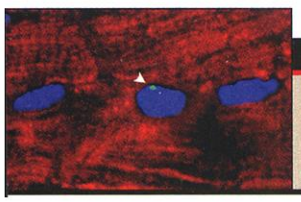

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plementing them will be expensive. "There's no doubt that institutions are going to need more resources and more bureaucracy," says Danforth. Adds Martin, "Nobody out here has proposed how to pay for this increased scrutiny."

The association plans to issue a second report this year on institutional conflicts. The next few months may also see guidelines from the HHS Office for Human Research Protections, whose chief, Greg Koski, says that AAMC's recommendations are "by and large very consistent" with what HHS is contemplating.

–JOCELYN KAISER

HIGH-ENERGY PHYSICS

Repairs Weakened Neutrino Detector

TOKYO—A single cracked photomultiplier tube apparently triggered the devastating accident on 12 November 2001 that has closed Japan's Super-Kamiokande neutrino detector for at least a year. An investigation into the accident has confirmed early suspicions about the sequence of events that destroyed about 7000 of the observatory's 11,000 light-detecting sensors (*Science*, 23 November 2001, p. 1630).

The $100 million detector has produced convincing evidence that neutrinos have mass, contrary to decades of theoretical predictions. The wispy particles cannot be observed directly, however, so the 39-meter-diameter, 41-meter-high observation tank is filled with water and lined with photomultiplier tubes that can catch a distinctive glow, known as Cerenkov radiation, produced when neutrinos smash into atomic particles in the water. Last summer, for the first time since the facility was completed in 1996, the water was drained so some 100 burned-out tubes could be replaced. The tank was being refilled when one of the tubes imploded and started a chain reaction that destroyed almost all of the submerged tubes.

By analyzing the sequence in which the sensors stopped sending signals, the investigators narrowed down the initial break to one of two tubes—one original, one a replacement—on the floor of the tank. To make the repairs, technicians stood on thick Styrofoam pads placed directly atop the tubes, after determining that the tubes were capable of withstanding the stress. Examining that assumption, investigators applied eight times the load calculated to have been imposed during the repair operation on an array of 12 tubes. One of these tubes subsequently broke at its neck when subjected to a water-pressure test. This result "hints" that the neck of the original tube could have been weakened by the repair work, the report concludes, although the replacement tube might also have been damaged during handling or installation.

To test the theory that a single imploding tube could destroy thousands of others, the investigating team three times submerged an array of nine tubes and deliberately punctured the central tube. Each time, the shock wave resulting from the implosion broke all the surrounding tubes. Yoji Totsuka, a professor at the University of Tokyo's Institute for Cosmic Ray Research and director of the observatory, says the team plans to test whether acrylic housings for the tubes will contain the shock wave and prevent a chain reaction. They are also working with the manufacturer to develop more shock-resistant tubes.

The Japanese and U.S. project scientists running the experiment must now convince a University of Tokyo committee that they understand the causes of the accident well enough to prevent it from recurring. If they do, scientists hope to resume some observations within a year using a limited number of photomultiplier tubes. But bringing the facility back to full strength could take 5 years and cost between $15 million and $25 million.

–DENNIS NORMILE

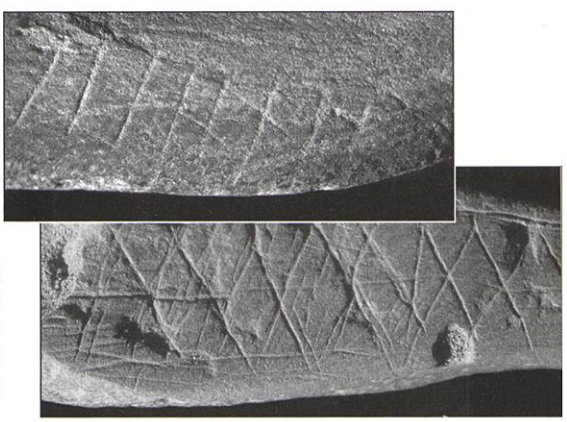
Fix-it fiasco. Repairs to the photomultiplier tubes triggered a costly accident when the tank was refilled.

CREDITS: (TOP) C. HENSHILWOOD *ET AL.*; (BOTTOM) ICRR

OLDEST ART

From a Modern Human's Brow—or Doodling?

Archaeologists in South Africa have found what may be the oldest known art, dated at least 40,000 years before the earliest cave paintings in Europe. The artifacts, two chunks of red ochre engraved with geometric crosshatches, were recovered from 77,000-year-old cave deposits. It's unclear what the ancient artist meant the marks to represent. Nevertheless, some researchers argue that the find in Blombos Cave, published online by *Science* on 10 January (www.sciencexpress.org), strengthens the case that modern human behavior arose much earlier than previously thought and that it took root in Africa long before spreading to Europe. Others caution against drawing sweeping conclusions from what may be a relatively rare find.



Ochre oeuvre? Researchers claim these engravings are evidence of symbolic representation.

Most experts believe that *Homo sapiens* arose about 130,000 years ago in Africa, when anatomically modern humans debut in the fossil record. But scientists have been puzzled by the seemingly long gap between when humans began looking modern and when they started acting modern. Until recently, there was little evidence of modern behavior—such as the use of advanced hunting and fishing techniques and the creation of elaborate tools and art or other symbolic expression—earlier than about 40,000 years ago, the start of Africa's Later Stone Age and Europe's Upper Paleolithic, when stunning cave paintings in France and Spain appeared.

Since 1993, however, a team led by ar-