

# Growing Networks

[Art Projects by Thomas McIntosh and Roman Kirschner]

It doesn't look especially chaotic or complex, but rather clear, simple and transparent. It is a strong image, and the sound fuses with it in a natural way. Its name is *Ondulation*, which literally means "wavelike movement." An ondulater, by the way, is a converter or transformer, and that word, too, is perfectly appropriate. **Thomas McIntosh** – architect, artist and the creator of *Ondulation* – describes it as a composition for water, sound and light. It consists of a basin filled with 2,000 liters of water, which is gently made to move by sound coming from speakers installed underneath. A pattern of waves arises on the surface of the water. Beams of light trained on it reflect this pattern onto a projection screen on the wall. The water, according to McIntosh, becomes a liquid mirror: it forms a direct, three-dimensional rendering of the musical composition issuing from the speakers under the basin. The sound, the wave movements in the water, and the images on the screen reflected by the light all correspond.

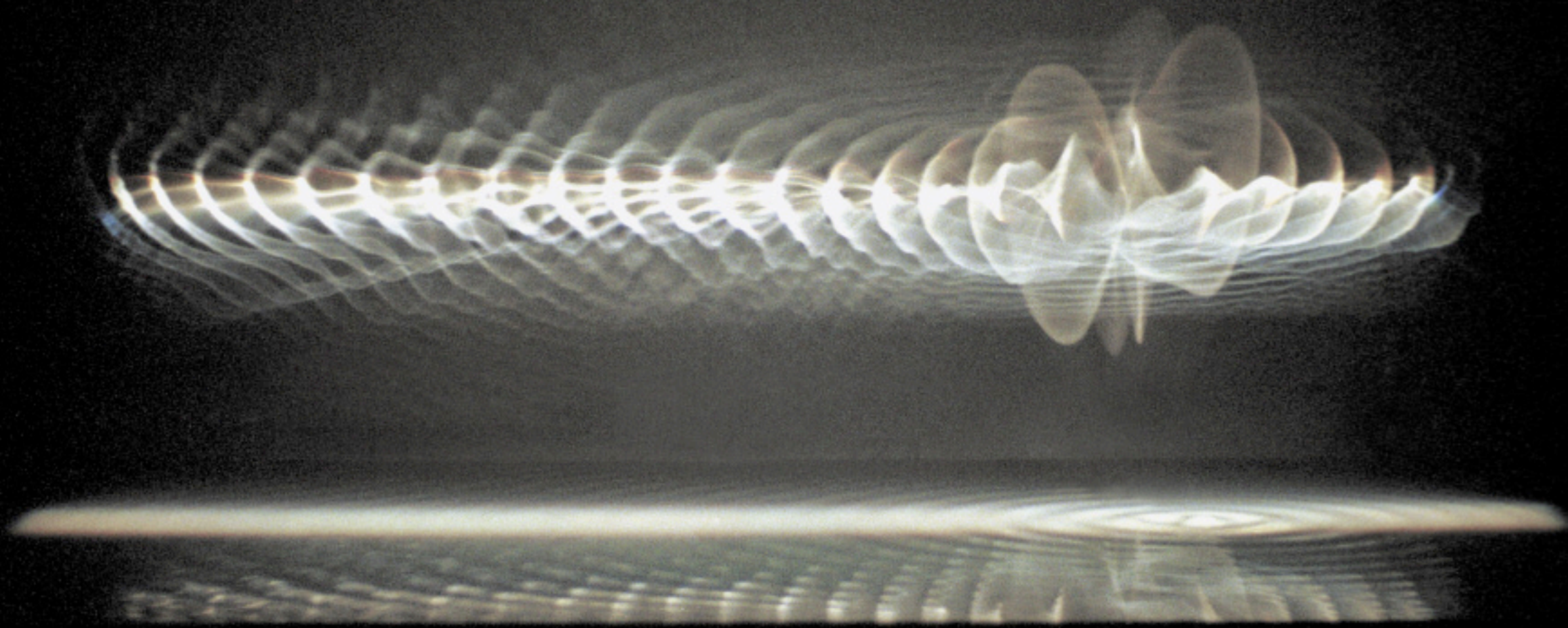
*Ondulation* is, first of all, an impressive example of a work in which image and sound go together perfectly. It is a work in which conversion comes about not by means of computer algorithms that guide image and sound or convert computer-generated beats into abstract visual patterns, but by water, or more precisely, by the complex way in which waves form, move through the water, collide with each other, and form new patterns, which in turn move through the water (and through time). In this respect, *Ondulation* affords a direct view of what we could call natural beauty – the laws that govern the behavior of nature, in this case water. These laws are difficult to capture in mathematical analogies. The displacement of air, in the form of sound waves, is converted into waves in a liquid. Invisible yet audible waves are rendered visual in a liquid medium.

This description gives an idea of what *Ondulation* does, and of the sensory and aesthetic experience it calls forth. *Ondulation* makes a process visible and thereby offers insight into the interaction that takes place between waves in a liquid medium. We can observe a similar process when we look



Thomas McIntosh, *Ondulation* (2004)

at the ocean, throw a stone into a pond, or allow ourselves to be enchanted by sunlight reflected on the ripples in a canal, although those "systems" are more open than *Ondulation's*. In *Ondulation*, the sound waves in the water basin form a more or less closed system – one which, for example, is disturbed only by people stomping past or visitors who cannot resist tapping on the glass of the basin to create new waves. The piece was not designed for such user interaction. *Ondulation* shows us an interactive process, one which begins simply, with a single note that produces the first wave, and gradually becomes more and more complex, in accordance with the progression of the sound composition and the interaction between the waves colliding in the water.





*Roman Kirschner, Roots (2005–6)*

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The Austrian artist **Roman Kirschner** created a piece called *Roots*. Wires hang in a brownish-green liquid. The liquid is a special mixture which has to sit for two weeks prior to the exhibition so that the correct ingredients can sink slowly to the bottom. Within this mixture, a kind of iron crystal grows steadily from the wires. The wires forge connections, intersect, and sometimes separate again. The constellation of iron crystals slowly changes and adapts under the influence of the environment and the connections that have been made and lost. The whole thing has an organic feel. Bubbles rise to the surface like jellyfish (as Kirschner wrote). The network of iron crystals resembles a bush. Now and then pieces break off, or whole branches, causing thicker and thicker clouds of dust to rise, gradually throwing a shadow over the scene.

There is electricity running through the sculpture of wires. The current causes the wires in the liquid to grow and transform. The process is an interactive one: the growth of the network changes the routes and directions



of the electric current, which has consequences for the development of the network. It is not a process in which one actor acts on another and that actor subsequently reacts, but rather one in which the various actors continuously influence each other. This process plays out in a liquid that functions, one might say, as the surroundings, the environment, that makes specific interactions possible.

Kirschner makes the process of the network's growth (and deterioration) audible. The wires are connected to a computer, and the voltages at the ends of the iron crystals are sent through resonance filters, which convert

the current into sound. With the visual connection to the iron crystals in the fluid, it creates the impression of an orchestra of bubbles rising to the surface – even though a 4/4 pulse is programmed in the software.

*Roots'* background and the implicit statements it makes about the development of technology and its links to the philosophy of technology may also be of interest. The idea of an environment could be a reference to the ideas of the French philosopher Simondon, who outlined a very idiosyncratic view of the development of technology in *Modes des existences des objets techniques* (1958). Simondon considered the development of technology to be an evolutionary process comparable to biological ones – with which he sees parallels as well as differences. In contrast to most technophilosophy of his time, he did not consider nature and technology opposing terms. For Simondon, technology is never just an "instrument" or a machine. Rather, it consists of ensembles: relationships between instruments and machines, between people and machines, between people and the environments in which they use machines, and between people and the materials they interact with. Interaction between an open or closed system and its environment is also central in his view. Maturana and Varela would describe a similar process in the 1970s as "autopoiesis"; Simondon used the term "individuation." He emphasized that it concerns a process of continuous change, influenced by formative and informative impulses from the environment, and adaptation to it. Technology, likewise, is not a finished product but a continuous process that forges new connections again and again, and re-configures and re-produces its relationships with the environment and people. Simondon's philosophy does not assume that there are stable systems, nor even that systems search for equilibrium; rather, he assumes a situation in which everything is metastable – stable on the verge of instability.

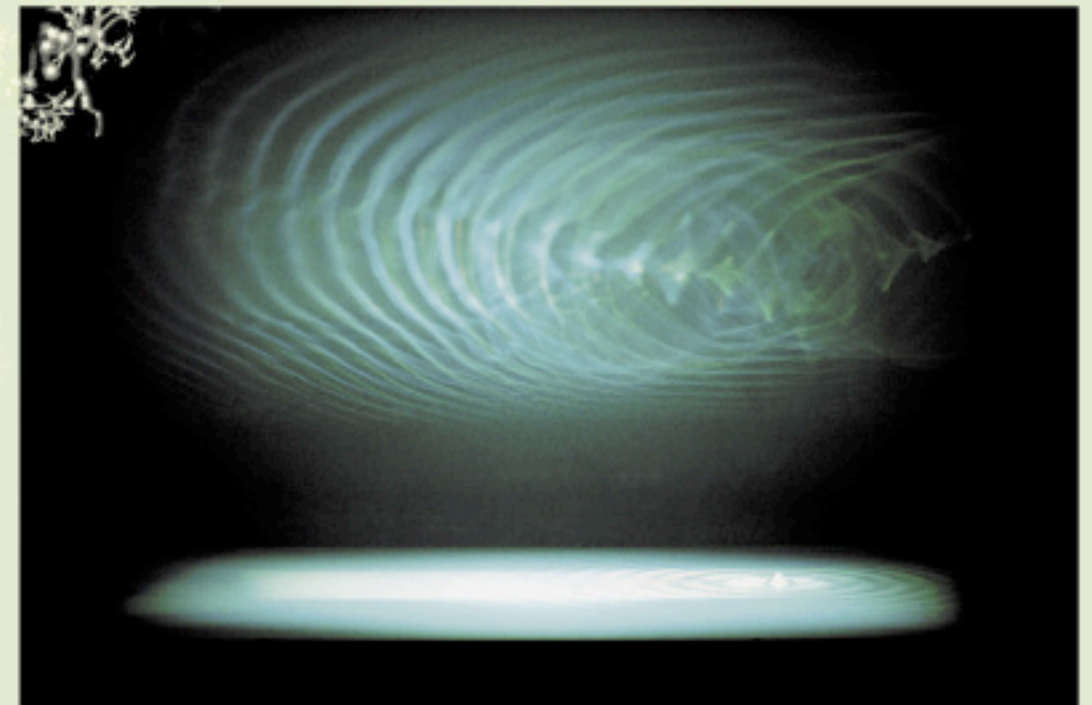
In this context, "unstable" is a positive term: it denotes a system or network that is able to change, adapt and continuously develop. This is how it manages to survive. The outcomes of processes in such a network are not fixed – they depend on interactions and exchanges between the (changing) elements in the network and (new) elements from outside with which the network enters into a relationship.

What Simondon approaches in a philosophical manner, *Roots* shows in an artistic way. Kirschner himself explicitly states that he owes a debt to the work of the eccentric English cyberneticist Gordon Pask, who died in 1996. Pask's ideas – for example, his theory of conversation, knowledge construction, and interaction between actors – are currently being rediscovered, mainly by artists. In 1961, in *An Approach to Cybernetics*, Pask argued that it was possible to build chemical computers. Specifically, he argued that chemical computers are made possible by the fact that an active evolutionary network develops out of interaction between electrochemical processes.

In the 1950s, Pask built machines with sensors that made them sensitive to outside influences. He regarded a "computer" as an open system. Kirschner's *Roots* is a homage to this idea of Pask's, and a concrete representation of it – what takes place in the tank of liquid is an electrochemical process through which a network evolves. It is also a tangible reminder of an era in which people were far from certain what a computer was or what it should do, and dreamed of computers coming to life.

Both *Roots* and *Ondulation* show us interactive processes – one chemical, the other physical. Each also allows us to perceive a conversion through our senses – the conversion of sound into image and of an electrochemical process into sound. Neither *Roots* nor *Ondulation* does this through interaction with users. As works of art, they are, as it were, closed systems, outside which the observer stands, watching and listening in admiration, absorption or interest.

Arie Altena



Thomas McIntosh, *Ondulation* (2004)