ation Research Center in Hsinchu, Taiwan. And the construction of a 2-GeV synchrotron facility, the Pohang Light Source, has begun at the Pohang Institute of Science and Technology in South Korea. Posco, a steel company, has funded at least half of the approximately $200 million project, with the rest being provided by the government. The ring has a 280-m circumference, 12 straight sections and a 2-GeV linac as a full-energy injector.

## Other works in progress

A number of nations are building other synchrotron radiation facilities. Some are designed primarily for research on x-ray lithography. Others, while not having either enough straight sections or high enough brightnesses to qualify as third generation, will nevertheless be vaulable resources for the large numbers of researchers who would like access to these machines. After all, notes Herman Winick (Stanford Synchrotron Radiation Laboratory), the intensitites of bending magnets are still 100 000 times those of x-ray machines.

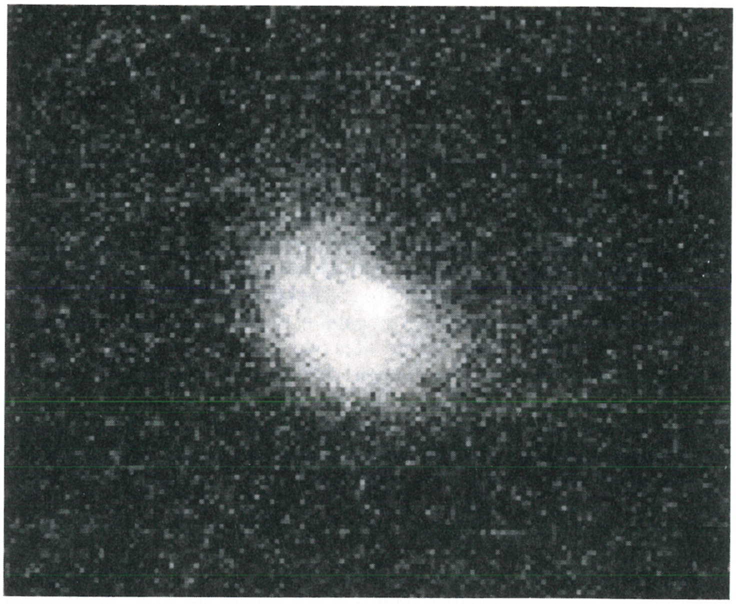
The Laboratorio National de Luz Sincrotron in Brazil is constructing a 1-GeV synchrotron radiation facility in Campenas, which is scheduled for completion by 1992. That ring would be followed by a 2- to 3-GeV ring by 1995. The Kurchatov Institute in the USSR has contracted with the Institute for Nuclear Science and Research in Novosibirsk to build a 2.5-GeV ring, called Siberia II, to be located at the Kurchatov Institute. The injector will be an existing 450-MeV accelerator, Siberia I, which, in the words of Ednor Rowe (Synchrotron Radiation Center at the University of Wisconsin), "is a synchrotron facility in its own light." In the People's Republic of China, an 800-MeV storage ring patterned after BESSY I has begun to operate at its design specifications in the last year. It is run by the Hefei National Synchrotron Radiation Laboratory (HESYRL) in the province of Anhui. India's Center for Advanced Technology in Indore is building a 450-MeV machine known as Indus, and has plans for one at higher energy.

The most unusual project is one undertaken at the Aarhus storage ring (known as ASTRID) in Denmark, which was built for heavy ions. The accelerator has been operating with ions since 1990, and now scientists at the Institute for Synchrotron Radiation at Aarhus University are adding an electron injector so that the ring can operate with either ions or electrons.

In general, synchrotron sources facilitate a wide variety of measurements—absorption, diffraction, spectroscopy and so forth—on materials as diverse as DNA, silicon, catalysts and polymers. The high brightness opens the door for many measurements that were previously very time consuming—or not possible at all. The rapid pulsing combined with the high brightness will also enable dynamical studies of such things as ultrafast chemical reactions: The new machines essentially replace a photographic capability with a cinematic one. The applications of soft- and hard-x-ray machines are complementary, and many investigations require machines of both types.

—BARBARA GOSS LEVI ■

## A Surprise from the Predictable Comet Halley



A sudden eruption on Comet Halley enveloped it in a cloud of dust that is 300 times brighter and about 20 000 times larger than its nucleus. (The width of the photograph above corresponds to 71 arcseconds, or about 700 000 kilometers at the distance of Halley.) Previously the comet had behaved as expected, reappearing in our solar system right on schedule. At that time, our visitor had also generated a cloud of dust, but such a phenomenon was expected when the comet was close to the Sun: The solar energy sublimated the water ice on this "dirty snowball," and the outward-moving water vapor carried the dirt particles off the surface. But as the comet gradually receded from the Sun, its surface temperature fell back and the dust cloud virtually disappeared. Then, on 12 February, as Comet Halley was between Saturn and Uranus, some two billion km from the Sun, comet trackers Olivier Hainaut and Alain Smette of the European Southern Observatory in Chile found the comet to be greatly enlarged, as shown in the above photo. Three days later, another Halley watcher, Karen Meech (University of Hawaii) independently saw the vast cloud of dust. Smette subsequently made spectral measurements and determined that the comet's light was consistent with sunlight reflecting from dirt particles. Richard West of ESO reports that through 17 March the comet was still extremely active, with the shape of the cloud changing from night to night. This behavior just deepens the mystery, West feels.

So what happened? The continuing activity seems to rule out the already distant possibility that the comet collided with another body. It is also improbable that the cloud resulted from effects of the comet's interaction with the solar wind. More plausible, speculates Zdenek Sekanina of the Jet Propulsion Laboratory, is some type of dynamic process that opened a crack in the comet's crust, permitting the frozen carbon monoxide or carbon dioxide to sublime and drive dirt off the surface. Astronomers are peering at Comet Halley now with new interest, but will they be able to get an answer to this mystery before Halley retreats from view for another 76 years?

—BARBARA GOSS LEVI