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Mystery of 'chirping' pyramid decoded

Philip Ball

Acoustic analysis shows how temple transforms echoes into sounds of nature.

A theory that the ancient Mayans built their pyramids to act as giant resonators to produce strange and evocative echoes has been supported by a team of Belgian scientists.

Nico Declercq of Ghent University and his colleagues have shown how sound waves ricocheting around the tiered steps of the El Castillo pyramid, at the Mayan ruin of Chichén Itzá near Cancún in Mexico, create sounds that mimic the chirp of a bird and the patter of raindrops¹.

The bird-call effect, which resembles the warble of the Mexican quetzal bird, a sacred animal in Mayan culture, was first recognized by California-based acoustic engineer David Lubman in 1998. The 'chirp' can be triggered by a handclap made at the base of the staircase.

Declercq was impressed when he heard the echo for himself at an acoustics conference in Cancún in 2002. After the conference, he, Lubman and other attendees took a trip to Chichén Itzá to experience the chirp of El Castillo at first hand. "It really sounds like a bird", says Declercq.

Sound structure

But did the pyramid's architects know exactly what they were doing? Declercq's calculations show that, although there is



El Castillo's strange echoes have fascinated visitors for generations

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evidence that they engineered the pyramid to produce surprising sounds, they probably couldn't have predicted exactly what they would resemble.

Lubman was at first convinced that the pyramid-builders did create the bird-chirp effect intentionally. But that's not necessarily so, Declercq and his colleagues argue. Their analysis of the pyramid's acoustics show that the precise sound caused by the echoes depends on the sound that excites them. Drums, for example, might produce a different type of resonance.

The researchers hope that others will make more on-site measurements of El Castillo's acoustics to see what effects other sounds sources induce.

Indeed, Declercq heard one such variation during the 2002 trip. As other visitors tramped up the steps of the 24-metre high pyramid, he noticed a flurry of pulse-like echoes that seemed to sound just like rain falling into a bucket of water.

Declercq wonders whether this, rather than the quetzal call, could have been the aim of El Castillo's acoustic design. "It may not be a coincidence," he says - the rain god played an important part in Mayan culture.

But perhaps such meaningful interpretations are ADVERTISEMENT fanciful. Declercq's team has shown that the height and spacing of the pyramid's steps creates like an acoustic filter that emphasizes some sound frequencies while suppressing others. But more detailed calculations of the acoustics shows that the echo is also influenced by other, more complex factors, such as the mix of frequencies of the sound source.

Ultimately, then, it will be virtually impossible to prove that any specific echo effect is intentional. "Either you believe it or you don't," says Declercq. He himself is now sceptical of the quetzal theory - not least because he has now heard similar effects produced by staircases at other religious sites. At Kataragama in Sri Lanka, for example, a handclap by a staircase leading down to the Menik Ganga river produces an echo in response that resembles the quacking of ducks.

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