

Phase Revival: An Optical Harmonica came together when Leeds-based artists Becs Andrews and Dave Lynch applied for a residency at CERN in Switzerland, and on the way arranged to visit a physical chemistry laboratory at the University of Leeds.....

I was really delighted and quite surprised when we visited the chemical physics laboratory at the University of Leeds in research for our CERN proposal. I had no idea that we were going to see something that was made up of lasers and optics and apertures and mirrors; bending, stretching and bouncing light around – although obviously for scientific and not just visual research! These are things that we both have been really interested in and done experiments with for a while – we are both obsessed with early forms of cinema and moving image – camera obscuras, zoopraxiscopes, zoetropes (as well as more technologically advanced things!) Really this particular area of science and the things we do in our art and theatre practices weren't so far apart after all.

Straight after our first visit we booked a black theatre space and carted along all the mirrors, smoke machines, lenses and projectors we could lay our hands on and tried to do a large (and very approximate) visual version of what we had seen in the lab. The results were beautiful and we took some photographs of what we had done to show the scientists – Mike Nix and Ben Whitaker. They both thought they were fantastic (although we later found out that this was for scientific rather than aesthetic reasons – they thought we had captured an unusual phenomenon but we had unwittingly duped them with an optical illusion because of the projected footage we had used!) As a result Ben secured a little bit of funding from the Royal Society of Chemistry to research a 'spectroscopy outreach' project, which I supplemented with my DARE Fellowship project funding from the Opera North Future Fund and the four of us began to meet up pretty regularly to discuss what form this might take. After almost a year, and the deadline to show the RSC looming, we suddenly hit on the idea for *Phase Revival: An Optical Harmonica* and I quickly contacted Jon Hughes the composer, whom I had recently worked with and loved his work on *Terrarium* (a dance piece by Simon Birch). Jon was a great fit with the project and brilliantly translated the physics behind the sculpture into a sound composition, which many of our audience thought was triggered by movement of the lenses themselves. We did discuss the possibility of creating a triggered sound environment, but what I find interesting at this point is that your brain assumes the two are more linked than they actually are – your perception when watching the phase revival is that the sound and the motion are inherently linked – and they are through physical theory, but not actual physical motion. In fact the optical harmonica is a silent musical instrument of sorts – hence its name.

I am more widely interested in making work that communicates scientific theory in a visually seductive and non-verbal way. So much of science is incredibly interesting, but delivered in such a dry way that it turns off non-scientists, and I think that is a shame. There is a real case for people like us, skilled in drawing out visual metaphor, and communicating without words, but relatively unversed in scientific knowledge and theory, pairing up with scientists in different fields. Of course having found this interesting way in to physics we then read (and youtubed) around the subject and I hope this is what our audiences will do – that our work might inspire them to find out more about spectroscopy and wave-forms, but even if it doesn't I think there is another level on which the work can be appreciated as purely experiential, and that is

fine too. I am also collaborating with biologists and physiologists for a few other installation projects...watch this space!' Becs Andrews

'Phase Revival: An Optical Harmonica is based on the physics that controls the motion of the molecules in almost everything we see. The work is inspired by the science of spectroscopy, the study of molecules with light. In our laboratory we observe the motion of molecules governed by quantum mechanics, the strange duality of waves and particles. We watch complex patterns emerging from simple physical objects and see miniature molecular phase revivals. Similar patterns exist in almost every scientific field imaginable, from astronomy to biology. The beauty of the installation reflects the mathematics and physical laws which help us to understand our universe.' Professor Benjamin Whitaker and Dr Mike Nix

'The aim when creating music for Phase Revival was to give the audience the sensation of being immersed in a sound fabric intimately connected with the movement of the pendula, and so both the rhythm and pitch of the sounds you hear are derived directly from the mathematics that govern the pendula movement. Using a music program called Max/Msp, 12 individual metronomes were created, each programmed to tick in time with one of the 12 swinging lenses. Each of these 12 metronomes was connected to an oscillator, omitting a tone derived from the frequency of each pendulum, scaled up into the audible range. The 12 resultant pitches are a natural harmonic series, built on a fundamental tone of 68.27 Hz. The 12 tones were then layered with a range of synthetic and sampled sounds and mixed ambisonically to create the final complex texture. As with the kinetic sculpture, the rhythmic intensity of the music changes as each 240 second phase cycle passes; the clearly regimented rhythmic form present at the start gradually dissipates to match the decreasing amplitude of the pendula movement. By the end of the complete 16 minute cycle, we are left in a formless sea of ambience and atmosphere, not knowing quite how we got there, but ready for the pendulums to drop once more, and for the process to begin again.' Jon Hughes

Audience Feedback:

"Hypnotic – sometimes almost anthropomorphic. Beautiful reflections and refractions. Fantastic"

"Mesmerising, hypnotic and emotional"

"Beautifully simple and complex at the same time. Immersive and organic. One of the best expanded/paracinematic works I've seen"

"Fascinating and strangely soothing"

"Eerie and thought provoking"

"Wonderful, beautiful and moving"