

Fossilized cricket song brought to life in a work of art

Alla Katsnelson, *Science Writer*

The height of the Jurassic period, some 165 million years ago, was the golden age of massive plant-eating dinosaurs. Other animals—such as small mammals and birds—also darted through conifer forests, which themselves were relatively new on the arboreal scene. But a study published four years ago in PNAS adds a new dimension to our knowledge about the fauna of that time: a sliver of soundscape (1).

The PNAS paper describes the fossilized wing of a male bush cricket, or katydid, *Archaboilus musicus*, found by Chinese paleontologists in Inner Mongolia. Crickets and katydids make their characteristic trill by rubbing the serrated vein of one wing, called a file, against the so-called scraper on the other wing, and the veins of both wings were remarkably well-preserved in the fossil. By creating mathematical models based on high-resolution images of these structures, Fernando Montealegre-Z, an entomologist then at the University of Bristol, United Kingdom, recreated the sounds that these insects likely made. (See www.pnas.org/content/suppl/2012/02/03/1118372109.DCSupplemental/sm01.mov, movie S1 in ref. 1.) Today, their closest modern relatives sing in the ultrasonic range to evade predators, such as bats; but back in the Jurassic, before bats, these insects could sing freely, at about 6 kiloHertz, to be precise. And now, these ancient sounds are fueling an artist's meditation on communication across time.

Sounds from Silence

When he read about the research in the popular press, Peter Eudenbach, an artist based in Norfolk, Virginia, was captivated by the idea that these recreated chirps were the oldest sounds on Earth. Eudenbach, whose work often explores anachronism, had brushed shoulders with ancient life earlier in his career: in the late 1990s he had freelanced at the American Museum of Natural History in New York, where he was tasked with placing fossils from each major period of Earth's history into display cases.

The sound recreated from the bush cricket fossil made him think of different channels of communication between the past and the present: from the reproductions of old master paintings and samples of Mozart's symphonies sent into space or buried as time capsules, to the echoes of the Big Bang that scientists try to capture in studying the universe's origins. "You have this sound, which is by nature ephemeral, that has now been preserved in stone," Eudenbach says. "There's this poetry in it, this cry into the darkness."

Eudenbach felt compelled to make an art project based on the research, but didn't pursue the idea in ear-

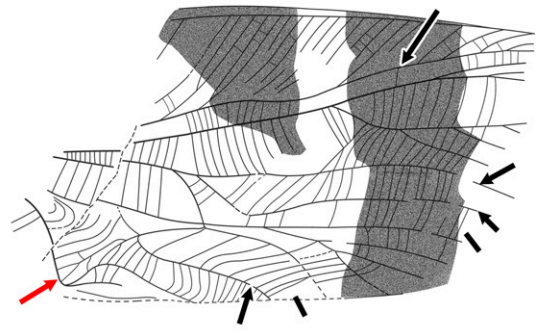


Inspired by fossil finds that enabled researchers to recreate the chirps of ancient bush crickets, artist Peter Eudenbach fashioned a work of art evoking the emanation of sound across time and space. Image courtesy of Peter Eudenbach.

nest until early last year. After talking to Montealegre-Z, who walked him through the research and sent him the original sound file, Eudenbach began to envision the elements of his new sculpture, *Jurassic Serenade*. Eudenbach collaborated with an artist named Sergey Jivetin, who fabricated the sculpture's physical components. One of these is an amber carving about the size of a chicken egg, turned on a lathe to replicate the shape of the sound wave that the scientist had decoded. Amber, which is fossilized tree resin, is generally younger than the fossil of the katydid's wing—most pieces of amber are under 100 million years old—but the material hints at the notion of preserving an insect, much as the wing fossil preserved the bush cricket's aural features. The amber's carved shape is also a nod to the cricket's role in Chinese culture. Stretching back to antiquity, people kept these creatures in specially crafted tiny boxes, appreciating their songs, setting them against each other to fight, and revering them as symbols of death and resurrection.

Tinny Tweets

The other component of the sculpture that Jivetin made, an ebony horn shaped like the mouthpiece of an old-style telephone, evokes the concept of transmitting



This photograph and drawing show the left wing of the bush cricket specimen and the veins in the bush cricket fossil. The red arrow points to the file: the serrated vein, against which the scraper on the other wing rubs to produce the insect's characteristic trill. Black arrows point to other veins. Modified from ref. 1 and courtesy of Fernando Montealegre-Z and Jun-Jie Gu.

sound. And in fact, in the auditory part of the piece, this horn will emit a sound composition created by New York-based sound artist Alfredo Ma. Eudenbach connected with Ma through a mutual friend and described the physical elements of the piece. Eudenbach explained his idea: to transmit to viewers the sensation of hearing something from far away, even somewhere "deep in time," by using relatively low-quality, difficult-

"We're listening to an echo from so many million years ago, so the way the sound comes through the piece should somehow reflect that."

—Peter Eudenbach

to-localize sounds. "We're listening to an echo from so many million years ago, so the way the sound comes through the piece should somehow reflect that," Eudenbach says. And it's also how we hear bush crickets: disembodied calls that we can't quite pinpoint in space.

In Montealegre-Z's 25-millisecond sound file, the ancient insects' call has a tinny, electronic sound, like a fire alarm running out of batteries. "My outlook toward the project was not to create a sound design that would realistically represent [ancient crickets]: that's

what the scientists created," says Ma. Instead, the science had an indirect influence, guiding some of the themes and structural elements he chose.

To create the piece, Ma drew on a musical genre called circuit bending, which involves exposing the circuit board of low-voltage electronic devices and pressing or tweaking it with one's fingers to create feedback loops that generate sounds. He then amplified those sounds and recorded them, editing hours of tape to create a 10-minute composition of layered beeps, clangs, and static bursts that are at times intensely intermixed and at times soothingly sparse. The fact that Ma used near-extinct technologies to pay homage to an extinct species was an artistic accident, he says.

Eudenbach is still putting the final touches on *Jurassic Serenade*. The piece will debut in a solo exhibition of his work at the Halsey Institute for Contemporary Art in Charleston, South Carolina, from late October to early December 2016. Meanwhile, Montealegre-Z, now at the University of Lincoln in the United Kingdom, and his paleontologist collaborators continue to study the evolution of acoustic communication in katydids, looking to newly discovered fossils for musical inspiration.

1 Gu JJ, et al. (2012) Wing stridulation in a Jurassic katydid (Insecta, Orthoptera) produced low-pitched musical calls to attract females. *Proc Natl Acad Sci USA* 109(10):3868–3873.