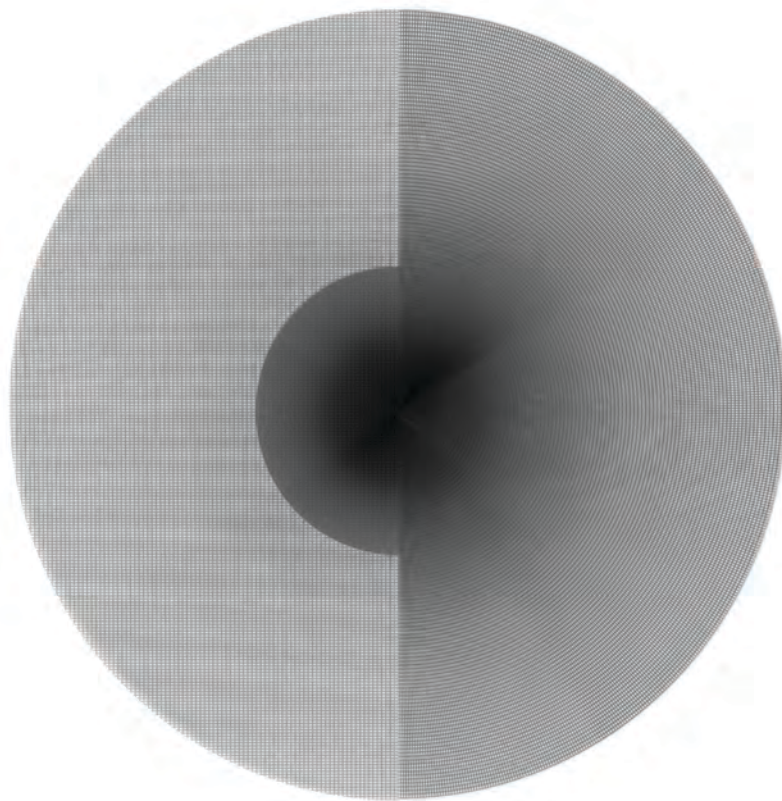


ORGAN

OF

CORTI



Evaluation and Impact Report

Liminal: Frances Crow

22 October 2011

Introduction

“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”.

Introduction from “A Guide to Organ of Corti”

Taking its name from the organ of hearing in the inner ear, *Organ of Corti* explores the wider implications of recent developments in our understanding of acoustics and the neuroscience of hearing (how we listen) on health, music and culture, including our attitudes to sound in architecture, planning and our environment.

The project also raised questions about the experience people have when actively listening to their environment and the impact that has on their relationship to organised sound and music. The project explored the relationship between science and art and the impact these have on a visitor’s expectation before they visited *Organ of Corti* and the influence these expectations have on their experience at the time.

Activity

PRS for Music New Music Award 2010

Organ of Corti was winner of the PRS for Music New Music Award 2010 and received a grant of £50,000 for Liminal to realise the winning idea by the end of 2011. In terms of the development of the project, it broke down into three main areas, developing the design of the structure, the tour and surrounding events, and the development of a wide and diverse audience.

Developing the Design

The idea for *Organ of Corti* was conceived following a 2-year research project “*Tranquillity is a State of Mind*” funded by the Wellcome Trust, which interrogated the relationship between sound, health and wellbeing. One of the outcomes that developed from the cross-disciplinary team comprising, a sound artist, an architect, 2 acousticians, a neuroscientist and a clinical audiologist was the proposal for a ‘listening aid’ or a device that would invite a listener to listen reflexively. This proposal was called the *Cochlea Unwound*.

Cochlea Unwound was an idealised proposal for a site next to the Diglis Weir in Worcester and used an acoustic phenomena called ‘Sonic Crystals’ to alter the frequency content within the broadband sound of the weir. The proposal for *Organ of Corti* extended this idea to traffic sound, which has a similar frequency content to falling water. We were interested in taking sounds conventionally described as ‘noise’; such as road traffic, and by recycling it. Without creating any sound of its own, *Organ of Corti* would therefore become instrumental in affecting a listeners’ experience of their sonic environment, challenging their perception of the value of sound, the way they listen and their relationship to music.

Acoustics

Through the *Tranquillity is a State of Mind* project we had developed a good working relationship with the Open University Acoustics Research Group and created a scaled prototype of an ‘acoustic lens’. The development of *Organ of Corti*’s design was lead by the acoustics on which it was based, but acoustic criteria had to be balanced against cost of manufacture and the need to transport the structure to the four tour locations.

Using their existing research developed for road traffic noise barriers, the Open University developed the structure of the sonic crystal for *Organ of Corti* and this was then tested through auralisations and computer models. It was clear as the project developed that there was not sufficient time or money to do a test run before the tour, so the final test site for the acoustics was to become the four sites during the tour.

The logistics of moving the structure installing it and de-installing it in publicly accessible locations became a fundamental consideration for the choice of materials and the detailed design. Working with Tandem as fabricators and OMK Consulting as structural engineers the final design for a 4-meter tall transparent sonic crystal constructed of 96 acrylic tubes and a timber and steel base was finalised. The base was designed so it could be constructed either as a square of 4 boxes or a line of 4 boxes giving overall dimensions of 3 x 3 meters or 1.3 x 6 meters respectively.

“Silent View”

Two weeks before the tour began *Organ of Corti* was installed in Foxhole Theatre at Dartington Hall. It was put up by 8 people, so that we could iron out any snags and to see how fast it could be built by hand. In the evening friends and local press were invited to see the structure. Without the sound source it remained a silent experience. The following morning it was deconstructed and packed for transporting to the first site.

The Tour

Over the summer of 2011 *Organ of Corti* toured England to 4 different sites each rich in broadband noise either from road traffic or water. At each site the layout of the structure was altered to reflect the specifics of the site.

- July 1-7: City of London Festival; Carter Lane Gardens, St Paul's Cathedral
- July 9-11: Lake District Summer Music Festival; Lay-by on A685 overlooking M6, Tebay Gorge
- Aug 15-17: Cotswold Water Park; Lake 6, near A419
- Aug 19-21: Worcester Music Festival; Diglis Weir, River Severn.

Supporting Events

At each location we developed a series of events that extended the reach of the original proposal. This included a Soundwalk by sound artist and researcher, John Levack Drever as part of the City of London Festival. Liminal also offered two listening walks, one in the Cotswold Water Park and one in Worcester. In Cumbria, local schools from the surrounding area came and experienced *Organ of Corti* and were able to ask Liminal about the ideas behind the project. Liminal presented two talks; the first in Cotswold Water Park was an informal discussion about the project and the relationship to the park and the second talk in Worcester was a presentation about *Organ of Corti* in the wider context of *Tranquillity is a State of Mind*, held at The Commandary.

Official Launch – 1 July 2011

On 1 July 2011, *Organ of Corti* was officially launched by PRS for Music Foundation at the Carter Lane Garden site. 334 guests were invited by PRS for music Foundation. In addition to the 46 guests that accepted the invitation there were guests of liminal and the partner organisations and passers-by. Ian Ritchie, Director of City of London Festival and Vanessa Reed the Director of PRS for music Foundation addressed the crowd.

Winkball media videoed a number of interviews with visitors at the unveiling and they can be seen at:

<http://www.winkball.com/walls/kVaHGiWGTvxM/city-of-london-festivals-organ-of-corti>

Organ of Corti: City Soundscape Walk

On Sunday 3 July at 2pm John Levack Drever sound artist and researcher lead 8 people on a soundwalk through the City of London which focused on ...

” the everyday sounds of the City as they unfold around us. Haphazard by-product or conscious design, the walk will expose the atmospheres and rhythms of the Square Mile, stopping at the *Organ of Corti* to experience its 'recycling' of this City noise into new music. Opening with a short talk on listening, the walk will end with an open forum to discuss what was experienced”

Extract from City of London Festival website

Schools Day, Cumbria

On Monday 12 July we had 4 primary schools visit *Organ of Corti* from the Eden Valley and Tebay area, Asby Primary School, Grayrigg Primary School, Orton Primary School and Staveley Primary School, with a total of 129 children and 12 accompanying adults.

Cotswold Water Park: Artist Talk and Listening walk

On the evening of Monday 15 August 2011, 30 people attended an informal talk and opening of *Organ of Corti* at the Cotswold Water Park Gateway Centre and attracted a number of visitors that were not members or supporters of the Cotswold Water Park Trust. The listening walk on Wednesday 17 August 2011 had 10 bookings (max 12) and was attended by 8 people.

Worcester: Artist Talk and Listening Walk

The presentation was held on Friday 19 August, in the Commandary in Worcester and included a small exhibition of work derived from the *Tranquillity is a State of Mind* project. It was attended by 42 people, a number of whom came to see *Organ of Corti* on the site over the weekend. 21 people attended the listening-walk. We divided the group into two, with one group walking along the river to *Organ of Corti* and the other exploring the sounds in the City Centre, ending at the Cathedral, where they could catch the rowing boat over to *Organ of Corti*.

Inner Ear

In London we proposed putting on an afternoon's conversations and music called "Inner Ear" and we applied to Wellcome Trust Arts Award to fund this. Unfortunately, we were not successful in the application. It is still our intention to develop this proposal into an event that might happen in 2012. However, during the development of this proposal we were invited to present a talk on *Organ of Corti* and a listening walk as part of the Summer school on Auditory Cognition held at Groningen University. Links were made through this event for a future collaborative project around the themes explored in the proposal for 'Inner Ear'.

Environmental walks

One of the drivers to the events we organised, was to draw visitors' attention to the indigenous sound-scapes in the areas *Organ of Corti* visited and in particular, the Cotswold Water Park's status as a SSI for their bird life, and the Lake District's Borrowdale Valley being one of the quietest valleys in the area right next to the M6 and the Tebay Gorge, (recognisably one of the noisiest valleys in the area). Unfortunately, the walk through Borrowdale Valley in Cumbria was cancelled, as publicity for the walk did not draw sufficient numbers to run it. The RSPB walk was rescheduled for spring. As this was realised late on in the planning of the tour, Liminal offered a listening walk that was based on the sound-cycle ride, originally devised for the Cotswold Water Park as part of their *Tranquillity is a State of Mind* project.

Additional presentations about Organ of Corti

Following the PRS for music Foundation's New Music Award win, Liminal were asked to present talks about *Organ of Corti* at the Peninsular Arts Festival, University of Plymouth, in February 2011; at Oxford Brooks University as part of a one day symposium called Ways of Hearing including presentations from the London Sound Survey and the 2008 New Music Award winners, Fragmented Orchestra. University of Falmouth invited David to present *Organ of Corti* as part of their nationally recognised Digital Futures series of lectures. Frances contributed to the Sound and Music research project Ways of Hearing and Liminal were also invited to be workshop leaders on Field Studies 2011 organised by the Musarc research group at London Metropolitan University in September.

Other Places

David Prior was originally commissioned by Dutch Ensemble, Lunapark for his piece *Other Places* during the period liminal were researching *Tranquillity is a State of Mind*. It was premiered on 9 November 2009 at De Doelen, Rotterdam and then had 2 further performances in the Netherlands. The piece takes the noise from a slide projector and sculpts it into an immersive 8-channel piece for speakers. It was the exploration of the way sonic crystals can sculpt broadband sound in the environment that led to the development of this piece. Since winning the PRS for Music Foundation's New Music Award we have presented this piece at University College Falmouth on 14 June 2011 and we are discussing the possibility of it taking part in Oxford Brookes University's Audiograph festival 2011.

Interpretation

Liminal developed a series of assets that would help visitors to *Organ of Corti* to interpret the work, these included a pre-tour visual identity, "A Guide to Organ of Corti" edited by Frances Crow and David Prior, a document called 'Instructions for use...'. We also worked closely with the invigilators at each site and in most cases were on site for the full period of the installation.

Pre-tour visual identity

As part of the development of the project we were given financial support from the Escalator Fund administered by University College Falmouth to work with Kin to develop a visual identity for *Organ of Corti*. They produced the 'logo' and a short animation that we used to publicise the project before the structure was completed. We also used the image on the front of the catalogue "A Guide to *Organ of Corti*".

The animation was also used as the splash screen on 2 short video interviews with Keith Attenborough, produced by WildKat PR.

"A Guide to Organ of Corti"

A Guide to *Organ of Corti* was designed and edited by Frances Crow and David Prior and included a poem in Braille called *Underheard* by artist and writer Mark Leahy, an essay by Helen Frosi, creative director of Soundford Gallery, London, called *Listening with Open Ears* and an essay by Keith Attenborough called *Sonic Crystal: How it works*. The essay by Helen Frosi was also made available in Braille with the support of New College Worcester.

2500 programmes were printed and an estimated 1700 were given out. We originally proposed selling the guides for £1 per guide. This was not possible in London as the invigilators were not insured to handle money. In London about 800 programmes were distributed giving about 11.5% take up. In Cumbria the programmes were sold for £2 per programme only 12% of the visitors took away a programme. Money made from the sale of these programmes was given to the invigilators. We decided that in the other two locations the guides should be distributed free and in the Cotswold Water Park and Worcester we had about a 48% and 70% take up respectively.

We printed 200 Braille essays of which 50 were given to the Dursley talking book group and 4 further copies were given to blind or partially sighted visitors to the site in Worcester. A further 40 copies were distributed to interested fully sighted visitors and partners.

The remaining Guides are with Poltimore House for distribution to visitors to *Organ of Corti* at Poltimore. We are hoping to arrange a visit to the site for a local group of visually impaired

children, to continue the work that we have been doing in Worcester with Worcester New College.

“Instructions for Use...”

Following the first half of the tour, we produced a document called “Instructions for Use” which provided a series of ideas or techniques that we had developed in the past for our listening walks. These gave visitors simple actions to carry out that might help them listen and suggest ways in which they could use the structure without having to talk to one of the invigilators.

Invigilators

At each of the four sites invigilators were present to hand out the “Guide to Organ of Corti” and also answer any questions visitors would have. In London the four invigilators for the 7 days came from the music degree at Goldsmiths College, London. The numbers of people visiting the structure meant that they were only able to provide interpretation to a small proportion of the visitors. Each day a member of liminal visited the site over the lunch period.

In Cumbria, Christian Barnes and two local artists provided the invigilation and assisted with the Park and Ride scheme that brought visitors to the site. Liminal was on site for the full 3 days explaining the structure and the ideas behind the project to the visitors. In the Cotswold Water Park, Lesley Greene provided interpretation for the most part with one member of liminal present on site for a 4-hour session each day. In Worcester, the Worcester City park rangers, Sustrans and Liminal provided the invigilation over the period of 3 days.

At all the sites it was necessary to provide overnight security and as well as looking after the structure the guards provided information to the many visitors that came during the evenings, this consisted of active discussions with visitors in Cumbria, to handing out the “Guide to Organ of Corti” at the other 3 venues.

Managing the Tour

The project was managed by liminal with assistance from Mark Leahy, who undertook the role on a voluntary basis until Liminal were able to secure funding from the Escalator Fund administered by University College Falmouth at a late stage in the project.

Following the awards ceremony for the PRS for Music Foundations New Music Award in the Serpentine Pavilion on 16 September 2010 we had to finalise all the initial agreements that we had made with the festivals that had agreed to host *Organ of Corti*. City of London Festival, Lake District Summer Music Festival, Cotswold Water Park Trust, Sustrans and Worcester Music Festival were incredibly supportive of the project and contributed in-kind both time and expertise in managing and marketing the event within their festivals.

Regional Management

Following visits to each of the regions in the early stages of the project to finalise the site for *Organ of Corti*, each host organisation undertook consultations with local communities and negotiations with stakeholders, statutory authorities and local organisations in their region.

To appreciate *Organ of Corti*, it was important that all four sites were seen as one whole composition in four ‘movements’. One of the major difficulties we had was keeping each of the

local organisations informed about the other locations' activities and the impact these had on the overall tour.

On-site Legacy

In preparation for the installation of *Organ of Corti* at the sites in Tebay and in Worcester, the local Highways Agencies and Councils respectively undertook maintenance work to provide a safer and more attractive environment for the installation of *Organ of Corti*, and have left the sites in a better state of repair than they were in originally.

In Tebay, the lay-by barriers were replaced and awareness has been raised about the significance of the Civic Award that the M6 received in the 1970's for its sensitive design in response to the landscape of the Tebay Gorge. There have been calls to have the Civic Trust Award sign that was stolen from the Lay-by (previous to our use if it!), reinstated. There is some evidence then, that the interest in the site generated by *Organ of Corti*, will have a positive longer term effect.

In Worcester, Severn-Trent provided a semi-circular piece of land and work was carried out by Worcestershire County Council to move the fence and lay a new area of tarmac. This has provided a more generous public space around the weir on the West side of the river Severn and Liminal are now working with Sustrans and their partners in Worcester on proposals for a permanent version of *Organ of Corti* that would be installed on the site prepared as part of this project.

Transportation, Installation and De-installation

The logistics of transporting, installing and striking *Organ of Corti* took a significant amount of time in terms of organising the tour and managing of the volunteers involved in each set up. Trucking company Edwin Shirley provided invaluable support and expertise in transporting *Organ of Corti*. At each site 8 volunteers assisted us in installing and de-installing the structure by hand. One of the most enjoyable parts of the tour was meeting and working with the volunteers in the construction of *Organ of Corti* and these relationships demonstrated what an invaluable contribution each local region had invested in the project.

It was decided that the most economical way to transport the structure was 'flat-packed' in an 18-tonne truck. To install and de-install we needed a minimum of 8 volunteers at each site. In each location we had to overcome different problems; in London, to avoid issues with pedestrians, *Organ of Corti* had to be installed in 4 hours from 4am – 8am in the morning and de-installed from 8pm to 11pm in the evening. In Cumbria, we worked through a deluge of rain and installed the structure in a very wet 3 hours (although the de-install was sunny and took 2.5 hours). In Cotswold Water Park we needed a tractor and trailer to take the structure from storage, through a nature reserve piece by piece, taking 7 hours to install and 4 to de-install. In Worcester, our lorry proved too long to access the main path as originally proposed, so the Worcestershire council engineers helped with a dumper truck and the rangers helped with a trailer and 'Mule'.

Live Audience

City of London Festival

Organ of Corti was installed on Carter Lane Gardens at the top of St Peter's Hill and in front of St Paul's from Friday 1 July to Thursday 7 July. Invigilators were in attendance from 8am to 8pm

and security guards looked after the structure over night. Access into the structure was allowed during daylight hours and visitors could experience the structure from behind and surrounding it through the night.

The road traffic was continuous with a significant number of idling and/or accelerating buses. *Organ of Corti* was very close to the traffic and the volume level was high. *Organ of Corti* was installed in a square layout to respond to the lower dominant frequency from the bus engines.

It was unfortunate that the road works to the coach park for St Paul's was ongoing. We had worked with the City of London, Environmental Services, Pollution team to find a site where there would be no road works during *Organ of Corti's* installation and the site in front of St Paul's had been identified as quiet at the time. The road works did finish at around 3 pm so it was possible for visitors to listen to the road traffic undisturbed from then on.

City of London Festival estimated that there was an audience of about 7000 people based on about 1000 people per day. This includes those who saw the installation from a distance, passersby as well as those who went through it and interacted with it.

In terms of responses from visitors, City of London Festival focused their distribution of audience surveys to live performance events and have no direct audience feedback or specific data for the *Organ of Corti*. However anecdotally, they felt the work was well received by the public.

Oliver Trickett one of the invigilators summarises his experience:

“Being part of a team invigilating this installation, I got a very good experience of its nature. On first looks I thought it was so sharp in contrast to the landscape around, being outside St Pauls. However in the next few days it seemed to merge more with its surroundings. Possibly this is due to the technique of listening to it. The change in sound is subtle, yet the processing of this sound is not only interesting but isolates one from its audible and visible surroundings, as its structure manipulates both senses.

The publics' interest in it was great, literally hundreds of people took part during my week, although most visited in the first three days. As it was a very touristy area, a lot of people just wanted their photo taken in it. Because of the language barrier I could not explain its function properly, but this did not change their interest in it, however with the very subtle changes, some found it inaudible or even unnoticed. This said, many people loved the idea and although the outside traffic noise would overpower the sounds from within the organ, [there] were still admirers. “

Oliver Trickett, Organ of Corti invigilator, City of London Festival.

Cumbria

Organ of Corti was open to the public from 10 am though to 4 pm at a Lay-by over looking the M6 as it cuts through the Tebay Gorge. There was no parking at the site, a park and ride scheme ran from Westmorland Hotel on the Saturday and St James's Church Tebay on Sunday.

Christian Barnes of Vistaprojects worked with the Highways Agency, the Police to provide safe access to the Lay-by and Westmorland Hotel and the Friends of St James's Church and Social Club provided refreshments to visitors to the site. Amey construction provided bollards to prevent ad hoc parking at the site.

The Lay-by was provided originally by the Rees Jefferies fund to celebrate the Civic Trust Award that the M6 received for its sensitive design. Visitors were able to appreciate the location for its view as well as the soundscape.

Over the weekend there were 447 visitors to the site including people who came to the site after hours specifically to experience the structure without other people around. With the schools groups the total visits to the site was 588 people, Christian Barnes advised us that “this is a significant number of visitors over three days in an area where events such as this are simply not presented.”

Lake District Summer Music Festival and Vistaprojects invited visitors to the site to fill in an Evaluation form, 61 were received. Visitors were asked if they had ever attended a ‘sonic installation’ project before, what their primary reason was for coming to the event, whether they had visited the area before and if they would be interested in attending similar events. They were also asked what their experience of *Organ of Corti* was and in what way, if any the experience changed their attitudes to landscape conservation or the acoustic environment. Christian Barnes has selected a series of comments that he feels fairly represents what people said to him during the 3 days he was on site:

Visitor comments on Saturday 9th July

“I was curious and wanted to know whether the structure would really alter the ambient sound. I was disappointed. The sounds inside and outside were exactly the same to me, the constant roar of the relentless traffic. Having known the Tebay Gorge before the motorway arrived my visit reminded me most how much man is destroying this beautiful planet.”

“A lovely looking thing. The sound is subtle and interesting and the setting is wonderful”.

An innovative concept. Unfortunately the traffic noise negated any auditory effect although I thought I did hear a silent murmur/vibration sensation at one point.”

“I would be happy to support any project for the restoration of the stolen bronze sign”.

“Initially disappointing. Sounds virtually inaudible but on second attempt treated the installation as a meditation tool. Eyes closed, different sounds and different colours.”

“To be honest I could not hear anything different despite several attempts.”

“To experience and support art in Cumbria a beautiful structure but I did not hear it. I would like to try it again maybe in a different location.”

“I live locally and not much usually goes on in Tebay. Didn’t hear much, maybe motorway noise when ear close to the tube.”

“Strange. Listened hard, listened soft. Did not know what to hear. Loved the experience.”

“I do understand the science behind it but did not experience any difference in the motorway sounds. Perhaps you have to stand for quite a while, difficult when people are queuing behind you”.

“Seriously underwhelming.”

“Could not hear anything but may be that is the plan to stop and take in the silence.”

“Difficult. Cannot honestly say I could hear any effect but found the visual a pleasure and there is no harm in focussed listening”.

"I found it difficult to experience anything but may have been distracted by people visiting."

"Glad I was there alone. The experience needed concentration and quiet".

"The strong wind made the motorway traffic less obtrusive".

"Fascinating. Trance-like listening makes a huge difference to what and how sounds are heard. Very positive impact. More similar opportunities would be great."

"Interesting – feel as though I need to be tuned in a little more to every day environmental sounds."

"Fascinating – the location on the historic M6 corridor and the subtlety of pressure in the ear. A felt hearing experience."

"Bemused."

"Overwhelming and curious at first then greatly enhanced by Christian Barnes describing the science behind it."

"Because mum and dad were coming, I came. I loved it and I like the motorway."

"I am afraid I experienced none of the predicted effects."

"Wanting to see art in the environment here. I dislike traffic noise and was troubled. However found it fascinating."

"We do not get much opportunity to visit artistic projects in this area. Made me listen carefully to the environment and to realise how much we do not hear of what is going in. It seemed to clarify the environmental sounds. Really interesting experience. Thanks."

11th July Sunday

"I really wanted to be impressed but was completely underwhelmed. All I heard was traffic noise. The idea sounded fascinating."

"Curiosity satisfied but still puzzled as to the eventual purpose."

"Enjoyed the organ's construction. Disappointed I couldn't hear changes in the sound".

"Subtle. Could not hear for the cars. The structure was interesting. Could be developed. A bigger structure might make more impression."

"Lovely landscape. Shame about the cars."

"Would wind make a big difference. The low hum only audible occasionally."

"Very subtle. Best result was realising how all-encompassing the sound of the traffic is."

"Wind turbines should be constructed along motorways as their sound pollution would surely be drowned by traffic noise."

"The organ seemed to amplify the sound of the traffic and it sounded like water."

"Deflation. Farical. Made me even more cynical. Outrageous use of public money."

“Very little to start with but noticed after much concentration a seeming intensity of noise.”

“It did not change much and was a bit of a let-down.”

“I struggled to hear the noise differently but the installation was very good visually.”

“Thumbs down. May be tubes should be varied in height.”

“Difficult to hear any difference. Interesting talking with staff here and spending time discussing and thinking.”

“Wonderful structure. Fabulous landscape. Interesting idea. Too subtle a sound.”

“The noise of the motorway is seen as intrusive by the local community. It has made me look at it in a more positive light.”

“Made me think that there might be ways to improve sound quality or experience in areas where you do not like the noise.”

“Not such an obvious effect as I had anticipated from the installation.”

“The most fun I have ever had with traffic noise and a new view of Tebay Gorge and the M6.”

“Changed my view of the place of the motorway in our relationship with landscape.”

“Lovely work. Subtle and calming. I enjoyed the experience surrounded by a great project and subtle sound.”

“I was unable to get the effect. I am sure that in the right conditions it does work but unfortunately I did not experience it.”

“Liked the visual aspect of the Corti location etc. Didn’t really experience the subtlety of the Corti itself. I did hear subtle whistles on occasion.”

“Society is always full-on meaning life is noisy, chaotic, busy. We want impact. This Corti project has taught me about stillness to listen to the quiet of the environment.”

“Slightly disappointed by the subtlety. Loved the concept though.”

“A little unsure that I heard sounds. Better when I was in there alone.”

Cotswold Water Park Trust

Organ of Corti was installed next to Lake 6 at the Cotswold Water Park on 15 August 2011 till 18 August 2011. It was sited at a distance from the A419 one of the noisiest roads in Europe and the sound level changed over the days with the change in the direction of the wind.

Lesely Green summarises below the impact of *Organ of Corti* at Lake 6:

“Organ of Corti was stored in Cotswold Water Park Trust barn (free of charge) from 12 July -15 August. Installed August 15th, and on display Tuesday and Wednesday 16th and 17th. Organ of Corti left Lake 6 on Thursday 18th.

The site was on a circular public footpath around Lake 6 owned by the hotel The Four Pillars Hotel, and the CWP Gateway Centre – a popular venue for visitors.

The installation was very complicated and took a lot longer than anticipated (from 8am – 4pm with Rangers assistance 8am-3pm) as the site was some distance from the storage yard, and access to the Lakeside site was only possible by tractor and trailer. Installation undertaken by 8 people -liminal (2), 2 volunteers and 4 paid CWPT Rangers. Dismantling undertaken by 10 people –liminal (2), 4 volunteers and 4 paid Rangers (8am – 12noon). Volunteers were offered expenses.

30 people attended the launch at the Gateway Centre on Monday evening (5.30pm) attracting people who were not the usual CWPT ‘followers’. The Sound Walk led by liminal on Wednesday had 10 bookings (max 12) and was attended by 8 people, and the response /feedback was excellent, including one emailed¹

The attendance figures noted on each full day of display was 85². Total noted attendance 207 of which a significant number (approx 50%) had come to the CWP and walked around the lake specifically to see the work. Most of these had seen articles in the local press – and clearly there had been press ‘pick up’ in Cheltenham, Stroud and Dursley as well as the Wiltshire /Standard area. One visitor was a representative of a ‘talking book’ group in Dursley so he was taking back descriptions to 70 local visually impaired members. He was given 50 copies of the Braille version of the catalogue. Feedback of responses were taken as far as possible, see list.

Overnight security provided by liminal was excellent and important, although there were no incidences and the nights were consistently quiet.

Summary of Feedback

1. The majority of visitors were local (Gloucestershire) and some had come as far as Cheltenham, Stonehouse, Dursley, Gloucestershire – all of these had come specifically attracted by the publicity in the local Echo/News and Journals.
2. 36 were recorded as visitors to the area from Bristol, London, Portsmouth, Germany etc – most of these had been attracted by pr in the Four Pillars Hotel and Gateway Centre. At least 10 were reported as coming specially because of national pr and another 2 were walking the Thames Path and diverted their walk specially as they had seen some national pr.
3. Most visitors commented that the work was visually arresting and interesting (‘unusual’, ‘unique’ ‘fun’ were amongst the descriptions used) and enjoyed seeing it as a sculpture, but most found it aurally disappointing. Whilst some people clearly did hear and reported on a subtle change in ‘listening’ – especially to what one man called ‘the edges of sound’, the majority of people of all ages could not hear anything. That said, one man joked that he had come on a CWP nightingale walk and didn’t hear a single nightingale!! On Wednesday the road noise from the A419 was exceptionally and continuously intrusive. On that day –almost without exception - people commented on the ‘horrendous’ road noise (‘an assault’ said one visitor). Perhaps one of the best descriptions came from a young woman who said that although she could not personally hear any change in sound in the sculpture, having the work there was ‘like putting up a frame to see a view –it makes you use your ears and challenges me to listen more to a spectrum of sound’. “

Lesley Green, Cotswold Water Park Trust, August 2011

¹ “Thoroughly enjoyed walk yesterday with David and Frances. Couple of photos attached – one I thought they might like as it shows Frances who is normally behind the camera and people wearing various hearing devices! No-one objected to having their pictures published by the way”. (Alison Tinsley)

² The figures are an under-estimate as there were some visitors ‘after hours’ but the security guard did not note these

Worcester

Organ of Corti was installed at Diglis Weir in Worcester on the afternoon of 18 August and open to the public from 19 August through to 21 August 2011 as part of the Worcester Music Festival and the wider Worcester Festival.

Over the weekend there were 1071 visitors to the structure, the site was about a mile walk outside the City Centre on the National Cycle Network 45, which is connected with the City side of the river by a new bridge opened recently as part of the Connect 2 initiative. 50% of visitors arrived on bike and the rest walked. The Worcester Pedicab offered free rides from the city centre to *Organ of Corti* and over the weekend cycled in excess of 130km. Visitors crossed all age ranges and included one wheel chair user and 3 partially sighted visitors. Visitors stayed on average 3-15 minutes with a few spending over half an hour with the structure.

The noise source in Worcester is a weir, which was the most static sound source *Organ of Corti*, recycled on the tour. There was no variation in the frequency content or loudness, it was therefore immediately apparent to visitors as to the affect of the sonic crystal on the sound of the weir.

On the Sunday, Keith Attenborough and his team from the Open University visited the site to take measurements of the sonic crystal. He demonstrated that the perceived drop in sound level behind the structure was due to a shift in the frequency content, meaning that it was actually as noisy in volume as before but perceived to be quieter. They also found that there were interesting shifts in the frequency spectrum within the structure. They are interested in taking further measurements of *Organ of Corti* at Poltimore. The results of the measurement on site in Worcester are included as an appendix to this report.

Invigilators were briefed in the first instance to observe the visitors interaction with the structure and note their gender and the number of visitors. 10% of the visitors were approached by invigilators and engaged in discussions about the installation, feedback forms were then filled in by the invigilators following the discussions. 7 visitors were asked to contribute to a follow up conversation about their visit. These forms and conversations will be evaluated by Nottingham University and collated into a evaluation report for the *Tranquillity is a State of Mind* public engagement project. As part of the preparation for this Katy Hallett highlighted a number of comments that she felt represented the responses to *Organ of Corti*:

Come to see it – in the local paper this morning

Not often we have things on this side its cool, good

I made my own symphony - she spent over half an hour with her family listening.

I totally love it but I think people make it out to be more complicated. To me it distorts the noise of the weir in waves- as if you were blowing across half filled bottles of water. My husband doesn't get it at all.'

All I heard was my heart beat boom, boom, boom. The second tune I heard the weir whispering.

When inside she closed her eyes and held onto one of the sonic crystals for a minute

This link [the new Worcester connect2 bridge etc] is as good as it gets – it links the city... helps to knit the town together – people using it... the numbers are still going up.

I can hear a noise that I never could before

*I didn't notice anything – when details explained he said – Oh yes I can notice this – I'll bring my daughter
– I can hear a marked difference*

Anything that embraces the river has to be applauded

*It photographs better than it looks. The sound is more intense behind the structure. The weir I think is a bit too
over powering*

Interesting but finding it difficult to hear anything – like the ideas

*I'm really surprised how it changes just with a small step the pitch goes up or down It makes the sounds much
more lively ..by listening*

Like bearing – look with your ears

You can feel the sound is different

*When you walk through – because of the change of sound it was disorientating – it was interesting to be
disorientated*

Poltimore House

On 22 August 2011 *Organ of Corti* was installed in the Gardens of Poltimore House, Exeter where it will remain for the foreseeable future. It was open to the public as part of National Heritage Weekend on the 10 and 11 October 2011 and interested parties and individuals can visit it by special arrangement. As a 21st Century 'folly' to sound, it stands on the main lawn inviting visitors to listen to the M5 road traffic noise and reconsider the wider environmental sounds found on the Poltimore Estate.

A range of research, education activities are being developed and we are currently in discussions with the Open University and the Noise Abatement Society about the use of the structure for an extended research project.

A number of queries arose following the tour, asking if *Organ of Corti* could take part in other festivals, including *Brighton White Nights* and the *Audiograph* Festival in Oxford. Due to the logistics of moving the structure and its temporary nature, we have decided that the structure should remain at Poltimore House as a '*folly to sound*'.

Wider Audience

There were two aspects to developing a wider audience. The first was working with the existing audiences that we and our partner organisations already had, and the second was using local, national and international press to provide pre-tour information and post-tour reviews.

National Tour

In preparation for the National tour we worked with PRSF and their PR company WildKat PR on developing an approach to the promotion of the project to a wider audience.

PRS for Music Foundation featured *Organ of Corti* in the New Music Award section of their website and WildKat PR also created an online presence before and during the tour, managing

the *Organ of Corti* Facebook page (<http://www.facebook.com/OrganOfCorti>), producing 2 videos interviewing Professor Keith Attenborough of the Open University explaining how *Organ of Corti* works and featuring the project on their website.

In addition to the *Organ of Corti* page on the liminal website, (www.liminal.org.uk/organ-of-corti) we developed online content including the *Organ of Corti* Google Map which received 2016 views. As the tour developed we uploaded images to our flickr stream and included a video *0.1ms* on our Vimeo site. Liminal issued 15 news items in preparation and during the tour and these were automatically published to two twitter feeds (133 followers) @LiminalSound and @LiminalArch. These were all linked back to the liminal website. Project Manager, Mark Leahy also tweeted during the development and tour (42 followers). Online media produced by WildKat were also linked to our site. E-invites detailing the full extent of the tour were sent out before the tour to liminal, PRS for Music Foundation and Sustrans' contacts.

Regions

We worked with the host organisation and local partners to promote *Organ of Corti* to their existing audiences, in each of the four venues that *Organ of Corti* visited on the tour.

London

City of London Festival included *Organ of Corti* and the associated *Organ of Corti Soundwalk* with John Levak Drever, in their three festival brochures and their website. The brochures were sent out to 150,000 people. Overall the festival site for the period between 1 April and 31 July 2011 had 253,809 unique views with the *Organ of Corti* pages the 52nd most visited page on the site with 1016 page views (885 unique visitors). The *Organ of Corti* soundwalk page had 280 page views (255 unique visitors)

PRS for Music Foundation sent out 336 invitations to the official opening of *Organ of Corti* on 1 July 2011 in London and an estimated 200 people attended.

Cumbria, North West

Christian Barnes of VistaProjects worked as the project/events manager for *Organ of Corti* in Cumbria and with the Lake District Summer Music Festival developed strong relationships with local organisations to organise the project and promote it in the area.

LDASM included *Organ of Corti* in their Brochure sent to 100,000 people and included two pages on *Organ of Corti* and the Lay-by on their website. VistaProjects featured *Organ of Corti* on their homepage and Christian Barnes set up *Organ of Corti* Facebook group (organofcorti@groups.facebook.com). Christian also posted a postcard invitation to 150 local contacts.

Westmorland services were very supportive of the project and as part of widening the audience, included *Organ of Corti* on their onscreen display at their Westmorland's Gallery at Reghed, which had 880 visitors over the weekend.

Posters advertising *Organ of Corti* were installed at both Westmorland Hotel and St James's Church where the Park and Ride facilities were located. AA signage directed people to *Organ of Corti* during the weekend of its installation.

Cumbria Tourism were very supportive in promoting the project and in addition to the *Organ of Corti* page on their site, provided an inset 'advert' for the duration of the tour and featured the project on their homepage.

Cotswold Water Park, South West

The Cotswold Water Park Trust featured *Organ of Corti* on their website for a week before the installation at the Cotswold Water Park. In the month of August the site had 40,126 visits. *Organ of Corti* was also advertised via posters sent to parish clerks in these Parish Council areas: 'Ashton Keynes PC'; 'Castle Eaton PC'; 'Cirencester Town Council'; 'Cricklade Town Council'; 'Down Ampney PC'; 'Driffield PC'; 'Eastleach PC'; 'Fairford Town Council'; 'Highworth PC'; 'Kemble PC'; 'Kempsford PC'; 'Latton PC'; 'Lechlade Town Council'; 'Leigh PC'; 'Marston Meysey PC'; 'Meysey Hampton PC'; 'Minety PC'; 'Poole Keynes PC'; 'Poultton PC'; 'Siddington PC'; 'Somerford Keynes PC'; 'South Cerney PC'; 'Southrop PC'.

Following a visit to *Organ of Corti* by a representative for the Dursley Talking Book group 50 Braille and print programmes were distributed to their 70 blind or partially-sighted members.

Sustrans also published a news article on their website that covered both the Cotswold Water Park and Worcester sites, both on the National Cycle Network route 45.

Worcester, West Midlands

We worked closely with Sustrans and Worcester Music Festival who hosted *Organ of Corti* within the wider Worcester Festival.

Worcester Music Festival has 4 pages specific to *Organ of Corti*, *Organ of Corti* Listening Walk , *Organ of Corti*: Meet the Artists and *Organ of Corti*, how it works, with a total number of unique page views of 695 during the period of the tour. *Organ of Corti* and the associated events were also featured in both the Worcester Music Festival and Worcester Festival brochures with a distribution exceeding 100,000 in the Worcester region.

Sustrans featured *Organ of Corti* on their website as part of their Art and the Travelling Landscape pages, these received 1226 unique page views over a one month period. A week before the event, the Worcester City Council rangers put up posters locally.

Press Coverage

The PRS for Music Foundations New Music Award received extensive media coverage during the short-listing process and following *Organ of Corti's* win in September 2010.

PRS for Music Foundation recruited WildKat PR to run the PR campaign for the New Music Award within the overall profile for the PRS for Music Foundation. In addition to this Liminal worked with media partners and local press officers in the local regions to provide information for local audiences.

To date we have identified 70 separate instances of *Organ of Corti* in the media since January 2011, this does not include information and news articles that Liminal have instigated through their website or social media. The information provided by partner organisations, including City of London Festival, Lake District Summer Music Festival, Vistaprojects, Cotswold Water Park Trust, Worcester Festival, Worcester Music Festival, Sustrans or PRS for Music Foundation.

On-line Media

The independent press includes press with an international (19) national (25) and local (17) reach. The majority of the press has been online media in the form of e-magazines (4) News items (17) on sites with both local and national interests, Blogs (14) and other types of social media (7) including Vimeo, YouTube, Facebook, Soundcloud, Twitter and audioboo.

Highlights within these include an extensive review in The Gramophone Blog and a feature on Wired Magazine home page for one week. 'Everything London' tweeted the Wired article and this reached 126,183 people via 50 tweets (tweetreach report for 5 July 2011).

Items by London Sound Survey, Mr Underwood Blog, Trevor Cox and FiDunn are personal reviews from independent artists, musicians and audiophiles who have picked up *Organ of Corti* and have included audio recordings of their experiences.

Printed Media

Notable instances of national media include Time Out's editors recommendation in their Classical Music section following and interview with Liminal just before the tour began and a mention in the Guardian's Travel Section, Eccentric Britain, in-between the first and second half of the tour.

Locally both the Cumberland and Westmorland Herald and Worcester Standard featured *Organ of Corti* pre- installation and reviewed it afterwards. In the Cumberland and Westmorland Herald, *Organ of Corti* made the front page twice. The local press has proved to be invaluable in drawing visitors to the regional sites at the Tebay Gorge, Cotswold Water Park and Worcester venues.

Printed Features

In addition to the online features, *Organ of Corti* has also featured in an extensive article in the ISM Music Journal (September/October 2011) and in the November issue of Blueprint Magazine, 'Produce' section as one of five case-study projects that contributed to Sound and Music's *Ways of Hearing* project.

Broadcast

During the tour Liminal were interviewed by 4 radio stations, 3 of these were local and took place at the venue and during the times *Organ of Corti* was on-site. An interview for Hear and Now made at the launch in London for Radio 3 was not followed up. Soundart Radio will be doing a feature on *Organ of Corti* for their radio programme 'Take Note' and this has a wide local audience and a large national and international arts audience via their website and the RADIA network.

Organ of Corti has also been filmed at Poltimore House by Tern TV company for an upcoming BBC 2 series of Heritage at Risk.

Cross-disciplinary Reach

In terms of the reach across sectors, *Organ of Corti* was represented in Music both Leftfield (16) and Classical (10) the broader Arts (7) within science and technology (5) and wider cultural

contexts (10). Other instances concerned general interest, listings and news both local and national.

Extent of Media Interest

Of the press there have been 27 instances where a version of the press release has been reprinted without any further follow-up. *Organ of Corti* has been reviewed either by a visit to site, an interview with Liminal or another partner and the results of these interactions published 25 times. Liminal has authored content for 7 specific publications and there have been 8 instances of online content (social media etc.) directly produced by others in relation to the project.

Budget

Grant Funding

Organ of Corti was made possible by the £50,000 commission from the PRS for music New Music Award. In the initial stage of the development of the project we made additional funding applications to Arts Council England for £10,000 to widen the impact of the tour from 1 day at each site, to 7 days in London and 3 in the other 3 locations. We were also successful in getting grant funding of £6101.80 from the Escalator Fund, administered by University College Falmouth and £490 from Worcester City Council. Sustrans also adopted *Organ of Corti* as part of the ongoing public engagement project *Tranquillity is a State of Mind*, in Worcester and contributed to the costs of hosting *Organ of Corti* in Worcester. These additional funds contributed to a series of events associated with the *Organ of Corti* installation and information about the project online, printed and in Braille versions before and during the tour.

Public and Private Sector Support

In addition *Organ of Corti* received extensive in-kind support from the host festivals and partners in the project. Through the project we made strong links with other local organisations that provided in-kind support in the form of time, resources, marketing and access to existing audiences to make the project a success.

Summary of Budget Expenditure

The total cost of the *Organ of Corti* tour including the in-kind support was approximately £84,500 of which approximately £28,000 was the cost of constructing *Organ of Corti* itself at about 33% of the overall budget. The rest was divided between audience development and engagement 35% and cost of managing and coordinating the logistics of the tour 32%.

Impact

We have collated in the following sections the responses from our partners involved in the delivery of this project, who summarise the impact that *Organ of Corti* has had on them personally and for their Organisations and the wider audiences and communities they serve.

City of London

“Anecdotally, the work seemed very well received by the public. General appreciation tended to centre around its visual aesthetic, rather than its manipulation of sound. A significant number of people thought that the work's focus was visual, and its treatment of sound required greater explanation, because this dimension was less obvious to the general public in the first instance.

This was a strong opportunity for the Festival to revisit its connections with the PRS Foundation and to work in partnership with Liminal for the first time. The working relationship with Liminal was productive and clear. It was a very positive experience for the Festival team.

Sculptural sound art is a relatively new territory for the outdoor programme of the City of London Festival, but there does appear to be an increase in interest from artists, and possibly also audiences, to present more of this kind of work in outdoor City spaces. The consultation process with City departments and surrounding communities for presentation of this work is quite involved and the *Organ of Corti* provided us with greater experience and footing going forward in delivering large art installations in the City's outdoors.“

Ruth Oakley, Education and Outdoor events. 19 September 2011

Cumbria

Lake District Summer Music Festival

“We have greatly valued the opportunity to bring together the LDSM Festival with partners who have never before been part of our programme. The project has helped to establish a new dimension to our activities.”

“At a time when partnership is never more important our experience was a happy and productive one - particularly thanks to the contribution made by Christian Barnes and Vista Projects. We are delighted to have worked with and supported David and Frances' (Liminal) project and with the PRS Foundation for Music once again, and are keen to explore and develop further partnerships in this area. This project shared a synergy with our ethos at LDSM challenging all to use their ears critically. While the sonic result at Tebay Gorge was less pronounced than we had hoped, we do not regret our involvement in any way. The installation clearly had a positive impact on visitors and was understood as an experiment where perhaps more constraint and control of the sound source would have allowed visitors to better explore the aural effect.”

Andrew Lucas, Chief Executive, Lake District Summer Music Festival, 13 September 2011

VistaProjects

“Presenting the project in the Tebay Gorge involved close work between the Police, Highways, Westmorland Limited, Eden Arts, the LDSM, Liminal, Vista Projects, the Friends of St James' Church Tebay and Tebay Social Club.

The project has resulted in partnership discussions between the LDSM and Vista Projects over the presentation of other special projects in the context of the LDSM Festival. Local support financial/in kind from Westmorland Limited in providing

accommodation and facilities for the project were vital in delivering the project on a much stretched budget. Westmorland Limited is keen to develop its arts programme through its new gallery and facilities at Rheged and elsewhere. The project provided an opportunity for Westmorland Limited to promote the event in this context through its information displays. Westmorland Limited has employed one of the invigilators in an arts role at its Rheged site.

The Friends of Tebay Church welcomed hundreds of visitors to St James' Church and sold £150 worth of teas. They are very happy and would welcome another such opportunity! It was felt that a visit to this special church added value to the visitors who came on Sunday with an interesting exhibition about the heritage of the area in relation to national transport and infrastructure.

The input of Highways and Police at the planning stages in respect of event management was very much appreciated by the organisers. Year-end budgets were used to improve the physical environment eg. repairs to retaining wall and safety barriers. Help was also given free by contactors Amey with traffic management equipment and road closure protocols were operated in a way that was convenient to the project organisers. The event itself which took place in the public highway was as a result conducted safely with a large number of visitors attending the site without accident or incident. This aspect of the project has built my confidence in attempting other similar event based projects and in being secure of positive input from the highways engineers, contractors and police. Thanks are very much due to all of these.

Thanks are also due to Eden Arts who have been an important point of reference and discussion throughout the project and whose support for the project provided an early and positive point of reference in relation to Arts Council funding.

Eden Arts were themselves pleased to assist the project taking place in Tebay, an area that receives very little arts provision.

From my perspective I found that with the exception of Westmorland Limited approaches to local funders for assistance with the costs were both consumptive of time and unsuccessful although one of those approached did visit the project and was encouraging. It is unfortunate for us that in order to maintain particularly the educational part of the project it was necessary to absorb project costs within the level of our agreed fees although we were happy to do this to accommodate David and Frances having made the commitment to deliver the project and in fairness the pain was shared equally between all of us!"

Christian Barnes, Vistaprojects, 13 September 2011

Cotswold Water Park

General Conclusions:

1. Art installations attract a different 'clientele' from the usual CWPT followers' broadening the range of knowledge about and interest in the CWP and the CWPT. There is therefore the possibility that new members for the CWPT can be attracted by art installations if organised beforehand
2. The fact that there was 'something special to see' on Lake 6 was generally commented on and appreciated by visitors
3. Art installations potentially attract a different kind of volunteer (an art student for example who had never visited the CWP before)

4. Temporary art installations are clearly attractive to the public. Several requests were noted to 'make walks in the CWP "more interesting" ', and/or a "sculpture trail"
5. Dramatic and potential risky temporary art installations are labour intensive and physically demanding, and in this case the project's success depended on a budget being available for professional Rangers support, plus volunteers, and overnight security.
6. For an experimental project like *Organ of Corti* it was important to have 'guides' on site to help people 'use' the work and take feedback. In addition many people found the information helpful and were seen reading the catalogue
7. Most visitors were intrigued and very interested and liked discussing the issues. Whilst some (surprisingly few) dismissed the work, *Organ of Corti* provided a visually positive experience and created questions about the sound of, and listening to, our environment.

Lesley Greene, Cotswold Water Park Trust, 28 August 2011

Worcester

Worcester Music Festival

"...we've been delighted at the wonderful feedback the festival has been receiving! The combination of workshops, demonstrations, industry clinics and concerts alongside our massive programme of live performance throughout the city, creates a wonderful atmosphere where sound oozes from every nook and cranny and helps countless people fall in love with music all over again. This is so important and means so much to so many. Your enthusiasm, skill, expertise and knowledge are massively appreciated as the participatory element of the festival is crucial to it's longevity and growth.

We certainly had a great time and were captivated by the workshops and concerts we were each able to attend - and by the *Organ of Corti* itself.

We very much hope that you enjoyed the weekend and the wonderful part you played in it - and that we'll be able to work with you again. I hope too, that funding becomes available somehow, to realise the cochlea unwound project or something similar as a permanent sound/listening installation on the banks of the river severn."

Marie Oldaker, Worcester Music Festival Workshops coordinator, 27 August 2011.

Sustrans

"The *Organ of Corti* has brought a lot of interest from other schemes wanting to find out about the process. It has added a greater confidence to Sustrans Art & the Travelling Landscape programme –

The *Organ of Corti* visit consolidated a couple of years of work by Liminal through Tranquility is a State of Mind. it has made a big impact in Worcester and winning the NMA added greatly to the scope of the project especially in Cotswold water park.

We are now planning the next design phase with Liminal to explore potential for making a permanent work beside the water at the same site so it also became a prototype for this. The Worcester planners met on the site and were very positive about the structure. The presence of this structure brought hundreds of visitors to the site - walkers and cyclists who have not visited the path before and who were very positive

about the benefits this new circular route have both for leisure and work.”

Katy Hallett, Sustrans, 4 October 2011

Open University

“The Acoustics Research Group at the Open University has recently completed a three year project funded by the Engineering and Physical Sciences Research Council (EPSRC) concerned with developing a novel type of sound barrier based on sonic crystals. This involved development of theory, laboratory measurements and field trials at a specially constructed barrier test site at the Open University.

The Acoustics Research group was pleased to have the opportunity to assist with Liminal’s application for the 2010 PRSF New Music Award by carrying out initial estimates of potential dimensions and configurations for the ‘*Organ of Corti*’.

Following the success of Liminal’s proposal, the OU Acoustics Research Group contributions to the execution of the ‘Organ of Corti’ project included (a) advising on materials for the cylinders (b) predictions of the sound field in and around various potential ‘*Organ of Corti*’ configurations (c) auralisations based on the predictions and (d) time domain calculations showing the progress of single frequency wavefronts through the ‘*Organ of Corti*’ array for use on the relevant websites. The theory allows for a source of wideband noise such as road traffic noise which is subjected to multiple scattering by the cylinders in an array and predicts the resulting sound spectrum at any location. The theory assumes that the cylinders are acoustically-rigid and infinitely long. Several cylinder materials were considered initially including cardboard. Tests at the OU showed that a cardboard tube would be sufficiently acoustically-rigid but eventually acrylic tubes were used. The theory assumes point sound sources or an array of point sound sources close to the array but does not allow for background noise from distant sources. The auralisations were accomplished using Adobe ‘Auditions’ software and the time domain calculations were made using COMSOL.

The criteria used for testing a particular configuration were (a) significant spectral differences predicted between positions inside and/or outside the array and (b) subjectively noticeable differences in auralisations of the predicted spectra at these positions.

Measurements made on August 21st in the ‘*Organ of Corti*’ at the Diglis Weir site have validated predictions, have shown the importance of representing the weir as a line of sound sources rather than a single point and have demonstrated the acoustical effects of the ‘pathway’ in the structure.

The work carried out for the ‘*Organ of Corti*’ has ‘expanded the horizons’ of our research activities to embrace subjective reactions to sonic crystal derived sound patterns. Also the work is contributing to a PhD Thesis and involvement with the project has provided a useful input to a follow on fund proposal to the EPSRC for development of ‘Sonic Crystal Acoustically Resonant Fences’ (SCARFS).”

Professor Keith Attenborough, Acoustics Research Group, Open University, 22 September 2011.

Poltimore House

“Poltimore House Trust was delighted to receive the *Organ of Corti* at Poltimore House in August, following its national tour. We hope that we will be able to provide a good setting for this amazing 'instrument' for an extended stay at Poltimore House. We hope to offer Liminal an opportunity to work with the *Organ of Corti* over a period of time, to encourage visitors to engage with its sound qualities, and to learn ourselves to appreciate the subtle intensity of listening required to experience its effect.

The initial process of installation was an experience that volunteers on the day still talk about. Seeing this instrument take shape was something that formed the focus of a very interesting and intriguing day for all the volunteers who worked together as a joint team.

The *Organ of Corti* has provoked much interest from Poltimore visitors. There is a layer of mystery to it which, through learning more about it, will enable Poltimore House volunteers to provide better guidance to its impact on the way we hear the Poltimore landscape - and in particular the way it encourages us to listen. Visually of course it is stunning, and has transformed that area of the great lawn behind the house, shimmering in the sunshine, reflecting the trees around and the changing patterns of clouds. It mediates sound for visitors, but equally mediates the way we see the familiar landscape of lawn, trees and people.

So far we have not had group visits to the *Organ of Corti* itself - most visitors encounter it with some kind of wonder and surprise. We hope to create a stream of visitors to come to Poltimore for the *Organ of Corti* experience, with it providing an introduction to Poltimore House rather than the other way around. A recent filming for a BBC2 programme on Heritage at Risk diverted onto the lawn, so struck by the potential of the *Organ of Corti* as a first installation in the grounds, which could be followed by further large-scale sculpture - engaging in different ways with the theme of sound.

The legacy that the *Organ of Corti* offers to Poltimore House is yet to be discovered. We are at the start of the journey that will identify what will follow - in the pursuit of sound, music, and engagement with the arts in the magic spaces of Poltimore's historic grounds.”

Claire Donovan, Secretary for Poltimore House Trust, 4 October 2011

CONCLUSION

Winning the PRS for Music New Music Award 2010 has provided us with the opportunity to produce an innovative, experimental and ambitious project that would not have been realised otherwise. Our original proposal was to create an instrument that invited the listener to listen to the noise in their environment in a creative way. The medium through which this was achieved was the acoustic technology of sonic crystals, which we used to mediate broadband noise sources present in the environment and filter them to produce a subtly altered version of the original sound. By doing this we hoped to raise questions as to the relationship between the way we listen to noise in our environments and its value in relation to sound and music.

Through the development of the design, the structure became larger than we had originally expected and we were unable to test the effect of the sonic crystal until it was installed on the four sites. It was disappointing for us that the effect of the sonic crystal was less strong than we had originally hoped and by watching and engaging with visitors at the London and Cumbria sites it became clear that we needed to provide additional material to suggest ways of listening that would help them engage with the structure. It became easier to hear the effect of the sonic

crystals as the structure moved from London to Worcester, because the noise sources became progressively more 'static'. It was also clear that people were listening for the effect of the sonic crystal and not to the wider environmental sounds 'framed' by *Organ of Corti*.

"The experimental nature of the project was something that it was difficult to describe or encapsulate in a programme blurb or an events listing, and there was a sense that visitors came to the work expecting a more pronounced or guaranteed or distinct audible effect. Except at the Worcester site, this was not always their experience. For some this was a disappointment and they felt the object hadn't worked or had let them down, or for some participants that they hadn't operated it properly. For others there was a sense that they were missing something that was audible to others, or that they were listening for something that they could not identify. The importance of well-briefed invigilators, and strong supporting texts became clear as the tour progressed, and those visitors who were spoken to or who read the accompanying material before engaging with the Organ had more satisfying experiences.

The fact that the installation used the word 'organ' in the title meant that some visitors came expecting a musical instrument with familiar features and modes of use or attention. This is evident in the second sound recording published by Fi Dunn on audioboo, where the structure is interpreted in terms of a musical instrument with the base understood as a resonant box, and the pipes as tubes for air to pass through or over. The concept of playing an instrument or listening to it being played set up particular roles or ways of engaging, and the kind of mobile active listening that the installation encourages needed to be explained to visitors or they needed direction towards it"

Mark Leahy, writer and project manager for Organ of Corti

We developed additional information called "Instructions for use..." as the project developed and invigilators were well briefed and engaged visitors in discussions about the work.

In retrospect, the 9 months between winning the award and the premiere of the piece did not allow any time to reflect on the way we could manage visitor's expectations for the piece and their engagement with it. However, in general, the overall response to *Organ of Corti* has been positive.

The support from the Arts Council to extend the tour allowed us to widen the impact of the project and enable more people to experience the project first hand and to engage with the ideas and themes around it. Partners and host organisations have made strong links with local organisations and businesses in the four regions through the *Organ of Corti* project. The engagement with local businesses and public and private sector organisations in each of the regions demonstrates a commitment to the installation of contemporary art in the regions. Liminal have benefited from the experience of working with a wide range of organisations and this process has contributed to their experience of drawing on and coordinating support and funding from a wide range of sectors.

Organ of Corti has had a wide impact over a number of different sectors including, arts, music, culture and science. *Organ of Corti* has been used as a case study for the Open Universities EPSRC current research project and has contributed to a PhD on Sonic crystals. The Noise Abatement Society has recently nominated *Organ of Corti* for the John Connell Award 2011 (<http://noiseabamentsociety.com/john-connell-awards/john-connell-awards-2011-and-european-soundscape-award/>).

The numbers of visitors to *Organ of Corti* was much higher than anticipated with many people travelling long distances and for different reasons to visit the structure. *Organ of Corti* was not something that was just to be looked at but needed visitors to engage with it and take time to

appreciate its subtlety. With its installation at Poltimore House, *Organ of Corti* becomes a 21st Century 'folly' to sound and provides a context for people to experience it over a longer period of time. There is now the possibility for people to come upon it accidentally and hopefully without expectations of how it *should* perform. Over time they can come to appreciate the subtle changes in the sounds of Poltimore Estate.

Appendices

Reports:

- Evaluation report by Mark Leahy
- Open University report on *Organ of Corti* by Professor Keith Attenborough
- Analysis of Press Coverage for *Organ of Corti*
- Breakdown of Audience for *Organ of Corti*

Digital Copies of:

- Press clippings for *Organ of Corti*
- Host and partner organisations websites and brochures

Links to websites:

- PRS for Music Foundation's New Music Award
<http://www.prsformusicfoundation.com/newmusicaward/index.htm>
- Liminal
www.liminal.org.uk/organ-of-corti

Images:

http://www.flickr.com/photos/liminal_sound/sets/72157625876756584/

Video:

- *Organ of Corti* winner of New Music Award
<http://www.youtube.com/watch?v=6S6raz1AsBs>
- Keith Attenborough explains *Organ of Corti* Part 1
http://www.youtube.com/watch?v=qkm_LRFPwic
- Keith Attenborough explains *Organ of Corti* Part 2
<http://www.youtube.com/watch?v=YHRwcbbs0NQ>
- Winkball Interviews from launch:
<http://www.winkball.com/walls/kVaHGtWGTVxM/city-of-london-festivals-organ-of-corti>
- *Organ of Corti* animation by Kin:
<http://vimeo.com/23288412>
- *Organ of Corti* Sites by Liminal
<http://vimeo.com/24412489>
- *Organ of Corti* 0.1m/s by Liminal using animations from Open University
<http://vimeo.com/25088720>

Audio Files:

- London Sound Survey
<http://www.soundsurvey.org.uk/mp3s/categories/Organ%20of%20Corti%20sound%20sculpture.mp3>
- Mr Underwood Blog
<http://www.mrunderwood.co.uk/news/the-organ-of-corti/>
- FiDunn
<http://audioboo.fm/boos/454919-the-organ-of-corti-recorded-21-august>

Printed media:

- “Guide to *Organ of Corti*” including ‘Underheard’ (poem available in Braille)
- “Instructions for Use...”
- Braille version of Helen Frosi’s essay
- Print version for Arts Council Archive otherwise see PDF’s on CD of:
 - City of London Festival Brochures
 - Lake District Summer Music Festival Brochure
 - Worcester Festival Brochure
 - Worcester Music Festival Brochure

Organ of Corti: a reflection and evaluation

Mark Leahy (project manager)

background

The Organ of Corti grew out of earlier projects by Liminal, including a master-planning project with the Cotswold Water Park, a sound art project with Sustrans, and a Wellcome Trust funded project 'Tranquility is a State of Mind' in Worcester. Liminal, (architecture and sound art duo, Frances Crow and David Prior) entered a proposal to build an experimental acoustic sculptural installation for the Performing Rights Society Foundation (PRSF) New Music Award 2010. This would become the Organ of Corti.

Liminal were awarded the PRSF New Music Award 2010 in September 2010, following a high-profile short-listing and public voting process. The award funding of £50,000 would cover the costs of fabricating the experimental instrument, the Organ of Corti, and its installation at a number of sites. Liminal were keen to extend the installation period at the four sites and also planned to develop additional contextualising events. I came on board the project, at first on an informal basis, in November 2010, initially to work on the additional fundraising, and later took on a role in managing practical aspects of the tour.

fundraising process

With Frances Crow, I worked on a Grants for the Arts (G4) application to Arts Council England. We applied for funding to extend the installation time at each of the four locations on the Organ of Corti tour. These were, a site opposite St Paul's Cathedral, London (with City of London Festival - COLF), a site overlooking the M6 at the Tebay Gorge in Cumbria (with Vista Arts and the Lake District Summer Music Festival – LDSMF), the Cotswold Water Park near Cirencester, and at Diglis Weir on the Severn in Worcester (with Sustrans and Worcester Music Festival). The funding would allow us to extend the time at each location from one day to three or four days. This would increase the potential for audience engagement, for media coverage, for word of mouth and for social media response.

We also worked on an application for funding to present a one-day event, 'Inner Ear,' bringing together researchers in the sciences and the arts who would engage in a set of conversations around and in response to the Organ of Corti project. This event would link research in public art, cognition, acoustics, new music, urban planning and architecture. Proposed as part of the Organ of Corti's presence in the City of London Festival the event would extend the dialogues Liminal had begun on 'Tranquillity is a State of Mind'. This earlier project was funded by the Wellcome Trust and established links for the company with acoustics researcher Professor Keith Attenborough (OU) and extended their relationship with Sustrans, and with the City of Worcester. These applications were undertaken through December 2010 and January 2011.

The application for the 'Inner Ear' event was unsuccessful. On reflection, I think that this was in part due to a lack of clarity as to the status of the event as art, and to our applying under the 'art' funding stream rather than the 'people' one. This would have been a better context for an event focussed on developing new conversations between arts and sciences. The application to G4A for additional touring money was successful, and this funding along with extending the installation time, would support the editing, design and printing of a catalogue or brochure to accompany the installation.

We conducted research into other funding sources, local government, private foundations etc. was conducted and we made two smaller applications for funding specific to the installations at Tebay Gorge and at Worcester. If successful these would have further extended the installation time, covered the costs of additional audience engagement activity, and supported ancillary art events within the context of the Organ of Corti visit. As these applications were not successful, the funding already in place was stretched to cover some of the shortfall in Cumbria, and additional money was allocated by Sustrans for activity at Worcester.

practicalities and production

In parallel with seeking additional funding, and planning the tour, we needed to work out what would become of the installation at the end of the Summer 2011 tour. Following various conversations, we made a site visit to Poltimore House near Exeter on June 14th, and spoke with the site manager and with the Secretary of the Poltimore Trust. We proposed that the Organ of Corti would reside at Poltimore following its tour, and that it would be available to visitors and researchers at that site. This was finally confirmed as a possibility in early August, and the Organ of Corti was installed in the gardens at Poltimore on August 22nd 2011. It was open to the public during their Heritage Open Weekend, September 10-11 2011, and will remain accessible by appointment through to Summer 2012.

Once we secured additional funding, my role became one of liaison with the partners at each location, and of managing the practical aspects of the tour. These included storage and test assembly of the structure, the transport of the installation components, organising assistance for the get-in and get-out, and contracting overnight security for the installation. These tasks were variously complicated or frustrating or resistant. After fruitlessly exploring different options of hiring vehicles and self-drive transport we contracted Edwin Shirley to take on the job, and everything to do with moving the installation materials between sites ran smoothly and without hitch or worry. Similarly with storage prior to the tour, having researched a number of options we eventually were given the use of a large space by Dartington Arts which allowed for the final fabrication and test building of the Organ of Corti. On June 20th we put the structure together in the former Foxhole Theatre at Dartington and invited friends, colleagues and local press to a preview presentation, a 'Silent View'. We then disassembled the structure the following morning, documenting and timing the process on both days. As we knew we had limited get-in time or resources at the various sites, it was important to be sure we could put the installation together within a specific timeframe.

The details of the site and of access were different at each location, and this affected the get-in and get-out each time. In London we could get close to the site, it was on a solid paved area, and we had some professional event rigging personnel on the team. Also, it was a beautiful sunny morning so it made the process quicker and smoother. In Cumbria the weather was very wet and though the lorry could get the materials right up to the site, the conditions on the day made for an uncomfortable get-in.

The installation was very complicated and took a lot longer than anticipated (from 8am – 4pm with Rangers assistance 8am-3pm) as the site was some distance from the storage yard, and access to the Lakeside site was only possible by tractor and trailer. Lesley Greene, CWP

At Cotswold Water Park and at Diglis Weir there materials had to be moved quite a distance from lorry to site and this added to the get-in and get-out times. In all the locations, get-in and get-out were managed well, and nothing was broken, lost, forgotten, stolen or put together incorrectly. Our experience with overnight security on site was very different however. The process of finding security personnel, negotiating and contracting with them, and then ensuring the fulfilling of that contract was difficult and frustrating. While we were delighted with the man who looked after the installation in Cumbria, who was interested in the project and helped engage visitors to the site, at other locations we had a 'no show' and had to make last minute arrangements to get someone on site. In the event, nothing was damaged, no one was injured and the tour passed without problems in this regard.

expectations and reception

The production of a brochure or catalogue for the installation was important as the science and research behind the project is significant to the reception and understanding of the work. The booklet that Frances Crow and David Prior produced, included a framing statement from Liminal, and contributions from musicologist Helen Frosi, from acoustician Keith Attenborough, and myself, and gave a lot of information to the visitor. It placed the installed structure in context as a musical instrument, as an acoustical experiment, and as art. The inclusion of a copy of the introductory essay in Braille format, and my poem in Braille emphasised the manner in which the installation encouraged sensory engagement beyond the visual. In reality, the work was visually very striking, and for sighted visitors this was often the first aspect of encounter with the Organ of Corti. It made a lovely backdrop for photographs, and visually it made for an interesting juxtaposition with the site.

At St Paul's, the strong verticals of the tubes echoed the pillars of Wren's Cathedral. It also strengthened the association with church or concert organs. In the Tebay Gorge at Cumbria the structure sat above a valley creating a dramatic image against the sky, and in the relation of tubes to base paralleling the horizon and sky of the Lake District. At the Cotswold Water Park the upright tubes echoed the reeds and water plants and the horizontality of stretches of still water. In Worcester by the Severn the Perspex tubes were set against the pine trees behind the structure, and the flowing water crossing the weir paralleled the striations of the massed tubes. These strong visual statements might be felt to have distracted from the intended emphasis on listening and aural awareness, but they helped attract attention to the work and to draw visitors to the structure.

It is a stunningly beautiful object. I read the description and instructions and tried my best to get myself into listening mode. [...] I gathered myself, listened deeply and entered. The first thing that struck me was a shift in where I perceived the sound to be coming from. All of a sudden it seemed to have shifted to emanate from the piece itself, directly in front of where I stood. This was something I hadn't expected. (blog at www.mrunderwood.co.uk)

The experimental nature of the project was something that it was difficult to describe or encapsulate in a programme blurb or an events listing, and there was a sense that visitors came to the work expecting a more pronounced or guaranteed or distinct audible effect. Except at the Worcester site, this was not always their experience. For some this was a disappointment and they felt the object hadn't worked or had let them down, or for some participants that they hadn't operated it properly. For others there was a sense that they were missing something that was audible to others, or that they were listening for something that they could not identify. The importance of well-briefed

invigilators, and strong supporting texts became clear as the tour progressed, and those visitors who were spoken to or who read the accompanying material before engaging with the Organ had more satisfying experiences.

For an experimental project like Organ of Corti it was important to have 'guides' on site to help people 'use' the work and take feedback. In addition many people found the information helpful and were seen reading the catalogue. (Lesley Greene, CWP)

The fact that the installation used the word 'organ' in the title meant that some visitors came expecting a musical instrument with familiar features and modes of use or attention. This is evident in the second sound recording published by Fi Dunn on audioboo, where the structure is interpreted in terms of a musical instrument with the base understood as a resonant box, and the pipes as tubes for air to pass through or over. The concept of playing an instrument or listening to it being played set up particular roles or ways of engaging, and the kind of mobile active listening that the installation encourages needed to be explained to visitors or they needed direction towards it.

The reception of the Organ of Corti at its four tour sites and at its current home in Poltimore has been varied. There have been very positive and very negative comments, and the work has been engaged with by a wide variety of people, from very young to very old, including locals, tourists, people in education, persons with disabilities, festival audiences and community groups. There were a mix of participants, those who came to the work specially, and those who happened upon it as part of other leisure activity. In particular the installations at Tebay and CWP had high numbers of visitors who had deliberately chosen to engage with the installation following up on press and marketing in local and national media. In London, as it was a much busier urban area with very high numbers of tourists, the mix of participants included many more who came on the work by chance. The striking visual impact of the installed work attracted participants in this area.

The public's interest in it was great, literally hundreds of people took part during my week, [...]. As it was a very touristy area, a lot of people just wanted their photo taken in it. (Oliver Trickett, invigilator, London)

In Worcester, there were both visitors who specifically walked or cycled to the installation as part of the Worcester Music Festival programme, or as recipients of publicity from Sustrans and in the local press, as well as regular users of the busy cycle path along the river who happened on the work.

Most visitors were intrigued and very interested and liked discussing the issues. Whilst some (surprisingly few) dismissed the work, Organ of Corti provided a visually positive experience and created questions about the sound of, and listening to, our environment. (Lesley Greene, CWP)

There were those who came to the work expecting a much more dramatic or discernable sound effect than was possible. And those who expected or responded to the installation as a musical instrument, something that could be played or tuned or that would produce recognisable notes or tones. In part this was because the work was presented in the context of music festivals in Tebay and Worcester, and as it was publicised as the winning PRSF New Music project. Those visitors who read the supporting material, who attended the artist talks, or the ancillary events such as 'sound walks' were much more attuned to the intentions of the work. But even with this level of engagement in the background and theory the variable conditions on site meant that people experienced the sound and the installation very differently.

[...] most people I spoke to were willing to give the Corti experience a decent try, spending a good length of time inside the structure and moving their heads around to hear the effect. Whilst for some people the filtering effect of the installation was enough, for others (I'd say about half those I spoke to) the lack of the resonance effect spoiled the experience somewhat. (Niall McCallum, invigilator, London)

Perhaps one of the best descriptions came from a young woman who said that although she could not personally hear any change in sound in the sculpture, having the work there was 'like putting up a frame to see a view –it makes you use your ears and challenges me to listen more to a spectrum of sound'. (Lesley Greene, commenting on feedback from CWP)

I'm really surprised how it changes just with a small step the pitch goes up or down It makes the sounds much more lively ... by listening. (audience feedback, Worcester)

We do not get much opportunity to visit artistic projects in this area. Made me listen carefully to the environment and to realise how much we do not hear of what is going in. It seemed to clarify the environmental sounds. Really interesting experience. (audience feedback, Tebay)

The response to the project as a public art project was generally positive, and indicated that in certain areas visitors felt underprovided with contemporary projects that directly engaged with the local area or their environment. The fact that the work was easy to 'get' as a visual object encouraged some visitors to approach it more closely, and to then engage with the more 'difficult' work around listening and perception of the environment. The work thus combined challenging and accessible aspects that allowed for different audiences and different kinds of participation.

media coverage

The Organ of Corti tour was covered in regional and local press, in national magazines, on local Radio, and online in a number of forms. Recordings made at Worcester and at London were posted on her audioboo page by Fi Dunn, on his blog by mr.underwood, and on the London Sound Survey site. Short video interviews were conducted for Winkball at the City of London Festival launch and posted online. Wired magazine carried a feature on their website with images and links to information. In London, Time Out ran a full page on the Organ of Corti heading its Classical Music section on the week of the launch. Overall there was a wide distribution of notices, listings, and brief comment. There were some more extensive review and comment pieces, and interviews with the artists. This coverage supported the marketing by the partner festivals, and raised awareness of the project nationally and in the areas where the work was installed. A more extensive review or critical essay may yet be developed. An hour-long piece for radio is currently being edited and will be broadcast by SoundArt Radio.

partnerships

As a project, the Organ of Corti was very much dependent on a series of partnerships between the artists, Liminal, and the host festivals, and local partner organisations at each site. The primary partner was the PRSF, who as the commissioning agency and the body who awarded the prize made the realisation of the project possible. The public voting process and the award presentation events had given significant early publicity for the project and raised a general awareness. The prominence

of the award and the security of the base funding made developing the partnerships for the tour much smoother.

In London, the installation was presented as part of the outdoor events series within the City of London festival. This meant that there was an infrastructure and personnel who dealt with permissions and licensing, invigilation, security and assistance with installation, and handled all the print publicity and marketing. Liminal were thus able to present the Organ of Corti as an event within the festival, confident that much of the practical on-the-ground work was done for them. The London installation also drew on links to the Music Department at Goldsmiths University, and involved students as invigilators. Sound artist John Drever conducted a sound walk in the context of the Corti installation and the COLF education section brought school groups to visit the work.

In Cumbria, the organ of Corti was presented as part of the Lake District Summer Music Festival and so this provided a context for publicity, marketing and ticketing. The work on the ground was chiefly done by Christian Barnes of Vista Projects, an arts event administration and management company with whom Liminal have worked in the past. Eden Arts, the local authority arts body for the area were also involved in supporting the project. Through Christian Barnes' work the Westmorland Hotel and the Westmorland Services company became involved in the project offering support in kind, including parking and accommodation. Other local groups including a birdwatching group, local schools and the local church were also engaged in participating, supporting or organising ancillary activity to the project.

At the Cotswold Water Park, the arts officer Lesley Greene was the driving force in sorting the practical issues on site, and developing relationships with local business, media and community groups. The Four Pillars Hotel at CWP was supportive, and there was significant media coverage in the local press and radio. The positive reception of the work by visitors and volunteers will encourage the Park to consider other temporary public art projects.

In Worcester, the Organ of Corti was presented as an event within Worcester Music Festival, and this meant that marketing and publicity was managed through the festival structures. The City Council were also very supportive, making personnel and equipment available for get-in and get-out. The site adjoined land owned by Severn Trent Water and they supported the project through facilitating access and preparing the ground where the installation was constructed. The major partner for the Worcester installation were Sustrans, with whom Liminal have an ongoing relationship. For Sustrans, the Organ of Corti was part of a larger series of arts projects sited at or near parts of the National Cycle Routes network.

Overall the involvement of different types of partnership, and different levels of involvement from festivals, community groups, individuals and businesses was an important element in the success of the Organ of Corti. Liminal were able to focus more on the realisation of the installation itself, and on offering interpretative or ancillary activity, while the business of marketing and planning was dealt with at each locality. The partnerships also have established relationships which may lead to future collaborations or other projects.

conclusion

Reflecting on my involvement with the Organ of Corti project has generated a mixture of responses and thoughts. I have gained additional experience in raising funds for arts projects and in writing and formulating funding applications. I have learnt practical lessons around transport and logistics for large art works or performance tours, and I have learnt lessons in relation to installation, security and management of medium sized projects. The importance of recommendations from colleagues and friends has been underlined, and my recognition of the importance of a network of professional contacts was reinforced by my work on this project. It has been a pleasure to see the project through from the initial stages of fundraising and fabrication through its tour to an ending. The opportunity to work with partners such as Liminal, Vista Projects in Cumbria, Sustrans at Worcester, or Lesley Greene at Cotswold Water Park has been beneficial to my professional activity, and has opened up the possibility of further future collaborations.



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Report of *in situ* measurements of the acoustical performance of the ‘Organ of Corti’ Sonic Crystal at Diglis weir, Worcester

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1) Introduction

A crystal lattice structure can produce electronic band gaps and hence conducting and insulating bands in an electromagnetic field. Similarly sonic crystals (SC) consist of periodic arrays of identical circular cylinders and are known to give high sound attenuation at selective frequencies as a consequence of Bragg scattering. SC can be engineered to give rise to specific acoustic band gaps (i.e. maxima in transmission loss) by adjusting the spacing between scattering elements (the lattice constant). For a given lattice spacing, SC exhibit low amplitude narrow pass bands at frequencies between the band gaps. The amplitudes in the band gaps depend on the filling fraction i.e. the diameter of the cylinders. The passage of sound waves through periodic arrays can be manipulated also by deliberately introducing defects (vacancies) in their structure.

The 'Organ of Corti' project resulted from the PRSF new music award to Liminal in 2010. The proposal for the award and the subsequent realisation of the 'Organ of Corti' were developed in partnership with the Acoustics Research Group. The aim was to employ SC technology to accentuate and attenuate frequencies within the broad range of sounds present in road traffic and falling water (i.e. a weir) and to thereby draw people's attention to the sounds already present in the environment by 'reconfiguring' them *in situ*.

The 'Organ of Corti' has been deployed in two basic forms. The design studied in this report consists of eighty one 4 m long 0.222 m diameter vertical acrylic cylinders arranged in a hexagonal lattice with lattice constant 0.3 m except for 'vacancies' used to create a passageway through the structure (see Figure 1a). The cylinders are on a wooden platform about 0.5 m high. This structure was placed on the bank of the river Severn at Diglis Weir, near Worcester, as part of the Worcester Music Festival (see Figure 1b). The quasi-ordered or partial lattice arrangement in the 'Organ of Corti' results from the absence of cylinders along a passage through the structure. Visitors are able to walk through and around the structure and listen to the different characteristics of the (predominant) sound of the weir at different locations.

A 'full' SC with regular hexagonal lattice arrangement with lattice constant, L , of 0.3 m has a first (Bragg) band gap (centre frequency) given by:

$$f = \frac{\text{speed of sound in air}}{\sqrt{3}(L)} = \frac{344}{\sqrt{3}(0.3)} = 660 \text{ Hz}, \quad (1)$$

2) Measurements

Measurements at Diglis weir were carried out between 12 noon and 2 p.m. on 21st August 2011. The weather was mostly sunny and there was not much wind. The positions of four receiver microphones and the an assumed single source location are shown in figure 1(a) and their coordinates are specified in Table 1. The time signal at each microphone was recorded for 7 seconds using a data sampling rate of 20 μ s for each set of measurements. Three sets of measurements have been made and, for each set of measurements, there were 16 repetitions (i.e. a total of 48 measurements) to improve the signal to noise ratio. Transfer function estimation has been used to obtain the frequency spectrum from the recorded time signal. *Unfortunately errors made in the data acquisition system mean that sound at only 2 (the Ref pt and Pt 1) of the 4 microphones was recorded correctly.*

The insertion loss (IL), i.e. the difference in sound level at a point with and without the structure, can be calculated from,

$$IL = 20 \log_{10} \left| \frac{P_{Direct}}{P_{Total_transmitted}} \right|, \quad (2)$$

where P_{Direct} is the pressure (Pa) measured or predicted without the SC and $P_{Total_transmitted}$ is the pressure (Pa) measured or predicted with the SC.

The meteorological conditions monitored during the measurements were:

- i) Temperature: 23°C.
- ii) Average wind speed: 1m/s.
- iii) Wind direction: West (cross wind).

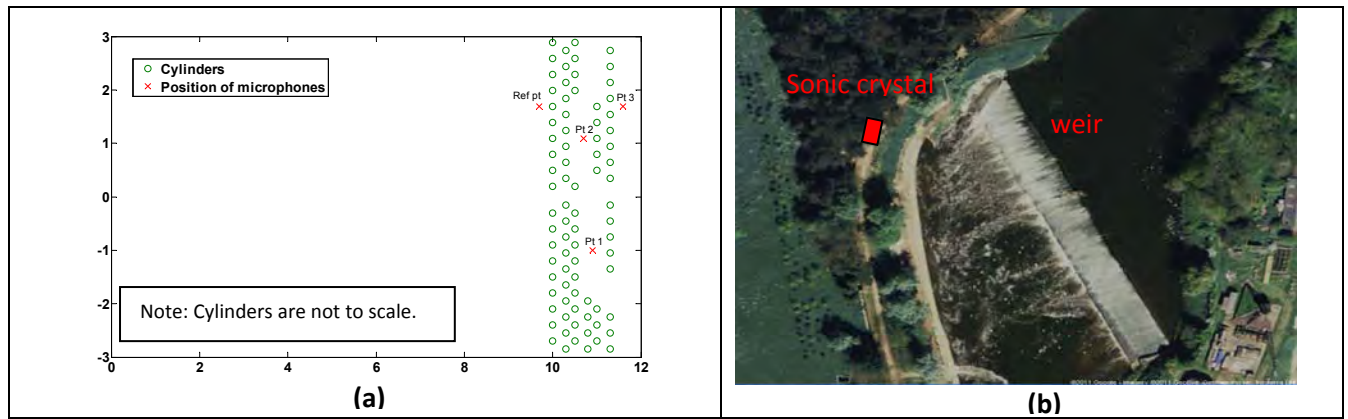


Figure 1: (a) The 'Organ of Corti' sonic crystal structure and microphone positions, (b) the measurement location at the Worcester site (picture taken from google map®).

Microphones location	x	y
Reference microphone (Ref pt)	9.7	1.69
Microphone 2 (Pt 1)	10.9	-1
Microphone 3 (Pt 2)	10.7	1.09
Microphone 4 (Pt 3)	11.6	1.69

Table 1: Coordinates of source and receiver positions.

2) Results

The mean Insertion Loss (IL) spectrum for Pt1 (inside the structure) averaged over 3 measurements is shown in Figure 2. The first Bragg band gap appears at a frequency of 480 Hz rather than the 660 Hz calculated from Equation (1). As investigated further in section 5, the difference is a consequence of the fact that the 'Organ of Corti' being a *quasi-ordered* array (since elements have been 'removed' to create the passageway resulting in a series of 'vacancies' in the regular structure) instead of a regular (full) array.

Since the receiver is inside the structure, the spectrum shows additional attenuation peaks around 250 and 320 Hz as a result of evanescent modes in the vacancies (i.e. sound trapped in the passageway). Negative IL (corresponding to sound enhancement or focussing) is also present particularly at 150, 230, 350 and 650 Hz.

As a result of the outdoor environment at Diglis being largely uncontrolled there are large differences between successive measurements probably caused by the presence of other noise sources in the vicinity. These are manifested by the large error bars shown in Figure 2. Nevertheless, the variation at the peak of the “modified” Bragg band gap (480 Hz) is relatively small (< 6 dB).

The occurrence of negative IL in the measured data below 200 Hz and at higher frequencies (particularly at low frequencies) could be the result of reflections from the wooden platform support for the cylinders. It is not as significant in the predictions discussed later since these assume that there is no ‘ground’.

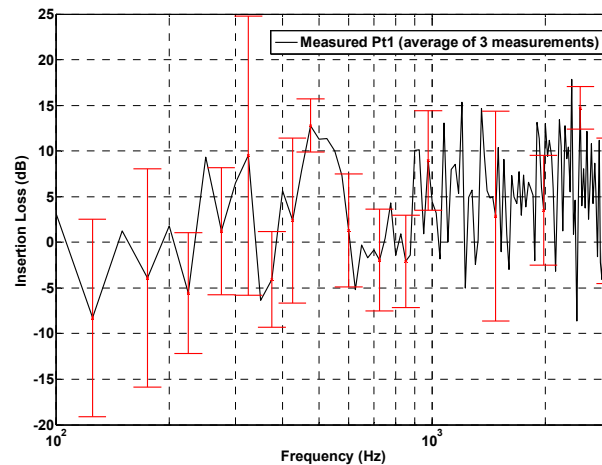


Figure 2: Mean IL spectrum (average of 3 measurements) with error bars for receiver position Pt 1.

3) Predictions of the acoustical performance using Multiple Scattering Theory (MST) and assuming a single point source

A 2D Multiple Scattering Theory (MST) has been used to predict the IL spectrum at the Pt 1 receiver position assuming that the weir can be represented by a single (point or, more exactly, vertical line since the theory is 2D) source. Predictions have been made assuming that the source is located either at coordinates (0, 0) or at (0, 10) respectively (see Figure 1(a)). The predicted levels at the Pt 1 receiver position have been obtained by averaging the predictions over the ‘actual’ and 4 nearby positions representing ± 0.05 m perturbations of the ‘actual’ position along both axes from (see Figure 3). This is to allow for some uncertainty in the ‘actual’ locations, since, as can be seen in Figure 4, the predictions are very sensitive to the assumed geometry.

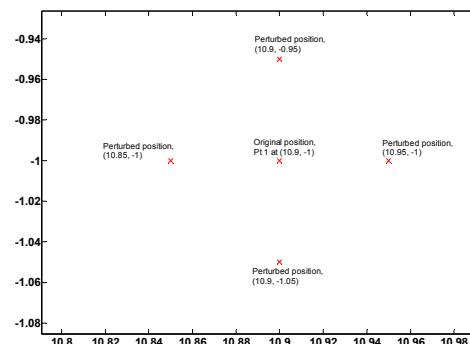


Figure 3: The assumed ‘actual’ receiver position Pt 1 and 4 perturbed positions used in MST predictions.

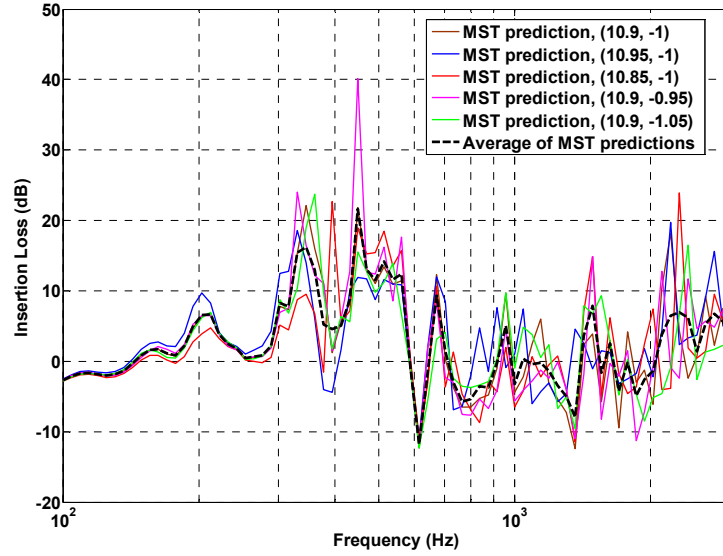


Figure 4: Predicted IL spectra for 5 receiver positions (Pt 1 ‘actual’ and 4 perturbed positions) and the averaged IL spectrum. A single source is assumed at coordinates (0, 0).

Figure 4 shows the predicted IL results for all 5 positions (i.e. the ‘actual’ Pt 1 and the 4 perturbed positions) and the averaged IL spectrum. The source is assumed to be at coordinates (0, 0). Variations in individual spectra are noticeable for even a slight change in the receiver position but overall they exhibit a common trend. An exception is the prediction for the (perturbed) receiver at coordinates (10.9, -0.95) where almost 20 dB difference from the other predictions occurs at approximately 450 Hz. Since it occurs only at a single frequency point in the calculation, this could be a numerical artefact.

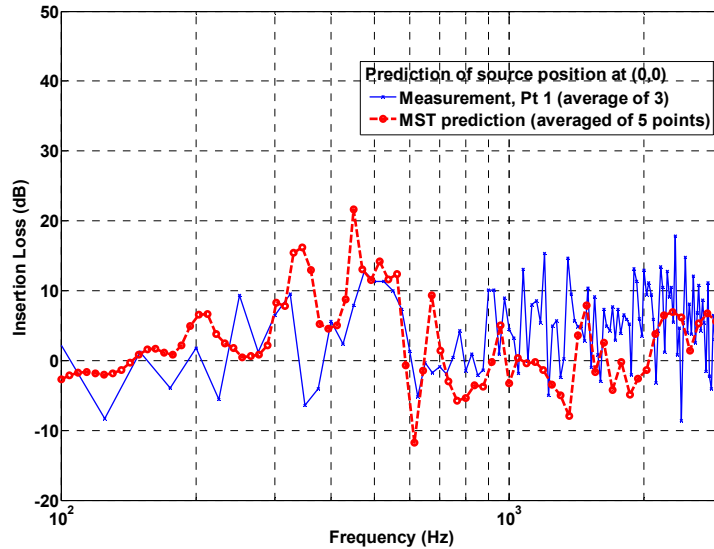


Figure 5: Measured (average of 3 measurements) and predicted (average over 5 receiver points) IL spectra for receiver position Pt 1 with source assumed at coordinates (0, 0).

Figure 5 compares the measured (average of 3 measurements) and MST-predicted (averaged over 5 receiver points) IL spectra with the source assumed to be at location (0, 0). There are several discrepancies. In particular the predicted first peak (200 Hz) is shifted in frequency compared with

that in the data. On the other hand the second and third peaks are similar to those measured. Indeed the third peak, which corresponds to the ‘modified’ Bragg band gap, is predicted well.

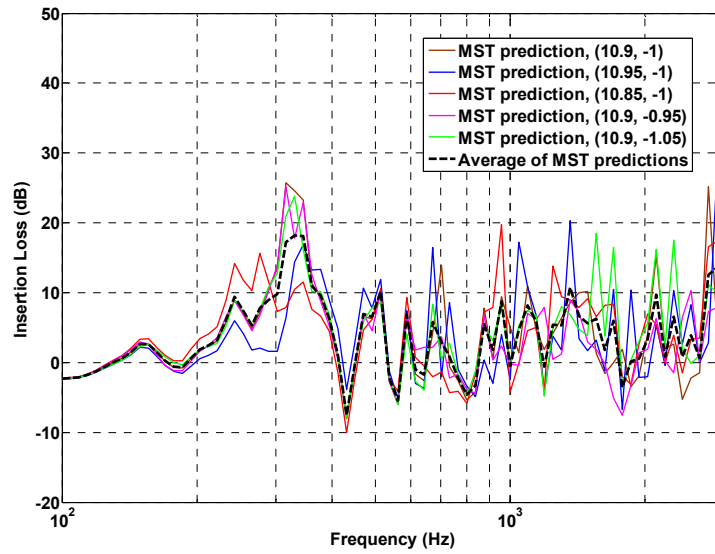


Figure 6: Predicted IL spectra for 5 individual positions (Pt 1 ‘actual’ and 4 perturbed positions) and the averaged IL spectrum. Source is located at coordinates (0, 10).

Figure 6 shows the predicted IL spectra for all the 5 positions (Pt 1 ‘actual’ and 4 perturbed positions) and the averaged predicted IL spectrum. The single source is assumed to be (0, 10). As is shown in figure 4, the predicted IL spectra are strongly influenced by a slight change in the receiver position.

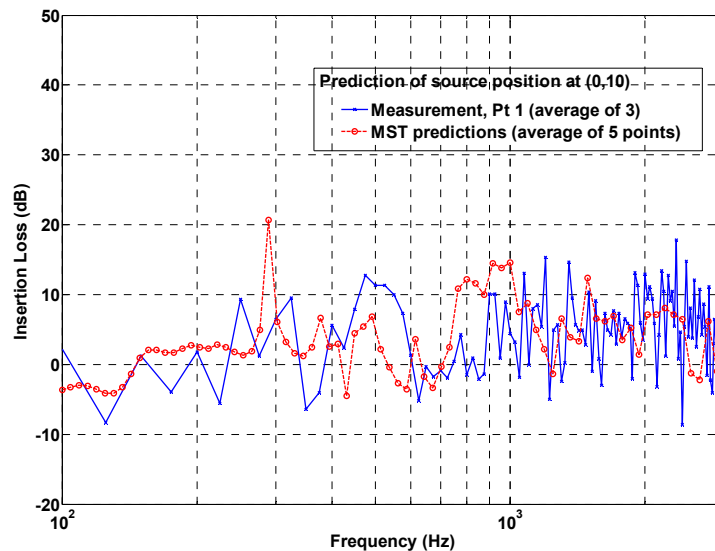


Figure 7: Measured (average of 3 measurements) and predicted (average over 5 points) IL spectra for receiver position Pt 1 with source assumed at coordinates (0, 10).

Figure 7 compares the measured (average of 3 measurements) and MST predicted (average over 5 points) IL spectra with the single source assumed to be at (0, 10) i.e. at an oblique angle to the ‘Organ of Corti’ axis. This prediction assuming a single (vertical line) source at (0,0) seems to give slightly better agreement with the measured data (Figure 7) than that obtained assuming a source at

(0,10) (Figure 5). Three peaks are again predicted at 290, 380 and 500 Hz. The centre frequency (near 500 Hz) of the first (Bragg) band gap is predicted reasonably well but the predicted amplitude is smaller than the measured one.

4) Predictions of Multiple Scattering Theory (MST) using a line of ten point sources

The weir is an extended source of sound so representing it by a line of point (i.e. vertical line) sources rather than a single source should improve the accuracy of the prediction. Consequently, the weir has been represented by 10 point (vertical line) sources spaced along the whole span of the weir (approximately 200 m). The positions of the sources are shown in figure 8 and the corresponding coordinates are shown in table 2. MST predictions of pressure at 5 receiver positions close to Pt 1 (see table 1) have been made for each 'component' source location (see table 2). An average over the 5 receiver points (Pt1 'actual' and 4 perturbed positions) has been made (see figure 3). The direct pressure (without SC), $P_{Direct(dB)}$ is calculated as the sum of those predicted for each source at each frequency point, n ,

$$P_{Direct_total(dB)} = 10 \log_{10} \sum_0^n \left(10^{\frac{P_{Direct(dB)}}{10}} \right), \quad (3)$$

Similarly, the total transmitted pressure (with SC), $P_{Total_transmitted(dB)}$ is calculated as the sum of those predicted for each source at each frequency point, n ,

$$P_{Transmitted_total(dB)} = 10 \log_{10} \sum_0^n \left(10^{\frac{P_{Transmitted_total(dB)}}{10}} \right). \quad (4)$$

The IL in dB has been calculated from

$$IL = P_{Direct_total(dB)} - P_{Total_transmitted_total(dB)}, \quad (5)$$

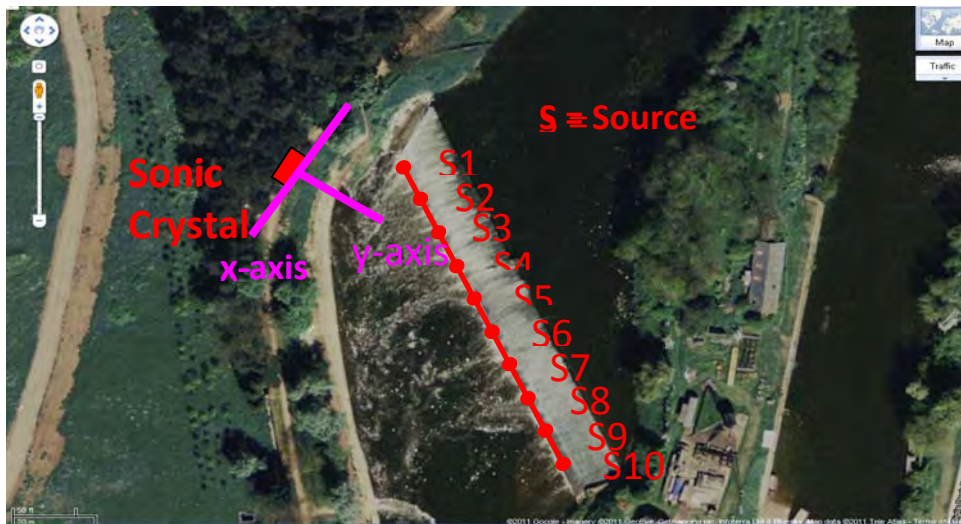


Figure 8: Assumed locations of 10 equally spaced sources (S1 to S10) across the weir and the position of sonic crystal.

Source no.	x	y
S1	-7.82	10.92
S2	-16.73	6.38
S3	-25.58	1.72
S4	-34.11	-3.55
S5	-42.83	-8.45
S6	-50.92	-14.47
S7	-58.93	-20.6
S8	-67.15	-26.35
S9	-75.63	-31.65
S10	-83.29	-38.29

Table 2: Coordinates of ten sources distributed uniformly along the weir.

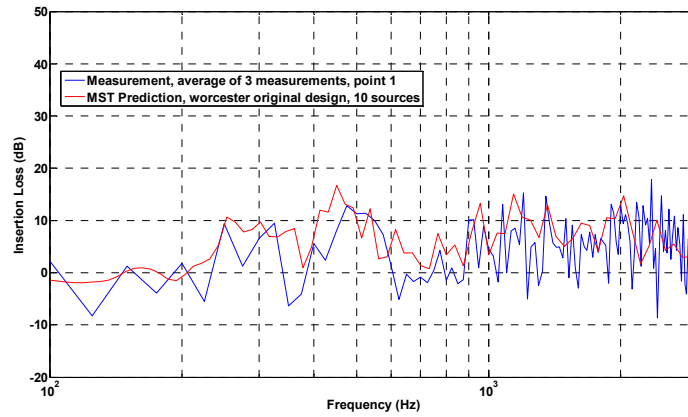


Figure 8: Measured (averaged of 3 measurements) and MST predicted with multiple point sources IL spectra for receiver position Pt 1 (averaged of 5 receiver points for each individual source).

Figure 8 compares the measured and MST-predicted IL spectra at receiver position 1. This prediction, resulting from summing levels from 10 sources, shows better agreement with measurements than those for fixed single point sources either at location (0,0) or (0,10) (see Figures 5 and 7). The first IL peak between 250 and 350 Hz, possibly to the evanescent mode suggested in connection with figure 2, is predicted well. Also, the ‘line of sources’ prediction of the ‘modified’ Bragg band gap for the quasi periodic ordered array (near 450 Hz) agrees fairly well with the measured data.

5) Investigation of the influence of quasi periodic ordered array

Quasi periodic ordered arrays are both ordered and non-periodic, i.e. they form patterns that fill the whole space but lack translational symmetry. This is the case with the ‘Organ of Corti’ structure. Although some parts of the structure are periodic, other parts are not. This creates a more complex system than a regular array and results in the ‘modified’ Bragg diffraction shown in our measurements and predictions. One way of studying the effect is to compare the predicted acoustical performance of the quasi-ordered array with those of (a) a complete (regular) version of the quasi periodic ordered array created by replacing the ‘missing’ elements (blue circles in Figure 9) and (b) a lattice array containing the same number of elements as the quasi-ordered array but redistributed to form a regular lattice array (magenta circles in Figure 9). This increases the lattice constant to 0.45 m and thereby results in a larger array area (see magenta circles in Figure 9). The

associated predictions of IL spectra are compared in Figure 10 assuming a single fixed (vertical line) source position at (0, 0) and receiver point at (10.9, -1).

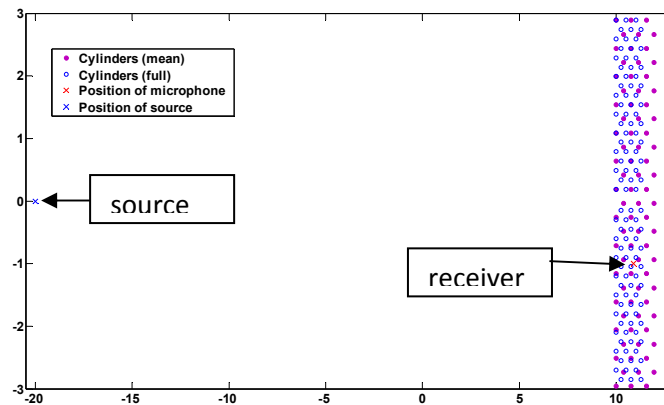


Figure 9: A complete regular lattice array with lattice constant 0.3 m and regular lattice array of lattice constant of 0.45 m and the assumed locations of source and receiver.

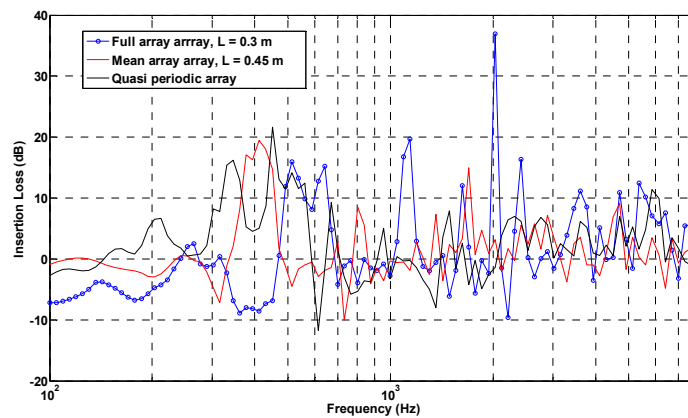


Figure 10: MST-predicted IL spectra for the original (quasi periodic) array (black solid line), a full regular array with lattice constant of 0.3 m (connected blue circles) and a ‘redistributed’ regular array with lattice constant of 0.45 m (red solid line).

The Bragg band gap predicted for a regular array with lattice constant of 0.45 m (near 440 Hz) agrees fairly well with that calculated using equation (1). The predicted spectrum for the full regular array with lattice constant of 0.3 m has two peaks at 500 and 650 Hz: the latter of these is near to the calculated Bragg band gap frequency (660 Hz). The 500 Hz peak could be due to the evanescent mode since the receiver position is inside the structure. The predicted spike at 2 kHz is likely to be a numerical artefact since it corresponds to a single frequency point. The third peak (near 550 Hz) in the predicted IL spectrum for the quasi periodic order array falls between that in the predicted spectra for the full and ‘redistributed’ regular lattice arrays so it corresponds to a “modified” Bragg band gap. Two other peaks predicted at lower frequencies (200 and 350 Hz) could be due to evanescent modes.

Press Analysis								Print		Online				Broadcast	Audience	Sector	Type														
Date	Publication	Title	Access	daily	weekly	monthly	bi-monthly	Magazine	News	Blog	Social media	Radio	TV	International	National	Local	Musical-Classical	Musical-Litfield	Arts	Science	Technology	Culture	General	Press release	Review	Initial	Generated by others				
Significant Press Following Win on 16 September 2011																															
17-Sep-10	Displaced Sounds	The Organ of Corti	http://www.displacedsounds.com/?s=organ-of+corti http://welcometrust.wordpress.com/2010/10/11/guest-post-the-organ-of-corti/								1			1				1								1					
11-Oct-10	Wellcome Trust Blog	Guest Post - The Organ of Corti	http://welcometrust.wordpress.com/2010/10/11/guest-post-the-organ-of-corti/								1			1					1												
10-Jan-11	The Sampler Event	Peninsula Arts Contemporary Music Festival City of London Festival 2011 - Full Programme Announced	http://www.soundandmusic.org/thesampler/event/2011/02/peninsula-arts-contemporary-music-festival-city-of-london-festival-2011-full-programme-announced							1	1							1								1					
31-Mar-11	Classicalsource.com	World premiere of Organ of Corti, winner of PRS for Music Foundation's New Music Award	http://www.classicalsource.com/db_control/db_news.php?id=1709							1								1							1						
17-May-11	WildKat PR website	Organ of Corti wins PRS for Music Foundation's New Music Award	http://wildkatpr.com/news/news/2011/05/17/world-premiere-of-organ-of-corti-winner-of-prs-for-music-foundations-new-music-award/								1							1							1						
23-May-11	MUSO e-newsletter	Organ of Corti	http://www.facebook.com/OrganOfCorti															1							1						
25-May-11	Facebook	Winning Sound Installation	Issue 40, p7 http://www.soundandmusic.org/thesampler/event/2011/07/organ-corti-city-soundscape-walk															1							1						
1-Jun-11	M Magazine	Organ of Corti	http://www.thewine.co.uk/articles/6772/							1								1							1						
1-Jun-11	The Sampler Event	Organ of Corti City Soundscape Walk	http://www.youtube.com/watch?v=qkm_LRFPwic									1						1							1						
6-Jun-11	The Wire	Keith Attenborough explains: Organ of Corti Part 1	http://www.cityam.com/lifestyle/city-london-festival-goes-down-under															1							1						
7-Jun-11	YouTube	City of London Festival goes Down Under	http://www.golakes.co.uk/do/arts-and-culture/culture-liminal.aspx							1								1							1						
10-Jun-11	CityAM	The Organ of Corti	http://www.soundandmusic.org/thesampler/event/2011/07/organ-corti-city-london-festival															1							1						
11-Jun-11	Cumbria Tourism - Lake District Website	Organ of Corti - Lake District Summer Music Festival	http://www.soundandmusic.org/thesampler/event/2011/07/organ-corti-lake-district-summer-music-festival								1							1							1						
14-Jun-11	The Sampler	Organ of Corti - City of London Festival	http://www.soundandmusic.org/thesampler/event/2011/07/organ-corti-city-london-festival															1							1						
14-Jun-11	The Sampler	Oraan of Corti - Cotswold Water Park	http://www.soundandmusic.org/thesampler/event/2011/07/organ-corti-cotswold-water-park															1							1						
14-Jun-11	The Sampler	Oraan of Corti - Worcester Music Festival	http://www.soundandmusic.org/thesampler/event/2011/07/organ-corti-worcester-music-festival															1							1						
17-Jun-11	ArtsCulture	Award-winning new instrument the Organ of Corti prepares for national tour	http://artsculture.newsandmediarepublic.org/2011/06/17/award-winning-new-instrument-the-organ-of-corti-prepares-for-national-tour/						1									1							1						
18-Jun-11	Classical Music Magazine	Antipodean slant for City of London Festival	http://www.italoouropo.com/							1								1							1						
20-Jun-11	italoouropo.com	Sound of music organ prepares for nationwide tour	http://www.thisissouthdevon.co.uk/Sound-music-organ-prepares-nationwide-tour/story-12814437-detail/story.html															1							1						
22-Jun-11	This is South Devon	Innovative Organ ready for UK tour	http://www.thisissouthdevon.co.uk/Sound-music-organ-prepares-nationwide-tour/story-12814437-detail/story.html							1								1							1						
22-Jun-11	Totnes Times Herald Express	Sound of Music Organ prepares for nationwide tour	http://www.thisissouthdevon.co.uk/Sound-music-organ-prepares-nationwide-tour/story-12814437-detail/story.html							1								1							1						
23-Jun-11	(Torquay)	Award Winning experimental music instrument 'tested' at Dartington	http://www.dartington.org/blog/award-winning-experimental-music-instrument-tested-at-dartington							1								1							1						
29-Jun-11	Dartington Trust Blog	£50,000 arts award winner coming to Tebay Gorge	http://www.dartington.org/blog/award-winning-experimental-music-instrument-tested-at-dartington															1							1						
25-Jun-11	Westmorland and Cumbrian Herald	Front Page	http://www.timeout.com/london/classical-music/event/229717/city-of-london-festival-organ-of-corti							1								1							1						
27-Jun-11	Time Out Recommends	City of London Festival - Organ of Corti	http://www.timeout.com/london/classical-music/event/229717/city-of-london-festival-organ-of-corti										1					1							1						
30-Jun-11	Time Out Magazine	Breaking the Noise Barrier	http://www.timeout.com/london/classical-music/event/229717/city-of-london-festival-organ-of-corti							1								1							1						
30-Jun-11	YouTube	Keith Attenborough explains: Organ of Corti Part 2	http://www.youtube.com/watch?v=YHRwcbbs0NO									1						1							1						
1-Jul-11	Trevor Cox Tweet	435 followers	http://twitter.com/#!/trevor_cox									1						1							1						
1-Jul-11	Hear and Now	BBC Radio 3 interview with David Prior and Frances Crow	Not broadcast															1													
1-Jul-11	Westmorland Gazette	Pioneering Lake District Summer Music Festival Mixes traditional with cutting edge	http://www.thewestmorlandgazette.co.uk/leisure/9102967_Pioneering_Lake_District_Summer_Music_mixes_traditional_with_cutting_edge/															1							1						
1-Jul-11	Yahoo! Via Reuters	Photos of Organ of Corti	http://news.yahoo.com/photos/people-walk-organ-corti-sound-sculpture-created-liminal-photo-155319936.html							1								1							1						
1-Jul-11	SunSentinel.Com	A Man Walks though "Organ of Corti"	http://www.gulf-times.com/site/topics/article.asp?cu_no=2&item_no=444709&version=1&template_id=38&parent_id=20															1							1						
2-Jul-11	Winkball	City of London Festivals: Organ of Corti	http://www.winkball.com/walls/kVAHGtWGVxM/city-of-london-festivals-organ-of-corti										1					1							1						
3-Jul-11	London Sound Survey	Organ of Corti Sound Sculpture - audio recording	http://www.soundsurvey.org.uk/mp3s/categories/Organ%20of%20Corti%20sound%20sculpture.mp3															1							1						
4-Jul-11	Gulf Times	Sound Sculpture	http://www.gulf-times.com/site/topics/article.asp?cu_no=2&item_no=444709&version=1&template_id=38&parent_id=20															1							1						
5-Jul-11	WIRED.co.uk	Amazing Sound Sculpture 'Organ of Corti' Installed in London	http://www.wired.co.uk/news/archive/2011-07/05/organ-of-corti							1								1							1						
5-Jul-11	WIRED.co.uk	Organ of Corti - Featured on Home Page	http://www.wired.co.uk/news/archive/2011-07/05/organ-of-corti							1								1							1						
5-Jul-11	Everything London	Tweet of Wired gallery to 85,000 followers	http://twitter.com/#!/LDN															1							1						
6-Jul-11	The Times	Southwark Cathedral Choir at Southwark Cathedral	http://www.thetimes.co.uk/tto/arts/music/classical/article3084731.ece							1								1							1						
6-Jul-11	London Sound Survey Blog	Drown noise weekend with Jamie Reid and the Organ of Corti	http://www.soundsurvey.org.uk/index.php/survey/blog_comments/139/															1							1						
7-Jul-11	BBC Music Magazine	Organ of Corti opens at the City of London Festival	http://www.classical-music.com/blog/team/organ-corti-opens-city-london-festival										1					1							1						
7-Jul-11	Blog	Listening to yourself listening through the Organ of Corti	http://www.gramophone.co.uk/blog/the-gramophone-blog/listening-to-yourself-listening-through-the-organ-of-corti										1					1							1						
8-Jul-11	Gramophone Blog	Listening to yourself listening through the Organ of Corti	http://www.humansinvent.com/#!/1556/the-sculpture-that-creates-music-from-gossip															1							1						
8-Jul-11	Humans Invent	The sculpture that creates music from gossip	http://www.humansinvent.com/#!/1556/the-sculpture-that-creates-music-from-gossip															1							1						
8-Jul-11	BBC Radio Cumbria	Live interview with David Prior	No recording															1							1						
9-Jul-11	BBC Radio Cumbria	Live interview with Andrew Lucas	No recording															1							1						
14-Jul-11	Architects Journal	James Pallister lks at two interactive works by architects with a musical bent	http://www.architectsjournal.co.uk/critics/james-pallister-looks-at-two-interactive-works-by-architects-with-a-musical-bent/8617372.article										1					1							1						
16-Jul-11	Cumbrian Herald	Hearing is believing	Front Page							1								1							1						
29-Jul-11	This is Gloucestershire	Organ of Corti	http://www.thisisgloucestershire.co.uk/event/Organ-Corti/event-13030955-detail/event.html															1							1						
1-Aug-11	Public Art Online	Organ of Corti - events	http://www.publicartonline.org.uk/whatsnew/trainingevent/s/article.php/Organ+of+Corti+Events															1							1						
3-Aug-11	Public Art Online	Organ of Corti on Nationa Cycle Network route 45	http://www.publicartonline.org.uk/whatsnew/news/article.php/Organ+of+Corti,+National+Cycle+Network+route+45															1							1						
12-Aug-11	The Guardian	Eccentric Britain	Travel section page 3 http://www.guardian.co.uk/travel/2011/aug/12/modern-craft-knitting-gardening-cakes?INTCMP=SRCH							1								1							1						
12-Aug-11	www.Guardian.co.uk	eccentric Britaine	http://www.thisisgloucestershire.co.uk/MUSIC-Experimental-instrument-installed-Cotswolds-story-13118140-detail/story.html															1							1						
12-Aug-11	Gloucestershire Echo	MUSIC: Experimental instrument installed in the Cotswolds	http://www.thisisgloucestershire.co.uk/MUSIC-Experimental-instrument-installed-Cotswolds-story-13118140-detail/story.html															1							1						
13-Aug-11	Wills and Gloucestershire	Instrument is music to the ears of Cotswold Water Park Visitors	http://www.willsglossstandard.co.uk/news/Cotswold_Water_Park_visitors/?ref=rss							1								1							1						
14-Aug-11	Standard	Water Park Visitors	http://www.willsglossstandard.co.uk/news/Cotswold_Water_Park_visitors/?ref=rss							1								1							1						
16-Aug-11	The Lakes by yoo	Organ of Corti: Cotswold Water Parks New music instrument that recycles sound on show in the Cotswolds	http://www.thelakesbyyoo.com/news/?p=2023http://www.thelakesbyyoo.com/news/?p=2023															1							1						
17-Aug-11	Gear4Music	Organ of Corti: Cotswold Water Parks New music instrument that recycles sound on show in the Cotswolds	http://www.gear4music.com/news/article/New-music-instrument-that-recycles-sound-on-show-in-the-Cotswolds/41K/2011-08-17															1							1						
18-Aug-11	Worcester Standard	Unique Sound of Organ to be Heard	http://www.worcesterstandard.co.uk/2011/08/18/story-Unique-sound-of-organ-to-be-heard-15261.html							1								1							1						
19-Aug-11	BBC News Hereford and Worcester	Organ of Corti is part of Worcester Music Festival																													

[illegible]

Audience for Organ of Corti						
			Artists	Participants	Live Audience	Wider Audience
London						
	Local host organisation			6		
	Security guards			2		
	Installation			6		
	7 day exhibition				7000	
	Soundwalk		1	8		
	invigilation		4			
	deinstallation			6		
	COLF website					1276
	COLF brochures					150,000
	Subtotal	158309	5	28	7000	151276
Cumbria M6						
	Local organisation			24		
	Installation			4		
	Security Guards			2		
	2 days open to public				447	
	Schools day			141		
	invigilation		2			
	deinstallation			4		
	Vistaprojects website					unknown
	Westmorland services onscreen display					880
	Go-lakes website					unknown
	LDSM website and brochure					100,000
	Subtotal	101504	2	175	447	100880
Cotswold Water Park						
	Local Organisation					
	Installation			8		
	Security guards			1		
	2 full days open to public				207	
	Talk			30		
	Soundwalk			8		
	invigilation			2		
	deinstallation			10		
	Dursely Talking Newspaper					70
	Posters in Gateway Centre, 4 pillars hotel + 23 parish councils					36+
	CWPT website					40126
	Subtotal	40462	0	59	207	40196
Worcester Diglis Weir						
	Local organisation WMF/Sustrans			19		
	Installation			6		
	security guards			2		
	3 days open to public				1071	
	Talk			42		
	Soundwalk			21		
	invigilation		1	5		
	deinstallation		1	5		
	WMF and Worcester Festival brochure					100000
	WMF website					886
	Sustrans Website and newsletters					1,226
	Worcester New College					5
	Subtotal	103290	2	100	1071	102117
Overall Tour						
	Project management		1			
	Liminal		2			
	Organ of Corti Google Maps					2016
	PRSF website					2923
	Liminal website 1 May to 30 September 2011					4198
	Mark Leahy twitter					42
	Facebook					105
	Liminalsound twitter					133
	LiminalArch twitter					42
	Subtotal	9462	3	0	0	9459
TOTAL		413027	12	362	8725	403928
						total 412653 Audience

Performance Days		
London	7	
M6 Cumbria	3	
CWPT	2.5	
Worcester	3	
	15.5	
Programmes issued		
	Programm braille	
London	800	25
M6 Cumbria	50	
CWPT	100	70
Worcester	750	4
	1700	99

Disabled Audience 74
invited from PRSF 334
Accepted 46