

Organ of Corti: A Listening Device

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Abstract

The author discusses a piece that recycles noise in the surrounding environment, inviting active listening and contemplation on the act of listening itself.

Organ of Corti is a recent piece by Frances Crow and myself (working together as liminal). We think of it as a "listening device"; an instrument that can be used to focus attention on the act of listening itself. The piece is constructed from an array of up to 96 vertically mounted 4-meter cylinders (it can be arranged in a number of configurations) that are placed near to a broadband noise source. Collectively, the cylinders form a "sonic crystal" array, a term used to describe the effect that these regularly spaced cylinders have on incoming sound waves. As a wave passes through the structure, its path is redirected, altering its ability to propagate. The acoustic effect of this is to attenuate certain bands of frequencies (a band gap), the tuning of which is defined by the diameter and spacing of the tubes. What interested us in particular, however, was the way this natural filter accentuates a small band of frequencies on either side of the attenuated band gap. Using a combination of these resonant notches and broadband attenuation, it is possible to subtly sculpt the noise of the environment into a constantly evolving acoustic mediation of the surrounding sound that changes according to a person's proximity and orientation to the structure.

Despite its physical resemblance to a pipe organ, *Organ of Corti* takes its name not from the instrument but from the organ of hearing in the inner ear. Our proposal for the piece came out of a sustained period of research, funded by the Wellcome Trust, in which we lead a multi-disciplinary team investigating the relationship between sound, health and wellbeing. During this project, entitled *Tranquillity is a State of Mind*, we became interested in the physiology and neuroscience of hearing, and in particular, the process by which sound is physically mapped according to its frequency content along the length of the basilar membrane in the inner ear. We became fascinated by the fact that, like so many animals, our auditory system is predicated on the physical

separation of sound in space, and we began to develop ways of exploring this frequency mapping on an architectural scale.

Organ of Corti doesn't map the frequency spectrum across its structure as a literal interpretation of its biological namesake. However, the resonant notches that occur on either side of the band gap do behave somewhat like the over-active hair cells that occur on either side of portion of damaged hearing in the inner ear: one of the causes of tinnitus. Given this project's genesis in the earlier *Tranquillity is a State of Mind* research, we were intrigued by this similarity. However, where tinnitus, an unwanted sound in the head, is often treated by audiologists through a process of *habituation* (the technique of blocking out unwanted sound by learning to get used to it), the *Organ of Corti* recycles unwanted sound in the environment, *dehabituating* the listener to it. Both by its acoustic behavior and by its presence as an architectural "folly" to sound, *Organ of Corti* serves as a device that invites an active listening to the surrounding environment and also contemplation on the act of listening itself.

Organ of Corti is entirely passive. It produces no sound of its own. The piece eschews the creation of new sounds in favor of mediating that which we are already surrounded by. However, this work is not primarily a statement about authorship or a reiteration of the notion of the sonic readymade. Rather, in a world already saturated with sound, *Organ of Corti* seeks to rematerialize an engagement with sound by encouraging the reconsideration of what is already there.

Organ of Corti won the PRS (Performing Rights Society) for Music Foundation's New Music Award in September 2010. It was developed over the following year in partnership with Keith Attenborough and his team in the acoustics department at The Open University in the U.K. This piece toured in the U.K. during the summer of 2011, visiting sites that included St. Paul's Cathedral, London; Teebay Gorge on the M6 motorway in Cumbria; a section of the A419 in the Cotswold Water Park, Gloucester and Diglis weir in Worcester. We working with Sustrans, the sustainable transport charity to develop a proposal for a permanent version of the piece, called *Cochlea Unwound*. In November 2011 *Organ of Corti* won the John Connell Innovation award and received an honorary mention at the 2012 Prix Ars Electronica Competition.

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David Prior is a musician and an artist. His work spans song writing and concert music, as well as sound installations, listening walks and radio programs. With architect Frances Crow, he is a partner in liminal (www.liminal.org.uk), a studio specializing in making work that explores the relationship between sound, listening and space.

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Fig. 1.

Organ of Corti, Teebay Gorge, Cumbria, August 2011. (Photo <c>
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