



Trevor Cox bursts a balloon under a railway arch in Manchester, UK, to demonstrate the resulting echo.

Q&A Trevor Cox

The sound hunter

Acoustical engineer Trevor Cox has designed concert halls, but recently turned to 'sound tourism' — gathering audible phenomena worldwide for his book *Sonic Wonderland*. He talks about burping sand dunes, the bass baritone of a cracking glacier and the hiss of the nervous system.



How did you get into sound tourism?

A few years ago in London I went down a Victorian sewer and heard this amazing spiralling echo. It made me wonder what other curious sounds might be out there. I decided

to turn my training in acoustic engineering on its head and seek out aural distortions and illusions. Travel guides to the sights rarely said much about sounds, and I couldn't find a list of the most amazing sounds in the world. So I started a blog mapping unusual sonic spaces, and that became *Sonic Wonderland*.

What happens with noise in a chamber?

Whenever you make noise in an enclosed space, millions of reflections bounce around the room. Echo is when you hear a separate reflection, such as in a bad concert hall where the trumpets sound like they are coming both from the stage and from the wall behind you. There is a mosque in Iran where,

when you flick a piece of paper, the echo bounces between the ceiling and the floor seven or eight times. When your brain lumps room reflections into one event, that is reverberation. It adds a subtle bloom; without it your voice sounds dry and muffled.

What are the most reverberant spaces you have visited?

A mausoleum in Scotland claims to be the most reverberant place in the world, but it didn't seem that impressive on my visit. Then I learned about Inchindown in northwest Scotland, a depot built to protect fuel during the Second World War. The oil tanks are the size of enormous cathedrals dug into the side of a mountain, with thick concrete walls and no doors, and to get in you have to go through the pipework. You can have a quiet conversation in there because the walls are so far away. But as soon as you raise your voice this fog rises around you, a haze of echoes that build up and resonate for about a minute and a half.

How does noise travel over large distances?

In the early nineteenth century, sailors off the coast of Brazil reported hearing the sound of bells ringing some 160 kilometres away. That

may have been due partly to the concave shape of the ship's sail, which might have reflected the sound, and to a wide layer of cold air over the ocean that might have refracted the sound back downwards to the ship. For similar reasons, on some nights when the weather is right, I can hear the crowd at Manchester United's football ground quite clearly from my house, even though it is more than three kilometres away. Inside buildings, it has been known for centuries that a curved ceiling can transmit sound across a large room. In some cathedrals, if you whisper into the walls, the sound will skim the dome and come through clearly tens of metres away.

What about the sounds of ice?

Ice makes so many sounds. You can get the most catastrophic bass notes when great chunks of a glacier drop off into the ocean. If you throw rocks on to a frozen lake, it sounds a bit like phaser gunfire from George Lucas's *Star Wars* films. When bits of ice wash up around the shore of a glacial lagoon, you get a gentle tinkling sound like wind chimes. There is a musician in Norway, Terje Isungset, who makes trumpets and xylophones out of ice. He has to source it from lakes that froze slowly, to ensure a regular crystalline structure. He calls them "the only instruments you can drink after you've finished playing".

And sand dunes?

Explorers Marco Polo and Charles Darwin observed that some sand dunes make rumbling sounds when you walk on them, owing to the uniform size of the grains and whether they are loose and sifted. Scientists describe the sound as you walk on the dune as burp-like, but to me it sounds more like a tuba. If you scoot down the dune on your rear, you can get a couple of metres of sand to vibrate. With more people, more of the dune surface vibrates and that creates a huge avalanche of sound, a continuous booming that can travel for a kilometre or so.

Is total silence possible?

Before I wrote the book, my answer would have been no. When I work in my anechoic chamber, a room that deadens most sound, I have found that you cannot get rid of bodily sounds such as blood pumping through your head or, if you are unlucky, a hissing that is probably spontaneous firings on the auditory nerve, a bit like tinnitus. But while researching the book I went to some places — such as a sensory-deprivation flotation tank and a remote peat bog in Northumberland, UK — where I was not conscious of any sound whatsoever. My suspicion is that, for some continuous sounds like the hissing of the nervous system, your brain just learns to ignore it after a while. ■

INTERVIEW BY JASCHA HOFFMAN