Pyramid power

Archaeologists have failed to learn the secrets of Mexico's largest ancient monument. Particle physicists might save the day, says Michael Hopkin.

It's not the kind of place you'd expect to find a particle-physics laboratory. The ancient Pyramid of the Sun at Teotihuacán is an hour's drive from Mexico City at the end of a bumpy jeep track. But deep inside this massive monument a state-of-the-art particle detector is being assembled, and my companions, both physicists, have brought me here to see how it's getting on.

The project is the brainchild of researchers from the National Autonomous University of Mexico (UNAM) in Mexico City, who hope to succeed where traditional archaeology has failed. Instead of taking up pickaxes and shovels to get at the pyramid's secrets, they will use their machine to detect the cosmic rays that continually pass through this mass of stone and dirt. With patience, the researchers believe, the rays will generate a picture of what is inside the monolith.

"The mass of the pyramid is so huge that we need twenty-first-century technology to study it," concedes UNAM archaeologist Linda Manzanilla, who is collaborating with the physicists.

The Pyramid of the Sun is believed to be the third largest pyramid in the world, with a base that is roughly 200 metres on each side. Built some 2,000 years ago, it formed the centrepiece of a bustling city for five centuries until Teotihuacán was abandoned. When archaeologists first dug into it in 1922, they hoped to find the bones of Teotihuacán's rulers. But unlike the neighbouring Pyramid of the Moon, which contains numerous stone chambers, the Sun pyramid is filled with earth and volcanic debris. Further digging seemed likely only to damage the structure.

Going underground

The physicists didn't need to dig. A cramped tunnel just below ground level that leads to several chambers at the heart of the pyramid was discovered in 1971. Although it provided scant clues for archaeologists as to what lies above, it made a perfect, if humid, spot for a particle detector.

As tourists admire the views from the top of the pyramid some 65 metres above us, we don hard hats and open a rusting metal door at the base of the great structure. My guides, UNAM particle physicists Arturo Menchaca and Ernesto Belmont, lead me down an iron staircase beyond the door to the tunnel opening. After several minutes of walking stooped through the stifling humidity of the tunnel we come to the metal shed that the researchers have set up to house their instrument.

Menchaca's team has been working on the

Catching rays: Arturo Menchaca (right) and Ernesto Belmont hope their muon detector will let them see inside the Pyramid of the Sun (above).

But he warns that even if something that looks like a room is spotted, it could simply be the result of subsidence over the centuries, rather than architectural design. "Everyone's expecting Tutankhamun," he says, "but we may find something that means nothing."

Subterranean blues

Doing science down here creates unusual problems. The researchers had to install their own power supply and encase it in a metal pipe to protect it from thieves. Once the detector is running, they will have to ventilate the chamber and tunnel before entering to avoid suffocating on the mix of carbon dioxide and noble gases used in the instrument.

No one should expect results any time soon. The researchers are testing parts of the detector in the lab and installing them underground piece by piece, a process they hope to complete within the next two months. They will then collect data for at least a year before releasing it to archaeologists. Should any of the tiny wires break, as has been known to happen, everything gets set back a week.

Perhaps there's no rush. As we emerge blinking into the sunshine to the curious stares of camera-clutching sightseers, the baking sun reminds me that it's better not to hurry in this climate. "This problem has been waiting 2,000 years," Menchaca says. "Nothing's going to happen if we're delayed another month."

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