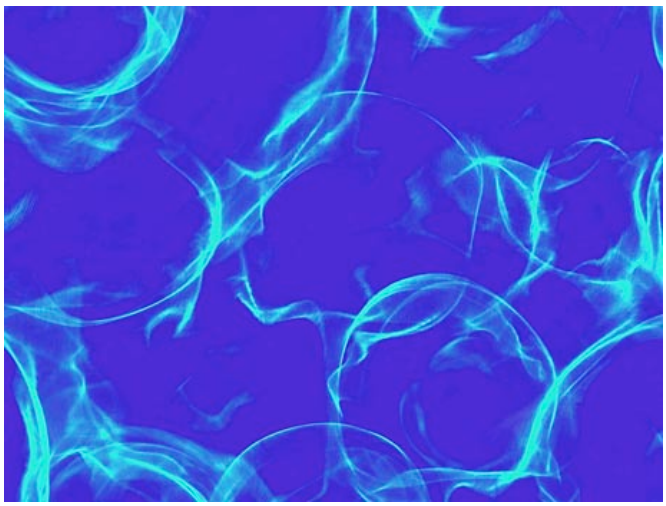
From Hydrophonics to Interactive Sound Fountains

Johannes Birringer



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Although modest and seemingly unspectacular, Caroline Locke's phrase "seeing sound" – a phrase she used to describe her interests in creating sculptural sound-performance works when I first met her in 2004 – has stuck with me. It is an odd paradox, but one that has gained resonance in recent years as we have moved along with the scientific and technological advances in a culture obsessed with data visualizations and location mapping. Today's ultrasonic medical scanning of our arterial blood flow allows us to peer inside ourselves, so to speak. We depend on x-ray vision to diagnose a fracture of our bones, and neurologists look into our brains to pinpoint areas responsible for thoughts, feelings, and actions. Sound and vision are two closely related sensory registers, yet we do not commonly think of sight being audible, and sound being visible. We do not see with our ears, we use them to listen to the wind as we go forth in the world, as the anthropologist Tim Ingold once suggested, noting that wind and breath are intimately related in the continuous movement of inhalation and exhalation that is fundamental to life and being.[1]

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[1] Cf. Tim Ingold, "Against Soundscape," in Angus Carlyle (ed.), *Autumn. Leaves: Sound and the Environment in Artistic Practice* (Paris: Double Entendre, 2007), pp. 10-13.

Even though my immediate contact with Caroline Locke's artistic creativity and collaborative ventures was limited to a brief two-year period (2004-05), I propose to reflect here on her major performance installation *Hydrophonics* (2005) and her on-going preoccupation with water and sound, attempting to sketch a particular collaborative and interactive trajectory in the various manifestations of her artistic project.

Water is a vital and powerful medium or conduit, less noticeable as an artistic material in the long history of medium-specific practices – yet very fundamental in the make up of our universe and our relationship with the natural environment and its physical properties, its seasons and climes. Water is liquid, though it can have different physical states or phases: its molecules transform and therefore it has the metamorphic qualities so many poets have admired and written about. It is a surface of imaginary projections, and thus a metaphorical screen. It has even been used as a real screen; I remember seeing the dance company DV8 perform *The Happiest Day of My Life* at a theatre in Southampton, using a filmic projection onto water dripping down from the grid to the stage floor. A curtain of water.

Sound, on the other hand, has long been considered as the primary channel of auditory musical reception in the non-visual world of the arts, music having been given prime of place precisely because it cannot be seen but only heard. For composers outside the multi-media traditions of opera or music theatre, there would be no distraction from the experience of listening. Even the more recent sound art evolution of the 20th century, from the early futurists and Russolo's noise intoners to musique concrète and acousmatics, electro-acoustic and computer music[2], seemed often troubled by the sight of sound, and a good many contemporary sound installations focus on multi-channel aural spatialization of music rather than a more conceptual orientation towards the apparatus of the instruments or the sound process (the generation). At the 2004 Nottdance Festival in Nottingham, Francisco López showed an immersive sound work that he explicitly did not want to be seen: the listeners were encouraged to close their eyes or wear blindfolds to concentrate on the sound experience alone.

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[2] Composers and sound artists, from Russolo, Varèse, Schaeffer, Cage, Le Monte Young and many others to more recent sound art experimenters like Christina Kubisch, Janet Cardiff, Francisco López, or Ryoji Ikeda, of course display diverse and sometimes contradictory sensibilities towards visual (performance, installation) dimensions of sound. A direct preoccupation with the tactile materiality of sonic media and sound frequency is perhaps more characteristic of artists who have a visual or performance/body art background.

In contrast, Locke's performances and sound installations from the beginning of her exhibition career tended to emphasize a more choreographic and sculptural sensibility, anticipating the plastic as well as temporal-performative dimensions that have recently gained rather more attention in some museums attuned to research into intermedia and transmedia work.[3] Locke arrived at her sculptures (the various site-specific pieces she created in the early part of the new century) through live art and her exploration of presencing – both of human performers and machine performances. In recent architectural theory I have come across the notion of "machining architecture" (Lars Spuybroek), a term that corresponds well to Locke's choreographic ideas about ensembles which, in terms of their theatrical presences or actions, incorporate material agency and the dynamics of material systems (the buckets, containers, vessels, water-filled tanks and electro-mechanical devices). Similarly, since her early performances (e.g. *Breath),* she sought to correlate physical energy and exertion, such as her amplified breathing, to the temporal movement afforded by video/film projections or images that accompanied her action based performances on monitor screens. The early images reveal a tactile quality that was soon to be transferred more explicitly to the *movement of the material* itself. Spuybroek's practice and theory[4] examine the relationships between systems and materials methodologically, combining different procedures to allow a step-wise infusion of information into a system to generate new form. As a design method it echoes what during the 1990s – with the increasing emergence of new media/digital technologies – was called "liquid architecture" or virtual/augmented space, except that Spuybroek did not mean to celebrate the cyberspatial but to focus on concrete materials coming into action, so to speak, becoming mobile themselves.

Locke's *Hydrophonics* project, which occupied most of 2004 and 2005 and led to her extended cooperation with artists in Australia during the latter half of 2005, is a massive choreography that impressed me not only aesthetically and conceptually, but also with its

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3 See, for example, the exhibition *See this Sound: Versprechungen von Bild und Ton*, at Lentos Kunstmuseum Linz. The catalogue of the same titled was edited by Cosima Rainer, Stella Rollig, Dieter Daniels, Manuela Ammer (Cologne: Verlag Walther König, 2009). In 2011, the Barbican Art Gallery, London, showed *Laurie Anderson, Trisha Brown, Gordon Matta-Clark: Pioneers of the Downtown Scene, New York 1970s,* reminding us of Brown's amazing early "equipment pieces" and Anderson's sound experiments, including the 1978 *Handphone Table* which involves two listeners sitting down putting their elbows on a table, covering their ears with hands; they can hear the sounds coming through wood and bones of their own arms which, similarly to wood, have a porous structure. The principle of the performance is based on the conduction of sound vibrations through bones.

4 Lars Spuybroek, *NOX: Machining Architecture* (London: Thames & Hudson, 2004),

meticulous organization and development. Locke took over various roles, including that of the director and producer, and she felt at ease moving between her craft, the engineering tasks, and the conceptual compositions, fusing the various building blocks of the work. Over a period of many months, seven tanks of different sizes were built, and a wiring and speaker system devised to be applied to the underside of the tanks. Sound was to be sent to the tanks to animate a thin layer of watery surface through the various sound frequencies. Locke had asked an ensemble of musicians to join her for the public performance to take place on Monday 21st March, 2005, at the Malt Cross (Nottingham), a public bar featuring a beautiful and unusual two-storey architecture that would allow audiences to look down from the balcony onto the stage set below. During months of rehearsal, the tanks were tested and "tuned," and a configuration for the ensemble sketched, at which point I was also invited to provide additional interface programming through camera (attached to tripods overlooking the tank surface) and Isadora software.[5] The instrumental musicians and a vocalist were invited to develop, with Locke, a five-part musical "symphony" of sound, sent from their instruments (guitar, double bass, saxophone, cello, trombone, percussion) and voice to the tanks and their water surfaces.

The main feature of this multimedia assemblage is the array of tanks holding the water, and during the hydrophonic concert attention is directed to the relationship between performers/musicians – Gareth Bailey, Tom Bailey, Charlotte Bishop, Paul Deats, Rachel Foster, Sam Hempton, John Thompson and Steve Truman – and the effect their musical instruments have on the behavior of the water. Locke's primary interest may have been the "sight of sound," rather than the sound itself, but I would argue that there are two key aspects to the work, for the audience, and one surely has to be the musical performance of the band, given the public setting and the expectations that audiences generally bring to a music concert. At the same time, Locke was exhibiting her "orchestra," namely the configuration of kinetic sculptures[6], or *sculptures of vibration*. One must consider the band's performance and

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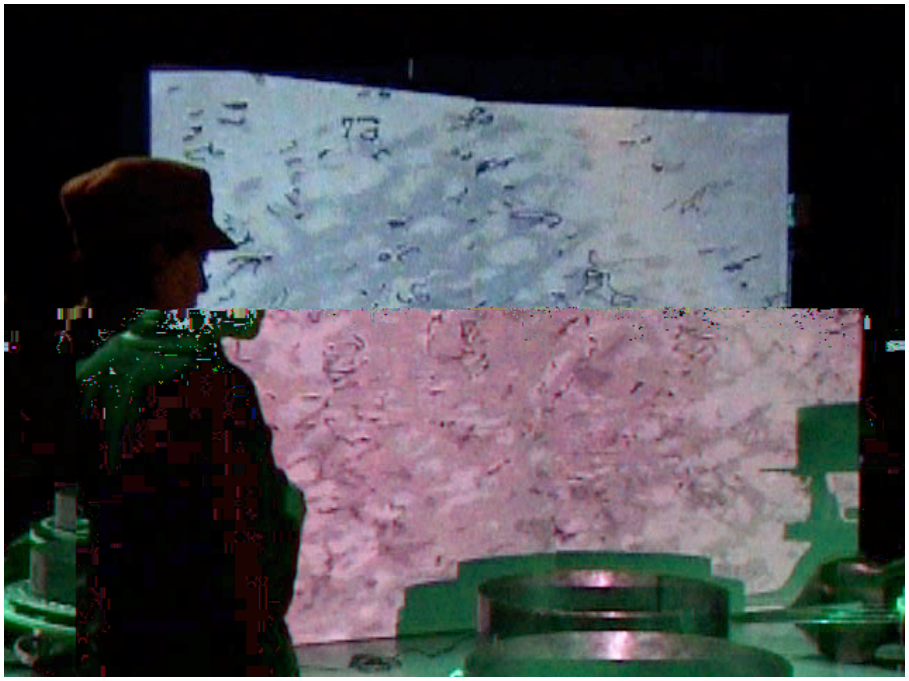
[5] Isadora is an interactive media presentation software originally developed by Mark Coniglio for dance companies wanting to use camera or sensor input to manipulate digital media output and real-time interactivity (graphic, sonic, MIDI data etc).

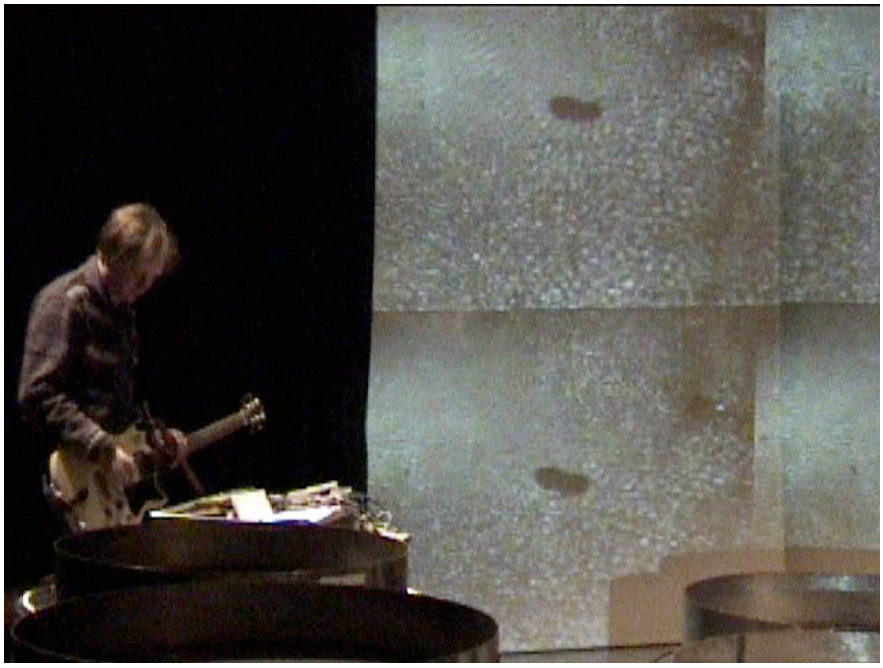
[6] Historically, it might be of considerable interest to link Locke's hydrophonic sculptures with kinetic art of the 1960s, earlier abstract film-sculptures such as Lázló Moholy-Nagy's *Lichtspiel* [*Lightplay]* (1930), which was created by filming light reflected by a motorized sculpture made of glass, mirror, steel, and acrylic, and sound art experiments like Alvin Lucier's *Music For Solo Performer* (1965), in which the artist amplified his brain waves to excite a number of percussion instruments by placing them on or next to loudspeakers. The cones of the speakers, set into motion by Lucier's brain waves, were the actual performers, while the composer remained a silent and stationary presence. Lucier's scientific interests, for example into atmospherics and the acoustic

the musical material as an operational system "affecting" the dynamic properties of the water inside the resonant tanks, each surface mobilized differently by the particular sound waves that reach the bottom of the tanks and the speakers attached to the differently sized round tin. The audience's attention is thus drawn to the variations of the formations on the water surfaces that each sound frequency makes. The formations are an effect of the vibrational qualities of sound, lower frequencies causing the water to "act" in wider, more pulsating bubbles and sparkling fountain-like agitations that generate a turbulent pattern, whereas higher frequencies generate a different, faster turbulence and more prickly, oscillating field of droplets that might appear like the agitated pounding of raindrops hitting the surface of a lake during a thunderstorm. The turbulation of the water, and the propensity of its viscosity to ball up into droplets or spheres, also generates sound, but the primary, magical effect of the animating frequencies is the generation of complex patterns that are like fractal geometries building up a seeming coherence that can suddenly turn into tumultuous chaos and equally quickly reintegrate into a "standing" wave form that regularly expands and contracts in phase with the oscillating wave pressure.



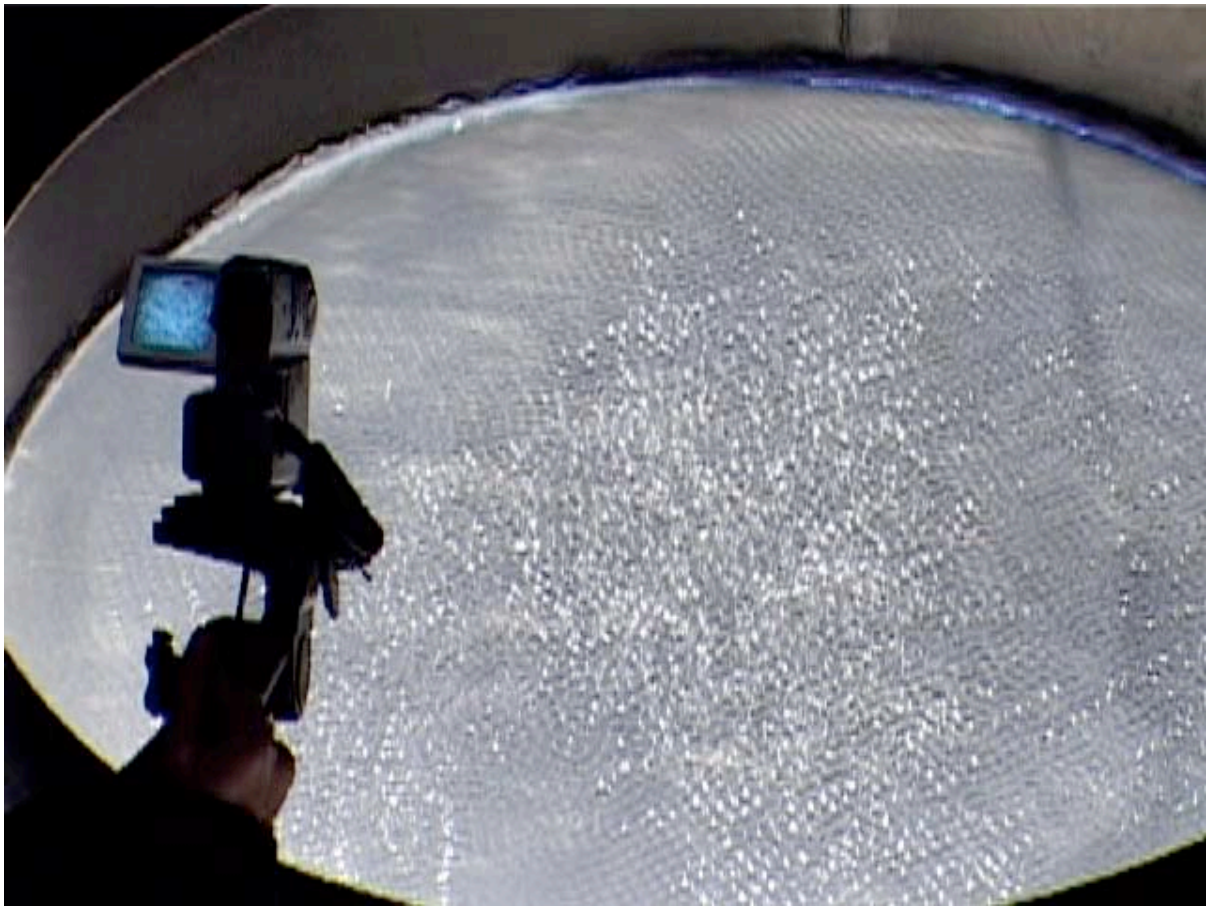
Rachel Foster in rehearsal for "Hydrophonics," January 2005, Powerhouse Nottingham © J Birringer

potential of brainwaves, show a fascinating correspondence to Locke's investigations into amplified breath and cymatics.



Sam Hempton in rehearsal for “Hydrophonics,” January 2005, Powerhouse Nottingham © J Birringer

As an ensemble, we rehearsed under Locke’s guidance and “charted” the music to recall some of the pattern effects in the tanks, each musician and vocalist Rachel Foster exploring the liquid manifestations in order to compose music based on the sight of the composition rather than the sound. Interestingly, rehearsals took place at some point at Nottingham Trent University’s Powerhouse, a now defunct theatre where I then worked as a research fellow in digital and live performance art. We had set up a screen that allowed filmic projections of the vibrational patterns of the water, captured by Locke’s camera peering into the tanks and enabling close up images of the “sights” – images that could be manipulated (in coloration and shape) or distorted as well in real-time and mixed with other filmic materials Locke wanted to bring to the premiere performance. In the Malt Cross performance, we worked with a double interface design, invisible-sound-to-visual-vibrations on the water surfaces, and visual vibrations-to-camera/software-to-graphic-projections, the latter thrown up to a high wall just above the audience gathered on the second tier of the pub. Locke used the opportunity of the concert to let the camera travel, to capture not only close ups of the turbulent watery surfaces, but also the bodily movements of the musicians at their instruments and the facial expressions of audience members immersed in the experience of this “visual” music gig.



Camera interface and turbulence pattern in “Hydrophonics,” January 2005, Powerhouse Nottingham © J Birringer

While Locke may have been drawn to the physical and metaphysical aspects of the vibrational patterns, satisfying her long-standing curiosity in such watery phenomena that she later expanded into the creation of her sound fountains, she clearly pursued more than the creation of a kinetic sculpture. Already in 2004-05 she must have been attracted to the generative and interactional potentials of such intermedia performance installations. Furthermore, at this juncture in her life Locke had a subtext in mind that must have had a deeply personal and narrative significance for her, even if she did not much comment upon such matters. But she had given us a rough sketch, a kind of libretto, which outlined the different affective qualities of the sound she was interested in, and which were then structured and composed, mainly by trombonist/composer Gareth Bailey, into a sequence of eight “tracks” comprising the main five movements that ordered the tonalities and dynamics she wanted to dramatize visually. For Track 2 (2nd Movement), for example, she also brought me a short dance film she wanted to project against/alongside the light and lighthearted, radiating rhythms of the music. In the performance, I projected this short dance film through the texture of the real-time captured continuous rotary motions of the water surface; the

composite generated a perplexingly beautiful and implicated "water dance," richly curved patterns of liquids or liquid particles percolating through the female figure dancing in virtual space. In Track 5 (3rd Movement Part 2), a very different mood is evoked, and I projected a short film of flames and burnt charcoal (referring to a catastrophic moment in her life, when Locke's house into which she had moved some years prior, had caught fire and burnt down), symbolic signifiers slowly subsumed and drowned by a vortex of viscous liquid. From this reversal of fortune, the ensuing despair, bitterness and anger, the symphony of sound moves forward to its final track which indicates a gradual release into a brighter and more optimistic frame of mind, voice and instruments building intensity that was forcefully translated into the shimmering movements of the pulsating water in the seven tanks – currents and eddies forming "harmonic" shapes that one might imagine as the pattern or cycle of life itself.

Audience on the balcony, with video fresco above, at the premiere of "Hydrophonics," March 21, 2005, Malt Cross, Nottingham © J Birringer

Of course I cannot tell or recall what the audience might have imagined witnessing[7], and

[7] A television crew was present, however, and interviews with some audience members reveal that several spectators felt affected emotionally on a level they found hard to express except through voicing a certain awe or bewilderment. It is obvious that Locke has grown more persistent, through the development of her public sound fountains, in wanting to involve audiences directly in the generative process of the experience of the work and its unstable morphological manifestations.

these subtexts of the libretto were not known to anyone except the ensemble. But Locke dared to bring an emotional narrative to an experiment in physics, and the musicians interpreted the vibrational score as only musicians can, giving this *Hydrophonics* event a unique acoustic energy. I will remember it as a live art event, with all its ephemeral splendor, a few months later to be redirected into a more radically unstable networked performance (*Hydrophonics Online*) between Melbourne, Australia, and Nottingham, data-waves sent through the internet from one island to another, to arrive at some other end where they could activate a kinetic-fluid assemblage, potentially witnessed by many viewers online. At the Malt Cross, the performance of the tanks, with their animated water surfaces, drew the local audience in; one can speculate that the psychological and perceptional affect largely resided in the astonishing vibrational conditions (including the alternation of stillness and motion) evoked through the patterns of water movement, touching upon a fundamental human connectedness to flow/fluidity and the liveliness we recognize in the way in which the world is permeated by rhythm.

There is also a scientific subtext that was not apparent to me at the time; in more recent years, however, attention has been given to *cymatics* and the study of visible sound/vibration, and research has been conducted in physics and medical science as well as in related health sectors where hydrosonics and its experiential effects are used for healing purposes.[8] Cymatics is the study of wave phenomena and the effect sound frequency and vibration have on particles and mass; the term (*Kymatik* in German) was first adapted from the Greek word for wave, *ta κύμα*, in the 1960s by Swiss medical doctor and natural scientist, Hans Jenny, who developed a scientific methodology that demonstrates the vibratory nature of matter and the transformational nature of sound. Not surprisingly, and similar to the aesthetic interest aroused by fractal geometry, the visualizations of Jenny's experiments, namely how audible sound frequencies can animate inert powders, sand, pastes and liquids into life-like flowing forms, have led to metaphysical interpretations about the hidden dynamics of nature. Whereas materialistic science cannot fully explain why certain geometric forms, like the spiral, hexagon and sphere, comprise the basis of so many of these nature-forms, and why these same patterns tend to replicate in such diverse dimensions as single celled sea creatures and cosmic dust clouds light years in diameter, growing evidence points to the invisible workings of resonance. From an artistic point of view, and we only have to

8 Cf. Hans Jenny, *Cymatics: A Study of Wave Phenomena and Vibration* (Newmarket, N.H.: MACROmedia, 2001). See also: Suguru Goto, *Cymatics* (http://www.watermans.org.uk/media/27545/suguru%20gotov3.pdf).

remember the tremendous emphasis that Antonin Artaud placed on sensorial experience and vibrational resonances in his vision for a theatrical poetics of/in space and sound, it is of course tempting to imagine that the material world is held together via "resonance," a mysterious property that determines how subatomic particles orient and bond with one another, as well as the massive oscillations of gravitational fields in galactic interactions. On a more human and societal scale, we often hear today of the need for a relational aesthetics or architecture, and the kind of public art works that Caroline Locke has explored over the past few years (*Sound Fountains*) makes me wonder whether her hydrophonic project has not expanded in such a more communitarian as well as cosmological direction. Eastern cosmologies and the science of homeopathy encourage us to trust interconnections and interrelationships, to acknowledge a holistic organic basis for these normally invisible workings of resonance. As we witness audible sounds exciting inert masses of sand and water into dynamic forms that mimic living organisms, we can begin to visualize the hidden mechanisms that animate our world.

While Jenny's experiments, and those of subsequent researchers in Cymatics, are conventional physics and solidly based in the observation of causal relationships of physical phenomena, the magic of this scientific artistry comes in its interpretation. Cymatics shows how vibrations interact to create the world we experience "out there," in the dense physical world of matter, form and function, while illuminating more intuitively how our subjective perceptions, shaped by our emotional and cognitive experience, "see" conflicting principles in action, such as the push of an imposed vibration against the pull of gravity, the dynamic exchange between stasis and movement.

Locke's *Sound Fountains,* developed since her first commission for a design of a permanent public sculpture in Maastricht (The Netherlands) in 2006, reflect her own careful research into new designs for water tanks and speaker systems and a new concern for the interactive potential of such a symbolic structure – fountains traditionally having been given prideful places in urban or village squares and parks where they feed the existential imaginary – now largely forgotten in the industrialized West – of the population relying on water as a source of life-giving sustenance. In our cities, fountains function as sublimated civilizational artefact, a decorative transformation of the ancient well and the mythologies associated with water. In parks the fountains can be enjoyed, in the warmer days of the summer, as source of refreshment, children like to jump into them when they are accessible, wanderers and visitors

rest at fountain statues of cherubs, mermaids, animals, gods and goddesses, tourists throw coins into them. Fully aware of this powerful attraction, Locke places her *Sound Fountains* in public sites, even though so far these sites appear relatively controlled (indoor) spaces, such as School of Governance at Maastricht University, the new Faculty building for Arts and Technology at The University of Derby, and now the Chapel at Yorkshire Sculpture Park.

Emplacing the work in an interactive context brings numerous challenges with it, regarding the interactional design, the relational space and freedom of accessibility, and the intelligibility of the system. While computational and networked interactivity are now a common feature of our daily lives, Locke's *Sound Fountains* are not domestic or public technical objects; they attract attention because they are carefully crafted aesthetic sculptures that enact their own organism. For Maastricht, she had two new fountains built out of stainless steel, feeding them with musical sound and the sound of students' voices activating the water surface. At Derby, she collaborated with the Signal Processing Applications Research Group (School of Technology), further experimenting with speakers, wave generators and pitch shifters, and designing special units to house separate speaker canopies underneath the steel tanks. From this collaboration emerged her interest in using sensor-driven or microphone input into the wave generation, enabling visitors to affect the wave generation and "build their own soundscapes," as she calls it. This was tested successfully during a performance installation at Nottingham Contemporary (November 2011); a much expanded arrangement expects the visitors to the Chapel at Yorkshire Sculpture Park, where several Sound Fountains are placed in the nave, with large projection screens on either side; a red chair, a lectern with book and microphone, and a small silver suitcase complement the ensemble. When the visitor enters the space, the turbulence system is already at work: various generative sonic processes are activating the water surfaces, and visitors can add to this symphony if they recognize the in-put "channels" available to them.

Audience engaging *Sound Fountains* at the Chapel, Yorkshire Sculpture Garden 2012, © C. Locke

Having mentioned the paradox of "seeing sound" in the beginning, I now return to it with a weary mind, sobered by several years of theatrical experimentation with interaction design. While in contemporary digital culture, and lately in many museums, galleries, and performance venues, the urge to design participatory applications is understandable, the artistic values of interactivity – and of making the "user" a co-producer of the work or the work's *generative process* – are much harder to grasp and define. Intrinsically interactive and generative process art depends on what theorists of the processual have called "technical ensembles," implying organisms that co-evolve with their environment. In such environments, we create dynamic models to detect changes in behavior patterns and the equilibrium within digital/electro-acoustic and physical space. Digital performance art has run into limitations that concern both compositional practice (e.g. the dramaturgical placement of interfaces for trained performers in a stage work) and the participatory promise of interactive design for audiences (who haven't trained with the interfaces or cannot intuitively navigate the programmed parameters). In artificial intelligence research, engineers are working hard towards toward instilling learning capabilities into their creatures: intelligent technical organisms might learn from the behavior of the audience or the processual systems (artificial life, multiagent populations) develop their dynamic

(self)reconfigurations – their emergence.[9]

As I suggested earlier, new notions of relationality have been used increasingly often in the visual arts contexts, where the immersion in installations accentuates sensorial experience or provokes interactional play with the environment. Some performance companies have adopted such participatory strategies to resituate their work within the public sphere, utilizing public spaces and information networks or creating theatre and dance installations involving the audience in imaginative ways. The question whether participatory design and emergence are actually achievable or desirable in staged performances or installations was addressed by the *Pixelspaces* symposium ("Re-Scripting the Stage") at the 2011 ars electronica:

> Interactivity and participation have been core elements of media art since its very inception. In performances and installations produced in recent years, more or less successful attempts have been made to put this immanent interactive element in the hands of the audience attending the performance –for example, through the use of various tracking technologies. In addition to the attendant problems associated with people's inability to grasp the connection between cause and effect, the process of enabling audience members themselves to generate sounds or visuals often quickly results in the exhaustion of the performance's aesthetic, emotional or intellectual quality. In the spirit of our contemporary Age of Participation in which social media and a digital lifestyle set the tone, we will conduct a transdisciplinary discussion on innovative participatory scenarios for the multimedial stage-audience context …in the future (*Pixelspaces* program).

If it is euphemistic to speak of the "age of participation," it is certainly pertinent to inquire about the aesthetic, emotional or intellectual quality of performances that deploy technical interfaces to generate new modes of experience. Locke's installation of *Sound Fountains* at Yorkshire Sculpture is modest yet provocative, in this respect, due to its choice of location: the chapel. Although no longer in use as a place of religious service, the scenario of Locke's arrangement evokes a spiritual ambience, and the implicit invitation to the visitor is to delve into a meditative as well as conductive space, a space of communal sharing. We might have thought of the spiritual as a search or a journey toward a certain form of enlightenment or equilibrium, and in Locke's sonic environment the visitor can look for their sensual or sense-making understanding of the ecology of the room, e.g. trigging different sound sequences via

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9 Cf. the exhibition *Process as Paradigm – art in development, flux and change*, curated by Susanne Jaschko and Lucas Evers, for LABoral Centro de Arte y Creacion Industrial in Gijon, Spain (23 April - 30 August, 2010). The exhibition catalogue can be found at http://www.laboralcentrodearte.org/en/714-catalogue

motion sensors connected to the fountains, using the microphone to use their voice and send word or song to the fountains, gaze at waveforms on the water's surface, or enjoy watching others and how they react to the environment. As a consequence, the room will always be alive, and life goes on, patterns emerge and disappear, repeat themselves or become modified. Someone might sit on the red chair and look into the ocean, becoming lost in a dream. Someone else might behave in an eccentric fashion, daring to dip their hands in what they imagine to be a baptismal fountain, while others try to remain unnoticed, fearing to engage the dangerously protean qualities of turbulence. Proteus, after all, was a prophetic old sea-god; they captured him to he would foretell the future, like oracles of old used to do. Now we no longer believe in oracles. Yet if we could in fact see sound around us, we would see an extraordinary kaleidoscopic-like social pattern and how our actions overlap, effecting each other.

Johannes Birringer is a choreographer and artistic director of AlienNation Co (www.aliennationcompany.com). He has directed numerous multimedia theatre, dance, and digital performances in Europe, the Americas, Japan and China; collaborated on site-specific installations, and exhibited work at film and video festivals. Author of Theatre, Theory, Postmodernism (1991), Media and Performance (1998), Performance on the Edge (2000), Performance, Technology and Science (2009). Founder of Interaktionslabor (http://interaktionslabor.de), and co-director of DAP-Lab, Brunel University, where he is Professor of Performance Technologies.