D. HERSCHKOWITZ

DEFENDING ISRAELI SCIENCE
Minister speaks out on proposed budget cuts.
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the strain clear on his face. "But now it is OK — we are back!"

Geologist Gianluca Ferrini finds his attention still absorbed in his work as a voluntary member of the science faculty's civil-protection unit. He was one of the first on campus after the earthquake hit at 3:32 a.m., checking for immediate dangers of fire or flooding from gas leaks or broken water pipes. He remembers that even in those eerie night hours, looters were already trying to make off with computers.

He also recalls, with some pain, how in the dawn light the unit quickly moved on towards town to help the bare-handed search in the rubble for survivors, or for bodies. As the morning wore on, Ferrini says he found six of the dead, their dust-covered arms indistinguishable from the grey rubble except by touch.

Ferrini also helped to secure many of the university's scientific resources — from keeping fridges running after electricity was lost, to looking after experimental animals and stowing away valuables such as a collection of insects that had once belonged to Charles Darwin. "I have very little time to do my research work," he says, although he does frequently drive more than two hours to different locations to teach.

For Horvitz, visiting L'Aquila was a deeply moving experience. "Life does go forward — and these scientists are trying to find out how to deal with their lives and at the same time continue research," he says. ■

Alison Abbott

Elements reveal fossils' origins

Researchers are closing in on a way to 'fingerprint' fossils to match them to their precise geological origins.

Federal land managers and scientists have long dreamed of finding a way to link a potentially stolen fossil to a specific site, and thus subvert poachers who take fossils from public land. The US Paleontological Resources Preservation Act, signed into law in March, contains tough criminal penalties — felony charges carrying two- or five-year sentences — for such offences.

At the eighth Conference on Fossil Resources on 20–21 May in St George, Utah, researchers were scheduled to report on methods that can closely tie a fossil to a site through analysis of rare earth elements (REEs).

There are 15 REEs in the lanthanide series — from lanthanum, the lightest, to lutetium, the heaviest — all of which can be incorporated into bones as they become fossilized. The ratio of REEs varies from place to place depending on the chemical composition of groundwater in the region; a fossil's REE signature can thus be matched up to a geological location like pieces fitting into a jigsaw puzzle.

"Rare-earth-element analysis could be used as a prosecutorial tool."

The methods are getting ever more precise, says Dennis Terry, a geologist at Temple University in Philadelphia, Pennsylvania. "I have been able to say if a fossil is from Nebraska or adjacent South Dakota with 99% confidence," he says. "But now we are getting much closer to distinguishing locations on a regional level."

In a study to be presented in Utah by Terry's undergraduate student William Lukens, the team matched 45 fossil samples to three sites from which they were taken with 96.7% accuracy. All of the fossils originated just a few kilometres apart in and around Toadstool Geologic Park, a remote area in northwestern Nebraska where fossils are often poached.

Terry has also been using REE analysis to date bones more precisely, by comparing their elemental ratios to the stratigraphy of the rocks from which the specimens were taken (D. E. Grandstaff and D. O. Terry *Appl. Geochem.* 24, 733–745; 2009). This summer, he and his colleagues will be testing this method on the Flagstaff Rim, south of Casper, Wyoming, where they hope to use REE analysis to reduce the dating error bars from a span of about 100,000 years to about 20,000 years.

Meanwhile, Celina Suarez, a doctoral student at the University of Kansas in Lawrence, was due to present results at the conference showing how a laser can chart REE signatures in different parts of a single fossil specimen, making identification more exact. Rather than dissolving a piece of fossil in solution and testing the subsequent samples for REEs, her technique involves burning numerous spots on a specimen — with each ignition emitting gas that a mass spectrometer reads for REEs. This method can produce an elemental map of a bone's REE absorption.

"There are some problems, but overall the method is sound," says Suarez. "In some cases, I can tell where a fossil was removed from within a quarry."

Lucy Kuizon, head of palaeontology for the US Bureau of Land Management in Washington DC, says that such approaches are one way to fight fossil poaching. "These techniques are still under study, and not perfected yet," she says.

However, REE analysis is already moving into the courts. In a fossil probe on 11 April, the bureau used the technique to support a search-warrant application that was approved by a federal court in Kansas City, Missouri.

One day, REE analysis could be used as a prosecutorial tool, says palaeontologist Barbara Beasley of the Nebraska National Forest in Chadron. ■

Rex Dalton

D. TERRY

Fossils incorporate chemical elements from soil.