



PAGE 1639
The latest exotic import



1641
Oldest modern humans

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Environmental Report Paralyzes Italian Neutrino Lab

NAPLES—Work at the world's largest underground facility for the study of subatomic particles from space, Italy's Gran Sasso National Laboratory, has ground to a near-halt following a court-ordered report that said the lab's drainage system could contaminate local water supplies. A local court has ordered one experimental area closed indefinitely, and the government agency that runs Gran Sasso has halted most experiments throughout the lab. But physicists there say that fears are exaggerated and that the shutdown could set their research back by months or more. "This is a disaster for us," says Gianpaolo Bellini of the

pseudocumene (1,2,4-trimethylbenzene), a liquid chemical that scintillates when a neutrino strikes. The Borexino detector uses 300 tons of the fluid to spot neutrinos coming from reactions of beryllium-7 in the sun. "They quickly realized that pseudocumene was being drained from the vessel. They kept the incident to 50 liters and reported it immediately to the lab authorities and local authorities," says Frank Calaprice, the principal investigator of Princeton University's contribution to the Borexino project. The volatile chemical quickly evaporated, but some of it drained into a nearby creek, where picnickers smelled it and it killed a fish, Calaprice says.

Environmentalists seized on the incident and took the lab to court. A tribunal in Teramo ordered an independent engineer to prepare a report on environmental safety conditions at the lab. Meanwhile, Italy's high-energy physics research institute, the National Institute of Nuclear Physics (INFN), ordered the lab to halt

any work involving pseudocumene in Hall C, the area where the spill took place.

The 10,000-page report was released on 29 May. It acknowledged that no traces of trimethylbenzene had been found in local drinking water but concluded that chemicals spilled in the future could find their way into the local drinking water and river. In response, the Teramo tribunal immediately sealed off Hall C indefinitely, stopping all activities except safety checks, and INFN banned the handling of fluids throughout the lab.

Some experiments—such as Icarus, a detector for muons produced by cosmic ray interactions in the atmosphere—do not re-

quire the handling of liquids and are still running, reports Gran Sasso laboratory director Alessandro Bettini. But others, such as Borexino, are in limbo. "I'm worried it could take a long time, but I have no idea," says John Wilkerson, a physicist at the University of Washington, Seattle, who sits on Gran Sasso's review board. "I hope that the government and INFN will resolve the issue quickly, or there will be damage to the [Borexino] project and damage to the lab." In the meantime, he says, "most of the experiments are certainly on hold." Adding to the uncertainty, Bettini is stepping down this month. Wilkerson thinks major decisions about making the lab fully operational again will wait until Bettini's successor, Eugenio Coccia of the University of Rome, comes on board.

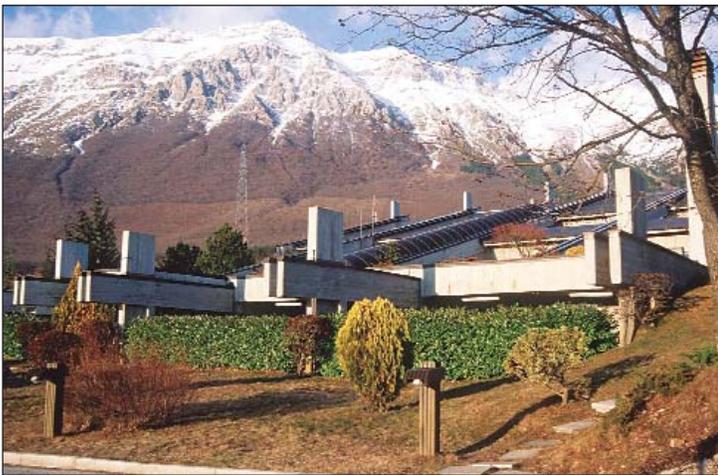
"Borexino is the best hope, in the near future, of seeing beryllium-7 neutrinos," says Wick Haxton, a physicist at the University of Washington, Seattle. "This is a very bad time for them."

GNO, a gallium-based solar-neutrino detector that has been operating since 1998, is also shut down while the ban on liquid operations is in place; it uses a tank of germanium chloride to detect neutrinos, Calaprice says. It's not clear whether the ban applies to the several experiments that are cryogenically cooled by liquid nitrogen, he adds.

Bettini says he hopes to persuade the local judiciary to reopen Hall C. INFN is prepared to appeal to Italy's Supreme Court of Cassation in Rome, he says. A recent meeting with government officials left him optimistic that the lab's piping system that evacuates excess water will be inspected during the next few months, he says. Bettini also says the lab has received approval to build an extra safety tunnel that would allow better access to the laboratory as well as safer evacuation of water and its treatment in external basins in case of accidental contamination.

To Calaprice, the concern over leak plugging is only half the story. "I'm concerned in the long term, one, how long will it take to fix the technical problem?" he says. "Two, how long will it take to regain the trust of the locals and for the local authority to stop putting seals here and there?" Until Gran Sasso gets on better terms with its neighbors, the headaches will almost certainly continue.

—ALEXANDER HELLEMANS AND CHARLES SEIFE
Alexander Hellemans is a writer in Naples.



High and dry? Gran Sasso National Laboratory put experiments on hold after a chemical spill raised fears that the lab might be leak prone.

University of Milan, a spokesperson for a solar-neutrino detector under construction at the lab called Borexino.

The laboratory, a 6000-square-meter complex shielded from cosmic radiation by 1400 meters of rock, was built in the mid-1980s alongside a 10-kilometer-long highway tunnel under Gran Sasso Mountain, between Rome and the Adriatic Sea. It cools its equipment with water from the same aquifer that supplies drinking water to two nearby towns, L'Aquila and Teramo. But despite its sensitive position, for years environmental tensions stayed below a simmer.

Then, last August, two researchers working on the Borexino experiment spilled

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Editor's Summary

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