
ORGAN
OF
CORTI

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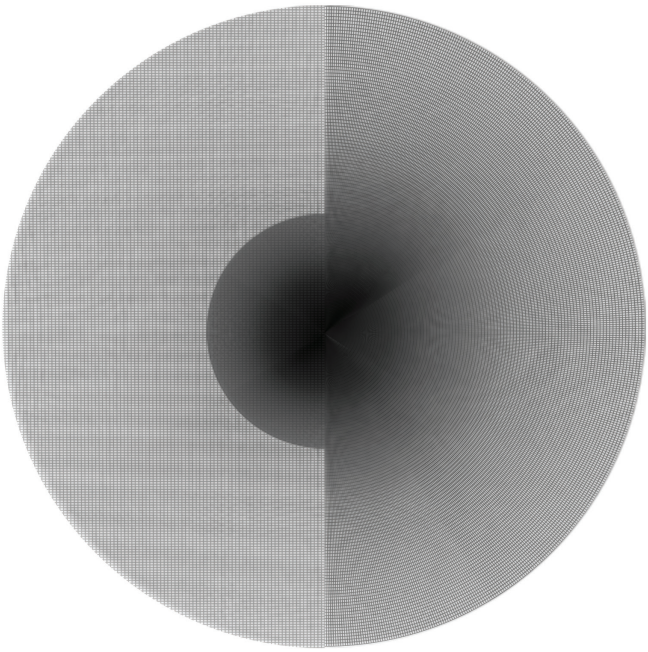

“LISTEN TO OURSELVES LISTEN”

Cover Illustration: Kin

A GUIDE TO

ORGAN OF CORTI

EDITED BY
FRANCES CROW AND DAVID PRIOR
Liminal

WINNER OF
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HOSTED BY
City of London Festival, Lake District Summer Music Festival, Cotswold Water Park Trust and Worcester Music Festival

IN PARTNERSHIP WITH
Acoustics Research Group at the Open University, Sustrans, Vista Projects and Mark Leahy

CONTENTS

TOUR DATES

1 - 7 July 2011
Carter Lane Gardens, St Paul's Cathedral, Cannon Street, London ..... *City of London Festival*

9 - 12 July 2011
Lay-by on A685 overlooking M6, Tebay Gorge, Cumbria ..... *Lake District Summer Music Festival*

15 - 17 August 2011
Lake 6, Cotswold Water Park, Gloustershire ..... *Cotswold Water Park Trust*

19 - 21 August 2011
Diglis Weir, West bank of river Severn, Worcester ..... *Worcester Music Festival*

ORGAN OF CORTI

FRANCES CROW AND DAVID PRIOR
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Organ of Corti is an experimental instrument that recycles noise from the environment. It does not make any sound of its own, but rather it attempts to draw our attention to the sounds already present by framing them in a new way.

Named after the organ of hearing in the inner ear, it uses the acoustic technology of sonic crystals to accentuate and attenuate frequencies within the broad range of sound frequencies present in road traffic or falling water.

By recycling surplus sounds from our environment, we hope to challenge expectations of what might constitute a piece of music by adding nothing to the existing soundscape but rather offering new ways of listening to what is already there.

We very much hope that this instrument might be a device that rematerializes our experience of sound, inviting us to "listen to ourselves listen".

LISTENING WITH OPEN EARS

HELEN FROSI
Co-founder and creative director of SoundFjord, London

With its vertical arrays of transparent cylinders the Organ of Corti is reminiscent of a fairground pipe organ, albeit a somewhat unusual one. Rather than introducing new sonorities to the environment it instead recycles the very sound of the environment; transmogrifying the 'white noise' of the world into distinguishable, euphonious tones.

The Organ of Corti does not sound out to the caress of fingers nor the pumping of pedals. Instead one is asked to participate – to become both composer and performer at once – by moving into and through the instrument. By shifting one's own body through space and structure the multi-dimensionality of the sounds emitted becomes apparent. One becomes aware of the magnitude and duration of the world's hum – whether naturally created by the gush of a waterfall, or by Man in the bustle of commuting. If one stands still within the forest of crystal pipes and turns one's head, the ears act as radar, gleaning accentuated and attenuated frequencies; one is composing and performing one's own composition instinctively – a composition that is constantly shifting and evolving with every step taken deeper into the Organ's core.

Having worked closely with a team of acousticians, a computational neuroscientist and clinical audiologist, Liminal conceived of the Organ of Corti as a listening aid, an instrument or device

to facilitate the act of listening. The Organ was designed to highlight awareness of the act of listening *per se*. Fittingly named, the Organ of Corti garners its appellation from a structure of the inner ear that creates nerve impulses in response to sound vibrations; it allows one to hear.

The instrument itself consists of four-meter high cylinders which constitute a sonic crystal. This structure absorbs the predominant frequencies from the location in which it is situated – a road, weir, river for example – and plays them back attenuated and enhanced without the addition of new sounds. The sonic crystal absorbs, filters and exudes the sounds that envelop its surroundings, allowing musical structures to be perceived. Thus, the instrument may be seen to sculpt quotidian noises into a composition that questions one's notion of musicality and indeed the evolution of music itself. One questions whether the soundscape of the everyday could be, or already is, music.

Such acoustic surprises, created from the known world, re-situate and ground the listener within the aural environment. Through once dulled senses, the ears listen consciously, actively once more – cutting through the noise and hyper-stimulation of contemporary life. Listening via the Organ of Corti transports one to a world moulded in and from sound. This is what it is to listen to one's self listening.

The origin of the Organ of Corti's 'world composition' is a mediated soundscape filtered from the environment and made celestial through cutting-edge technology. It could be said that the conceptual and structural qualities of the crystal frames the sonic landscape, whilst the physicality of the Organ of Corti acts as a focal point for causality and context for the listener. This

framework allows one to listen - perhaps more acutely, certainly differently, and to notice that difference. Thinking analogously here, the Organ of Corti heightens awareness of the aural sense, allowing one to listen to sound comparable to the way that the eyes 'look' and 'watch'. One is thus able to challenge assumptions of the hierarchy of looking and listening. Within the Organ, the ears rule.

The very placement of the Organ of Corti within specified landscapes, acts as a metaphorical acoustic lens focusing and calibrating the ears to perceive both environmental noise and sound through the reinvigoration of a changed familiarity – that which the crystal imparts on the sound (by way of the crystal's ability to filter and attenuate). The listener perceives familiar sounds in novel and unexpected ways and is reminded of sound and noise and how one differentiates between the two. Could the former be/come the later and vice versa, simply by changing context or conceptual framing?

Heedful of the wider implication of sound and one's experience of locality and environment, the Organ of Corti raises awareness of acoustics and mental and physical wellbeing by way of the consideration of which sounds may be considered pleasant and which may be thought of as noise (unwanted, disruptive, too loud, painful). This sensitivity not only calibrates one's enjoyment of the environment and good health but also one's appreciation of space and spatial awareness, architecture and one's negotiation through fabricated environments and natural landscapes. It affects and informs the planning of one's town and cities, roads and logistical channels, and greatly impacts lives - it shapes one's sense of place and in some instances, one's personality.

In a world saturated with sounds, pervaded with noise or simply plugged up with iPods and other portable music players, the Organ of Corti acts as an antidote to sounds falling on deaf ears. In a radical departure from the conventions of music creation, the Organ acts as a circus for performance, a ringmaster provocateur, enticing the listener to simultaneously perform and create, listen and 'look' with the ears, whilst the Organ's crystal mediates one's experience of broadband noise within the landscape and surrounds, empowering one's oft-disregarded faculty of hearing.

The Organ of Corti is not simply an ear trumpet for hearing, but is instead an instrument for listening to the world, opening up a portal to sonic domains that have thus far remained veiled. Step within the Organ, and listen with the ears as intently as the eyes watch.

A SONIC CRYSTAL: HOW IT WORKS

PROFESSOR KEITH ATTENBOROUGH
Acoustics Research Group at the Open University

Organ of Corti consists of ninety five 4 m long 22.2 cm diameter vertical acrylic cylinders. Apart from gaps for a passageway they are arranged regularly at the corners of equilateral triangles with length of side equal to 0.3m. The two designs are shown in plan in Figure 1 (the noise source is at the top).

When sound waves encounter this cylinder array, every cylinder deflects part of each wave (like sea waves 'bending' around the cylindrical supports of a pier). The fact that the cylinders are spaced regularly means that the deflected waves combine in particular ways. For example if the wavelength of the incoming sound is a whole number of multiples of the centre-to-centre spacing, the sound at that wavelength is trapped. So, if this is the case, on the opposite side of the array to a sound source there will be lower sound levels than if the array was not present.

The 0.3 m centre to centre spacing in the Organ of Corti array means that the lowest frequency trapped is 570 Hz. This is just over an octave above 'middle C' on a piano. But also there will be poor transmission of sound through the array at two, three and four times this frequency i.e. 1140 Hz, 1710 Hz, 2850 Hz (and so on) through the frequency range where the human ear is particularly sensitive. At wavelengths between the ones that are trapped, there will be higher levels on the opposite side of the array to the sound source than if the array was not present.

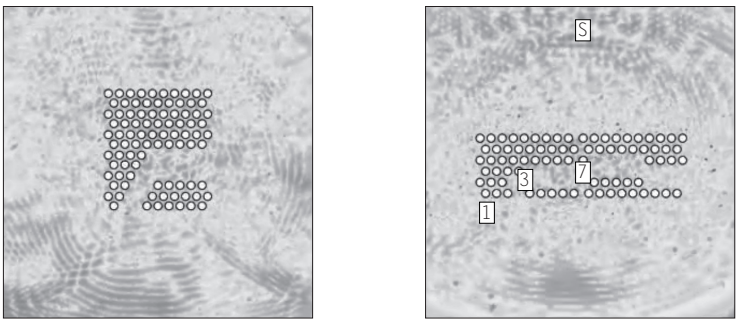

Figure 1. plan views of the square (left) and rectangular (right) designs of Organ of Corti. Refer to figure 2. for the predicted spectra at each location 1, 3 and 7 in rectangular array.

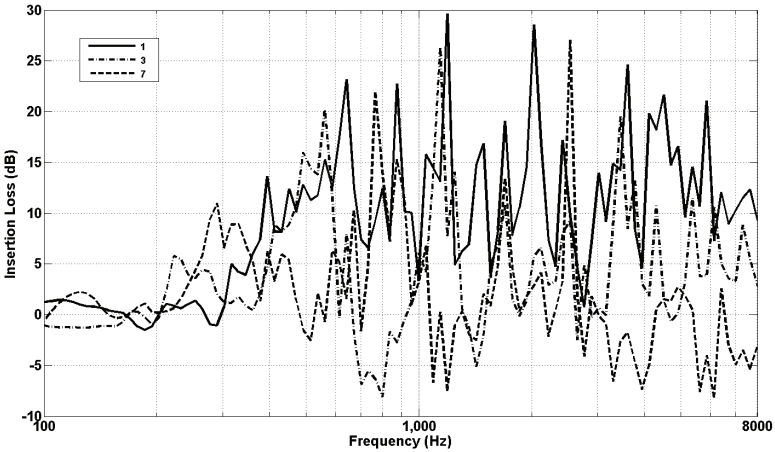

Figure 2. graph showing predicted spectra of the difference in sound levels with and without the rectangular cylinder array, given the source and three receiver locations shown on the right of Figure 1.

The magnitudes of the peaks and dips in the sound levels at the receiver depend on the size of the cylinders and the number of rows between the sound source and the listener. The bigger the cylinders and the greater the number of rows, the greater will be these magnitudes. At least three rows are needed for the cylinder array to make a significant difference to the sound levels.

To achieve subjectively noticeable differences at the lower frequencies present when the main noise is from slow moving individual vehicles like buses, a relatively large number of rows between sound source and listener is necessary. This is the reason for using the 'square' array (which interposes up to twelve rows between the road and a listener on the opposite side) at the City of London site, rather than rectangular array (with fewer rows between the road and the listener). The rectangular array will be used where the noise is from a continuous stream of high speed vehicles.

Peaks and dips in the sound levels occur inside the arrays. The graph in Figure 2 shows predicted differences between spectra of the sounds at receivers located at the back of the array and at two positions along the passageway (see Figure 1) with and without the rectangular Organ of Corti array with a source located 1 m from the centre of the top of the array.

Behind the array (position 1) and just inside the array (position 3) there are peaks in the difference spectra near multiples of 570 Hz which are the 'trapped' frequencies. But, at the location further along the passageway (position 7), the lowest 'trapped' frequency is shifted upwards and a further peak appears near 300 Hz which is related to the size of the array. The negative differences (troughs) indicate enhancements of sound. Different

magnitudes and frequencies of enhancements are predicted at different locations. Consequently as a listener enters and walks along the passageway s/he will hear different versions of the incoming sound.

SUPPORTING EVENTS

CITY OF LONDON FESTIVAL

1 July - 3pm, Official opening …….. *PRS for Music Foundation/ City of London Festival*

3 July - 2pm, Organ of Corti Soundwalk …….. *John Levak Drever*

LAKE DISTRICT SUMMER MUSIC FESTIVAL

9 July - 10am, Borrowdale Valley Walk …….. *FOLD*

11 July - Schools day…… *LDSM*

COTSWOLD WATER PARK

15 August - 4pm, Artist Talk …… *Liminal*

17 August - 2pm, Birdsong walk …… *RSPB*

WORCESTER MUSIC FESTIVAL

19 August - 6pm, Artist talk at Commandary….. *Liminal*

21 August - 2pm, 'Listening Walk'…… *Liminal*

For further details see www.organofcorti.co.uk

WITH SUPPORT FROM

University College Falmouth, Knowledge Escalator South West Proof of Concept Fund (administered by University College Falmouth), City of London Pollution Team, Eden Arts, Friends of the Lake District, Cumbria Tourism, Four Pillars Hotel, Cotswold Water Park,Worcester City Council, Worcestershire County Council, Severn Trent Water, Diglis Hotel, Worcester, New College Worcester, Westmorland Ltd, Westmorland Hotel and Tebay Services. Organ of Corti was developed at Space with support from The Dartington Hall Trust.

DESIGN TEAM

Concept and Design: Liminal
Acoustic design: Acoustics Research Group at the Open Univeristy
Structural Engineer: OMK Consultancy
Fabrication and Design: Tandem, Plymouth

MAP OF LOCATIONS

1.
51°30'47.37"N,0°5'53.44"W
Carter Lane Gardens, St Paul's, London

2.
54°24'1.73"N,2°36'17.99"W
Lay-by on A685, overlooking M6, Cumbria

3.
51°40'6.43"N,1°53'34.48"W
Lake 6, Cotswold Water Park, Gloustershire

4.
52°10'47.27"N,2°13'35.56"W
Diglis weir, river Severn, Worcester

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