The Secrets of the Dead of Yucatán

Archaeologists are bringing sensational finds to light from a flooded labyrinth of caves beneath Mexico: human skeletons from the Ice Age. Who were these settlers who lived in Central America thousands of years before the Mayans? And where did they come from? Researchers dive deep to solve this puzzle.

By **Lars Abromeit** (text), **Marc Steinmetz** and **Eugenio Acevez** (photos)

The cave system beneath the Yucatán peninsula branches out across hundreds of kilometres. The tunnels were dry during the Ice Age more than 13,000 years ago, but then the sea level rose—and filled them with water.

The cenotes, water holes concealed in green thickets, are the only way into the underworld. This abyss, known as 'the Pit,' drops down to a depth of about 50m. Divers have found human skeletons in its darkness.

There are limestone palaces beneath the forest. Dark. Silent. Hardly explored.

THE CRIME SCENE: A VERTICAL shaft, about 10m wide, filled with blue-green water, in the rainforest of the Yucatán Peninsula of Mexico. Bats huddle together on the overhanging walls covered with stalactites. Aerial roots extend all the way down to the glassy depths where the rays of the sun are swallowed up. Somewhere down there, in the darkness, lie the dead. At least two of them.

"We're in luck," says Alejandro Terrazas.

He shoos away the mosquitoes in the oppressive midday heat, and tries to be patient. The 43-year-old palaeoanthropologist at the Universidad Nacional Autónoma de México, has travelled 1,600km from the capital city to the eastern part of the country near the Caribbean coast in order to find the missing persons. It is a quest for certainty, an attempt to find definitive answers.

But now he has to wait—and that's making him edgy.

Terrazas, respected worldwide for his skill in making the dead speak and for reconstructing entire biographies from bone fragments, wants to find out how these people lived, when they died and why. He wants to decipher their story because it is also his.

The answers he finds will tell the story of one of humankind's greatest adventures—how they came to settle on the American continent. This drama, thousands of years old, is mired in secrets and so far Terrazas only knows how it ends. "We, the Americans of the modern period, are at the very end," he says. "But where did we come from? And how did we become what we are?"

Questions that can only be answered by the dead—like the ones down there in the dark.

Terrazas surveys the clearing with his GPS device and draws an outline of the cave shaft in his notebook. Then he discusses the timetable with his colleague Carmen Rojas, 36, an underwater archaeologist, a specialist from the research institute Instituto Nacional de Antropología e Historia.

Despite the stifling tropical heat, she is wearing a black hooded suit made of neoprene. For the past several hours she has been assembling compressed air tanks, torches and respirators at the edge of the clearing. Along with her five assistants, Rojas will try to bring the recently discovered bones up to the surface.

Her plan is a bold one. This shaft—which was discovered by American speleologists in 1994 and named 'the Pit'—goes down further than it appears to from the surface. It is one of the entrances, known as cenotes, leading to one of the biggest labyrinths of underwater caves in the world. So far, hundreds of kilometres of tunnels and vaults have been surveyed. It is estimated that thousands more still lie undiscovered deep beneath the Yucatán Peninsula.

Nobody knows how widely the bones are dispersed at the bottom of the shaft. Will Rojas' air supply be enough for a thorough archaeological analysis of the site? At most she can remain 3 to 4 hours in the water with her team, and the researchers will have to dive at least 40m down into the cave—without being able to surface from time to time.

The dive is too risky for Terrazas, the analyst. However much he may want to see the site for himself, he knows his limits. He can only help with lowering the equipment on ropes into the water. He watches as the divers, followed by photographer Eugenio Acevez and me, descend into the pit.

Terrazas is going to wait for the resurrection of the dead in the forest, with neither visual contact nor a radio link with his colleagues. And he will be hoping that his hunch turns out to be correct: that the bones will reveal how humankind came to the New World.

With a final check of the breathing equipment and torches, we dive in.

WHO DISCOVERED AMERICA? Until recently, we thought this question answered. The majority of experts in the field agreed that it was only towards the end of the last Ice Age,* 13,000 years ago, that groups of hunters and gatherers first migrated from Siberia to Alaska.

During the Ice Age, the sea level was about 120m lower than it is today. An isthmus extended across the Bering Strait and connected Asia with America—the last great wilderness still left for *Homo sapiens* to conquer on its campaign of conquest around the world. About 60,000 years ago, representatives of the species had headed out from East Africa, spreading gradually up to the western coast of Europe and East Asia, and even up to Australia. They built musical instruments, complex weapons and tools, created rock drawings and sculptures, and developed religious beliefs.

However, experts were sure that until 13,000 years ago, America was still terra incognita. According to this scenario, it was only when the glaciers started melting and an ice-free corridor opened

(* or rather, the 'cold climate period.' Since the polar caps are still covered with ice today, we are actually still in the Ice Age, albeit in a warm stage within this Ice Age.)

Do finds this ancient mean that we will have to rewrite the history of America?

up along the banks of the Yukon River in Alaska and Canada that the first settlers ventured southwards from there. Then they discovered the Land of Cockaigne, prairies in what is now the USA where there mammoths, bison and possibly also camels roamed. Today, this human society is referred to as the 'Clovis Culture' after an archaeological site in New Mexico. According to popular belief, the descendents of the Clovis people eventually made it across the Isthmus of Panama and reached South America.

The settlements and stone weapons of the Clovis culture have been verified by innumerable archaeological finds. But were these big-game hunters from Siberia really the first people to settle in America?

The researchers in Yucatán have their doubts. Besides Terrazas and Rojas, the group includes the Mexican biologist Arturo González as well as Wolfgang Stinnesbeck from the Institute for Geosciences at the University of Heidelberg (Germany). The scientists have been searching in the cenotes for 12 years. They have brought spectacular archaeological treasures to light which tell of another course of history: dozens of human skeletons, bones and skulls so wonderfully preserved that it seems as if they had just been buried. Some of them turned out to be those of ritual sacrifices from the Mayan culture, which was at its peak between 300 and 900 BC.

However, radiocarbon dating revealed that four of the skeletons were from an era long before the magnificent buildings, bloody feuds and elaborate calendars of the Mayans, from a time when Yucatán was not covered by rainforests but by savannahs and prairies where 2m-long armadillos grazed and sabre-toothed cats hunted.

The caves have also preserved the bones of giant ground sloths, tapirs and primitive camels. Did the Stone Age settlers exterminate these giants?

The skeletons are up to 14,000 years old. According to the standard scenario, Central America was as yet uninhabited.

So how did they come to Yucatán—long before an ice-free path through the inland glaciers in present-day Canada even existed?

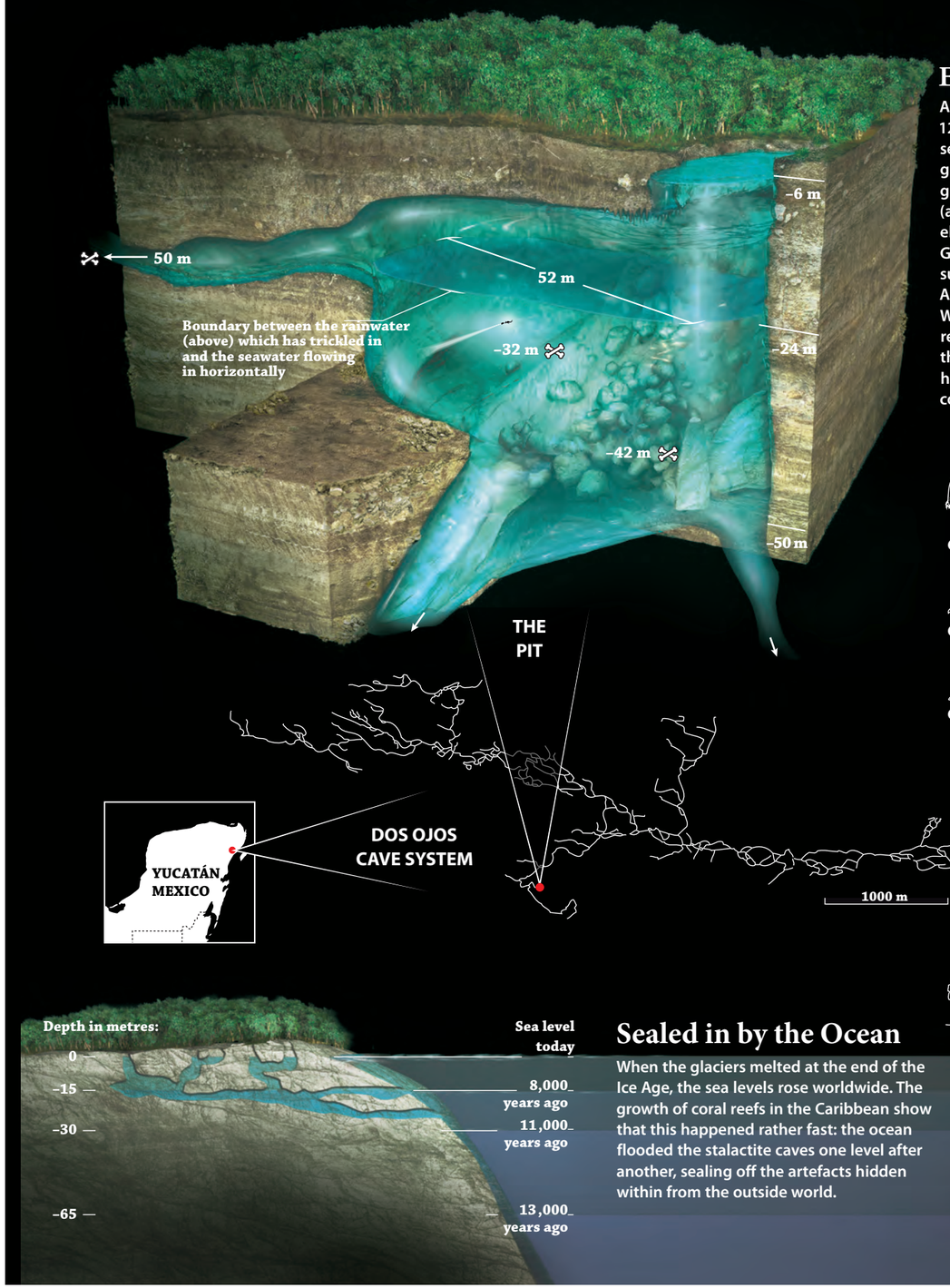
IT IS FINDS LIKE THESE that contradict the accepted wisdom that the whole of America was conquered over the land route in the North. Decades ago, archaeologists had found remnants of human dwelling places in Monte Verde, Chile, in the southern part of the continent, which were approximately as old as the skeletons from Yucatán. And stone tools have been found on the west coast of present-day USA as well as in Texas, for example, which date back more than 13,000 years ago but are clearly different from the weapons of the Clovis culture.

The community of anthropologists is shaken. For decades, advocates of the 'Clovis First' theory have denied all evidence that did not fit in with their opinion and contested the dating of finds at sites like Monte Verde.

Now, however, the mood has begun to change and suddenly questions that had seemed resolved are being reopened: what kind of people were these who had settled in America even before the Clovis culture? What did they live on? And where did they come from?

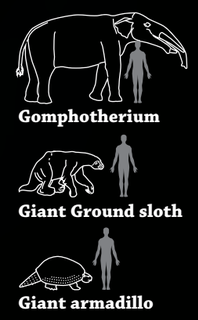
The Abyss of Knowledge

The Pit, about 6km from the Mexican coast in the rainforest, is a part of the cave system of Dos Ojos, one of the biggest sections of the hidden underwater labyrinth of Yucatán ever explored. Archaeologists have discovered fossilised human bones on the floor of the chamber, between 32m and 42m deep. They also found an Ice Age skeleton of a Giant Ground sloth in a side tunnel.



Eyewitness

About 10,000 to 12,000 years ago, several primitive giants like mammoths, gomphotherium (a relative of the elephant) and Giant Ground sloths suddenly died out in America and Europe. Was climate change responsible for their extinction? Or humans? The answers could like in the bones.



Sealed in by the Ocean

When the glaciers melted at the end of the Ice Age, the sea levels rose worldwide. The growth of coral reefs in the Caribbean show that this happened rather fast: the ocean flooded the stalactite caves one level after another, sealing off the artefacts hidden within from the outside world.

The muddy pool, known as the Jailhouse, leads underground into huge halls filled with crystal clear water. A single dive can last up to 4 hours, each minute of which is fraught with danger.

The trail back into prehistory can only be followed using the most modern techniques

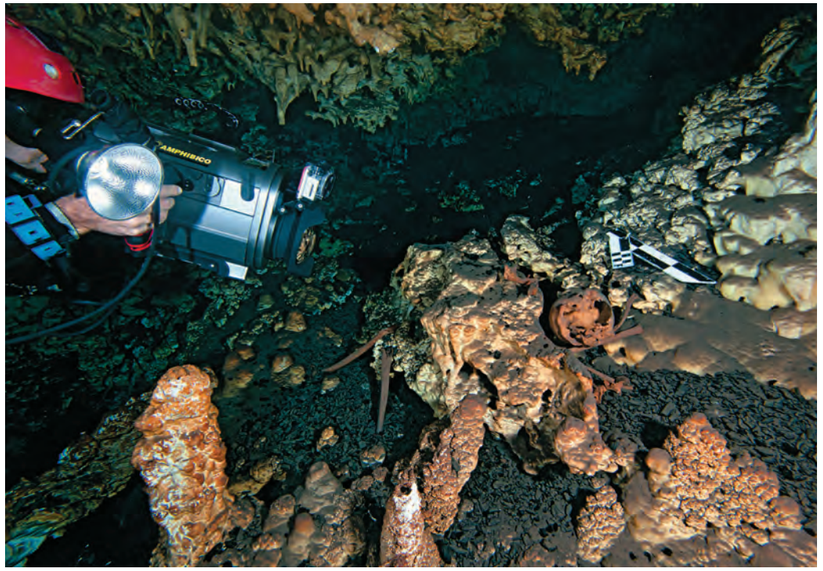
Researchers still do not have a clear picture. The key finds containing clues to the day-to-day life and migration patterns of these pioneers are much too rare and contested. The rising sea has submerged settlements along the coast; and for those inland, particularly in the tropical and sub-tropical belt of America, the forests have long since overrun the ruins and stone tools, and skeletons have decomposed.

It was only in the depths of the earth that the traces of early American history survived. Thus, no other place offers such a high chance of enlightenment as here in the underground darkness.

The cave system of Yucatán was still above sea level during the Ice Age. Prehistoric settlers probably sought shelter here from predators and storms. Perhaps they also made sacrificial offerings to their gods here. But then, the sea level rose as the ice sheets started melting. The tunnels filled up with water, enclosing all the relicts like burial chambers: sealed off from sunlight and ocean currents, largely undisturbed by corrosive organisms and treasure hunters.

It is only thanks to the latest developments in diving technology that these unique time capsules have now become accessible. Some of the skeletons studied by Terrazas and his team were hundreds of metres away from the cave entrances. Some were embedded in narrow niches surrounded by the remnants of coal from long defunct fire pits. The researchers also found chips of stone which were probably used by the Ice Age settlers as tools. They also found remains of the primeval creatures that became extinct at the end of the Ice Age at an inexplicable speed: the giant ground sloth, primitive camels and gomphotherium—an elephant-like creature with four large tusks.

A burnt offering? The researchers gather up fragments of another skeleton in the cave system of Naranjal. It was surrounded by the remains of a coal fire.



Some of the camel bones bore burn marks and incisions from which Terrazas could draw only one conclusion: they had been cooked at the fire pits.

Were the cenotes sanctuaries for the Ice Age settlers—as they had been for the Mayan priests thousands of years later? Did they burn their dead here, deep in the heart of the earth, during special ceremonies?

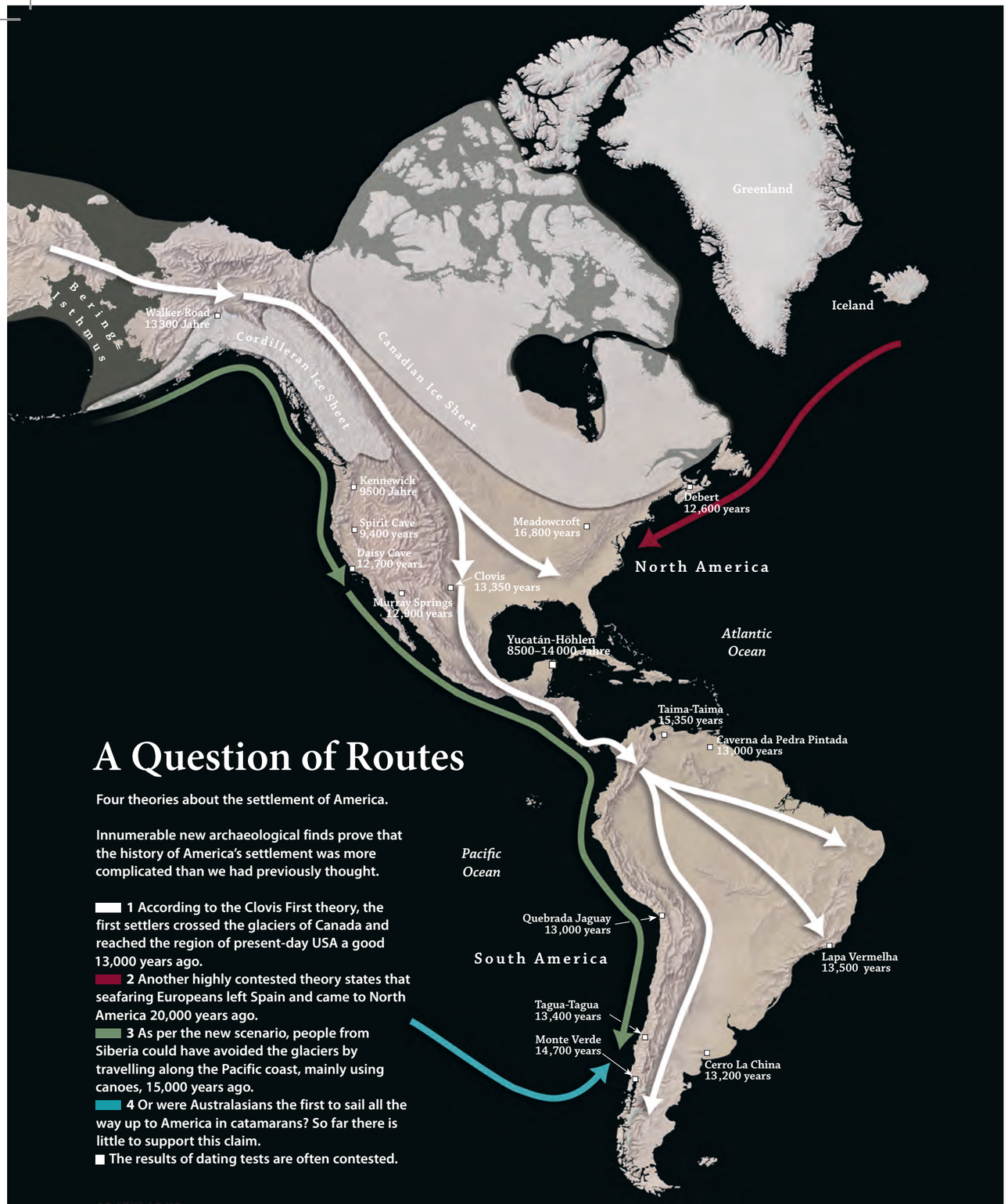
SHE SEEMS TO SINK into liquid glass. The water that Carmen Rojas drops into is absolutely clear. She follows the beams of light downwards, swimming through clouds of small, glittering fish, sinking ever deeper into the blue depths until the shaft opens a few metres below the surface into a flooded cathedral lined with thousands of stalactites. It is 50m across and at least equally deep. A side tunnel, adorned with columns and candelabra, branches off into the darkness halfway down. Our air bubbles converge at the hall's vault, forming a shimmering ceiling mirror. Only a single finger of light penetrates through to the floor of the cathedral.

If the Ice Age settlers were looking for a breathtaking setting underground, they would have found it here.

Eighteen metres under the roots of the forest, Rojas checks her depth gauge. She

The scientists want to gather information about the climate in the Ice Age from stalactite samples. They record every stage using helmet-mounted cameras—since there isn't time to look at details down in the depths.

The rewards of patience: after hours of search, a researcher displays the fruits of their labour:the almost completely preserved skull of a human adult.



A Question of Routes

Four theories about the settlement of America.

Innumerable new archaeological finds prove that the history of America's settlement was more complicated than we had previously thought.

1 According to the Clovis First theory, the first settlers crossed the glaciers of Canada and reached the region of present-day USA a good 13,000 years ago.

2 Another highly contested theory states that seafaring Europeans left Spain and came to North America 20,000 years ago.

3 As per the new scenario, people from Siberia could have avoided the glaciers by travelling along the Pacific coast, mainly using canoes, 15,000 years ago.

4 Or were Australasians the first to sail all the way up to America in catamarans? So far there is little to support this claim.

■ The results of dating tests are often contested.

The skull indicates that the settlers were prepared for life in the unknown

breathes slowly and evenly. Every breath of air from the compressed air tank is precious. However, she seems relaxed, even when the water suddenly becomes streaked: we have broken through the border between the rainwater that fills the upper part of the cave and the salty, underground extensions of the Caribbean Sea that penetrate several kilometres into the rocks from the coast.

It has become really dark now. Only the cones of light from our diving torches show the way. Then, 32m below the surface, we finally reach the ground.

Rojas burrows between the stones, tries to find her balance in the water, directs her torch into crevices and forces her way through a bottleneck. And then, she discovers a cache of bones in a niche.

Three bleached slivers, probably from a forearm, hardly recognisable in the white debris. Their ends have decayed and they seem very fragile, as if a single puff of breath could make them crumble. Rojas maps their position. Then she carefully lifts one fragment after another, using a plastic bag, and places them in a case padded with foam which will be taken up to the surface by one of her assistants.

She ventures into ever more obscure niches of the cave, 35m, 38m, 42m down. Where could she find other contemporary witnesses? And how much time does she have left?

The underworld is so ambivalent for archaeologists. Tantalising because it is full of artefacts like a treasure chest, but a nightmare as far as scientific work is concerned.

The divers can only communicate through gestures underwater. They have to manoeuvre through frighteningly narrow tunnels and constantly look for their way through the flooded labyrinth. The light from their torches barely illuminates the darkness and a single misjudged flap of a flipper over the sediment can block their view in seconds. Even the air they breathe out sometimes triggers a shower of limestone powder from the roof of the cave which clouds the water like a fine snow squall.

Most of all, it is the extreme depth that hurries them along. Whereas conventional archaeologists spend weeks scraping out their finds a layer at a time from the soil, the scientists in the cenotes only have a few hours per day at their disposal. They can use at most one-third of their air supply in searching for and analysing the bones. The second part is kept reserved for the way back and the last as fallback in case of emergencies.

They have even less time to search for bones at such great depths like in the Pit: nitrogen from the air tanks rapidly builds up in their bodies. It befuddles their senses on the floor of the cave, making it imperative to check and double-check their readings. On the way back, they are forced to make long halts so that their body tissue can release the potentially lethal gas. There's little margin for error in the deep. Those who panic, lose their orientation line, overestimate their air supply or their strength will never resurface.

IT IS DARK and bats flit about the cave entrance when the last divers return

The face of early America: a reconstruction of an Ice Age woman from the skeleton of a female in her early 50s, devoting special attention to the face.

Did the Stone Age humans burn their dead in richly decorated halls like the one in the cave Aktun Chen which is still accessible today? González and Stinnesbeck think this is not unlikely.

The skull from a deep cave is reminiscent of people from Central or South Asia

life as fishermen, but some of them also gradually started to explore the interiors, south of the American glaciers in present-day California and Mexico. They found themselves in unfamiliar natural habitats as high mountains and deserts, forests and marshes opened up before them.

Third and Final Act: The Powers of Adaptation. How did the adventurers manage to survive in the foreign environment? Some anthropologists reckon that the earliest pioneers failed because of these hurdles. The first Paleoamericans perished when the climate changed around the end of the Ice Age, when sea levels rose and the easy-to-hunt herds of the Pleistocene period became increasingly rare—possibly because humans themselves had killed them off. It was only later in a subsequent wave of migration that new, physically tougher immigrants from Siberia established themselves in the wilderness of America: the ancestors of the present-day Native American peoples.

Terrazas, however, sees this last act differently. For him the story continued: the first humans came—and they remained in America. According to him, the skull from the caves indicates that these early settlers managed to get accustomed to the new world (at least in Yucatán). Many of them certainly failed to face up to the challenges, but a few from each generation survived. And since there were similar living conditions on Mexico's Caribbean coast as in parts of southern Asia, similar anatomies evolved over time.

A jigsaw: anthropologists assemble bone fragments in order to establish how these people had lived—and what caused their death.

Alejandro Terrazas sees the skeletons from Yucatán as intermediate forms of this micro-evolution. As a section of the development from the Paleoamerican Stone Age nomad to the Amerindian—people with a smaller stature better adapted to the heat of the tropics, and with facial features characteristic of the later American high cultures of the Mayans, Incas, Aztecs and Anasazis.

The stalactites are analysed in a lab in Heidelberg in southern Germany: the temperatures in the caves are calculated on the basis of their inert gas content.

"We tend to underestimate the abilities of the Stone Age peoples because we still know so little about them," says Terrazas. But isn't it much more likely that, after wandering thousands and thousands of kilometres towards the south, the early settlers were in a position to tap other food sources besides seals, herds of mammoths and sloths?

There are signs of this also in the neighbouring province of Chiapas. Anthropologists have discovered the remains of a vegetable garden there with pollen and seeds from the cacao, tomato and fig families. It was planted up to 12,000 years ago and provides evidence of an early agriculture that we so far thought had existed only in the Middle East in this period. It bears testimony to the immensely innovative spirit that the exploration of the unknown must have demanded of the first settlers.

TERRAZAS IS TIRED as he packs up the plastic cases. It is almost midnight.

It will take several days to bring them back to the laboratory. Weeks to clean them chemically and to dry them. Perhaps years to extract all the secrets that his technology can squeeze from them. Terrazas will date the bones. He will survey the trace elements in the bone tissue to find out whether the Ice Age settlers used just one drinking water source or several in order to determine whether their lives were settled or nomadic. He will ask geologists to reconstruct the climate in Yucatán during the lifetime of these people from micro-fossils and stalagmites.

He will have to investigate like a forensic criminologist. But for now, as he stores away the pile of bones from the caves into his all-terrain-vehicle, he allows himself a moment to dream: how happy he would be if he could reconstruct every single step in the chronology which, according to him, led from the Ice Age settlers to the present, an uninterrupted arc all the way down to him.

Perhaps this is possible. Perhaps the underworld in Yucatán holds a plausible answer not only for the beginning of Terrazas' story, but also for each subsequent chapter. After all, only a fraction of the cave system has been discovered so far. There must still be hundreds of cenotes hidden in the forest, far from the roads, not even visible on satellite images: multi-storeyed halls whose floors were gradually flooded and sealed by the ocean.

If Terrazas' team could find even a single human skeleton from each storey, the anatomical changes that occurred in the early settlers over time would be revealed. The course of evolution would become visible. An archaeological code to merge all the details of America's settlement history conclusively.

The phone rings. A colleague calls out excitedly: they have to prepare for another expedition immediately. Two divers have found a human skeleton in a tiny chamber surrounded by charcoal remains in the cave system known as Naranjal just a few kilometres away! ■

■ ■ ■ *GEO editor* Lars Abromeit *(left, in conversation with Alejandro Terraza) would have liked to make more dives into the cenotes, something that photographer* Eugenio Acevez *has done often.* Marc Steinmetz *has built himself a formidable reputation with innovative documentations of archaeological projects, using multiple exposures in Yucatán as well as other places.*