

# Reseau/Resonance - Connective processes and artistic practice

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"feels like I'm falling into this stream of sound /  
going back and coming forward / backwards and  
forwards, caught on the wave of a wave"  
(Jeff Noon, *Needle in the Groove*)

## 1. Into the Wire

Most internet art projects use the net solely as a telematic and tele-communicative transmission medium that connects computers and servers through which artists, performers and users exchange data, communicate and collaboratively create files and events. At the same time, some artists are exploring the electronic networks as specific socio-technical structures with specific forms of social and machinic agency related to them, in which people and machines interact in ways unique to this environment. Recent projects by Knowbotic Research, Marko Peljhan and Carsten Nicolai, Ulrike Gabriel, and Atau Tanaka, use the net as a performative space of social and aesthetic resonance in which notions of subjectivity, action and production are being articulated and re-assessed. This text discusses the notion of 'resonance' in order to think through these approaches to network-based art practices.

Resonance is, first and foremost, a phenomenon of sound. The acoustical instruments that we know, from the flute and the trumpet to the guitar and the piano, use the resonance activated by hitting the strings or blowing into them to bring about the instruments' sounds. The sound of the guitar are the waves effected in the body of the guitar by the vibrating strings that have been struck or plucked by the player. These vibrations transform into the rich and full-bodied sound of the acoustic guitar.

An art project that articulates the notion of resonance in relation to the Internet is the Global String, a recent project by Paris-based artist Atau Tanaka and his colleague Kaspar Toeplitz. Tanaka has explored the performative and acoustical qualities of network structures in many performances of the Sensorband, in which he is joined by the two sound artists Edwin van der Heide and Zbigniew Karkowski. Global String is a network installation which consists of two steel strings, up to 12 metres in length, placed in two separate locations which are connected through an Internet connection. Each of the strings ends in an interface that is able to pick up the vibration of the string and transform it into a signal that can be sent across the Internet. Additionally, there is a magnetic actuator which can activate the string according to

the signal received from the other string. The two parts of the Global String can thus be thought of as the two ends of a single string, connected to each other through the virtual space of the network. The signal travelling from one end to the other is not transmitted in its pure form, but is modulated by the number of hops it has to take through the Net's server space, the amount of traffic it encounters on the server nodes, and the delay time that it experiences on its journey. The parameters chosen for the modulation of the sound are defined by these technical conditions. Like in a physical, acoustical instrument, the physical technological infrastructure of the Internet modulates the sound that can be heard at one end of the string when it is hit or plucked at the other end. Global String uses the Net and its infrastructure as a tuned resonant body and is thus both an interactive, telematic installation and an electro-acoustical instrument.

One of the aims of this essay is to ascertain in how far the notion of resonance can, beyond such a literal application of the concept of resonance in the network, function as a useful metaphor and concept for describing specific aspects of an aesthetics of network-based art.

## **2. Making Things Hum**

The US-American artist Mark Bain has dealt with the phenomenon of resonance in a most radical way. In his series of 'resonant architectures', Bain seeks out the resonant frequencies of built structures like houses and bridges. Each structure has its own frequency at which it starts to resonate, making it possible to veritably 'play' a building by mechanically exciting it. Thus, the building itself can be made to act as a resonant body, as the body of an over-sized acoustical instrument.

Bain has studied the properties of resonance in depth. He writes:

"The basic idea is that when a system is stimulated with a self-reinforcing method of activation, then a kind of self-propelled resonance can occur. As I've described with some of my work on buildings, this resonance becomes a kind of ringing of the architecture; a complex grouping of structural elements coupled to an acoustic activator which feeds the system. A similar concept is the 'standing wave', where all the elements along with the provocative force combine into a stable situation."

Bain continues

"Resonance seems to straddle a knife-edge between stability and instability depending on the motivating factors. One element that can't be left out though is that of the self-referential or feedback. This is where the system is self-sensing or feeling its own output in order to align the proper input and therefore reinforcing the output again. This sensing line back to itself is required for any kind of suitable resonance to occur. As you can see in this arrangement, potentials for things to lose control are great. (...) Essentially though this destabilized form is always looking for stability (imagine atomic and molecular structures), but of course it may have to destroy everything in its path first. Resonance also has a kind of efficiency, which makes it seem that the

sum of the parts is much greater than what is put in originally." (M. Bain, private communication, October 2002)

Much earlier, John Cage has pointed out the fact that the human body can also function as a resonant object which produces its own continuous soundscape that envelops us. Cage describes how he was trying to find a fully silent space and entered an anechoic room at Harvard University where, as he recalls, "I heard two sounds, one high and one low. When I described them to the engineer in charge, he informed me that one was my nervous system in operation, the low one was my blood circulation. Until I die, there will be sounds." (1961, cit. P. Sherburne, *Parachute* 107, p.68).

These examples illustrate that resonance is an intensely analogue phenomenon which is immediately tied to the physical properties of an object, body or structure, properties which range from the molecular micro-structure to the overall macro-structure and the configuration of the materials in space. When taken from an electronic source, resonance is the material transformation of the wave form in electronic currents into a physical experience or event. Resonance is the agitated response of matter to the immaterial call of the electronic wave.

The transmutation of electrical currents into material wave forms already surprised the researchers of electricity in the 18th century, who were exploring the wondrous continuity between the visible and the invisible world of the yet hardly understood phenomena of the electrical current. The Hungarian-German researcher Ernst Florens Friedrich Chladni published, in 1787, a book called the *Theory of Sound*. In this book he presented research that he had done on the effect that physical excitation would have on a glass plate covered by graphite. Chladni would use the bow of a violin to stroke along the side of these glass plates, discovering that depending on the material of the plate and the speed of the stroke, the graphite would form very distinct star-shaped patterns which were a remediation of the sonic vibration as an image. Chladni's 'sound figures' are a visible manifestation of standing wave resonance on the material surface of the glass plates. They illustrate the physical continuum between the waves constituting the experiences of light, sound and matter whose existence as specific, separate events of perception depend on the perceptive system which categorises them as optical, acoustical or material.

Another master of these explorations, Nikola Tesla, not only did an experiment which precisely prefigures Mark Bain's experiments in resonant architecture, when Tesla fed back the resonant frequency of a skyscraper in New York to the building until it started vibrating and almost collapsed. Tesla also did extensive research about infrasonic waves and thus laid the basis for the research about acoustic weapons which in turn target the human body as the aim of their penetrating sound waves.

Resonance thus becomes the medium for sculpting with the hidden acoustic and material potentials of all things material.

### 3. With the Flow

The question is in how far we can speak of electronic network space as a resonant space. Although constituted by material technical objects, the network system is characterised by the discontinuity of its parts and the discreteness of the digital signals that flow through it. In a practical sense, it will hardly be possible to make a network connection hum in the same way as a telegraphic wire may hum in the wind, or the way Mark Bain's Live Room resonated through the walls as well as the bodies of its visitors.

Networks, however, resonate in a different sense of the word which is worth exploring. Philip Sherburne, for instance describes the increasing liquidity of the digital soundscape:

"The digital object seeps between the cracks of matter, spills out of the grooves of the vinyl or aluminium disc and becomes liquid. In this model, a model so nascent we can hardly recognize its true impact, music ceases to be a question of objects and becomes an issue of pure circulation - hence the burgeoning culture of peer-to-peer trading, and also remixes, bootlegs, versions and repackaging underground hits as car commercials and writing concertos for the turntable." (ibid., p.68-69)

This understanding of excitation, of liquidity and resonance departs from a narrow physical understanding of resonance and its foundation in the transformation of waves. In a technological infrastructure like the digital networks, the material of transformation and propagation, the carrier of waves can also be strings of digital code and information segments. Atau Tanaka's project Global String refers to such trans-mediations between the analogue vibration of the string and the digital representations of this vibration through the actuators and their tuned transmission.

A highly modular, heterogenous disposition was presented by the telecommunications artist Marko Peljhan and sound artist Carsten Nicolai in their installation project POLAR which was first presented by the now defunct Canon ArtLab in Tokyo. POLAR constitutes a complex interface to the network which it approaches as a quasi-animated organism of knowledge. Data streams, zones of intensity and information structures are represented by different visual and acoustic modules which can be modified interactively by the visitor. The installation is not concerned with the knowledge stored and represented in the network, but with the technical infrastructure of the network which is the object of this aesthetical investigation. As a reminiscence to the intelligent ocean in Andrej Tarkovski's film *Solaris*, POLAR speculates about a complex and unbounded, autonomous technoid intelligence into which the visitor is allowed partial insights. Requests sent through the network are fed back as transformed, amplified, fragmented experiences that immerse the visitor in a resonant environment that treats text, sound and technology as a continuous matrix connecting semiotic with self-expressive strata.

In his more recent explorations, Mark Bain is on a similar trail. He writes:

"Lately, I have been working with data networks and the audification or sonification of data streams. Using 'sniffer' agents to capture and listen to pure data signals allows you to hear on a certain base level, the activity of a signal without using the usual modes of perception. There are sniffing agents that are also designed to analyze the Internet, showing you peaks and nodes of activity and connection, providing a better understanding of what and where things are happening." (ibid.)

The network environment in which these signals travel is made up of machines as much as of the people who use them for all different types of communication and data transfer. Bain continues:

"[Sometimes] the Internet feels sluggish and the bits don't get through, user peak and slow death. But then alternate connections develop, rerouting to other locations and thus disturbing normal traffic that was already there, expanding, propelling, growing, and speeding to the shortest point possible. You see it in the way the time of day plays a factor in who's online and where, like an electronic horizon moving across the earth in clockwork motion. And when networks crash, a system provocateur. Feedback and ripple effects also occur due to the very nature of the nets medial form. Self-generating Spam, virus hoaxes, news events, hackavism, all lead to these peaks in flows. - Ultimately, net resonance resides in the users. The net is just the connective tissue allowing the flow to occur. And where you have flow, dynamics and action, resonance effects will be endemic to that system." (ibid.)

You can see us entering a different terrain when we think of the net as a resonant space in which the vibrato of the spammer, the wave of a small yet powerful computer virus spread and resonant with particular ease across the world of Windows and Microsoft Outlook. The spam-driven grunge of Lagos, the smooth glitch of Redmont, spinning on our hard-drives, tickling the wires, jumping from node to node.

The material basis of network-based resonance is uninterrupted connectivity, a machinic continuum that has its own properties burnt into processors and software configurations. As in the models of architectural resonance quoted earlier, this digital resonance is based on the generative qualities of software which is able to multiply its effects in a favourable network environment where through feedback it can acquire an uncontrollable, at times destructive dynamics which will lead to a temporary stabilisation on another plane. And it is this instability which is creatively used by the artists practicing net activism: The politics of the Net are inseparable from the technological and juridical regimes that rule it. The trick, as in Bain's resonant architecture, is to find the resonant frequencies that make networked computers hum...

This kind of feedback has featured prominently in the artistic work of Japanese artist Seiko Mikami who implicates the perceptual system of the installation visitor into strongly involving techno-physiological feedback loops. Similarly, German artist Nikolas Anatol Baginsky has built intricate dispositions in which neural networks serve robotic installations to react with ever more simulated intelligence and precision to a visitor's presence.

We encounter an even more direct confrontation with the physical efficacy of networked data realities in Ulrike Gabriel's project Sphere. This project is based on the construction of a data body which is an abstract and externalised representation of the Internet user. This 'sphere' can be used as a kind of tele-bomb to shoot down the network terminal of another user. The trajectory of this projectile moves across IP-space of the Internet which is mapped back to the geographical coordinates of the globe. On a precisely calculated orbit, the projectile of the data-sphere effects electromagnetic turbulences on the computers it passes on its route, before the sphere forcefully hits its target and temporarily disturbs the electrical field on computer screens, in projections and light sources. As in other works of Ulrike Gabriel, we experience an intense and violent articulation of technology and perception, of cybernetic systems and physiological experience. The network is the site at which digital presence is constituted, medialised and consumed. The medialisation of this confrontation is the electro-magnetic resonance of the data-body on its trajectory

through the physical space of the network. The subject of this medialisation emerges from the sharp, edgy interface between body, information and trajectory, a phylum which resonates at the frequency of fear.

#### 4. In the Guts

When a heavy sound hits us, it reminds us of the physical nature of the sound wave, and of the material presence of our bodies in space. Think of the moment when you are sitting somewhere inside and a truck waiting outside turns the whole building, including yourself, into a resonating instrument. The sound is, at the same time, disembodied and non-directional, as well as penetrating deep into our guts.

In electronic music and sound art, the relationship between technology, space and the human body as it is sculpted by resonant sounds has been explored in depth. The visually and sonically excessive performances by Granular Synthesis overwhelm the viewers and deliberately blur the boundaries between image, sound and body in aggressively immersive spatial configurations. Quite differently, La Monte Young's long-term installation *Dream House* (1993-2003) which can still be seen at the MelaFoundation in New York until next year, finely sculpts a sonic environment which envelops the visitor and gives him a strong sense of space, place, and the effect that his own movements in the space are having on the sonic conditions of the space.

A set recently played at the dis-patch Festival in Belgrade (Cinema REX, 23 Oct. 2003) by Swedish musician Andreas Berthling and a trio called Tape travelled precisely on the boundary between pure resonance and the coded sound of music. With his computer, Berthling created very lush, standing sound waves which turned the performance space into a single continuous sound object, whereas his co-musicians played different acoustical instruments that were able to break the continuous envelope and define time, place and musical meaning through their rhythmic and partly melodic play. The performance oscillated between the disembodied and subjectless experience of the resonant sounds, and the structured musical interventions. It was possible to experience that music is the representational mode of sound, transcending the purely physiological impact of the sound waves on to a semiotic level. Resonance is a function of the disposition coupling space, sound, technology and bodies into a heterogenous machine. In contrast, music works with the separation and the decoupling of space, sound and body through rhythm and melodic structures which subjectify the listener by placing him in a context of semiotic systems and modes of socially meaningful sonic representations.

Is the contrast between resonance and music homologous to that between "becoming machine" and "becoming subject"? The electronically induced resonant wave forces a transgression which can be described as cyborgian, as was attempted by British music theorist Kodwo Eshun when a few years ago he talked about the vocoder as a technico-musical instrument for narrowing the gap between human and technological music machines.

In one of the most impressive pieces of network-based art so far, the group Knowbotic Research created the installation *Anonymous Muttering* which was first presented in Rotterdam in 1996. In their self-developed connective interfaces, Knowbotic Research have, for many years, explored the possibilities and the conditions of networked action and cooperation. *Anonymous Muttering* is their most radical gesture as yet in the direction of a dramatisation of the interface in which dislocated subjects resonate in a translocal, techno-social environment. For this installation, the music from DJ-events is transmitted, digitised and cut up by a computer into small,

granular sound units which are in turn recomposed in a felt-like sound surface according to parameters of probability. These sounds are projected in the installation which is delimited by two circles of stroboscopic lights and a loop of loudspeakers. A silicon membrane, through which the data flow, is placed in the installation. It can be bent, turned and folded by the visitors who thus fold and modulate the felt of sound. A similar, net-shaped JAVA interface on the website of the project can be pushed and pulled in a similar fashion by visitors of the website who can thus interact in realtime with the same sound events that are also projected into the on-site installation and follow it through a live-stream on the net. The productive tension between local and trans-local possibilities of intervention, between human and technical agents can be experienced as an irritating and overwhelming oscillation between order and sheer perceptive, de-subjectified sublimation. Anonymous Muttering sends bodies spinning, with eyes and ears, humming and hovering in a space that is all light and sound, without boundaries. Resonating in perception.

## 5. On a Different Note

I would like to end on a note that is different from this rather romantic fantasy of immersion and transgression. In their most recent work, *Minds of Concern*, the group Knowbotic Research invite gallery visitors to choose from a list of selected NGOs whose Internet servers are subsequently port-scanned in order to discover potential security risks on those servers. The results of these port-scans are published in a news-ticker on the website, though in encrypted form. The project *Minds of Concern* seeks to raise awareness around the contested public space of the electronic networks in which the most progressive agents often run the greatest risk, and it wants to point to the dilemma that the enlightened, liberal NGO world needs to protect itself and police the technological boundaries of the very zones of liberty that it opens up.

In our present context, *Minds of Concern* is relevant because it rejects a notion of resonance, in which the wires would start to hum, and instead uses the principle of syncopation, the hard rhythm of the exploitation tools scanning and attacking the outer shells of the Internet server. While network resonance is a fascinating and potentially beautiful phenomenon to study, the urgency of the political situation, in which the war that was declared in the days after September 11th continuous to rage and penetrate deeper and deeper into our lives, in this situation we may not want to seek the immersion of resonance but the syncopated subjectivation of port-scan reality.

## Online references

Nicolas Anatol Baginsky - <http://www.provi.de/~nab>  
Ulrike Gabriel: Sphere - <http://www.codelab-berlin.de>  
Paul Garrin: Name.Space - <http://name-space.com>  
Knowbotic Research - <http://www.krcf.org>  
Seiko Mikami - [http://bionet\\_org.tripod.com](http://bionet_org.tripod.com)  
Marko Pejhan/Carsten Nicolai: POLAR -  
<http://www.canon.co.jp/cast/artlab/artlab10/>  
RTMark - <http://www.rtmk.com>  
Atau Tanaka: Global String - <http://www.sensorband.com/atau/>  
Herwig Weiser: zgodlocator - <http://www.zgodlocator.org>  
La Monte Young: Dream House (1993, NYC, The Mela Foundation)  
<http://melafoundation.org/dream02.htm>

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