Gran Sasso Laboratory Sees Light at the End of the Tunnel

Work in Italy's underground lab stalled following a chemical accident. Now researchers have plugged the leak and are soothing local nerves

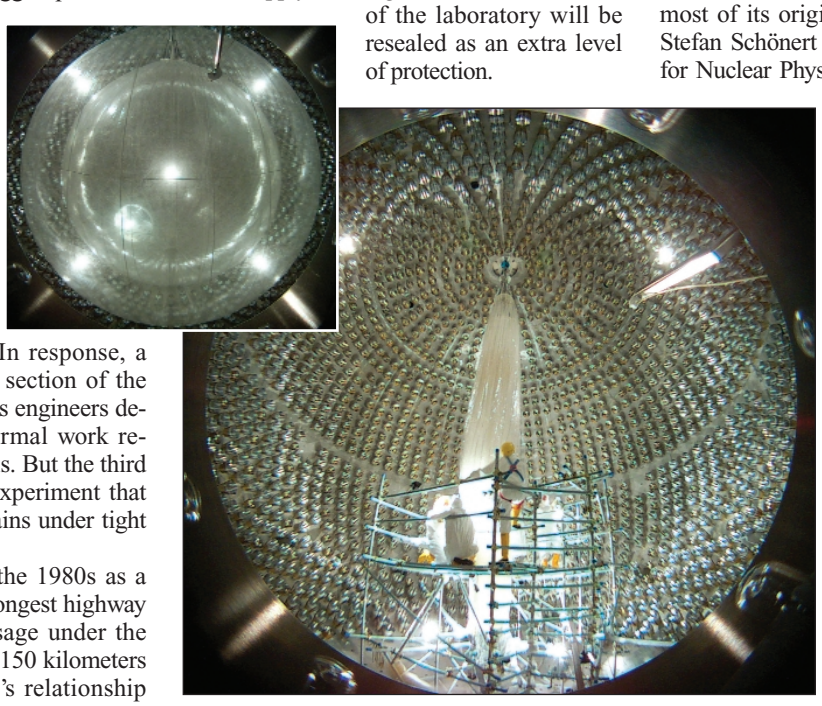
ASSERGI, ITALY—It was a small spill, but it had a huge impact. In August 2002, researchers at the Gran Sasso National Laboratory here accidentally opened a valve they shouldn't have, and 50 liters of pseudocumene (1,2,4-trimethylbenzene) escaped into the lab's drainage system. The spill was quickly contained and caused only slight environmental damage: It may have killed a fish, and it spoiled the afternoons of picnickers who smelled the volatile chemical, a common additive in paint and gasoline. The resulting investigation and environmental flap, however, have had serious consequences, killing one long-running project and seriously delaying another.

A year and a half later, work at the world's largest underground laboratory for subatomic physics is nearly back to normal; one large project remains on hold, and scientists are bracing for possible delays this summer as the lab's floors are resealed. Despite the disruptions, some observers say the lab may have had a lucky escape. The relatively minor spill brought to light weaknesses that would have left the facility vulnerable to a much larger mishap. "The accident … flagged problems that needed to be addressed," says director Eugenio Coccia, who took over in June 2003.

Indeed, an investigation ordered by the local courts after the spill revealed that a system designed to keep the laboratory's drainage system sealed off from the water supply for two neighboring cities, L'Aquila and Teramo, was not effective. In response, a judge halted all work in the section of the lab where the spill occurred as engineers designed a fix. In January, normal work resumed in two of the three halls. But the third hall, housing the Borexino experiment that was the site of the spill, remains under tight restrictions.

Gran Sasso was built in the 1980s as a side project in one of Italy's longest highway tunnels, a 10-kilometer passage under the 2912-meter Gran Sasso peak 150 kilometers northeast of Rome. The lab's relationship with some neighbors on either side of the mountain has always been wary, says staff scientist Aldo Ianni, who grew up in nearby Isola del Gran Sasso. The lab is run by Italy's National Institute of Nuclear Physics (INFN), and the "nuclear" in the name sounds ominous to residents, he says. It employs only 65 people, so most residents have no personal connection to the lab. The spill has highlighted the importance of public realations, says Ianni. "In the U.S., they are more sensitive to outreach," he says. "We have perhaps started a bit too late."

Since the accident, the lab has made efforts to engage its neighbors and demystify its work. The Teramo city council held one of its meetings at the lab, Coccia says, and members toured the experimental chambers and met scientists. This summer the lab will sponsor the first Gran Sasso–Princeton Physics Summer School, offering 20 local high school students free transportation and room and board to study English and physics for 4 weeks at Princeton University, the home of several Borexino collaborators. Meanwhile, new pipes—paid for by the highway authority—will carry drainage from the laboratory and the highway away from the towns' water supply. Starting next month, the floors of the laboratory will be resealed as an extra level of protection.



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Ready to roll. Researchers on the Borexino experiment are prepared to fill their spheres, once environmental clearance comes.

The improvements have cost research dearly, however. The Borexino experiment, designed to detect neutrinos produced in the sun's core, has been hardest hit. Construction stopped for 16 months, when the experiment was still a year and a half from completion, and is only now slowly getting back on track. "It was a disaster" for scientists on the project, says Thomas Shutt of Princeton. "A 2-year pause is deadly for a graduate student," he says. "A lot of people had to leave the project," adds Andrew Sonnenschein of the University of Chicago.

When the spill happened, the team had just shipped from Princeton a polymer sphere designed to hold 300 tons of pseudocumene, which gives off a flash of light when a neutrino hits. This month, the researchers installed and inflated the double-layered sphere, and it has proved airtight, Ianni says. They hope the local judge will give them the go-ahead to fill it with pseudocumene by the end of the year.

The other casualty of the spill is the Gallium Neutrino Observatory (GNO), which detects different neutrinos from the sun using 30 tons of dissolved gallium. The project, launched in 1991, provided some of the first evidence that solar neutrinos change type en route from the sun. Although it had achieved most of its original objectives, collaborator Stefan Schönert of the Max Planck Institute for Nuclear Physics in Heidelberg, Germany, says, the team had planned to keep gathering data for at least five more years. The experiment itself is extremely safe, he says, but the reflooring of the hall would have required dismantling and rebuilding the experiment. INFN decided the expense would not be worth it and shut the project down.

Coccia manages to put a positive spin on the shutdown. Several new projects have been proposed, and the lab was running out of room, he says. Scrapping the GNO will ease the shortage of floor space and, he hopes, help keep Gran Sasso on the cutting edge of physics.

–GRETCHEN VOGEL

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