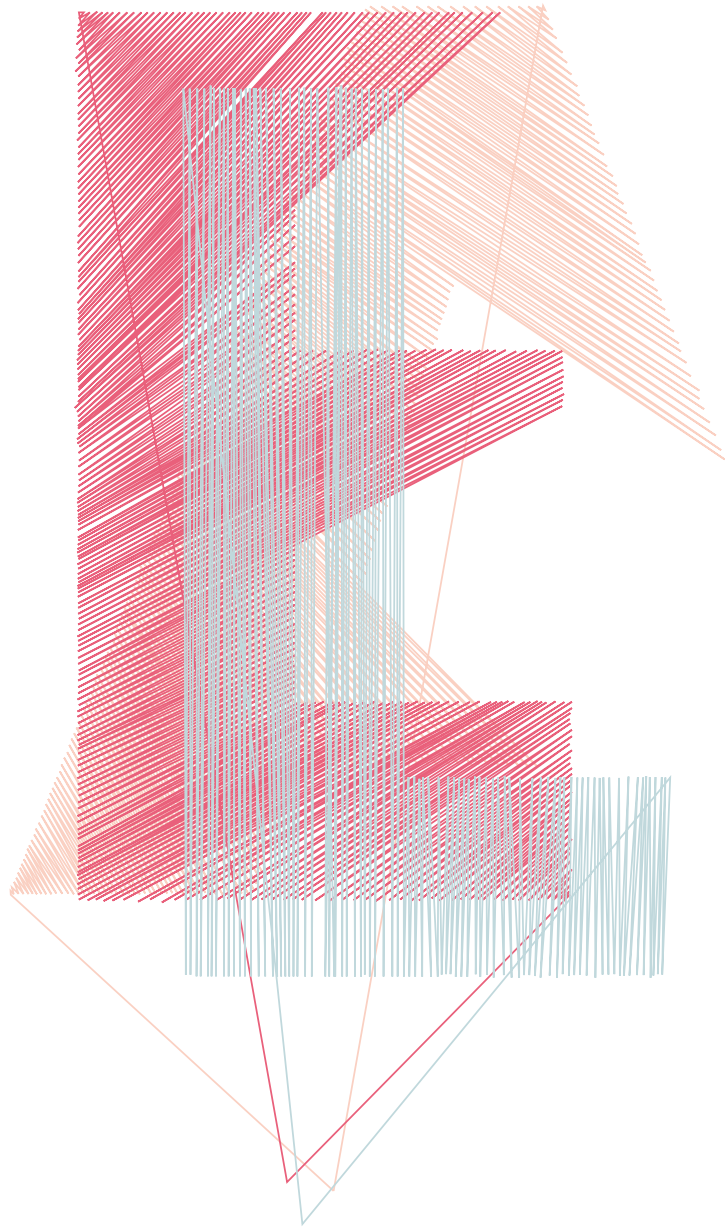
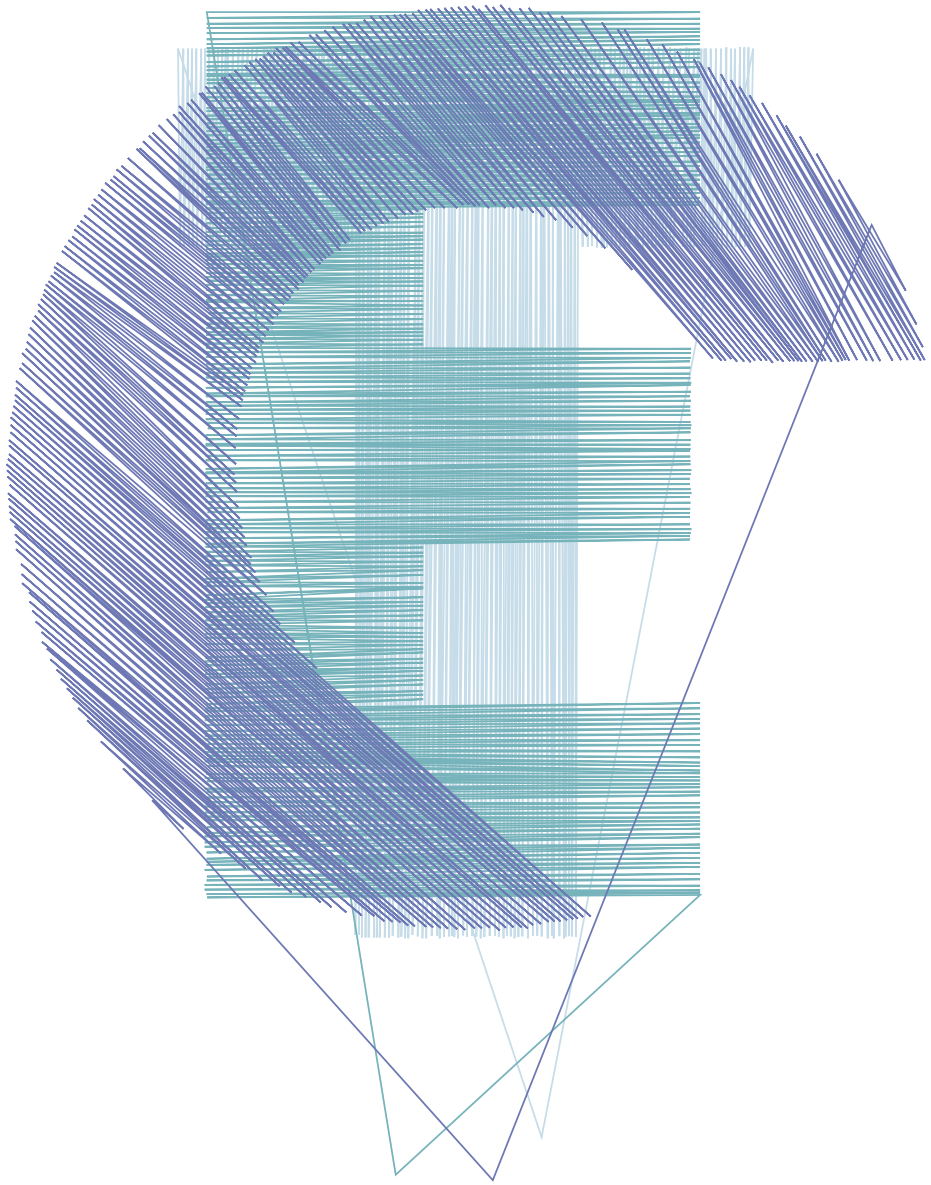
THE AFLECTRO SONIC

Sonic Acts Press 2011





IMAGINARY LANDSCAPES OF ELECTRICAL NATURE

or, a Journey Along Some of the Inspirations for the 2011 Kontraste Festival

Arie Altena

Man on telephone pole works on changing the lines, ca. 1940.

In the spring of 1939 John Cage, then just 26 years old, wrote a composition for two variable-speed turntables, frequency recordings, muted piano and cymbal. The piece is meant to be recorded in a radio studio and presented as a broadcast or recording. At the time Cage was experimenting with the possibilities of the radio studio for composing music, and he prescribed how the sound was to be picked up by four microphones. The piece premiered live on 24 March 1939 as part of a "Hilarious Dance Concert" – actually a dance class – at the Cornish School in Seattle, and was performed by John Cage, Xenia Cage, Doris Dennison and Margaret Jansen. Two of the four performers operated two variable-speed phonograph turntables. One played a Victor constant frequency test recording (catalogue number 84522B) and a Victor constant note record (#24, catalogue number 84519B), the other played another Victor constant frequency test recording (84522A). Cage's use of turntables can be seen as a crude example of handmade "electronic" music. The frequency recordings were normally used to test if the speed of a gramophone was correct and stable. Varying the speed of the turntable changed the sound, a method which is to some extent comparable to modulating a sine wave.[1]

IMAGINARY LANDSCAPES

Cage entitled his work for two turntables *Imaginary Landscape* – the first one in what would become a series of five. *Imaginary Landscape #4* (1951), probably the most famous, uses a different source of electronic sound. Twelve radios are operated by 24 players – two performers are stationed at each radio, with one tuning into the radio stations, while the second controls amplitude and timbre.

The title *Imaginary Landscape* seems to indicate that the sounds evoke a landscape. The texts Cage wrote about these works mainly deal with the compositional methods; critics have stressed the indeterminacy of the compositions and Cage's radical proposal to use all possible sounds and noises as music. Perhaps the title is not that important. Nevertheless it is intriguing that Cage's first electroacoustic composition is presented as a landscape. Maybe we should see it as an imaginary depiction of the landscape of electricity? Electromagnetic waves travelling through the air? It sounds somewhat like it. But rather than a depiction in the sense of Romantic program music – imitating the sounds of a little brook, singing birds or a furious storm, as in Ludwig von Beethoven's *Sixth Symphony* – it is as if the metaphor of a "landscape" grafts itself onto such an arrangement of sounds. The sounds evoke something in the brain of the listener for which one is inclined to use the word "landscape".

1. Later performances of *Imaginary Landscape #1*, like John Cage – *Imaginary Landscapes*, hatART CD 6179, (1995), do not use turntables, but for instance an oscillator and a Yamaha DX7 as the test recordings are not available anymore.

INTRODUCTION

Bruce Davis of the World Soundscape Project recording with a stereo Nagra machine, June 1974.

World Soundscape Project recording setup at Westminster Abbey, Mission, B.C., Canada, summer solstice, June 1974.

Pierre Schaeffer, 1979.

SOUNDSCAPES

The word "soundscape" did not exist in 1939; it came into use as late as the 1970s with the Vancouver Soundscape Project led by the Canadian composer Murray Schafer. Schafer defined soundscape in his 1973 pamphlet *The Music of The Environment* as: "the vast musical composition which is unfolding around us ceaselessly".[2] He quotes Cage: "Music is sounds, sounds heard around us, whether we are in or out of the concert halls (cf. Thoreau)"[3] and, referring to Cage and *musique concrète* states that, "This blurring of the edges between music and environmental sounds may eventually prove to be the most striking feature of all 20th-century music".[4]

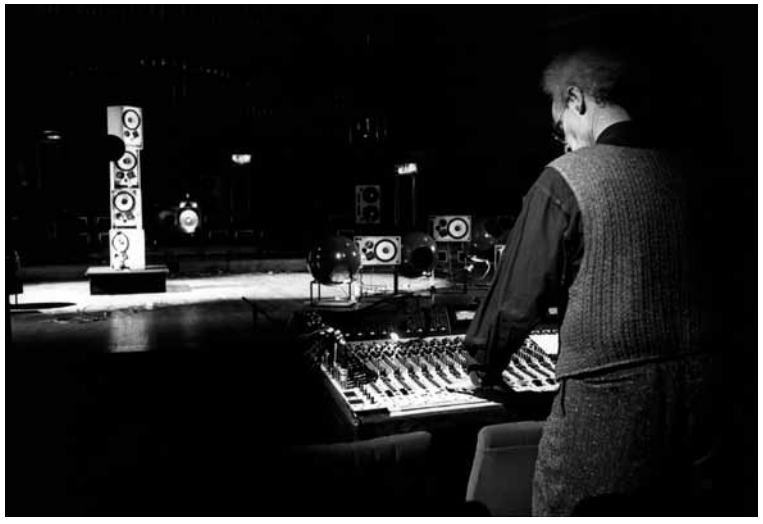
Both Cage's and Murray Schafer's approaches are ecological – but not in the same way. It is Cage who included the electrical soundwaves of everyday in his works. Where Cage favoured a truly all-inclusive approach allowing all sorts of noises and sounds in his compositions, Murray Schafer and some of those who followed in his footsteps favoured an approach of recording existing soundscapes, and of listening to these soundscapes as an exercise in opening our ears to the beauty of the environment.

MUSIQUE CONCRETE

Cage's first *Imaginary Landscape* predates Pierre Schaeffer's experiments with tape music by almost a decade. On 5 October 1948 Schaeffer's *Cinq études des bruits* (1948) premiered in a radio programme entitled *Concerts des bruits*. The five studies are the earliest examples of *musique concrète*, and exclusively use recorded sounds. Schaeffer composed these pieces in the Studio d'Essai – he had already been experimenting in radio studios for some years. He would continue on this track, establishing the *Groupe de Recherche de Musique Concrète* (GRMC) in 1951, after meeting Pierre Henry, with whom he collaborated on many different musical compositions. The GRMC would become the GRM in 1958.

In 1948, operations such as sound transposition, looping, sample extraction, and filtering were available in radio studios, but the processes were complex and time consuming. The early *musique concrète* by Schaeffer, Henry and others was pasted together by hand. For Schaeffer, using the sounds of the world as a compositional resource was also an attempt to reconstruct music from the bottom up: starting with the sound object (*l'objet sonore*), instead of working with received ideas about instruments, harmony, or melody. At the basis of Schaeffer's music was a totally new phenomenology of music and listening.[5] In a way quite different from Cage, *musique concrète* creates landscapes of sounds.

2. Quoted here from Christoph Cox and Daniel Warner (eds.), Audio Culture. *Readings in Modern Music*, Continuum, (London, New York, 2004), 29.
3. *Ibid*, 30.
4. R. Murray Schafer, *The Soundscape. Our Sonic Environment and the Tuning of the World* (Rochester: Destin Books, 1977 / 1994), 111.
5. See Daniel Teruggi: "Technology and *Musique Concrete*: The Technical Developments of the Groupe de Recherches Musicales and Their Implication in Musical Composition", in *Organised Sound,* vol. 12, no. 3, 2007, 213–31; and, for instance, Michel Chion, *Guide To Sound Objects. Pierre Schaeffer and Musical Research* (Paris: Ina, Edition Buchet Castel; translation by John Dack, 2009 / 1983).



The Acousmonium.

François Bayle playing the Acousmonium.

Etude aux chemins du fer is a recording, manipulation and arrangement of train sounds which transports the listener to a train station, and into a train: it becomes a journey through a landscape, through sound.

SPATIAL SOUND

Many of the composers who started working with electronic sounds in the 1950s experimented with the spatialisation of sound. Stockhausen famously used rotating loudspeakers to achieve a space effect. Schaeffer and Pierre Henry distributed speakers throughout a space. Their engineer Jacques Poullin built a *potentiomètre*, a system using induction coils to spatially control the sound. On stage, the *potentiomètre* allowed a performer to position a sound either to the left or right, above or behind the audience by moving a small transmitter towards or away from four somewhat larger receiver coils arranged around the performer.[6] The effect is that a sense of space is created for the listener.

François Bayle, who took over the direction of the GRM in 1966, further explored this approach and in 1974 commissioned the design of a massive loudspeaker orchestra. The Acousmonium is an orchestra of up to 100 speakers of different sizes placed across a stage at varying heights and distances. Their placement is based on their range, power, quality, and their directional characteristics. When built, Bayle stated: "It puts you inside the sound. It's like the interior of a sound universe." The Acousmonium was conceived as "another utopia, devoted to pure listening, (...) as a projection area, arranged for the immersion in sound, and a spatialised polyphony".[7] Such a spatial sound landscape is just one step away from a sound or audiovisual installation that can be explored interactively by an audience.

ELECTRICAL LANDSCAPES

How "electrical" are these imaginary landscapes, sound environments and spatial compositions? Cage's *Imaginary Landscapes #1* and *#4* use electricity, but neither of them fits comfortably in a narrower history of electronic sound. If these landscapes are electrical, then it is primarily because they imagine a landscape of electricity, of radio waves, and electromagnetic fields. Schaeffer's *musique concrète* is not purely electronic in nature – its source material consists of recorded concrete sounds. Rather, both examples point to a certain use of the idea of a landscape of sound in a broader history of electronic sound. On the other hand, both Cage and Schaeffer were experimenting with sound propagated in an electronic way, and carefully researched the nature, effects and aesthetic possibilities of such sounds.

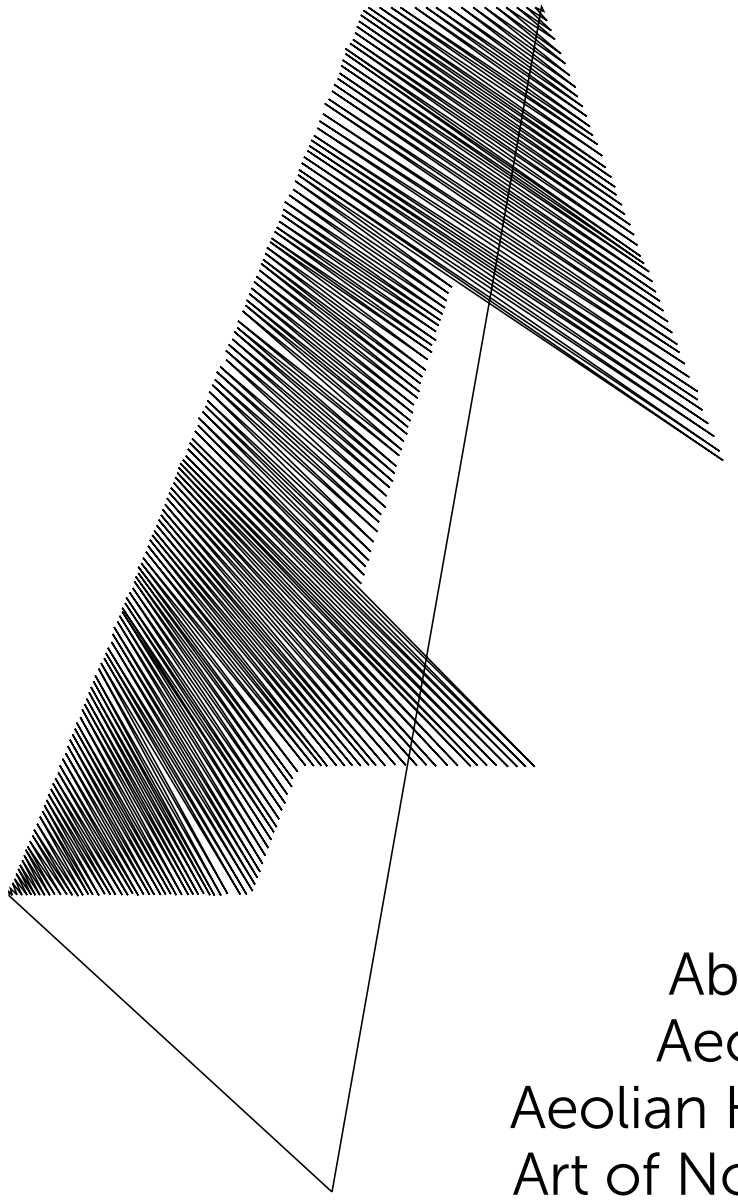
6. See Teruggi *op. cit.*, 218.
7. See François Bayle, *Musique acousmatique, propositions... ...positions* (Paris: Ina-GRM-Buchet/ Chastel, 1993).

Christina Kubisch,
Electrical Walks.

There is also a real landscape of pure electricity. We are surrounded by electromagnetic fields. Apart from naturally appearing electromagnetic fields there are fields generated by electrical wires and appliances. Computers, mobile phones, street lights, security systems, surveillance cameras, elevators, ATMs, neon lights – all these create electrical fields. The electrical landscape is ubiquitous – and invisible. We have broadcast radio waves for over a century and can imagine how these transmissions are still travelling through outer space. And there is, for instance, the electrical activity in our brains, which can be measured and made audible.

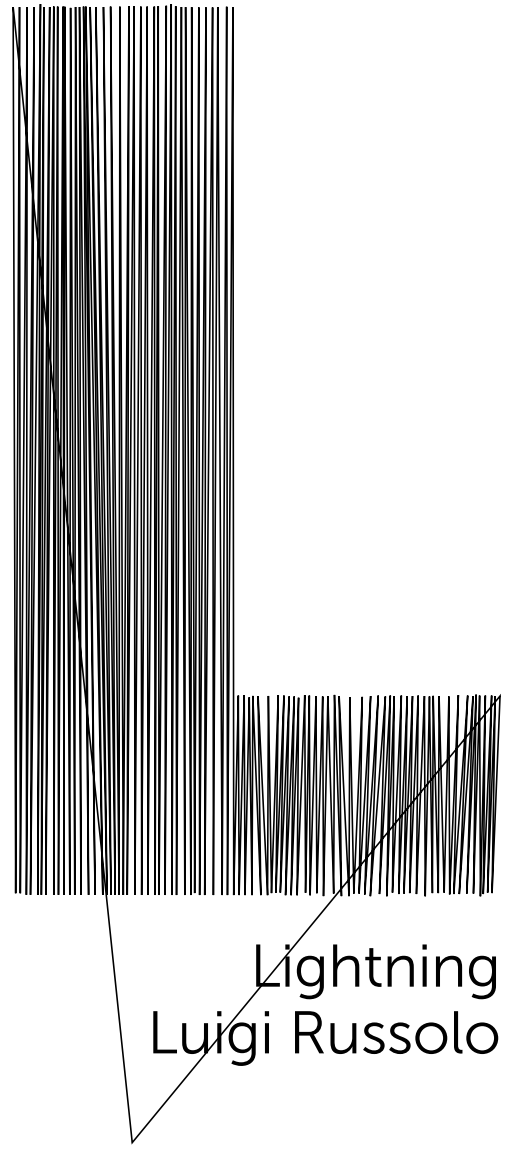
At the end of the 1970s, the German artist and composer Christina Kubisch started making works using electromagnetic fields. She developed special headphones that make electromagnetic fields audible and built several sound installations that listeners explored wearing these headphones. The headphones, which she continues to develop, respond to electromagnetic fields in the environment: the magnetic component is picked up by sensor coils, and after amplification, made audible by the speakers in the headphones. She has been creating *Electrical Walks* since 2003 to explore electrical landscapes. She maps a territory, identifying hot spots where the signals are strong or interesting, and creates a sound walk through this hidden dimension. What the listener hears during her *Electrical Walks* are predominantly sounds emitting from man-made electrical equipment. But there is natural electricity too, which is also picked up by the headphones. In an interview with Christopher Cox in 2006 Kubisch recounted: "This summer I put on my headphones during a very strong thunderstorm. There was no electricity, because all the power had gone out. But, when I recorded, I got the sounds of natural electricity, which was wonderful. The recording is so strange: very low, but very clear. At two points, you hear voices. You can't understand the words, but you can tell that they are voices. I knew that electricity could transport voices, but I had never heard it before. It's quite breathtaking when you hear things like that. This is nature, too – *electrical* nature!"[8]

8. Christoph Cox, "Invisible Cities: An Interview with Christina Kubisch", in: *Cabinet Magazine*, issue 21 Spring 2006, "Electricity" online www.cabinetmagazine.org/issues/21/kubisch.php. For a description of Kubisch' work see www.christinakubisch.de.

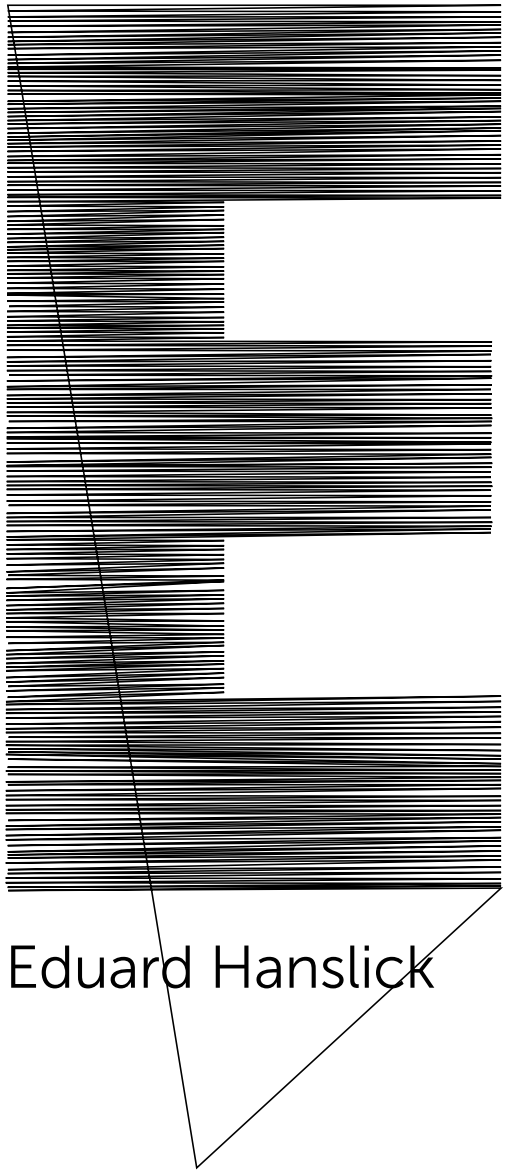


Abiotic
Aeolian
Aeolian Harp
Art of Noises
Atmospheres
Aurora

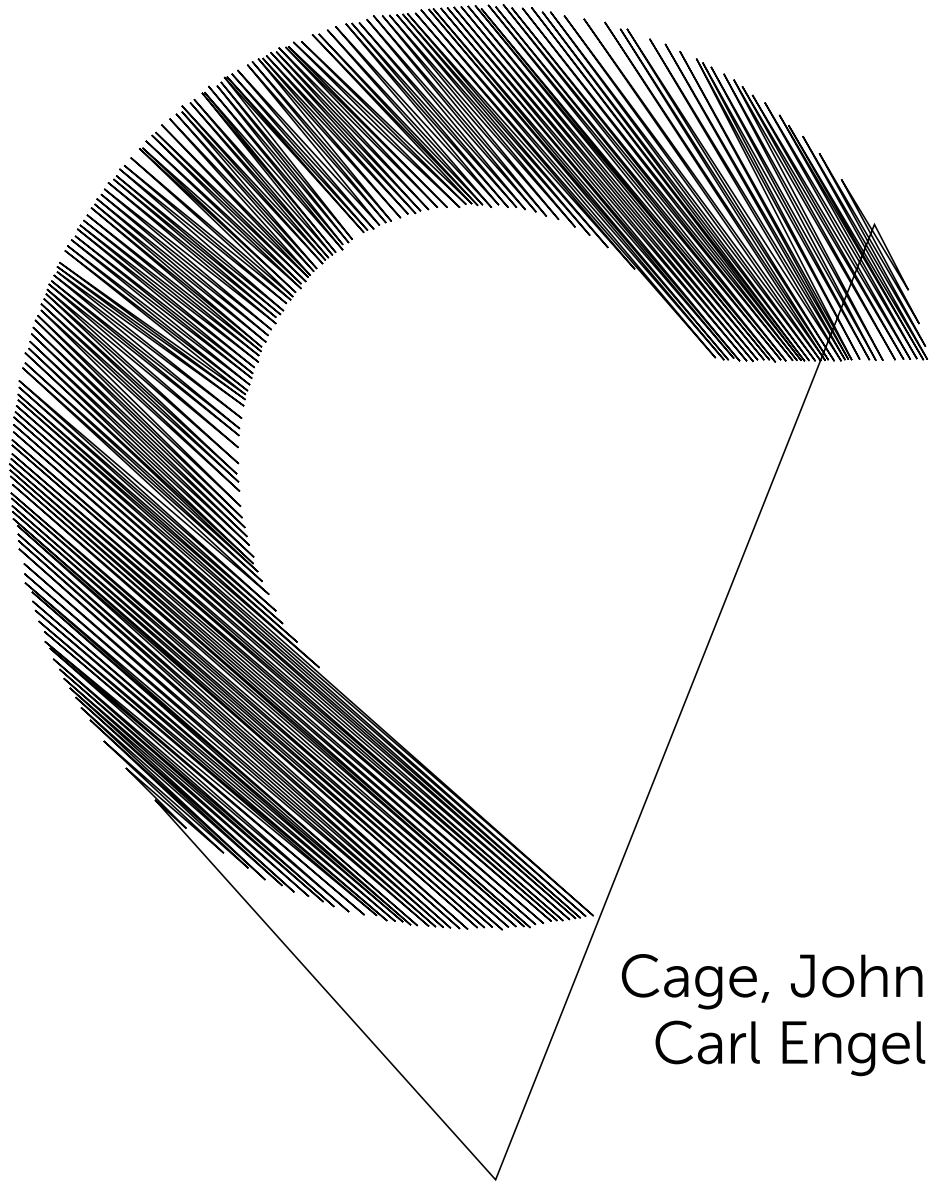
Electricity
Electromagnetism
Electroacoustic



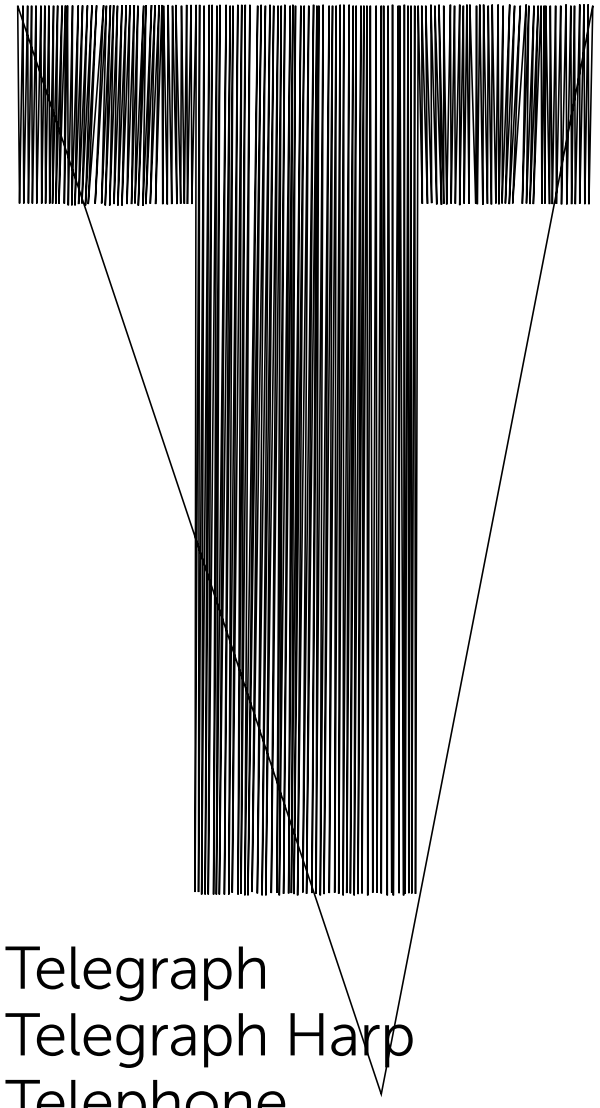
Lightning
Luigi Russolo



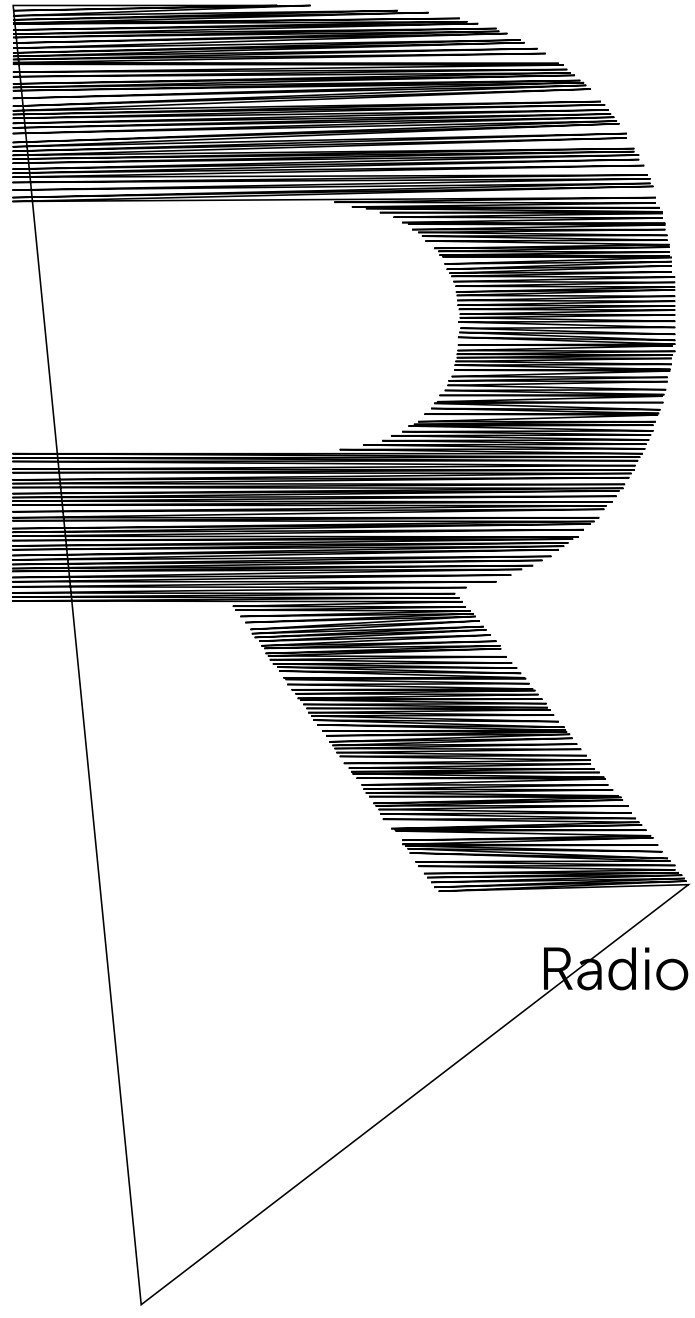
Eduard Hanslick



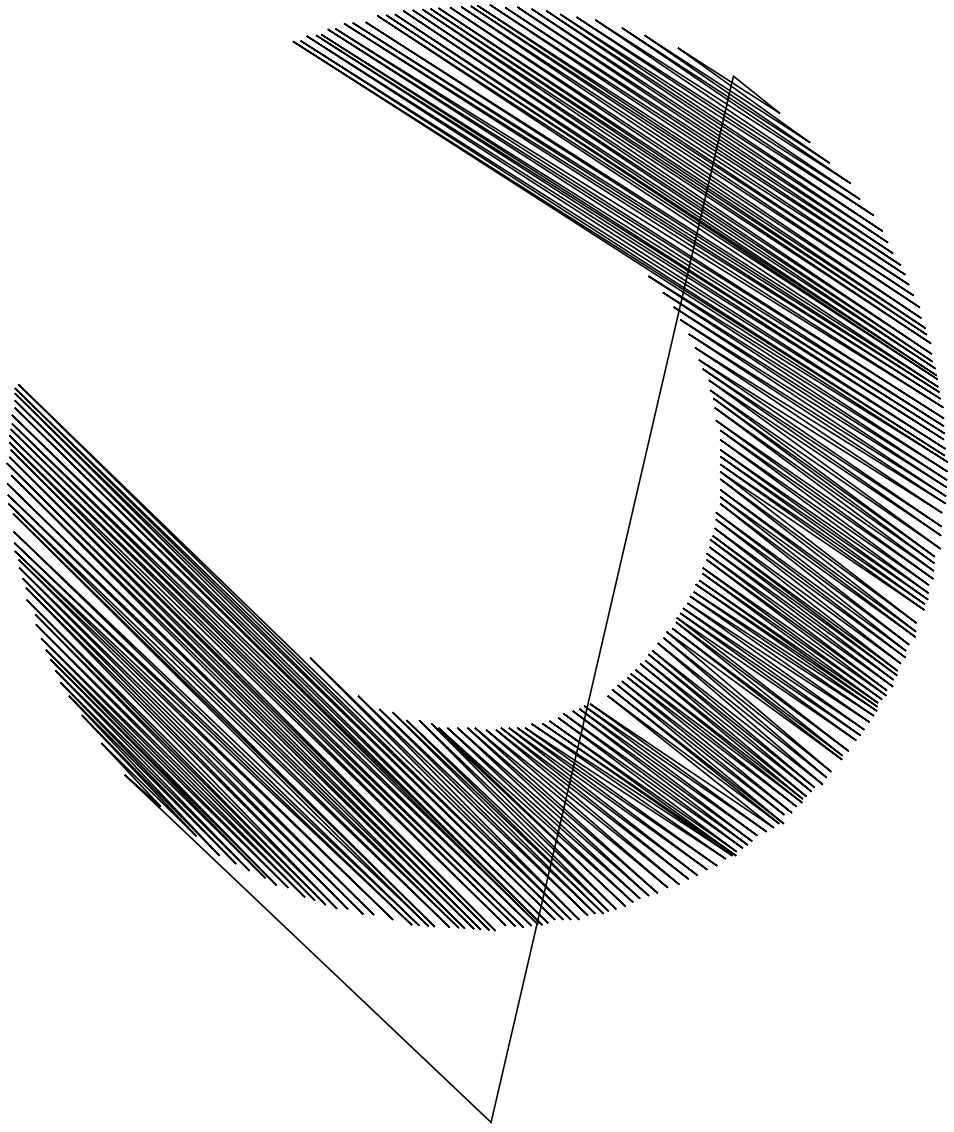
Cage, John
Carl Engel

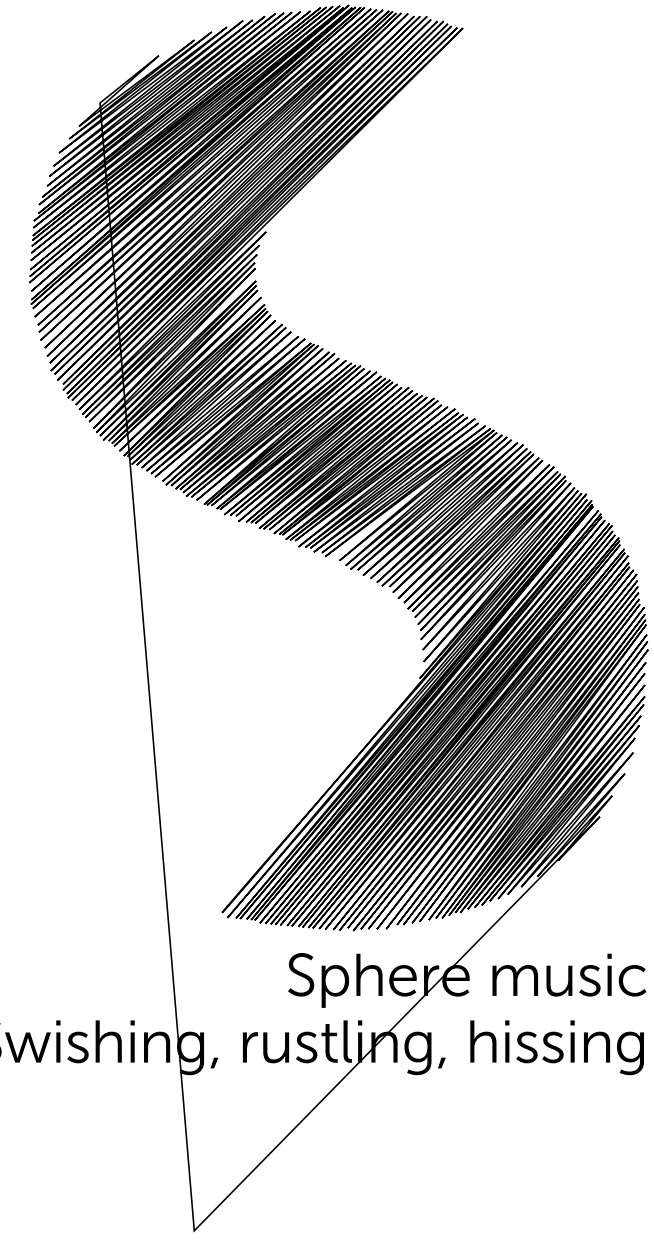


Telegraph
Telegraph Harp
Telephone
Telharmonium
Theremin
Thomas Watson
Thoreau, Henry David
Thunder

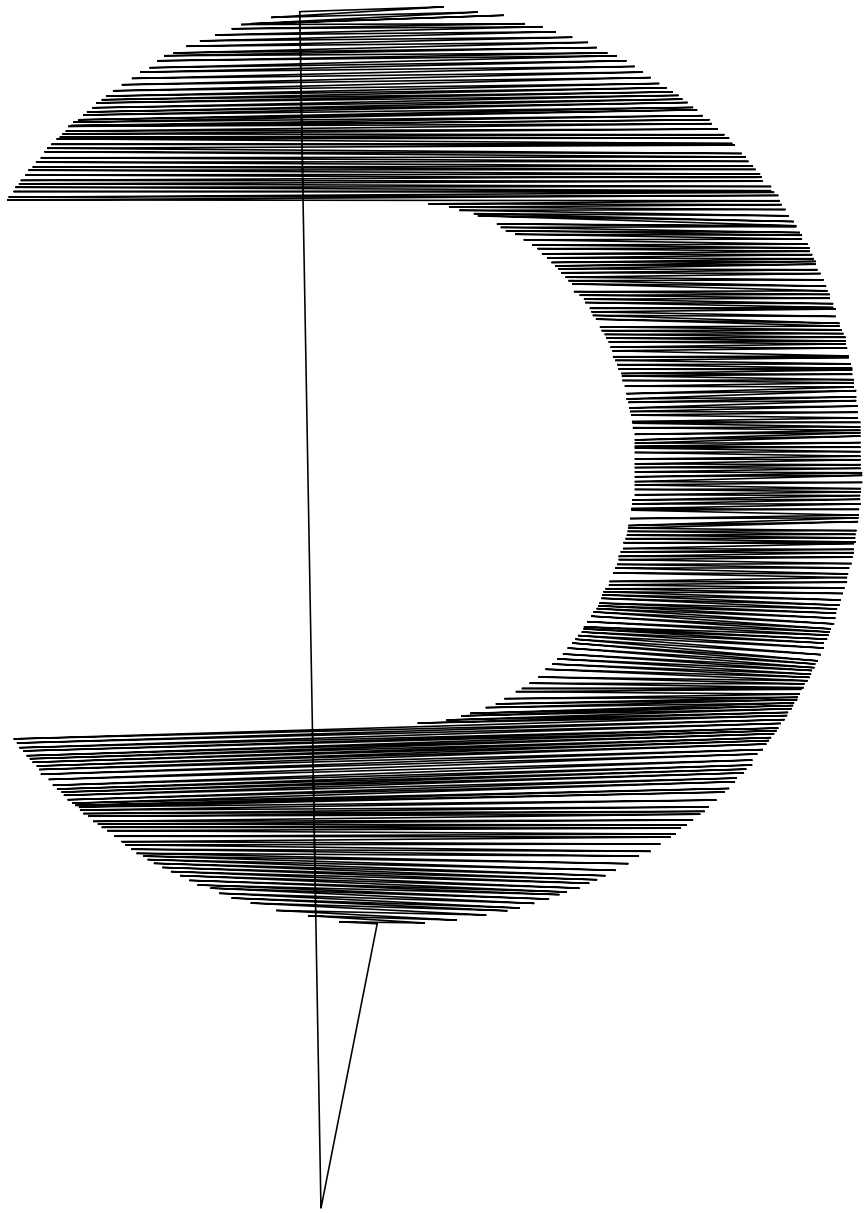


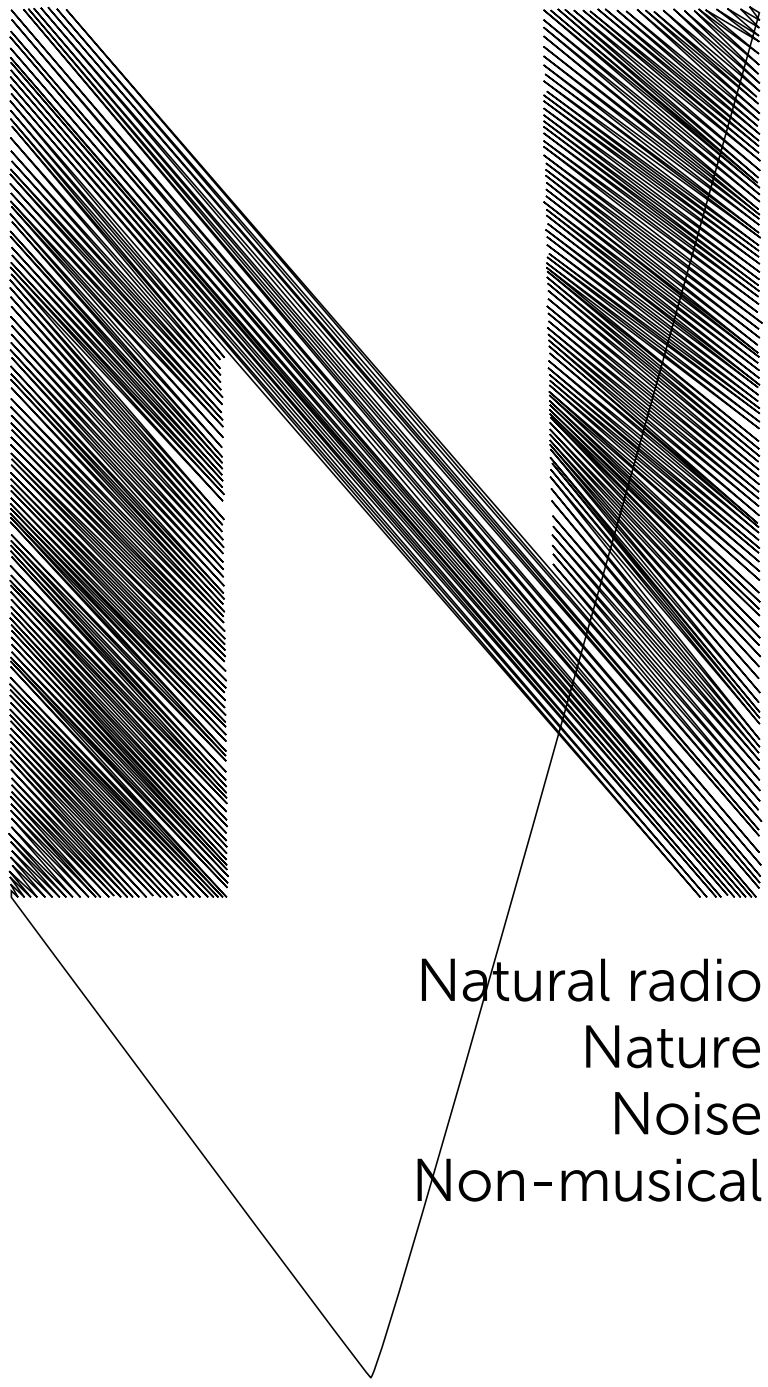
Radio



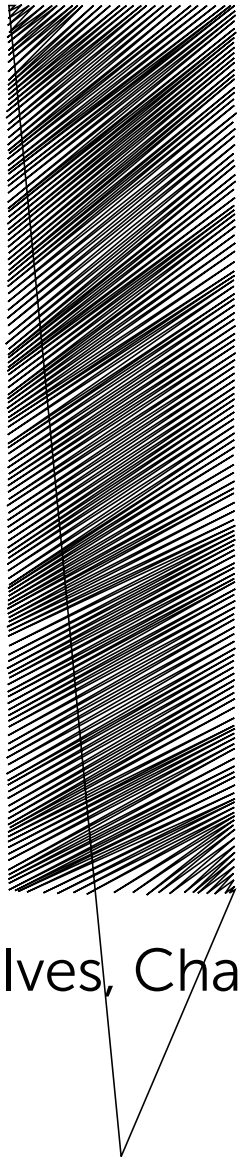


Sphere music
Swishing, rustling, hissing

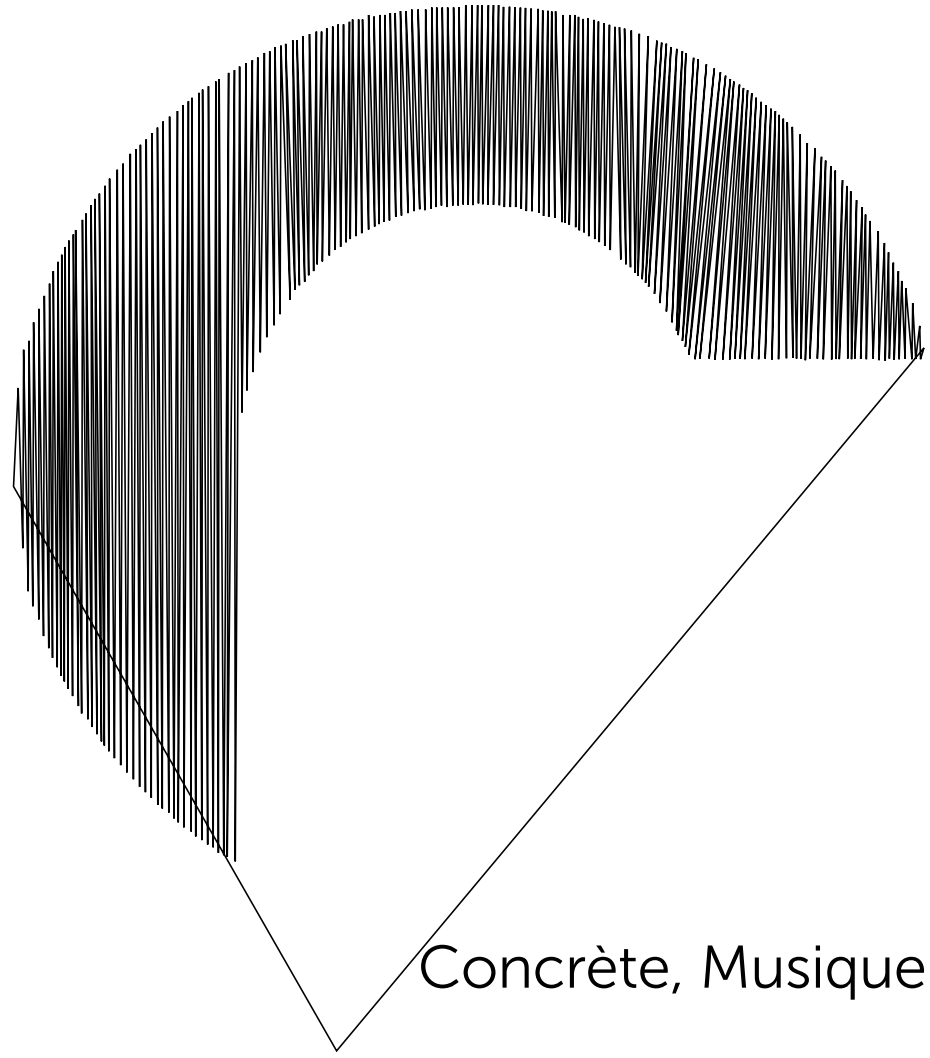




Natural radio
Nature
Noise
Non-musical



Ives, Charles



Concrète, Musique

BOTH HENRY DAVID THOREAU AND THOMAS WATSON WERE ENTHRALLED WITH THE SOUNDS OF THE WIRES

Repairing telephone lines,
Indonesia, June 25th 1948.

Map of telephone and telegraph connections, 1891.

SCIENTISTS STUDYING NATURALLY OCCURRING RADIO DISCUSSED "MUSICAL ATMOSPHERICS"

Three ALMA antennas.

Cyclone Clare, January 2006.

THERE IS A CORRESPONDING NATURE FOR ELECTRONIC MUSIC FOUND IN THE PHYSICAL NATURE OF ELECTRICITY AND ELECTRO MAGNETISM

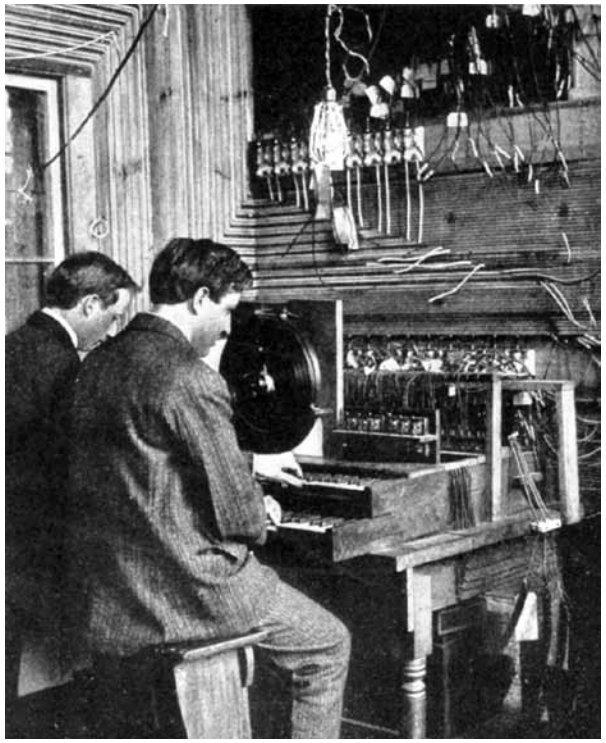
Lightning, Saturday 17 June 2006 .

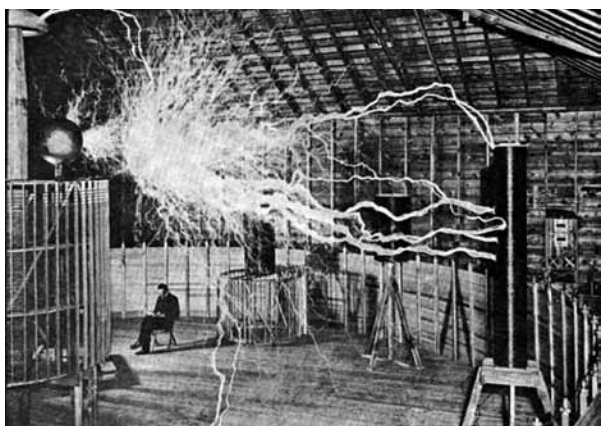
APART FROM THE CRACK OF LIGHTNING AND ITS ECHO IN THUNDER, AELECTRO SONICS CAN BE FOUND IN ATMOSPHERIC ELECTRICITY AND THE SOUND OF THE AURORAS

Polar aurora.

Douglas Kahn

for Heidi Grundmann





Musicians playing the Telharmonium, 1906. The electro-magnetic keyboard of Cahill's Telharmonium was attached to a 200-ton machine consisting of 145 different dynamos, each of which generated an alternating current of a specific frequency, ranging from 40 to 4000 Hz.

Leon Theremin performing a trio for theremin, voice and piano, ca. 1924.

Telephone wires, Tygart Valley, West Virginia, June 1939.

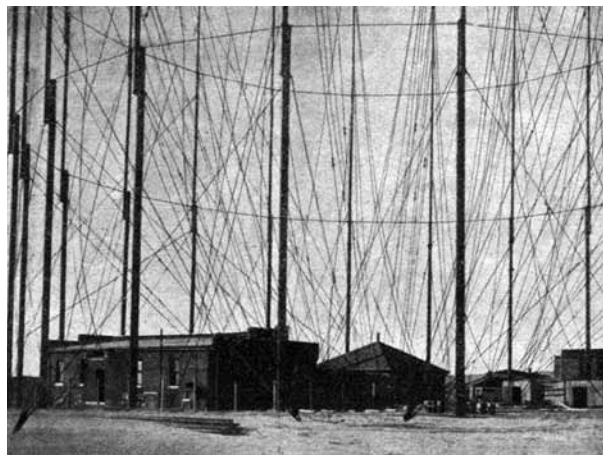
Publicity photo – using double exposure – of a participant sitting in Nikola Tesla's laboratory in Colorado Springs, December 1899.

What is the *nature of electronic music*? Not "nature" as in *the character of, a type of personality*, of electronic music, but nature as in Nature. It might seem like an odd question because electronic music is understood to be a technological phenomenon devoid of nature. Its histories are written almost exclusively as processions of technological devices, the sequence roughly being: the industrial-strength Telharmonium; the Theremin and other performance instruments; synthesizers and other instruments to be patched, programmed and performed; then computation which enabled the programmable incorporation of composition, performance and instrument design itself.

Before getting too far, let me briefly explain the term "nature". For the longest time, ecological discourse was about living things, that is, biotic nature. Ironically, anthropogenic climate change has given dominion to physics, to abiotic nature. Climate change has also diminished whatever fulsome meaning "nature" once may have had by eradicating the possibility of being separate from humans and human influence. Eco-theorists have been required to take rhetorical recourse to distinctions between nature/Nature, environment and ecology, but only because they need to talk about everything at once and nothing seems adequate to the task.

Luckily, I am merely focusing on abiotic natures (or at least as a methodological priority). Although much music and other arts of sound have involved the biotic sounds of creatures, they have also found nature in abiotic sounds, for example, in the Aeolian. I am proposing that there is a corresponding nature for electronic music found in the physical nature of electricity and electromagnetism, in what I call the Aelectrosonic. So there is a narrower focus, but also some latitude in introducing nature where it has never existed. The lack of nature is what the history of electronic music shares with histories and theories of electronic media – there is larger discussion about why this is the case that we cannot embark on here – and they both help sustain notions of modernity that have run their course as surely as older notions of "nature".

The next question is what I mean by *electronic music*. To a certain extent it is an anachronistic term. For many people, there is not much music that is not electronic in one way or another. I will nevertheless follow the given histories of electronic music, for the moment, with the exception of the role of sound recording, specifically the catchall term of electroacoustic music. True, after an initial period of acoustical recording, sound recording became dependent on the control of electrical and magnetic forces as much as any synthesizer, but there is an inbuilt way to talk about a mimetic relationship between nature



Thomas A. Edison and his first phonograph, 1877.

Students examining radio parts at Capitol Radio Engineering Institute, ca. 1920–50.

Nikola Tesla's experimental Wardenclyffe World Wireless Telecommunications Station on Long Island, 1901.

Radio station Cornwall, ca. 1901.

and *musique concrète*, the same one that underpins acoustic ecology and phonography as surely as it did in the 19th century with program music. So the *musique concrète* of Pierre Henry won't make the cut, but his *Mise en Musique du Corticalart de Roger Lafosse*, and other instances where voltage differences come into play, do. If the phonograph was the medium that prefigured *musique concrète* proper, then it was telecommunications technologies – telegraph, telephone, wireless telegraphy, radio – that prefigured the electronic music to which I refer. Indeed, the Aelectrosonic evolved from 19th-century telecommunications. That said, electronic music quickly becomes more encompassing than the histories we have and, likewise, just as its nature may be lodged in the Aelectrosonic, so too have the natures that are infiltrated by electricity become more plentiful.

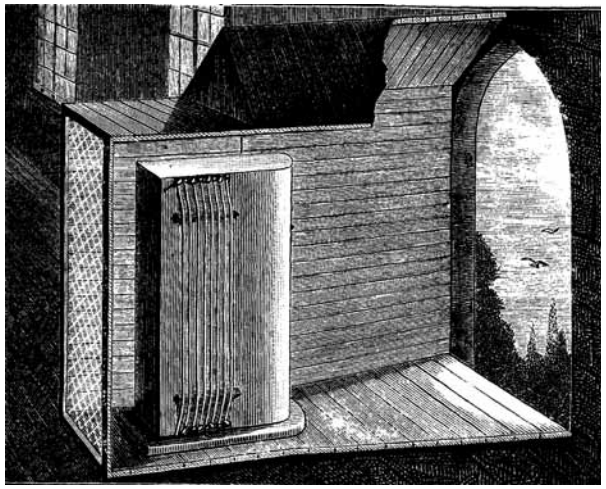
Histories of electronic music are a testament to how easily electricity turns musical instruments into "technology". It is only possible because of a conceit that, somehow, other instruments are not already technological. Symphonic orchestras have always been large technological assemblages, and are still veritable refurbished factories of yesteryear, hermetically sealed in specialised architectural spaces that themselves are sophisticated technological achievements. Who can examine the historical iterations of the piano and not know them as technology? But in the historical literature something uncannily transformative happens when well-placed electricity meets a musical instrument. The instrument seems to leap either from, or into, the future and, in any event, is far from nature.

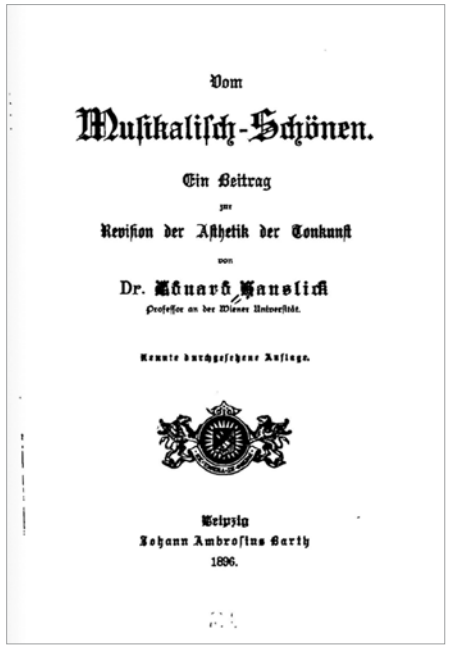
To what extent has *nature* ever been capable of *music*, let alone electronic music? Writing in the mid-19th century, Eduard Hanslick was Western art music's most ardent champion for a complete break with nature. "For music, there is no such thing as the beautiful in nature". Only along a trail of slaughter – sinews, entrails, the guts from which instruments were made – could nature be of any use.

> Nature does not give us the artistic materials for a complete ready-made tonal system but only the raw physical materials, which *we* make subservient to music. Not the voices of animals but their entrails are important to us, and the animal to which music is most indebted is not the nightingale but the sheep.[1]

Likewise, the musical nature of living trees appealed to Hanslick only because upon their demise they supplied wood for the string and woodwind sections. Animals

1. Eduard Hanslick, "The Relations of Music to Nature", in *On the Musically Beautiful: A Contribution towards the Revision of the Aesthetics of Music* (1854), 1891 edition translated by Geoffrey Payzant (Indianapolis: Hackett Publishing Company, 1986), 72, 73.




Vom

Musikalisch-Schönen.

Ein Beitrag

zur

Revision der Ästhetik der Tonkunst

von

Dr. Eduard Hanslick

Professor an der Wiener Universität.

Neunte durchgesehene Auflage.

Leipzig

Johann Ambrosius Barth

1896.

Eduard Hanslick, from *Eduard Hanslick: Aus meinem Leben*, 1894.

Title page of *Vom Musikalisch-Schönen. Ein Beitrag zur Revision der Ästhetik der Tonkunst*, 1854.

Aeolian harp in the old castle of Baden Baden.

and vegetables were required to die and become silent to mimic the "mute ore from the mountains... proper building materials of music, namely pure tones".[2] Other abiotic materials and forces were in motion and were not as mute as ore, and therefore the sounds they made could not be musical.

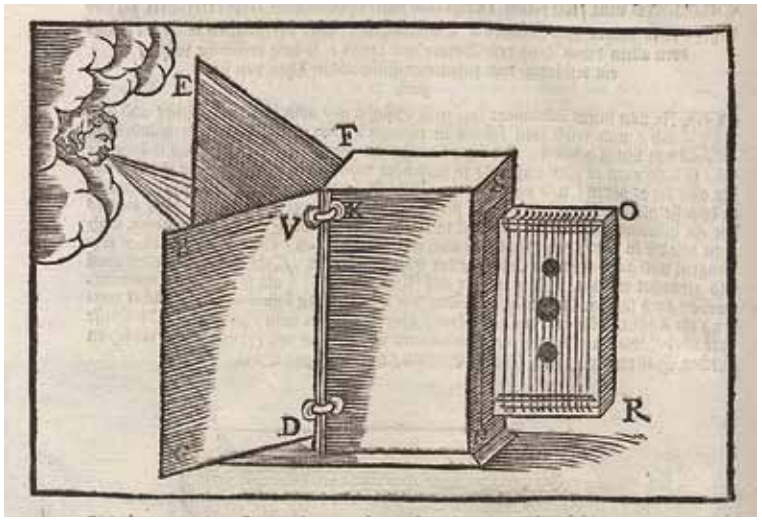
> Against our claim that there is no music in nature, it will be objected that there is a wealth of diverse voices, which wonderfully enliven nature. Must not the babbling of the brook, the slap of waves on the shore, the thunder of avalanches, the raging of the gale have been the incentive to a prototype of human music? Have all the murmuring, squealing, crashing noises had nothing to do with the character of our music? We must in fact reply in the negative. All these natural manifestations are nothing but noise, i.e., air vibrations of incommensurable frequencies.[3]

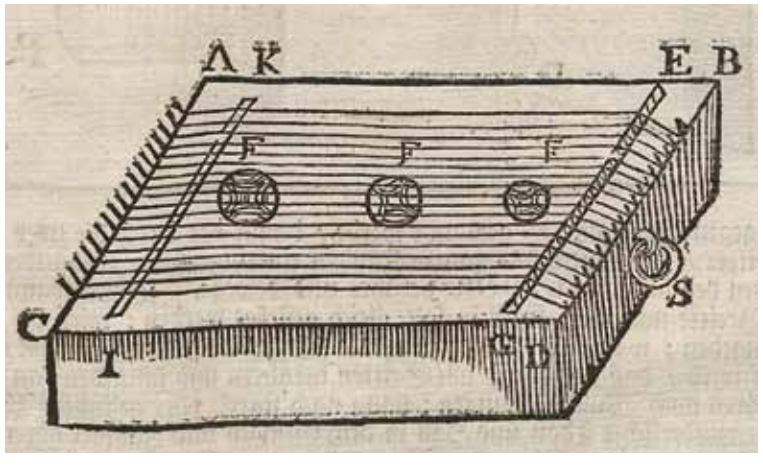
The Aeolian for Hanslick was "mere noise" and anything musical it might have to offer would not come from nature, but only from the artfulness of special instruments built to wrench beauty from it.

Writing not long after Hanslick, Carl Engel was more open to the Aeolian being the music of nature, conceding nevertheless that it might require "a peculiar imagination which is not possessed by every lover of the noble art of music".[4] His generosity no doubt derived from his role in collecting the stories of others, rather than being an arbiter of taste. One was from 1695: a farmer near Bergen in Norway leads three musicians to some cliffs where they waited impatiently, until the wind hit the right speed and...

> Suddenly it began to sound in the hills as if tones were produced in our immediate neighborhood. First a chord was struck; then a single tone was sounded, apparently for the purpose of tuning the instruments; then commenced a prelude on the organ; and directly afterwards we heard a number of voices accompanied by cornets, trombones, violins, and other instruments without being able to see any performer...
>
> At last, when we had listened a long time, the organist, having become uneasy about these invisible performers and subterranean musicians, called out to them: "If you are of

2. *Ibid.*, 68.
3. *Ibid.*, 71.
4. Carl Engel, "Aeolian Music", in *The Musical Times*, vol. 23, no. 4 (1 August, 1882), 432–36.





Three aeolian harps, engravings from Athanasius Kircher & Tobias Nislen, *Neue Hall- und Thon-Kunst, Oder Mechanische Gehaim-Verbindung der Kunst und Natur, durch Stimme und Hall-Wissenschafft gestifftet*, 1684.

> heaven, show yourselves; but if you are of hell, leave off that mysterious music."[5]

While Eduard Hanslick fortified Western art music against the incursions of nature, Henry David Thoreau was busy at the same time embracing it. In contrast to Hanslick's sentiment that the sounds of "natural manifestations are nothing but noise", Thoreau proclaimed, "Nature makes no noise".[6] When something did make noise, Thoreau opposed it to *sphere music*, his term for a Music of the Spheres brought down to earth.

The Music of the Spheres had descended from the Pythagorean monochord and the harmonic ideal in Plato's *Timaeus*, through Johannes Kepler's *Harmonies of the World*, to other notions of social harmony and occult rationality. This correlation between musical intervals and the positions of the planets, and its offshoots, was a Western myth of incredible longevity, but the structured ordering it presumed ran counter to the turbulence of Thoreau's *sphere music*. The winds that drove the Aeolian were the turbulence of the atmosphere torqued by the rotation of the earth in the heliosphere.

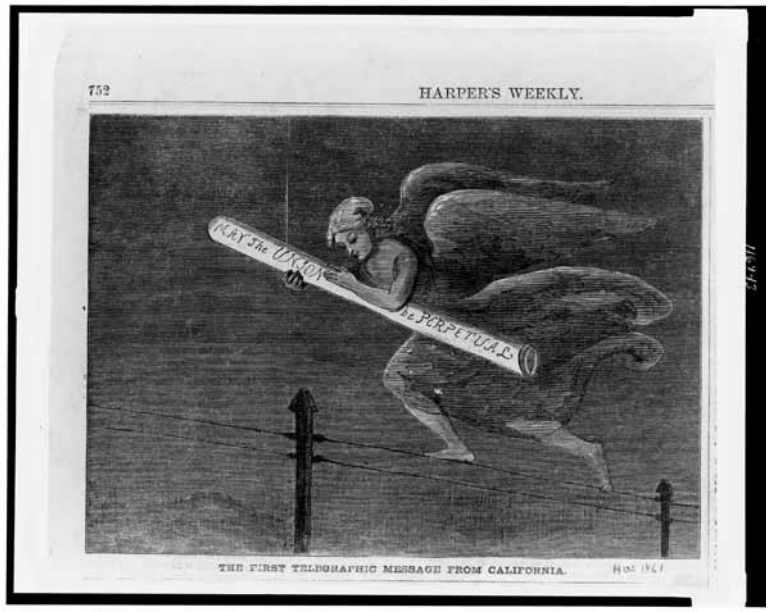
> How can a man sit down and quietly pare his nails, while the earth goes gyrating ahead amid such a din of sphere music, whirling him along about her axis some twenty-four thousand miles between sun and sun, but mainly in a circle some two millions of miles actual progress? And then such a hurly-burly on the surface – wind always blowing – now a zephyr, now a hurricane...[7]

This is what the composer Charles Ives meant when he wrote that Thoreau "seems rather to let Nature put him under her microscope than to hold her under his".[8] Thoreau privileges the Aeolian among all the sounds in nature because of its ability to give sound to the magnitudes of *sphere music* on local and global scales. He had his own modest Aeolian harp made of rosewood, but the most important one was strung on a much larger scale, being the Aeolian sounds produced by the wind blowing over telegraph lines, what he called the *telegraph harp*.

> The resounding wood! How much the ancients would have made of it! To have a harp on so great a scale, girding the very earth, and played on by the winds of every latitude and longitude, and that harp were, as it were, the manifest blessing of heaven on a work of man's![9]

5. Carl Engel, "Aeolian Music", in *The Musical Times*, vol. 23, no. 4 (1 August, 1882), 432–36.
6. Hanslick, *op. cit.*, 71. Henry David Thoreau, Journal, vol. 1, 1837–1844 (Princeton: Princeton University Press, 1981), 12.
7. Henry David Thoreau, *Journal*, vol. 1, 1837–1844 (Princeton: Princeton University Press, 1981), 332.
8. Charles Ives, "Essays before a Sonata", in *Three Classics in the Aesthetic of Music* (New York: Dover Publications, 1962), 142.
9. Henry David Thoreau, *Journal*, vol. 3, 1848–51 (Princeton: Princeton University Press, 1981), 11–12.

Telegraph lines and stations map in the United States, Canada and Nova Scotia as of 1853. Map by Charles B. Barr, published 15 January 1854.



The first telegraph message, wood engraving, 1861. Illustration from *Harper's Weekly.*

By "every latitude and longitude", he did not mean a cartographic ordering at such regular intervals; he meant instead national and colonial networks of telegraph lines spreading across the entire earth. The lines he listened to followed the railroad lines cutting through the forests and hills of Massachusetts. He had political objections to the commerce the railroad and telegraph represented, including the telegraph's aid to the South's slave trade, but he waxed prolific about the sounds he heard.

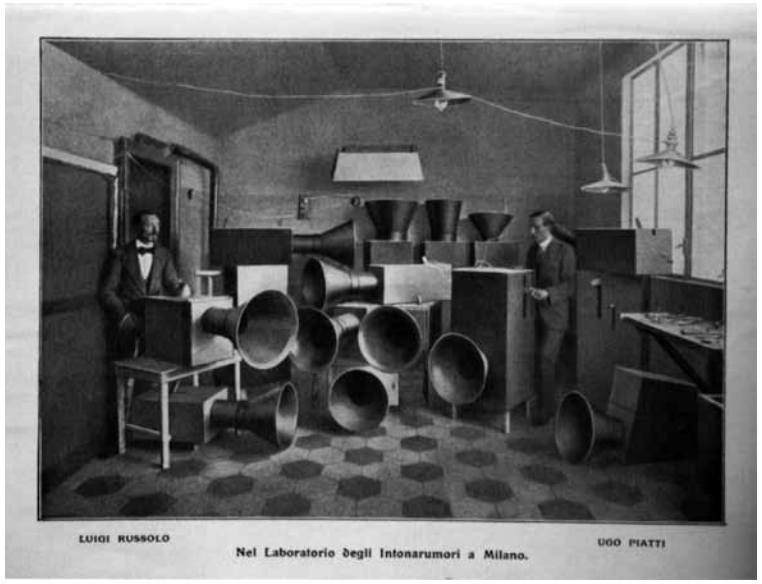
John Cage has clarified the relationship of Thoreau to experimental music; many key elements of Cage's aesthetic of listening, environment, sounds-as-music, and impossibility of noise are anticipated in the writings of Thoreau. Indeed, there is indeterminacy intrinsic to the Aeolian, no matter who celebrates either one. What is less recognised is the place of nature in accounts of "noise" in musical modernity and the historical avant-garde. The usual story told is that the raucousness of industrialism and other evolutionary fates of technology introduced noise to musical practice and, while this is certainly the case to an extent, it is not the only story. The case in point is none other than Luigi Russolo, the Italian Futurist largely responsible for the codification of noises as music with his *Art of Noises* manifesto of 1913.[10]

In his manifesto Russolo understood noise in music to be an outgrowth of increasing harmonic complexity in late 19th-century Western art music, both a self-destruction and evolutionary expression of harmony due to its own incorporative power. This complexity was at the same time an embodiment of sounds imposed by new industrial landscapes over a silence that had survived since antiquity. "The loudest of noises that interrupted this silence was neither intense, nor prolonged, nor varied. After all, if we overlook the exception movements of the earth's crust, hurricanes, storms, avalanches, and waterfalls, nature is silent."[11] Nevertheless, Russolo sought a broader explanation for his *Art of Noises* in his 1916 book of the same name, and found sounds in nature that were in fact intense, prolonged and varied.

As someone usually considered moonstruck with industrialism, urbanism and technology, in the chapter "The Noises of Nature and Life (Timbres and Rhythms)", he is transfixed by the sounds of nature.

> Let us start with the noises of nature. Thunder. Mysterious muttering that comes from afar, a threat, or the crash of strange and powerful rhythms that explode to the zenith. Its roars are scattered, hardly weakening, when a new blast resumes and renews them with infinite echoes, to which windowpanes

10. Luigi Russolo, "The Art of Noises: Futurist Manifesto", in *The Art of Noises* (1913), translated by Barclay Brown (New York: Pendragon Press, 1986), 23–30.
11. *Ibid.*, 23.



Luigi Russolo and Ugo Piatti with the Intonarumori, 1914.

Cover of Luigi Russolo's *L'arte dei rumori,* 1916.

L'ARTE DEI RUMORI

Manifesto futurista

Caro Balilla Pratella, grande musicista futurista,

A Roma, nel Teatro Costanzi affollatissimo, mentre coi miei amici futuristi Marinetti, Boccioni, Carrà, Balla, Soffici, Papini, Cavacchioli, ascoltavo l'esecuzione orchestrale della tua travolgente **Musica futurista,** mi apparve alla mente una nuova arte che tu solo puoi creare: l'Arte dei Rumori, logica conseguenza delle tue meravigliose innovazioni.

La vita antica fu tutta silenzio. Nel diciannovesimo secolo, coll'invenzione delle macchine, nacque il Rumore. Oggi, il Rumore trionfa e domina sovrano sulla sensibilità degli uomini. Per molti secoli la vita si svolse in silenzio, o, per lo più, in sordina. I rumori più forti che interrompevano questo silenzio non erano nè intensi, nè prolungati, nè variati. Poichè, se trascuriamo gli eccezionali movimenti tellurici, gli uragani, le tempeste, le valanghe e le cascate, la natura è silenziosa.

In questa scarsità di *rumori*, i primi *suoni* che l'uomo potè trarre da una canna forata o da una corda tesa, stupirono come cose nuove e mirabili. Il *suono* fu dai popoli primitivi attribuito agli dèi, considerato come sacro e riservato ai sacerdoti, che se ne servirono per arricchire di mistero i loro riti. Nacque così la concezione del suono come cosa a sè, diversa e indipendente dalla vita, e ne risultò la musica, mondo fantastico sovrapposto al reale, mondo inviolabile e sacro. Si comprende facilmente come una simile concezione della musica dovesse necessariamente rallentarne il progresso, a paragone delle altre arti. I Greci stessi, con la loro teoria musicale matematicamente sistemata da Pitagora, e in base alla quale era ammesso soltanto l'uso di pochi intervalli consonanti, hanno molto limitato il campo della musica, rendendo così impossibile l'armonia, che ignoravano.

Il Medio Evo, con gli sviluppi e le modificazioni del sistema greco del tetracordo, col canto gregoriano e coi canti popolari, arricchì l'arte musicale, ma continuò a considerare il suono *nel suo svolgersi nel tempo*, concezione ristretta che durò per parecchi secoli e che ritroviamo ancora nelle più complicate polifonie dei contrappuntisti fiamminghi. Non esisteva *l'accordo;* lo sviluppo delle parti diverse non era subordinato all'accordo che queste parti potevano produrre nel loro insieme: la concezione, infine, di queste parti era orizzontale, non verticale. Il desiderio, la ricerca e il gusto per l'unione simultanea dei diversi suoni, cioè per *l'accordo* (suono complesso) si manifestarono gradatamente, passando dall'accordo perfetto assonante e con poche dissonanze di passaggio, alle complicate e persistenti dissonanze che caratterizzano la musica contemporanea.

L'arte musicale ricercò ed ottenne dapprima la purezza, la limpidezza e la dolcezza del suono, indi amalgamò suoni diversi, preoccupandosi però di accarezzare l'orecchio con sonvi armonie. Oggi l'arte musicale, complicandosi sempre più, ricerca gli amalgami di suoni più dissonanti, più strani e più aspri per l'orecchio. Ci avviciniamo così sempre più al *suono-rumore*.

Questa evoluzione della musica è parallela al moltiplicarsi delle macchine, che collaborano dovunque coll'uomo. Non soltanto nelle atmosfere fragorose delle grandi città, ma anche nelle campagne, che furono fino a ieri normalmente silenziose, la macchina ha oggi creato tanta varietà e concorrenza di rumori, che il suono puro, nella sua esiguità e monotonia, non suscita più emozione.

Per eccitare ed esaltare la nostra sensibilità, la musica andò sviluppandosi verso la più complessa polifonia e verso la maggior varietà di timbri o coloriti strumentali, ricercando le più complicate successioni di accordi dissonanti e preparando vagamente la creazione del **rumore musicale.** Questa evoluzione verso il « suono-rumore » non era possibile prima d'ora. L'orecchio di un

sometimes respond with a high-pitched tinkling...
Often a low, human howl, menacing or imploring, sad or even mocking in the high persistent whistlings of the wind, makes an accompaniment to the thunder, with a succession of ascending or descending enharmonic scales, and with pauses that – as in human breathing – hold the necessity or repose.
The wind that sometimes howls in ascending and descending passages within a range that does not exceed a fifth and continues with this variation as a low arpeggio, sometimes instead hurls itself up on high, where it comes to rest on a long and persistent whistling. Pause, silence – complete, sudden.
Suddenly the high whistling resumes, and then, descending rapidly down, down, becomes once again a low howling, receding into the distance.
And what a marvellous variety of rhythm and timbres if the wind is accompanied by rain![12]

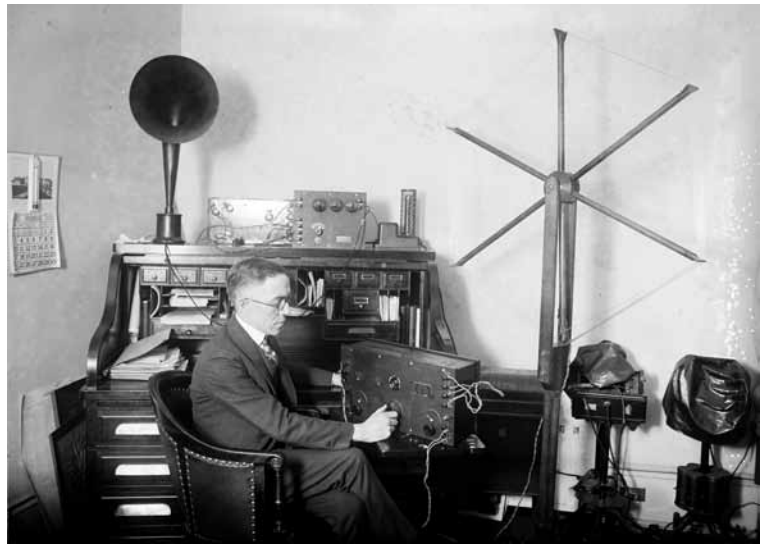
He continues at length and, most notably, creatures are absent from his litany of nature noises; all the sounds are abiotic.

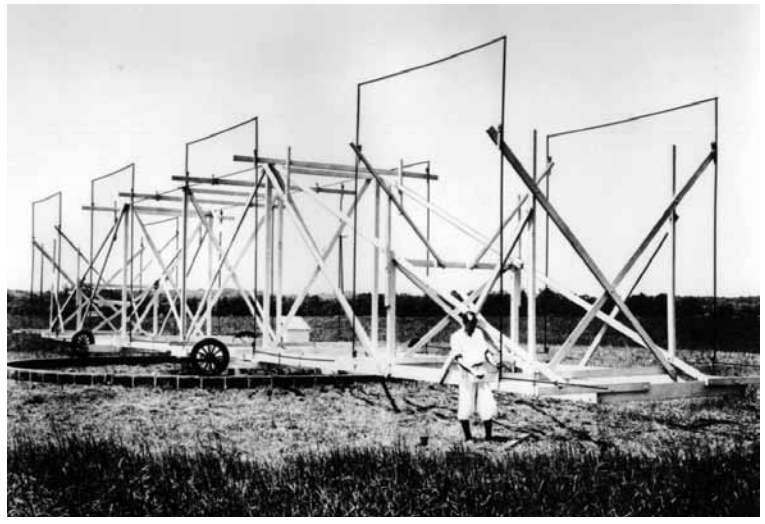
However, we can only go so far in finding the nature of electronic music in the aesthetic treatises of noise, or in the Aeolian, for the simple reason that they both exist in the wrong branch of physics. The sounds that Russolo and Thoreau listened to belong, like the wind and rotation of the earth, to mechanics, whereas electronic music belongs to the fields and waves, electricity and magnetism of electromagnetism.

A crude piece of technology was needed to transduce electromagnetism to acoustics, that is, to transform one fundamental state of energy to another. The human body does this on a regular basis and, in fact, if you are reading this there is a protein called *transducin* in your retina helping transform photons into electrochemical signals in your brain or, if you are listening to someone read this, the sound is vibrating in the room all the way to the cilia in your cochlea which open ion channels sending electrochemical signals to your brain.

Outside biological systems, the technology that could transform electromagnetism into a range of intelligible sounds was the telephone. The same telegraph lines that Thoreau listened to were interacting all the while with natural electromagnetic forces in the environment. Telegraph lines were long metallic conductors that

11. *Ibid.*, 23.
12. Luigi Russolo, "The Noises of Nature and Life (Timbres and Rhythms)", in *The Arts of Noises* (1916), translated by Barclay Brown (New York: Pendragon Press, 1986), 41–48.





Vincent Morrison Brennan, Republican of Michigan, listening in on the proceedings of the House, with a radio receiving set, 1922.

Antenna designed by Karl Jansky to receive radio waves at a frequency of 20.5 MHz. Photo National Radio Astronomy Observatory.

HAARP antenna array, 2010.

attracted the energy and acted, in effect, as long-wave antennas, but no one had the means to hear them until the invention of the telephone.

It was Thomas Watson, Alexander Graham Bell's assistant, who was the first person to listen in on the lines. After a long workday he listened in on the first telephone test line, a half-mile long and suspended over the Boston rooftops in 1876, before the electrical grid, trolleys, automobile ignition systems, and other electromagnetic radiators made the energetic environment too noisy. On the line he heard what were then generically called earth currents and what is now generically called natural radio.

> I used to spend hours at night in the laboratory listening to the many strange noises in the telephone and speculating as to their cause. One of the most common sounds was a snap, followed by a grating sound that lasted two or three seconds before it faded into silence, and another was like the chirping of a bird.[13]

His writings show that he had long been fond of observing nature and, in his later years, he formalised his ideas in a natural theology based upon what he called "earth's divinity". He recognised how he was in the right place at the right time, at the invention of the transducer that was the telephone, and thus had the privilege to say, "I, perhaps, may claim to be the first person who ever listened to static currents".[14]

Both Henry David Thoreau and Thomas Watson were enthralled with the sounds of the wires and both heard them as sounds of nature. Thoreau heard the sounds on the outside of the lines whereas Watson heard the sounds from the "inside". Telegraph and telephone lines were interchangeable; telegraph lines could also be transformed into long-wave antennas once a telephone was attached to them. Although Watson did not specifically characterise the sounds as music, many who subsequently heard natural radio did note its musical qualities. Obviously, the sounds of nature that Watson heard were not Aeolian. What he heard belonged instead to the electrical charges, the electromagnetic fields and the waves of the Aelectrosonic.

Thoreau's *sphere music* was composed within and from a universe of turbulence and torque, but it needed the right medium of an earthly atmosphere, whereas the transduced sounds of electromagnetism could make their way across the vast vacuums of the actual universe. Watson thought he might be listening to storms on the sun, which made sense because telegraph communication had been interrupted by magnetic storms and auroral activity that

13. Thomas A. Watson, *Exploring Life: The Autobiography of Thomas A. Watson* (New York: D. Appleton and Company, 1926), 80–82.
14. *Ibid.*

Lightning over Steinenbronn, Germany, 2007.

Lightning over Las Cruces, New Mexico, March 2004.

Cloud to cloud lightning strike, Swift's Creek, Australia, March 2007.

themselves were correlated to sunspots and coronal mass ejections. What he heard was actually of a more terrestrial origin, although some of the signals would have travelled into the magnetosphere, literally into outer space, and back to earth again.

The Aelectrosonic is equally tuned to naturally occurring electromagnetism and the sounds of electronic music. Watson, after all, was listening to noises and odd little sounds for pleasure, late at night no less. Beginning in the last quarter of the 19th century, people listening to "disturbances" on the telephone mentioned their musical qualities. Starting after World War One, scientists studying naturally occurring radio discussed "musical atmospherics" and analysed the sound along a gradient of *musical*, *quasi-musical and non-musical*. This was in a parallel with the aesthetics of Edgard Varèse, Henry Cowell and other avant-gardists at the time.

It remains to be asked if there is a "naturally occurring" Aelectrosonic. The Aeolian can be heard blowing across broken bamboo in a windstorm, or bamboo crafted specifically to produce sounds and tones. As Carl Engel notes, on windy days on the Malay Peninsula one could hear "the languishing bamboo" or "the bamboo of the storm", an Aeolian flute 30 to 40 feet long carved with holes or slits. Elsewhere, slit bamboo was suspended in trees, and bundles of smaller bamboo exposed on one end formed natural sounding pan pipes.[15] An Aeolian nature sounds equally on cliffs near Bergen or when generated by an elaborate Aeolian harp. Thus, it becomes difficult to determine where *nature* leaves off and *technology* begins and, one must ask, what is the purpose of doing so.

Apart from the crack of lightning and its echo in thunder, Aelectrosonics can be found in atmospheric electricity and the sound of the auroras. Because the former usually takes place atop high mountains during approaching storms and the latter at latitudes near the Arctic Circle or in the Antarctic, anecdotal reports are not as widespread as the Aeolian. During the late 19th century a party had surmounted Pike's Peak in Colorado as an electrical storm approached; as a light snow fell each flake that hit the mule's back gave off the click of a spark. In 1856 during a French scientific expedition on the volcano Nevado de Toluca near Mexico City, a fog enveloped the slopes as a storm approached, "Soon there came a dull, indefinable sound, at first weak, though in all directions, and then growing stronger and stronger, very distinct, and even alarming. It was a universal crepitation as if all the little stones on the mountain were jostled together."[16] Others report a mountainside saturated with what sounded like the rattling of flints, or a kind of whistling, a buzzing round the head, fields of innumerable sparks.

15. Carl Engel, *op. cit.*, 432–36.

Lightning over Steinenbronn, Germany, 2007.

Aurora in Illinois, 7 November 2004.

Polar aurora.

Almost everyone characterises the sound of the auroras, when it happens, as hissing, swishing, rustling or crackling, but that could be a hissing like air escaping from a tire, or swishing like that produced by a handful of birdseed being thrown in the air to fall on hardwood floor, or rustling like a person moving about dressed in voluminous folds of taffeta-silk, or crackling as when a couple of slices of good fatty bacon are dropped into a red-hot pan. Then there was a continuous crushing of aluminium foil of the type once used to wrap chocolate bars. Silk was used to relate the sound of fabric to the visual drapes of the auroras; others gave instructions on how to perform the sounds verbally, and others still related the sounds to the discharge of an electric battery, sparks from an electric machine, horn-gap lightning arresters, and figured that these phenomena must somehow involve electricity changing into sound. One person in the far North reported holding "aurora parties" and a few even related the sounds to music, as when the strings of a harp are lightly touched, or like the sounds produced by violin strings when it is placed on or near a piano. Many noted how it was unlike any sound they had ever heard and one person conceded, as he might try, "my description is weak in comparison with the reality".

In 1894 in southwest Wales, with the display of the Aurora Borealis in sight, and with a telephone attached to a telegraph line, one person noted:

> [...] peculiar and weird sounds distinctly perceived, some highly pitched musical notes, others resembling [the] murmur of waves on a distant beach... The musical sounds would very much resemble those emitted by a number of sirens driven at first slowly, then increased until a 'screech' is produced, then again dying away.[17]

Where does nature stop and technology start? In terms of what was heard as music and certainly in what we now hear as music and the arts of sound, this is as natural as the wind blowing across the Aeolian. It is not due to the mechanical turbulence of Thoreau's *sphere music*; it is, instead, electromagnetic, an Aelectrosonic *radio of the sphere*.

16. M. J. Fournet, "Electrical Countries and Their Action on the Weather", in *The Intellectual Observer: A Review of Natural History, Microscopic Research and Recreative Science*, vol. XII (London: Groombridge and Sons, 1868), 134–35.
17. W. H. Preece, "Letters to the Editor: Earth Currents", in *Nature*, vol. 49, no. 1276 (12 April 1894), 554.

DOUGLAS KAHN is a Research Professor at the National Institute of Experimental Arts (NIEA), College of Fine Arts, at University of New South Wales, in Sydney. He is a historian and theoretician of media arts and music, with a focus on sound, electromagnetism, and natural media. His books include *Noise Water Meat*: *A History of Sound in the Arts* (MIT Press, 1999), the newly published *Source: Music of the Avant-garde, 1966-1973,* a rich documentary source of experimental music, edited with Larry Austin, and the forthcoming *Mainframe Experimentalism: Early Computing and the Foundations of the Digital Art*s, edited with Hannah Higgins. His major project, Earth Sound Earth Signal, is the product of a decade of research into natural electromagnetic and acoustical phenomena occurring at a geophysical scale in the arts, media, science and the military from the late 19th century to the present, and includes an attempt to theorise media in terms of nature.

ARIE ALTENA studied Literary Theory and writes about the intersections between art and technology. He curates the Sonic Acts Festival and works for V2_ Institute for the Unstable Media in Rotterdam. For Sonic Acts he (co-)edited the publications *The Poetics of Space* (2010), *The Cinematic Experience* (2008), *The Anthology of Computer Art* (2006) and *Unsorted, Thoughts on the Information Arts* (2004). He regularly contributes to magazines like *Open* and *De Gids*, and lectures at art academies.

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28/29 Nationaal Archief, Fotocollectie Dienst voor Legercontacten Indonesië, http://proxy.handle.net/10648/aefe4e1a-d0b4-102d-bcf8-003048976d84.

30/31 commons.wikimedia.org/wiki/File:Lines_and_Metallic_Circuit_Connections,_American_Telephone_and_Telegraph_Co,_March_1,_1891_edit.jpg

32/33 Three ALMA antennas linked together as an interferometer for the first time, on the 5000-metre altitude plateau of Chajnantor. Having three antennas observing in unison makes it possible to correct errors that arise when only two antennas are used, thus paving the way for precise images of the cool Universe at unprecedented resolution. Photo ALMA (European Southern Observatory/ NAOJ/NRAO), CC Attribution 3.0 Unported, www.eso.org/public/images/eso1001a/.

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38/39 Photograph taken at Tältlägret, near Abisko, Kiruna Kommun, Lappland, Norrbotten, Sweden, CC Attribution-Share Alike 3.0 Unported, commons.wikimedia.org/wiki/File:Aurora_near_Abisko,_Sweden,_2.jpg.

42 From *McClures Magazine* 27.3 (1906): 294.
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— Unknown photographer, from Reclams Universum 1902, de.wikipedia.org/wiki/Datei:Funkstation_Cornwall_1901.jpg.

46 —
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— From *Scientific American Supplement*, No. 483, April 4, 1885, commons.wikimedia.org/wiki/File:Aeolian_harp_in_the_old_castle_of_Baden_Baden_-_Project_Gutenberg_eText_14097.png.

48 Image from Deutsche Phonothek, SLUB/ Deutsche Fotothek, photo: MIK-Center Berlin GmbH, 2008, www.deutschefotothek.de.

50 Map by Charles B. Barr, published 15 January 1854. commons.wikimedia.org/wiki/File:Telegraph_lines_us_canadas_nova_scotia.jpg.
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The Aelectrosonic is the first Kontraste Cahier, a series published by Sonic Acts Press for Kontraste. It is published on occasion of the 2011 Kontraste Festival, Imaginary Landscapes, 14–16 October in Krems, Austria. The series is edited by Sonic Acts, and aims at publishing intriguing thoughts and materials connected to the theme of the Kontraste festivals.

The Kontraste Cahier series is made possible thanks to Klangraum Minoritenkirche Krems and NÖ Festival-Ges.m.b.H., Austria.

Published by
Sonic Acts Press
Weteringschans 6–8
1017 SG Amsterdam
the Netherlands
info@sonicacts.com
www.sonicacts.com

ISBN: 978-90-810470-0-5
NUR: 662

Editor
Arie Altena

Kontraste Cahier series editors
Sonic Acts
Arie Altena
Nicky Assmann
Martijn van Boven
Gideon Kiers
Lucas van der Velden
Annette Wolfsberger

Design
Femke Herregraven

Print
Druckerei Paul Gerin

English proofreading
Mark Poysden

Special thanks to Pierre Ballings and Albrecht Großberger.

The 2011 Kontraste Festival, Imaginary Landscapes is curated by Sonic Acts and produced by Kontraste, Krems.