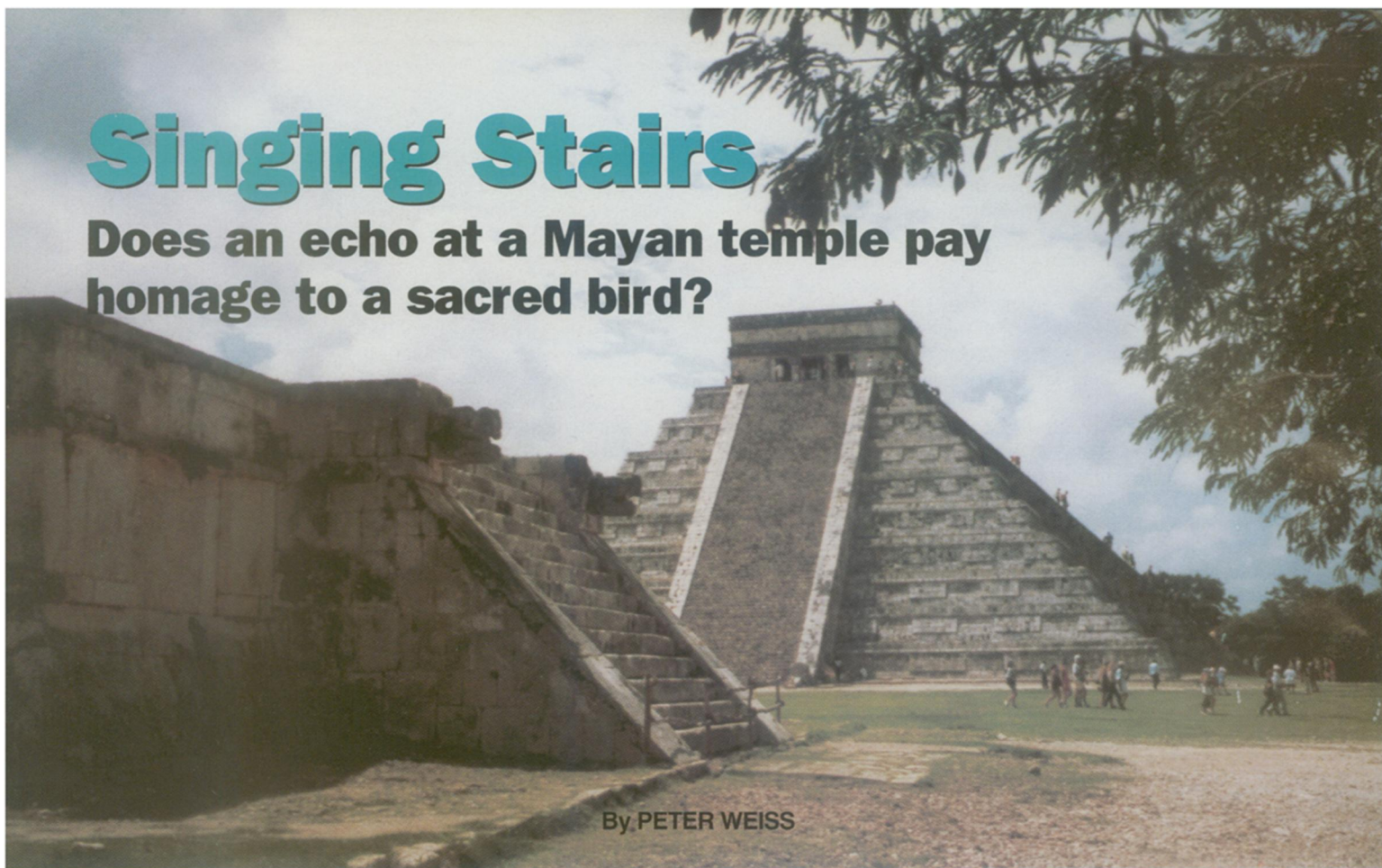


Singing Stairs

Does an echo at a Mayan temple pay homage to a sacred bird?



The Temple of Kukulcan (background) rises from the Mayan ruins at Chichén Itzá, Mexico. The pyramid's extraordinarily steep staircase, flanked by narrow stone ramps, echoes handclaps as quickly descending tones.

Lubman

Clap your hands in front of the ancient Pyramid of Kukulcan at Chichén Itzá, Mexico, and an odd echo replies. It's a quick, descending tone that might ring a bell in your memory—if you have ever heard a resplendent quetzal bird's call.

The fast-disappearing quetzal lives in shrinking mountain forest areas of Central America and Mexico, hundreds of miles from the Mayan temple. Yet its long, blue-green tail feathers adorned the helmets and robes of the kings of the Mayan people across a region stretching from present-day El Salvador through the state of Tabasco in Mexico.

Tour guides say that echoes off the massive pyramid recall the screams of virgins sacrificed on its summit. Archaeologists dismiss such sounds as accidents of the 1,300-year-old building's design. Now, an acoustics expert is making the remarkable claim that the ancient Maya knowingly planned the building to echo with a quetzal chirp as a way of paying homage to the revered bird.

"This might be the world's oldest known sound recording," says David Lubman, a consultant based in Westminster, Calif. He and other acoustics specialists agree that a cascade of reflections from the temple's flight of 92 stone steps generates the echo's sliding pitch, but only he proposes that the effect was

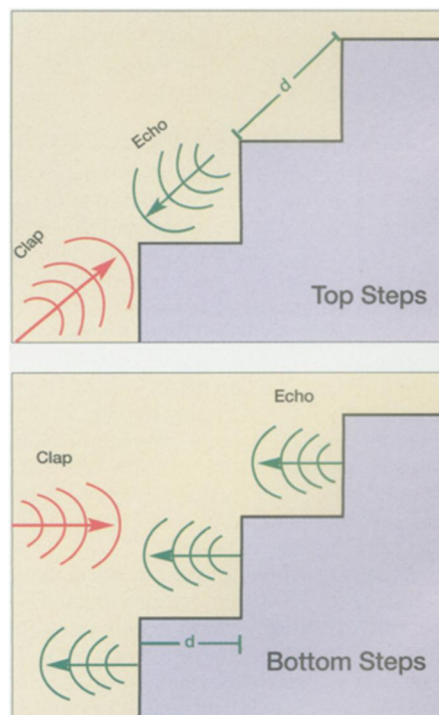
intentional.

Lubman says that the idea of comparing the sound to the quetzal's call came to him after reading that the bird was considered the "messenger of the gods." At the October 1998 meeting of the Acoustical Society of America in Norfolk, Va., he played recordings of the bird's call and the echo while he displayed their sonograms, which are curiously alike.

The pitches of both sounds fall at about the same rate from a frequency of about 1,500 hertz to less than 1,000 Hz. He suggests that the stairs' echo is, in effect, a 1,000-year-old recording of a quetzal call. "It's not perfect," he admits, "but if you listen to a Caruso recording from 100 years ago, would you expect perfection?"

Lubman's theory of quetzal homage has evoked a dissonant echo from Maya scholars who say it is out of tune with much of what is known about ancient Mayan culture and construction. Although to some it's a tantalizing speculation, the Maya researchers say they would be better convinced if other ruins also produced such echoes.

Also, Lubman needs to explain in terms of the indigenous culture why the Maya would have created the chirp, says archae-



A hand clap resounds as a periodic tone due to a roughly constant delay (d) between echoes from riser to riser. As the stairs become higher and the sound's rebound angle steepens, the delay increases, causing a drop in the frequency of the tone.

ologist Karl A. Taube of the University of California, Riverside. "I don't think he's made a very good case for that."

Endowing the building with a quetzal chirp might have helped the Maya feel as if the cherished-but-faraway bird was nearby, Lubman says. A number of aspects of the approximately 30-meter-tall pyramid suggest that it was built specifically in homage to the quetzal. A Mayan picture, for instance, depicts Kukulcan, the temple's namesake, as a person with a quetzal draped across his back.

The ancient Maya demonstrated in numerous ways the technical prowess to knowingly create the world's first "soundscape," Lubman maintains. Besides the obvious marvels of the temples and vast cities constructed without benefit of the wheel or metal tools (SN: 1/24/98, p. 56), the Maya were also the sole ancient New



The resplendent quetzal's prized tail-feathers can grow 75 centimeters long.

World people to have developed a written language, he says.

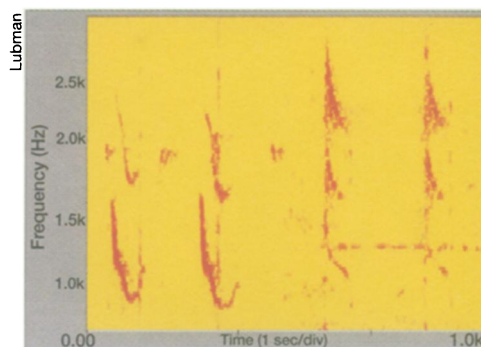
Scholars don't dispute that the ancient Maya were builders sophisticated enough to erect a structure intentionally with such an echo. However, says art historian Samuel Y. Edgerton of Williams College in Williamstown, Mass., it would have to have been a copy of a building accidentally made that way.

More at issue is to what extent the Maya were enamored of the quetzal and inclined to use their skills toward such goals as birdlike echoes. Edgerton says of Lubman's idea, "He's trying to make a lot out of the quetzal bird, which was much admired by the Maya, but mainly so they could kill it to get its tail feathers for their helmets."

According to both Edgerton and Taube, Lubman has also overstated the bird's relevance to the temple where the echo is heard. The temple honors not the quetzal but a serpent, named Quetzalcoatl, that was covered with quetzal feathers, they say.

Lubman retorts that Quetzalcoatl is half quetzal, so it is not such a stretch to think that the Maya highly honored the bird half. "It could be that the Maya scholars themselves are underrating the significance of the quetzal," he suggests.

Richard D. Hansen of the University of California, Los Angeles also has doubts about Lubman's idea, but, he says, "[it] is a fascinating discovery, if it's true." He urges tests at other Mayan pyramids to see if they also chirp. Lubman reports



Sonograms show that sound frequencies of a recorded quetzal bird chirp (shown twice at left) and the hand-clap echo (twice at right) off the steps of the Temple of Kukulcan fall at about the same rate. This chirp ends with an increase in pitch not common to all quetzal calls.

that he has found a similar echo at a temple at Uxmal in Mexico, but in a lower, less quetzal-like, frequency range.

The skepticism of the Maya scholars comes as no surprise to Lubman because archaeologists are rarely sound-savvy, he says. "If they paid more attention to subtle sounds, they might learn more about the world in which we live," he asserts.

Edgerton acknowledges that there are mysteries of archaeological acoustics that sorely need study, such as how the Mayan kings projected their voices to large crowds. He is unimpressed, however, by the quetzal-bird echo described by Lubman. "The story he is telling us is a little off the wall." □

Letters continued from p. 35

Look at the birdie

"Killer toxin's punch lies below the belt" (SN: 10/3/98, p. 213) reminded me of an article many years back commenting on vultures' high tolerance of botulism. Possibly, those researching inhibitors of the toxin would consider looking into how these animals have built up an immunity to such a powerful toxin.

William Read
Deland, Fla.

Science 'fun'? Maybe not

The managers of museum science exhibits should look at the meaning of the words "fun" and "pleasure" ("The Science of Museums," SN: 9/19/98, p. 184).

I volunteered to work with an exhibit to show conservation of angular momentum and the reaction of a gyroscope. The gyroscope was a bicycle wheel with handles on the axle. To understand conservation of angular momentum, visitors were to sit in a chair, have a friend rotate the chair, then pull their arms and legs in toward the center of rotation. If there was no adult who was familiar with the exhibit to guide the visitor, few experienced angular momentum and no one experienced the reaction of a gyroscope. The visitors could have fun. The fun was to see how dizzy they could get in the rotating chairs.

I could make the exhibit a pleasure and help them experience conservation of angular momentum and the reaction of a gyro-

scope. I wanted their museum visit to be a pleasure but not fun. They learned more science when I helped.

James Jackson
Carlisle, Ind.

Burdock and bats

I was both saddened and intrigued by the fate of hummingbirds which tangled with burrs ("Botanical 'Velcro' entraps hummingbirds," SN: 10/17/98, p. 244). It reminded me of bats my husband Alan and I saw as we hiked in Mendon Ponds Park near Rochester, N.Y., in August 1991. We came upon two bats hanging on a plant right out in the open in the hot sun. They appeared to be dead and desiccated. Alan photographed them (below). It certainly appears that they became snared in the burdock. Your article solved an old mystery for me.

Margaret Kaminsky
Rochester, N.Y.



National Park Service biologists confirm that this plant is burdock.

The story on the entrapment of hummingbirds by burdock was interesting but hardly seemed newsworthy. As a caver, I have for some time observed entrapment of bats on burdock near cave entrances. In fact, I believe this to be common knowledge in the caving community.

Thomas Engel
Delmar, N.Y.

Has anyone wondered whether burdock has been killing birds and bats for millions of years? By capturing flying animals and dropping mummies on the ground, burdock could fertilize itself and prosper. Or is a new variety of burdock forming?

Perhaps climate change is affecting the birds' behavior. Instead of finding out, the people in charge intend to chop the clump of burdock down.

Harry Morel
Prescott, Ariz.

It's all too true what you said about hummingbirds, brown bats, and burdocks. My daughter once rescued a bat whose wings were completely stuck together.

Nothing is all bad, however. Inconvenient as these burrs can be for birds, furry animals, and human hair and clothing, it is important to remember that burdock root has valuable medicinal properties. Better to snip off the burrs than kill the plants.

Bina Robinson
Swain, N.Y.