some binaries, perhaps including Nova Persei 1992, emit radiation in bursts that die down after a few months, allowing researchers to observe the dim dwarf star and estimate its mass and velocity. From such data, scientists can determine if the dwarf's compact partner has more than three times the mass of the sun — the minimum value a star must have to become a black hole. Two binary stars that recently unleashed an outburst of radiation — Nova Muscae 1991 and V404 Cygni — would qualify as black hole systems on the basis of their mass (SN: 2/15/92, p.101).

If Nova Persei is also a binary, as scientists suspect, they need wait no more than a year to determine whether it harbors a black hole. But several features already hint at its character, says Rashid Sunyaev of the Space Research Institute in Moscow. He reported that observations over many wavelengths, including



X-ray intensity of GRO J0422+32, as seen by the GRO. At its peak, the source emitted about three times the X-ray output of the Crab Nebula (solid line).

those made with a gamma-ray telescope aboard the Soviet satellite GRANAT, show that Nova Persei's outburst matches the pattern expected when matter falls onto a disk surrounding a black hole. In addition, GRO spectra, described by Gerald J. Fishman of NASA's Marshall Space Flight Center in Huntsville, Ala., as well as GRANAT data, show that Nova Persei's output flickers in a near-periodic fashion — a feature that could stem from instabilities in such a disk.

"I haven't any doubt that this object is a black hole," says Sunyaev. Based on recent observations, he estimates the Milky Way contains 3,000 to 5,000 binaries that harbor black holes. —*R. Cowen*