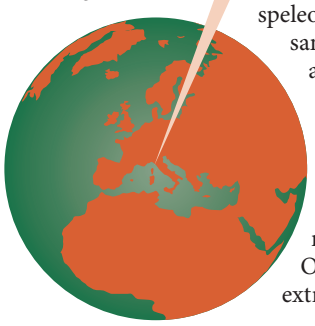
Underwater treasures

Fabrizio Antonioli, Andrea Dutton and their colleagues prised a stalagmite out of an underwater cave to learn about sea levels during the penultimate interglacial period.

Why did you choose this location?
Argentarola cave is located below sea level on an island approximately 100 km north of Rome. This cave is known to contain stalagmites with layers of encrusting biogenic marine calcite. Argentarola is the only cave in the world where submerged speleothems containing these unique layers have been dated to give a precise absolute chronology of past sea-level oscillations. I first came across a picture of the cave in a scuba-diving magazine, and immediately thought that the stalagmites must have great potential for climate reconstructions. The stalagmites in the cave were literally covered in tube-building worms called Serpulids, and my hypothesis was that overgrowths could have been conserved within the stalagmites during previous interglacial periods.

What was the objective of the work?
We went to the cave with the hope of sampling a very large stalagmite that recorded climate and sea-level oscillations extending back in time well beyond the last interglacial period (~125,000 years ago). Unfortunately, the majority of the specimen (stalagmite N) that we recovered was altered by dissolution, so the focus of the project was narrowed to the well-preserved portion of the stalagmite that grew during the penultimate interglacial period (~190,000–245,000 years ago). This is the nature of the geological record — we can only study the portion of the record that is well preserved, and it is not always the portion of the record that was targeted for study.

What sorts of data or samples were you after?
Argentarola cave contains about 2,000 speleothems — we sampled stalagmites and stalactites in hidden and less visible areas of the cave to preserve as much of the geological record as possible. Our aim was to extract a very large stalagmite containing a long record of climate and sea-level oscillations.



ALBERTO MURO PELLICONI

Diving deep. A team of seasoned divers was needed to manoeuvre stalagmite N, a particularly large specimen, out of Argentarola cave.

Did you encounter any difficulties?
The smaller stalagmites we recovered were very easy to obtain. However, recovery of stalagmite N (described in the paper) posed a big problem. The height (1.7 m) and dimension of this stalagmite forced us to organize an expedition team of six divers. The turbulent energy in the cave is very low, and consequently the bottom of the cave, by the base of the stalagmite, is filled with mud. After a few minutes the scuba diver was completely submerged in brown smog with a visibility of only 2 cm! So, it took three full days to sample and remove the stalagmite from the cave, and the stalagmite was so heavy that we had to tie an air-filled balloon to it as we guided it out of the cave. This effort was coordinated by Giorgio Caramanna and me, and we were aided by the scuba firemen of Rome. All of the divers had many years of experience — which was quite necessary because of the complicated nature of the dive.

Did you have encounters with dangerous animals?
A lot of curious fish and a moray eel that lives in the cave watched us very closely during the three days of work, but the scuba divers were probably the most dangerous animal in the cave. We enjoyed the presence of the fish, although I suspect that they were not pleased that we were blocking their exit from the cave!

What was the highlight of the expedition?
We were so happy when we finally manoeuvred the large specimen out of the cave. The best moment was when the stalagmite was cut open for the first time and we could see all of the marine layers that are so valuable for us to study and date.

Did you learn anything new about yourself or your team members?
The retrieval of the specimen was carried out by expert divers, who worked as volunteers to provide new scientific opportunities for Italy. I would like to thank them for their participation and for making this work possible.

This is the Backstory to the work by Andrea Dutton and colleagues, published on page 355 of this issue.