would face a reduced cancer risk. Their findings revealed that, on average, blacks in the study tended to detoxify NNAL less effectively than whites who smoked the same number of cigarettes.

The researchers speculate that many black smokers are less able than white smokers to detoxify NNAL.

Yet averages don't tell the whole story. The research showed that 6 percent of the black smokers detoxified NNAL aggressively and thus were at less risk of lung cancer than most other black smokers. By contrast, 30 percent of white smokers metabolized NNAL aggressively.

Additional metabolic differences may exist in the way blacks and whites handle the carcinogens in cigarette smoke. For example, compared with white smokers, black smokers run less risk of developing bladder cancer. If scientists can elucidate such differences, they may someday devise tests that give smokers individual portraits of their cancer risks.

"That information would be extremely useful in getting people to quit smoking," Richie says. "If you know you're at especially high risk for cancer, that might be all that much more incentive to give it up."

The researchers say that confirming the finding will require more research. "If it holds up, it's going to be very exciting," comments Steven Tannenbaum, a toxicologist at the Massachusetts Institute of Technology.

The question of whether an individual smoker gets lung cancer remains a highly complex one, Tannenbaum says. Some people may inherit a vulnerability to such cancers. However, many other factors go into the lung cancer and smoking equation, he adds. — *K.A. Fackelmann*

Rare supernova brightens April Fool's Day

"I thought that the message on my [answering] machine about a new supernova was an April Fool's joke at first," says Robert P. Kirshner. Once reassured that it wasn't, Kirshner, of the Harvard-Smithsonian Center for Astrophysics, spent much of the weekend alerting his fellow astronomers to the explosion of the dying star.

Amateur astronomers first spotted Supernova 1994I — the ninth discovered this year — on April 1. It exploded in a spiral galaxy known as M-51, or the Whirlpool Galaxy. The supernova itself lies about 18 million to 20 million light-years away and should soon reach its peak brightness, says Richard A. Sramek of the National Radio Astronomy Observatory (NRAO) in Socorro, N.M. The supernova can be seen through a telescope.

"We get one about this bright every 10 years or so," says Kirshner. There was an equally bright supernova last year, he adds, but "once in a while, you get the once-in-a-decade supernova twice."

Astronomers detected radio signals the next day, an unusual occurrence. Only radio waves from supernova 1987A, which exploded in a neighboring galaxy, have been detected as quickly. "And compared to this one, 1987A was a real wimp," says NRAO astronomer Michael P. Rupen. "You would never have seen anything [from it] at this distance."

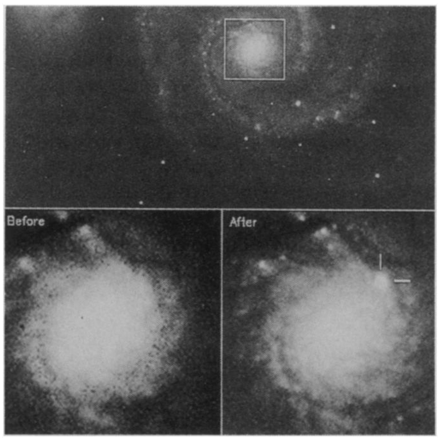
All stars continuously shed their skin, releasing particles that form a so-called stellar wind. When a supernova explodes, it flings off its outer layers of gas. To recreate the last moments of a dying star, astronomers look at the light and ultraviolet emissions produced in the heat of the star's explosion and the radio waves created as the star's outer layers slam into its stellar wind.

Because they saw so many different radio waves, astronomers hypothesize that 1994I's stellar wind included a narrow, but dense, band of particles. "If you throw a brick through the air, you don't hear much of anything," Rupen says. "But if you throw it into a wall, it goes 'Bang.'" Yet it must have been a narrow band, he adds, because otherwise the radiation couldn't have "eaten away at the curtain to let you see in."

Supernova 1994I resembles a select group of 5 to 10 known supernovas. Astronomers speculate that they formed from the collapse of a large star that had already lost its outer layers of hydrogen and helium.

"We're still guessing on that," Kirshner says, "and it may be that this one is going to give us the chance to sort it all out." One speculation is that supernova 1994I may have formed from the collapse of a blue Wolf-Rayat star that was up to 40 times more massive than our sun.

"Presumably, the fate of a star has much to do with its mass," says Kirshner, "but we don't know what path in its life brings it to this colossal moment of destruction. By sorting out this one's biography, we may be able to sort out some of the factors." — *D. Christensen*



P. Challis, O. Kuhn, B. Schmidt/Whipple Obs.

New supernova in spiral galaxy M51 (above). Close-ups before (left) and after (right) the explosion.

Riding a plasma wave toward high energies

With the cancellation last fall of the Superconducting Super Collider, high-energy physicists are paying closer attention to alternative, potentially less costly schemes for accelerating electrons and other particles. One possibility involves the use of powerful electric fields generated by waves traveling through plasmas of charged particles at nearly the speed of light.

Last year, electrical engineer Chan Joshi and his team at the University of California, Los Angeles, demonstrated that they could boost the energy of electrons injected into waves in a laboratory plasma. Now, the same group has shown that a plasma wave can trap injected electrons, allowing the electrons to gain additional energy as they move along with the wave.

This is "a necessary condition for obtaining the maximum amount of energy theoretically possible for such schemes," the researchers report in the April 7 NATURE.

Although the idea of plasma-wave particle accelerators originated 15 years ago, researchers have only in recent years overcome tough technical problems and gained the expertise required to make plasma waves of sufficiently high quality for acceleration experiments.

Joshi and his coworkers focus a pair of beams from a carbon dioxide laser — operating at two slightly different frequencies — and a beam of electrons on the same point in a chamber filled with hydrogen. The hydrogen breaks down into a low-density plasma consisting of electrons and hydrogen nuclei, or protons.

The overlapping laser beams interfere with each other, creating a sequence of pulses of light. These pulses, in turn, exert a force on the electrons in the plasma, thus altering electron distribution. The result is a rapidly propagating plasma wave at a frequency equal to the difference of the two laser frequencies. Injected electrons race along with the plasma disturbance like surfers riding an ocean wave.

The researchers found that they could increase the energy of injected electrons from 2 million to 30 million electron-volts over a distance of about 1 centimeter. This represents "the largest coherent man-made accelerating field yet produced," Robert Bingham of the Rutherford Appleton Laboratory in Chilton, England, notes in the same issue of NATURE.

Joshi and his collaborators are now aiming for higher electron energies, while other groups continue to work on somewhat different strategies for plasma-wave acceleration. "It is . . . gratifying to see that some of the ideas on alternative acceleration schemes proposed more than a decade ago are coming to fruition," Bingham comments. — *I. Peterson*

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