



Rupert Till and his team capture the acoustic fingerprint of the Tito Bustillo cave in Spain.

Q&A Rupert Till

Acoustic archaeologist

Rupert Till at the University of Huddersfield, UK, studies the sonic properties of caves containing prehistoric paintings. As he addresses a conference in Malta on the archaeology of sound, he talks about the hum of Stonehenge, acoustic fingerprinting and simulating primeval concerts in the dark.



How did you come to study cave acoustics?

The anthropologist Igor Reznikoff believes that cave paintings were sited on the basis of the acoustic properties of those chambers, and

says he can locate the paintings in complete darkness by using his voice to gauge the resonance of the spaces. Last year, I travelled with a group of archaeologists and musicians to explore this hypothesis in five caves in northern Spain. In both painted and unpainted chambers, we used a laptop and loudspeaker to sweep a sine wave tone through all audio frequencies, recording the results to capture the acoustic fingerprint of each space. This can give hints about what might have occurred there: how intelligible speech would have been; whether the chamber would have been suited to music; and whether it might have been ritually important due to unusual sounds or acoustic effects.

What patterns did you find?

Our acoustic testing revealed a change in the location of paintings over the millennia. The oldest paintings, from up to 40,000 years ago — some as simple as dots or handprints — tend to be in small, intimate places where there is less reverberation. Perhaps 15,000 to 20,000 years later we get paintings of animals like deer and bison, sometimes overlaid on top of each other, starting to appear in more echoey spaces that are large enough for groups of people to have gathered for rituals.

What kind of music do you think people made in these caves?

We may have to think about sound-making, rather than music with performers and audiences. There is generally little background noise, so even the sound of footsteps might have seemed loud. If there were rituals, everyone might have participated by clapping, stomping, banging or singing.

Have you experimented with playing ancient instruments *in situ*?

Some of the earliest musical instruments have been found in caves. We brought simple tools like bone scrapers, seashells and river stones.

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Bullroarers — leaf-shaped pieces of stone or wood that emit powerful low frequencies as you whirl them on a string — have been found in a nearby cave, so we brought those too. At one point, someone played a reconstruction of a 40,000-year-old vulture-bone flute in complete darkness. The music seemed to bring the environment to life.

Might natural sounds have formed part of the ancient soundscape?

Mostly the caves are incredibly quiet. Near some dramatic paintings there are big holes in the ground that open onto underground rivers whose sound rushes up from the depths. Some stalagmites and stalactites ring like a xylophone when struck, and were marked with paint in prehistory. In a way, a cave plays itself: you'll hear a little ping as water drips from the ceiling onto a stalagmite.

Can the public access prehistoric music?

We created a film aiming to reconstruct what it might have looked, sounded and felt like to be in the caves in prehistory, which will be on the Songs of the Caves project website (<http://songsofthecaves.wordpress.com>). In 2015–16, as part of the European Music Archaeology Project, we will mount a travelling exhibition about ancient instruments, including simulations of spaces such as caves and temples, and recordings of instruments being played with accurate acoustics. I'd love to document the acoustics in monuments such as the Taj Mahal and the Parthenon.

What did you discover about Stonehenge?

I worked with acoustician Bruno Fazenda to reconstruct how Stonehenge would have sounded when it was intact. Using digital modelling, we found that the ring of stone slabs had two modes of resonance that line up near the lowest F sharp on a grand piano. If the wind blew hard, it could produce a powerful hum at that frequency. Thomas Hardy wrote about the phenomenon in his novel *Tess of the d'Urbervilles*: "The wind, playing upon the edifice, produced a booming tune, like the note of some gigantic one-stringed harp." It's hard to hear now because of traffic.

What will remain of today's music?

It's hard to say. When we study ancient music, the instruments we find may just be the ones made of materials that lasted. But it may be that most music was made by clapping and singing, or by striking clay pots or pieces of wood, which leave no archaeological trace after a certain period. I'm sure that in thousands of years people will have a distorted image of what music means to us today. ■

INTERVIEW BY JASCHA HOFFMAN