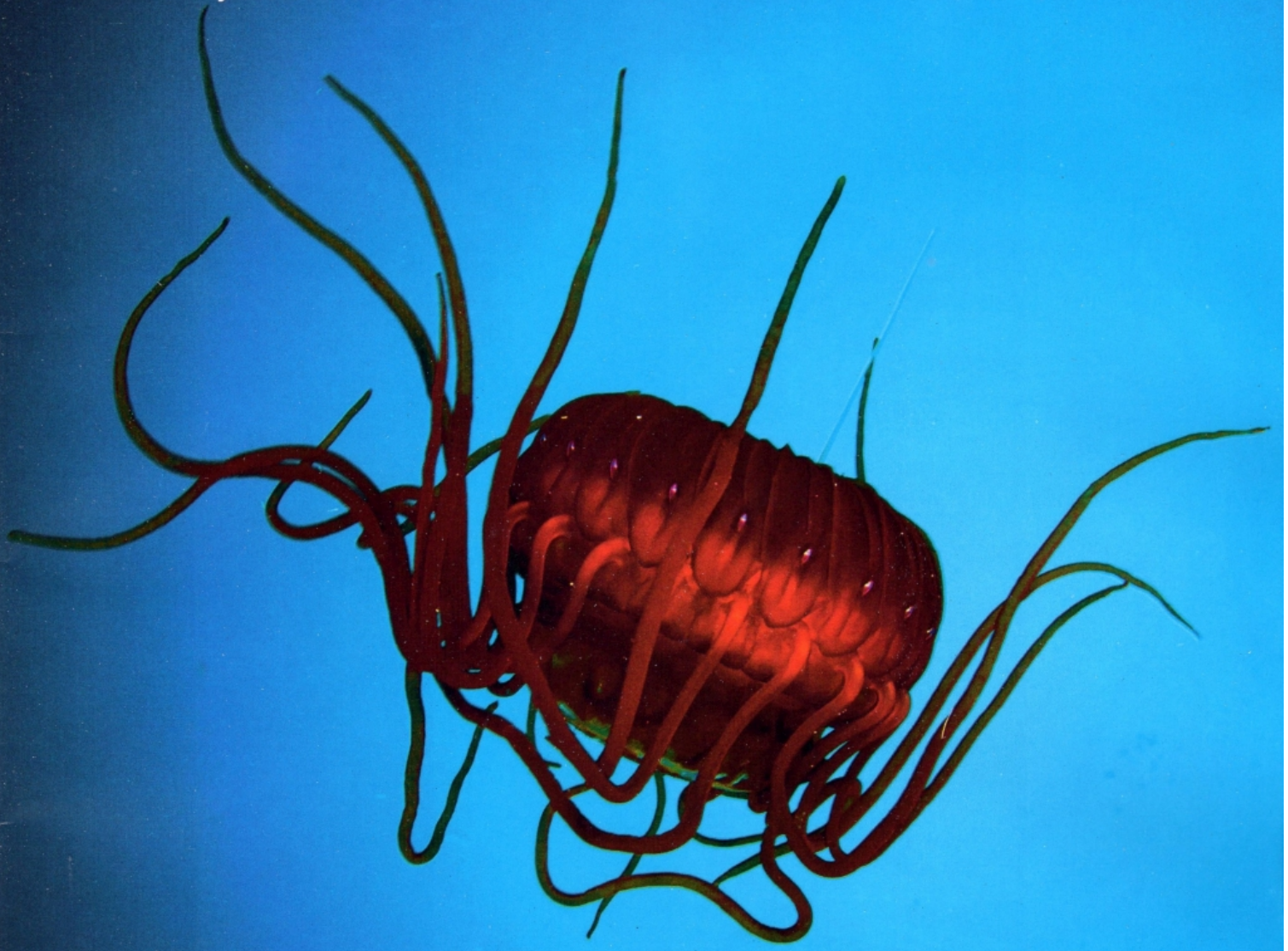


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JANUARY 2020



Mysteries of the Deep

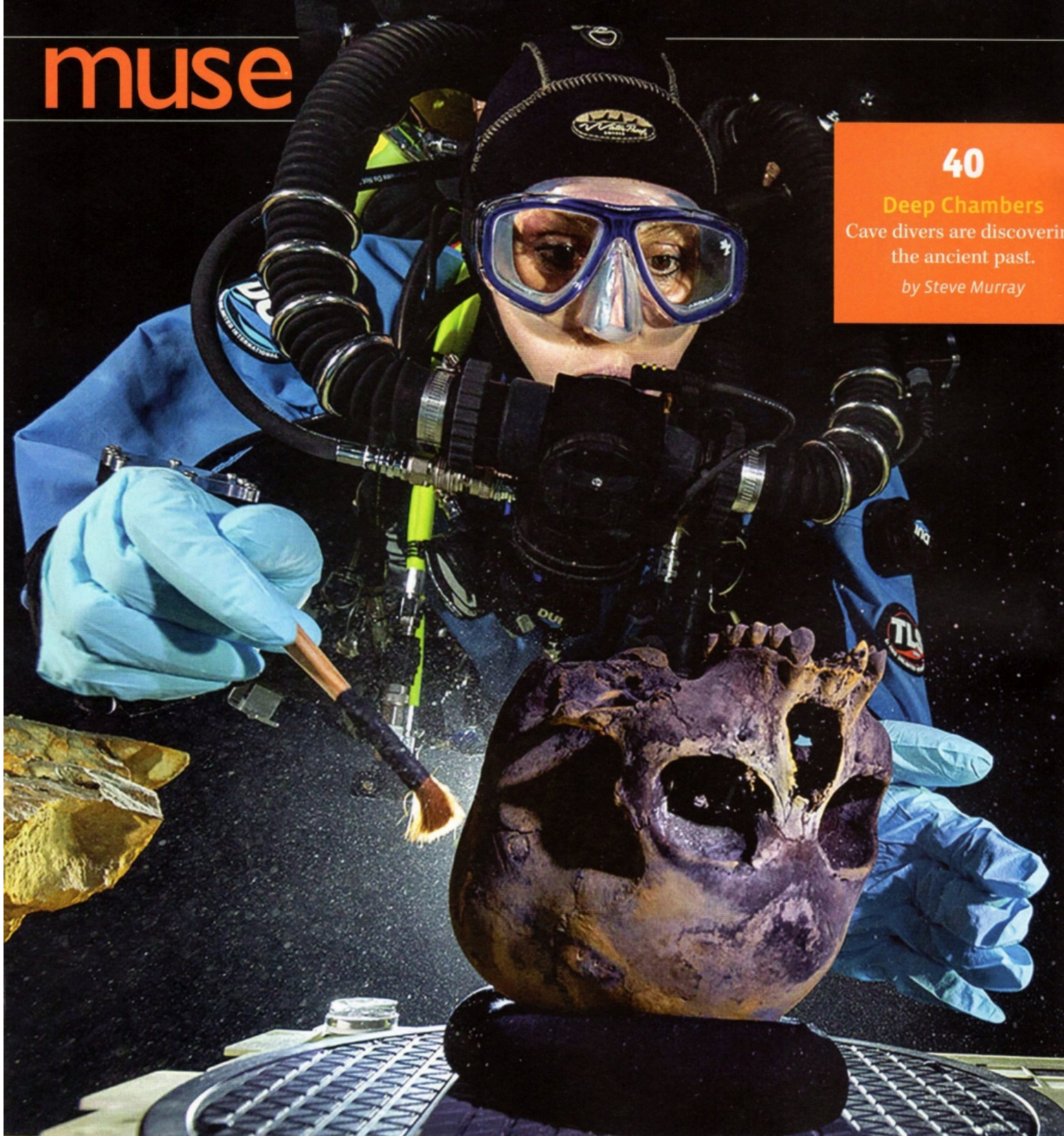


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Cave divers are discovering the ancient past.

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DEEP CHAMBER

Cave divers are helping us discover the ancient past.

by Steve Murray

In ancient times, people used caves as shelters. When they moved, they often left things behind. Animals used caves for shelter, too, and left their bones inside when they died. Many of these remains were organic, such as wood tools and animal hides, and seldom lasted very long after time and weather destroyed or scattered them. Finding organic artifacts has always been a challenge for archaeologists and paleontologists.

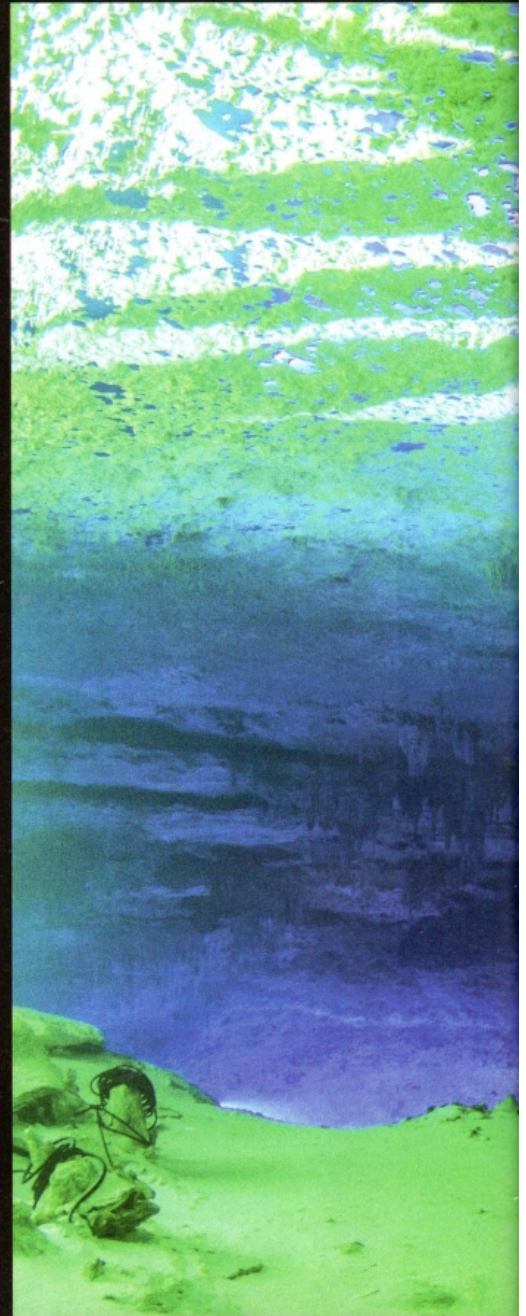
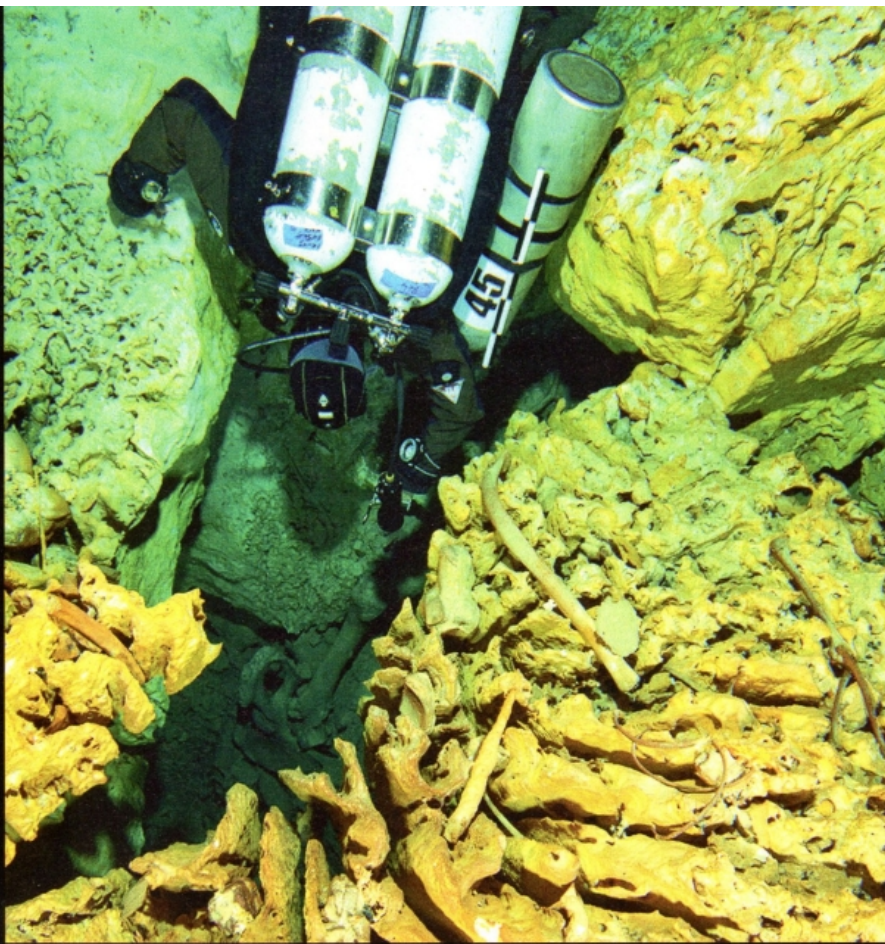
About 12,000 years ago, warming temperatures melted much of the world's glacier ice. Sea levels rose about 360 feet (110 m), and many caves were flooded. Cold, still water can preserve and protect organic materials in caves by keeping people and animals out. This water often has very little oxygen, so there are fewer

living organisms and chemicals to damage cave contents. Without wind, waves, or strong currents to move things around, underwater caves hold clues to how early humans lived. They're just waiting for scientists to find them.

AN ICE AGE TIME CAPSULE

Most of the porous limestone caves beneath Mexico's Yucatán Peninsula are filled with water. Divers have been working for many years to map them. In 2007, three divers—Alberto Nava, Alex Alvarez, and Franco Attolini—entered a huge underwater chamber, now named Hoyo Negro ("Black Hole"), and made a discovery that would change our understanding of ancient peoples in the Americas. "We discovered it somewhat by luck," says Nava. "We were just exploring a tunnel and all of a sudden we came up into this big pit." Hoyo Negro was more than 200 feet (62 m) wide and its floor was 150 feet (47 m) below sea level. It had been formed by the collapse of limestone where three underwater tunnels came together. The chamber contained the remains of large, now-extinct animals . . . and a human skull.





Different kinds of animals prefer different climate and vegetation. Some, for example, prefer deep forest, while others prefer marshes or thorny scrub. Studying these animal bones can therefore tell scientists a lot about the Yucatán environment in prehistoric times. Scientists believe the animals walked into the dark tunnel entrances when the land was still dry and fell almost 100 feet (30 m) into the pit. They were either killed by the fall or unable to climb out.

The explorers' first concern was how to protect their discovery. "We didn't tell anybody about it for the next two years," says Nava. "We wanted to keep it secret because there was no way to protect these finds." Eventually, however, they told Dominique Rissolo, an underwater archaeologist with the University of California, San Diego.

"I've been working on the Yucatán peninsula for over 25 years," says Rissolo, "and I got to know many people who were exploring submerged caves. They were discovering amazing

things and sharing them with me. As a professional archaeologist, I could help them better understand what they found.

"When a group of divers shared photographs of Hoyo Negro with me, I knew immediately that they had discovered something incredibly important." The group began to document the contents of Hoyo Negro and to collect some of the specimens for study. It was a long, painstaking job.

A SPECIAL WAY OF EXPLORING

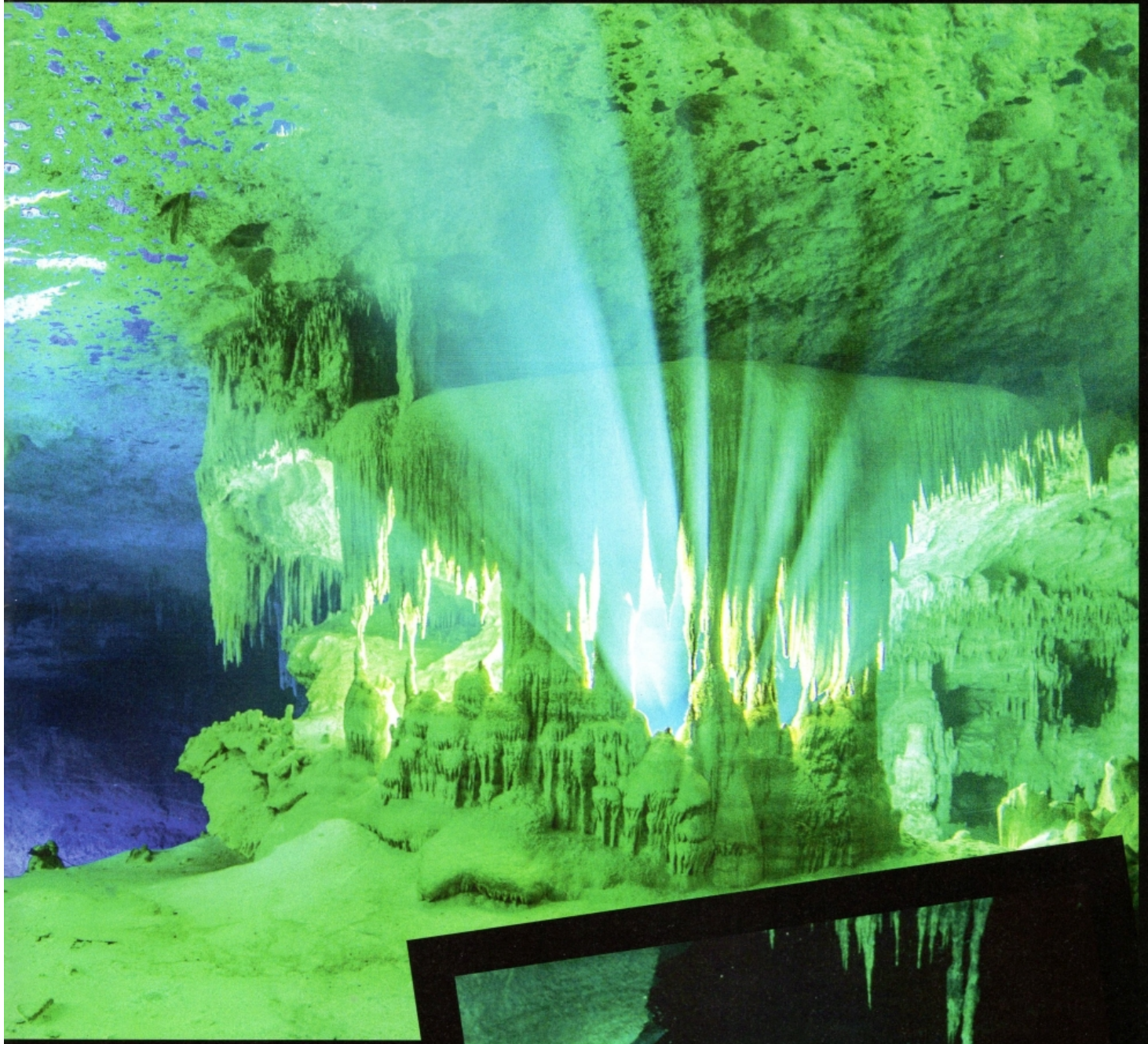
Cave diving requires advanced training and a lot of practice. "It's a dangerous activity, so you've got to learn gradually," says Nava, who instructs scuba divers in these special skills. "Prior to finding Hoyo Negro, I probably had 10 years of cave diving experience."

When divers explore a cave, they often don't know how far it goes, so they carry extra air tanks and carefully watch their air supply. GPS navigation systems don't work in caves, so divers

have to rely on measuring lines and compasses to swim through the dark, winding tunnels. Sometimes they also use underwater scooters to travel further in their limited diving time.

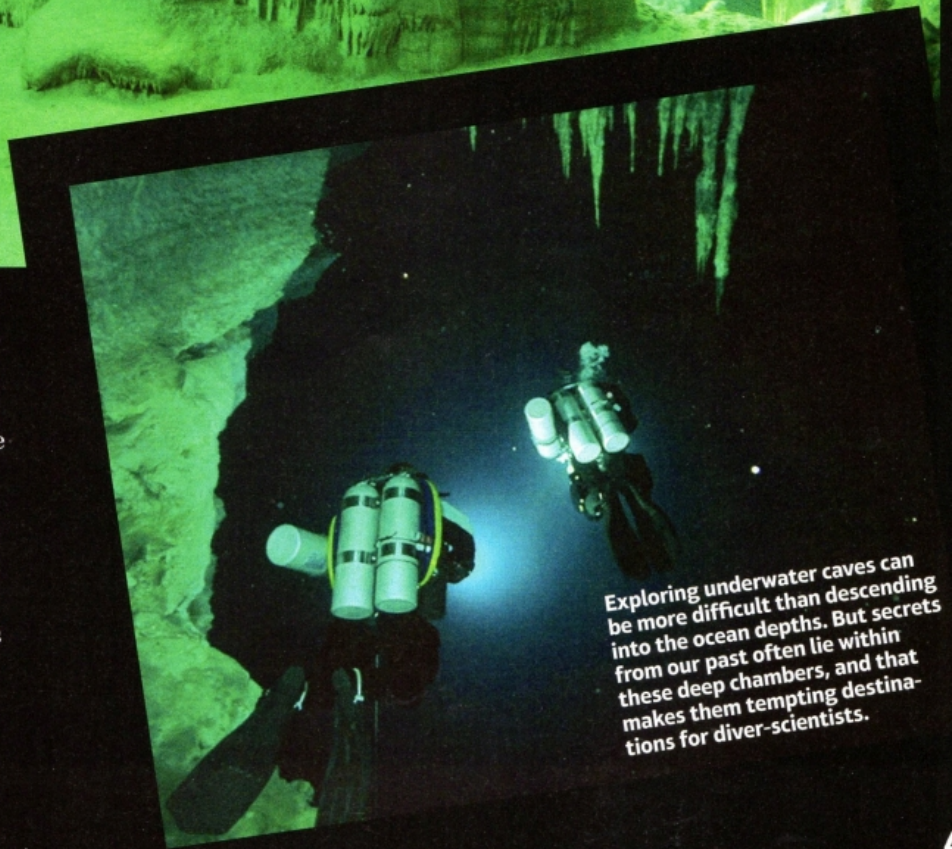
Back in 2007, the trip to Hoyo Negro was long. "When we originally found the chamber," says Nava, "it was about 3,000 feet (915 m) away from an entrance. That's about an hour swim underwater. We came back the next day with scooters, which reduced our swim to about 20 minutes."

The technical skill required for diving like this is why many caves



haven't yet been explored. Deep dives require slow, controlled ascents back to the surface. The goal of these safe ascents is decompression—a process where divers carefully breathe out nitrogen gas. "Our dives take about four hours" says Nava. "The floor of the pit is about 150 feet (46 m) down, so all our dives require decompression. Most of the time, we work between 90 minutes and 2 hours on the bottom, and then we have two hours to decompress on the way up."

The artifacts that the divers have recovered have shed new light on



Exploring underwater caves can be more difficult than descending into the ocean depths. But secrets from our past often lie within these deep chambers, and that makes them tempting destinations for diver-scientists.



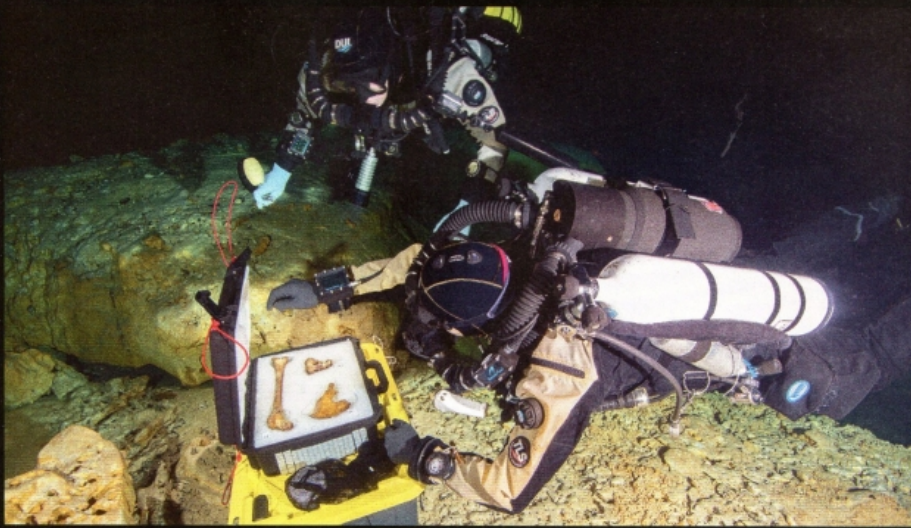
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The human skull belonged to a girl who died between 12,000 and 13,000 years ago. Scientists named her “Naia.”



life in the ancient Yucatán. The team has found bones from the saber-toothed tiger, a gomphothere (an ancient elephant-like species), and a new species of giant ground sloth. Scientists believe that these animals became extinct about 12,000 years ago, at the end of the Pleistocene epoch.

The human skull they found belonged to a girl, and divers were later able to find most of her skeleton. Scientists named her “Naia” after the ancient Greek Naiads, or water nymphs. She was 15 or 16 years old and almost 5 feet (148 cm) tall. Scientists calculated that she died between 12,000 and 13,000 years ago, long before the Maya civilization





lived in the region. In fact, her DNA showed that she was Beringian—from people who came across the land bridge between modern-day Russia and Canada in Paleolithic times. This makes Naia one of the oldest human skeletons ever found in the Americas.

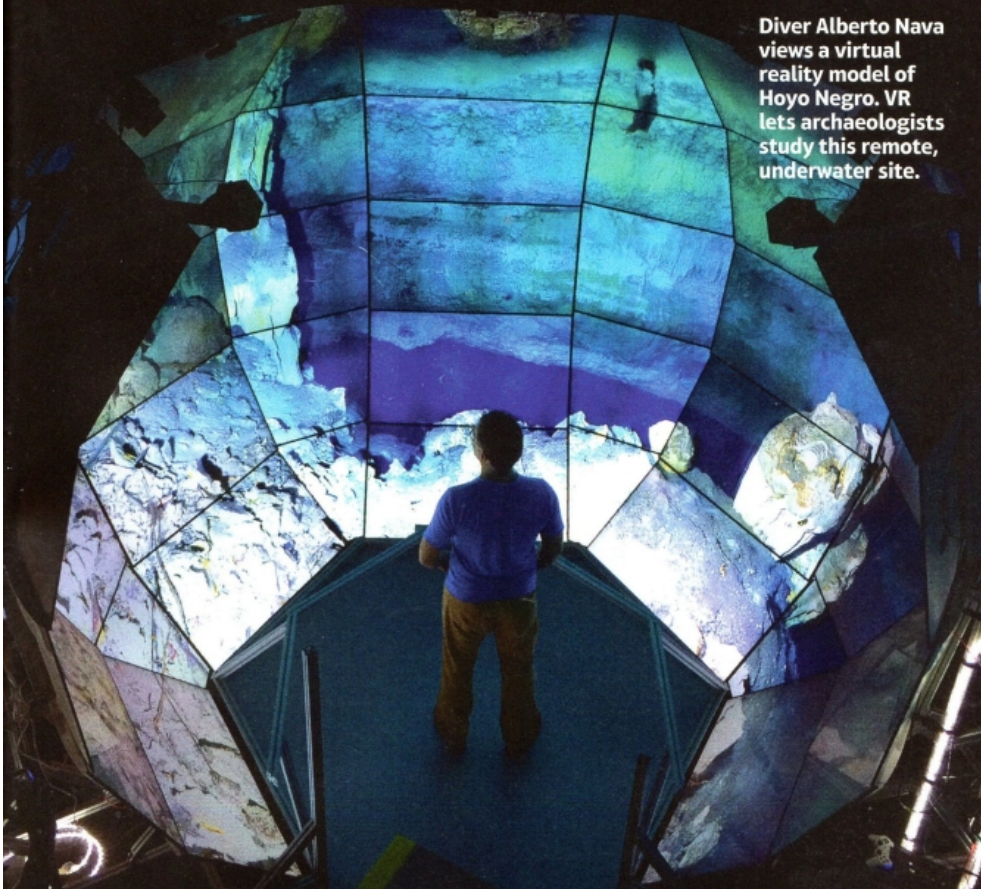
SHARING THE KNOWLEDGE

It's difficult to guard Hoyo Negro, and the site is vulnerable to damage or theft. But Rissolo, Nava, and their team have a high-tech plan for preserving it. "We capture it all in 3D," says Nava, "so we have

a detailed copy of the site in case anything is disturbed." The team uses photogrammetry, a tool that blends large numbers of photographs into three-dimensional digital maps. "Most researchers aren't divers," says Nava. "With photogrammetry, we can bring the site out to them. Then, they can study it all on a computer, without even getting wet."

Engineers working with the Hoyo Negro team have even created virtual reality models of the cave so that experts can explore it as if they were actually there. "We bring scientists

Diver Alberto Nava views a virtual reality model of Hoyo Negro. VR lets archaeologists study this remote, underwater site.



to our campus," says Rissolo, "and take 'virtual dives' in Hoyo Negro all the time. We actually discovered three new animals in the cave just by exploring it this way. Visualization like this is really changing the way that we do science."

ALWAYS MORE TO FIND

And with an estimated 6,000 water-filled caves throughout the region, there's more to find. "So far, people have mapped 800 miles (1,290 km) of underwater passages in the Yucatán peninsula," said Nava, "and the estimate is that there's at least twice that much remaining to explore."

There's a whole lifetime of adventures still left on the Yucatán Peninsula, waiting for future diverscientists to explore them.

Steve Murray is a freelance science writer. A former research engineer, he now covers space science, archaeology, and the environment.