

## ENVIRONMENT

# Italian physicists to stand trial

Prosecutors say measures at underground lab do not do enough to protect drinking water.

BY NICOLA NOSENGO

Three officials from Italy's National Institute for Nuclear Physics (INFN) will face trial for allegedly overlooking environmental safety regulations at the institute's Gran Sasso underground laboratory, a world-leading physics facility near L'Aquila, in central Italy.

Prosecutors in nearby Teramo have charged INFN president Fernando Ferroni, lab director Stefano Ragazzi and the head of the lab's environmental services, Raffaele Adinolfi Falcone. According to the accusations, which were prompted by complaints from environmental activists, they have failed to verify the correct functioning of systems that, in the event of a large spill, would keep toxic substances away from drinking-water sources. If found guilty, they face fines and sentences of up to four years in prison. The trial is set to begin on 13 September.

Ferroni and Ragazzi declined to comment. Adinolfi did not reply to *Nature's* request for an interview, and neither did the prosecutors. Antonio Zoccoli, the INFN's vice-president, responded on behalf of the institute, saying that if any risk at the facility exists, it is not the current management's fault.

## CHEMICAL SPILLAGE

The Gran Sasso National Laboratory is the world's largest underground physics facility. It was built in the 1980s next to a highway tunnel under the Gran Sasso mountain chain, and currently hosts 16 experiments on neutrino physics, dark matter, astrophysics and particle physics. Problems at the lab began in 2002, when 50 litres of the hydrocarbon trimethylbenzene accidentally spilt from the Borexino experiment, which looks for solar neutrinos. The substance, which can be toxic in high doses, was then detected in a nearby river.

As a result, Borexino was put on hold. Part of the lab was sealed by the Teramo court, and the Italian government ordered a renovation of the facility's safety systems. The intervention cost more than €80 million (US\$90 million), and was completed in 2006.

But environmental groups argued that the lab was still not complying with regulations enacted that year, which say that toxic substances must be kept at least 200 metres away from sources of drinking water. The lab halls are surrounded by the aquifer that feeds the local aqueduct and is the main source of water for the surrounding Abruzzo region.

In addition to Borexino's 1,300 tonnes of trimethylbenzene, the labs host about 1,000 tonnes



Workers inside Borexino, an experiment in the Gran Sasso lab that detects solar neutrinos.

of petroleum-derived liquids stored in the Large Volume Detector (LVD), which looks for neutrinos emitted by supernovae.

Tensions rose again at the end of 2016, after a lab technician accidentally spilt some solvent while doing maintenance on CUPID, another neutrino experiment. A further accident, this time unrelated to the lab's activity, occurred in May 2017 and involved a chemical found in the paint used for renovating the highway tunnel. In both cases, tests performed by the local environmental-protection agency found the substances in the aqueduct's waters, although within safety thresholds.

## COMPLAINTS FILED

Still, those accidents prompted Augusto De Sanctis, an environmental activist and president of the local non-profit organization Abruzzo Ornithological Station, to file complaints with local prosecutors, who appointed three experts for a thorough investigation into the lab and tunnel's safety. This found that the lab lacks proper isolation between the experimental areas and the aquifer — as required by Italian environmental regulations — as well as between the lab's own drainage system and the aqueduct.

Without such insulation, the prosecutors argue, a serious toxic spillage would threaten the health of the local population. The prosecutors

also reaffirmed that Borexino and the LVD should be at least 200 metres away from the aquifer. In addition to the three physicists, the court indicted managers of the companies operating the highway and the aqueduct.

"The work done between 2004 and 2006 to renovate the safety systems was validated by the government, and by the court itself that unsealed the lab," Zoccoli says. "Now the prosecutor is saying that those works were not done properly, but it was not INFN's responsibility to check them." As for the 200-metre rule, he says it refers to surface springs rather than to aquifers such as Gran Sasso, where the source is the whole mountain. And risks have to be assessed "rationally", he says. "The two detectors are sealed in very robust steel tanks and are constantly monitored. There's no such thing as zero risk, but here the risk is really low."

De Sanctis disagrees, noting that the area is highly seismically active, and that the possibility of a very strong earthquake causing an accident cannot be ruled out. He wants the Italian government to find €170 million to renew all water conduits at the lab and the tunnel, as requested in January by the Abruzzo regional authorities. And he says that the INFN must remove Borexino and the LVD as soon as possible and plan the next experiments differently. "I know Gran Sasso is a great place for doing physics," he says, referring to how the mountain shields the labs from radiation that would interfere with the detectors. "But it has limitations, in particular because of water and earthquakes." ■