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Sounding Sound Art

*A study of the definition, origin, context, and
techniques of sound art*

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Preface

In the summer of 1986 my mother took me along on her bike. Not on a Sunday bicycle trip, but for a visit to *Chambres d'Amis*, an exhibition curated by Jan Hoet who had brought the cream of the international contemporary art scene to Ghent, Belgium. We went from house to house, each time visiting one room that was altered by an artist. The living room, the kitchen, the staircase...even the basement could not escape an artist's intervention and was transformed into an exhibition space. No less than 51 artists participated. (Hoet & Museum van Hedendaagse Kunst, 1986)

About one month later we visited *Anti-Chambres*. As a reaction to *Chambres d'Amis*, artists that felt left out gathered and organised an exhibition in an abandoned textile factory close to our home. Artists made use of the circumstances to create a unique site-specific work, not in the womb of carefully selected private houses, but in a deserted rough factory where rain and wind had free play.

As a little girl of merely 7 years old I was very impressed by these two exhibitions. The fact that art was not limited to a museum or gallery and could be found in alternative locations, that it did not always had to be serious; but could be funny or absurd and that it could above all surprise, had stolen my heart.

In those troublesome teenage years I developed an interest in noise and experimental music, while during numerous trips to the multimedia section of the library I gained interest in contemporary music.

In 1995 Kevin Van Volcem and I founded Cling Film, a label of experimental music. Although Cling Film started out as a record label, the flood of concert requests incited us to become a concert organisation as well. The numerous concerts Cling Film organised opened up a new world of sound sources: from jumping rice grains [Klangkrieg], to metal chains [Guilty Connector], homebuilt instruments [Noise-Maker's Fifes] and radio waves [Jacques Brodier]. The Cling Film festivals not only presented experimental music, but often also sound art. During Bruges 2002 a large-scaled sound installation was set up at *Kaapstad*, the youth site of the European capital of culture. Four train wagons, placed in a square, were crammed with speakers and functioned as the equivalent to boom cars.

At the conservatory my interest in experimental music was fed in the courses taught by Dr. Godfried-Willem Raes, amongst which improvisation, chamber music and composition. My interest in experimental instrument building was stirred during the hands-on composition classes in which we built amongst others a crackling box and a Theremin.

In my professional career in the cultural field sound art continued to fascinate me. During my work at Arts Centre *Vooruit* and festival *Happy New Ears* I was engaged in the organisation and set-up of sound works and I met many sound artists. In my own work I actively sought the borders of music and took my first steps into the world of experimental instrument building and interactive media art.

When I applied for a position as a research assistant, my research subject was quickly decided on: sound art. It was only when I actually started my research project and formulated my research questions that I realised that sound art is not only a very exciting young trend in art, but that it is also difficult to grasp and hard to define. A tough challenge awaited me.

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Problem definition

The outburst of high profile exhibitions since the end of the sixties (see p.393) has made the term sound art familiar, but it has also created a lot of confusion as to what is actually meant by this term.

Exhibitions focusing on sound often include a broad variety of art forms so that the term 'sound art' gets contaminated with other categories. For example, some exhibitions include a listening room where the audience can listen to music¹, whilst the content of other exhibitions solely exists of music². In addition, the exhibition programme is regularly extended to include a series of performances, sometimes of artists whose work is included in the exhibition³, sometimes including performances of

¹ For example, the *Audiothèque* which was presented at the exhibition *Sound in Space, adventures in Australian sound art* at the Museum of Contemporary Art, Sydney (Michael & Ewington, 1995) included a variety of compositions from Australian artists. The works were not specifically composed for the exhibition.(Cavallaro, 1995)

² For example, the exhibition *Volume: Bed of Sound*, that took place in 2000 at P.S.1., New York and in 2001 at the Henry Art Gallery, Seattle, consisted of one giant futon with 58 listening stations and headphones. (Hackett, 2001) (Henry Art Gallery, 2013b) In Seattle there was an adjacent space provided with a CD jukebox "for casual communal listening." (Henry Art Gallery, 2013b) The exhibition *Blind Sight* presented in Turku, Finland and Dundee, United Kingdom in 2004 consisted of audio work by 50 artists within the format of the CD. (Dahlsten, 1994)

³ For example, *Sehen um zu Hören -Objekte & Konzerte zur visuellen Musik der 60er Jahre* [Düsseldorf, 1975] (Baecker, 1975b), *Sound, an Exhibition of Sound Sculpture, Instrument Building and Acoustically Tuned Spaces* [Los Angeles, 1979] (Smith & Wilhite, 1979a), *Für Augen und Ohren. Von der Spieluhr zum akustischen Environment. Objekte. Installationen. Performances* [Berlin, 1980] (R. Block, Dombois, Herlting, & Volkmann, 1980), *Sonic Art* [San Bernardino, 1982] (Halverson, 1982a), *Sonorità prospettiche: suono, ambiente, imagine* [Rimini, 1982] (Masotti & Masotti, 1982), *Klangskulpturen '85* [Würzburg, 1985] (Stahmer, 1985), *So und So und So III: geluid kunst Nederland* [Amsterdam, 1988] (Jonker, 1988) and *Crossings: kunst zum horen und sehen* [Wien, 1998] (Pichler, 1998).

Exit Art took a different approach. Artists who presented an art work at the exhibition *The shape of sound* [New York, 1996], curated a live performance for one weekend evening at Exit Art. (Exitart, n.d.)

artists who have nothing to do with the exhibition itself⁴, either at the exhibition space itself⁵ or at another location⁶.

Not only performances but also radio broadcasts⁷ and film projections⁸ can be part of the exhibition programme. Besides sound installations and sound sculptures the exhibition itself can contain experimental music⁹, documented performances¹⁰, radio broadcasts¹¹, visual installations¹², happenings¹³, mail art¹⁴, project intentions¹⁵,

⁴ For example, the programme of the exhibition *Jack, Cinch & XLR: images amplifiées* [Crestet, 2002] (Chambon, 2013) and of *ARTE SONore* [various locations, 2010] (Martín, 2010) included a series of performances of artists not included in the exhibition. In addition to its exhibition, Belgian festival *City Sonic(s)* always has included concerts as part of their festival programme, mostly a mixture of exhibiting and of artists not represented in the exhibition. (Franck, 2007)

⁵ Performances were sometimes organized with the infrastructure that was specifically installed for the exhibition. This was the case for the exhibition *Call & Response* [London, 2011] where multi-channel works were played from a 8.1 surround sound system during the exhibition. The programme also included one evening where several musicians played live on the surround sound system. (Call & response, n.d.) This was also the case for *The Morning Line* as the presentation of the pavilion was accompanied by performances on the installation. (Thyssen-Bornemisza Art Contemporary, n.d.-a, n.d.-b, n.d.-c)

⁶ The programme of the exhibition *Sound in Space, adventures in Australian sound art* [Sydney, 1995] also included a series of performances spread over two days at Artspace. Some of the performing artists were taking part in the exhibition. (Michael & Ewington, 1995) Besides a group exhibition organised at the Apollohuis in Eindhoven, the Netherlands, the programme of the *Echo festival, the images of sound I* included concerts presented at the Vleeshal in Middelburg and at O42 in Nijmegen. (P. Panhuysen, 1987a)

⁷ The programme of the exhibition *Sound in Space, adventures in Australian sound art* [Sydney, 1995] contained a series of radio broadcasts, consisting of radio plays and compositions, linked to the exhibition. (Michael & Ewington, 1995) During *Sonambiente - festival für hören und sehen* [Berlin, 1996] radio plays were presented in the sfb-klangalerie. (De la Motte-Haber, 1996c)

⁸ The programme of *Sonambiente - festival für hören und sehen* [Berlin, 1996] included the broadcasting of films, selected by Bady Minck und Alexander Dumreicher-Ivanceanu. (De la Motte-Haber, 1996c) *ARTE SONore* [Madrid, 2010] included an extensive cinema programme, *Beyond Sound*, that included 25 films and a retrospective of the audiovisual work of the LINE record label. (Martín, 2010)

⁹ For example, *Sound Sculpture: 11 artists working in the field of Audio-Kinetic Art* [Vancouver, 1973] (Aesthetic Research Centre of Canada, 1973), *Sehen um zu Hören - Objekte & Konzerte zur visuellen Musik der 60ger Jahre* [Düsseldorf, 1975] (Baecker, 1975b), and *Volume: Bed of Sound* [New York, 2000 & Seattle, 2001] (P.S.1 Contemporary Art Center, 2008) (Henry Art Gallery, 2013b).

¹⁰ For example, the exhibitions *Sehen um zu Hören -Objekte & Konzerte zur visuellen Musik der 60ger Jahre* [Düsseldorf, 1975] (Baecker, 1975b) and *SoundArt. Klang als Medium der Kunst* [Karlsruhe, 2012/2013] presented documented performances.

¹¹ The exhibition *Audio* [Stockholm, 1983] documented the radio programme *Night Exercise* and presented the broadcasts as sound art. (Meyer, 1983)

¹² The exhibition *Écouter par les yeux - objets et environnements sonores* [Paris, 1980] wanted to highlight the importance of the 'new' material sound in the visual arts and mainly exhibited objects and installations from visual artists. (R. Block, 1980) Visual installations were shown at various other exhibitions amongst which *Sehen um zu Hören -Objekte & Konzerte zur visuellen Musik der 60ger Jahre* [Düsseldorf, 1975] (Baecker, 1975b), *Sound/Art* [New York, 1983] (The SoundArt Foundation, 1983), *Formen hören - Klänge sehen* [Esslingen, 1990] (Kröz, 1990), *Sonambiente - festival für hören und sehen* [Berlin, 1996] (De la Motte-Haber, 1996c), *El espacio del*

sketches¹⁶, kinetic sculptures¹⁷, experimental instruments¹⁸, antique instruments¹⁹, video art²⁰, poetry²¹, conceptual art²², graphic art²³, technological demonstrations²⁴, internet websites²⁵, photography²⁶, records²⁷, paintings, drawings and sculptures with

sonido: el tiempo de la Mirada [San Sebastian, 1999] (Iges et al., 1999) and *Sound of Music* [Kortrijk, 2007] (FRAC, Happy New Ears, & Stedelijke Musea Kortrijk, 2007):

¹³ The *Sonomobiles* exhibition, part of the *6th Internationaal Mixed-Media Festival* [Ghent, 1976], included a happening by the London performance group COUM. A milk bottle was heated on a gas fire. The sound of the milk heating up and eventually the sound of the splashing milk bottle was amplified. (Stichting Logos, 1976) The exhibition *Sound Sculpture As* [San Francisco, 1970] included a work by Tom Marioni who urinated from the top of a ladder into a bucket below to achieve modulation of the sound as the bucket gets fuller and fuller. (Foley, 1981, p. 33), while the exhibition *El espacio del sonido: el tiempo de la Mirada* [San Sebastian, 1999] did not include the actual happening, but only the set-up of *Fluxus-Sinfonie für 40 Hoovers* by Wolf Vostell (Iges et al., 1999).

¹⁴ For example, mail art was presented at the exhibition *Audio* [Stockholm, 1983]. (Meyer, 1983)

¹⁵ For example, a large part of the exhibition *Sonorità prospettiche: suono, ambiente, imagine* [Rimini, 1982] consisted of virtual projects in the form of sketches, suggestions, scores, programmes or drawings. None of the presented projects had been realized, due to technical and/or conceptual reasons. (Masotti & Masotti, 1982)

¹⁶ The exhibition *Vom Klang der bilder. Die Musik in der Kunst des 20. Jahrhunderts* [Stuttgart, 1985] (von Maur, 1985b) presented a technical drawing of *Klangsaulen, Komposition ¼* by Edmund Kieselbach (see Figure 5). Sketches of sound works by Max Neuhaus have been regularly exhibited at exhibitions focusing on sound, amongst others at Weinhaus Huth during *Sonambiente* [Berlin, 1996] (Kneisel, Osterwold, & Weckwerth, 1996), at *Crossings. Kunst zum Hören und Sehen* [Vienna, 1998]. (Pichler, 1998) and at *El espacio del sonido: el tiempo de la Mirada* [San Sebastian, 1999] (Iges et al., 1999).

¹⁷ Amongst others the exhibitions *Für Augen und Ohren - Von der Spieluhr zum akustischen Environment - Objekte, Installationen, Performances* [Berlin, 1980], *Soundings* [New York, 1981] and *Klangskulpturen, Augenmusik* [Koblenz, 1995] included work by Nicolas Schöffer.

¹⁸ The *Echo festival, the images of sound I* [Eindhoven, 1984/1985] (P. Panhuysen, 1987d) presented several experimental instruments by Hans-Karsten Raecke. (see Figure 6)

¹⁹ Antique instruments were included in amongst others *L'Art et la musique* [Bordeaux, 1969] (Gilberte, 1969), and *Für Augen und Ohren. Von der Spieluhr zum akustischen Environment. Objekte. Installationen. Performances* [Berlin, 1980] (R. Block et al., 1980).

²⁰ Video works were included in, amongst others, *Formen hören - Klänge sehen* [Esslingen, 1990] (Kröz, 1990), *Crossings. Kunst zum Hören und Sehen* [Vienna, 1998] (Pichler, 1998), *Sonic Boom* [London, 2000] (Toop, 2000c) and *Sound of Music* [Kortrijk, 2007] (FRAC et al., 2007)

²¹ For *Sonambiente- festival für hören und sehen* [Berlin, 1996] (De la Motte-Haber, 1996c) Kyra Stratman created a work for the cloakroom of the State Council. A short dialogue previously recorded in public space, was written out and rerecorded.

²² For example, *Écouter par les yeux - objets et environnements sonores* [Paris, 1980] (Pagé, 1980) and *Sound of Music* [Kortrijk, 2007] (FRAC et al., 2007).

²³ For example, the exhibition *Sound of Music* [Kortrijk, 2007] presented graphic work by Christian Marclay, Allen Ruppersberg, Scott King, John Cage and La Monte Young (FRAC et al., 2007)

²⁴ At the *Sound* exhibition held in 1969/1970 at the Museum of Contemporary Crafts of the American Crafts Council in New York Echo Industries Inc presented an anechoic chamber. (KPFA, 1969)

²⁵ *Musiques en scène: exposition* [Lyon, 1999] presented *The Thing* by Wolfgang Staehle, a web project designed for the production, discussion and distribution of contemporary art. (Giroudon, 1999),

musical themes²⁸, reconstructions²⁹, models³⁰, musical automatons³¹, (scientific) experiments³², sound weapons³³, historic documents³⁴, stage properties³⁵ and graphical

²⁶ For example, *To Hear is to See – an intervention in electronic space* [Medellin, 1996] (Osorno, n.d.), *Crossings. Kunst zum Hören und Sehen* [Vienna, 1998] (Pichler, 1998) and *Sound of Music* [Kortrijk, 2007] (FRAC et al., 2007).

²⁷ For example, *Sonic Boom* [London, 2000] presented several 7 inches created out of alternative materials by Project Dark (see Figure 3). (Toop, 2000c)

²⁸ *L'Art et la musique* [Bordeaux, 1969] exhibited mainly paintings and sculptures with musical themes and historical musical instruments in addition to several works from the brothers Baschet. (Gilberte, 1969) The exhibition *Frozen – sound as space* [Amsterdam, 2008] presented images and sculptures using sound as input. This sound was broadcasted in the same exhibition space. (Watz, 2008) The exhibition *Sound of Music* [Kortrijk, 2007] included a sculpture by Erik M which consisted of parts of 888 vinyl singles connected by an iron cable. The sculpture as a whole reproduces the visual representation of a sound wave. (FRAC et al., 2007)

²⁹ The exhibition *Écouter par les yeux – objets et environnements sonores* [Paris, 1980] presented *Musique d'Ameublement* by Eric Satie. The reconstructed work consisted of three tape recorders and three endless tapes with music based on the original scores. The same exhibition also presented a reconstruction of *Kluster Musik* (1970) by Konrad Schnitzler, a space containing 12 violins, radios and microphones and reconstructions of Luigi Russolo's *intonarumori*. (Pagé, 1980) The exhibition *Moments Sonores* [Utsunomiya, 1989] also presented reconstructions from Russolo's *intonarumori*. (Sugimura, 1989) The exhibition *Sehen um zu Hören – Objekte & Konzerte zur visuellen Musik der 60er Jahre* [Düsseldorf, 1975] (Baecker, 1975b) presented a prepared piano, whilst the exhibition *SoundArt. Klang als Medium der Kunst* [Karlsruhe, 2012/2013] set-up a re-enactment of La Monte Young's *Piano Piece for David Tudor #1*. (Zentrum für Kunst und Medien, 2012) The exhibitions *Für Augen und Ohren. Von der Spieluhr zum akustischen Environment. Objekte. Installationen. Performances* [Berlin, 1980] and *Ces musiciens et leurs drôles de machines* [Bordeaux, 1980, Paris, 1982] included a reconstruction of Joe Jones's *Music Store* at North Moore Street, New York (1969-1970) (see Figure 7). (Sigma, 1980) (R. Block et al., 1980) The exhibition *Lumières Sonores !* [Créteil, 2006] presented a reconstruction of Terry Riley's *Time Lag Accumulator II*. (Girardeau, 2006)

³⁰ The exhibition *Vom Klang der bilder. Die Musik in der Kunst des 20. Jahrhunderts* [Stuttgart, 1985] (von Maur, 1985b) presented a model of *Phonoskulptur* by Thomas Lenk.

³¹ For example, *Sound Sculpture: 11 artists working in the field of Audio-Kinetic Art* [Vancouver, 1973] (Aesthetic Research Centre of Canada, 1973), *Sehen um zu Hören – Objekte & Konzerte zur visuellen Musik der 60er Jahre* [Düsseldorf, 1975] (Baecker, 1975b), *Écouter par les yeux – objets et environnements sonores* [Paris, 1980] (Pagé, 1980) and *Ces musiciens et leurs drôles de machines* [Bordeaux, 1980, Paris, 1982] (Sigma, 1980).

³² Nikolaus Gansterer presented an experiment at the Space gallery in London during the 2009 exhibition *Sound Escapes*. Gansterer let two plants grow of the species the mouse ear cress [*Arabidopsis thaliana*], a small flowering plant. One plant was provided with music by Johann Sebastian Bach, while the other plant got to hear music by death metal band the Perversists. The plant listening to death metal grew faster (see Figure 2). (Gansterer, 2013) (Gansterer, n.d.)

³³ Marie de Gaulejac exhibited LRAD, originally a sound weapon used by the U.S. law enforcers, together with a silent video at City Sonics [Mons, Belgium, 2007]. (Franck, 2007)

³⁴ For example, *SoundArt. Klang als Medium der Kunst* [Karlsruhe, 2012/2013] (Zentrum für Kunst und Medien, 2012) presented a variety of historic documents, amongst which correspondence, festival programmes and photographs of events that took place at Het Apollohuis.

³⁵ The exhibition *Vom Klang der bilder. Die Musik in der Kunst des 20. Jahrhunderts* [Stuttgart, 1985] presented under the section *Klangplastik* amongst others *Glockenwagen* (1971), a stage property from Staatstheater by Mauricio Kagel (see Figure 4) (von Maur, 1985b) The exhibition *Sehen um zu Hören – Objekte & Konzerte zur*

scores³⁶. Sound art seems to be a trend in art which can include anything which produces sound or, in some cases, things which do not. (M. Neuhaus, 2000)

Although the term 'sound art' can incorporate nearly all of the artistic expressions mentioned above³⁷, we believe that it is not appropriate to call anything that deviates from traditional music practices just 'sound art'. We should indeed avoid what happened with the term 'environment' in the sixties, a hot and catchy term which was employed for a variety of works that had nothing to do with an environment³⁸. Similarly, the designation 'sound art' would lose its meaning when it would be used for anything that is somewhat related to sound.

Moreover, the confusion increases as in some cases - processed or unprocessed - audio recordings of sound art are published as music releases.³⁹⁴⁰ On top of that many sound artists are also active in other art forms. For example, Max Neuhaus makes drawings of all his installations and also exhibits these (des Jardins, 1994), Peter Bosch and Simone Simons do not only display sound works, but also videos of their work and graphical scores (Bosch & Simons, 2011) and Pierre Berthet often performs on his sound installations and uses them as a musical instrument (Berthet, n.d.-a).

In short, 'sound art' exhibitions that seem to include nearly everything that is in some way related to sound, recordings of sound works that are issued as music releases and the multidisciplinary of many sound artists add to the confusion surrounding the designation 'sound art'.

Sound works have been presented during temporary exhibitions in galleries, museums, public space, either rural or in the city, or in special locations such as abandoned factories. Yet sound art as such does not seem to end up easily into the permanent collections of museums and galleries devoted to sound art are still a rare breed.

visuellen Musik der 60er Jahre [Düsseldorf, 1975] (Baecker, 1975b) also presented stageproperties by Mauricio Kagel, this time from *Schall für fünf Spieler* (1968).

³⁶ For example, *Sehen um zu Hören - Objekte & Konzerte zur visuellen Musik der 60er Jahre* [Düsseldorf, 1975] (Baecker, 1975b), *Formen hören - Klänge sehen* [Esslingen, 1990] (Kröz, 1990) and *Sound of Music* [Kortrijk, Belgium, 2007]. (FRAC et al., 2007)

³⁷ Many sound works make use of field recordings for example, but this does not imply that field recordings in themselves can be labelled sound art.

³⁸ The exposition *Four environments by four new realists* in Sidney Janis Gallery in 1964 did not present, as the title seems to suggest, any environments. (Reiss, 1999, p. 41)

³⁹ For example, Cling Film Records (Noise-Maker's Fifes, 1997), NMT productions (Noise-Maker's Fifes, 2005), Sub Rosa (Wynne, 2011), CD Edition Museum Ostwall (Kubisch, 2012), Paradigm Discs (Eastley, 2010), Skiti (Suzuki, 2010), Nurnichtnur (Hölscher, 2006) and A.R.C. records (Various, 1975).

⁴⁰ The Dutch radio programme *Café Sonore*, the current version of the former radio programme *Audio Art*, featured on the VPRO each week, often broadcasts recordings of sound art. (VPRO, n.d.)



Figure 1

Left: The curators of *Sonambiente* [Berlin, 1996] included the staircase of the Court of Justice in the festival and presented it as the ultimate site-specific sound work. Sounds coming from the numerous corridors resonate in the staircase of the court. The curators present this space as a “Klangraume per se” (Kneisel et al., 1996, p. 8), as “a space without sound art”, a reference to the 1992 exhibition cycle *A space without art* that was conceived by Klara Wallner. (De la Motte-Haber, 1996c)



Figure 2

Right: Nikolaus Gansterer, *the Eden Experiment* presented at Space gallery, London, United Kingdom during the *Sound Escapes* exhibition in 2009 @Laura Maes

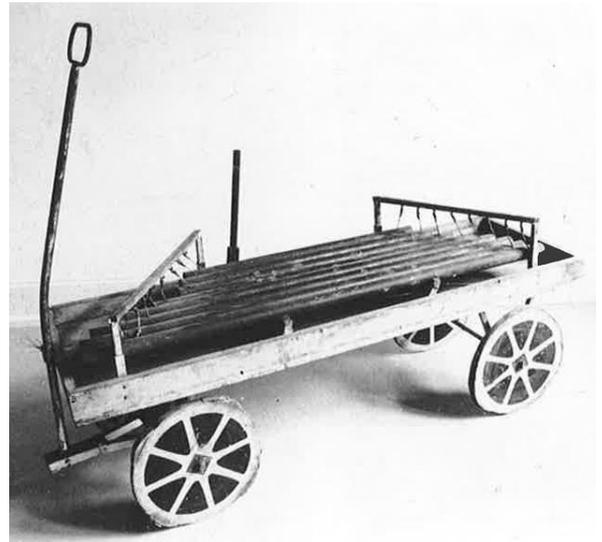


Figure 3 Left: Project Dark's Braille 7" single (1997) was presented at the exhibition *Sonic Boom* [London, 2000] (Project Dark, 1997; Toop, 2000c)
 Figure 4 Right: *Glockenwagen* (1971), a stage property from *Staatstheater* by Mauricio Kagel (von Maur, 1985b, p. 320) was presented at the exhibition *Vom Klang der bilder. Die Musik in der Kunst des 20. Jahrhunderts* [Stuttgart, 1985].

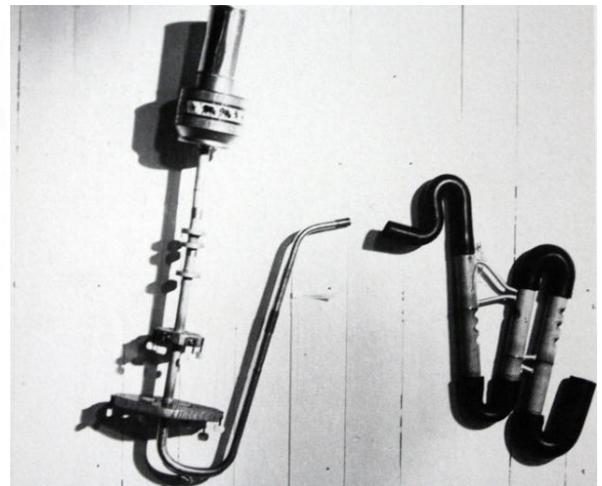
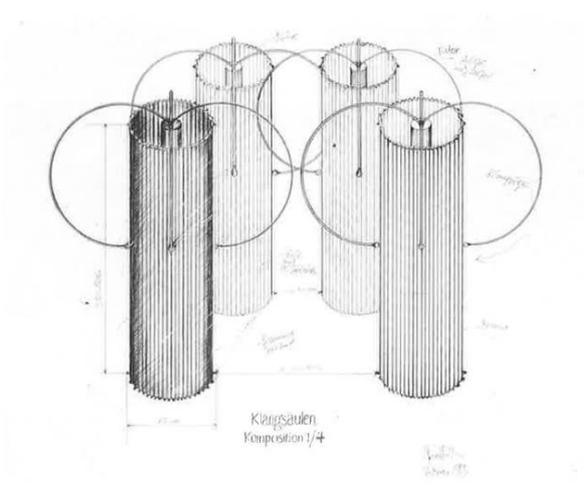


Figure 5 Left: Technical drawing of *Klangsäulen, Komposition 1/4* by Edmund Kieselbach (von Maur, 1985b, p. 325) as presented at the exhibition *Vom Klang der bilder. Die Musik in der Kunst des 20. Jahrhunderts* [Stuttgart, 1985].
 Figure 6 Right: Hans-Karsten Raecke's *Blasrohr Instrumente, Suraphone* and *Zinkflöte* presented at The Apollohuis during the exhibition *Echo, the images of sound I* [Eindhoven, 1984/1985] @ Pieter Boersma (P. Panhuysen, 1987d, p. 112)



Figure 7 A reconstruction of the *Music Store*, a New York based shop where the music machines of Joe Jones could be activated day and night by means of a button on the outside of the building, was presented at the exhibition *Für Augen und Ohren. Von der Spieluhr zum akustischen Environment. Objekte. Installationen. Performances* [Berlin, 1980] (Daadgalerie, 1990)

Research questions

Based on the above considerations, the goal of our research is to provide an answer to the question “What is sound art?”. Given the broad coverage of this question, various sub-questions can be formulated. We grouped these sub-questions into three categories which we call definition, presentation and techniques.

Definition

This first group of research questions serves to define sound art and to mark the borders of this research. The following questions are addressed:

- What are the various shapes and appearances that sound art can adopt?
 - How does sound art sound like and does sound art always produce sound?
 - How does sound art look like and is there always something to see?
 - Should visual elements, if any, have a direct link to the audio?
- Who are its makers?
 - What is the background of the creators of sound art?
 - Is there a defined lowest common?
 - Does this background tell us something about the art form?
- What to call it?
 - What are the various descriptors that have been given to sound works?
 - In what way do these descriptors differ?
- How can we analyse sound art?
 - What are the characteristics of a sound work?
 - Can we distinguish different clusters?
 - In what way do these clusters differ?
- What discriminates sound art from other art forms?

- How does sound art differ from sculptures incorporating or referring to sound ?
- What distinguishes sound art from visual installations incorporating, reflecting or referring to sound?
- What differentiates sound art from experimental instruments?
- What differentiates sound art from music?
- What distinguishes sound art from functional music applications and from art with functional purposes?
- What distinguishes sound art from educational arrangements?
- What are its musical forerunners?

Presentation

The second group of research questions revolves around the presentation of sound art. The following questions are addressed:

- Where has sound art been presented?
- What are the advantages and disadvantages of presenting sound art in museums and galleries, in public space and alternative locations and in specifically built constructions?
 - Why do very few sound works seep through to permanent collections?
- What evolutions can we observe in the presentation of sound art?
- How and where is sound art presented in Belgium?

Techniques

The third group of research questions focuses on the techniques used in sound art. The following questions are addressed:

- What techniques in sound art are used to create sound?
- What techniques in sound art are used to convey sound?
- How can sound art incorporate natural phenomena?

Methodology

Three different steps were taken in order to be able to formulate a tentative answer to the above research questions. The first step treats the collection of data related to sound art. The second step is concerned with an analysis and attempt at classification, and the third step, last but not least, is based on practice-based empirical artistic research. It should be noted that these steps do not follow each other sequentially. As it often goes in research, the final result comes out of a constant updating and adaptation of data, analysis and practice.

Collection of data

A general inductive approach was employed, starting from the specific and moving to the general. In order to do so, sound art was looked at in its own context by studying exhibition catalogues from the sixties till now. These catalogues provided information about the various designations used to label sound art and their inherent meaning, the type of works exhibited, the way in which these works were presented and the various locations where exhibitions were held. Several trends could be spotted from this data and the development of the art form, both its shape and the techniques used to create and convey sound, was investigated as well as the evolution of its presentation.

These catalogues as well as newsletters by artists, newsletters by coordinating organizations such as the Electronic Music Foundation and e-mail correspondence with organisers and artists formed the basis of a list of group exhibitions that have sound, sound art or the cross-pollination of sound and art as a curatorial theme. We constructed an overview that focuses mainly on Western Europe and North-America. Sources from other areas were less accessible and are therefore less well represented in our research. Our research was not limited to high-end exhibitions in established museums and included smaller exhibits. Therefore, we believe that our list provides

valuable information about the evolution of the exhibition environment and the geographical distribution of exhibitions focusing on sound, sound art or the cross-pollination of sound and art.

Classification

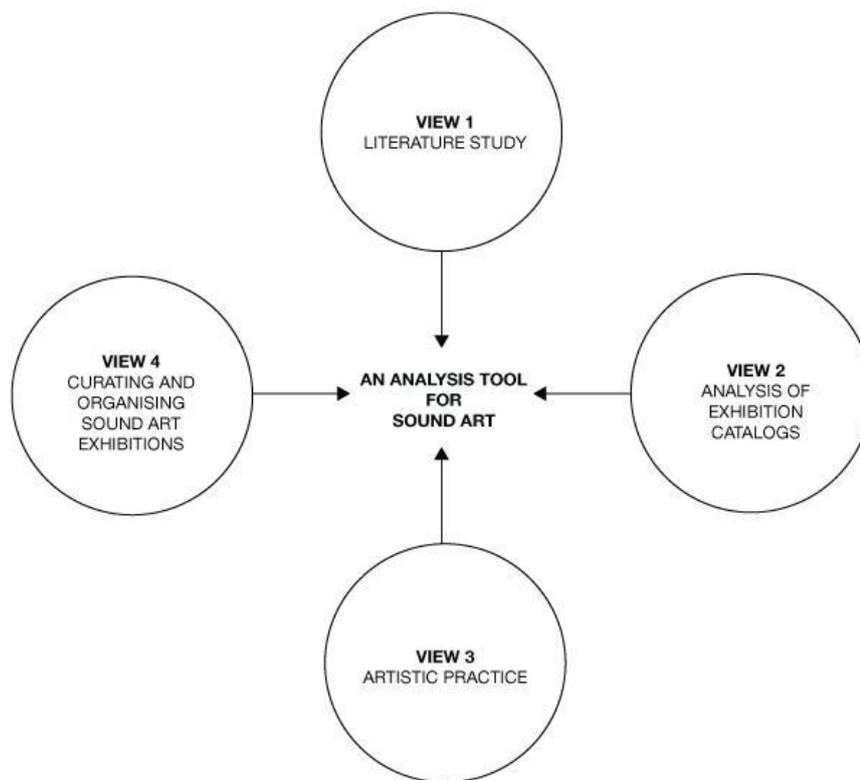


Figure 8 Four methods used to provide different perspectives on the central issue, an analysis tool for sound art

The information gathered and experiences gained were combined to develop an analysis method for sound art. The literature study, the analysis of exhibition catalogues, the author's experience in organising sound art and the author's artistic practice (see Figure 8) all provided different insights into the development of an analysis tool for sound art. We ended up with thirteen parameters that we found to be significant for our analysis tool. The different perspectives on the analysis tool (see Figure 8) and the application of the analysis tool to various works have all greatly helped to demarcate sound art.

The analysis tool permits to categorize the data into clusters, and thus to identify 'groups'. This cluster analysis is based on criteria of likeness and differences to generate specific clusters within sound art itself.

Practice-based empirical artistic research

As Bernard Baschet, who created sound sculptures with his brother François, stated when he discussed their creative method: "The first method is empiricism. It is the hands which discover and the completely unconditioned ear which listens attentively." (Bernard F. Baschet, 1975, p. 7)

The research questions tackled in the theoretical part of this thesis were empirically researched and reflected on in the author's artistic practice. In turn the author's artistic practice helped to test the theoretical research by practical experience.

During this process several art works that balance on the border of sound art and other art forms have been developed. The works created helped to define the boundaries of sound art. For example, *3times4*, an installation that converts movement into sound and image in real-time, could be experienced on the world-wide web as well as in a physical location. Although the work originally was sound based, in the final result sound and image turned out to be of equal importance. This equality of sound and image also holds for *Up & Down de Vliet*, a collaboration with Dutch artist Nico Parlevliet, in which the borders of sound art and video art are explored. The performance *O_Rex* (p. 278), created in cooperation with the multimedia theatre group Crew, challenged the role of performer and spectator, whilst *Oorwonde [Ear Wound]* was designed as an interactive audio operating table on the intersection of sound art and performance whereby the visitor turns himself over to aural surgery and hears and feels the soundtrack of a fictitious operation. *Tondelier & Tolhuis* show the process of a composition in an installation context, whereas *Glis glis*, a composition pur sang, was created in response to a call for sound works.⁴¹ Lastly, *Ijspaleis [Ice Palace]* investigates how a sound sculpture relates to a sound installation.

⁴¹ The Winchester University Press launched a "call for art works in sound and writing" for their new online series, *Experiments and Intensities*. The call for works took off with the sentence: "Sound art proliferates." The editors foresaw the following submissions: Documentation of performative events or artworks, Existing made-for-sound performative art works, New sound works made in response to the call, Spoken words and text, Recordings/technologically generated/edited work, combinations of these, Anti-sound or not-sound, Hybridizations of the above. (Winchester University, n.d.)

In all our works several techniques have been explored in order to create and to convey sound. For example, *Oorwonde* extends the audio perception to a tactile perception and makes use of various elements such as loudspeakers, contact speakers, vibrator motors, electro-magnets and piezo-electric discs to convey sound and movement, while *O_Rex* deployed a network of tubes and horns above the heads of the audience to acoustically spread sound in the performance hall, while horn robots distributed sound on stage. In *Ijspaleis* sounds travel through stainless steel rods and *Tolhuis* made the juices of plants audible.

The creation of these works followed a typical trajectory (see Figure 9, p. 14). In the initial phase of the development of each art work a rough idea arose. Materials were then collected and the first experiments were set-up. These experiments were evaluated and the concept and planning of the art work were evaluated and adapted. During the further development of the art work we were often confronted with problems, either of a technical nature or in the field of design or composition. Once solutions were found and implemented, we obtained a first version of the art work that we then presented to a group of peers. Their critical remarks, discussion and feedback were taken into consideration and in most cases, adaptations were executed before a new version of the work was presented again.

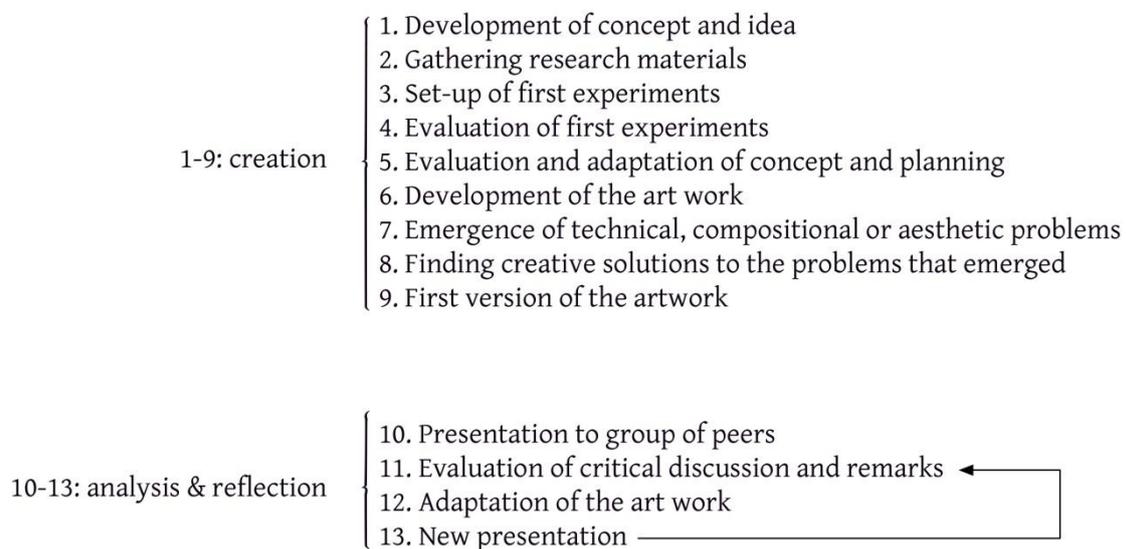


Figure 9 Overview of the creative process

Outline of the thesis

This thesis will provide an answer to the global question ‘What is sound art?’. In the following five chapters various aspects of the art form will be presented from different angles.

In chapter one sound art will be delimited. Through examining the sonic (see p. 17) as well as the visual aspects (see p. 23) of the art form, the diverse appearances of sound art will be outlined. This diversity is also reflected in the background of its creators. (see p. 27) In four case studies, we will investigate how an artist’s education and experience has influenced his take on sound art. The work of painter Ulrich Eller, musician Max Neuhaus, architect Bernhard Leitner and physicist Felix Hess will be looked at in greater detail. Next, we will show how sound art has been labelled (see p. 45) and we will discuss the meaning and usage of descriptors involving kinetic aspects (see p. 45), visual aspects (see p. 47), spatial aspects (see p. 50), technology (see p. 52) and art (see p. 54). Subsequently, the origin of the term sound art will be investigated and the differences between sound art, arts sonores and Klangkunst will be clarified. Thirteen parameters significant to sound art will be deduced and discussed (see p. 60). These are: concept, perception, space, site-specificness, open form, interaction, production of sound, performer, narrativity, implementation of techniques and technologies, visual component, endurance and place of presentation. On the basis of these parameters an analysis tool will be developed that will allow us to determine whether a work can be considered sound art. This demarcated area of sound art will be further subdivided into several clusters. Subsequently, sound sculptures (see p. 76) and sound installations (see p. 78) will be discussed and defined and their differences will be examined. To complete our first chapter we will investigate the borders between sound art, other art forms, functional sound applications and educational set-ups (see p. 86).

In chapter two we will focus on the musical precursors of sound art. The need for renewal that makes the development of a new art form outside the concert hall possible, will be illustrated with examples that highlight historical experiments with the extension of time (see p. 144), the usage of space (see p. 148), the incorporation of visual elements (see p. 157) and the expansion of sound sources (see p. 161).

In chapter three we will look at sound art in its social-cultural context. The advantages and disadvantages of the presentation of sound art in museums and galleries (see p. 169), public space and alternative locations (see p. 178), and lastly, specifically built constructions (see p. 184) will be discussed. Furthermore, the rise of sound art (see p. 187), the location and accommodation (see p. 189), the evolution of the types of works on display (see p. 191), the set-up of the exhibition (see p. 192) and the incorporation of interactivity (see p. 193) will be investigated. Chapter three will be completed with an overview of the history of sound art in Belgium, its current situation and a glance at future opportunities (see p. 198).

In chapter four we will investigate the relation of sound art to technique and technology. We will group sound works at an initial level according to the nature of the sound-producing material such as distinguished in the Sachs-Hornbostel system: idiophones (see p. 220), aerophones (see p. 230), chordophones (see p. 240) and membranophones (see p. 244). From each main category one type of sound-producing material will be looked at in greater detail and various types of activation of this material will be investigated. In a large case study we will take a closer look at the technical aspects of the electro-mechanic and electro-pneumatic automatons of the *Man and Machine Orchestra* (see p. 246). A fifth category, electrophones, will be discussed in greater detail (see p. 246). Furthermore, several ways to redirect (see p. 251), damp (see p. 252), reflect (see p. 253) and convey (see p. 254) sound will be discussed. To conclude chapter four the usage of natural phenomena in sound art will be considered.

The final part of this thesis revolves around the author's artistic practice in which several works were created that balance on the border of sound art and other art forms. The development of *O_Rex* (see p. 278), *3times4* (see p. 285), *Up and Down De Vliet* (see p. 295), *Oorwonde* (see p. 298), *Glis Glis* (see p. 318), *Tondelier & Tolhuis* (see p. 320) and *Ijspaleis* (see p. 333) will be discussed according to the process set out in Figure 9 (see p. 14).

Chapter 1

Defining sound art

This chapter focuses on defining sound art through the study of the auditive as well as the visual aspects of the art form. In addition, the background of its creators will be explored. Moreover, the labelling of sound art will be studied and thirteen parameters significant to sound art will be deduced and discussed. They will form the basis of the analysis tool. Furthermore, our demarcated area of sound art will be subdivided into several clusters. To conclude this first chapter the borders between sound art, other art forms, functional sound applications and educational set-ups will be investigated.

1.1 Auditive aspects of sound art

The sonic aspect of sound art can take a large variety of appearances. Although sound art is often associated with electronic sound sources, namely speakers, many sound works do not rely on them to create sound. In sound art, sound can be produced electro-acoustically, acoustically or electronically. For instance, the majority of the works of Hans van Koolwijk produces sound acoustically. Van Koolwijk makes use of bellows to activate flutes or pipes.(Van Koolwijk, n.d.-d) Conversely, in *Call and Resonance* by Ted Apel microphones are utilized to pick up the sound of the environment. That sound is then reproduced through speakers positioned in test tubes (Apel, 2013), whereas in most of Ryoji Ikeda's sound works sound is generated electronically. (Ikeda, 2010)

1.1.1 Amplitude

The amplitude of the sound produced by a sound work can differ immensely. It can be deafening such as the sounds up to 100 dBA produced by the organ pipes of Stephan von

Huene's *Totem Tones*. Von Huene utilizes a typical low pressure wind system and pipes similar in energy output to those used in many church organs. The difference in decibel rating between von Huene's works and a typical low pressure church organ can be attributed to the rooms, made of concrete and rock plaster - nearly totally reflecting surfaces - in which von Huene's work was exhibited. (Dean, 1975)

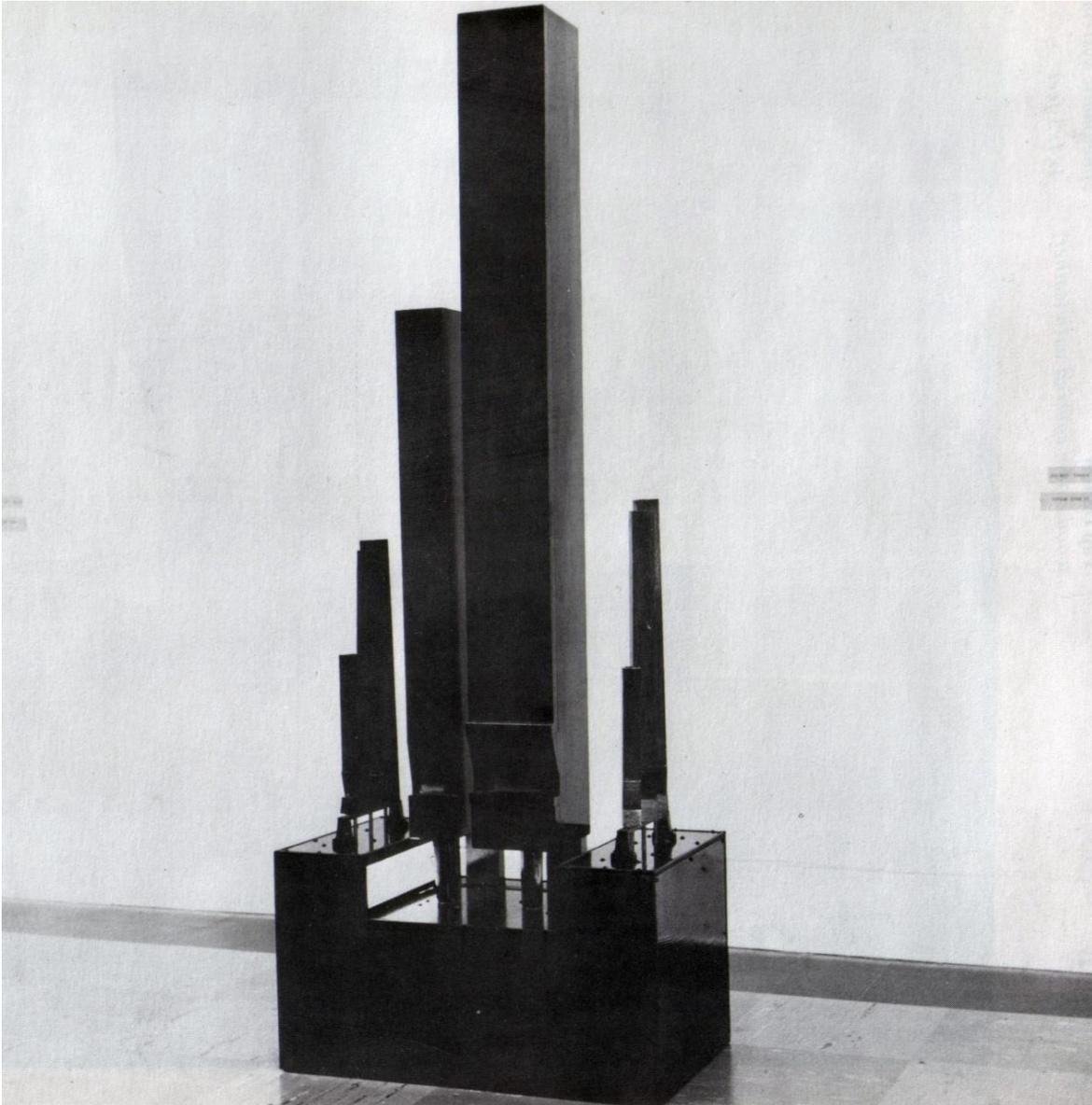


Figure 10 Stephan von Huene, *Totem Tone III* (Kaprow, 1975, p. 30)

However, the amplitude of sound works can also be nearly inaudible like the 16 hertz bass produced by the impressive organ pipes of Gunter Demnig (Bernd Schulz, 1988), where sound can mainly be physically felt. (Messing, 1987)

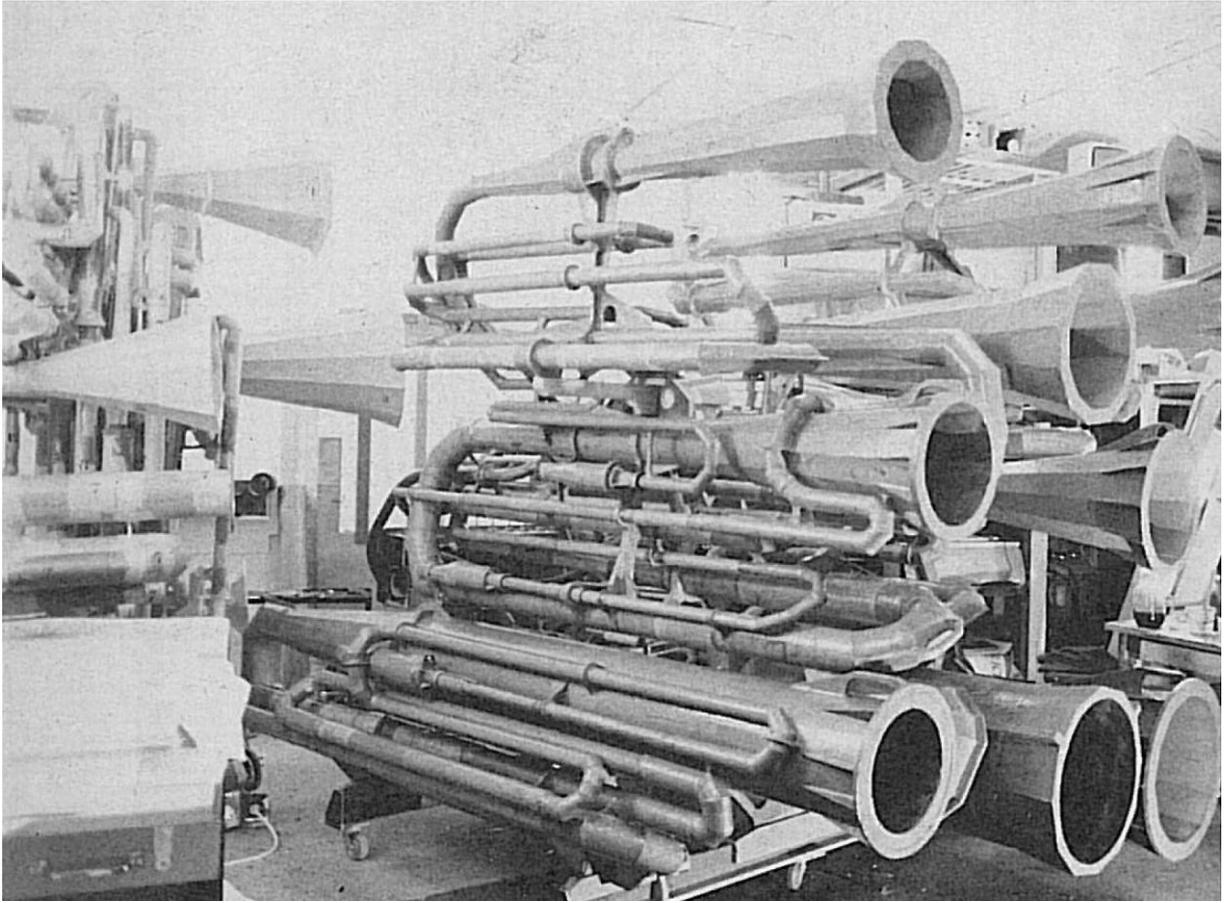


Figure 11 Gunter Demnig, *Infraschall* (Bernd Schulz, 1988, p. 17)

It may seem contradictory at first sight but sound works do not necessarily produce sound. Some works are based on the idea of reflecting or muffling sound generated by the audience or its surroundings such as Marvin Torffield's large, clean structures who simply serve to reflect sound (Peter Frank, 1979) or Michael Asher's installation for the exhibition *Spaces* [1969]. Asher built two walls and a ceiling in his assigned space and covered all sides with drywall⁴² (J. Licht, 1969) (Asher, 1983a) The existing walls were filled with fibreglass insulating material and in order to extend the sound absorbent characteristics of the room, two additional layers of wall were added to the interior surfaces of all four walls and the ceiling and floor were covered with two layers of textured acoustical panelling. The final dimensions of the highly sound absorbent space were 6,96 meter [north-south], by 6,04 meter [east-west] and a ceiling height of 2,39 meter. Environmental sounds merged from the two entry/exit openings. (Asher, 1983a)

⁴² Although the catalogue of *Spaces* mentions the usage of speakers, a noise generator and an oscillator, these were never deployed in the finished work. (Asher, 1983a)



Figure 12 Set up of Michael Asher's installation presented at *Spaces* [1969] @Claude Picasso (Asher, 1983a, p. 27)

Figure 13 Akio Suzuki's *Otodate* presented during *Sonambiente, festival für hören und sehen*, Berlin, 1996 @ Akio Suzuki (Osterwold, 1998, p. 53)



Other works go even further, they do not add sound and also refrain from adding material to reflect or muffle sound. Instead, the acoustic qualities of an existing space are put to use. An example is the work of Akio Suzuki, who seeks points of the greatest echo-density in an existing space. Suzuki has carried out his project, which he calls *Otodate*⁴³, in various landscape situations – indoors and outdoors –

⁴³ Meaning “enjoying sounds in the open”(Osterwold, 1998, p. 46)

since the sixties. He marks echo points with a specific logo consisting of 2 footprints - each resembling an ear - surrounded by a circle. The passer-by is invited to stand on the mark and to listen. In downtown Berlin, in the area Fischerinsel, Suzuki marked 25 of these echo points for the *Sonambiente* project⁴⁴ in 1996. He made use of a bamboo slit drum to locate the echo points. Suzuki adopted the same approach also indoors, for instance in the exhibition *Klangräume* in 1997-1998 at the Stadtgalerie Saarbrücken where he projected a logo on the floor of a long corridor. This logo did not mark an echo point but it invited the listener to imagine a sound world while looking through windows that provided a view on other, mostly silent, installations by Suzuki. (Bernd Schulz, 1998) (Osterwold, 1998) (De la Motte-Haber, 1996c)

1.1.2 Frequency



Figure 14 Logos Ensemble, *Holosound*, Ars Electronica, Linz, Austria, 1988 @ Logos Foundation archive

Whilst most sound works employ frequencies within the human audible range [20-20000 Hz], some works explore the borders of what is humanly audible, either above [ultrasound] or below [infrasound] the audible range. Works that make use of sounds below the audible range do so to create sensations (see p.313) or to visualise these inaudible sounds (see p.315). However, works that make use of sounds above the audible range are rarer. While ultrasound technology has been used in many different fields as a measuring or imaging tool, it has been used in the arts to measure distances or to determine

⁴⁴ The programme of *Sonambiente* also included another space of which the sound environment had not been modified. Sounds coming from the numerous corridors resonate in the staircase of a court. (see Figure 1) The curators present this space as a “Klangraum per se” (Kneisel et al., 1996, p. 8), as “a space without sound art”, as an allusion to Klara Wallner’s 1992 exhibition cycle *A space without art*.

position. A good example is the *Holosound* installation⁴⁵ by Godfried-Willem Raes. The reflection of ultrasonic sound beams against the human body is used in this work to convert the position of human bodies into audible sound. A frequency modulated ultrasound-emitter is placed in the vertex of an imaginary tetrahedron. In its remaining corners three ultrasound-receivers catch the emitted ultrasounds. If a human body moves in the imaginary tetrahedron each receiver will detect a different differential signal within the audible range. Every, relatively slow, body-movement causes a Doppler-shift of the sound produced by the ultrasound-emitter. As a result a pitch-shift is produced that is within the human audible range. (Raes, 1978) The position of the body determines the sound. If nobody is present in the scope of the imaginary tetrahedron, then no sound is audible. In the imaginary tetrahedron every movement, no matter how small, changes the pitch of the sound. In a newer version of *Holosound*, MIDI conversion was integrated so that a variety of sounds could be implemented.

A similar technique is employed by Ron Kuivila who transforms sounds ranging from 30kHz to 50kHz to audible sounds, between 1Hz and 20kHz through reflection of movement. (Kuivila, 1989)

Ultrasound has also been applied in sound art to create highly directional beams of sound. If two inaudible frequencies are produced by the same sound source, then the difference tone can be within the audible range. The advantage of playing a 40kHz and a 42kHz sine wave from the same sound source, is that the resulting wave of 2kHz will create a narrow beam of sound. (Pampin, Kollin, & Kang, 2007) The Holosonic Research Labs has created a commercial application based on this principle. It has been implemented in museums and retail stores, amongst others.(Holosonic Research Labs, 2009)

⁴⁵ *Holosound* has been used as a musical instrument but it has also been presented as an interactive sound installation.

1.2 Visual aspects of sound art

Although there is not necessarily a physical object in sight, there is always a material aspect to a sound work. This aspect can take the form of a location, such as in numerous works by Max Neuhaus who creates site-specific works and always hides his sound-producing elements so that “the system producing the sound doesn’t become a physical reference”. (Tomkins, 1988/1994, p. 11) In most of his works there is nothing to see apart from the pre-existing environment. Therefore, the surroundings and noises present in the location where the work is situated form an essential part of the work. The sounds added by Neuhaus, comment on or question the existing sound environment. He makes the listener more aware of the existing sonic characteristics of that environment. “The sound is not the work, the place is – the sound is only the catalyst which creates the sense of place.” (Max Neuhaus, 1989, p. 244)



Figure 15 View from the pedestrian island that houses Max Neuhaus’s installation and grid from which the sounds emerge, Times Square, New York, United States @ Laura Maes

This is also the case for his work on Times Square⁴⁶. On the narrow pedestrian island that separates Broadway from Seventh Avenue, between Forty-fifth and Forty-sixth (Tomkins, 1988/1994), a rich harmonic sound texture, tuned to the noises of Times Square, emerges from underneath a ventilation grille. The small pedestrian island is the ideal spot for tourists to take pictures of Times Square. The sounds added by Neuhaus perfectly blend with the existing noises of traffic and tourists. The sound island that Neuhaus created, provides a moment of calm within the overall busy cosmopolitan atmosphere of Times Square with its sky-high apartment buildings, roaring traffic and flashing billboards. (see p.178)



Figure 16 Christina Kubisch, *Il respiro del mare*, 1981, Capo d'Orlando, Italy (Kulturamt der Stadt Rüsselsheim, 2000, p. 44)

The works based on electromagnetic induction by Christina Kubisch stand in contrast to most of Neuhaus' oeuvre. In these works by Kubisch, the electric wires through which sound is sent sometimes take specific forms⁴⁷ such as a triangle or a labyrinth (see

⁴⁶ The work was installed by Max Neuhaus in 1977. It ran 24 hours a day, 7 days a week until 1992. In May 2002 the work was reinstated. It is still running today. (Tomkins, 1988/1994) (Dia Art Foundation, 2002)

⁴⁷ Several artists have shaped the wires that sound is sent through. For example, in *Interspersion* by Takehisa Kosugi the cables and loudspeakers are placed in such a way that they portray plants and flowers (Pagé, 1980, p. 90) (P. Panhuysen, 1987d, p. 40) (R. Block et al., 1980, p. 212) In Robin Minard's *Silent Music* the wires are also

Figure 16, p. 24), sometimes the form is abstract or follows the architecture of a space (see Figure 17, p.25) or the contours of trees. (Kubisch, 1985) Sound, generally from a tape, is amplified by a dedicated amplifier from which the cables depart and return, forming a loop. The visitor received a wireless headphone - or in earlier versions small cubes with built-in loudspeakers (Gercke, 1999/2000) - of which the dynamic range can be adjusted. The built-in electro-magnets in the headphone function like a pick-up. The visitor actually becomes the mixing device. Her or his location determines the amplitude of the various sounds. (Kubisch, 1986) (see p.247)

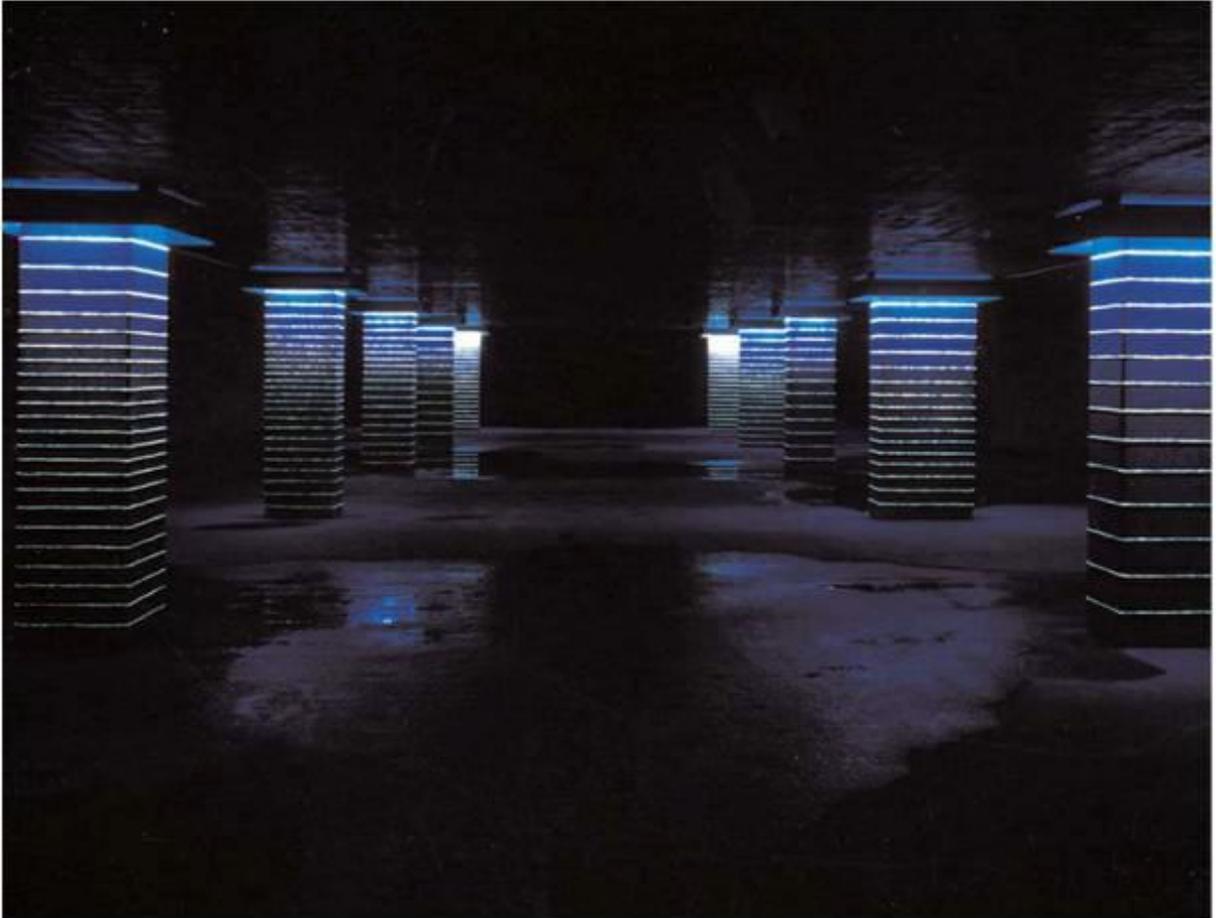


Figure 17 Christina Kubisch, *Klang Fluss Licht Quelle*, underground garage, Klangkunstforum, Berlin, Germany, 1999 (Kulturamt der Stadt Rüsselsheim, 2000, pp. 78-79)

These wires are not only essential to produce sound, but become a visual element by putting them in specific shapes. Moreover, Kubisch reinforces this by using coloured cables⁴⁸ or treating the wires with phosphorescent pigments.⁴⁹

shaped to resemble plants (Giroudon, 2000, p. 63) In Ulrich Eller's *Membran* (1990) oval, rectangular and circular speakers reach for the sun. (Eller, 2012g) 192 loudspeakers of various shapes form a semicircle in Eller's *Grosse Geräuschform* (2001). (Eller, 2012e)

⁴⁸ For *Il respiro del mare* (see Figure 16, p. 26) Kubisch made use of red and blue electric wire.

However, the physical appearance of sound art is not inevitably linked to the generation of sound. Sometimes external visual elements that are not necessary for the production of sound are added to the work. (see the work of Ulrich Eller p.29) For example, for *Mausware* Christina Kubisch placed ten computer mice in a star on a round table and, at regular intervals around the edge of the table, ten real mice cast in resin that she had borrowed from a museum of natural history. The visitor hears a composition for 10 channels of soft clicking noises that evoke the clicking of PC mice as well as to the rustling of real mice. (Kulturamt der Stadt Rüsselsheim, 2000)

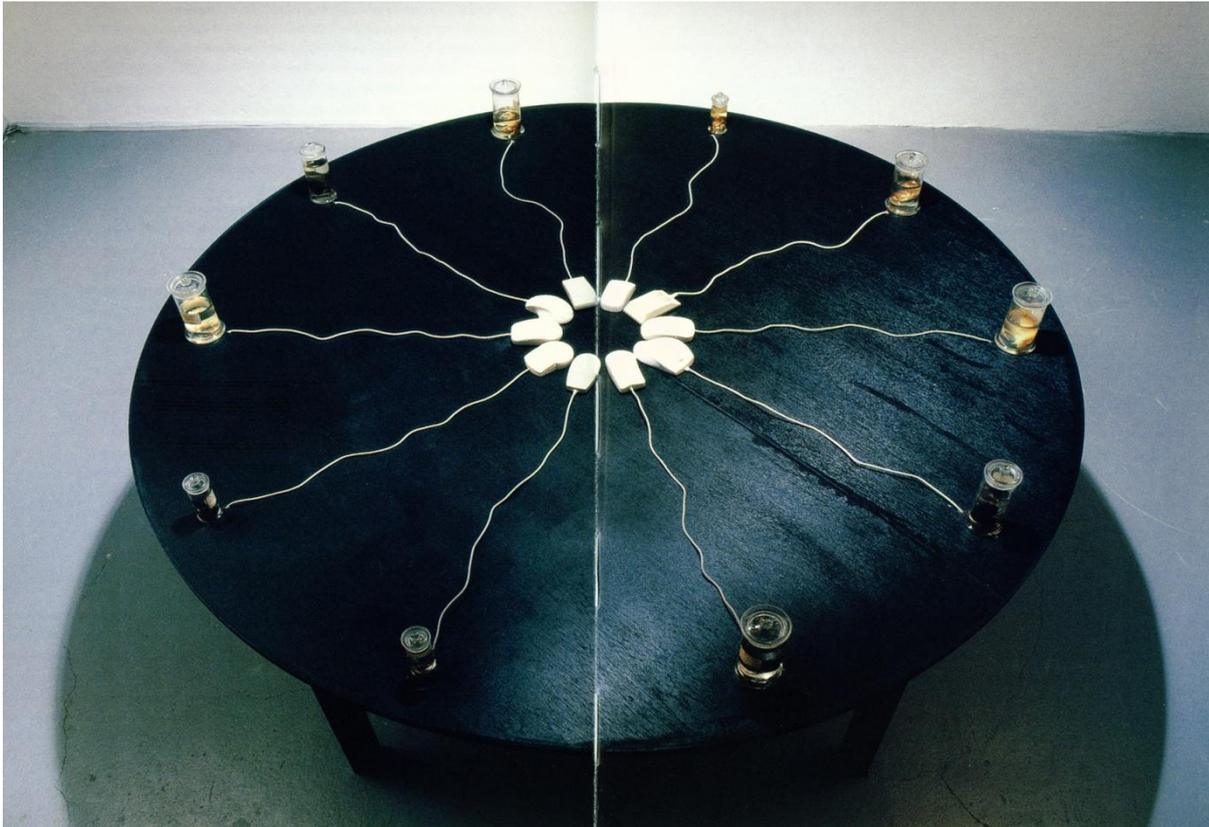


Figure 18 Christina Kubisch, *Mausware* (Kulturamt der Stadt Rüsselsheim, 2000, pp. 28-29)

⁴⁹ For her installation *Klang Fluss Licht Quelle*, at Potsdamer Platz Parkkolonnaden in Berlin, Kubisch utilised phosphorescent pigments and black light. (see Figure 17, p. 27)

1.3 The many faces of sound art – a look at the diversity of its creators

We are musicians because we are performers and play in concert; sculptors because with our hands we shape sheets of metal into forms, and assemble iron and other metals; poets, because we attempt to create the “supernatural element” – a universe of light, shape and sound; craftsmen, because with our hands we build musical instruments, referring also to our sensoriality; stage directors because we have staged productions where music, lighting effect, and shapes enter with the participation of actors, dancers... (B. Baschet, 1975, p. 4)

Sound art accommodates a high number of artists with very diverse backgrounds. Whereas in painting the majority of the artists have a background in visual arts, this parallel cannot be drawn with sound art. Few educational institutions organise courses in sound art or offer a graduation programme in sound art⁵⁰. This sparsely available schooling has contributed to the fact that since its origin the background and education of sound artists has been very divergent. This diversity is not only caused by the lack of available education, but has also a lot to do with the nature of the art form itself. Sound art is not one trade that can be taught. Its manifestations are extremely diverse, from mechanically moving sculptures to home-made software. Sound art invokes all sorts of disciplines and many trades can be involved.

⁵⁰ Nowadays several institutions organise courses on sound art. For example, the London College of Communication, the Sound Arts and Design department, part of the Faculty of Media, offers a Bachelor Sound arts & design and a Master Sound arts since 2008 (Voegelin, 2012) Since October 2011 (Nacenta, 2012) the University of Barcelona organizes the Master en Art Sonor targeted towards professionals already active in the field of sound art as well as degree holders in visual arts, architecture or music. (Universitat de Barcelona, n.d.) Since 2003 the Universität der Künste, Berlin yearly organises KlangKunstBühne, a one week lasting course. (Universität der Künste Berlin, 2013) Since 2007 the Royal Danish Academy of Fine Art, Finnish Academy of Fine Art, Bergen National Academy of the Arts, Dept of Fine Art and Umeå Academy of Fine Art organise the two year Joint Study Programme *Nordic Sound Art*. (DET KONGELIGE DANSKE KUNSTAKADEMI, n.d.)

Although these sound art masters are a relatively new phenomenon, there were already individual courses in the past that taught sound art practices, such as Leif Brush's *Audible Constructs* at the School of the Art Institute in Chicago in the beginning of the seventies (Gilmore, 1970).

As space plays an important role in many sound works, it is no surprise that some works appeal to acoustics⁵¹ and architecture⁵². The majority of sound works are not acoustic and incorporate some form of electronics. While many artists utilise plug-and-play devices, several artists take up the soldering iron and create circuits themselves.⁵³ Apart from designing hardware, artists also program their own software.⁵⁴

Whilst acoustics, architecture, electronics and information science seem natural disciplines to deploy by sound artists, less obvious disciplines are also called in. Some artists use electromagnetic induction to uncover sounds⁵⁵, while others make an appeal to electrodynamics and create works based on the theory of electric currents.⁵⁶ Therefore, physics provides an important source of inspiration: sound works based on fundamental natural phenomena (see p. 255), works that explore the travelling of sound through other substances than air (see p. 254), works that make use of mechanical processes or pneumatics, either activating pipes or flutes or using only pressed air⁵⁷. In addition, artists are not only inspired by physics, but also by processes from chemistry⁵⁸ and biology.⁵⁹

An artist's background and education determines in many cases his or her focus. Their schooling and interests often affect which disciplines are appealed to in their work. In the following section we will investigate how that background has influenced

⁵¹ Such as Michael Asher's installation for the exhibition *Spaces*. (see Figure 12, p. 22)

⁵² Architect David Hanawalt and sound artist William Close constructed a house with built-in string installations turning the whole house into a sound box. (Hanawalt & Close, n.d.)

⁵³ The majority of Peter Vogel's oeuvre is based on home-built circuits, soldered not on a printed circuit board but "in the air". The components are clearly visible and do not only determine the operation of the art work, but also its aesthetics. (Grathwohl-Scheffel, Ludwig, & Vogel, 2007) (see p. 183)

⁵⁴ In his sound sculptures Paul Slocum reprograms chips from redundant hardware, such as dot matrix printers. (Slocum, n.d.)

⁵⁵ A large part of Christine Kubisch's oeuvre is based on electromagnetic induction. (see p. 26)

⁵⁶ In *[stop]Kontakt*, a sound work by Boutique Vizique, the skin of the visitors is deployed as a conductor of an electric circuit. The visitor has to touch two contact points so as to trigger certain events, such as the playing of sound or the flickering of light. The contact points, shaped as electron and proton cartoon figures, are spread in the space and therefore encourage visitors to work together and to form chains. (Happy New Ears, 2007)

⁵⁷ In *Pneumatic Sound Field* Edwin van der Heide builds a grid of 42 [7 times 6] independently controllable valves that release pressurized air in the open air. While walking underneath the grid of valves the public can listen to a composition of nothing more and nothing less than compressed air. (Happy New Ears, 2007)

⁵⁸ The installation *Roots* from Roman Kirschner is based on the model of a chemical computer by Gordon Pask, developed in the early fifties. In a glass tank, iron crystals grow trying to make connections. Electricity is pulsed through all the wires. Growth or decay changes the flow of the current. The voltages at each wire are transformed into sound. (Kirschner, n.d.)

⁵⁹ In 2004 sound artist Anne Niemetz and biologist Andrew Pelling created the installation *The dark side of the cell* based on cellular audio. Cells were exposed to disruptive liquids and life-impairing environments to produce different sounds. (Pelling, Sehati, Gralla, Valentine, & Gimzewski, 2004) (Niemetz & Pelling, n.d.)

the focus of four sound artists: painter Ulrich Eller, musician Max Neuhaus, architect Bernhard Leitner and physicist Felix Hess. All four artists have in common that they forged their fascination into sound art.

1.3.1 Case study Ulrich Eller (background in visual arts)

Ulrich Eller studied painting at the Hochschule der Künste in Berlin (Eller, 2012b) (Haerdter, 1987) and although painting plays no longer a role in most of his works, the majority of Eller's sound works still have a strong visual aspect that in most cases is not directly related to the production of sound.

In *Klangzeichen - eine Materialmusik* [1983], 255 washers that served as a balancing element between rails and sleepers in railway construction are spread on the floor of an abandoned factory. The soundtrack consists of the sound of these washers thrown individually or together by Eller on the factory floor. This throwing-event was repeated for six days in a row. Former locations of the washers are marked with white chalk, each day the soundtrack is renewed. (Eller, 2012f) (Wulffen, 1983/1987)

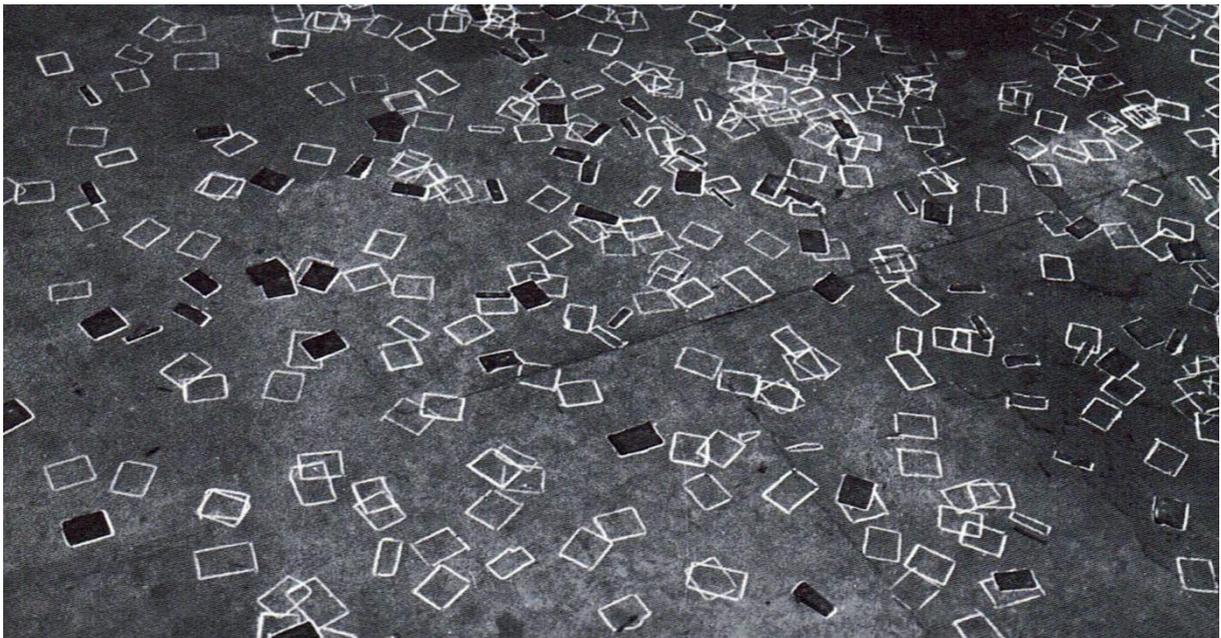


Figure 19 Ulrich Eller, *Klangzeichen* [1983] (Wulffen, 1983/1987, p. 13)

Eller employed a similar technique in *Perkussion zweier Räume* [1983]. While he knocked on the windows, floor and walls of the two spaces of gallery Giannozzo in Berlin, Eller searched for different timbres, pitches and resonances. He attached paper sheets in these places and drew lines or points with black chalk, creating visual interpretations of the sound. The recorded sounds resulted in an 8-channel composition reproduced by cassette recorders, placed on the same spot where the original sound was created. (Langebartels, 1987)

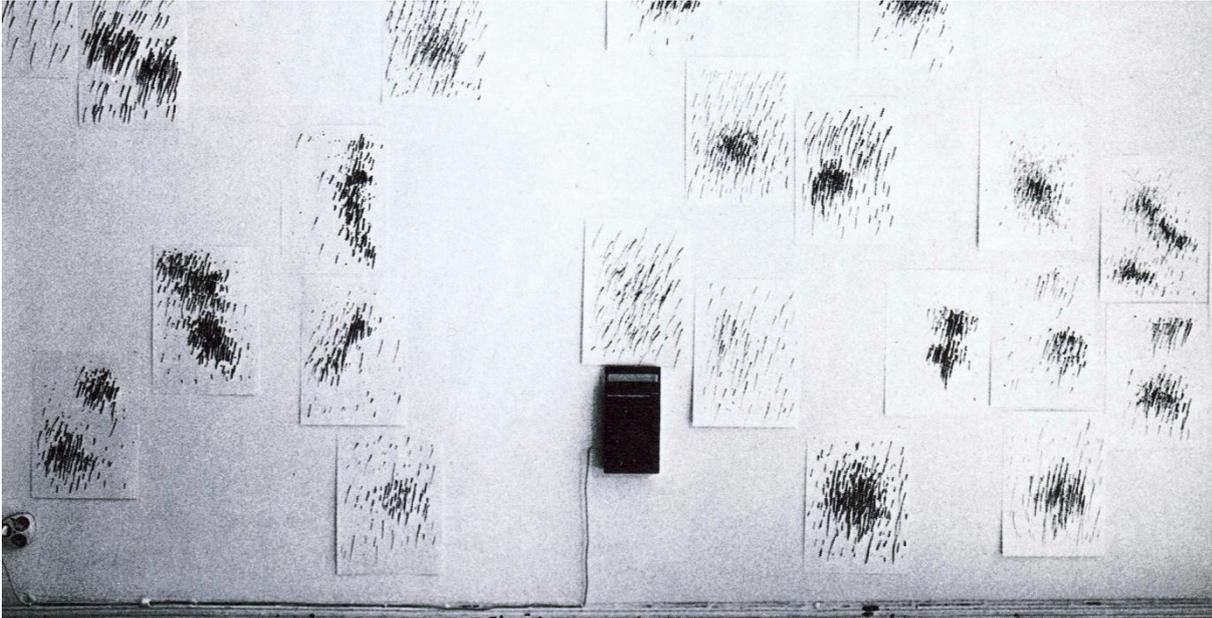


Figure 20 Ulrich Eller, *Perkussion zweier Räume* [1983] (Haerdter, 1987, p. 25)

Accordingly, in many of Eller's works the visual elements are inspired by sound. In *Die Kreise* [1988] Eller visualised percussion sounds with charcoal on long transparent sheets of tracing paper. Behind each sheet a speaker is placed that plays the adjacent sound. (Eller, 2012d)

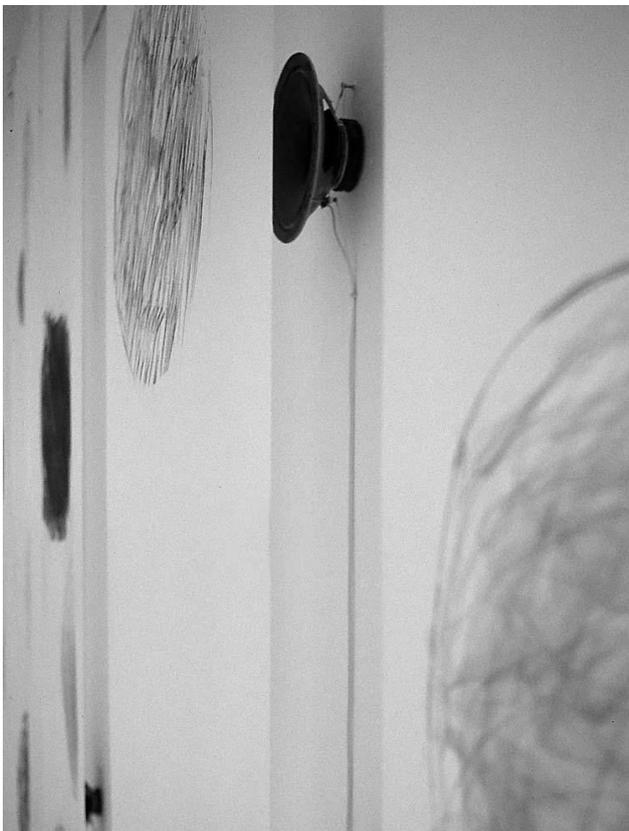


Figure 21 Ulrich Eller, *Die Kreise*, [1988] (Eller, 2012d)

The connection between sound and image is not always as clear as in the works mentioned above. In some works this connection remains strictly formal as Eller employs visual elements to enhance the idea behind the sound. For example, in *Das Quadrat* [1987] Eller places 43 rectangular glass panes on as many loudspeakers. As the loudspeakers have various diameters and different heights, a layering of glass panes is created. Eller uses electric guitar sounds in connection to the glass panes. "Meine Gitarrentöne sind so wie Glas, durchsichtig und schnell und in steter

Auf-und Abbewegung." (Eller, 2012c)

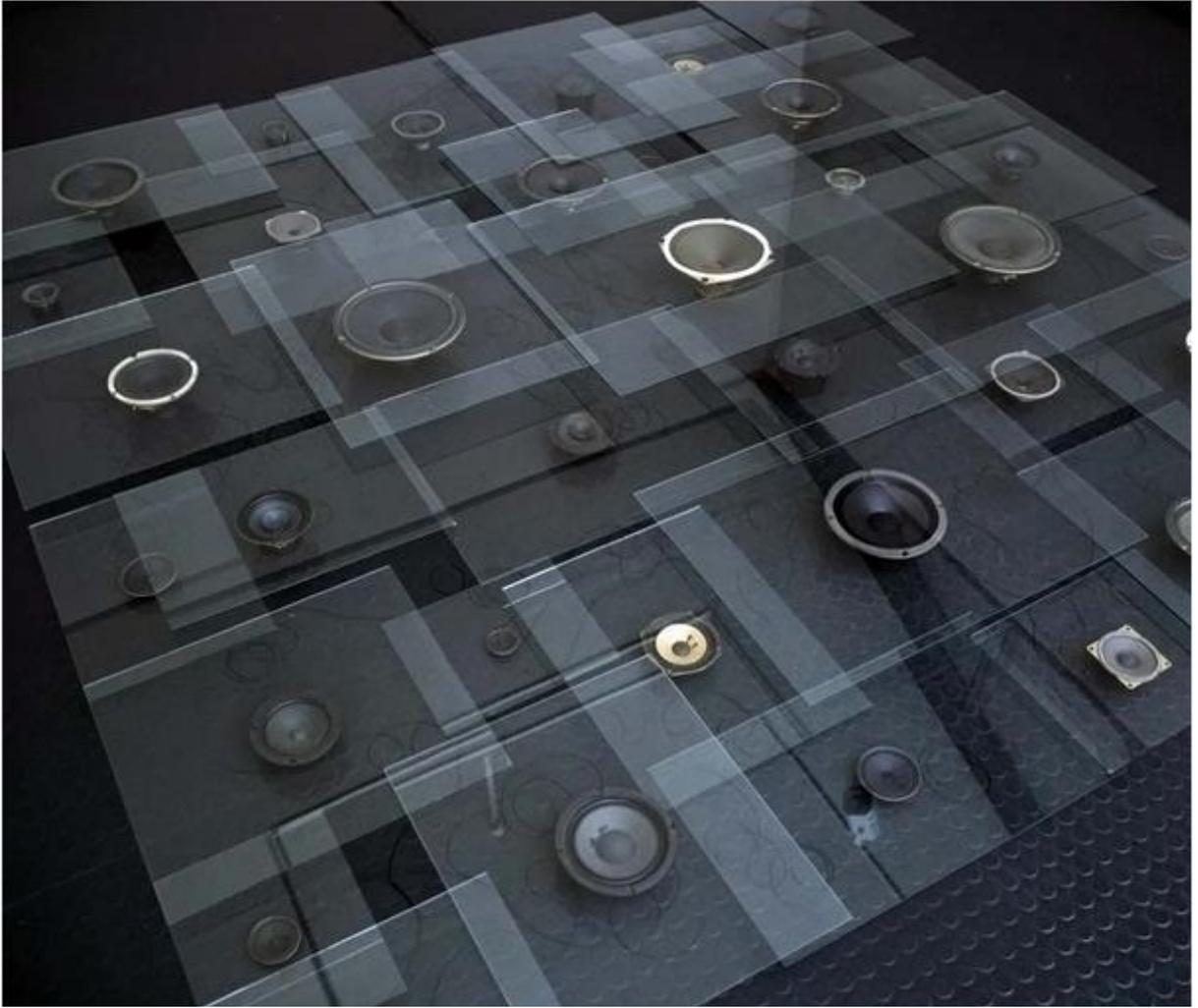


Figure 22 Ulrich Eller, *Das Quadrat* [1987] (Eller, 2012c)

The speaker as a pedestal returns in *Stocktrommeln - Musik am Meer* [1989], this time not for glass panes, but for photographs. The wires of each of the 14 speakers lead towards a row of 250 bent spruce sticks, similar to the ones used for coastal defence properties, lined up against the wall. (Eller, 2012h) Again the connection between sound and image remains vague.



Figure 23 Ulrich Eller, *Stocktrommeln - Musik am Meer* [1989] @ Tom Gundelwein (Eller, 2012h)

In addition, the sea has formed a source of inspiration in several of Eller's works. Horn shells appear attached to speakers to enhance the image of the sea [*Seestück*] (Kroz 1991) or are used as resonators [*Alo-a-he double*, 1991]. (Eller, 2012a)

The speaker is Eller's main instrument, either hidden or clearly present. Seashells, stones, drums and drawings are returning elements in his work.

Although there is always a connection between the visual and the auditive material in the works of Ulrich Eller, this connection is not always instant. Eller creates mainly site-specific works and utilises not only the acoustic characteristics of the room but also its current or former function. In his early works the visual elements are often traces of the production of sound. In Eller's later work the sound gains importance. In recent works such as *Zwölf Stimmen* [2010], the only visual elements are the twelve perforated synthetic rectangles that are built in the windows of the inner garden of the

Brüderkonvent in Braunschweig, Germany and that serve to hide the speakers. (Eller, 2012i)



Figure 24 Ulrich Eller, *Alo-a-he double* [1991] (Eller, 2012a)



Figure 25 Ulrich Eller, *Zwölf Stimmen* [2010], Brüdernconvent, Braunschweig, Germany @Andreas Bormann (Eller, 2012i)

To summarize, artists with an education in visual arts seem to be inclined to pay more attention to the visual representation of their sound works and to put the focus of their work not solely on sound.

1.3.2 Case study Max Neuhaus (background in music)

Max Neuhaus studied classical percussion at the Manhattan School of Music in New York. After a successful career as a performer of contemporary percussion works, Neuhaus lost interest in the concept of the concert hall, performance and virtuosity. In 1968 he quit performing and started to explore non-musical sounds in public space and other spaces beyond the concert hall. (Tomkins, 1988/1994)

Like Eller Neuhaus mostly works with speakers to transmit sounds. These speakers are always hidden to the eye of the spectator. There are no visual elements placed in front of or on the speakers as is done by Eller in the majority of his works. The only visual elements in Neuhaus' oeuvre are the surroundings of the work. Most of his works are also site-specific in the sense that the sounds are designed for a specific location. They cannot be transferred to a different location than the one they were designed for. The construction of the sound and its placement in space is the most time-consuming part of Neuhaus's modus operandi. (Max Neuhaus, 1992/1994)

Neuhaus wants to make his sounds available instead of imposing them. He lets people discover the sound for themselves through tickling their curiosity and persuading them into listening. (Cueff, 1988/1994) This was also the motivation behind his first sound installation *Drive In Music* [1967]. Neuhaus wanted *Drive In Music*, in which sounds could be explored through the car radio, to be part of the daily activity. (see p. 79)

In contrast to Eller who mainly uses pre-recorded sounds, Neuhaus always makes uses of synthesizers or sounds produced electronically. (Ammann, 1983/1994) The loop effect is less prominent than when tape or digital audio storage means are used.

Interestingly, Neuhaus's works often remain unnoticed by the majority of the passers-by⁶⁰. He does not add completely new sounds to the existing sonic environment. Instead, his sounds tend to blend with, emphasize or blur the sounds already present at the location. For example, in *Time Piece* created for Kunsthalle Bern the volume of Neuhaus's added sound gradually increases during twenty minutes until it is suddenly stopped. The majority of the audience only notices the changed sonic environment once the added sound has disappeared. (Ratcliff, 1983/1994)

The museum environment is not Neuhaus's preferred presentation spot (Tomkins, 1988/1994) as he prefers to reach the unaware passers-by who have not formed a preconceived idea or expectation of the work.

Neuhaus's installation for Villa Celle in Italy was his first installation outside the urban environment. Once more the sounds he added are tuned to the existing sonic environment. Neuhaus opted for a sloping hillside in the picturesque garden to install his work and added high pitched non-rhythmical sounds to the already present buzz of insects, the sound of rustling leaves and bird songs. The four speakers were not hidden behind walls or underneath metal grills, but were surrounded by dense shrubbery that hide them from view. (Ratcliff, 1983/1994)

In conclusion, artists with a musical formation seem to be inclined to focus more on sound and less on visual elements. The visual elements often arise from the production of sound or are less explicitly present.

1.3.3 Case study Bernhard Leitner (background in architecture)

Bernhard Leitner studied architecture at the Vienna Technical University. Leitner never studied music and did not apply himself to conventional compositions, but instead points his arrow –nearly six years after the completion of his architectural studies- at sound art. In 1968, when he trades Vienna for New York, he develops his first ideas on working with sound and space. His complete oeuvre revolves around the creation or transformation of space with sound and the relationship between them. The intensity, the rhythm, the speed of the moving sound and their mutual connections determine the shape of a space for Leitner. (Traber, 1998) (Drechsler & Leitner, 1992/1998)

⁶⁰ As is the case for his permanent work on Times Square. (see Figure 15, p. 25)

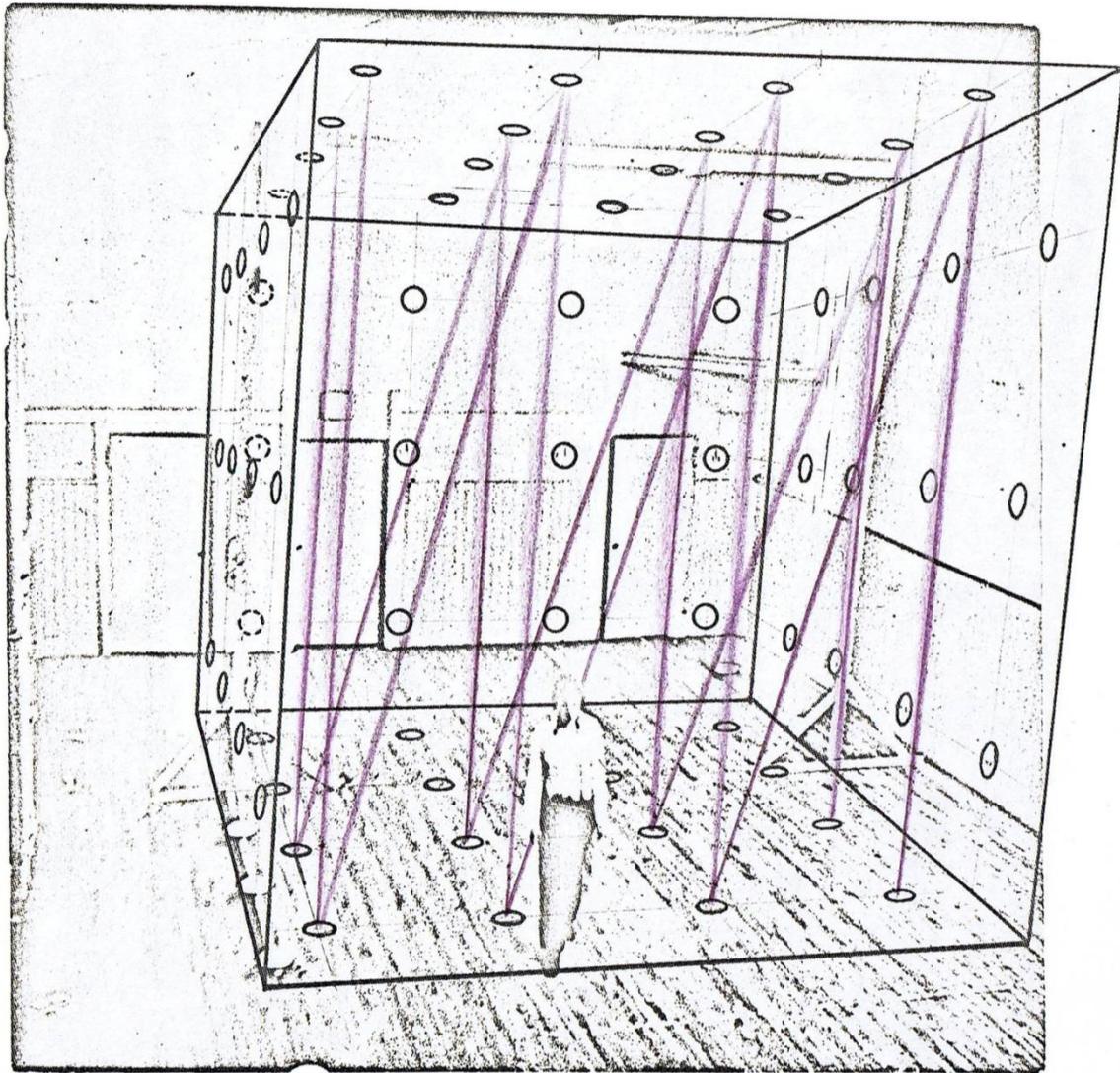


Figure 26 Bernhard Leitner, *Sketches for sound spaces in cube architecture with 80 loudspeakers* [1971] (Traber, 1998, p. 56)

Although Leitner is commonly regarded as a sound artist, he prefers the term “sound architect” (Ripley, 2007, p. 6). He considers sound as a building material, similar to stone, plaster or wood. (Leitner, n.d.-b) He would label his works as “sound-space works” and motivates this labelling as follows: “...essentially they have to do with space, with the experience of space, with space that is created and shaped with sound.” (Drechsler & Leitner, 1992/1998, p. 7)

In 1971 Leitner sketches the *Soundcube*: a visual neutral cube with a grid of loudspeakers mounted on each of its six internal sides. Leitner describes the *Soundcube* as “an instrument for producing space (with sound)” (Leitner, 1971/1998, p. 41) and also as “a laboratory for experiments and studies in environmental research, definition and character of space”. (Leitner, 1971/1998, p. 41) Leitner wanted to investigate the

relationship between the movement of sound and its audio-physical experience. *Soundcube* was not realised at the time⁶¹, but thanks to those hypothetical situations and his first practical empirical studies whereby loudspeakers placed on wooden boards were positioned in space, Leitner was able to develop his theoretical framework that lays the foundation of his oeuvre.

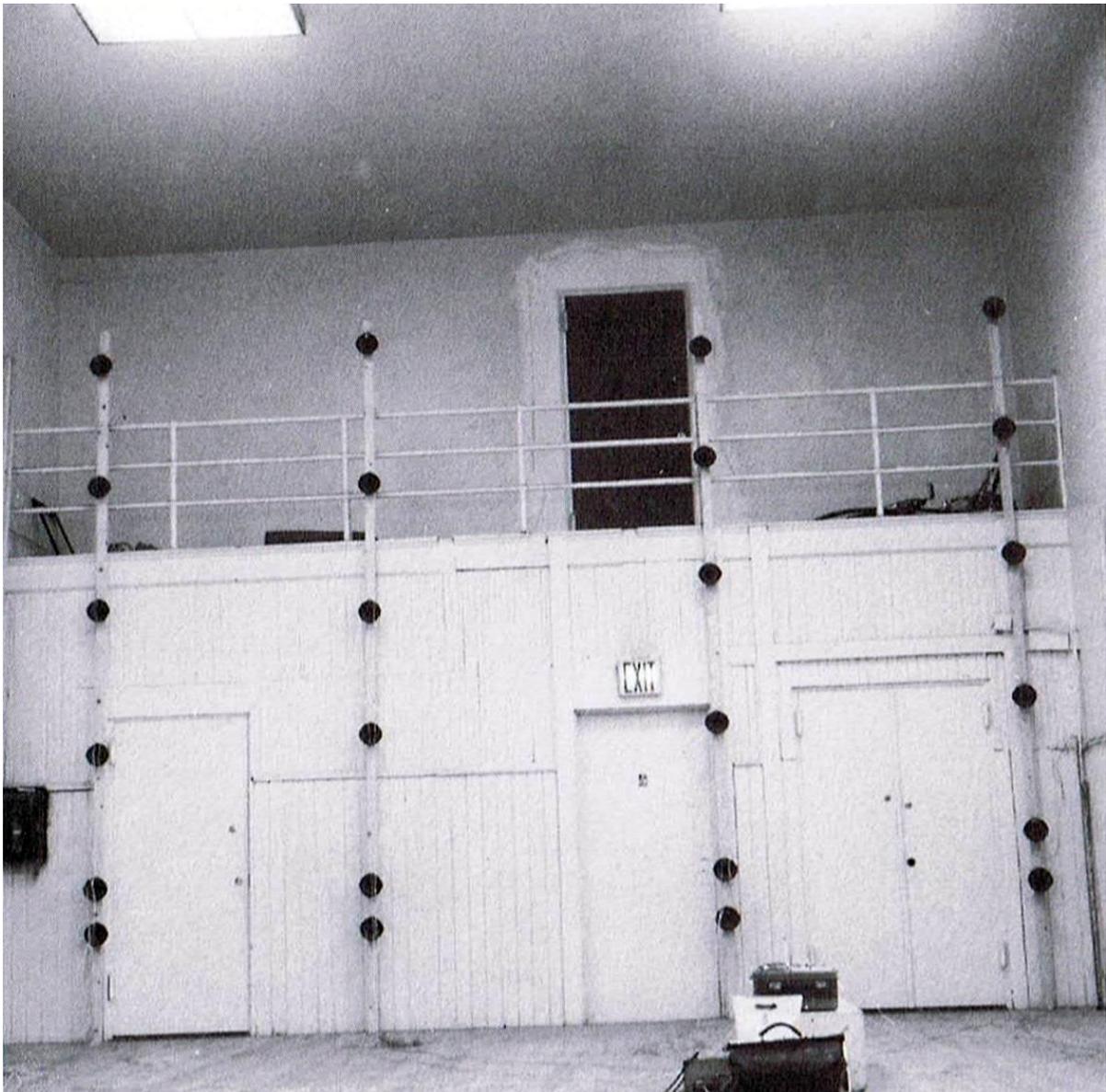


Figure 27 Bernhard Leitner, *Vertically bouncing sound Lines* [1972] (Traber, 1998, p. 47)

⁶¹ In 1980-81 Leitner created a variation on his original concept. *Sound Cube* was a cube-like room in which eight loudspeakers were distributed. (Leitner & Pehnt, 1984/1998)



Figure 28 Bernhard Leitner, *Ton-Raum* [1984], Technical University, Berlin, Germany (Traber, 1998, p. 140)

Leitner does not only create new spaces, but also makes works for existing locations. *Ton-Raum* [1984], a sound work permanently installed at the Technical University of Berlin, was made for a cube-shaped space in which two corridors and a stairway meet. Sound absorbing material was mounted on the walls and ceiling. Leitner installed 42 loudspeakers behind these perforated metal sheets that made sure that although the sound source is not visible, the sound remains audible. The computer-controlled, multi-channelled amplification system is hidden as well. (Traber, 1998) (Ohff, 1984/1998)



Figure 29 In *Le Cylindre Sonore* [1987] by Bernhard Leitner, permanently installed in Parc de la Villette, Paris, France, the circular space functions as a passageway for the rivulets and for the visitors of the park. (Traber, 1998, p. 160)



Figure 30 Bernhard Leitner, *Space Sources* [1997] (Traber, 1998, p. 258)

Leitner frequently conceals his sound source. In the permanent work *Le Cylindre Sonore* [1987], a double cylinder with an inner diameter of 10 meter and a height of 5 meter designed by Leitner in collaboration with landscape architect Alexandre Chemetov, the 24 loudspeakers are integrated behind eight perforated concrete elements. (Barré, 1998) The sounds are designed by Leitner to evoke reactions from its environment, the bird population of the bamboo thicket. In *Tonfield* [1991] Leitner hides 13 loudspeakers underneath the concrete floor. Through splits in the floor the emitted sound reaches the audience. (De la Motte-Haber, 1999)



Figure 31 Bernhard Leitner, *Metal Waves* [1998] (Traber, 1998, p. 280)

In *Space Sources* [1997] Leitner attaches loudspeakers on metal for the first time. At the glass-covered inner court of a building in Berlin four hollow metal columns of nearly six meter high are placed in a line. Loudspeakers are magnetically attached to the inside of each column,. At the back of the inner court Leitner placed two water basins above each other. Water from the top basin drips into the lower basin. This sound is registered by two microphones incorporated in the top basin and is reproduced live through the loudspeakers in the metal columns that resonate and vibrate along. The filtered

sound is projected into the inner court via the open top of each hollow column. Sound source and its resonators fill up the complete atrium. (Traber, 1998) In *Metal Waves* [1998] and *Sound Architecture* [1999] loudspeakers are also magnetically attached on metal: not on columns, but on hanging plates. (Leitner, n.d.-g)

In all his works Leitner tries to create a space with the aid of sound. This space is sometimes limited to the human body. In *Sound Chair I* [1975] Leitner places two loudspeakers underneath a couch: one loudspeaker directed toward the upper body and another loudspeaker directed towards the lower body. (Leitner, n.d.-f) He wants to let the spectator listen in a different way, not only with the ears, but with the entire body. With *Headscapes* [2003] Leitner goes one step further: he wants to activate certain areas of the brain. (Leitner, 2003) Therefore, placing the work of Leitner on an audio carrier only seems useless because the spatiality cannot be captured in a recording.

Nevertheless, with *Headscapes* [2003] Leitner delivers work for CD. Space still stands central, but the focus is on the space between our two ears.



Figure 32 Two of Bernhard Leitner's sound chairs placed parallel to each other but in opposite directions, at display at P.S.1, New York, United States in 1979 (Traber, 1998, p. 77)

To conclude, thanks to its specific physical qualities every space has a different inherent reflection of sound. Designing space and the resulting reflection of sound in that space is familiar ground for architects. It is no surprise that several architects have focussed on sound and did not only approach it as a by-product of architecture, but started to experiment with sound and space.

1.3.4 Case study Felix Hess (background in physics)

Felix Hess studied physics and obtained a PhD on the boomerang. His main interest is the movement of air and this is also reflected in his artistic work. He visualises air movement or makes this audible. His works do not divulge their operation at a single glance.

It's in the air [1994] is a collection of square shaped small flags fabricated out of white rice paper. The ingenious operation of the work is only revealed when a visitor spends some time in the same room as the small flags. As in most of Hess's works air pressure fluctuations stand central. Every turbulence has an influence on the positions of the small flags, which do not only react on movements or sounds of the visitor, but even on

his or her breathing. When a single spectator stands still for some time in the same room as the small flags, the small flags will, after a while, all turn into the direction of the visitor. The body heat of the visitor heats up the air around him which makes that air rise. Consequently colder air is attracted over the floor and as a result the small flags turn into one direction. (Kuitenbrouwer, 2003) Although this work does not produce any audible sounds, it is based on the basic principle of sound: the movement of air.

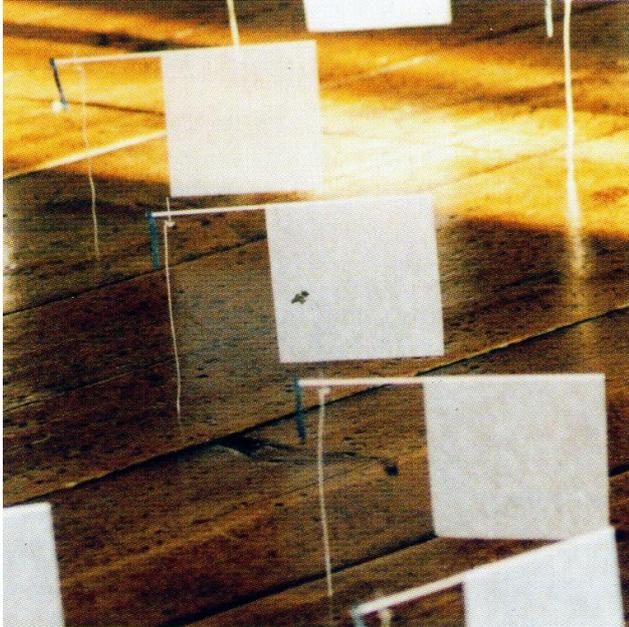


Figure 33 Felix Hess, *It's in the air* (1994) (Witteveen+Bos-prijs voor Kunst+Techniek, 2003, p. 24)

Hess's fascination for air pressure fluctuations can be traced back to his doctoral research. In 1975 Hess obtained his doctorate with a dissertation on the aerodynamics of boomerangs. (Doedens & Hess, 1997/2012) He equipped a boomerang with a light and registered the lightened movement of the boomerang through camera's with a long shutter speed. (Kuitenbrouwer,

2003) The movements of the boomerang were then tested to the theoretical model. (Doedens & Hess, 1997/2012)

His research brought Hess to Australia where he worked at the University of Adelaide from 1975 till 1979. There, Hess became fascinated by the interminable nightly concerts of the small tree frog (Bernd Schulz & Hess, 2001) and he recorded the frog sounds on tape. The mutual interaction between the frogs and their environment fascinated Hess. The frogs went silent when hearing an unfamiliar sound, but when they heard the croaking of a congener, they croaked back. Back in the Netherlands Hess missed this experience, despite his recordings which remained constant and therefore did not sound lively. (Bernd Schulz & Hess, 2001) In 1982 he created his first electronic sound animals based on a simplified model of the complex biological system of the small tree frog at STEIM [Studio voor Elektro-Instrumentale Muziek]. (Hess, 2001)

These circuits, *Tsjirpen en Stilzijn* (Leijdekkers, 2003), can distinguish the sound of their congeners from "strange" sounds. A strange sound increases the chance on silence, while the sound of a congener increases the chance of chirping. By placing numerous of those circuits in a silent room Hess wanted to imitate the process and not the sound of the nightly concerts of the Australian tree frogs. (Bernd Schulz & Hess, 2001) In 1991 Hess discovered that some electrets microphones are more sensitive than initially thought and that they were also able to register air pressure fluctuations, not

audible to the human ear. On the basis of this experience, Hess created *Windvuurvliegjes*, circuits that give green light flashes when changes in air pressure are being recorded. After this first experiment Hess builds *Krakertjes*, small machines that produce a series of clicks. When the air pressure increases the clicks follow rapidly and convert into crackling. When the air pressure decreases, the silences between each click become longer. (Kuitenbrouwer, 2003) Each *krakertje* consists of a battery, electronic components, a hand-made loudspeaker and a cheap electrets microphone. (B. Schulz, 2001). The loudspeaker consists of a piezo-element that is pressed by a small stone on a piece of balsawood, serving as a sound box. The size of the stone and its placement on the piezo element have an influence on the volume and timbre of the sound. The sounds are never loud and resemble the sounds of insects.

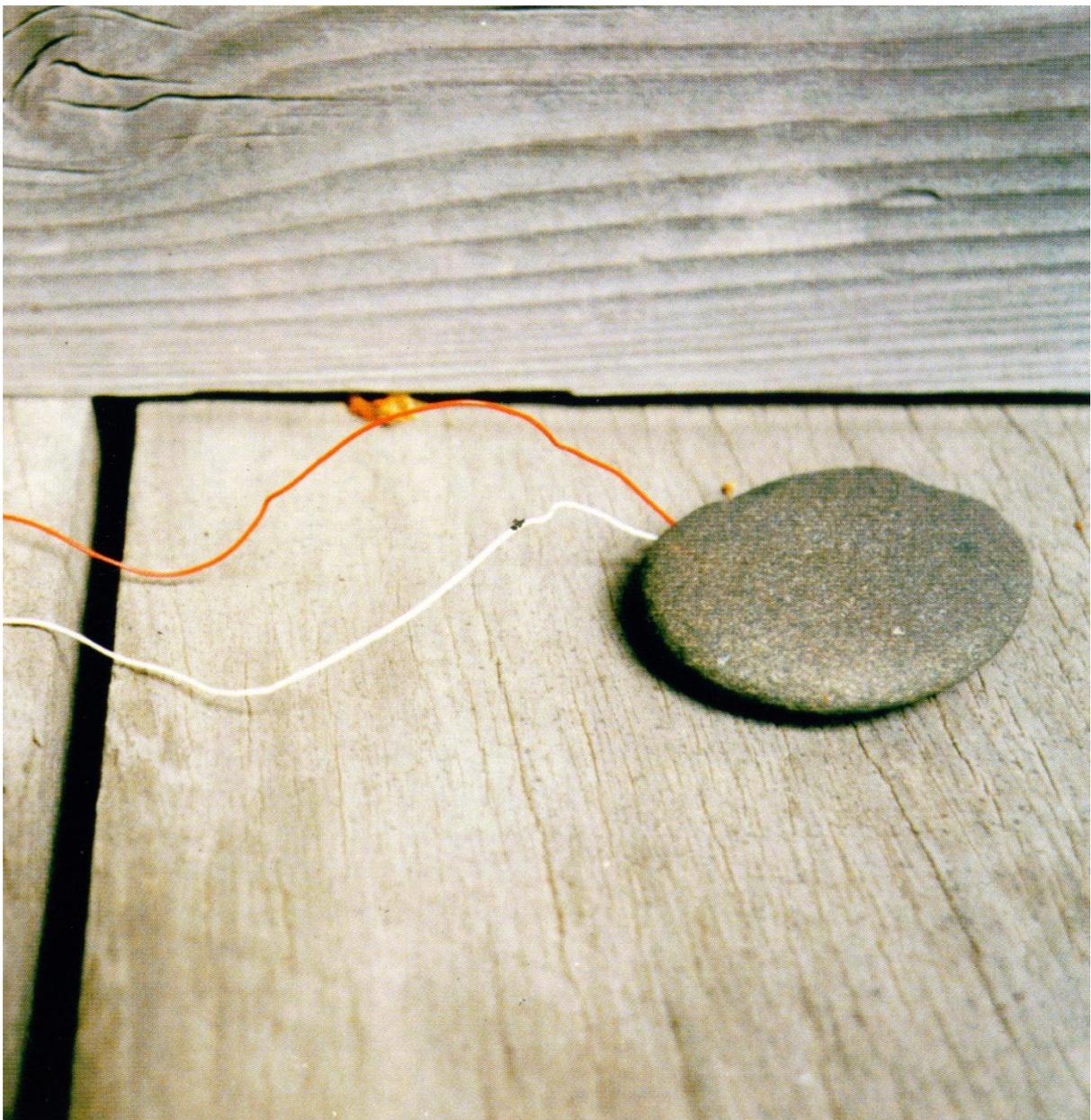


Figure 34 Felix Hess, *Krakertje* (Witteveen+Bos-prijs voor Kunst+Techniek, 2003, p. 21)

Just like the works of Leitner, the sound works of Hess cannot be grasped on an audio recording. Hess created a special work for cd. Not a recording of one of his sound works, but recordings of infrasound. Hess wanted to make the air pressure fluctuations that are actually a form of [inaudible] sound audible. During five days he recorded sounds with frequencies between 0,03 Hz and 56 Hz. He accelerated [and heightened] the recording 360 times so as to change the inaudible sounds into squeaking, hissing, rustling and buzzing sounds. (Hess, 2001) (Hess, 2003)

1.3.5 Conclusion

The case studies that were discussed, show that creators of sound art are as diverse as the appearances of sound art itself. The background of the artist plays an important role in relation to the sound works created. Visual artists are often attracted to sound art in their yearning for the liberation of matter. (Tittel, 2004) Composers “who find the academic practice of music too limiting” (P. Panhuysen, 1987b, p. 4) discover new ways of expression in sound art. Architects explore the non-physical space and scientists re-interpret natural phenomena in a creative way. These diverse backgrounds account for the divergent appearances of sound art and contribute to its innovative and cross-border nature. As a consequence, sound art is an artistic trend that is difficult to identify and to classify and has, above all, to be experienced.

1.4 Labelling sound art

“In life, things and not their names are important.” (F. Baschet, 1999, p. 40)

This quote by François Baschet⁶² has an element of truth. Labels are not important, but the art works themselves are. Yet, labels become important when we want to document or define things.

When we study exhibition catalogues and other literature we can see that a variety of descriptors have been used to label sound works. However, descriptors may mean different things depending on the author that uses the descriptor. Descriptors are connected to the character of an age and differ based on area, language and background of the author. Artists themselves have struggled with labelling their works and sometimes they use different descriptors for works intended to be presented in an exhibition environment and works presented in a performance setting. For example, the brothers Baschet labelled their sculptures used by musicians as “sound structures”, while “sound sculptures” were those sculptures made for museums, galleries and architectural projects. This distinction was mainly theoretical as François Baschet admitted to “still confuse the two”. (F. Baschet, 1999, p. 40)

Therefore, in this section we aim at giving an overview of the different descriptors that have been used to label sound works. In general these descriptors relate to different aspects of sound art, such as its kinetic, visual, spatial and technological aspect. The use of different terms has been widespread and sometimes inconsistent.

1.4.1 Descriptors that involve kinetic aspects

1.4.1.1 Audio-kinetic

At the end of the sixties up until the seventies works by artists such as Stephan von Huene (Newmark & Von Huene, 1972) and Charles Mattox (Mattox, 1969) were labelled as ‘audio-kinetic’. Von Huene described his work as “biomorphic forms activated by a player-piano mechanism and accompanied by music” (Newmark & Von Huene, 1972, p.

⁶² François Baschet created numerous “structures sonores” together with his brother Bernard. Their creations were used as musical instruments but were also exhibited.

69) Charles Mattox's sculptures were the result of an attempt to interlock art and technology. Mattox tried to involve the spectator in all his works, either directly by activating the piece or indirectly through influencing sound or light sensors. (Mattox, 1969) In von Huene's and Mattox's work, sound was mainly produced as a result of a mechanical action. The movement of this action was often visible. Therefore, the descriptor 'audio-kinetic' is appropriate for this kind of work.

In the same time period the exhibition *Sound / Sculpture: 11 artists working in the field of Audio-Kinetic Sculpture* [Vancouver, 1973] presented works by François & Bernard Baschet, Harry Bertoia, John Chowning, Paul Earls, David Jacobs, Gyorgy Kepes, Reinhold Marxhausen, Charles Mattox, Stephan von Huene, Walter Wright and David Rosenboom and labelled these works as audio kinetic sculptures. However, in the catalogue, that was published two years later in 1975, the designation 'audio-kinetic' had made room for 'sound sculpture'. (Grayson, 1975)

1.4.1.2 Kinetic environment

In his book *The Theatre of Mixed Means*, published in 1970, Richard Kostelanetz classified La Monte Young's *The Tortoise, His Dreams and Journeys* as a 'kinetic environment'. (Kostelanetz, 1970) Kostelanetz motivates: "Although music is the predominant force, the entire setting induces a multi-sensory involvement, and as the piece's time is open and its space is closed, I classify it as a kinetic environment." (Kostelanetz, 1970, p. 184) The work consisted of an open chord, amplified to the threshold of aural pain and of nearly infinite duration and is performed in a darkened room only lit by projections of pattern-art by Marian Zazeela. Kostelanetz makes a distinction between kinetic environments and pure happenings by saying that the space, organisation and the behaviour of participants or components of kinetic environments is more structured. According to Kostelanetz his kinetic environments share the structural openness in time and the encouragement of participational attention with happenings. (Kostelanetz, 1970, p. 6)

Kostelanetz distinguishes a recording of Young's piece from the actual kinetic environment as follows: "A recording of Young's theatre piece, however, is not a kinetic environment but a piece of sound - music, unless, of course, the listener recreates the original performance situation - the environment- of a darkened room, several loudspeakers, slides of oriental calligraphy, and an odor of incense." (Kostelanetz, 1970, p. 6) Kostelanetz effectively describes the difference between the registration of one aspect of the environment and the actual experience of the environment.

1.4.1.3 Sonomobiles/Sonile

In the seventies, the Logos Foundation in Ghent, Belgium organised not only concerts and performances, but also exhibitions in the framework of their Mixed-Media Festivals.

These so called ‘Sonomobiles’ exhibitions⁶³ included amongst others experimental instruments, performances, graphical scores and sound objects by artists or collectives such as Walter Giers⁶⁴, Michel Waisvisz⁶⁵, COUM⁶⁶, Linda Walker⁶⁷, Lieve De Pelsmaker & Godfried-Willem Raes⁶⁸, Ulrike & Wolf-Dieter Trüstedt⁶⁹ and Hugh Davies.⁷⁰ The term ‘Sonomobiles’ was launched as a collective noun for all works presented at these exhibitions

Sono refers to sound and mobiles refers to moving objects. The exhibition catalogue states that Sonomobiles address visual as well as auditive senses and that they cross borders and are not limited to one discipline. (Stichting Logos, 1976) “A ‘silent’ sonomobile is an ‘unfinished’ object.” (Moniek Darge, 1977, p. 6)

A similar term, also referring on the one hand to sound and on the other hand to mobile, was used by Eduard Johannes Stoecklin. Stoecklin made use of the designation ‘Sonile’ to label his moving and sounding sculptures, created between 1968 and 1978 (Stoecklin, n.d.), that had to be activated by the audience. “Ein Sonile ist eine bewegliche, tönende Skulptur.”(Stahmer, 1985)

1.4.2 Descriptors that involve visual aspects

1.4.2.1 Visual music – visuellen Musik

In 1975, the German version of the descriptor ‘visual music’, ‘visuellen Musik’, is used in a broad context in the exhibition *Sehen um zu Hören - Objekte & Konzerte zur visuellen Musik der 60er Jahre* [Düsseldorf, 1975] (Baecker, 1975b) The exhibition presented works by John Cage, Giuseppe Chiari, Stephan von Huene, Joe Jones, Mauricio Kagel, Nam June

⁶³ These exhibitions took place at the Museum of Contemporary Art (Museum van Hedendaagse Kunst), the current SMAK, in Ghent, Belgium. (Stichting Logos, 1976, 1977)

⁶⁴ Concerto, 1975 : sound-producing circuit mounted on poly acrylic (Stichting Logos, 1976)

⁶⁵ *Crackle Boxes* (Stichting Logos, 1976), portable battery powered sound producing electronic circuit that makes use of the conductivity of the human skin for its operation.

⁶⁶ Performance which consists of heating up a glass bottle filled with milk on a gas fire. The sound is amplified. The performance ends when the bottle explodes. At the same time, several graphical scores were exhibited. (Stichting Logos, 1976)

⁶⁷ Walker presented amongst others slides of Belgian Carillons combined with tape [John Cage’s Music for Carillon and Electronic Sounds] (Stichting Logos, 1976)

⁶⁸ The ceramic pieces of Lieve De Pelsmaker were equipped with keys or wheels or mounted on axles by Godfried-Willem Raes. The audience had to set the piece in motion by rotating it or by pressing a key. (D’Hondt, 1975/1976)

⁶⁹ Wind harps (Stichting Logos, 1977)

⁷⁰ Experimental musical instruments such as *Telephone-bell-tree*, an instrument made from bells recycled from dismantled telephones (Stichting Logos, 1976)

Paik and Dieter Schnebel, along with a series of performances. In the introduction of the catalogue Inge Baecker provides the example of Cage's composition 4'33"⁷¹ as a key work of the new visual music as it is necessary to see the pianist with stretched arms visually start the composition in order to comprehend the work. Another example of visual music discussed by Baecker is pop music in which visual elements, such as covers from LPs, claim an important role. (Baecker, 1975a) The designation 'visuellen Musik' receives a very broad, and possibly too broad, interpretation by Baecker.

In the introduction text of the exhibition catalogue *Für Augen und Ohren - Von der Spieluhr zum akustischen Environment - Objekte, Installationen, Performances* [Berlin, 1980] René Block and Nele Hertling narrow down the view on visueller Musik to utilising music in the form of sounds or noises as an expressive plastic material. "Musik wird nicht mer nur gespielt, Musik wird inszeniert. Spätestens seit den sechziger Jahren sprechen wir von "visueller Musik", die wiederum Künstler anregte, Musik in form von Tönen oder Geräuschen als plastisches Material zu benutzen." (R. Block & Hertling, 1980, p. 7)

1.4.2.2 Klangobjekte

The catalogue of the exhibition *Für Augen und Ohren - Von der Spieluhr zum akustischen Environment - Objekte, Installationen, Performances* [Berlin, 1980] makes a division between Mechanische Instrumente, Elektronische Instrumente and Klangobjekte & akustische Environments. Under the heading 'Klangobjekte & akustische Environments' mainly sound sculptures and sound installations are listed. The catalogue does not provide any further explanation of both designations, (R. Block et al., 1980) but we can deduct that the designation 'Klangobjekte' is used as a synonym for sound sculpture.

1.4.2.3 Klangplastik

The exhibition *Vom Klang der bilder. Die Musik in der Kunst des 20. Jahrhunderts* [Stuttgart, 1985] (von Maur, 1985b) gives an overview of music in the art of the 20th century. The catalogue is divided into several sections, from Futuristen und Vortizisten over Bildpartituren-graphische Musik up till Klangplastik. The catalogue's description of Klangplastik remains limited to "eine Vereinigung von Skulptur und Klang". (von Maur, 1985a, p. 25) The section Klangplastik included mainly sound sculptures by amongst others Joe Jones, Walter Giers, Bernard and François Baschet, Pol Bury, Terry Fox, Peter Vogel and only a few sound installations by amongst other Dennis Oppenheim.

⁷¹ A composition for any instrument or combination of instruments whereby the score prescribes the performer(s) not to play their instrument during the duration of the piece, 4 minutes and 33 seconds.

1.4.2.4 Akustische Bilder

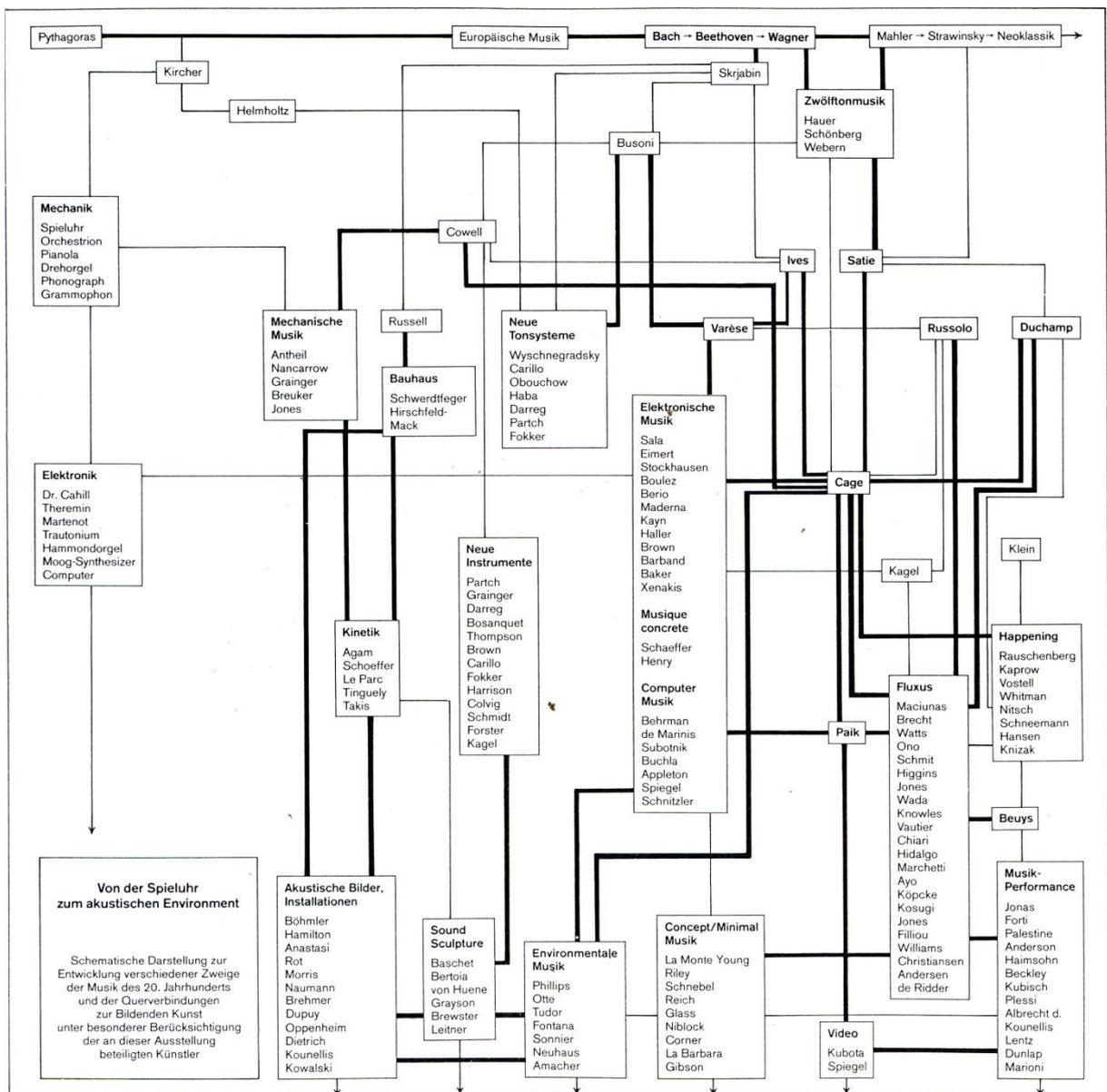


Figure 35 René Block's categorisation (R. Block et al., 1980, p. 6)

In the exhibition catalogue of *Für Augen und Ohren - Von der Spieluhr zum akustischen Environment - Objekte, Installationen, Performances* [Berlin, 1980] René Block drew up a categorisation. One of the listed categories, in addition to amongst others sound sculpture and Environmentale Musik, is Akustische Bilder, Installationen. Works by Böhmler, Hamilton, Anastasi, Rot, Morris, Naumann, Brehmer, Dupuy, Oppenheim, Dietrich, Kounellis and Kowalski are considered examples of this category.

1.4.2.5 Acoustic sculptures

Michael Brewster labels his own work as 'acoustic sculptures'. "I make the Acoustic Sculptures by physically matching an architectonic volume with long sound waves of a

size and power that will boost the room cavity into resonance. The sculpture that results is a field of palpable sound volumes, of differing sizes, densities and rates of excitement. In these pieces the user behaves sculpturally, probing the field as a “moving viewer”, in this case walking through instead of around volumes, apprehending physical conditions and spatial percepts as unique, as thick or thin, and active or inactive space, as well as more normative conditions like open/closed, large/small, inside/outside, all in “emptu” space.” (Smith & Wilhite, 1979b, p. 24) His description of acoustic sculptures has a lot in common with Bill Fontana’s view on sound sculptures. (see p. 77)

1.4.2.6 Phonic sculptures

Norman Andersen labels his work as ‘phonic sculptures’. According to Andersen phonic sculptures are “mechanically actuated musical instruments in a sculptural context”. (Andersen, 1986, p. 99) In Andersen’s sound sculptures chiefly existing musical instruments are automated, among which a saxophone, drum and classical guitar or components of instruments, such as organ pipes.

1.4.2.7 Ton-Skulpturen

Liz Philips calls her work ‘Ton-Skulpturen’. Her description of Ton-Skulpturen connects to Brewster’s description of acoustic sculptures (see p. 49) and Fontana’s view on sound sculptures. (see p. 77) “Anwesenheit und Bewegung und/oder Abwesenheit und Stillstand des Publikums im Raum bestimmen bei meinen Ton-Skulpturen die Kombinationen von Ton und Raum. Das Publikum wiederum entdeckt aber auch für sich, dass diese Töne dreidimensionale Formen, in Dauer und Tiefe unterschiedlich, erzeugen.” “Diese „Skulpturen“ kann man nicht sofort erfassen. Man braucht Zeit, um ihre Vierfältigkeit zu erfahren. Das Hörerlebnis muß oft wiederholt werden, um Abstufungen und Verästelungen zu erkennen – diese Ton-Bilder, die aus dem Kontext ihrer verwandten und simultanen Beziehungen entstehen.” (R. Block et al., 1980, p. 244)

1.4.3 Descriptors that involve spatial aspects

1.4.3.1 Akustische Environments

The catalogue of the exhibition *Für Augen und Ohren - Von der Spieluhr zum akustischen Environment - Objekte, Installationen, Performances* [Berlin, 1980] makes a division between Mechanische Instrumente, Elektronische Instrumente and Klangobjekte & akustische Environments. Under the heading Klangobjekte & akustische Environments mainly sound sculptures and sound installations are listed. The catalogue does not provide any further explanation of both designations, (R. Block et al., 1980) but we can deduce that the designation ‘akustische Environment’ is used as a synonym for sound installation.

1.4.3.2 Sound environment

Just as *akustische Environment*, ‘sound environment’ seems to be used as a synonym for sound installation.

In the catalogue of the exhibition *Echo, the images of sound* Hugh Davies describes sound environments as follows: “frequently set up out-of-doors, are related to the environment in a variety of ways, both positively and negatively; natural forces and water may make a significant contribution to the production of the sounds, exaggerated size [especially with long strings and tubes] may be employed, and existing features of the landscape [natural and man-made, such as trees, rivers, cliffs, caves, bridges, tunnels, roads and buildings] may influence the result.” (Davies, 1987, pp. 19-20) Davies considers works by Max Neuhaus, Davide Mosconi and Leif Brush to be good examples of sound environments.

In a similar way the designation sound environment is used by Calvin Tomkins to label the works of Max Neuhaus. “Places whose ambience is defined or altered by the electronic sound systems that he (Max Neuhaus) secretes within them.” (Tomkins, 1988/1994, p. 9)

1.4.3.3 Sonic environments

The book *Words and spaces: an anthology of twentieth century musical experiments in language and sonic environments* discusses the practice of Michael Brewster, Alvin Curran, Thomas Delio, Ron Kuivila, Alvin Lucier and Max Neuhaus as examples of sonic environments. The authors Stuart Saunders Smith and Thomas DeLio put the emphasis on the relationship of the works with their environment and alternate the usage of the designation sonic environment and sound installation. (DeLio & Smith, 1989)

1.4.3.4 Environmentale musik

René Block’s categorisation in the exhibition catalogue of *Für Augen und Ohren - Von der Spieluhr zum akustischen Environment - Objekte, Installationen, Performances* [Berlin, 1980] lists ‘Environmentale Musik’, besides amongst others Sound Sculpture. Works by Phillips, Otte, Tudor, Fontana, Sonnier, Neuhaus and Amacher are considered examples of the category Environmentale Musik. (R. Block et al., 1980, p. 6) (see Figure 35 p. 49)

1.4.3.5 Acoustically tuned spaces

The subtitle of the exhibition *Sound* organised at the Los Angeles Institute of Contemporary Art in 1979 reads: “an exhibition of sound sculpture, instrument building and acoustically tuned spaces”. (Smith & Wilhite, 1979b) Although the exhibition catalogue does not provide a description of what is considered an acoustically tuned space and the catalogue does not have a clear division, we can deduce that works from

amongst others Michael Brewster, Doug Hollis, Ron Kuivila, Alvin Lucier and Terry Fox are considered acoustically tuned spaces by the organisers and that the label ‘acoustically tuned spaces’ equals sound installations.

1.4.3.6 Sonambient

In 1959 Harry Bertoia got the idea to create a sculpture out of several standing rods. From 1960 onwards Bertoia creates freestanding sounding sculptures. In Bertoia’s sound sculptures the rods are flexible and move by touch or wind. When the rods bump into each other various tones are created depending on the length, mass and material of the rods. (Schiffer & Bertoia, 2003) (see p.223) Bertoia would label his sound sculptures ‘Sonambient’, a combination of sound ‘sound’ and ‘environment’. He preferred this appellation over ‘sounding sculptures’ as his creations were called by others. (Schiffer & Bertoia, 2003, p. 183)

1.4.3.7 Klangarchitektur

The designation ‘Klangarchitektur’ is used by Andreas Oldörp to label his works. He comprehends Klangarchitektur as “eine künstlerische Setzung, die eine Interpretation des Ortes zur Voraussetzung hat”. (Metzger & Oldörp, 1998, p. 94) Oldörp’s point of departure is the already present architecture, the atmosphere and the function of the place. He want to make “Ort” – a place - of the assigned “Raum” – space - by distributing his sound sources that have a direct link between the produced sound and the visual representation, throughout the room . (Metzger & Oldörp, 1998)

1.4.4 Descriptors that involve technology

1.4.4.1 Musikmaschinen / Music Machines

In a 1972 interview Dorothy Newmark labels the works of von Huene as audio-kinetic sculptures (see p. 45), whilst in a 1974 interview the works of von Huene are called Musikmaschinen. (Baecker & Von Huene, 1974/1975)

Music Machines was also the designation used by Joe Jones to label his electro-mechanical sound producing objects. Jones equipped mainly conventional instruments such as guitars, violins, drums and triangles with small motors, powered by batteries, electricity or solar cells, hung above the strings, membranes and metal elements. An extension such as a rubber band, a ping pong ball or a strip of leather is added to the motor and acts as a beater. (Hendricks, 1990)

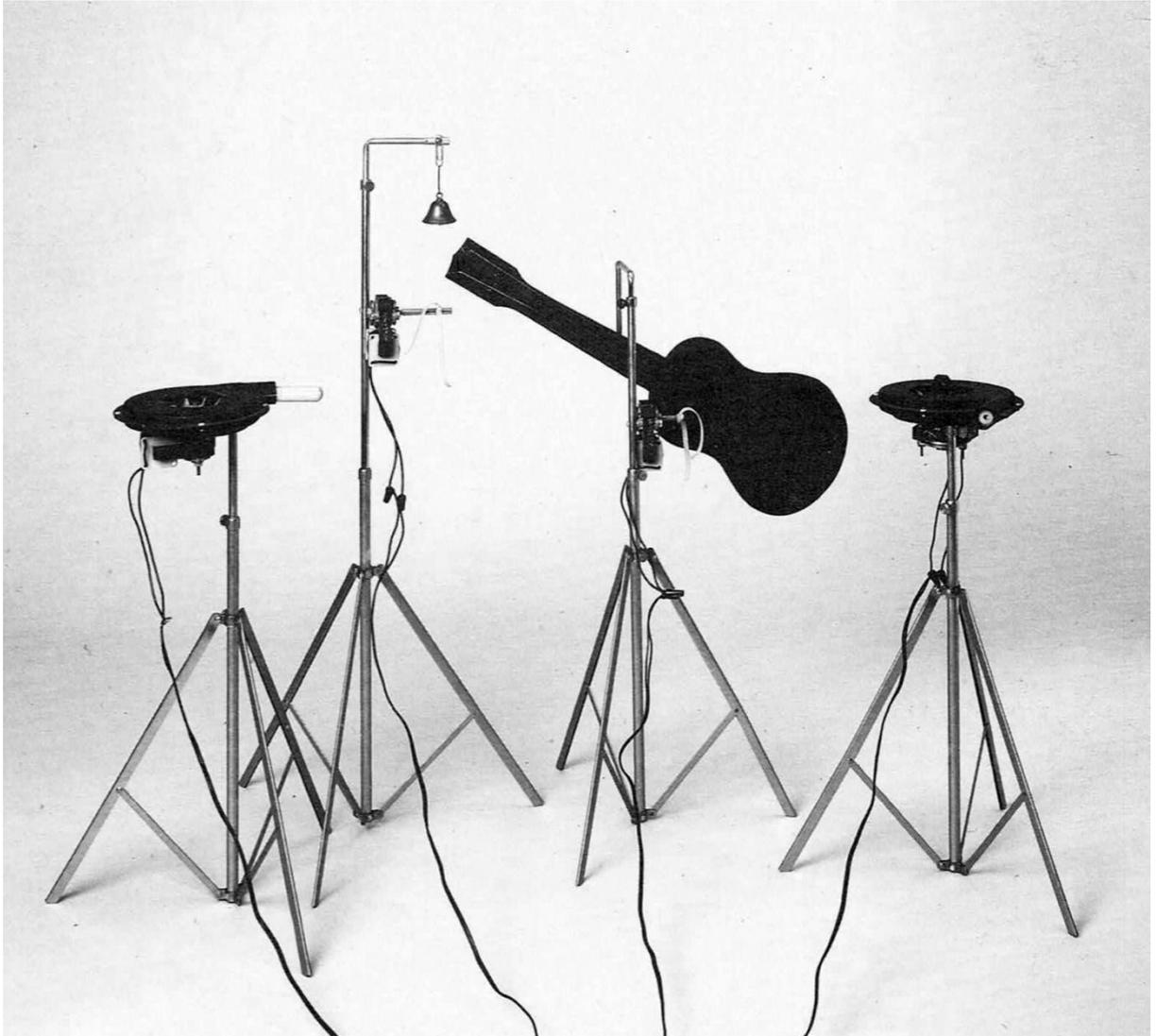


Figure 36 Joe Jones, *Mechanical Flux Orchestra* [1966]: guitar, bell, 2 aerophones, motors and transformers @ Coll. Sohm (Daadgalerie, 1990)

1.4.4.2 Ton-Mischmaschinen

“Meine Apparate machen keine Musik, meine Apparate benützen Töne, ich spiele mit den Tönen, ich baue manchmal Ton-Mischmaschinen, die mischen Töne, ich laß die Töne gehen, ich geb’ ihnen Freiheit... (Gertich, 1999, p. 146)

In a 1988 radio interview on the Saarländischer Rundfunk, Jean Tinguely named his *Méta-Harmonie* sculptures ‘Ton-Mischmaschinen’. (see p. 89) Tinguely does not organise or control the sounds. The created sounds are a direct consequence of the initiated movement.

1.4.5 Descriptors that involve art

1.4.5.1 Sonic art

In 1982 Marlin Halverson arranges the exhibition *Sonic Art* at the Art Gallery of the California State College. In the foreword of the catalogue Halverson describes *Sonic art* as “an exhibition that bridges the gap between the visual arts and music.” (Halverson, 1982a, p. 2) Halverson motivates his choice for Sonic above Audible, as the term sonic draws up everything related or affected by sound whilst the meaning of the term audible is narrower and is “only pertained to the ability of something to be heard” (Halverson, 1982a, p. 2).

Tony Gibbs employs the label sonic art in a broader context. “Sonic art can encompass a wide range of activities, perhaps wider than almost any other art form.” (Gibbs, 2007 : 8) Gibbs does not provide a clear description of the term as according to Gibbs “the form itself is often unclear.” (Gibbs, 2007, p. 8) However, Gibbs does give examples of what ‘sonic art’ can encompass: “from fine art to performance, from film to interactive installations, from poetry to sculpture and, of course, not forgetting music, all these can be part of the multicultural society that is sonic art.” (Gibbs, 2007, p. 8)

In contrast, Trevor Wishart has a totally different view on sonic art and he uses the term to label music. “We can begin by saying that sonic art includes Music and electro-acoustic Music. At the same time however, it will cross over into areas which have been categorised distinctly as text-sound and as sound-effects. Nevertheless, focus will be upon the structure and structuring of sounds themselves.” (Wishart, 1996, p. 4)

1.4.5.2 Audio art

In 1973 *Audio arts*, a magazine on cassette, is established by William Furlong and Barry Barker. (Furlong, 1994) The magazine combined “soundwork, performance interview, conversation, reminiscence and archive recording”. (Furlong, 1985, p. 18) Yet its content had very little to do with sound art. “The original aim in establishing *Audio Arts* was to create a publishing context within which information, ideas and thinking in relation to contemporary art could be expressed and disseminated in a primary form. However, it quickly extended to become a context or ‘space’ also for artworks, performances and other time-based activities.” (Furlong, 1985, p. 18) Although the magazine did not focus on sound art, other activities of *Audio Arts* moved more into that direction. In 1976 nine artists were invited to create a piece up to 10 minutes for tape and slides. The created works were presented in galleries and other spaces. (Furlong, 1994)

Since 1993 the Audio Art festival is organised yearly in Cracow, Poland. The festival’s view on ‘Audio Art’ reads as follows: “Audio Art is an integration of sound and visual arts. Presentations of Audio Art appear in the form of a concert, performance and installation. Audio Art creates a new concept of sound source: as an object and musical

instrument in certain space and time. Audio Art is a "one person art": designer, composer, sound artist and performer unify the whole process of art creation. Audio Art uses low and high technology." (Audio Art Festival, n.d.) This view is also reflected in the programme of the festival that in general consists of a mixture of concerts and sound art.

In the catalogue of *Sonic Boom*, curator David Toop uses 'Audio Art' as a synonym of 'Sound Art'. Toop states: "Detaching itself from the organizing principles and performance conventions of music, Audio Art explored issues of spatial and environmental articulation, the social and psychosomatic implications of sound or the physics of sound using media that included sound sculptures, performance and site-specific installations." (Toop, 2000b, p. 116)

1.4.5.3 Sound art - Klangkunst

Previous descriptions of sound art

Many descriptions of sound art focus on the merging of visual and auditive stimuli. "I was thinking about artists who let sound inspire them to make works that blend sound and image, so that this integration forms as it were a new medium: sound art" (P. Panhuysen, 1987b, p. 4) According to Panhuysen two type of artists are active in this new art form: composers and artists⁷² and the point of departure of sound art lies just as much in visual arts as in music (P. Panhuysen, 1987b) Panhuysen states: "The basis of sound art is the physics of sound, and the use of the rules and laws of nature itself. It means exploring different methods of sound production in various circumstances, and with a variety of materials and relationships of measure. Listening and also watching how sounds are created." (P. Panhuysen, 1987b, p. 4)

David Toop also states that sound art unites music and visual arts as he describes sound art as "sound combined with visual art practices" (Toop, 2000b, p. 107) Brandon LaBelle as well puts the emphasis on the merging of visual art and music: "In bridging the visual arts with the sonic arts, creating an interdisciplinary practice, sound art fosters the cultivation of sonic materiality in relation to the conceptualisation of auditory potentiality." (Brandon LaBelle, 2006, p. 151) Richard Lerman describes a sound artist as "somebody stuck in between sonic and visual artforms". (Lerman, 1987/1993, p. 29)

Christian Kneisel, Matthias Osterwold and Georg Weckwerth do not only focus on the merge of sound and visuals, but instead return to the 1952 description of Harry

⁷² This idea is countered in 1.3 The many faces of sound art – a look at the diversity of its creators p. 29.

Partch⁷³ and emphasise its interdisciplinary character. “Klangkunst’ ist Kunst zwischen den Künsten, ist Intermedia-Kunst par excellence. Der noch nicht sehr geläufige Begriff faß ebenso wie sein englisches Synonym 'sound art' alle möglichen Spielarten von Kunst mit Klängen zusammen, mit realen wie auch mit imaginären und virtuellen Klängen, die sich mit anderen Medien und Materialien im Kunstwerk zu einer integrierten, nicht mehr zerlegbaren Einheit verbinden.” (Kneisel et al., 1996, p. 6) “Sie ist Kunst zum Hören wie zum Sehen, nicht selten auch zum Tasten, machmal sogar zum Riechen und Schmecken.” (Kneisel et al., 1996, p. 6) Helga de la Motte-Haber also reverts to the merging of art forms that was considered as the greatest good in the 19th century. (De la Motte-Haber, 1996a)

There is no consensus on the various shapes sound art can adopt. Bernd Schulz states that in sound art “...sound has become material within the context of an expanded concept of sculpture.”(Bernd Schulz, 2002a, p. 14) According to Christian Kneisel, Matthias Osterwold and Georg Weckwerth sound art can embrace a wide variety of appearances: “Klangskulpturen, Klanginstallationen, Environments, Performances, Aktionen, Klangtheater, Klangpoesie bis hin zu medienkünstlerischen Arbeiten mit Radio, Film, Video und Computernetzen.” (Kneisel et al., 1996, p. 6) Also René van Peer, a curator and journalist, looks at sound art in a very broad way and considers field recordings as sound art. (Van Peer, 2008) However, we do not share the views of Kneisel, Osterwold, Weckwerth and van Peer. There is a clear distinction between a performance and sound art as sound art does not have a well-defined beginning and end. (see p.60 & p.118) We consider field recordings to be a form of composition. Musical notes and instruments are exchanged for mainly environmental sounds. John Cage defined music as “an organization of sound” (Cage, 1937/1987, p. 3). That sound can be anything, ranging from a cello to a mowing-machine.

Christoph Cox and Daniel Warner do not describe sound art based on its appearances or on its relationships with other art forms, instead their description of sound art is based on its place of presentation. “General term for works of art that focus on sound and are often produced for gallery or museum installation.” (Cox & Warner, 2004, p. 415) By limiting the place of presentation to galleries and museums a lot of other locations where sound art has been presented, such as public space, alternative art locations,

⁷³ The idea of combining sound with other disciplines is already described by Harry Partch in an essay, dated 1952: “Once in a while it would seem desirable, between all the specialized stimuli – of music in concerts, of the verbal in plays, of the dynamically visual in ballet – to find all these apparent desires and responses in a single work of art. A work that would not exclude any area of response –visual, aural, verbal – in any combination, in order to engage the whole person, either as performer or as observer.” (Partch, 1952/1975, p. 90)

specifically built constructions, non-art museums and sonic playgrounds (see p.169), are excluded and consequently a large chunk of sound art practice is left out.

In the liner notes of the CD released on the occasion of the exhibition *Volume:Bed of Sound* Max Neuhaus confirms the confusion that surrounds the designation: “Much of what has been called “Sound Art” has not much to do with either sound or art.” (Various, 2000)

Origin of the term sound art

In 1983 The Sculpture Center in New York hosted the exhibition *Sound/Art*⁷⁴, curated by William Hellerman, a presentation of the SoundArt Foundation that was established one year earlier, in 1982. A catalogue essay by Don Goddard explains the term ‘sound art’: “It may be that sound art adheres to curator Hellermann’s perception that “hearing is felt as another form of seeing,” that sound has meaning only when its connection with an image is understood. Hearing a recording of any one of these works could produce meaning, through imagination, but it is the actuality, the action of the work that has ultimate, useful meaning. The conjunction of sound and image insists on the engagement of the viewer, forcing participation in real space and concrete, responsive thought rather than illusionary space and thought.” (Goddard, 1983, p. 12) The exhibition mainly presented sound sculptures, as well as sound installations and a few visual installations utilising sound.

The SoundArt Foundation was erected to provide a framework for three activities: the calendar for new music, a monthly publication listing new music concerts in NYC, the DownTown Ensemble, a chamber ensemble dedicated to performing not often played works by experimental composers and SoundArt exhibitions. (Hellermann, 2013)

In fact, the term ‘sound art’ had already appeared prior to the formation of the SoundArt Foundation in 1982. Audio Transart Inc., established in 1979, is marketed as “the first New York-based quarterly magazine for sound art”⁷⁵. (Judith A. Hoffberg, 1980, p. 15) The magazine, produced as an audio cassette, features artists “known for their work in the field of video-performance art”. (Judith A. Hoffberg, 1980, p. 15)

⁷⁴ The exhibition presented works by Vito Acconci, Connie Beckley, Bill & Mary Buchen, Nicolas Collins, Sari Dienes & Pauline Oliveros, Richard Dunlap, Terry Fox, William Hellermann, Jim Hobart, Richard Lerman, Les Levine, Joe Lewis, Tom Marioni, Jim Pomeroy, Alan Scarritt, Carolee Schneemann, Bonnie Sherk, Keith Sonner, Norman Tuck, Hannah Wilke, Yom Gagatzi. (The SoundArt Foundation, 1983)

⁷⁵ Volume 1, number 1 contains contributions by Relly Tarlo, Hank Bull, Federica Marangoni, Gary Willis, Marshalore, Terry Fox, Fujiko Nakaya, Sam Schoenbaum, Barbara Smith and Nan Hoover. (Judith A. Hoffberg, 1980)

Sound art versus Klangkunst versus art sonores versus geluidskunst

Although Klangkunst, sound art, geluidskunst and arts sonores seem to be exact translations of one another, they have a different denotation.

Sound art and Klangkunst for example are not just the English and German terms for this trend in art, both designations also have a different inherent meaning. The use of the term sound art often remains very vague, whereas Klangkunst is generally used more strictly. Klangkunst developed within the academic field of musicology and is oriented towards the relation between sound and space, whilst the term sound art is used to appoint a wider variety of artistic expressions, often including field recordings and electronic compositions. (Engstrom and Tsjerna 2009) This is also reflected in the content of the group exhibitions organised in the United States, as several of these ‘sound art’ exhibitions mainly present music. Simultaneously, the term sound art is often used to label performances of experimental music, inside the United States⁷⁶, or abroad⁷⁷, whereas the term Klangkunst is far less used in that context.

There is also a difference in the intrinsic meaning of the word Klang versus Sound, Sonore or Geluid. As Bernd Schulz states the German Klang is usually colligated with musical sound in the context of a certain traditional cultural form (Bernd Schulz, 2002a) whereas the English Sound, the French Sonore or the Dutch Geluid can also refer to non-musical sounds such as noise.

1.4.6 Conclusion

The above-mentioned overview illustrates how different descriptors relate to different aspects of sound works, such as its kinetic, visual, spatial and technological aspect. These descriptors are often linked to a certain time period. For example, descriptors that involve kinetic aspects, were mainly used from the end of the sixties till the mid-seventies. While the many terminological variants often addressed a particular aspect of the art form, they also contributed to the vague idea of what sound art could be.

⁷⁶ In 2004 *the Lab* in San Francisco organised a series of performances entitled *Sound Rewound: Celebrating 20 Years of Sound Art*. Yet no sound art was presented as the programme solely consisted of performances of experimental music. (The lab, n.d.)

⁷⁷ In Japan the term sound art is also often used to label experimental music This is illustrated by the first sound art labs organised at Osaka Arts Aporia. These events included performances of artists from the Japanese noise and improvisation scene such as Sachiko M and Yamamoto Seiichi. (Osaka Arts Aporia, n.d.) The programme of the *Resound festival* incorporates “sound art performances” (Cornwall Autonomous Zone, n.d.), while the *Overgaden sound art festival* [Copenhagen, 2004] did present very little sound art and the programme did mainly consist of live performances, next to lectures, an audiotèque (sound archive) and a reading room. (Overgaden sound art festival, n.d.)

Although nowadays the designation sound art seems to have replaced most of these previous descriptors, the term is still used to label a variety of art forms. As a consequence the meaning of the term sound art remains unclear and a well-founded analysis remains a prerequisite to come to a better understanding of the art form.

1.5 Thirteen parameters of sound art

In the previous section, we have come to the conclusion that ‘sound art’ may be an appropriate term to cover the diversity of the art form. In order to determine whether an artwork can be labelled sound art, it is advisable to define a set of parameters that address characteristics of sound works. Based on our literature study, the analysis of exhibition catalogues, the author’s experience in organising sound art and the author’s artistic practice, thirteen parameters were put forward. They define a broad range of characteristics of sound works such as concept, perception, space, site-specificness, open form, interaction, production of sound, performer, narrativity, implementation of techniques and technologies, visual component, endurance and place of presentation. In the following section we aim at defining conditions for each of these parameters. These conditions should then allow us to define the field of sound art.

1.5.1 Concept

In sound art sound forms the starting point of a work. The generated sound is not a by-product nor does it serve to support visual elements. On the contrary, visual elements serve to support the sound.

We can make a distinction between four conditions:

1. The production, muffling or reflection of sound was not taken into account during the creation process.
2. The sound is a by-product.
3. The sound is one of the elements of the work and serves to support its general concept.
4. The production, muffling or reflection of sound forms the starting point of the work.

1.5.2 Perception

The experience of a sound work differs largely from the experience of a performance in a concert hall. In a concert hall the setting is determined: the visitor buys a ticket, there are seats or standing places, people dress up, the concert has a fixed beginning and end,

the audience applauds and the concert hall is divided in a stage - the exclusive domain of the artist - and a section for the public. This clear division between the territory of the artist and that of the audience has disappeared in many sound works. The audience often steps into the work and is part of the work. The perception of the visitor has been individualised as the route of the visitor and his time spent determine his perception and experience. There is no longer a collective viewpoint and a common start point and ending of the experience. Whereas a concert hall strives to bring across the same acoustic experience to all members of the audience, disregarding their seating, most sound works want to achieve an opposite experience as the perception changes and depends on the position of the visitor. In sound art the physicality of the sound is re-experienced. As sound is never limited to the sound producing element[s] but spreads into the room, the viewer automatically is submerged in the art work instead of only experiencing it visually from the outside.

The idea to let the visitor be part of the work can be found, for instance, in the work of Marinetti, who calls on the visitor to liberate himself from the slavish subordinated immobility and to set himself in motion (Marinetti, 1933/1973). However, the first impulses towards sound art can probably be traced back to large scaled performances in public space such as *Symphony of Sirens* by Arseny Avraamov that mingled audience and sound sources. (see p.163) The division between audience and performers, that had already become blurred in Futurism, could also be found in the happenings of the Fluxus movement from the beginning of the sixties till the end of the seventies.

We can make a distinction between three conditions:

1. The territory of the audience and the art work are fully separated from each other.
2. The territory of the audience and the art work partly overlap.
3. The audience proceeds in the work and is part of the work.

1.5.3 Space

The placement of sounds in space and the treatment of sound as plastic material is not a new idea. In his text *New instruments and new Music* [1936] Edgard Varèse states that there are actually three dimensions in music: horizontal [the progress of the melody and the rhythm], vertical [the harmony] and dynamic swelling or decreasing [crescendo – decrescendo]. However, Varèse wanted to add a fourth dimension, namely, the projection of sound (Varèse, 1936/1998). In fact, the potential of the projection of sound had surfaced many centuries earlier in the treatise *Musurgia Universalis* [1650] by Athanasius Kircher in which he envisioned spiral tubes that projected sound from an outside square to the mouths of statues, positioned inside a building. (Kircher, 1650)

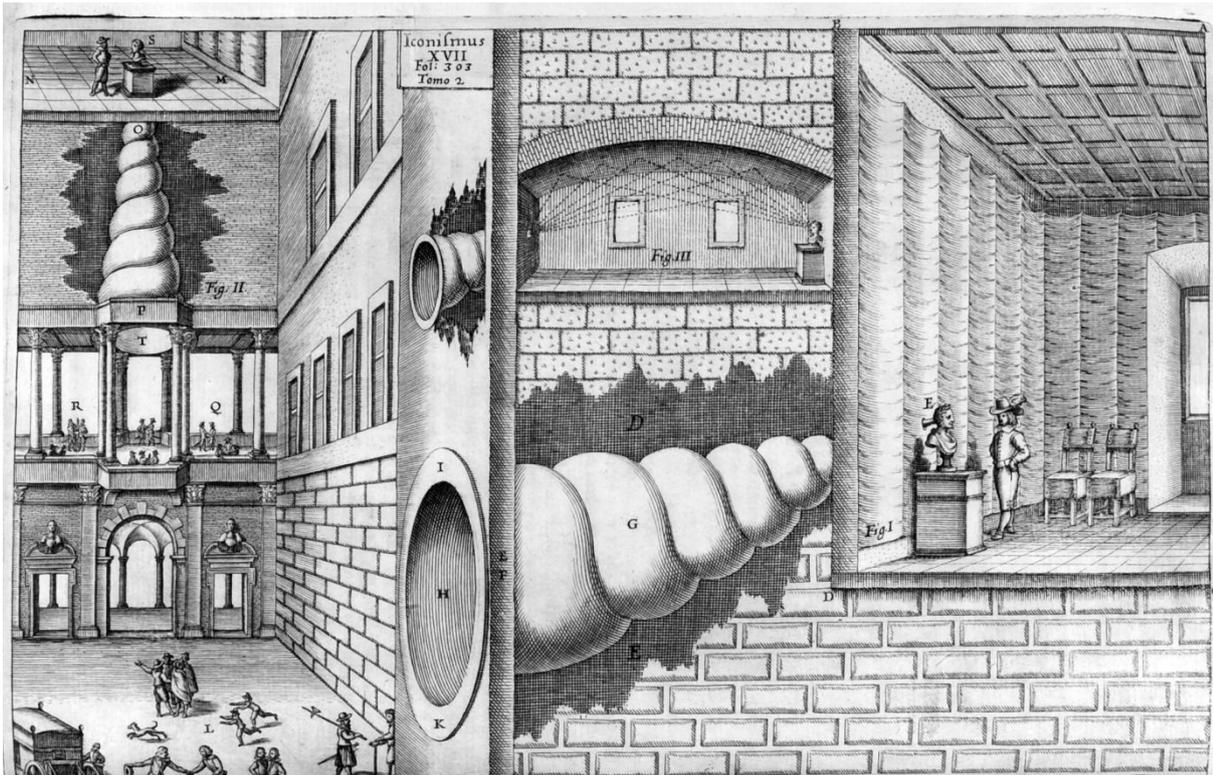


Figure 37 *Iconifmus XVII* by Athanasius Kircher (Kircher, 1650, p. 303)

In music, little attention is generally paid to space. Despite the famous example of the St Mark's Basilica in Venice, Italy, there is usually not much room left for spatial exploration. The division of most concert halls is determined and it often hinders spatial experiments. (see p.148) When music is not conveyed live, but through recordings, there is hardly a medium that can incorporate the element space in an appropriate way.

In sound art, however, the projection of sound plays an important role. The time dimension of sound becomes less significant, while the use of space comes to the fore. The projection of sound in space provides the artist with a lot of new artistic possibilities.

When sound is employed, the given space automatically serves as a resonator of the produced sound and, as a consequence, it has an influence on the work and becomes part of it. In some sound works this is explored through using sound to complement, contrast or emphasize existing features of a space. Other works create their own space within a given location⁷⁸ for example with the aid of directional speakers (see p.22), the distribution of sound sources in space or the deployment of sound absorbing, reflecting

⁷⁸ A common practice is the demarcation of a certain space through the placement of loudspeakers. In *A sound map of the Danube* Annea Lockwood uses five loudspeakers, each one put on a socket to mark out a pentagonal-like space. (Gibbs, 2007, p. 118) This practice to mark out space by loudspeakers, has been implemented in many sound installations.

or redirecting material. Other artists opt to have complete control over the space by accommodating their work in specifically built constructions. (see p.184)

We can make a distinction between three conditions:

1. The work has no connections with the space in which it finds itself other than its resonating qualities.
2. The work creates a separate space within a space.
3. A complete space is treated as one situation that can be entered by the spectator.

1.5.4 Site-specificness

“A work should include its environment, is always experimental (unknown in advance).” (Cage, 1982/2004, p. 222)

Reesa Greenberg specifies site-specific as “a term used to describe individual art projects where the location of the work is an integral part of its meaning.” (Greenberg, 1994/1996, p. 364) Richard Serra deepens this description: “The specificity of site-oriented works means that they are conceived for, dependent upon, and inseparable from their location.” (Serra, 1994a, p. 202) As described by Reesa Greenberg and Richard Serra site-specificity is not exclusively linked to sound art. In the visual arts many artists have created works for a specific location. Also in music we can find examples of compositions written to be performed in a specific location: from the distribution of singers in churches (see p.148) to more recent examples such as Morton Feldman’s *Rothko Chapel*⁷⁹ [1971].

For Richard Serra moving a site-specific work equals its destruction. “To remove the work is to destroy the work.”⁸⁰ (Serra, 1985/1988, p. 40) Not everyone shares this opinion. According to Lygia Clark “a work of art ought to be alive like an organism.”

⁷⁹ The instrumentation of *Rothko Chapel*, composed for the building of the same name in Houston, United States, was influenced by the space of the chapel and the Rothko canvases. (Feldman, 1976/2000)

⁸⁰ Despite this bold statement, several of Serra’s so called site-specific works have been relocated with Serra’s permission. *Sight Point* was originally created for a space in front of the historic building of the Wesleyan University campus. The final design was rejected as the work was found “too large and too close to the campus’s historical building.” (Crimp & Serra, 1980/1994, p. 133) Two years after the initial rejection of the work. The Stedelijk Museum in Amsterdam collected money to build *Sight Point* in the back court of the museum. A work made for a specific location can seemingly be transferred to a completely different location without any adaptations to the original design. Although Serra agreed with the different location, he still expresses the work lost part of its meaning: “What happened with *Sight Point* was that it lost all relationship to a pattern of circulation, which was a major determinant for its original location at Wesleyan.” (Crimp & Serra, 1980/1994, p. 133)

(Brett, 1968, p. 7) The economic reality has urged artists to adapt site-specific works to new situations. In that way, each presentation of the work leads towards new adaptations. At the moment of presentation the work is no longer a finished object, but a temporary version. The art work is not static, but evolves continuously. Like an organism the work moves through various stages of development. Nowadays site-specific often stands for a “nomadic practice” (Kwon, 2000, p. 51) as it has come to mean “moveable under the right circumstances.” (Hapgood, 1990, p. 120)

The physical qualities of the exhibition space have a huge effect on the final result (Reiss, 1999). The surroundings contribute to the atmosphere the work of art radiates and to the way it is experienced. If the same work is presented on more than one location, it will not be the same due to the differences between the spaces and the distribution or position of the sound-producing elements.

Site-specific sound works can make use of certain physical characteristics of a space, but they can also be based on its current, former or future function, its social context, its history, the existing sound environment or certain environmental factors. In most site-specific works the surroundings contribute to the atmosphere of the work and to the way the work is experienced. In the creation of a site-specific sound work, the artist often treats a complete space as one situation that can be entered by the visitor.

We can make a distinction between five conditions:

1. The work has no connections with the location.
2. The work is based on historic, functional or social characteristics of a place.
3. The work is based on architectural characteristics of a place.
4. The work is based on environmental characteristics of a place.
5. The work is based on the existing sound environment.

1.5.5 Open form

*“No beginning, middle, or end (process, not object)”
(Cage, 1982/2004, p. 222)*

Open form is used to refer to a work of art without a clear-cut beginning or end, as distinct from the definition utilised by Umberto Eco: “works of art that call upon performers, readers, viewers, or listeners to complete or realize them”. (Eco, 1959/2004, p. 167)

The non-time-bound character of visual arts manifests itself in sound art through the open form. Whereas most performances have a fixed beginning and end, sound art is like a performance lasting 24 hours a day, 7 days a week. The visitor himself decides when and how long he or she attends the performance. The sound work starts when a

visitor enters and stops when that visitor is leaving. The duration of attendance can vary highly and is not determined beforehand.

In music, experiments with duration can mainly be found within the composition itself. Graphical scores often leave room for interpretation of the length of time. In those cases the duration of the piece is determined by the interpreters, not by the audience. (see p.144) Experiments whereby, during the performance of a piece, visitors can come and go as they please are more rare. (see p.146)

We can make a distinction between three conditions:

1. The art work has a clear-cut beginning and end.
2. The art work has a well-defined beginning but unclear end.
3. The beginning and ending of the art work are undefined.

1.5.6 Interaction

The participation of the audience is often limited to pressing a button, turning a switch or triggering a motion detector to activate the work of art. Once the work has been activated, either consciously or unconsciously, a pre-programmed process that cannot be interrupted or influenced by actions of the audience is executed.

On the other hand, the role of the visitor is no longer restricted to that of a spectator. A two-way interaction is necessary for the operation of the work. In this context interaction stands for essential qualities of the work, the course of the work and the perception of the visitor that depend on the acts of that same visitor. The visitor is inclined to listen, to analyse the effect of his actions and to master the system.

Interaction, with or without the use of technology, forces the visitor to listen and provokes him to fathom the sound producing system and to control it. In that way interaction does not only have an influence on the course of the work, but also on the perception of the work.

Besides acts of the visitor, a sound work can also interact with the environment⁸¹ or depend on external input⁸². There is an interplay between the audience and/or the environment and the work.

Even though technological developments have contributed to the exponential increase of interactive works, interactive art is not a recent phenomenon. For example, Moholy Nagy envisaged the participation of the spectator in environmental spectacles. (Brett, 1968, p. 58), while active participation of the audience was pioneered by Yaacov

⁸¹ Either the natural environment or an artificially created one.

⁸² For example information retrieved from the World Wide Web.

Agam and the G.R.A.V. in Paris. (Gadney, 1966, p. 39) In Fluxus events and happenings the separation between audience and performer often disappeared and members of the audience became participants. Their former passive role became an active one. The viewer did not only complete, but actually through their direct participation, became the work. (Rush, 2005)

We can make a distinction between four conditions:

1. No interaction takes place.
2. An act of the visitor, the environment or external input can start the work.
3. An act of the visitor, the environment or external input can start and stop the work.
4. Essential qualities of the work, the course of the work and the perception of the visitor depend on the acts of that same visitor, the environment and/or external input.

1.5.7 Production of sound

In sound works sound can be generated by electronic, electro-acoustic or acoustic means or any combination of the above.

When sound is created electronically, vibrations are being generated through electric oscillators and circuits. When sound is generated acoustically, the sound is not electrically amplified. If sound is created acoustically and it is thereupon amplified, the sound is generated electro-acoustically.

We can make a distinction between four conditions:

1. No sound is produced other than sounds from the environment and/or the audience.
2. Acoustic generation of sound.
3. Electro-acoustic generation of sound.
4. Electronic generation of sound.

1.5.8 Performer

In contrast to performances sound works do not rely on performers to produce sounds. The performer is traded in for either the visitor, animals or environmental elements. In these cases randomness becomes an important factor as the generation of sound

happens aleatory. In other works the generation of sound is automated. Whereas many automated sound works follow a mapped out route⁸³, elements of chance can also be implemented in automated works for example through the use of algorithmic software⁸⁴.

The absence of performers does not imply the absence of other people besides the audience. In many sound works guides are present. They do not have a performing task, but their only function is to guide the audience. At other times attendants are present. They do not guide the audience or give instructions but only warrant security.

Whether guides, attendants or no one besides the visitor is present, is not always a decision that is solely taken by the artist. Sometimes economic reasons or the policy of the exhibition space play a part.

We can make a distinction between four conditions:

1. Performers are present.
2. Guides are present.
3. Attendants are present.
4. No one besides the visitor is present.

1.5.9 Narrativity

In the time structure of sound art there is hardly any role for narrativity. As sound in sound art has no clear-cut beginning or end in most cases and an open form is employed, the sound is usually disconnected from the notion of the development of the material that is so characteristic for most music. Although time-based arts can never be truly static, sound works tend to have a more static character and a greater musical span is rarely present. As a consequence, most sound art has no linear argument and lacks narrativity as is the case in most classic compositions.

We can make a distinction between three conditions:

1. There is a greater musical span.
2. Fragments of the sound material have a musical span, but no greater musical span is present.
3. There is no greater development of the material.

⁸³ For example when sound is played or generated in a loop, whereby once the end of the sound file or programme has been reached the piece starts all over again.

⁸⁴ The conscious use of chance as a selection mechanism in a collection of possibilities or as aesthetic, can also be found in John Cage's work.

1.5.10 Implementation of techniques and technologies

Sound art often makes use of new techniques and technologies. (see p. 218) Technology to record and reproduce sound made it possible to separate sound and sound source and to create new constructions of sound, light and objects. Sound art is not one trade that can be taught as many trades (see p. 28) can be involved in the very diverse manifestations of the art form.

Technique has been individualized as never before. Nowadays, the creation of a sound work often implies the [re]discovery of a technique. Reusing a technique in sound art is often considered to be unoriginal⁸⁵ (Kneisel, Osterwold & Weckwert, 1996). Therefore, technique has become more than a means. The implementation of [new] techniques and technologies is also a quality norm.

Three different points of departure can be distinguished as far as techniques are concerned. The artist can start from an existing technology. In doing so the artist runs the risk that when the first impression of surprise and the illusion of novelty has evaporated, nothing is left of the work. The artist can try to develop the technical material needed for the realisation of a particular artistic concept. Finally, the artist can start from an existing technology and alienate it from its original use (Bosseur, 1996).

We can make a distinction between three conditions:

1. The work makes use of commercially available techniques and technologies.
2. The work makes use of adapted commercially available technologies and techniques.
3. The work makes use of homemade hardware and/or software.

1.5.11 Visual component

Sound art always comprises a visual component. Even when all the sound-producing elements are hidden and there are no extra visual elements added, there is always a material aspect to a sound work, namely the space where the work is presented. (see p. 23)

We can make a distinction between three conditions:

⁸⁵ Martin Riches puts it as follows: “I’m always interested in what people are doing, but I’d feel rather nervous about taking over someone else’s technology or technique; I wouldn’t like to copy someone.” (Riches, 1987/1993, p. 50)

1. The work has, in addition to the sound-producing elements, external visual components that are not related to the production of sound.
2. The sound producing elements are hidden to the eye of the visitor and no extra visual components are added to the work.
3. The visual elements serve to reflect or muffle sound.
4. The sound producing elements are the only visual components of the work.

1.5.12 Endurance

Sound art is rarely permanent or semi-permanent. Most sound works are temporary art works, put up for a specific exhibition or event. At the end of the exhibition or event, the art work disappears. Even works that are intended to be permanent often have a use-by date, as either the employed technology becomes outdated or environmental factors, on which the work is based, change. (see p. 177)

Charles Mattox states that builders of audio-kinetic sculptures are faced with the same problems that are part of a machine culture. "Sculpture designed to move or to be moved with motors and electronic parts has a short life span as compared to traditional sculpture. I feel this is as it should be, and I am willing to accept the fact that my works will have to be serviced, refinished and finally be expended." (Mattox, 1969, p. 356)

We can make a distinction between three conditions:

1. The work is permanent.
2. The work has been presented for a longer period.
3. The work is temporary.

1.5.13 Place of presentation

The place of presentation gives an indication of the nature of the work. Sound art will rather be found in an abandoned factory than on the stage of a concert hall.

Besides traditional art spaces such as museums and galleries, sound works are often presented in alternative locations and public space. (see p. 169) Some artists, such as Max Neuhaus, do not like the museum environment as people know what to expect. In public space most encounters happen accidentally and people respond to the work without preconceived ideas. (Tomkins, 1988/1994) The state of mind of the audience differs. This merging of daily life and art was already initiated by the Fluxus movement when Dick Higgins launched the concept of Intermedia in 1966. (D. Higgins, 1966) "I find I never feel quite complete unless I'm doing all the arts – visual, musical and literary. I guess that's why I developed the term 'intermedia', to cover my works that fall conceptually between these." (Pichler, 1998, p. 164)

We can make a distinction between five conditions:

1. The work is presented on the stage of a concert hall.
2. The work is presented in a science museum.
3. The work is presented in a museum or art gallery.
4. The work is presented in public space.
5. The work is presented on an alternative location.

1.6 Towards a clear-cut definition

The thirteen parameters and their various conditions stipulated above facilitate the definition of sound art. The field of sound art can now be mapped out and visualised (see Figure 37). This demarcation of sound art is not a priori given, but it is based on the empirical review of a large amount of art works. This review included works that we consider to be sound art as well as works that are often labelled as sound art, but that cannot be classified as such in our opinion. The resulting tool can be employed to define whether a given art work falls under the general category of ‘sound art’.

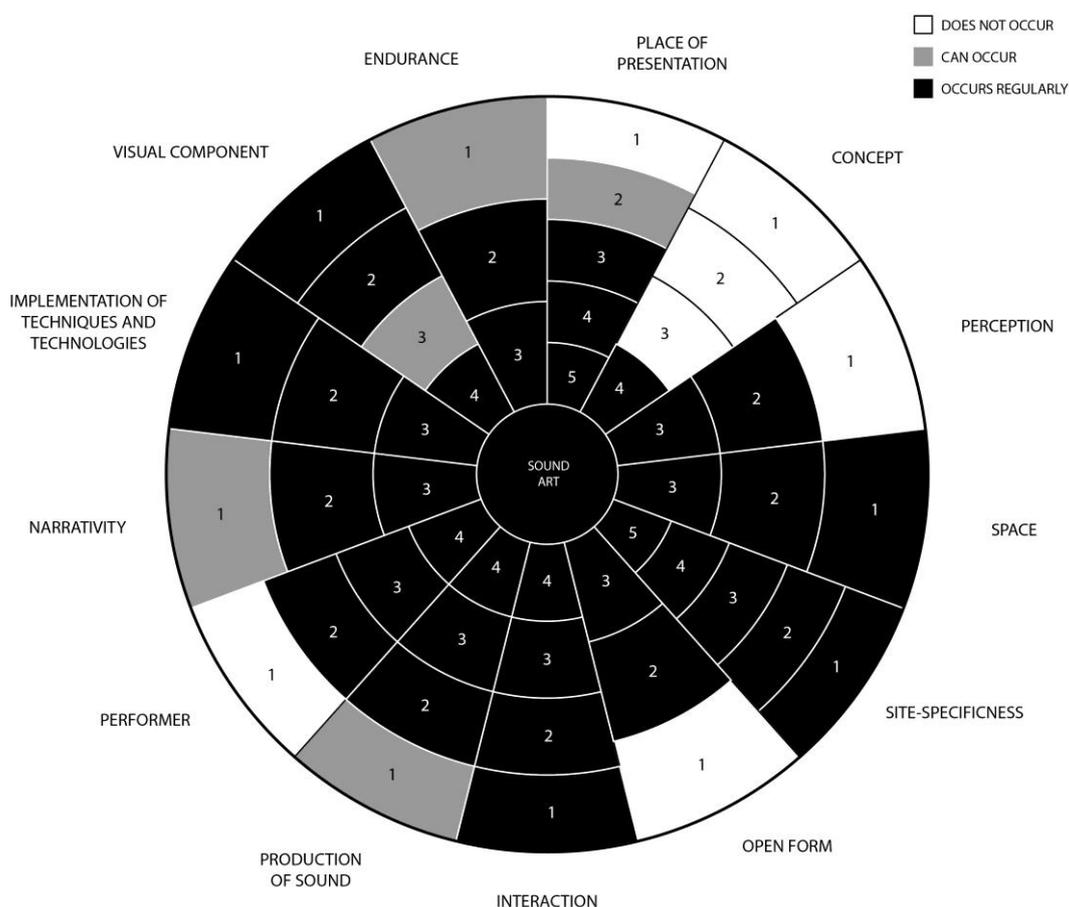


Figure 38 The image above shows the 13 parameters reproduced within a circle. The section of each parameter is divided into several segments where each segment represents a specific condition described in Table 1, p. 72. The image above shows the various segments in which sound art can be situated. The white surfaces are, although not filled in, necessary for the logical construction of the conditions.

Table 1 Explanation of the segments of Figure 37, p. 71; Figure 39, p. 81; Figure 40, p. 82 and Figure 41, p. 83.

	Concept	Perception	Space	Site-specificness
1	The production, muffling or reflection of sound was not taken into account during the creation process.	The territory of the audience and the art work are fully separated from each other.	The work has no connections with the space in which it finds itself other than its resonating qualities.	The work has no connections with the location.
2	The sound is a by-product.	The territory of the audience and the art work partly overlap.	The work creates a separate space within a space.	The work is based on historic, functional or social characteristics of a place.
3	The sound is one of the elements of the work and serves to support its general concept.	The audience proceeds in the work and is part of the work.	A complete space is treated as one situation that can be entered by the spectator.	The work is based on architectural characteristics of a place.
4	The production, muffling or reflection of sound forms the starting point of the work.			The work is based on environmental characteristics of a place.
5				The work is based on the existing sound environment.
	Open form	Interaction	Production of sound	Performer
1	The art work has a clear-cut beginning and end.	No interaction takes place.	No sound is produced other than sounds from the environment and/or the audience.	Performers are present.
2	The art work has a well-defined beginning but unclear end.	An act of the visitor, the environment or external input can start the work.	Acoustic generation of sound.	Guides are present.
3	The beginning and ending of the art work are undefined.	An act of the visitor, the environment or external input can start and stop the work.	Electro-acoustic generation of sound.	Attendants are present.
4		Essential qualities of the work, the course of the work and the perception of the visitor depend on the acts of that same visitor, the environment and/or external input.	Electronic generation of sound.	No one besides the visitor is present.

	Narrativity	Implementation of techniques and technologies	Visual component	Endurance	Place of presentation
1	There is a greater musical span.	The work makes use of commercially available techniques and technologies.	The work has, in addition to the sound-producing elements, external visual components that are not related to the production of sound.	The work is permanent.	The work is presented on the stage of a concert hall.
2	Fragments of the sound material have a musical span, but no greater musical span is present.	The work makes use of adapted commercially available technologies and techniques.	The sound producing elements are hidden to the eye of the visitor and no extra visual components are added to the work.	The work has been presented for a longer period.	The work is presented in a science museum.
3	There is no greater development of the material.	The work makes use of homemade hardware and/or software.	The visual elements serve to reflect or muffle sound.	The work is temporary.	The work is presented in a museum or art gallery.
4			The sound producing elements are the only visual components of the work.		The work is presented in public space.
5					The work is presented on an alternative location.

We consider sound art to be a hybrid of visual arts and music: art works that have both an aural as well as a visual component [parameter visual component], but where the production, muffling or reflection of sound forms the starting point of the work [parameter concept]. The static nature of visual arts reveals itself in the fact that the sound has no beginning or end [parameter open form]. Therefore, the emphasis no longer lies on the time dimension of sound, but has moved to its spatial dimension [parameter space]. As a consequence, most sound works are not narrative [parameter narrativity]. The visitors come and go as they please and can determine independently how long they attend the “performance”. Sound art is like a performance lasting 24 hours a day, seven days a week. Consequently, very few sound works make an appeal to performers to produce sound [parameter performer], instead sounds are generated electronically, electro-acoustically and/or acoustically [parameter production of sound]. The operation of most sound works relies on homemade hardware and/or software or on adapted commercially available technologies and techniques [parameter implementation of techniques and technologies]. The sounds are automated or activated either by natural sources, external input, animals or by acts of the visitors [parameter interaction]. The distance that is commonly kept between the spectator and the work of art or the performer[s] in both museums and concert halls has largely evaporated. The visitor can often walk around or into the sound work or is even encouraged to touch it [parameter perception]. Most sound works are temporary [parameter endurance] and they will rather be found in public space, alternative locations, museums and galleries than on the stage of a concert hall [parameter place of presentation]. Thus, the sound works are regularly based on specific characteristics of that location [parameter site-specificness].

Figure 38 (see p. 71) allows us to take an art work and describe it according to the different conditions of each parameter. When we do this for a large number of art works, then we will obtain clusters that give insight in the nature of the works. The above scheme thus works as a definition of the general category of sound art.

1.7 Clusters

Our definition of sound art, as defined above, can be further subdivided into several clusters. The reason for this subdivision is that we believe that sound sculptures and sound installations form two separate identities within the general category of sound art.

Alan Licht, however, subdivides sound art into three categories:

“1. An installed sound environment that is defined by the space [and/or acoustic space] rather than time and can be exhibited as a visual artwork would be.

2. A visual artwork that also has a sound-producing function, such as a sound sculpture.

3. Sound by visual artists that serves as an extension of the artist’s particular aesthetic, generally expressed in other media.” (A. Licht, 2007, pp. 16-17)

If Licht’s categorisation is applied, any art work that produces sound can be labelled sound art. Our approach to sound art is more restrictive but it also gives rise to less confusion.

In sound art we can cluster two main groups: sound installations and sound sculptures. In both categories the sound forms the focal point. In contrast to Alan Licht’s categorisation, works that utilise sound or refer to sound are not considered sound art. (see p. 86)

1.7.1 Sound sculptures

1.7.1.1 Origin of the designation sound sculpture

The French counterpart of the word sound sculpture, sculpture sonore, surfaced circa 1913. The subtitle of Marcel Duchamp's *Sculpture Musicale* consists of one page on which is noted: "sons durant et partant de différents points et formants une sculpture sonore qui dure." (Pichler, 1998, p. 64) This composition by Duchamp provides similar instructions as the Fluxus pieces such as the 1960 series by La Monte Young did. (see p. 145)

In 1956 the first sound sculptures of Bernard & François Baschet became operational. They called their works intended for museum and galleries and their architectural projects 'sculptures sonores', sound sculptures (F. Baschet, 1999, p. 40) and considered themselves to be the inventors of a new genre: "Si Calder a inventé la sculpture mobile, nous avons inventé les sculptures sonores." (B. Baschet & Baschet, 1980, p. 48) Their work meets Hugh Davies's description of a sound sculpture (see p. 77) and is generally considered one of the pioneers of sound art and more particularly, sound sculpture.

In 1970, the Museum of Conceptual Art in San Francisco [MOCA] founded by Tom Marioni opened its doors. The museum focussed on actions and situational art and was established as an educational, non-profit corporation. The second event that was organised by MOCA was the exhibition *Sound Sculpture As* which took place on the 30th of April 1970. Ten artists participated. (Foley, 1981) Whilst some works⁸⁶ resemble what we now understand to be a sound sculpture, others⁸⁷ took the shape of a happening in which sound was created.

In 1973 The Vancouver Art Gallery organised the exhibition *Sound / Sculpture: 11 artists working in the field of Audio-Kinetic Sculpture*. The announcement of the catalogue of the exhibition notes: "Sound sculpture is the first publication to deal completely with this new art form." (Aesthetic Research Centre of Canada, 1973) The exhibition presented works by the Baschet brothers, Harry Bertoia, John Chowning, Paul Earls, David Jacobs, Gyorgy Kepes, Reinhold Marxhausen, Charles Mattox, Stephan von Huene, Walter Wright and David Rosenboom. The publication *Sound Sculpture*, published two years later, presents nearly thirty essays and articles on sound sculpture. Artists discuss their practices, forerunners describe their work, several practical projects are explained and

⁸⁶ Paul Kos placed two twenty-five pound blocks of ice on the ground and surrounded the ice blocks with 8 microphones to record the melting process. (Foley, 1981)

⁸⁷ In Allan Fish's *Pissing Tom* Marioni urinated into a bucket from the top of a ladder. The sound modulated as the bucket became more full. (Foley, 1981)

the future directions of sound sculpture are handled. However, it lacks a description or definition of the concept sound sculpture. (Grayson, 1975)

Throughout the years the designation sound sculpture had various denotations and even today there are different takes on the designation.

1.7.1.2 Previous attempts at defining sound sculpture

“Music people said ‘this is no music’. Sculpture people said ‘this is no sculpture.’” (F. Baschet, 1975, p. 13)

Various people gave different interpretations to the designation sound sculpture. Bill Fontana defined sound sculptures as “a medium based on environmental models of sound where the essential form is not identified with the physical limits of the sounding body, but with the physical limits of space being made to sound. The sense of time is that of a continuum; without apparent beginning, middle or end. The sound is not conceived as a logical structure unfolding in time but as a presence.” (Fontana, 1979, p. 40) In his definition of sound sculpture Fontana rather describes a sound installation than a sound sculpture, as the usage of space is much more apparent in sound installations than in sound sculptures.

Michael Brewster shares the view of Fontana on sound sculptures, but calls his works acoustic sculptures (see p. 49) instead of sound sculptures. (Smith & Wilhite, 1979b, p. 24) Liz Philips’s description of her work (see p. 50) - that she labels Ton-Skulpturen – also connects to Brewster and Fontana.

Alan Licht states that a sound sculpture “...is not instrument-making but sculpture that is made with an inherent sound-producing facility in mind or a machine made for the same purpose...” (A. Licht, 2007, p. 199) Licht also considers sound sculptures to be “the oldest form of sound art” (A. Licht, 2007, p. 199) and provides examples of lithophones or Duchamp’s *A Bruit Secret* and Man Rays’s *Indestructible objects* to prove his point. As the above examples demonstrate, Licht does not make a distinction between experimental instruments, sculptures incorporating or referring to sound and sound sculptures. (see p. 86)

Kneisel, Osterwold & Weckwert define sound sculptures as “bespielbare oder selbstspielende tönende objekte zwischen musikinstrument und bildnerischer Plastik.” (Kneisel et al., 1996, p. 8) Hugh Davies’s description moves in the same direction, but is more specific: “a sculpture or construction that creates sound, not always of a musical nature, by means of its own internal mechanism, or when it is activated by environmental elements such as wind, water or sunlight, or when it is manipulated”. (Davies, 2013) The views of Brewster, Philips and Fontana differentiate from the views of Alan Licht, Hugh Davies and Christian Kneisel, Matthias Osterwold & Georg Weckwert. Frank Gertich formulates the difference in interpretation of these two main visions on sound sculptures as follows: “Als Klangskulpturen im engeren sinne seien im folgenden

also Skulpturen oder Plastiken, allgemeiner: materielle Objekte bezeichnet, die in irgendeiner Weise Klang hervorbringen. Nahme man die Bezeichnung 'Klangskulptur' jedoch wortlich, im selben Sinne wie in 'Stahlskulptur' oder 'Bronzeskulptur', dann muste man analog eine aus Klang geformte Skulptur denken." (Gertich, 1999, p. 149) According to Gertich, Fontana's and Brewster's view on sound sculptures is based on the literal interpretation of the word, a sculpture modelled by sound. As sound has no physical boundaries such as objects, it cannot be marked out and any sculpture producing sound will in that sense fill up the complete space.

1.7.2 Sound installations

1.7.2.1 Origin of the designation sound installation

In 1958 Allan Kaprow gave his room-scale work at the Hansa Gallery in New York the label 'environment' (Kaprow, 1958). This work, that Kaprow later called *Beauty Parlor*, consisted of a variety of materials: sheets of plastic, crumpled-up cellophane, tangles of adhesive tape, sections of slashed and daubed enamel and pieces of coloured cloth hung in bands that looked like Jewish prayer shawls or other ceremonial adornments. Five tape machines were spread around the space. The tape machines played electronic sounds every hour for about fifteen minutes, composed by Kaprow. (Kaprow, 1965) The exhibition space and the visitors were part of the work of art. The term 'environment' was picked up by critics and was used to refer to a series of works the following two decades. Douglas Davis describes 'environmental forms' as "works of art that fill, activate, or respond to the surrounding environment, frequently including the viewer himself." (Davis, 1973, p. 92)

In the sixties the word 'installation' was employed by art magazines to describe the way in which an exhibition was arranged. The photographic documentation of this arrangement was termed an 'installation shot', and this gave rise to the use of the word for works that used the whole space as 'installation art'. (Bischof, 2005)

We find a reference to the word 'sound installation' in music meaning a technical setting producing or processing sound.

The American artist Max Neuhaus is one of the first, if not the first⁸⁸, to introduce the term sound installation art. Neuhaus used the term 'sound installation' to describe his own works. In an interview with William Duckworth Neuhaus answers the following to the question how he would call his work: "I called them sound installations because the

⁸⁸ This does not mean sound installation art did not exist before Neuhaus introduced the term.

pieces were made from sound, and I was using the word ‘installation’ in the visual arts context for a work that is made for a specific place.” (Duckworth, 1982/1994, p. 42)

Place plays a primary role in Neuhaus’s installations as the sounds are tuned to their environment and, since no visible visual elements are exposed, the surrounding environment is the only visual aspect of the work. The majority of Neuhaus’s works was created for public space, e.g. *Drive-in Music* [1967] which he calls his first sound installation (Neuhaus, 1994). Neuhaus wanted to make a work that was part of the daily activity, where people could pass through at any time, as opposed to regular art works that you had to plan to visit and where you had to go to. (Duckworth, 1982/1994) He wanted to insert works into the daily domain in such a way that people could find them in their own time and on their own terms (Neuhaus, 1994). Neuhaus made a work that could only be listened to in the car, through the car radio. He placed a large number of wireless microphones in different positions along a stretch of roadway. Each microphone broadcasts a different continuous sound. Since the transmitters broadcast only a short distance, Neuhaus could shape the area covered by each sound by attaching an antenna wire and placing it in the shape he wanted that sound to occupy (Neuhaus, 1980/1994). The synthesis circuit was sensitive to weather conditions. Depending on the weather, the synthesis circuit gradually changed the levels in the mixture of those sine waves, creating different sonorities. The work was finished in October 1967 and ran till April 1968. (Neuhaus, 1980/1994). No two listeners heard the same. The sound depended on the tuning of the car radio, the speed, the position of the car and the weather.

1.7.2.2 Previous attempts at defining sound installation

In reference works we do not find ready-to-use definitions of sound installation art, but we do find descriptions of visual installation art. The *Oxford Reference* for example, describes ‘installation’ as “a term that can be applied very generally to the disposition of objects in an exhibition (the hanging of paintings, the arrangement of sculptures, and so on), but which also has the more specific meaning of a one-off work (often a large-scale assemblage) conceived for and usually more or less filling a specific interior (generally that of a gallery).” “...it was not until the 1970s that the term came into common use and not until the 1980s that certain artists started to specialize in this kind of work, creating a genre of ‘Installation art’.” (Chilvers, 2004) The *Glossary of Art, Architecture and Design since 1945* describes ‘installation’ as “a one-off exhibit fabricated in relation to the specific characteristics of a gallery space... In the late 1980s some artists began to specialize in constructing installations with the result that a specific genre- ‘Installation art’-came into being.” (Walker, 1992, p. 357) Whereas Chilvers and Walker mainly highlight the usage of space and the resulting site-specificity of an installation, Claire Bishop puts the focus on the experience of the visitor. Bishop describes installation art as “a term that loosely refers to the type of art into which the viewer physically enters, and which is often described as ‘theatrical’, ‘immersive’ or experiential’.”

(Bischof, 2005, p. 6) Julie H. Reiss also puts the emphasis on the viewer: “The essence of Installation art is spectator participation... the viewer is required to complete the piece; the meaning evolves from the interaction between the two.” (Reiss, 1999, p. xiii) De Oliveira, Oxley, & Petry, on the other hand, refer to the relation between objects: “a kind of art making which rejects concentration on one object in favour of a consideration of the relationships between a number of elements or of the interaction between things and their contexts.” (De Oliveira, Oxley, & Petry, 1994, p. 8)

These same elements, the usage of space, site-specificity, the experience of the visitor and the relation between objects, can be found in sound installation art.

Bill Fontana states “But in general an installation, I suppose, involves dealing with the space, dealing with sound as some kind of special and architectural phenomenon, is something that is continuous, that doesn’t have a beginning and an end, something that deals with the confrontation between the visual and the aural.” (Föllmer, 1995, p. 90) Brandon Labelle also emphasizes the continuous character of the sound and the spatial characteristics of sound installations: “Sound installation positions a listener inside a complex space defined by a general relation of the found and the constructed. It frees up sound’s durational performance to emphasize spatial and environmental conditions.” (Brandon LaBelle, 2006, p. 151)

In the catalogue of the exhibition *So und So und So III: geluid kunst Nederland* [Amsterdam, 1988] the usage of the complete space is emphasized: “geluidsinstallaties: het met behulp van instrumenten en geluiden inrichten van een ruimte.” (Jonker, 1988, p. 17)

For installations that consist of a collection of sound-producing objects through which the audience can wander the connection to the space in which the objects are distributed is less apparent than for sound installations that are based on architectural characteristics, environmental input or historic or social characteristics of the location. As a consequence the latter are more difficult to rebuild in a different location.

1.7.3 Sound installations versus sound sculptures

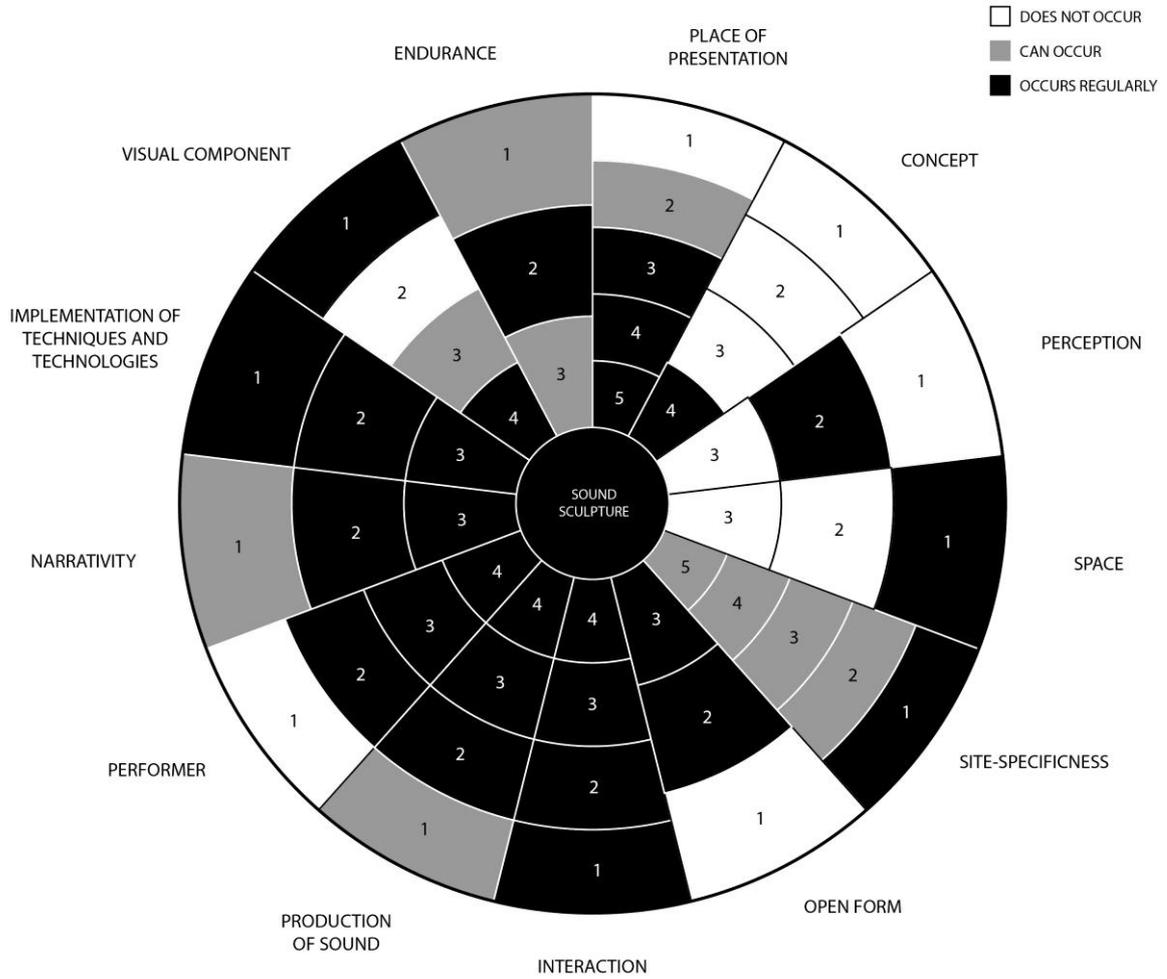


Figure 39 The image above shows the 13 parameters reproduced within a circle. The section of each parameter is divided into several segments where each segment represents a specific condition described in Table 1, p. 72. The image above shows the various segments in which sound sculptures can be situated.

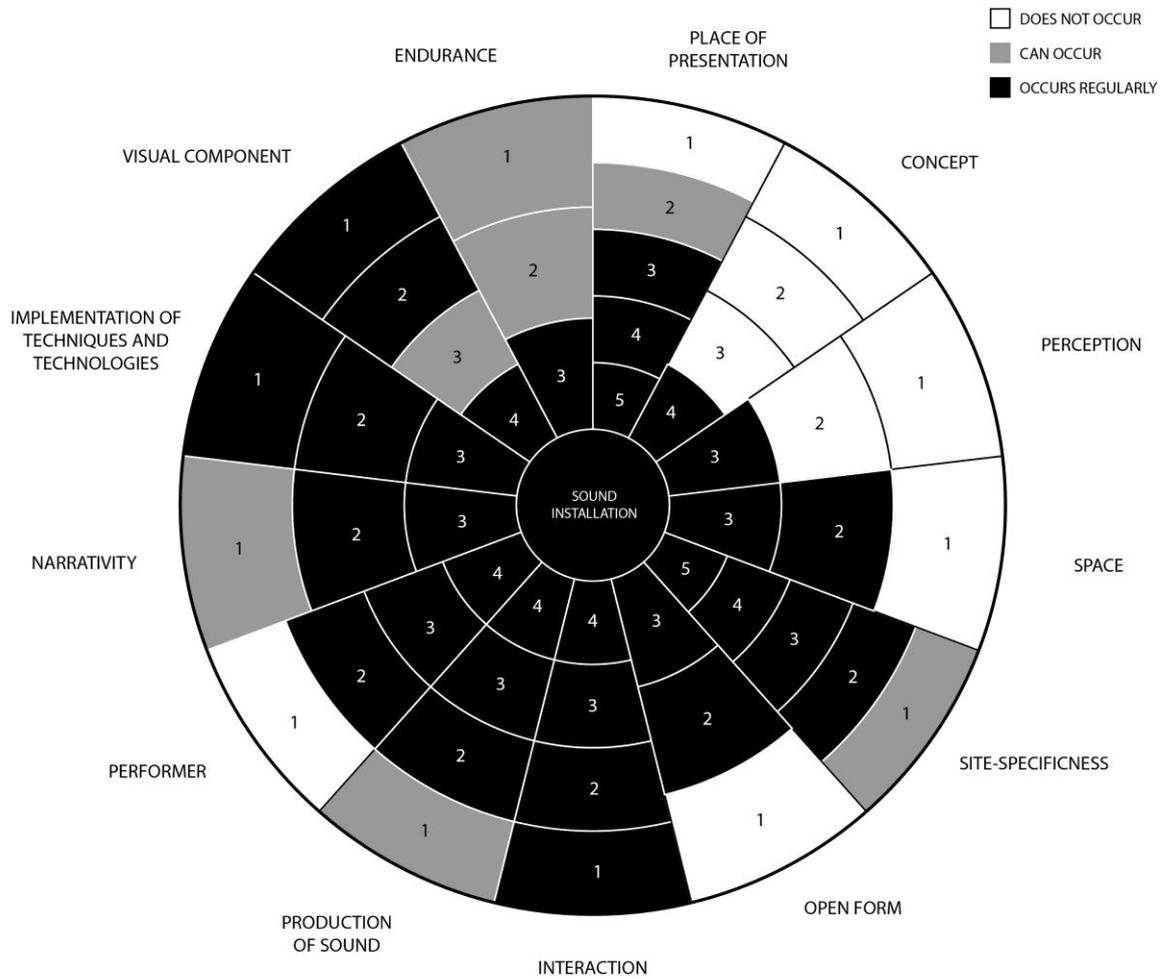


Figure 40 The image above shows the 13 parameters reproduced within a circle. The section of each parameter is divided into several segments where each segment represents a specific condition described in Table 1, p. 72. The image above shows the various segments in which sound installations can be situated.

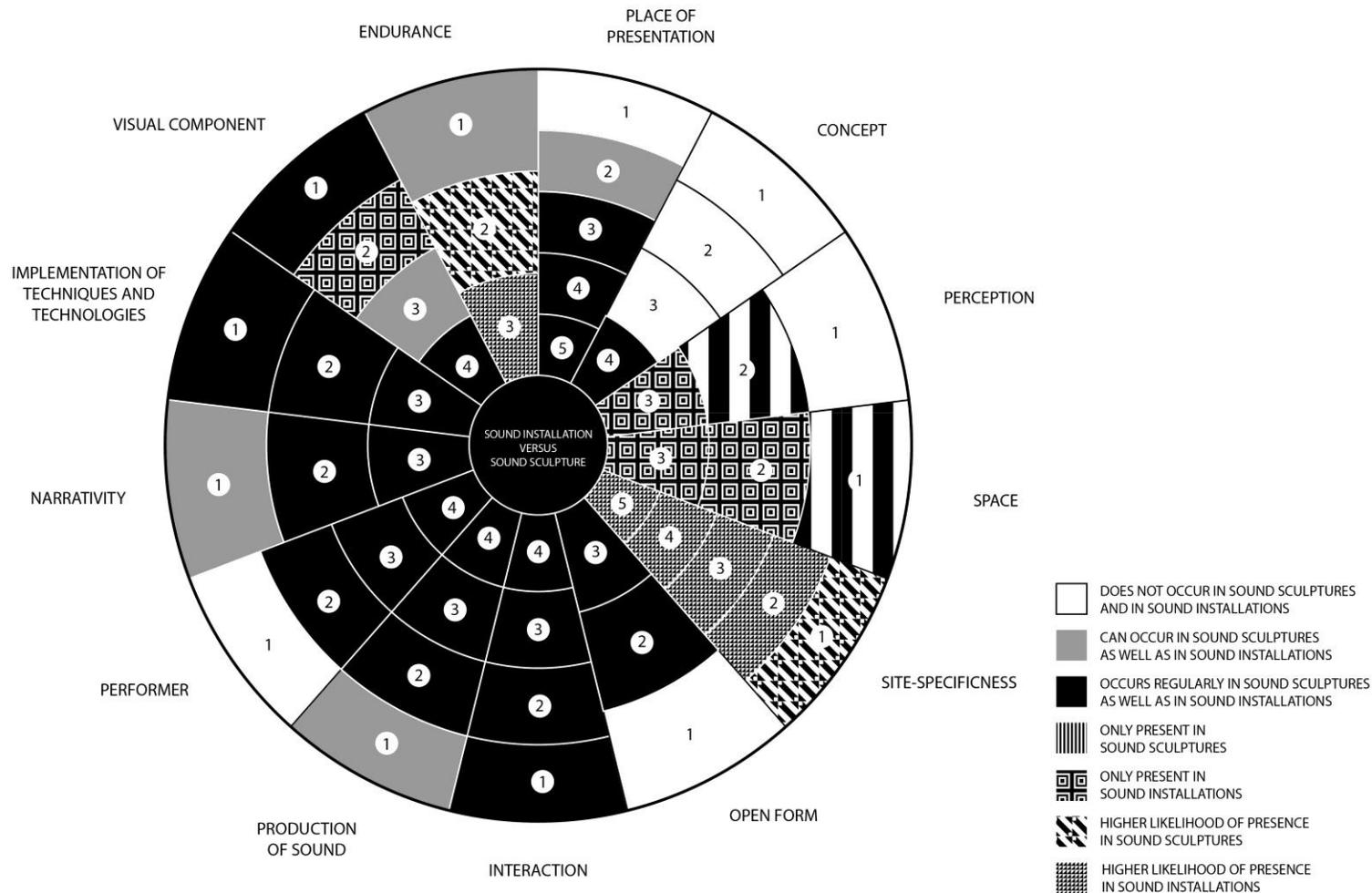


Figure 41 The image above shows the 13 parameters reproduced within a circle. The section of each parameter is divided into several segments where each segment represents a specific condition described in Table 1, p. 72. The image above compares Figure 39 and Figure 39 and visualises the differences between sound sculptures and sound installations.

As illustrated in Figure 40 the main differences between sound sculptures and sound installations can be attributed to the parameter space and related to that, also to the parameter perception. Smaller differences are situated within the parameters visual component, endurance and site-specificness.

In his book *Assemblage, Environments & Happenings* Alan Kaprow makes a distinction between 'assemblages' and 'environments'. Kaprow says that they are at root the same—the only difference is one of size. "Assemblages may be handled or walked around, while Environments must be walked into." (Kaprow, 1966, p. 159)

The same distinction can be applied to sound sculptures and sound installations. In sound installations the visitor steps into the work in order to experience the work, with a sound sculpture this is not the case.

Whereas sound installations are often dependent on the configuration of a certain space or situation, this is far less the case for sound sculptures. In the creation of a sound installation, the artist often regards a complete space as one situation that can be entered by the visitor. The acoustics of a space, its materials and the existing sounds are treated as a whole and become a substantial part of the art work. Sometimes non-physical qualities such as the historic, current or future function of the space or the cultural and social conventions of the given location become essential elements of the work. These spatial elements are not or far less present in the case of sound sculptures and as a consequence sound sculptures are less often created for a specific location.

Christina Kubisch states that sound installations cannot be repeated identically while sound sculptures can: "When I install something, whether it's an invisible loudspeaker or 20000 meters of electric cable, that's an installation in my eyes, simply because I've installed something in space. Sound sculptures, on the other hand, are objects that you can transport and repeat, unlike sound spaces, that can't be reconstructed two times in the same way." (Metzger & Kubisch, 2000, p. 87)

However, the distinction is not always that straightforward. The same art work can be a sound installation as well as a sound sculpture depending on its arrangement. In 2003 the German artist Erwin Stache presented his *Waschmaschinenprogrammmscheibenorchester* in a completely darkened room at a warehouse of the Belgian railways in Kortrijk, Belgium. The crackling sounds of mechanical program disks from old washing machines form the acoustic material of this installation. A rotation of such a disk normally lasts one up to two hours. Stache headed the disks with engines and the long washing programme was reduced to less than one minute. The sixteen disks were programmed to play at several speeds so that a composition is created. The acoustic sound of the disk is reinforced. When a disk moves and makes sound, a light burns. When only one *Waschmaschinenprogrammmscheibe* would be exhibited, we would speak of a sound sculpture. By presenting sixteen disks through

which the audience walks, the *Waschmaschinenprogrammmscheibenorchester* becomes a sound installation, even though the work has no direct links with its location.⁸⁹

⁸⁹ The same parallel can be drawn to *Ijspaleis*. (see p. 278)

1.8 The thin and often hazy borders of sound art

Many art works incorporate sound, but not every art work that produces sound is by definition sound art. Sometimes sound is used to set a certain atmosphere, to illustrate something or to reinforce the visual elements. At other times it is a side effect, a by-product of a mechanical operation, while in other cases it forms the essence of the work.

In sound art the acoustic component stands central. Where that is not the case, another art form is usually the pivot. This distinction is however not always straightforward. If visual elements of the art work are not related to the production, reflection or muffling of sound, it is often difficult to determine whether the sonic or the visual aspects form the most important component of the work.

In this section the borders between sound art, other art forms, functional sound applications and educational set-ups will be marked out. First, the main differences between sound art and installations and sculptures utilizing sound will be investigated. In this way a distinction between static sculptures referring to sound, static sculptures that incorporate sound, moving sculptures incorporating sound, installations referring to sound, installations incorporating sound and installations reflecting sound will be made. An example of each will be discussed and analysed. The differences between sound art and experimental musical instruments will be looked into. In some cases, sound works are employed as musical instruments or experimental musical instruments are presented in an exhibition environment. Next, the differences between sound art and music will be marked out and the distinction between sound art and functional sound applications such as water organs, the Japanese water harp, Taluktak, sonic environments, sounding buoys, melody roads and sound weapons will be looked at.

Lastly, art forms with purposes that are not solely or primarily artistic will be investigated and sound art will be compared to educational set-ups in science museums.

1.8.1 Sculptures

1.8.1.1 Static sculptures referring to sound

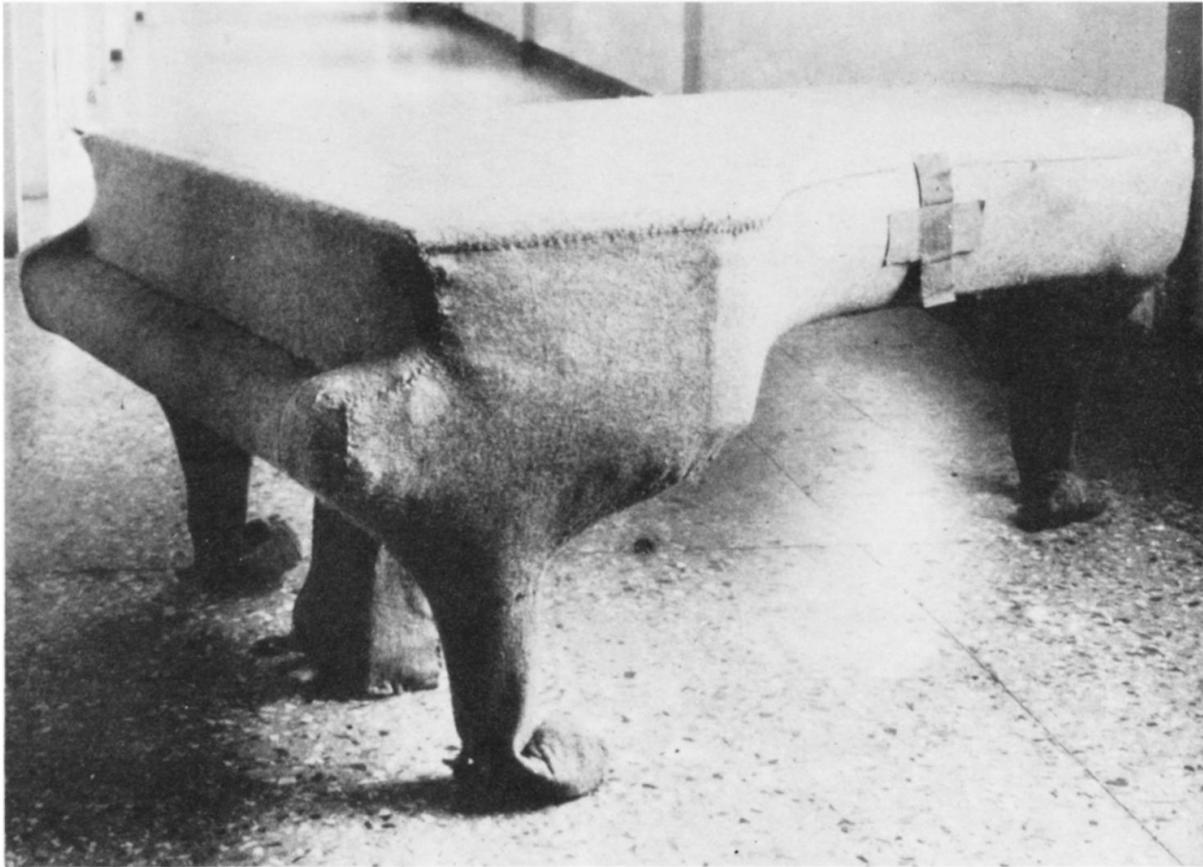


Figure 42 Joseph Beuys, *Infiltration-Homogen for Grand Piano* [1966] (Buchloh, Krauss, & Michelson, 1980, p. 15)

The works of Joseph Beuys have been included in several exhibitions focusing on sound⁹⁰. One of his most famous works *Infiltration-Homogen for Grand Piano* [1966] is a grand piano wrapped in felt and decorated with a red cross made out of tissue on each side. The grey felt cover spans the black lacquer piano as a second skin. The felt does not only distort the appearance of the piano, but also its function. The red crosses highlight its emergency state. Although no sound is present, the piano trapped and silenced by felt clearly refers to its potential musical output. The felt functions both as a collector and as a filter of the piano's sound. (Rothfuss, 1994) Beuys transformed the piano into “an homogeneous deposit of sound with the potential to filter through felt.” (Tisdall,

⁹⁰ For example, *Für Augen und Ohren - Von der Spieluhr zum akustischen Environment - Objekte, Installationen, Performances* [Berlin, 1980], *Soundings* [New York, 1981], *Klangskulpturen, Augenmusik* [Koblenz, 1995], *Crossings. Kunst zum Hören und Sehen* [Vienna, 1998], *Treble* [New York, 2004], *Sons & lumières : une histoire du son dans l'art du XXe siècle* [Paris, 2004/2005], *Im Auge des Klangs I - The Eye of Sound I* [Bedburg-Hau, Germany, 2007]

1979, p. 168) Although modifying or muffling sound reoccurs throughout Beuys's work, those works cannot be labelled sound art. The focus of his work lies on the imagery and - in the case of *Infiltration-Homogen for Grand Piano* - the impossibility of the piano to serve as a musical instrument, not on the production, muffling or reflection of sound.

1.8.1.2 Static sculptures incorporating sound

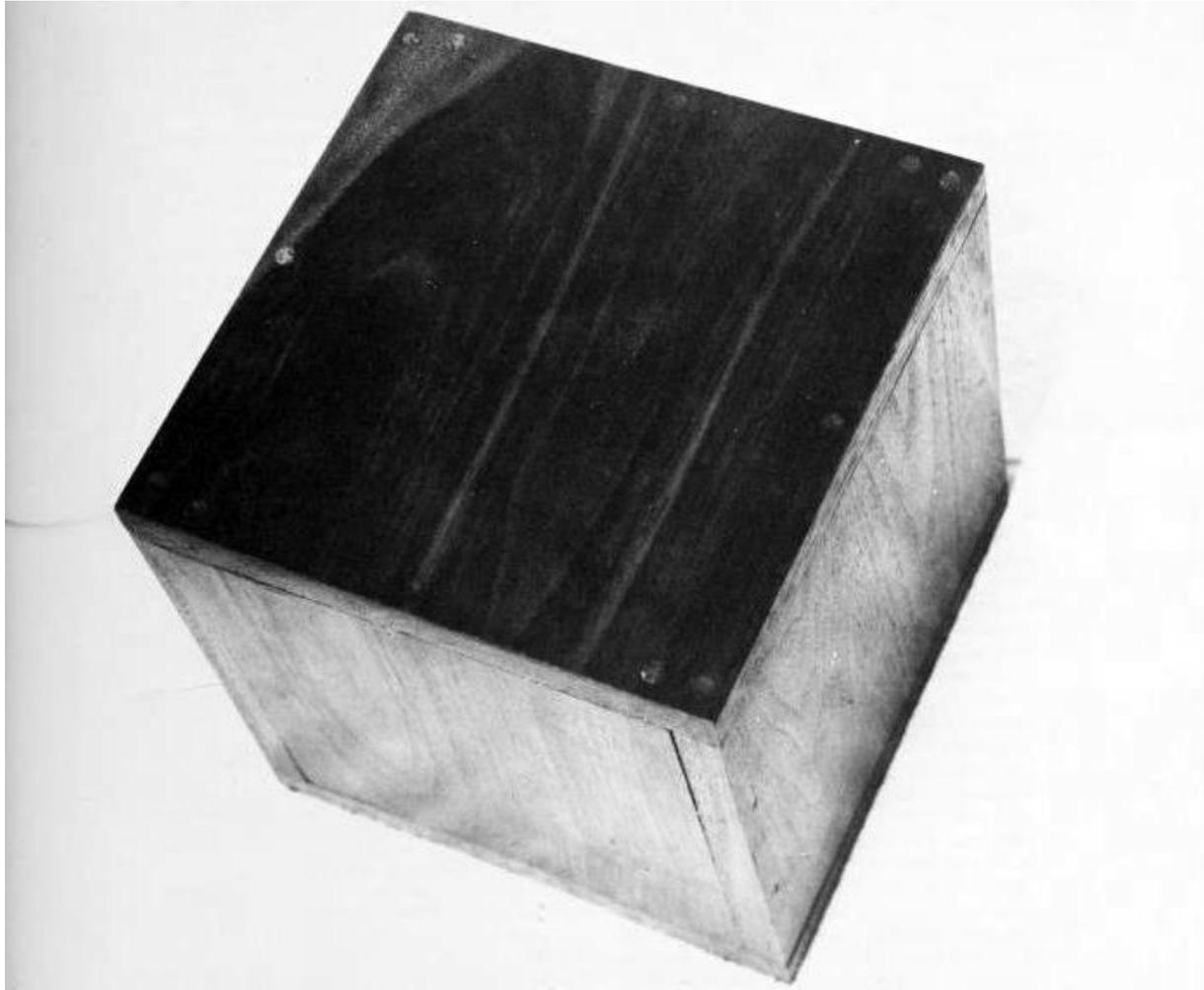


Figure 43 Robert Morris, *Box with the sound of its own making*, 1961 (Solomon R. Guggenheim Museum & Guggenheim Museum Soho, 1994, p. 105)

Robert Morris's *box with the sound of its own making* [1961] has also been exhibited at exhibitions⁹¹ focusing on sound and some authors such as Helga de la Motte-Haber (De la Motte-Haber, 1999, p. 184) (De la Motte-Haber, 1996b, p. 284) consider it as sound art. Although sound plays an essential role in this work, it is not its motive. Sound is part of

⁹¹ *Für Augen und Ohren - Von der Spieluhr zum akustischen Environment - Objekte, Installationen, Performances* [Berlin, 1980] (R. Block et al., 1980), *Écouter par les yeux - objets et environnements sonores*, [Paris, 1980] (Pagé, 1980)

the execution of the idea to create a finished object and to include its production process.

Box with the sound of its own making consists of a wooden 24,8 cm box in which a speaker reproduces sounds that originated during the construction of the box. The hammering, sawing, drilling, screwing and sanding sounds (Krauss, 1994) produced during its three hour, three and a half hour (Krens, 1978/1994) creation were recorded by Morris. (Solomon R. Guggenheim Museum & Guggenheim Museum Soho, 1994) Originally the tape player was located outside the box because of its size.(Krens, 1978/1994) The concept – briefly summarized by the title of the work - is of primary importance, not the quality of the sound nor its spatial image. Morris wanted to move the borders of fine arts by introducing a new medium, sound: “*Box with the sound of its own making* violates the Modernist separation of the genres by using sound to open up the closed silence of the traditional plastic arts.” (Solomon R. Guggenheim Museum & Guggenheim Museum Soho, 1994, p. 104)

1.8.1.3 Kinetic art incorporating sound

“Color (the element of space), Sound (the element of time) and Motion (that develops in time and space) are the fundamental forms of the new art.” (Davis, 1973, p. 52)

As Douglas Davis points out in the statement mentioned above, sound often plays a role in kinetic art. This is no coincidence as movement creates vibrations of air. Since sound is inherent to moving art, the artist can approach this surfacing sound in three ways:

“To attempt to reduce these sounds to a minimum, to ignore them, or to regard them as an integral part of the work and to make them more varied and interesting.” (Davies, 1987, p. 8)

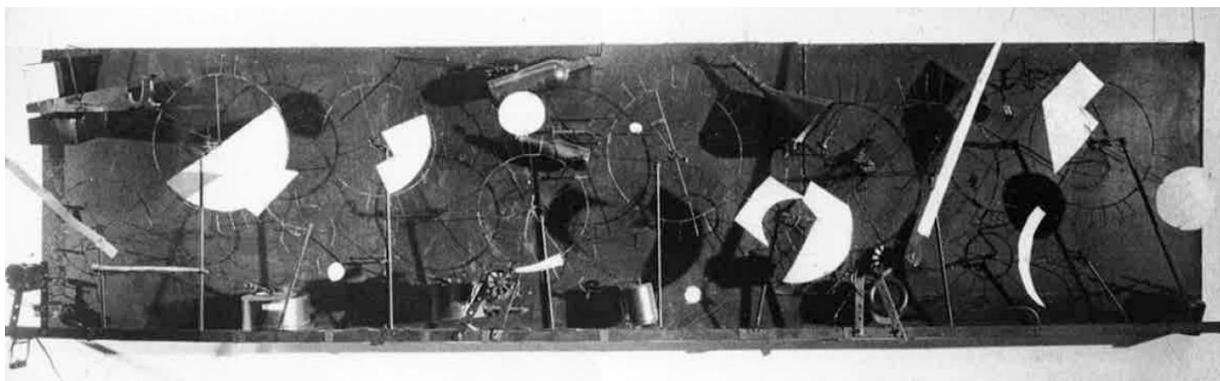


Figure 44 Jean Tinguely, *Reliefs Méta-Mécanique Sonore* [1955] (Bischofberger, 1982, p. 39)

One of the few kinetic artists who tried to make the sounds caused by movement more interesting is Swiss artist Jean Tinguely who made numerous mechanical sculptures that nearly all produce sound. In most of these works the sounds are a by-

product of a mechanical action.⁹² Sound starts to take up a more central role in *Reliefs Méta-Mécanique Sonore*⁹³ [1955], *Mes étoiles, Concert pour sept peintures*⁹⁴ [1958] and in Tinguely's numerous radio sculptures⁹⁵ [1962-1966] and *radio-reliefs*⁹⁶ [1962], but it is only in the *Méta-Harmonies series* [1978-1985], labelled 'Ton-Mischmaschinen' (see p. 53), that the sounds are fully developed and form the focal point of the work⁹⁷. The *Méta-Harmonies series* are reminiscent of the mechanism of a mechanical clockwork or of an old mill.⁹⁸ They enclose various objects such as glass bowls, metal shapes, saucepans, cans, barrels and pots, and also a variety of musical instruments such as piano, gongs, side drums, bongos, woodblocks, cymbals, various types of bells, triangles, tam-tams, a melodica and a toy reed organ. The objects as well as the instruments were selected by Tinguely because of their sonorous qualities. The sounds are no longer limited to percussive sounds as in previous works by Tinguely, more sustained sounds are added to the palette. The instruments and objects are activated by electric motors that set pulleys and drive belts in motion.

In a 1983 interview with Wim Toebosch, Tinguely puts the emphasis on the sonorous qualities of *Méta-Harmonie II*: "Maar harmonie moet er zijn – op mijn manier: de geluiden moeten passen, het ritme moet voelbaar zijn, de kleuren moeten tot mekaar in de juiste betrekking staan..." (Toebosch, 1983, p. 9)

⁹² Those works cannot be considered sound art.

⁹³ *Reliefs Méta-Mécanique Sonore* [1955] were a continuation of *Reliefs Méta-Mécanique* [1954] with that distinction that in addition to cardboard more sonorous materials such as metal rods, bottles and tins were selected by Tinguely. Instead of a steel tube frame a black wood panel was used in the *Reliefs Méta-Mécanique Sonore* [1955]. (Bischofberger, 1982)

⁹⁴ *Mes Etoiles – Concert pour sept peintures* consists of "seven different reliefs each consisting of a wood panel, metal-sheet, an electric motor, all painted black." (Bischofberger, 1982, p. 87) The seven components of *Mes Etoiles* all produce percussive sounds. The audience can turn on the motors via switches on a small control panel. (Hultén, 1975)

⁹⁵ In his radio sculptures Tinguely approaches sound in a different way. The sound is no longer the result of a movement, instead Tinguely opted to use radio sounds. The tuning knob moves back and forth over the frequency band, resulting in ever changing short fragments of sound. (Hultén, 1975)

⁹⁶ For his *radio-reliefs* Tinguely made use of demounted radio parts, but this time they were mounted behind a poly acrylate plate and hung on the wall as a painting. (Hultén, 1975)

⁹⁷ An 18 minutes performance of Tinguely's *Méta-Harmonie II* was part of the cassette *Jean Tinguely sculpture at the Tate* released as a supplement by Audio Arts in 1983. The cassette documented the sound of 13 sculptures presented at the Tate Gallery in London in 1982. (Tinguely, 1983)

⁹⁸ This was already visible in Tinguely's earliest experiments when – according to K.G. Pontus Hultén – he created at the age of 12 years [between 1937 and 1939], 'meta-mechanical' constructions, "water wheels with sound effects" (Hultén, 1975, p. 6), in the woods around Basel.

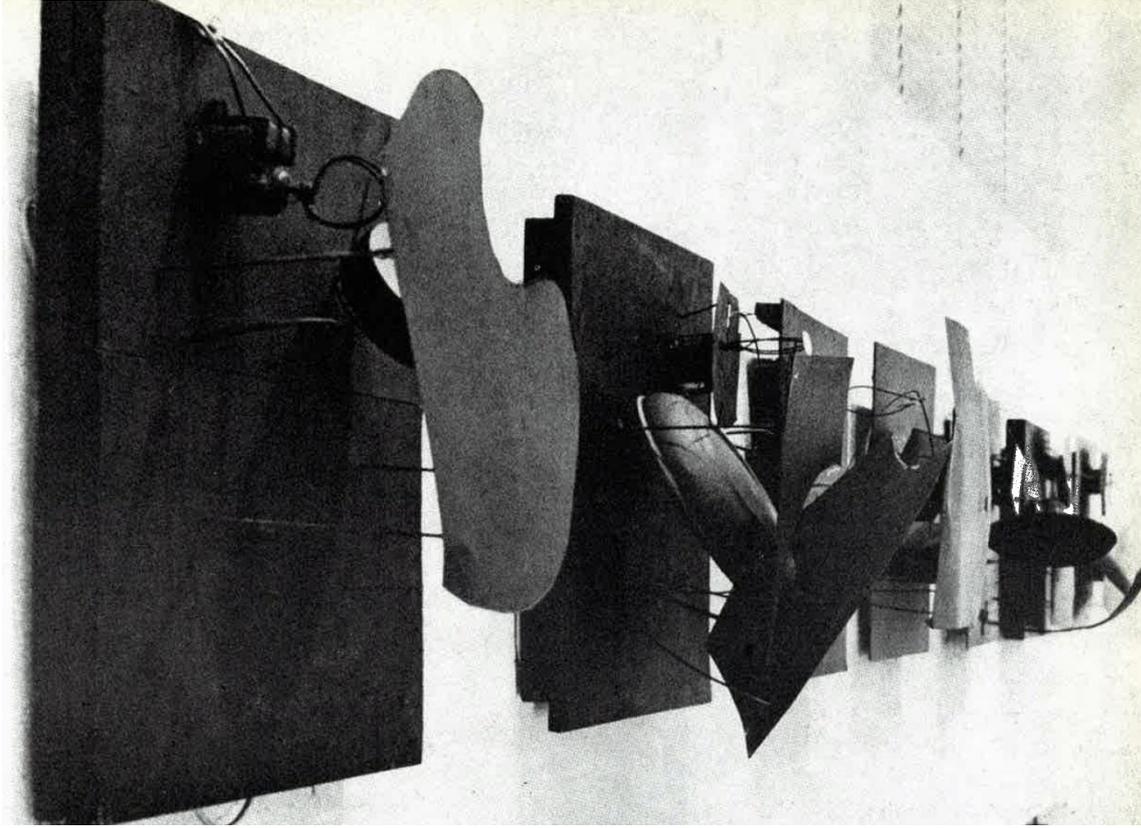


Figure 45 Jean Tinguely, *Mes étoiles, Concert pour sept peintures* [1958] @ Vera Spoorri (Hultén, 1975, p. 65)



Figure 46 Jean Tinguely, *Méta-Harmonie IV* [1985] (De Goede, 2007, p. 108)

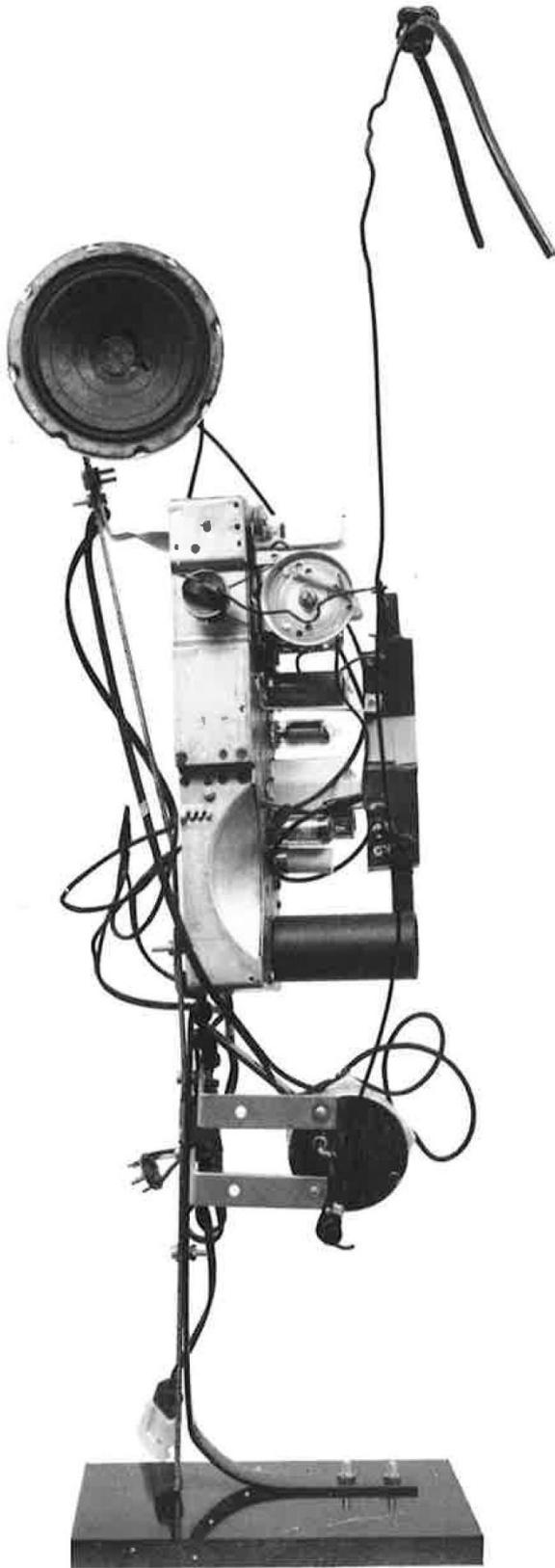


Figure 47 Jean Tinguely, *Radio sculpture I* [1962] (Bischofberger, 1982, p. 187)

Although Tinguely's works have been exhibited in exhibitions⁹⁹ focusing on sound, Helga de la Motte-Haber regards him as one of the forerunners of sound art. (De la Motte-Haber, 1996a, p. 16) Alan Licht considers Tinguely, together with Bertoia and the brothers Baschet, as one of "the major figures of contemporary sound sculpture". (A. Licht, 2007, p. 201) The majority of his works, apart from some notable exceptions, are, however, not sound art.

Nicolas Schöffer, another kinetic artist¹⁰⁰, partly takes a different approach. In addition to the sound caused by movement, Schöffer adds additional sounds in some of his works.

Schöffer was one of the first artists who made use of electronic control systems. (Benthall, 1972) In his book *La Ville Cybernétique* Schöffer envisioned a revolutionary cybernetic city. Schöffer holds a plea for the dematerialisation of our environment. "Mais d'autres matériaux immatériels remplaceront de plus en plus les matériaux solides, comme la trilogie espace, lumière, temps." (N. Schöffer, 1969, p. 51) This dematerialisation permeates his art works, where next to the usage of space and light, time is also incorporated. The latter is a parameter shared with sound.

Nicolas Schöffer's *Tour Spatiodynamique et Cybernétique*¹⁰¹ [1961] was installed in the Boverie Park in Liège next to the Meuse river in 1961 and consists of a network of square steel tubes up to a height of 52 meter. The 33 turning axes of the work hold 64 rotating mirrors and blades of various shapes and dimensions in polished aluminium. (Habasque, 1963) Furthermore, the motor-driven tower is equipped with 120 coloured lights and several loudspeakers. The sculpture has an electronic coordinating system that receives input from various sensors - microphones [sound], photo resistors [light intensity], thermistors [temperature], hygrometers [humidity], anemometers [wind] -

⁹⁹ For example, *Für Augen und Ohren - Von der Spieluhr zum akustischen Environment - Objekte, Installationen, Performances* [Berlin, 1980], *Soundings* [New York, 1981], *Klangskulpturen, Augenmusik* [Koblenz, 1995]

¹⁰⁰ According to K.H. Pontus Hultén Jean Tinguely felt a strong revulsion against the technological super-futurism of artists such as Schöffer. (Hultén, 1975, p. 46) Nevertheless, an exhibition *Two Kinetic Sculptors, Nicolas Schöffer - Jean Tinguely* presenting the work of the two extremes of kinetic art was presented at the Jewish Museum in New York [23/11/1965 - 02/01/1966], the Washington Gallery of Modern Art, Washington D.C. [14/01 - 20/02/1966], Walker Art Center, Minneapolis [07/03 - 10/04/1966], Carnegie Institute, Pittsburgh [28/04 - 29/05/1966] and The Contemporary Art Council of the Seattle Art Museum, Seattle [27/06-31/07/1966]. (Bischofberger, 1982) This revulsion can be traced back to Tinguely's preference that movement of his sculptures cannot be too smooth and has to incorporate hesitation and hitches: "Wel, ja, juist: het bewegingsvermogen dat ze bezitten mag niet vlot, rustig en regelmatig verlopen. Er moeten haperingen en aarzelingen in voorkomen, onverwachte wendingen en sprongen, anders is het wilde, het groteske er van af." (Toebosch, 1983, p. 8)

¹⁰¹ The tower, since 1997 acknowledged as a monument, is currently in the process of being restored. (Krins, 2013)

that control the sound [the reworked acoustic sounds and the electronic sounds], light [during daytime the natural light reflected by the mirrors, at night the coloured artificial light] and motion [mirrors]. (Institut du patrimoine Wallon, n.d.) (N. Schöffer, 1969) (Ragon, 1994)

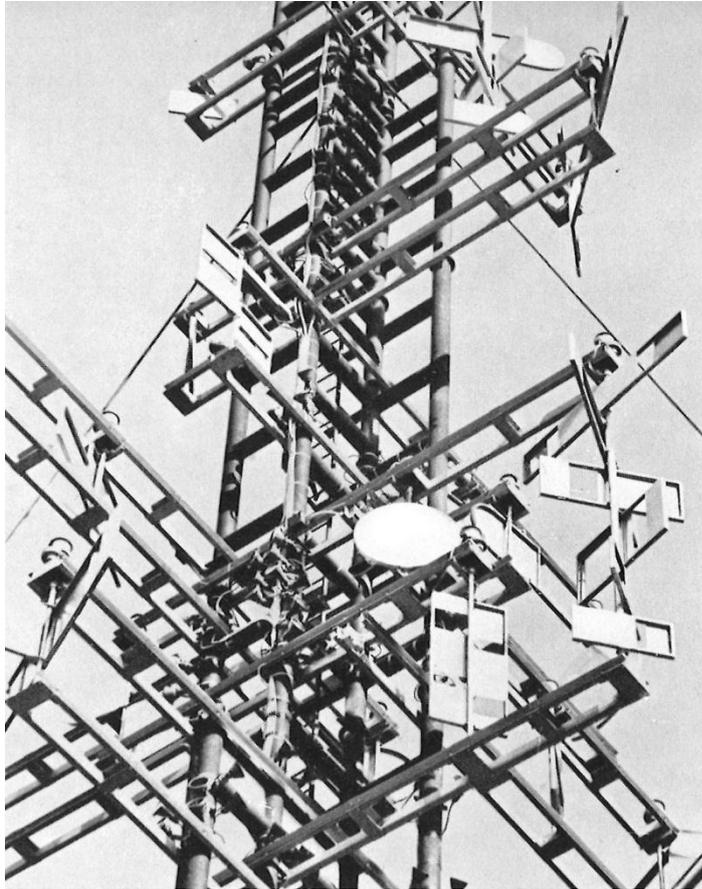


Figure 48 Nicolas Schöffer, detail of *Tour Spatiodynamique et Cybernétique*, Liège, Belgium [1961] (Cassou, 1963, p. 110)

As in many sound works the environment is crucial for the *Tour Spatiodynamique et Cybernétique* as the tower measures its immediate environment and this data determines the resulting movement, light and sound. In a 1998 lecture at the *La Musique Concrète* colloquium in Paris Eléonore Schöffer, widow of the artist, talked about the sound aspects of the tower in Liège¹⁰²: "En ce qui concerne la sonorisation de la Tour, j'utilisai pour la première bande des bruits de percussion

métallique exécutées sur la Tour et retravaillées électroniquement. Les autres bandes étaient composées de bruits de la ville, de chants d'oiseaux et de sons de cloches fidèlement enregistrés et reproduits. Mais la sonorisation de la Tour provoqua également de violentes réactions de la part des riverains et, après une année, il fallut y renoncer, non seulement pour cette raison, mais aussi à cause d'un fait que nous n'avions absolument pas prévu : les chants d'oiseaux émis par la Tour attirèrent les oiseaux du parc voisin qui ne se contentèrent pas de se percher sur la Tour, mais se

¹⁰² The installation of the *Tour Spatiodynamique et Cybernétique* was accompanied by a large "spectacle audiovisuel luminodynamique" on the façade of the Palais des Congrès and a composition by Henri Pousseur and poems by Jean Seaux. (N. Schöffer, 1969) Whether the composition *Trois visages de Liège* by Pousseur was actually used during the spectacle is unclear. The liner notes of the album *New Electronic Music From Leaders Of The Avant Garde* note that the city authorities preferred less unusual music and that they finally decided on using Gershwin's *Rhapsody in Blue* instead. (Cage, Pousseur, & Babbitt, 1967) This information cannot be found in Schöffer's book (N. Schöffer, 1969) nor on the website documenting his work (de Lavandeyra Schöffer, n.d.).

nichèrent bel et bien dans les moteurs pour le plus grand dommage de ceux-ci." (E. Schöffer, 1998)



Figure 49 Nicolas Schöffer, *Tour Spatiodynamique et Cybernétique*, Liège, Belgium [1961] (Cassou, 1963, p. 106)

Schöffner made use of five tapes, each lasting half an hour (Cassou, 1963), with several types of sounds created by Henri Pousseur: electronically treated percussive metal sounds created on the tower, city noises, singing of birds and the sounds of bells. The usage of sound in public space was not popular with residents in the neighbourhood of the tower and a year after the inauguration the sound was shut off. Not only the protest of the residents but also the fact that the bird songs produced by the tower attracted birds from the nearby park who unfortunately nestled down in the engines of the tower, caused the suspending of the sound.

Although Schöffner's *Tour Spatiodynamique et Cybernétique* is one of the three examples – together with the brothers Baschet and Tinguely – provided of “klassische Positionen” of sound sculptures by Frank Gertich (Gertich, 1999), the sound is of secondary importance. The movement, the play of light and its reflections stand central.

1.8.2 Installations

1.8.2.1 Installations referring to sound

Christian Marclay, who is well-known for his turntablism skills, has created several visual works that refer to sound.¹⁰³ A large chunk of his work relates to sound storage media^{104 105}. Marclay's works have been exhibited at exhibitions focusing on sound¹⁰⁶ and *Footsteps* even graced the cover of one of the main books on sound art: *Sound art – beyond music, between categories* by Alan Licht. (A. Licht, 2007) For *Footsteps* [1989] Marclay attached 3500 LPs with recordings of his own footsteps mixed with tap dancing with doubled-sided tape onto the floor of Shedhalle Galleries in Zurich. (De Oliveira et al., 1994, p. 83) (González, 2005) To reach adjacent rooms visitors had to walk on the records. The installation ran for six weeks and more than 1500 visitors walked over the fragile temporary floor contributing scratches and dirt onto the surfaces of the LPs. The

¹⁰³ Marclay is not the first to make visual works that refer to sound. Man Ray created *Perpetual Motion* (1923/1959), a metronome where the lever was equipped with the image of an eye (Pagé, 1980) and Dick Higgins created *Symphony Dispenser* [1968], a sculpture out of music paper. (Pichler, 1998)

¹⁰⁴ Sarkis is another artist who utilizes sound storage media, namely tape, and whose work is regularly included in exhibitions focusing on sound. (Palais des Beaux-Arts, 1985)

¹⁰⁵ Next to the sound storage media, Marclay also created numerous works with LP covers.

¹⁰⁶ For example, *Klangskulpturen, Augenmusik* [Koblenz, Germany, 1995], *Crossings. Kunst zum Hören und Sehen* [Vienna, 1998], *Musiques en scène* [Lyon, 1999], *Sonic Boom* [London, 2000], *S.O.S.: scenes of sounds* [Saratoga Springs, 2000/2001], *ART>MUSIC* [Sydney, 2001], *Audible Imagery: Sound and Photography* [Chicago, 2001], *Audioframes* [Kortrijk, 2002], *Sons & lumières : une histoire du son dans l'art du XXe siècle* [Paris, 2004/2005], *Audioframes 3 - expo geluidsinstallaties & video* [Kortrijk/Lille, 2004], *Sound of Music* [Kortrijk, 2007].

sound of the records was not audible during the installation. After the exhibition a selection of the records were packaged and put up for sale. (Marclay, 1989)

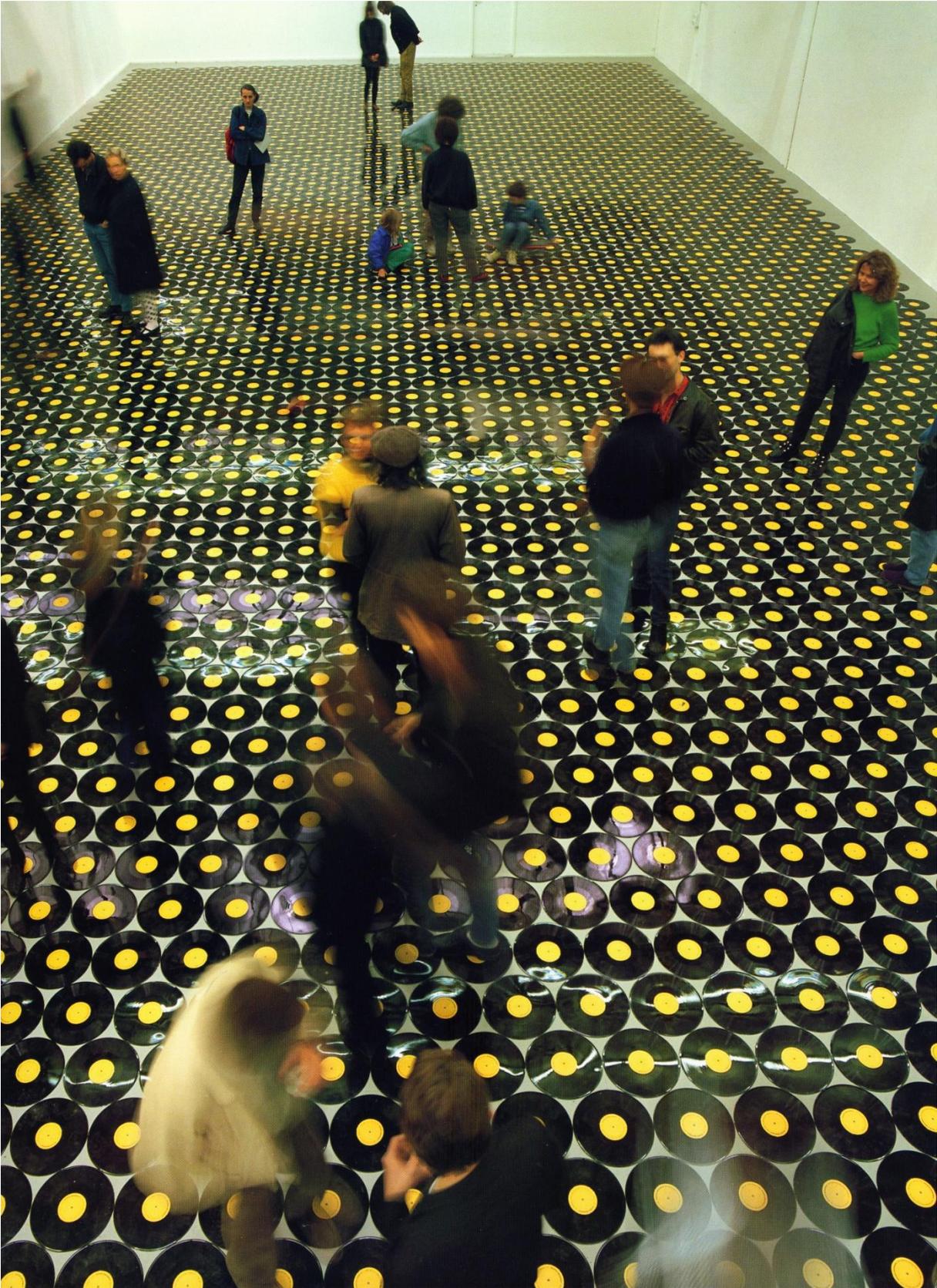


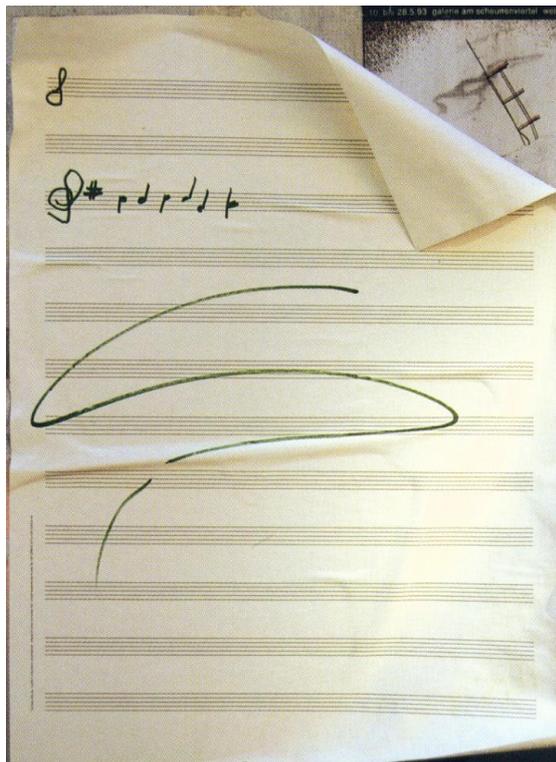
Figure 50 Christian Marclay, *Footsteps* [1989], Shedhalle, Zurich (González, 2005, p. 39)

Despite the fact that Marclay's work is often included in exhibitions focusing on sound, the majority of Marclay's oeuvre is not sound art and he refuses to be labelled a 'sound artist'. "I hate that term "sound art". It's just horrible. Some artists work with sound, but it isn't necessarily their whole practice. It's just a tool, a medium that's being used... A lot of times these categorizations, these ghettos, are created by the audience, not necessarily by the artists." (Hill & Marclay, 2000, p. 2) Marclay also states he does not think like a musician because he attended art school, not the conservatory^{107 108}. (Gordon, 2005, p. 10)



Figure 51 Above: Christian Marclay, *The Beatles* [1989] (Gordon, 2005, p. 11)

Figure 52 Below: Christian Marclay, *Graffiti Composition*, Sonambiente, 1996, Berlin (González, 2005, p. 80)



Marclay's sculptures often appeal to the auditive memory of the audience. *The Beatles* [1989] consists of a pillow crocheted from cassette tape containing the entire Beatles back catalogue. (Criqui, 2007) No sound is audible, the audience has to imagine their own Beatles soundtrack.

Marclay sustains this momentum when using magnetic tape to wrap a violin [*Violin*, 1988] or to create a woven web [*Net*, 1991]. Cassettes play a key role in *Möbius Loop* [1994], a curved fence of cassette tapes and nylon ties. Carpets and curtains of sound storage media are created with *Echo & Narcissus* [1992], a carpet of 15000 CDs and *Soundsheet* [1990], a curtain of transparent flexi-disks connected with white thread. Vinyl records are mounted on a steel cable [*Endless Column*, 1988], are melted and reshaped [*Cube*, 1989] or portray a

¹⁰⁷ "It's my background. I went to art school, not to music school. I don't think like a musician." (Gordon, 2005, p. 10)

¹⁰⁸ Ecole Supérieure d'Art Visuel, Geneva and Bachelor of Fine Arts, Boston Massachusetts College of Art (González, Gordon, & Higgs, 2005, p. 146)

human figure [*Galatea and Pygmalion*, 1989]. (González, 2005) (González et al., 2005) (Pichler, 1998)

For *Graffiti composition* [1993] Marclay distributed the most basic sound storage medium, 5000 music paper posters, each containing 12 blank staves, throughout Berlin (Michaud, 2007) (Gordon, 2005)

Sound storage media are also present in Marclay's video work. In *Fast Music* [1981] Marclay devours an old vinyl record (Lavigne, 2007) and in *Record Players* [1983] a group of people - only their torsos and legs are captured - is brandishing records across an empty room. Eventually they smash and stamp the LPs on the floor with increasing violence. (Michaud, 2007)

Although in many works of Marclay no sound is audible, sound is the common theme running through his work. Marclay's works rely on associations and although most works are silent, the sound is still present, created in the head of the visitor. "A lot of my work is about how image is expressive of sound, how sound is expressed visually." (Khazam, 2000, p. 32)



Figure 53 Christian Marclay, part of *Möbius Loop* [1994] (Gordon, 2005, pp. 18-19)

1.8.2.2 Installations incorporating sound

The border between installations incorporating sound and sound installations is often difficult to distinguish. If the visual components do not arise from the auditive, it is not always clear to determine whether the visual elements serve to support and enhance the sound (such as in the work by Ulrich Eller, see p.29) or if they form the most important component of the work.

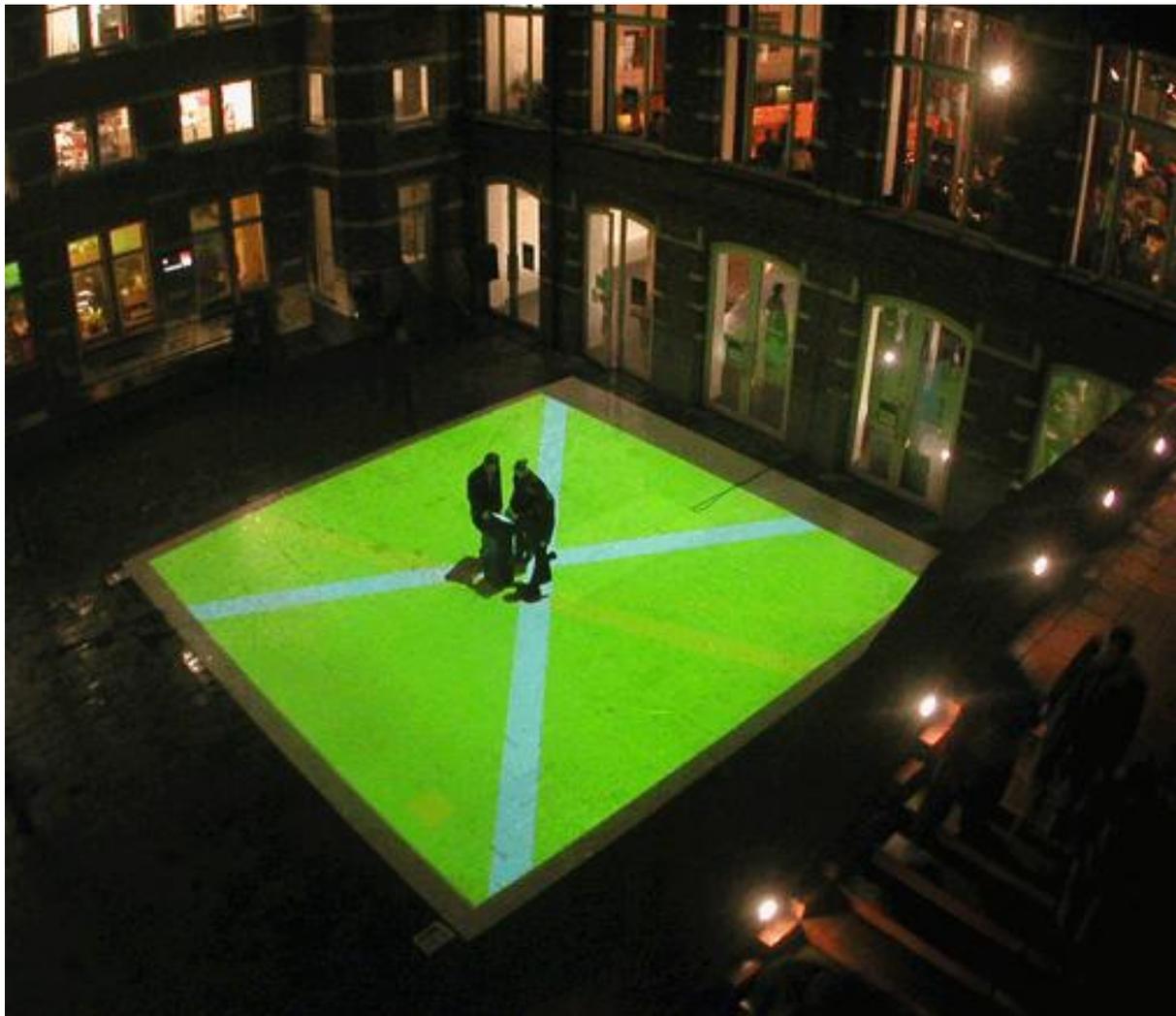


Figure 54 Lab[au], *Point, line, surface computed in seconds*, presented at Artefact, Arts centre STUK, Leuven, Belgium, 2005 (LAB[au], n.d.-a)

Lab[au], a collective based in Brussels, has created several works, combining auditive, visual and architectural elements, that are situated on this border. The installation *Point, line, surface computed in seconds*, an “interactive urban installation” (LAB[au], 2006) according to its makers, is based on the painting *Broadway Boogie Woogie* by Mondriaan and invites the visitors to create their own Boogie Woogie. In the middle of the plane of projection a touch screen is positioned. When the touch screen is touched, the installation gets into operation and the visitor can drag surfaces and lines in a field. The surfaces and lines are not only visible on the monitor, these same surfaces and lines are

also projected on and around the visitor. Each surface and each line is linked to a specific sound. Only when the surfaces and lines are dragged into the field, the according sounds resound. The sounds, mainly sine waves, are amplified by four speakers that are set up in the four corners of the projection field. The sounds are spatialised by means of a software algorithm. Not only the lines and surfaces move, the sound moves as well. Through the projection and the placing of speakers a particular space is created. The visitor can make endless combinations and create new audio-visual compositions.

It is difficult to distinguish whether the audio or the visual element of the installation is most important. In this work there is no direct relation between the image and the sound (such as in the work of Ulrich Eller, p. 29), but the image is necessary as a visual aid to be able to play the installation.¹⁰⁹

1.8.2.3 Installations reflecting sound



Figure 55 Richard Serra, *Intersection* [1992], Basel, Switzerland @ Kevin Van Volcem

¹⁰⁹ Similar to *3times4*, see p. 256.

Installations that were initially not conceived to create an auditive effect, can still have a huge impact on their acoustic environments.

A large part of Richard Serra's work consists of shaped metal plates erected in public spaces. In some of these public works Serra used more than one plate, creating a sort of tunnel effect [*Intersection*, 1992], or even a nearly enclosed space [*Charlie Brown*, 2000]. The positioning of metal plates not only has an impact on the visual representation of the place, but also influences its sonic experience.



Figure 56 Richard Serra, *Charlie Brown* [2000], San Francisco, United States (McShine & Cooke, p. 311)

In Basel, Switzerland, Richard Serra installed *Intersection* in 1992¹¹⁰. Serra chose¹¹¹ a square outside the entrance to Basel's City Theatre to install his work. (Schwander, 1996b) *Intersection* collides with its surrounding architecture. The work dissects the Theatre Plaza as all links to the staircase and the building are denied. (Boehm, 1996)

Serra positioned four concave Corten-steel plates, 3,6 meter high and 13 meter long (Keller, 1996) in pairs, hereby creating two tunnels, one where the steel plates bend inwards and one where the plates bend outwards, accessible by the audience. When you walk in one of the erected tunnels the

flutter echo¹¹² created constantly changes depending on your position.

An even greater, but more static, acoustic effect is obtained with *Charlie Brown*¹¹³ [2000], permanently installed at and commissioned expressly for the atrium of Gap

¹¹⁰ The work was originally installed for the exhibition *transForm. BildObjektSkulptur im 20. Jahrhundert* at the Kunstmuseum and Kunsthalle Basel. After a debate of two years the work was purchased with private funds collected by a committee which was specially established to that purpose. (Schwander, 1996a)

¹¹¹ Serra's first proposal, to place a work in the museum's courtyard, could not be realised. (Schwander & Serra, 1995/1996)

¹¹² "Flutter echo is usually caused by the repetitive interreflection of sound energy between opposing parallel or concave sound-reflecting surfaces." (Egan, 2007, p. 112)

headquarters in San Francisco, United States. (Stern & Dixon, 2003) Four vertically placed concave steel plates, more than 18 meters high, lean against each other, holding one another up and creating a sheltered place in their midst. On the side there is a crevasse, a small opening that seemingly invites you to come inside. When sound is created inside the sculpture an impressive delay can be observed.

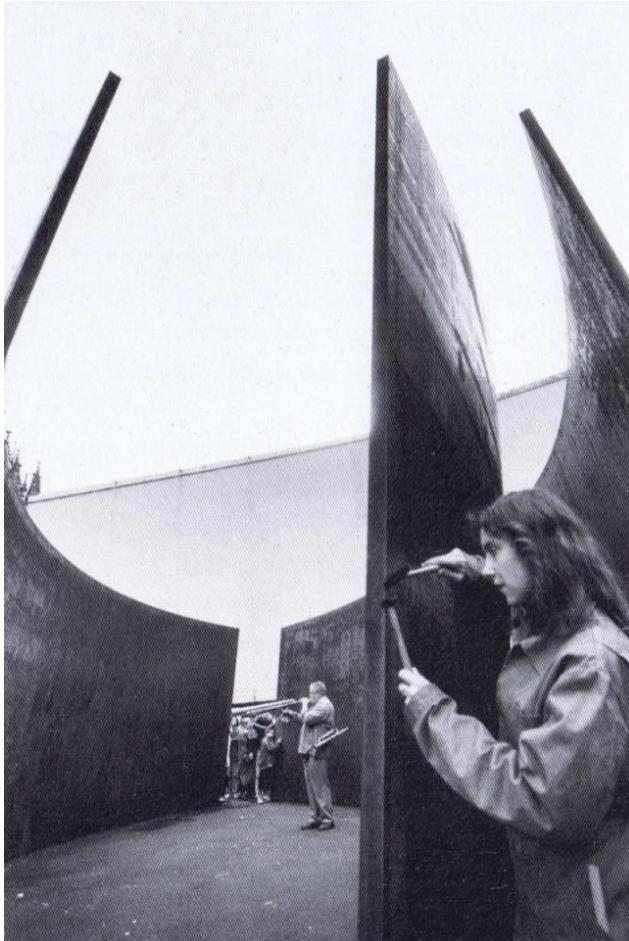


Figure 57 Member of *Metraxa*, the percussion ensemble of the Musik-Akademie Basel, beats *Intersection* with hammers during the Serra-fest on the 17th of September 1994 (Keller, 1996, p. 170)

The acoustic impact of Serra's works is largely ignored in the discussion of his work. Although clearly present, the sonic qualities are neglected and no value seems to be attached to them.

Richard Serra's interventions in public space are above all architectural interventions. As Serra himself puts it: "For the most part, the site determines how I think about what I am going to build, whether it be an urban or landscape site, a room or any other architectural enclosure." (Serra, 1994/1996, p. 73) "The scale, size, and location of site-specific works are determined by the topography of the

site, whether it be urban or landscape or architectural enclosure. The works become part of the site and restructure both conceptually and perceptually the organisation of the site." (Serra, 1994/1996, p. 75) The fact that these architectural interventions have an influence on the acoustic environment is not the point of departure of Serra, but a side-effect. These sound effects have not been fine-tuned and were not taken into account for the creation of the work. Although Serra did not experiment with sound¹¹⁴

¹¹³ *Charlie Brown* was named for the comic-strip character in honour of its author Charles Schulz who had died that year. (T. Golden, 2001)

¹¹⁴ Serra did experiment with sound in 1969 when he and Philip Glass installed 32 Polyplanar speakers in a 30 acre area of marsh land and coast line of Long Beach Island. The word "is", recorded on a 15 minute tape loop, was played from each speaker. The volume levels were set so that the speakers did not interrelate with each other. (Serra, 1970/1994, 1994b)

in or on his sculptures, others did. Alvin Lucier for example explored the sonic possibilities of Serra's *Tilted Arc* [1981-1989]¹¹⁵ (Senie, 1989) and during the inauguration festivities of the definitive instalment of *Intersection* [1992] in 1994 the percussion ensemble of the Musik-Akademie played the walls of *Intersection* with hammers. Serra said about this: "Er lauschte den Rhythmen, in der Plastik stehend." (Keller, 1996, p. 171)

1.8.3 Sound art versus experimental instruments: sound sculptures and installations as potential new instruments

1.8.3.1 Experimental instrument building

Every definition of a musical instrument is in one way or another influenced by the cultural background of the author. It is therefore nearly impossible to draw up a general all-embracing description of a musical instrument. While a boy from Laos might utilise a glass bottle and plastic jerry cans as a percussion instrument, few people in Western Europe would do so.

The Oxford Dictionary of Music describes musical instruments as 'objects or devices for producing mus. sound by mechanical energy or electrical impulses'. (M. Kennedy, 2011). In his book *Origins and Development of Musical Instruments* Jeremy Montagu is more specific about the type of objects or devices. He notes that "...preexisting objects can be adopted or adapted for the purpose of making music." (Montagu, 2007, p. 1). Any object or device can become a musical instrument even if it was designed with a different purpose in mind as long as it is used with the intention to create sound in a musical context.

The term experimental instrument building is directly associated with the journal *Experimental Musical Instruments* [defunct since 2000], edited by Bart Hopkin. The journal is devoted to "the broad range of current explorations in acoustic musical instrument making" (Hopkin, 1991, p. 11). Over time certain musical instruments have evolved and have become standardized as associated musical cultures came into being. These instruments can easily be replicated without tackling questions inherent to the process of creating an instrument (Hopkin, 1991). Experimental instrument building does not duplicate pre-existing instruments, but questions the building process, materials, construction, tuning and acoustics. In contrast to general musical instruments, experimental instruments are mostly unique specimens and are not mass-produced. As

¹¹⁵ *Tilted Arc* was installed in 1981 at Federal Plaza in New York City. The work was dismantled in 1989 after public controversy. (Senie, 1989)

an experimental instrument cannot fall back on a well-developed playing technique, it is often only played by its creator.

Although the journal *Experimental Musical Instruments* primarily focused on acoustic instruments, experimental instrument building should not be limited to this field. Because of its experimental nature, it can take a variety of shapes. Like in sound art, the sounds can be produced electronically, electro-acoustically or acoustically.

1.8.3.2 Interchangeability

Sound art and experimental instruments are frequently presented under one roof. In many group exhibitions where sound is central not only sound installations and sound sculptures, but also experimental instruments are displayed. Sound art and experimental instruments often seem to be interchangeable. Experimental musical instruments are presented in exhibitions and sound installations and sculptures serve as musical instruments in a concert setting, either at the museum or art gallery itself or on the stage of a concert hall. The program of exhibitions focusing on sound often includes concerts at which displayed sculptures and installations are played by their creator.

Not all sound installations and sculptures are however potential new instruments. A sound work has to obtain certain characteristics to be employable in a concert situation and to combine two seemingly conflicting functions: the static nature of an exhibited object versus the highly responsive nature of a musical instrument.

Three case studies will give an insight into what differentiates these works. These distinguishing characteristics will be distilled and generalised.

1.8.3.3 Three case studies

In the following section three works are discussed that share the fact that they are being employed as a musical instrument but have different approaches to how the actions of the performer are translated to an exhibition environment. In the first case study the audience takes over the role of the performer, whilst in the second case study the surroundings determine the auditive output. In the third and last case study the actions of the performer are automated when the work is displayed.

The exchangeability of audience and artist

Many sound works count on actions of the audience to display their operation. In a great number of works these actions are limited to activating the work, either consciously by pressing a button or turning a switch or unconsciously by triggering a motion detector sensor. Once the work has been activated, a pre-programmed process that cannot be interrupted or influenced by actions of the audience is executed. This form of audience participation simply comes down to pressing an on/off button and was widely implemented in kinetic art works. (see p. 89) By contrast, in many sound works

the visitors are no longer only spectators as their participation goes beyond the activation of the work of art. They have to play an active role, enter into a dialogue with the work and participate in a two-way interaction necessary for the operation of the work. In this context the actions of the visitor determine essential qualities of the work, the course of the work and the perception of the visitor that depend on the acts of that same visitor.

An example of such a work is Godfried Willem-Raes' *Pneumaphone* that is composed of several pneumatically-driven sound sculptures named after mythological wind gods such as Boreas, Favonius or Kolpia. Each sculpture is attached to an air pillow that when pressed allows flutes, single reeds, lips, tongues, double-reeds, sirens, whistles, membranes, mirlitons, water-organs or cavity resonators (Raes, 1983-1987) to sound. The air is provided by several low pressure air compressors which are equipped with conical control valves. By sitting, rolling, jumping or lying on the inflated tetrahedron shaped air cushions the audience or performers can modulate the wind flow and thus the pitch and intensity of the sound of each sculpture (Raes, 1983-1987, 1992)



Figure 58 Logos Foundation: *Pneumaphone*, Predikherenkerk, *Pepernoot music festival*, Leuven – Belgium, 2008 @ Logos Foundation archive

Pneumaphone was premiered in 1983 at the *Spiel- und Klangstraße* in Essen¹¹⁶ where it was presented as an installation. The audience could freely interact with the [then] twelve sound sculptures. *Pneumaphone*'s construction was completely finished in 1998 when the last sound sculpture Tembo joined the ranks of the –in the meanwhile– twenty-three other sound sculptures (Raes, 2009).

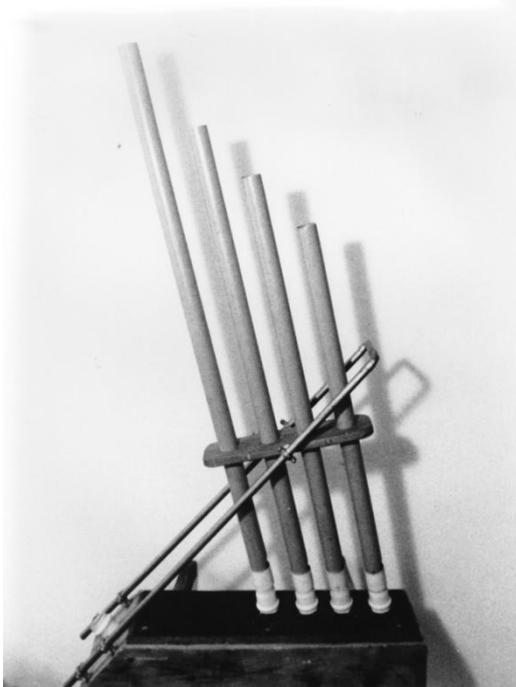
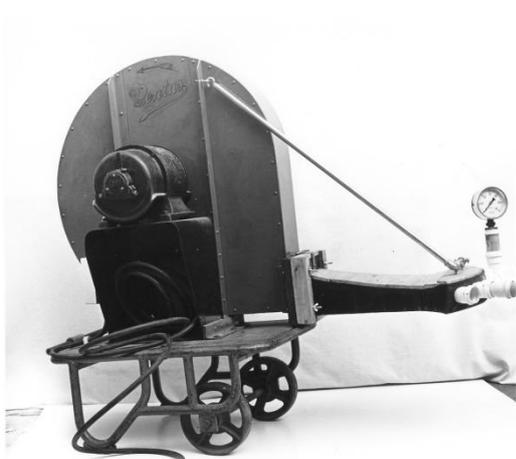


Figure 59 Upper: *Ventus*, a low pressure air compressor @ Logos Foundation archive

Figure 60 Lower: *Aeolus*, air is sent through four plastic flutes @ Logos Foundation archive



Pneumaphone was originally intended as a sound installation where the several pneumatically-driven sound sculptures are spread in the room and the audience is invited to press the various air cushions to produce sound (Raes, 2009). After its first presentation in Essen the idea originated to organise the sounds of the individual sculptures and to deploy *Pneumaphone* as a musical instrument (Raes, 2009). This new setting demanded a new approach. The sculptures are no longer spread in the room but grouped on stage and the air cushions are played by performers instead of the audience. To produce more than one sound at a time, several performers are necessary. Consequently there is a need to organise the generation of these sounds. For each performance a score adapted to the number of players and the concert situation was made (Raes, 2009). *Pneumaphone* has not only been employed as a polyphonic solo instrument; for a

performance at the Royal Conservatory in Ghent, Belgium, in 1986 a duet with organ was created.

¹¹⁶ The *Spiel- und Klangstraße* was organised each summer from 1979 till 1983 in Essen, a city in Northwest Germany.

Dependent on *Pneumaphone's* presentation the role of the Logos¹¹⁷ crew and the function of some components change. The conical control valves on the air compressors are used to restrict and control the volume in an installation environment, whilst in a concert environment they function as a musical element. When *Pneumaphone* is exhibited, members of the Logos crew do not have a performance task, as this role is reserved for the audience, instead they function as guides guaranteeing safety and restarting the installation when there is no air left in the air pillows.

Despite its use as a musical instrument, *Pneumaphone* has been presented much more often as a sound installation (Raes, 2009). The responsiveness of the installation, the diversity of the 24 different sound sources, the tactile aspect of pressing air cushions and the social aspect of “playing” together contribute to its attractiveness as a sound installation. Moreover, the set-up of the complete *Pneumaphone* project takes up at least two hundred square metres (Raes, 1984), space that is not available in every concert hall.

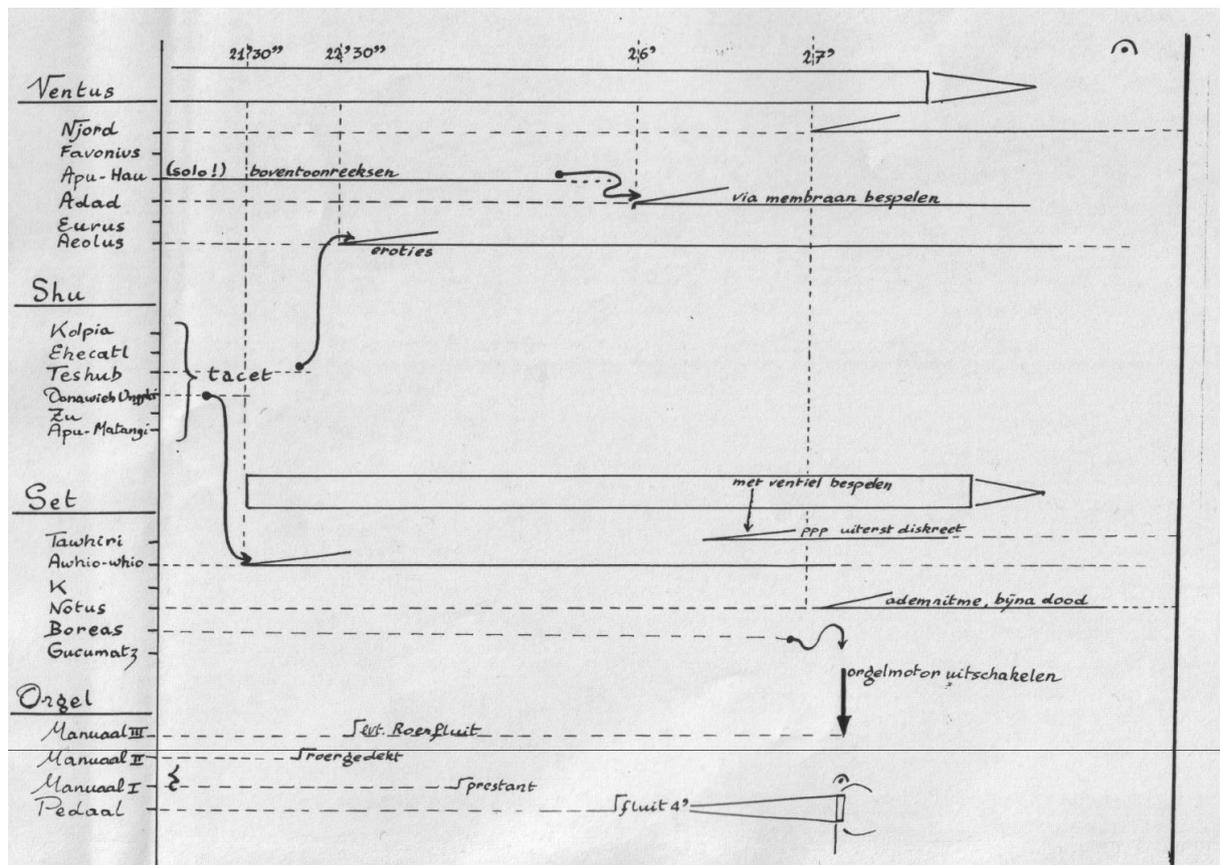


Figure 61 Godfried-Willem Raes 's *Concerto for Pneumaphone & Organ*, excerpt from score

¹¹⁷ Godfried-Willem Raes founded Logos Foundation in 1977. He has been the president of this foundation ever since.

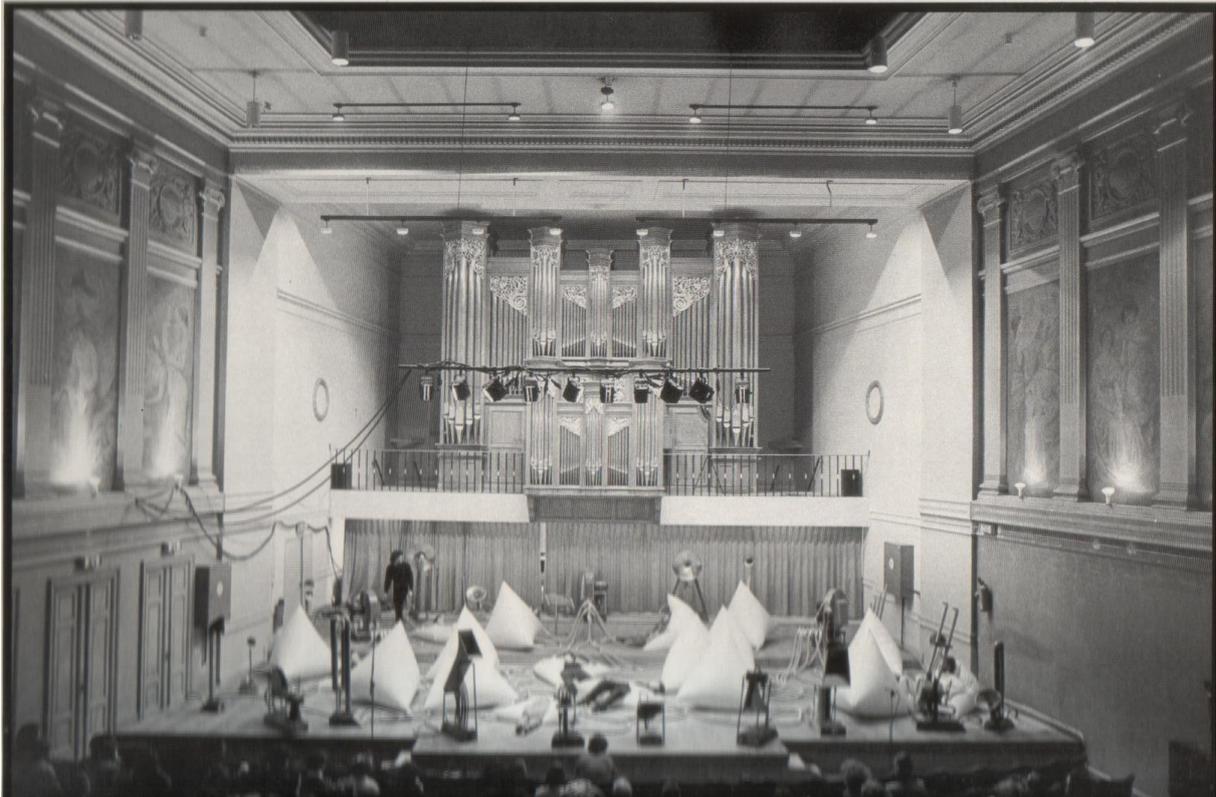


Figure 62 performance of *Concerto for Pneumaphone & Organ*, Royal Conservatory, Ghent – Belgium, 1986 @ Logos Foundation archive

The environment as performer

Natural sources such as water, wind, earth movements and weather conditions can take the place of the performer and interact with the sound work. Wind harps are a well-known example since their strings are not played by a performer, but by the wind. Although they originated in ancient Greek times, wind harps have various modern re-interpretations, most of whom traded in the sound box for contemporary technology.

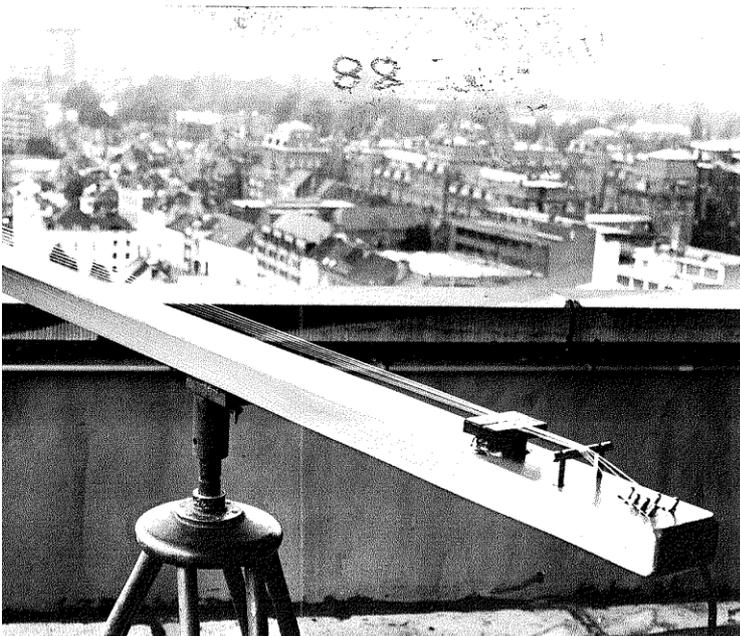


Figure 63 Wolf-Dieter & Ulrike Trüstedt's installation, book tower, Ghent – Belgium, 1988 @ Logos Foundation archive

Since 1973 Wolf-Dieter Trüstedt has done many installation projects involving wind harps and public space, first together with Ulrike Trüstedt, later on as a solo artist. (Trüstedt, 2009) Although Trüstedt also performs on his

wind harps, the majority of their use is as an installation. In 1988 he placed two wind harps on the roof of the 80 meters high building of the University library in Ghent, Belgium. During two months the audience could walk freely in and out of the room underneath the roof and listen to the amplified sounds produced by the wind playing the strings. Each harp was equipped with seven steel strings tuned to the same note. The sounds were amplified via pick-ups similar to the ones used on an electric guitar. (Trüstedt, 2009)

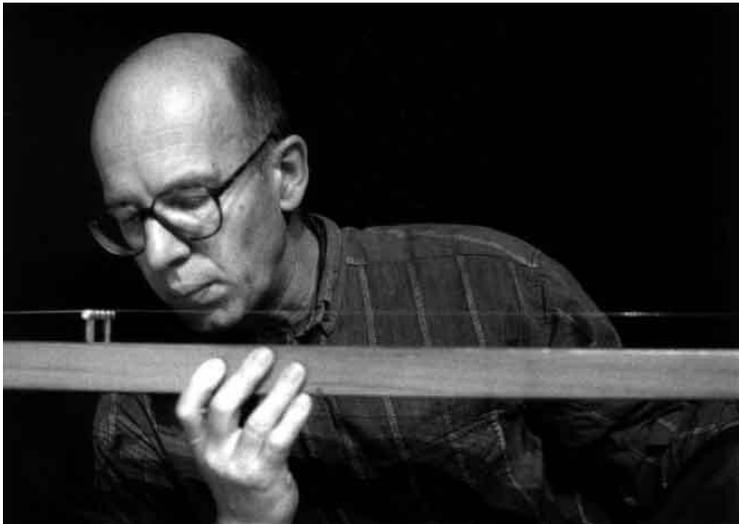


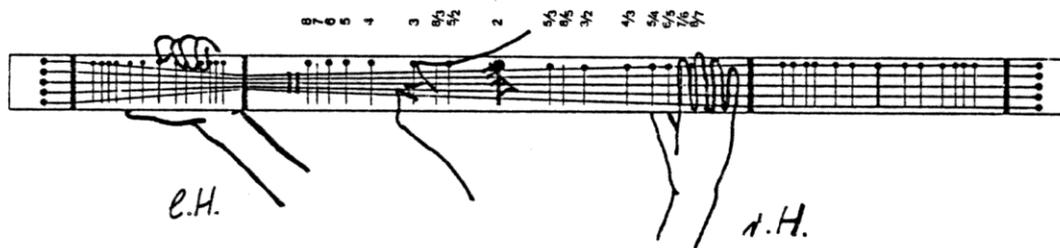
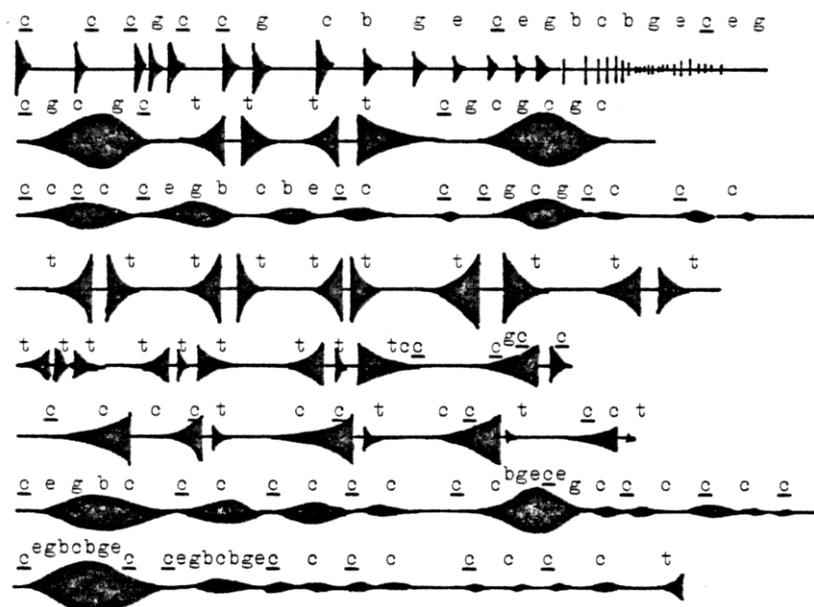
Figure 64 Wolf-Dieter Trüstedt performing on one of his wind harps.

The most interesting sonic results are achieved when all strings of the wind harp are tuned to the same pitch and when the thickness of these strings varies. As a result of the diverse tensions of the strings a

lively overtone spectrum originates. The sound becomes dull when the strings are tuned to various pitches. Fluctuations in temperature have an influence on the pitch and weather conditions such as rain, snow and fog affect the tone colour. Since 2009 Trüstedt also artificially modifies the tone colour. The electronic treatment of the sounds produced by the wind harp via the open source software programme Pure Data allows to greatly expand the timbre possibilities of the instrument.

In an installation environment Trüstedt always tunes his strings to either the fundamental or the octave. When he uses a wind harp as a musical instrument the strings are tuned in the harmonic overtone series: the fundamental tone, major third, fifth, natural seventh, octave. In contrast to the randomness of the wind playing the strings, Trüstedts actions are well-defined in a concert situation as he plays the strings either by blowing them or through utilising a plectrum, a glass rod, a piano string or a bow to activate the strings. (Trüstedt, 2010) Soft blowing of the strings becomes audible so that the strings can individually and unambiguously be played by the breath. The pick-up element designed by Trüstedt functions as a sound microscope: sounds that in normal circumstances are inaudible are clearly reproduced.

ARTIKULATION



Die Hauptsaiten werden angeblasen. Die rechte Hand dämpft während des gesamten Spiels alle Hauptsaiten. Es entstehen trockene Klänge, die unmittelbar auf das Anblasen reagieren.

t = alle Saiten gemeinsam anblasen (am besten im Bereich des Tonabnehmers).

c, e, g etc. = einzelne oder einige Saiten anblasen (am besten im Bereich 4 bis 2).

Die unteren Zeilen beschreiben die Lautstärkeartikulation. Dabei gibt es Explosivlaute und deren Umkehrung, vibrierende und kreisende Laute. Die Partitur ist nicht streng bindend.

Stärkeres Drücken der Saiten oder Verschieben der dämpfenden Hand ändert die Gesamttonhöhe.

Figure 65 Wolf-Dieter & Ulrike Trüstedt, *Touching*, 1978, score, International composition competition, Gaudeamus Foundation, the Netherlands

The automated instrument

Instead of the audience or the environment that interacts with the sound work, electronics¹¹⁸ or mechanics can take over the role of the musician and automate his actions.

This is the case for *Bambuso Sonoro*, the central work of the oeuvre of Hans van Koolwijk. The more than a hundred bamboo flutes with a length ranging from seven centimetres to nearly seven metres are either activated by the artist or through the use of bellows (Van Koolwijk, 1994).



Figure 66 Hans van Koolwijk: *Bambuso Sonoro*, Macba, Barcelona – Spain, 1996.

Van Koolwijk uses a powerful blower that provides wind to several dividing chambers from which tubes depart to the flutes (Van Koolwijk, 1994, 2009). To make the sounds produced more vivid van Koolwijk equipped the *Bambuso Sonoro* with several sliders to control the wind supply allowing nuances to be created in the generated tone. Some flutes are

supplied with “moving stops” that make the air column shorter or longer and permit to play glissandi. (Van Koolwijk, 1994, 2010, n.d.-d) Whilst almost completely blocking the wind passage the flute can generate sounds that resemble yodelling and glissandi. Van Koolwijk also created clusters so he could operate several flutes at the same time. (Dreese, 2004)

In 1989 the *Bambuso Sonoro* played by Hans van Koolwijk was premiered at the concert hall of the Ijsbreker, Amsterdam. *Bambuso Sonoro* is played by its creator or by other players¹¹⁹, solo or together with conventional instruments, experimental instruments or

¹¹⁸ Through computer software, digital and analogue electronic circuits, printed circuit boards, hardware and firmware microprocessors, amongst others.

¹¹⁹ Klaas Hoek was *Bambuso*'s visiting player for years on end.

electronics in small ensembles or even in orchestral formations. Several composers wrote pieces for the *Bambuso*.¹²⁰



Figure 67 Hans van Koolwijk performing on his *Bambuso Sonoro* @ Reyn van Koolwijk

Van Koolwijk describes his *Bambuso Sonoro* as “an unpolished sound sculpture that is sometimes used as a musical instrument, whereby the visual is closely related to the aural” (Van Koolwijk, n.d.-d). Because of the nature of the object a produced sound always has a mechanical, and therefore visual, action linked to it. This merge of hearing and seeing makes the *Bambuso Sonoro* extremely suitable to be presented as a sound sculpture next to being utilised as a musical instrument.

When the *Bambuso* is exhibited one or two bellows are added. The bellows are automated by placing a heavy ball on its highest point. This ball gets out of balance and rolls on a valve so as to open that valve and let the wind flow. Consequently the bellow loses height and as a result the valve is closed and the ball rolls back to its initial position and the whole movement can start again. The power of the bellow pulls open sliders between the blower and the flutes, therefore the wind pressure and flow varies

¹²⁰ Amongst others Hans van Eck, Caroline Ansink, Enrique Raxach, Rob Zuidam and Armeno Alberts wrote one or more pieces for the *Bambuso Sonoro*.

and as a result the sound of the flutes changes. In the slider space is reserved for a 'score' consisting of holes that can take various shapes and sizes. In order to get more variation a second smaller bellow between the blower and the other bellow is deployed. The timeframe varies, sometimes the 'score' is read faster, sometimes slower. The wind flow will stop when the slider of the smaller second bellow is closed and as a result static periods will appear (Van Koolwijk, 2010).

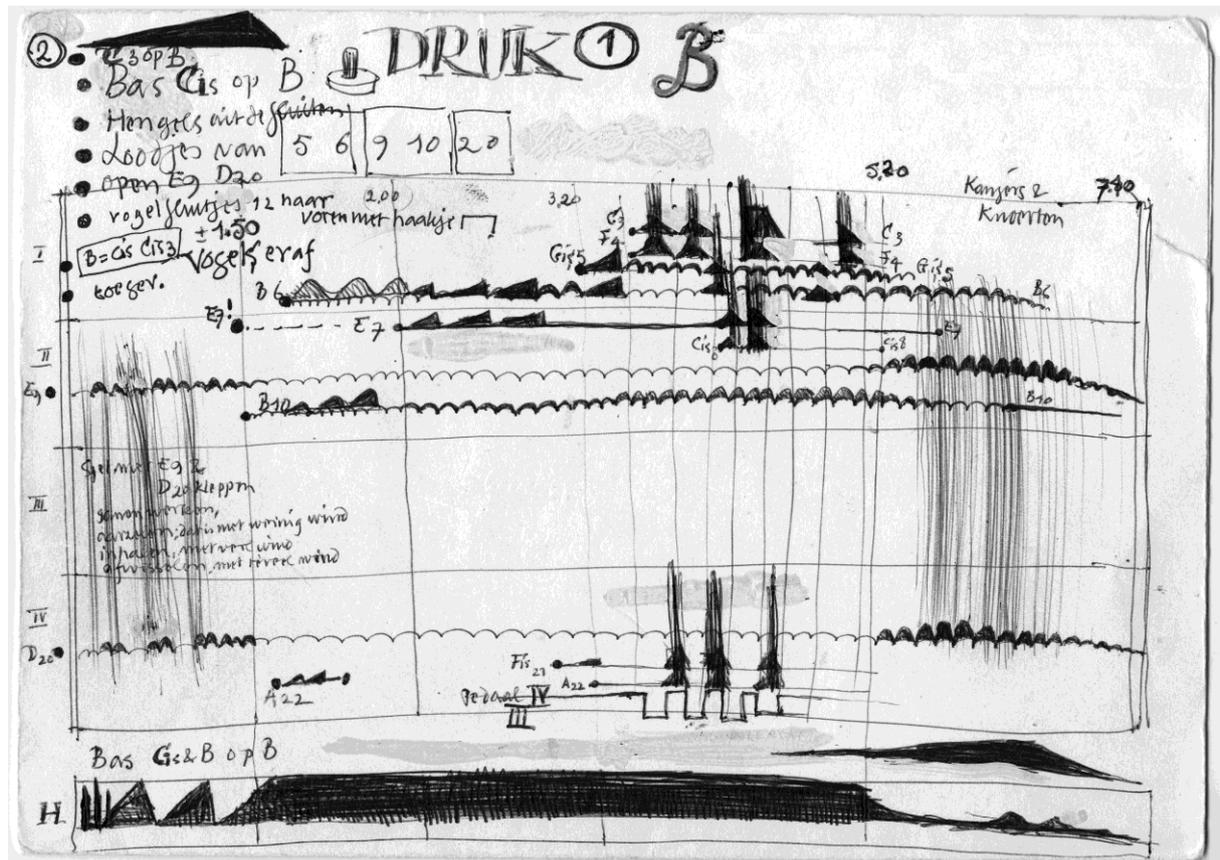


Figure 68 Hans van Koolwijk, *Druk*, excerpt from score.

The reason why van Koolwijk automates his *Bambuso Sonoro* is ambiguous. On the one hand the automation can take over some tasks of the player. This makes it possible for the *Bambuso* not only to be employed in a concert situation, but to be exhibited as well. On the other hand, the automation unfolds new sound possibilities. Through expanding the *Bambuso* with the automated bellows the static wind supply varies. Because of the inertia of the bellow and the sliders the character of the sound of the flutes subtly changes. The *Bambuso* has become an independent organism, moving and making sounds without human interaction (Van Koolwijk, 2010).

Hans van Koolwijk does not find the automation of *Bambuso Sonoro* completely satisfying. He built the *Bambuso* leaving a space in its centre to accommodate a player.

Without the performer the *Bambuso* seems incomplete as the console remains unmanned (Van Koolwijk, 2009). Van Koolwijk built several sound works¹²¹ that are multi-functional: either as an instrument or as an automated sculpture or installation. All of these works have one thing in common: they are automated. It is a conscious choice of van Koolwijk to opt for the automation of his works instead of making them interact with the audience¹²² as he wants to keep complete control of the output of his work.

1.8.3.4 Baschet's criteria

Whether the three works discussed above can be labelled a musical instrument will be established through applying François Baschet's criteria for defining instruments. Together with his brother Bernard, François Baschet produced numerous instruments and sound sculptures grouped as structures sonores. (see p. 45 & 223)

In 1955 François Baschet noted that a musical instrument combines at least three of the following four components:

- a vibrating element to create an oscillation (a)
- energy to start and maintain the oscillation (b)
- a device to modulate the scale (c)
- a device to amplify the sound (d) (Baschet and Baschet 1987).

The brothers Baschet explored the last category by using balloons filled with either air or an inert gas as a resonance chamber or utilising shaped metal sheets to acquire the relative amplification of desired frequencies. It was their intention to merge previously uncombined elements out of each category to create innovative instruments and generate new sounds. (F. Baschet, 1999)

The above definition of a musical instrument is strongly biased as it is based on and directly applicable to Baschet's own work and excludes several objects that are generally considered musical instruments, such as several non-pitched percussion instruments like wood blocks. Nearly all Baschet's instruments are composed of glass or steel rods [a], clamped on one side on a solid steel or aluminium block [b]. The vibrations in this block are amplified using either inflated bladders or balloons; cones

¹²¹ *Bambuso Sonoro, Eckoo and Bass boxes.*

¹²² Hans van Koolwijk has built one sound work where the audience generates the sounds. *TREK!* consists of four flutes and three reeds equipped with double bellows. Visitors can produce sounds by pressing the bellows. It was van Koolwijk's intention to let the audience listen to each other, to let them react on the sounds and to create music together. Only on rare occasions this actually happened. Van Koolwijk's disappointment in the ability of the audience to create music together led to his preference for automation. (Van Koolwijk, 2009) His point of departure is completely different from Godfried-Willem Raes's for whom the corporality and the tactile aspect form the starting point of his work.

produced out of steel or duraluminium; shaped metal sheets or a piano sounding board [d]. The variety of rods makes it possible to create different pitches [c]. The metal rods are bowed or played with mallets, while the glass rods are struck with wet fingers. In order to produce sound the player has to put his finger on a specific point that is indicated by a Meccano ring, on the rod (F. Baschet, 1999). Recycled mattress springs, springs from old clocks or whiskers or spirals produced out of piano strings often serve as resonators to create echo and overtones.

When Baschet's definition is applied on the three case studies discussed above, all three can be considered a musical instrument.

Pneumaphone's vibrating elements are reeds, lips, tongues, membranes and so on. [a] Wind, derived from a low pressure air compressor is used to start and maintain the oscillation. [b] The pitch of each sculpture can be varied by changing the applied air pressure delivered by the air pillows. [c] Some sculptures have additional bells, horns or sound reflectors in different shapes placed at the end of the tubes. [d]

In Trüstedt's wind harps the strings create the periodic oscillation. [a] The wind and or the blowing of a human being excite the strings. [b] There are a number of wires to allow modulation. [c] Pick-ups are used to amplify the sound. [d]

Bambuso Sonoro's vibrating elements are flutes. [a] Just like *Pneumaphone* it uses wind to start and maintain the oscillation. [b] The tone can be modulated with the sliders and the moving stops. The applied air pressure can also be adapted. [c] There are no additional means to amplify the sound. [d]

In contrast to the three case studies not all sound installations and sculptures are potential new instruments. The sound work should obtain certain characteristics to be utilised as a musical instrument.

1.8.3.5 Conditions for an equivocal musicality

In order for a sound work to be employable in a concert situation, it should be able to produce more than one sound, the produced sounds should be versatile and a performer should be able to perform more than one piece on the instrument. The sound work should have a certain predictability, a definite action should always generate the expected result.

For all of the three case studies above multiple scores have been written. This implies that all three sound objects are predictable to a certain extent. A prescribed action will create a sound desired by the composer. The three works also share that they can produce different pitches, either through tuning the strings [wind harps], the utilization of valves, moving stops [*Bambuso Sonoro*] or through changing the applied air pressure [*Bambuso Sonoro* and *Pneumaphone*]. The duration of the sound can also be determined. *Pneumaphone* can create short as well as long sounds depending on the duration of the pressure executed on an air pillow. The duration of the sound generated by Trüstedt's wind harps depends on the length of time air is directed towards the string. The system

of sliders makes it possible to control the duration of the sound produced by the *Bambuso Sonoro*. Although the timbre of none of the above sound objects can be varied, the diversity of vibrating elements of the *Pneumaphone*, the irregular bore of the bamboo flutes of *Bambuso Sonoro* and the manipulation of Trüstedt's wind harp sounds in *Pure Data* imply a rich palette of tone colours .

Through the use of clusters one performer can activate multiple flutes of the *Bambuso Sonoro*, in contrast to the *Pneumaphone* where this requires several performers. By directing air towards several strings of the wind harp more than one string can be activated simultaneously.

In a concert setting the musician(s) performing on one of the three above works is able to control at least two of the following musical parameters, either the dynamics, the pitch, the duration or the timbre.

Interactive works

An exhibited object where the actions of the audience or environment only influence the activation of the work is less likely to be employable as a musical instrument. When a visitor or an environmental factor can generate sounds, this is, at first glance, based on chance, not on a conscious act like that is the case with a musical instrument. It is only when a two-way interaction is possible and the visitor enters into a dialogue with the work, that the visitor can engage in the work and a learning curve comes into being. The visitor is inclined to listen, to analyse the effect of his actions and to master the system.

Objects that function as an interactive sound work as well as a musical instrument are characterized by the fact that the object can be played on various levels: it is possible to generate sound by chance as well as engage into a meaningful interaction with the work as is the case with a musical instrument.

Automated works

The programmability¹²³ does not play a role in whether or not an object can fulfil this plural identity. In most automated sound works that are also employable as musical instruments, only a few parameters are automated. This is also the case for Hans van Koolwijk's *Bambuso Sonoro*. While many musical parameters can be controlled by the artist during a concert, only a few of these parameters are automated in an exhibition environment. The musical output of the object is simplified when it is exhibited.

¹²³ The number of musical parameters that can be programmed by the artist.

1.8.3.6 Conclusion

A work that is employable both as a musical instrument and as a sound work should be able to produce more than one sound, the produced sounds should be versatile and a performer should be able to perform more than one piece on the instrument. The work should have a minimum nimbleness and verifiability and at least two of the following musical parameters, either dynamics, pitch, duration or timbre, should be able to be controlled by the performer.

Our perception of a work is also strongly determined by its surroundings. When these new “instruments” are presented in an exhibition context, the former musical instrument is seen as a sound sculpture or installation. When they are being played on the stage of a concert hall, we conceive them as musical instruments. Annea Lockwood states that she makes use of the term sound art for pieces that she intends to present in places such as museums and galleries, in contrast to pieces she makes for a performance (A. Licht, 2007), whereas Alvin Lucier notes: “My problem is deciding what work should be installed and what should be performed.” (Lucier, 1994/1995, p. 520)

In conclusion, new instruments often originate from the roots of sound art. Sound art can contribute to the extension of our concept of a musical instrument and to broaching new territories in the generation of sound and possible interfaces.

1.8.4 Sound art versus music

Music is often presented as or mistaken for sound art. Exhibitions focusing on sound that include compositions (see p. 1) and musicians creating experimental music labelling themselves as sound artists add to the confusion surrounding the designation sound art.

Helga de la Motte-Haber states that there is a place for music performances on the often unclear border of sound art: “Die Musikperformance kann wohl einen Platz an den unscharfen Rändern der Klangkunst haben, und sie hat in der Nachfolge der Aktionskunst auch eine starke Erweiterung erfahren.” (De la Motte-Haber, 1996a, p. 16)

Although some authors such as Helga de la Motte-Haber state that experimental music can be a part of the modes of expressions joined under the denominator sound art, we do not share that vision. The main distinctions between sound art and music are the usage of time (see p.64), the place of presentation (see p.69), the narrativity (see p.66) and the clear-cut division between audience and performers (see p.60). However, these distinctions are not always that clear. Hybrid forms exist that balance on the border of music and sound art.

During *Soundculture 96*, the third trans-pacific festival of sonic art and contemporary sound practice, Kathy Kennedy presented *The Blue Pathway*, a “soundwalk/performance piece”. (K. Kennedy, Moore, & Quin, 1996, p. 39) The piece was presented at the Corte

Madera Town Center Mall, near San Francisco on a busy Saturday afternoon. About 15 performers and as many portable radios are sparsely positioned around the walkways. In addition to a portable radio tuned to the frequency of the transmitter, each performer also has an instrument. The performers react on the tape that is being played through the transmitter, but also on each other and the environment as a whole. The piece asks passers-by to listen to the surrounding sounds.

The composition is not performed in an ordinary performance environment. Not only the setting of public space, but the scattering of sound sources is unusual. Audience and performers are not clearly separated. There is no clear-cut beginning nor end for the audience, but there is for the performers.

1.8.5 Sound art versus functional sound applications

Functional sound applications can have certain characteristics of sound art and often the division between sound art and functional applications utilizing sound is not clear-cut. Functional sounds are not limited to high-tech applications, even in ancient cultures sounds were incorporated in daily life. Before the loudspeaker and electronics were around, acoustic effects were integrated in architecture. Still today, acoustic applications are deployed such as the melody roads (see p. 124) or wind chimes used to chase away birds from the fields.

Since the advent of sound reproduction, functional applications utilizing sound have popped up like mushrooms. Artificial sonic environments and sound weapons are discussed as both show several similarities with sound works.

In functional sound applications sound is used to set a certain atmosphere [whispering galleries, Disneyland sound environment, water organs, Japanese water harp], to serve as a warning [Taluktak, sounding buoys, melody roads] or for entertainment purposes [melody roads].

1.8.5.1 Architecture

In his book *Stone Age Soundtracks: the Acoustic Archaeology of Ancient Sites* Paul Devereux wonders whether the buzzing sound resembling a swarm of bees that can be heard at the *Treasury of Atreus*, Mycenae, Greece when placing an ear close to the great curving wall is a coincidence or whether the architecture of the tomb is specifically designed to create this sound effect, referring to the spirits of the buried. “The buzzing is an acoustic distortion of the distant background sounds of the outside world coming in through the doorway, probably akin to the effect of so-called “whispering

galleries”.”(Devereux, 2001, p. 67) Those whispering galleries¹²⁴ Devereux refers to are another example of an acoustic effect, that is created when sound is reflected along a domed ceiling surface. Although persons in the neighbourhood of the whisperer will not be able to hear the conversation, persons at opposite ends of the rotunda will be able to converse at whisper voice level.(Egan, 2007)

A special acoustic effect can be experienced near the Kukulkan Pyramid at Chichén Itzá, Mexico. A hand clap in front of the 92 stone steps of the pyramid results in a distorted chirped echo, resembling a quetzal bird’s call. It is the reflections from the treads of the staircase that cause the echo’s sliding pitch. Although archaeologists dismiss those acoustic effects as a coincidence, David Lubman, an acoustic expert, states the effect was intentionally coded into the pyramid’s architecture. Lubman discovered that the sonograms of the quetzal bird’s call and the echo at the Kukulkan Pyramid are very much alike. (Weiss, 1999) (Lubman, 2010)

Functional sound applications can also be integrated in architecture on a smaller scale. In an article on the precursors of sampling Hugh Davies makes note of a Chinese temple where one of the doors was equipped with a stylus that each time as the door closed, tracked along a groove, carrying a recording thanking the visitor for closing the door, in the floor. (Davies, 1996)

1.8.5.2 Water organs

The water organ or hydraulic organ is a kind of automatic organ without bellows, played without human intervention. Instead, the pipes are blown by air compressed directly by water. Water organs were already described in texts by Ctesibius, 3rd century BCE. In ancient Greece these type of organs were used to imitate bird songs or to provide statues with sound. (Jeans & Ord-Hume, n.d.; Rowbotham, 1888)

Throughout the centuries water organs were incorporated in mansions and palaces and during the Renaissance water organs were integrated in gardens and grottoes.

Although five centuries apart, the 16th century water organs placed in parks such as the gardens of Villa d’Este in Tivoli, Italy, have a lot in common with contemporary versions such as the sea organ in Zadar, Croatia. (see p. 233) Both the organ at Villa d’Este and the organ in Zadar were designed by architects, resp. Lucha Clericho [finished by Claude Venard] [1566-1571] (Hopwood, 2009) and Nikola Bašić [2005], and are activated by natural water sources, resp. a waterfall and sea waves. The organ at Villa d’Este is drawn up vertically, about six meters high, while the organ at Zadar is spread horizontally. Whereas the organ at Villa d’Este was intended to play

¹²⁴ Such a whispering gallery can amongst others be found high up in the central dome of St Paul’s Cathedral in London.

compositions such as madrigals and was also provided with a keyboard, the sounds from the Croatian sea organ are fully dependent on the impact of the sea waves and cannot be controlled. The visual elements of the organ by Bašić are limited to a stone staircase whilst the organ at Villa d'Este is heavily decorated.

1.8.5.3 Sounding buoys

Aids for navigation can be traced back till the beginnings of shipping. From the middle of the 19th century the idea arose to equip buoys with light. Twenty years - and technological developments - later oil-vapour lamps were produced. The advent of sound deployed buoys took place around the same moment as their light deployed counterpart. In the 1850s a Revenue Marine captain developed Brown's Bell Buoy. A bell was activated by four clappers as the buoy dances on the waves. This bell buoy formed the basis for a whistle and foghorn version. (Marshall, 2012) Some of those later versions¹²⁵ are based on the same principle - the physics of air escaping under pressure from a tube through a whistle or pipe - similar to the contemporary sea organs that have been installed in amongst others Zadar, Croatia and Blackpool, United Kingdom. (see p. 233) Nowadays weighted bellows, amongst others, are utilised. They have a check valve that is activated by wave action. Similar to a calliope the whistles have 360 degree mouths. (Bover, 2008)

This principle was not only deployed in open sea, but also on the coastline. Worldwide several sound signals have been made utilising natural orifices in cliffs. In 1958-59 such a sound signal was constructed by Hartmann Bache on the Farallon Islands, near the harbour of San Francisco. The beating of the waves drives air to a whistle attached to the orifice of a subterranean passage opening out upon the ocean. (A. B. Johnson, 1885)

1.8.5.4 Japanese water harp

The Japanese suikinkutsu is often considered sound art avant-la-lettre. (Toop, 2004b) (D. Kahn, 1999)

This water harp originated in the Edo period [from the 17th century onwards] and became popular at the end of the 19th century, during the Meiji period. In the 1980s the suikinkutsu was rediscovered and regained popularity. A suikinkutsu is installed in Japanese gardens and is situated underneath the earth surface.

¹²⁵ Also buoys utilizing sirens, trumpets, steam-whistles, bell-boats, bells struck by machinery, cannons fired by powder or gun cotton, rockets, and gongs were developed. (A. B. Johnson, 1885)

It consists of an upside down crock, supported by pieces of stone in order not to

dampen the vibrations of the crock by the surrounding earth. At the top of the crock a small hole is situated. Water drops, coming from a washbasin, fall through the hole down the crock, splitting into a sequence of water droplets during their fall before hitting the surface of a small pool of still water. The resulting splashing sound resonates in the pot and can be heard through the small hole at the top of the crock. (Watanabe, 2004)

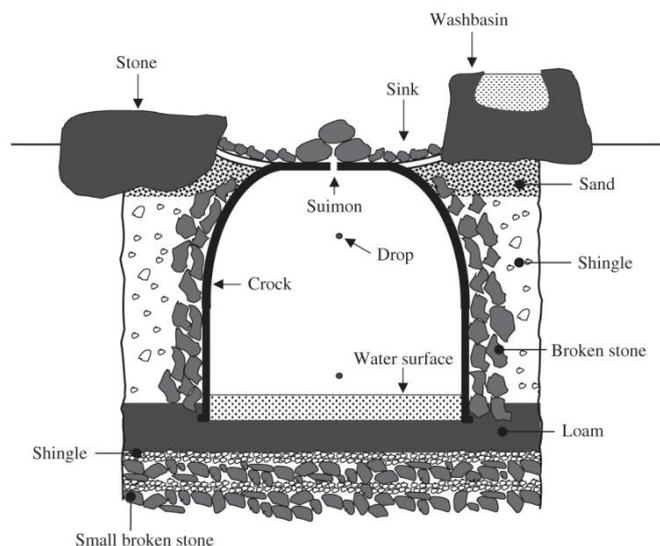


Figure 69 Construction scheme of a traditional suikinkutsu (Watanabe, 2004, p. 6429)

The Japanese water harp formed the inspiration of a work still to be completed by Hans Druart and Roberta Gigante. (Gigante, 2013) The sound work will be permanently installed in a new park located near the Keizerspark in the Visserij, a neighbourhood in Ghent, Belgium. (DIH, 2011)

1.8.5.5 Taluktak

The taluktak¹²⁶, tilting bamboo or bamboo water-clatterer, is one example of sound-producing objects from Southeast Asia related to agricultural methods to produce rice. The taluktak creates sound “from waters that inundate the rice paddies of Java. A hollow bamboo tube carefully cut at the knot is set on a pivot so that it fills with water from the irrigation canal of the upper paddy and, when it is full, the water runs over the top to fill the lower paddy. After it empties out, it goes back to its vertical position and its lower end bumps against a rock, giving off a sound at regular intervals.” (Robertson & Stevens, 1960, p. 77) The resulting repetitive soundscape is meant to inform the field owners of any irregularities in the water supply that might occur. As series of different sized bamboos have been used, various sounds at different frequencies come to being.

¹²⁶ Nowadays in Java mostly called bluntak. (Kunst, 1968, p. 58)

1.8.5.6 The sonic environment at Disneyland

At Disneyland the bird songs do not originate from real birds. A 1956 article, published in the journal *Popular Electronics*, describes the sound installation made by Altec that simulates the noises of birds amongst others. Seventy-four separate loudspeaker systems, every one of them camouflaged near animals or in trees, reproduced the sounds coming from a bank of tape players. Those sounds were carefully selected from archives of movie studios, broadcast stations and universities. To imitate real moving birds, the sounds had to travel from one spot to another. A specific device, a rotation audio fader, was developed to realistically mimic birds movement. “This device transfers the bird calls from one set of speakers to another so neatly that visitors to Adventure-land swear they actually see the non-existent birds flying in the dense foliage.” (Norman, 1956, p. 45)

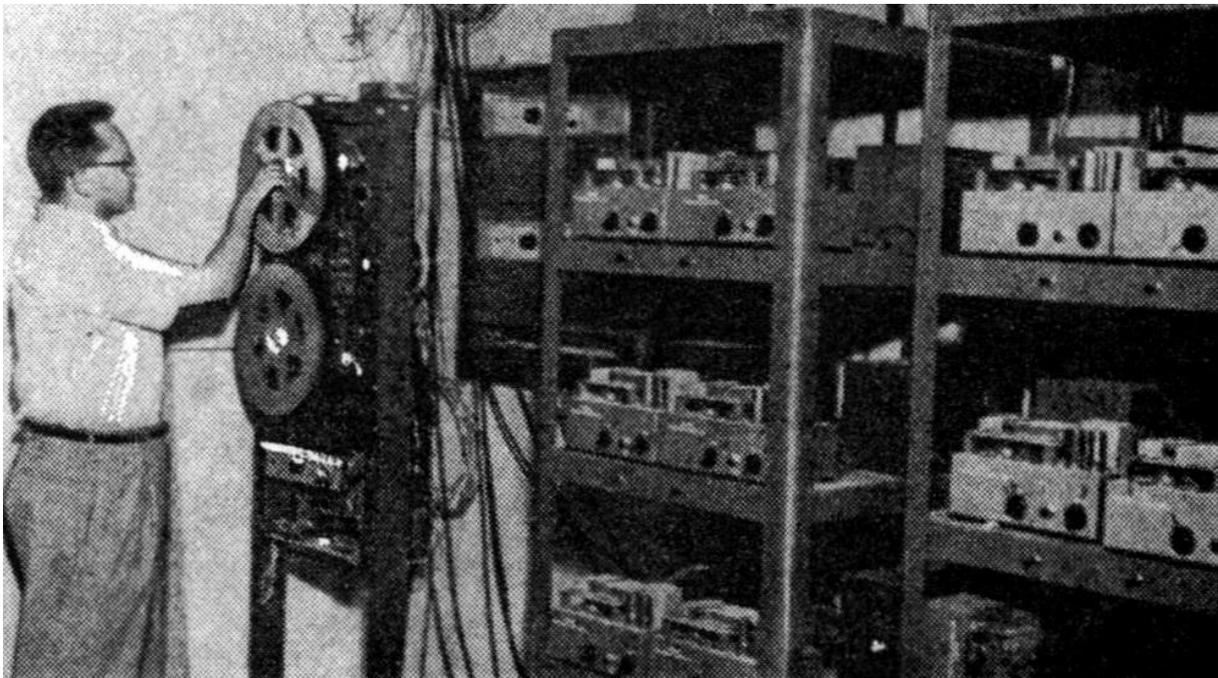


Figure 70 “Technician Jim Hervey adjusts the tape system that is the sound source for all audio effects heard throughout 160 acres of play area.” (Norman, 1956, p. 45)

Nowadays, bird songs are still realistically imitated at Disneyland and its sonic environment has also inspired others. During construction works at the University of San Francisco the construction site barrier was equipped with a temporary wall with built-in loudspeakers that emitted a variety of sounds, including bird calls during the day. Mike London, the vice president for Facilities Management at the University, claims to be inspired after a visit to Disneyland. “In preparation for the construction of the science building we visited Disneyland ...to explore ways they build in the midst of their customer base”. (Patino, 2010)

This sonic environment at Disneyland shows a lot of similarities with some sound works. During *Sounding City 2012* Dawn Scarfe attached 33 small speakers to the branches

of a tree in the Begijnhofpark in Kortrijk, Belgium. (see Figure 109, p. 206) Recordings made underneath the tree are electronically altered and specific frequencies are enhanced. The resulting soundtrack is played from the 33 speakers. The bird songs, although electronically altered, are still recognizable as such. A similar idea was executed by Dan St. Clair's *Call Notes* [2006] in which loudspeakers hidden in trees produce electronically manipulated sounds of birds singing popular tunes. (Martín, 2010)

1.8.5.7 Melody roads



Figure 71 Markings on the road announcing the melody road (紀美野町, n.d.)

In Japan researchers from the Hokkaido Industrial Research Institute have constructed several melody roads. Like the sound producing buoys, these melody roads have a warning function, not as guideposts to safe harbour, but to prevent speeding¹²⁷. The purpose of the melody roads, however, is more than just a warning, as their initial

¹²⁷ In the visual arts Nico Parlevliet has created a similar project whereby bowls can only be observed when the car is slowing down. This project was commissioned by the Province of Groningen and the Vereniging Kleine Dorpen to restrain speeding upon entering the built-up area. (Parlevliet, 1996)

intent was for entertainment. “One purpose of the melody road is to vitalize tourism and boost the downtown economy by it's entertaining features. Another purpose is traffic safety.” (Hashiba, 2008)



Figure 72 notches in the surface of the road (紀美野町, n.d.)

The melody roads can be considered as an elaborated version of the road markings on Belgian highways which let the car driver hear an annoying noise when the car is positioned too much to the right. For the melody roads these grooves in the road are not at equal intervals. Instead they are cut at very specific intervals in the surface of the road so that when a car drives over these notches at a specific speed, a melody can be heard for the passengers of the car. The interval between the notches determines the frequency. When this interval is small, higher tones come to existence, when it is larger, lower tones appear. The loudness of the sound is determined by the groove width. (Hashiba, 2008) The melody can be optimally heard when the windows of the car are closed and when the driver is driving at a specific indicated speed over these notches. The sound differs depending on the type of tires and the weight of the car. Heavy cars produce a more listenable sound as the sound of the melody road is created by tire-road contact. (Hashiba, 2008) Colourful music notes painted on the surface of the road mark the upcoming musical interlude of about 30 seconds. (B. Johnson, 2007)



Figure 73 *Asfaltofon* by Jakob Freud-Magnus and Steen Krarup Jensen @ Jesper Holdgaard (Schio, 1995)

In Japan several melody roads have been installed at the prefectures of Hokkaido, Wakayama, Gunma, Aichi and Oita. (Hashiba, 2008) Similar projects can be found in Lancaster, United States (The musical road, n.d.) and Anyang, South Korea. (Payne, 2013, p. 65)

Old sketches, titled 'Carmel' by Godfried-Willem Raes of Logos Foundation show a similar idea, however the project was never executed. (Raes, sixties-seventies) The first musical road was presumably realised in Gylling, Denmark in 1995. Cars had to drive at 70 km an hour to optimally hear the 6 seconds lasting melody, an interpretation of the letters of the name of the place, Gylling. (Harbo, 1996) (Schio, 1995) The project was realised by artists Jakob Freud-Magnus and Steen Krarup Jensen. Jakob Freud-Magnus suggested how 'Asfaltofonen' could not only be deployed to greet guests, but that they could also be used to improve road safety. (Harbo, 1996)

1.8.5.8 Sound weapons

Functional sounds do not only serve to create an atmosphere, to entertain or to warn, in modern warfare sound is deployed as a weapon. The potential effects of acoustic weapons range from "mere annoyance via temporary worsening of hearing to physiological damage of the ear, and in the extreme even of other organs, up to death." (Altmann, 2001, p. 202)



Figure 74 *E13 000625* [2010] by Alberto Tadiello (T239, n.d.)

Some artists have been inspired by these acoustic weapons. Alberto Tadiello created *E13 000625* [2010] after seeing a series of images dating from WWII of never activated prototypes of sound weapons by the Japanese army (Fiore & Tadiello, n.d.) *E13 000625* consists of two electric horns, the kind of horns used in cars, installed at the end of two plastic tubes directed at the legs of the visitor. Because the electric horns nearly just fit into the tubes, the vibrating plate of each horn cannot vibrate to the full and the normal functioning of the horns is distorted. When visitors draw near, the motion detector brings the work into action and “a very “pressed sound” (Tadiello, 2013) is emitted. (T239, n.d.) (Tadiello, 2013)

Sound weapons are not only utilised in war situations but also in everyday life. Ultrasonic frequencies are used to deter animals such as birds, bats, dogs, rodents, insects and monkeys (Bird-X, 2013) (Woodstream Corporation, 2013) (Conway Exports Private Limited, n.d.). Mosquito, a device dispersing frequencies between 17 kHz up till 20kHz which vary to prevent habituation, is not used to drive off animals, but to combat loitering. Those emitted high frequencies are perceived less well by most people above 25 years of age. (Rhine Consulting Group, n.d.-b) A certain spot, with a radius of 20 up to 25 meter, will therefore be less attractive for a certain age group, while most people above 25 year will not even notice it is there. Since 2006 nearly 700 such systems have been installed in trouble spots in about 175 municipalities in the Netherlands. (Rhine Consulting Group, n.d.-a)

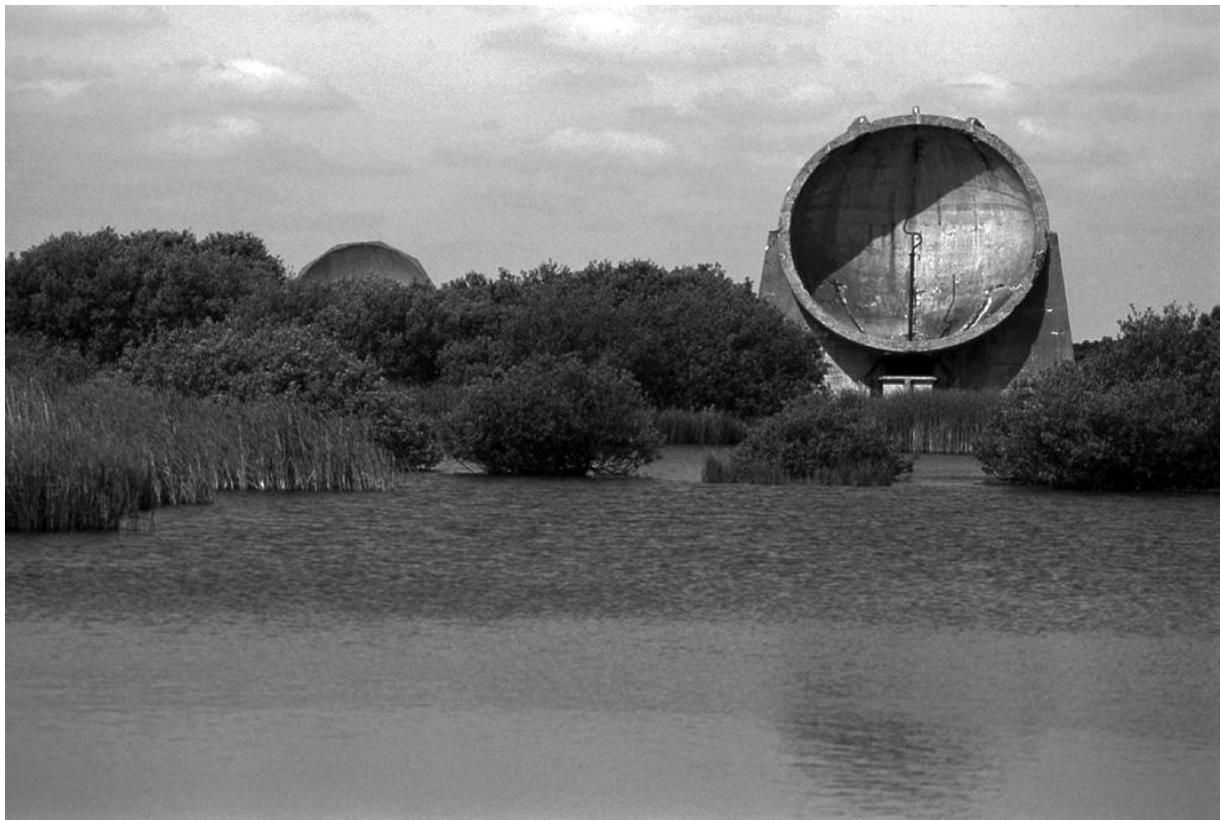


Figure 75 Sound mirror at Denge, Kent Coast, United Kingdom, 2005 @ Raviv Ganchrow (Ganchrow, 2009)

In sound art ultrasonic frequencies have been used to measure distances, to determine position or to create highly directional sound beams (see p.21), but similar to their application in devices such as the Mosquito, ultrasonic frequencies have also been employed to change the atmosphere of a place. In 1993 Christina Kubisch was invited to create a work for the former studio of Joseph Beuys in Kleve, Germany. She was not allowed to change anything to the room and eventually only worked with different lighting and setting up several ultrasonic sound generators that were just barely audible. These interventions changed the perception of the room. (Metzger & Kubisch, 2000)

Sound weapons are not always destructive or frightening. During World War I and in the advent of WWII sound mirrors were employed along the south and east coasts of the United Kingdom and Malta. As a forerunner of radar, sound mirrors could detect the sound of approaching airplanes and airships. Two types of listening dishes were developed: “One was deeper, with parabolic properties; the other shallow, with spherical curvature” (Ganchrow, 2009, p. 72) Besides stationary sound mirrors, rotating parabolic dishes were also deployed. This type of parabolic reflectors has been incorporated in many sound works. (see p. 258)

1.8.6 Sound art versus art with functional purposes

Some sound artists are not only interested in the artistic aspect of a work, but also in its functionality. Sound works have been created to obscure sounds, to put people at ease, or to provide specific signals.

With *Musique d'ameublement* Erik Satie wanted to diminish surrounding noises. (see p. 152) Like Satie, Brian Eno created *Music for airports* [1978]¹²⁸ with a specific purpose in mind. The music had the intention to diminish the anxious atmosphere at an airport terminal. Music for airports was created at the end of the seventies when flying an airplane was not as common as today. In 1980 *Music for Airports* was used for its initial purpose and was played in a continuous loop during one month at LaGuardia's Marine Terminal, New York. This was followed by further airing at Minneapolis/Saint Paul International Airport and a number of other terminals. (Sheppard, 2008) The LP contains four tracks all utilising tape loops of various lengths, repeating in incommensurable cycles. Acoustic piano sounds, female voices and an ARP 2600 synthesizer form the sound source of the four pieces. (Eno, 1978) (Sheppard, 2008)

¹²⁸ On the sleeve of the LP Eno coins the term ambient music and describes it as follows: “must be able to accommodate many levels of listening attention without enforcing one in particular; it must be as ignorable as it is interesting”. (Eno, 1978)

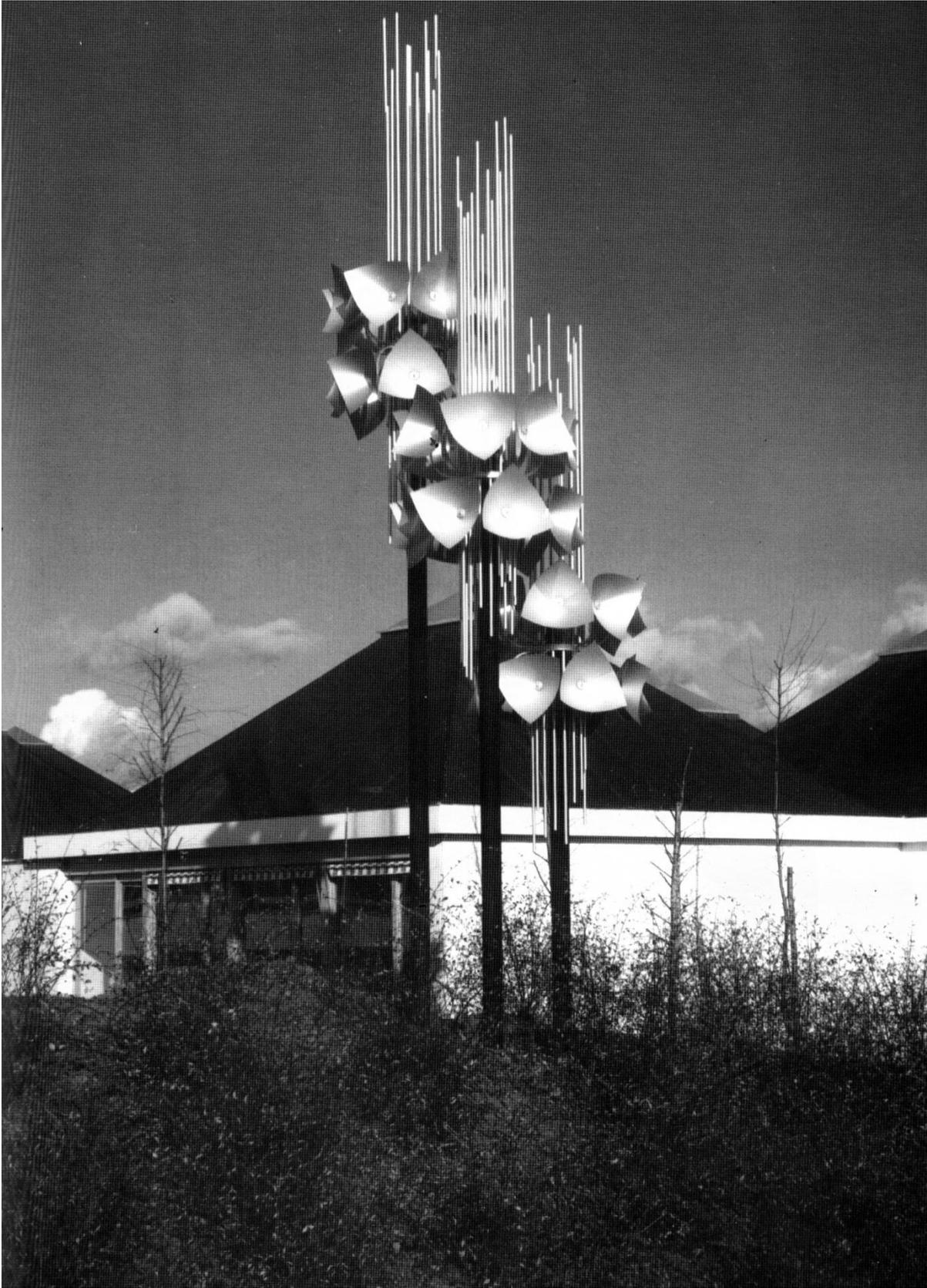


Figure 76 François & Bernard Baschet, bell tower for a school near Paris, France, 1968 @ Pierre Joly & Vera Cardot (F. Baschet, 1999, p. 116)

In 2013 Eno installed a permanent installation at the Montefiore hospital in Hove, United Kingdom. Its aim was not to have a soothing effect on jittery passengers, but to put patients at ease. Eno added visuals played from eight plasma screens to accompany the sound. (Dreaper, 2013)

The Baschet brothers created a bell tower for a school near Paris in 1968. A giant vibraphone replaced the bell of the school. François Baschet envisioned: “It will play a tune composed by the best pupil of the musical class, which will be changed periodically.” (F. Baschet, 1975, p. 13)

Not only the brothers Baschet, but also Christina Kubisch created a sound work that provides signals. In 1997 the Clockwork Tower Project was created for the Massachusetts Museum of Contemporary Art in North Adams, United States. In the past the clock tower determined the workday rhythm of the factory (U. Block, 1998), but since its closure in 1986 the bells had been silenced. (Massachusetts museum of contemporary art, 2013) In this permanent work the original clock tower bells were replaced with pre-recorded sounds created by amongst others rubbing, hammering, brushing and striking the original bells. Every hour, a composition of one minute sounds. The sounds are chosen out of a database of sounds and their selection depends on the intensity of light measured by solar panels. More light results in louder and more metallic tones while on a grey day softer sounds will be selected. For 9 AM and 5 PM specific signals are used. The sounds are audible through four directional speakers. (Kubisch, 2013)

1.8.7 Sound art versus educational set-ups

Alvin Lucier: “Now I realize that there is no difference between science and art.” (D. Simon & Lucier, 1995, p. 194)

“The artist becomes the scientist and vice versa.” (Bates, 1982, p. 3)

In most science museums we can trace back set-ups that incorporate sound or that relate to sound. An often occurring arrangement in a science museum is formed by two parabolas placed across each other so the sound bridges a large distance. These set-ups are often very similar to existing sound works. The parabolic sound reflecting experiment has been interpreted by several sound artists. (see p. 258) Sometimes very little, if not nothing, is changed to the original experiment and the only difference is the setting and the surroundings.

73,8 Kilo Ohm [2003] by Erwin Stache has a lot in common with a now defunct set-up (Förster, 2013) at the science museum of Berlin. Both works, in which the audience has to touch metal tubes, are based on the principle of the Theremin and their execution is

also similar. The educational set-up as well as the art work make use of metal tubes that are located on a platform. The audience has to make a connection between metal tubes to generate sound. The resistance of the skin completes the electric circuit and as a consequence sound is created.

The visual execution of *73,8 Kilo Ohm* is more straightforward, no extra visual elements such as colourful circles have been added. Its auditive execution on the other hand offers more possibilities than its educational counterpart. Whereas the audience can only influence the pitch of the sound in the set-up at the Berlin science museum, the mapping of the tubes of Erwin Stache's *73,8 Kilo Ohm* is much more complex. *73,8 Kilo Ohm* offers more than solely the adaptation of pitch, depending on the combination of tubes touched and the resulting resistance, other adaptations - such as filtering of the sound, the generation of different types of sounds or multiple sounds playing together - were integrated. (Stache, 2013)



Figure 77 *Ätherophon*, Stiftung Deutsches Technikmuseum Berlin, 2009 @ Laura Maes



Figure 78 Erwin Stache, *Kilo Ohm*, Sound Factory (see p. 204), Concertgebouw, Bruges, Belgium @ David Samyn

1.8.8 Conclusion

As the above overview demonstrates, the borders of sound art and other art forms, functional sound applications and educational set-ups are not always crystal-clear. Small differences in place of presentation or the underlying concept of the work can affect whether a work can be considered sound art or not.

Although static sculptures and installations that refer to sound are frequently included in group exhibitions focusing on sound, they cannot be considered sound art. When these sculptures or installations incorporate sound, the distinction with sound art is far less clear, as the concept behind the work cannot always be retrieved. The same indistinctness surrounds moving sculptures. While any moving sculpture produces sound, not every moving sculpture can be considered sound art. It is only when the artist tries to make the created sounds more interesting and the sounds are not solely a by-product of movement that the territory of sound art is entered. Art works in which sound is not the starting point, but where sound is just one of the elements of the work besides for instance light, cannot be considered sound art. Although the auditive result can be interesting, works that were initially not conceived to create an auditive effect and where sound is produced as a by-product of visual elements cannot be identified as sound art.

The territory of experimental musical instruments and sound art often intertwines. In some cases the classification of a work only depends on its surroundings. When presented in an exhibition context, the former musical instrument is seen as a sound sculpture or installation. When played on the stage of a concert hall, it is conceived as a musical instrument. Although sound art and music can easily be distinguished from one another, music is often presented as or mistaken for sound art and hybrid forms exist that challenge just those parameters that distinguish music from sound art, namely perception, narrativity, open form, performer and place of presentation.

Functional sound applications can incorporate many characteristics of sound art. Although the original idea behind the application is the performance of a functional task, namely to set a certain atmosphere, to serve as a warning or for entertainment purposes, the final result can have many similarities with existing sound works. The other way round, sound art can have a functional purpose, either to obscure sounds, to put people at ease, or to provide specific signals. Similarly to functional sound applications, educational set-ups can show many similarities to sound works. As with experimental musical instruments the location where the work is presented has an influence on our perception of the work.

1.9 Conclusion of chapter 1

In chapter one we have defined sound art by looking at its various visual and auditive appearances. These diverse appearances - ranging from silent to deafening, from infra- to ultrasounds and from no added to many added visual elements - can partly be attributed to the equally diverse backgrounds of its creators. Through the study of the work of four sound artists with an education in either visual arts, music, architecture or physics, the influence of that background on the created sound art has been made apparent. Each of the studied artists emphasized another aspect of the art form: its visual manifestation, its site specificity, its spatial aspects or its integration of natural phenomena. While these diverse backgrounds contribute to the innovative and cross-border nature of the art form, they also add to the difficulties of identifying and classifying sound art. In addition, the many descriptors used to label sound works often addressing a specific aspect of the art form, provided further insight in the various aspects of sound art. While the designation sound art is nowadays commonly used, the entangled usage of the term and its different definitions, support the necessity for a well-founded analysis. Based on the above-mentioned assessments and on the study of literature, the analysis of exhibition catalogues, the author's experience in organising sound art and the author's artistic practice, thirteen parameters significant to sound art were deduced: concept, perception, space, site-specific, open form, interaction, production of sound, performer, narrativity, implementation of techniques and technologies, visual component, endurance and place of presentation. Subsequently, for each parameter several conditions were formulated. On the basis of these thirteen parameters and their corresponding conditions the field of sound art could be defined. Furthermore, within this demarcated area of sound art two clusters, sound installations and sound sculptures, could be identified. Our analysis tool allowed us to tune the conditions of the thirteen parameters to sound installations and sound sculptures. Once the characteristics of sound installations and sound sculptures were mapped, their differences came to the surface. After we defined sound art, sound sculptures and sound installations, we looked at the hazy borders of sound art and compared it to art works that incorporate, refer or reflect sound, experimental musical instruments, music, functional sound applications, sound art with a functional purpose and educational set-ups. This elaborate delimitation of the borders of sound art has allowed us to strengthen our definition of the art form.

Chapter 2

An analytical-historical approach: Innovation has left the concert hall - the shift from contemporary music to sound art

While in the previous chapter our focus was on defining sound art, this chapter focuses on the musical precursors of the art form. By exposing the limitations of the concert hall, the need and necessity for a new art form outside the four walls of the concert hall is discussed.

Alcides Lanza: "But on the other hand, so many composers are involved I think it is much better that it is not a concert situation, so the museum situation is very welcome.

Well, it was developed and created for some other composers and artists and instruments, so I don't think it is valid. Unless, we consider them museums for the music. If they are gonna play the music from the past that is ok for the concert halls.

But today, nearly all of us we are so much involved with mixed media, our needs are so different." (KPFA, 1969)

In a 1969 radio special on the exhibition *Sound Show* that was at display at the Museum of Contemporary Crafts in New York City from October 1969 up till January 1970, composer Alcides Lanza expresses his concern about the concert hall. Lanza highlights the different needs of composers today and the inability of the concert hall to meet those needs. Lanza considers the concert hall a museum for music from the past, not a suitable location to present today's state of the art music. The concert hall is found too limited by Lanza, an opinion shared by kinetic artist Nicolas Schöffer who in a 1985 article summons to liberate music. Schöffer states: "Enclosing a musical work within a concert hall for a limited period with an equally limited public is as 'antisociocultural as enclosing visual works inside museums with limited spaces and entrance fees. But, while visual art, through architecture and sculpture has broken down these barriers, music

remains enclosed, if only inside appliances, such as radios, record players, tape recorders or television sets.” (N. Schöffler, 1985, pp. 59-60)

As shown in this chapter, we believe that sound art has broken down the walls of the concert hall and has liberated music. In that sense, sound art can be identified as an expanded form of contemporary music. Although sound art always has an aural as well as a visual aspect, the auditive component remains its point of departure. While contemporary music is often disseminated by means of the concert hall, sound art is presented in different dissemination environments, which go beyond the concert hall. (see p. 169) The underlying reason for this difference in dissemination can be traced back to the nature of the art form. Whereas in concert halls a secure distance is commonly kept between the spectator and the performer[s], this distance largely evaporates with sound works. Sound works have, unlike most performances, no fixed beginning or end. The duration of the piece is no longer determined by the composer or musicians but by the visitor. As a consequence most sound works are, in contrast to the majority of music, not narrative and do not make an appeal to performers to produce sound. Instead, the produced electronic, electro-acoustic and/or acoustic sounds are automated or activated by natural sources, external input or acts of the visitors. Consequently, sound art will rather be found in the corridors of the concert hall than on its main stage.

To better understand the nature of these new dissemination environments the parameters that define the environment in which music is disseminated will be analysed. On the basis of compositions of contemporary music pioneers the expansion of the environment for musical dissemination is uncovered. Experiments with the extension of time, the spatial placement of sound, the addition of visual elements and the expansion of sound sources clashed with the framework, the architecture or the traditions of the concert hall. This historical analysis will identify the main features and trends and may contribute to a better understanding of the development of a new art form, sound art, in which the time, space, visual and sound dimension have been much more explored than in contemporary music.

2.1 Background

2.1.1 Background on music dissemination

In Western art music, the concert hall has been a dominant environment for the dissemination of musical work. The concert hall is a typical 19th century concept, whose roots can be traced back to opera theatres and earlier prototypes at courts (Caeyers,

2009) (Hobsbawm, 1987) Concert halls still exist today, and they continue to dominate the environment of our musical dissemination, including contemporary music.

Yet, during the last decades, there have been several attempts that aim at exploring new environments for musical dissemination. These attempts go together with the expansion of the traditional musical structural parameters such as pitch, timbre, rhythm, articulation and form. While the expansion of the traditional musical structural parameters is defined in terms of acoustical output, the expansion of the dissemination environment is defined in terms of a multimodal output. Whereas acoustical output can be recorded and disseminated via a sound reproduction channel [e.g. CD or internet], the multimodal output cannot be readily recorded in a straightforward way because the dissemination environment forms an essential ingredient of the piece.

The question to be asked is concerned with the parameters of the dissemination environment. For example, which parameters should be distinguished and how did they evolve? In practice, we may consider physical parameters such as space and time as well as sensory parameters such as the acoustic[al] and visual dimension and movement.

2.1.2 Background of musical meaning formation models

The music dissemination environment forms part of a setting in which music ultimately leads to appreciation, reception, or consumption. In that sense, the dissemination environment forms part of a larger set of variables that define whether the communication of music is meaningful. Of particular relevance is the way in which music is communicated and how the mediator for music dissemination is somehow related to musical meaning formation. Three relevant models can be mentioned here, namely, the traditional information processing model, the reciprocal feedback model, and the embodied music communication model.

Claude Shannon and Warren Weaver's *Mathematical Theory of Communication* [1949] (Shannon & Weaver, 1969) that was primarily developed for telephone and broadcasting technology served as the basis for "almost every communication model which has been used in relation to instructional technology" (Ely, 1970, p. 85) and also for the traditional model of music communication that relies on information processing. Shannon and Weaver's model is based on a communicator who uses a channel to send information to a receiver. When this model is applied to music the composer or performer[s] are the communicators or senders. The music contains the message and the listeners are the receivers. The information only flows in one direction from sender to receiver. In the traditional model of music communication no attention is paid to external influences and the model does not take into account that the listener's role is not solely passive but can play a more active role shaping the content and the meaning of the message.

The reciprocal feedback model of musical response (Figure 79) assumes that the listener's role is not solely passive and also takes into account the situation and the context in which the music communication takes place as well as the demographic differences and the background of the listener. The information no longer flows in one direction; there is an interplay between the various elements.

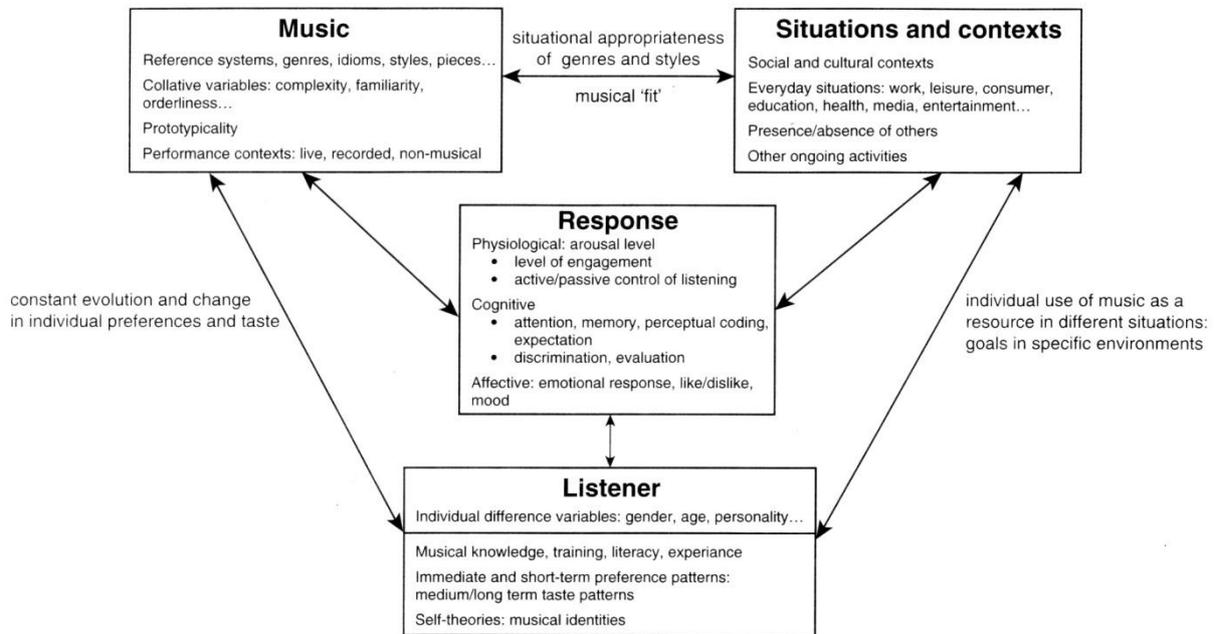


Figure 79 Reciprocal feedback model of musical response (Miell, MacDonald, & Hargreaves, 2005, p. 8)

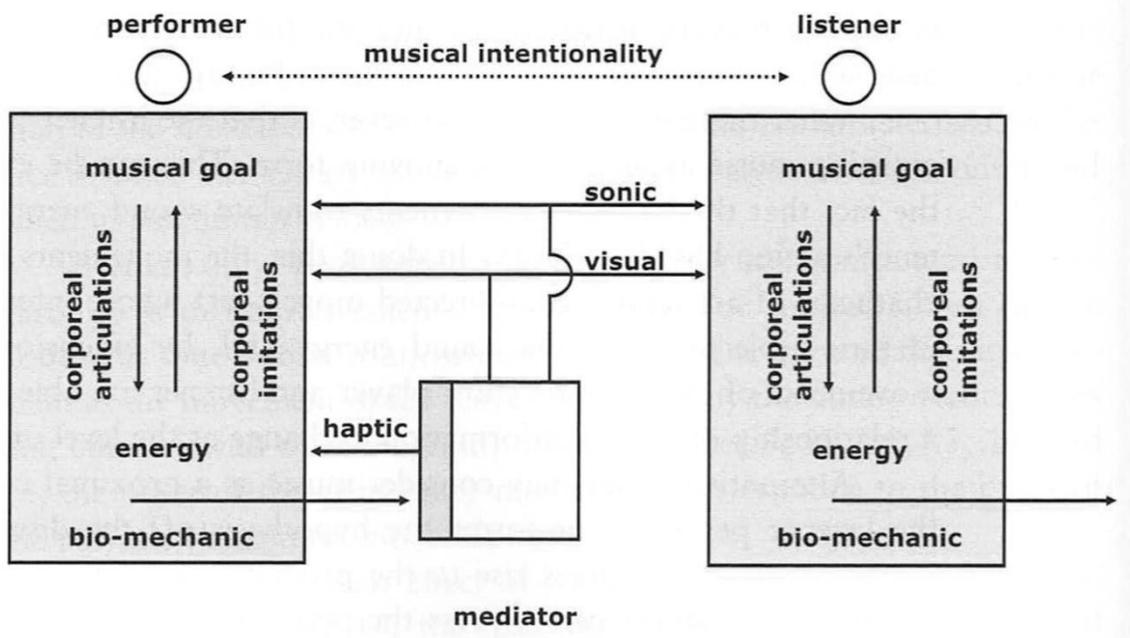


Figure 80 Embodied model of music communication (Leman, 2008, p. 160)

The embodied model of music communication by Marc Leman (Figure 80) has a major focus on movement and corporeal actions. The model pays attention to sensory-

interleaved cognition and the role of body movement in the formation of meaning. The instrument of the performer aka the mediator is considered an extension of the body. The model assumes action-perception coupling for encoding and decoding and sound to action mirroring, and pays less attention to the environment.

The Shannon's, Hargreaves's et al., and Leman's model provide an interesting basis for understanding how sound art evolved in an entirely different dissemination environment. However, because of the many auditive as well as visual appearances that sound art can adopt, it is hard to draw one single communication model that works for all cases. Many layers of meaning can be present, and there are many variables that need to be taken into account. Depending on the type of sound work, its communication model may show similarities with either the Shannon's, Hargreaves's et al., or Leman's model. Moreover, these models may need to be extended with additional components, e.g. related to interactive, environmental, and contextual aspects.

For example, in sound art the visitor is both a listener and a viewer. Typically, the performer/composer or music in the models above should be replaced by the art work itself. And in sound installations, the visitor is not situated outside, as in the above-mentioned models, but within the art work. Moreover, the visitor interacts with the components of a spatial environment, while in sound sculptures this spatial element is far less present and the visitor is located outside the territory of the art work. In non-spatial sound works where the course of the work is completely fixed and does not depend on external input, the communication happens in one direction, similarly to the Shannon's model. In contrast, the communication in works that rely on external input, is reciprocal and shows more similarities to the model by Hargreaves et al. as input from the visitor, environmental factors or external data have an influence on the operation of the art work. Similar to Leman's model, visual and haptic communication between the art work and the visitor occurs in sound art where it plays a more prominent role than in music. As the visitor is not seated in a fixed place, but can freely walk around, the visual (and auditive) perception of the work changes with the position of the visitor.

In short, although we feel that the available models do not provide a satisfying model for the communication situation in the case of sound art, we are in the position that we can propose an ultimate alternative. So far, we believe that the basic ingredient will involve an interactive component based on action-perception couplings that involve both auditory and visual aspects together with an enactive meaning formation component. It is likely that in order to fully grasp such a model, we need to separate the core essence of the model from the many variables that turn the model into a concrete sound art piece. The essence is about an interactive viewpoint on human encoding and decoding of auditory and visual patterns related to meaning formation. However, additional components mould the conditions in which such interaction takes place. These conditions also define the interaction. As our work focuses more on the conditions that allow musical meaning formation, and less on the meaning formation

processes as such, we feel that our main contribution is that we have defined a framework in which interaction occurs. That framework can be considered a model of variability and in order to have a fully working meaning formation model, we should link it to a model of interactivity, for which the above mentioned models provide the core ingredients.

2.2 Analytical-historical analysis

Table 2 Overview of creative possibilities

creative possibilities	extension of time	time is not fixed					nearly endless repetition				
	usage of space	call-and-response patterns	to create dramatic effects	as buffer between various ensembles	interplay of instruments in spatial arrangements	separation of audience and performer	site-specific spatial experiments		electronic spatial experiments		
							role of audience and performers becomes interchangeable	audience and performers are distributed in the concert hall	for a specific location	for a specific setting	electronic spatial experiments at music studios
	visual elements	light		laser		fire		projections		sound-objects	
expansion of sound sources	environmental sounds					expansion of instruments					
	in the concert hall, imitated by instruments	in the concert hall, produced by new instruments	in the concert hall, recorded environmental sounds	in situ	bringing outside sounds inside the concert hall in real-time						

In what follows we attempt to illustrate the limitations of the concert hall. Through a variety of experiments with the extension of time, the usage of space, the incorporation of visual elements and the expansion of sound sources the need for renewal is illustrated that has made the development of a new art form outside the concert hall possible.

2.2.1 The extension of time

Unlike a concert a work of sound art has no clear-cut beginning, end nor duration. The length of a composition is no longer stipulated by the composer because the audience can determine when and how long they attend the art work. Hence, the duration of a piece is different for each visitor.

Although in a traditional concert environment the length of a composition is not always fixed, the differences in length are not situated amongst the experiences of the individual listeners but between different performances.

Pieces that incorporate chance elements involved in the performance have in themselves a different duration for each performance. A piece can be composed so that the acts of the performer depend on actions of other performers¹²⁹. The structure of the piece and therefore the length will vary from performance to performance.

2.2.1.1 Graphical scores

Graphically notated scores whereby the graphical elements should be interpreted by the performer[s], often leave room for a particular interpretation of time. The execution of one of the most iconic graphical scores, namely Cornelius Cardew's *Treatise* [1963-1967], had many interpretations. Not only the sonification of these 193 pages of graphic information but also the duration of the piece varies greatly. The score does not have any instructions on how the graphic material should be interpreted and does not specify the number or kind of instruments to be used. (Cardew, 1967) Cardew did not stipulate what notes or sounds should be played or how long those notes/sounds – and thus the whole piece – should last. In the *Treatise Handbook* Cardew stated: “I wrote *Treatise* with the definite intention that it should stand entirely on its own, without any form of introduction or instruction to mislead prospective performers into the slavish practice of ‘doing what they are told’.” (Cardew, 1971, p. i) Even before the whole score was completed, it was customary to play a selection of pages.

¹²⁹ Christian Wolff has used this technique in many of his compositions.

In February 2009 guitarists Oren Ambarchi and Keith Rowe performed *Treatise* at the Bimhuis, Amsterdam, the Netherlands. The performance of four pages, namely page 53, 58, 168 and 169 was afterwards released on LP by the Italian label Planam. (Alga Marghen, n.d.) The length of the LP was 30 minutes and 57 seconds or on average approximately 7 minutes and 44 seconds for each page. In 1998 a collective consisting of Jim Baker, Carrie Biolo, Guillermo Gregorio, Fred Lonberg-Holm, Jim O'Rourke and conductor Art Lange recorded the complete score of *Treatise*. The double cd was released on hat[now]ART and the release claimed to be the "World Premier Complete Recording" (hat, n.d.)¹³⁰ of Cardew's *Treatise*. The total release lasts 141 minutes and 15 seconds, or on average approximately 44 seconds for each page. On *Goodbye 20th Century* Sonic Youth recorded their version of page 183 lasting 3 minutes and 29 seconds. (Sonic Youth, n.d.)

This short overview reveals huge time differences between different executions and recordings. The length of the composition is not fixed and is left to the interpretation of the performer[s].

Just like Cardew's *Treatise* La Monte Young's *Composition 1960 No. 7* also represents time graphically. The only lead for the performer[s] is a staff on which the G clef and two notes positioned above each other are indicated. Fis¹ and b are written as semibreves with ties. Underneath the staff the instruction "to be held for a long time" (Young et al, 1963) is placed. No formation nor timing is indicated. The interpretations and therefore the length of the piece vary greatly from performance to performance.

In the composition 1960 series of which *Composition 1960 No. 7* is part, La Monte Young frequently experimented with indefinite determination of time.

"The composition may be of any duration." (Composition 1960 No. 2)

"It may be of any duration." (Composition 1960 No. 3)

"The composition may be any length." (Composition 1960 No. 5)

"A performance may be of any duration." (Composition 1960 No. 6)

In short, these examples reveal huge differences in length between different executions and recordings of a piece. It is of course a consequence of the fact that the length of the composition is not fixed and is left to the interpretation of the performer[s].

¹³⁰ The piece was performed as a whole on the 8th of April 1967 at Commonwealth Institute, London. It was directed by the composer and performed by Zygmunt Krauze, John Tilbury, David Bedford, John White, Egon Mayer, John Surman, Lou Gare, Laurence Sheaff, Eddie Prévost, Keith Rowe and Robin Page. The execution lasted approximately 150 minutes. (Cardew, 1971 : xiii)

2.2.1.2 Nearly endless repetition

Erik Satie's *Vexations* [undated, approximately around 1892-93 (Gowers, 1965-66: 1)] challenges the conventions of time in music even further. Whereas the duration of pieces such as La Monte Young's *Composition 1960 No. 7* is undetermined, most realisations remain within an hour.¹³¹ Instead, Satie's *Vexations* consists of a short theme, a total of 52 beats. On the single paged score no formation is indicated, but it is generally assumed to be conceived for keyboard. Next to the theme the score mentions: "*Pour se jouer 840 fois de suite ce motif, il sera bon de se préparer au préalable, et dans le plus grand silence, par des immobilités sérieuses.*" (Bryars, 1983) This has been interpreted as an instruction to play the theme 840 times in a row.

Where La Monte Young lets the performers determine the duration of the piece or the number of repetitions, Satie stipulated what should be played, how many times it should be played and how fast it should be played.¹³²

Vexations was reproduced for the first time in 1949 [*Contrepoints* vol. 6]. (Bryars, 1983) The best-known and presumably first performance of *Vexations* was organised by John Cage in the Pocket Theater in New York, September 1963. Ten pianists and two substitutes were responsible for the execution of the piece: John Cage, David Tudor, Christian Wolff, Philip Corner, Viola Farber, Robert Wood, MacRae Cook, John Cale, David Del Tredici, James Tenney alternating each other every 20 minutes and substitutes Joshua Rifkin who performed for only 20 minutes in total and Howard Klein, a journalist from the New York Times who substituted for a substitute that did not show up. The alternation of pianists was executed without interruptions. The concert lasted 18 hours and 40 minutes. The audience was encouraged to attend the performance as long as possible as an innovative system was applied to the price of admission. The entrance fee was 5 dollar for the first admission, 5 cents were refunded for each 20 minutes of attendance and a 20 cent bonus was given to those who attended the entire performance. A journalist of the New York Times noted "They did not stay put; many moved in and out of the hall." (Schonberg et al, 1963: 45) The audience also behaved differently: "A number of those present combined listening with reading. Others dozed occasionally." (Schonberg et al, 1963: 45) The columnist also mentions someone doing his homework for an accountancy examination and someone else who had brought his own provisions. An actor, Karl Schenzer, remained present throughout the whole performance and collected the 3 dollar refund. He remarked: "Time? What is time? In this music the dichotomy between various aspects of art forms dissolves." (Schonberg et al, 1963: 45)

¹³¹ Although Young himself organised a five hour performance of his piece in 1963. (Smith, 1977-78)

¹³² The score indicates "très lent" or very slow. (Bryars, 1983)

During one of the first solo performances of *Vexations*, performed by Richard Toop, at the Arts Lab, Drury Land, London in October 1967, the piano was not placed on stage, but in the outer foyer where an art exhibition was held. Toop played for about 24 hours and described the situation as follows: “People walked round the piano, talked, sometimes stopped and listened...”(Bryars, 1983) The separation between audience and performer, intrinsic to a concert hall, had vaporised.

However, the initial intention of Satie is hard to detect. It is the question of the chicken and the egg. What came first: the notes or the idea of nearly endless repetition. The notes are written in a strong dark ink, whereas for the instructions and the signs, including the clefs, Satie used a very faint and faded ink. (Bryars, 1983) Satie created a static seemingly endless ongoing piece lacking a certain narrativity.

In short, these examples show that the concept of time in music has been exchanged for the nearly immobile character of sound. In most sound art we find the same transition. The invariability and lack of development give *Vexations* the nature of a sound object, whilst the flatness of the music suggests a two-dimensional surface.

2.2.1.3 Abandoning the concert hall

Repetition and flexible length are not something new. Even before the 20th century they could be easily found in functional music, for example music that accompanied certain rituals such as praying [e.g. Buddhist & Gregorian Chants] and dancing [e.g. Baroque suites] or even in ethnic music [e.g. Japanese gagaku & Scottish pipe music]. However, experimenting with time was new to the traditional concert hall and although Satie wrote *Vexations* at the end of the 19th century, it was the spirit of the Fluxus movement that made a performance of the piece possible. The blending of media, the term intermedia coined by Dick Higgins and the flood of events and happenings created an atmosphere that was receptive to new ideas. La Monte Young noted: “Although my 1960 compositions are unique events, and in that sense related to Events and Happenings, they are most effective when performed in a conventional concert setting.” (Young, 2001) La Monte Young wanted to give a response to a particular academic concert atmosphere that was prevalent at the University of California at Berkeley. (Young, 2001) In a sense, these type of pieces only exist thanks to this built in conflict.

To conclude, the consequence of the prolongation of time, the blurring of end and starting point makes that these type of pieces do not easily fit into the setting of the concert hall and therefore challenge the conventions of the concert hall. If these borders are extended even further, abandoning the concert hall is a necessary evolution as the clear separation between audience and performers, the fixed starting time of a performance, the impossibility of walking in and out of the hall, to eat, drink or talk prevents composers from continuing to experiment with time.

2.2.2 Exchanging time for space

In sound art the sound sources are often dispersed in the room and the separation between audience and sound sources has evaporated. Many sound works invite the audience to move in the work and to explore it. This newly attained relation also creates new challenges. The role of the audience is no longer by definition passive. On the contrary, many works demand the audience to participate consciously or unconsciously.

The concert hall space has assumed a new role as composers spread sound-producing elements throughout the concert hall and even amongst the audience and questioned the clear-cut division between audience and performers. However, the traditional concert hall lacks facilities to take these experiments any further and many initial ideas were not feasible as they collided with the division or regulations of the concert hall. To conduct further experiments artists therefore migrated to alternative locations such as public space, museums, art galleries and alternative spaces (see p. 169) that were more suitable to spread sound in space and to mingle audience and sound source[s].

2.2.2.1 Call-and-response patterns in 16th century sacred music

The origin of the spatialisation of sound goes back to the 16th century when composers composed pieces for various choirs to be performed in one church. In 1550 Antonio Gardano's printing shop issued a collection of psalms composed by Adrian Willaert [c. 1490-1562], who was maestro di cappella at the St Mark's Basilica in Venice, Italy, from 1527 until his death. Half of these compositions were created for 8 voices, designated for cori spezzati [singers divided in groups sometimes located in different parts of a building (Arnold et al, 2012)] and to be performed by two choirs, each consisting of four voices, on specific moments in the liturgical calendar of St Mark's. (Moretti, 2004 : 154) The treatise *Le institutioni harmoniche* by Gioseffo Zarlino was published in 1558 and showed an insight in the compositional techniques used and the manner of performance. In his treatise Zarlino made note of Willaert's advice to compose consonant music for each choir that should be able to be played independently. When the choirs sing together, no dissonances should be heard. (Moretti, 2004 : 155) Whether or not Willaert invented the cori spezzati is debatable, as the technique probably had already been experimented with by musicians working in northern Italy at the beginning of the 16th century. (Moretti, 2004 : 156)

This style remained until well into the 17th century (Fenlon, 1993: 561) and composers who came after Willaert such as Giovanni Gabrieli [1557-1612], Lassus, Andrea Gabrieli, Bassano, Bellavere, Croce, Donato further expanded the technique. The physical separation of singers was not undiscussed. The theorist Giovanni Maria Artusi criticizes the fact that choirs are situated at a distance and that not all parts can be

heard equally well, emphasizing the need for each choir harmonic self-sufficiency. (Artusi, 1589)

In *Sacri concentus* [1612] Ignazio Donati separated the soloists from each other, a technique he labelled as distant singing and that was previously used by Monteverdi. (Arnold et al, 2012) Michael Praetorius, a German theorist and composer, not only distributed musicians and singers throughout the church, but even included space outside the church by placing a number of trumpeters with or without a drummer just outside the church so that their loud sound would not drown out the rest of the musicians. (Arnold, 1959: 13) Not only singers and musicians were distributed in space, some churches, including St. Mark's Basilica had several organs, so that the architecture of the church allowed and even encouraged experimentation with the spatialisation of sound. The practice continued into the 18th century. Vivaldi divided the orchestra into groups placed on opposite sides of the church, Galuppo created masses with separated groups and Bach utilised the technique in, amongst others, his motets. (Arnold et al, 2012)

This shows that the use of space in music has been there for many centuries and that it formed a constituent part of the composition.

2.2.2.2 Romantic grandeur –space used to create dramatic effects

Berlioz too paid close attention to the spatial distribution of sound as his scores include directions for the placement of singers and musicians. Like Michael Praetorius he frequently made use of offstage music for example in *L'enfance du Christ* [1850-1854] the angels are in a neighbouring room whose door is gradually closed. (Macdonald, 2012) Berlioz used the separation of performers to create a sense of perspective.

In his *Te deum* [1849] Berlioz prescribes three choirs, of which one is a children's choir that has to be separated from the other choirs and has to be placed on a raised platform not far from the orchestra. It is striking that Berlioz mentions in a note prefixing the score that, although it contributes to the effect, this children's choir can be dispensed with. (Shedlock, 1884 : 684) It seems that with this note - next to the organisational difficulties and costs that go with putting together a large children's choir - Berlioz bears in mind the architectural limitations of the traditional concert hall by proposing a weakened version of his original idea. Although Berlioz considered the use of space in his music, the spatial distribution of performers is largely executed for its dramatic effect and is not a critical aspect of the composition.

2.2.2.3 Space as buffer

Stockhausen did not place groups of musicians above each other but next to one another, surrounding the audience. *Gruppen*, composed in 1955-1957, is scored for 109 musicians, divided into three groups surrounding the audience in a horseshoe

formation. (Misch et al, 1998 : 143) This set-up implies that the work can rarely be performed in concert halls. Instead, it has been performed in alternative locations such as the hall of an airport [Tempelhof airport, Berlin, 2008 (Goldmann, 2008)]. The configuration stems from Stockhausen compositional technique to distinguish the passages that are simultaneously played but musically separated. By spreading the three musical formations in space, it became possible to play three different temporal layers at different speeds simultaneously, surrounding the centrally placed listeners. (Misch et al, 1998 : 150) This division of the orchestra had a price, three conductors were deployed, each conducting one instrument group.

2.2.2.4 Interplay of instruments in spatial arrangements

Obviously, *Gruppen* by Stockhausen is not an isolated example. Various other composers have composed pieces for several orchestras or groups of musicians. The point of departure was not always the same as Stockhausen's. For example, Bruno Maderna created several pieces¹³³ in which the musicians are divided into groups. This division was driven by the possibilities created through the interplay of instruments in spatial arrangements and the resulting timbre possibilities rather than Stockhausen's starting point. (Dalmonte, 2012) The same goes for Luciano Berio who had a special interest in the mobility of sound in space. In works such as *Allelujah II* [1957-1958] the positioning of the performers is part of the composition. (Giomi et al, 2003 : 31) Whereas in *Allelujah* [1955] Berio was confronted with the acoustical limitations of distributing six orchestral groups on a conventional concert stage: as they could not be heard separately (Osmond-Smith, 1985 : 154), Berio spread the five orchestral groups in *Allelujah II* [1957-1958] in the space to surround the spectators. Berio notes: "The different acoustic and architectural characteristics of each concert hall demand that every time a different solution be found." (Berio, n.d.) However, after this surrounding sound experiment of *Allelujah II*, Berio, for practical reasons, returned to the traditional concert stage where he kept experimenting with new seating patterns for performers. (Osmond-Smith, 2012)

2.2.2.5 The audience-performer separation transcended

Along similar lines the separation and the role of audience and performers has also been questioned, for example, by La Monte Young whose *Composition 1960 No. 6* requires the performers to sit on stage and act as an audience. Performers and audience are still separated, but their role seems to be interchangeable. As an optional realisation of the piece La Monte Young indicates that tickets can be sold on the stairway to the stage so

¹³³ *Quadrivium* [1969], *Aura* [1972] and *Biogramma* [1972]

that the audience has the possibility to join the performers and watch the remaining audience. (Young et al, 1963)

Iannis Xenakis too experimented with the position of audience and performers. In *Terretêktorh* [1966] Xenakis distributed 88 musicians in between the audience. “L'orchestre est dans le public, et le public est dans l'orchestre.” (Tranchefort, 1986 : 861) The sound for each spectator is different, depending on their location and position towards the musicians. The instruments are divided in eight groups and the conductor is situated in the centre. However, the execution of the piece did not always turn out as prescribed by the composer. At its première in the UK in 1967 the fire regulations of the Oxford Town Hall prevented this set-up. Instead musicians were grouped radiating outwards from the conductor. A part of the audience was allowed to take place in the created gangways, whilst the remaining audience was located at the gallery. The piece was then repeated to allow the audience to switch positions. (Dennis, 1967 : 27)

2.2.2.6 Abandoning the concert hall, site-specific spatial experiments

Composers have envisioned performances away from the traditional concert hall, but few scores prescribe this and even fewer pieces are effectively performed in alternative locations.

Charles Ives had an original setting in mind for his magnum opus. In the unfinished *Universe Symphony* [begun c1915] he exchanges the concert hall for mountaintops. Ives had intended the piece to be performed on hillsides, mountains and valleys. Presumably, he was inspired by the Adirondacks, rock formations in the mountains, where he spent each summer. (Lyman et al, 2008 : 443)

Raymond Murray Schafer wrote several pieces, that have actually been performed, with a specific type of location in mind.¹³⁴ The score of Schafer’s *Music for Wilderness Lake* [1979] prescribes twelve trombones, stationed in three groups, around a rural lake. (Westerkamp et al, 1981 : 20) The piece was composed for the O’Grady Lake in Ontario. (Westerkamp et al, 1981 : 20) Besides the location, the time of performance is indicated as well: *at dawn and dusk*. (Truax, 1994: 183) To Schafer, the location, the climate and time of day are as important as the musical notes. (Schafer, 1981 : i) In *Music for Wilderness Lake* [1979] the performers are positioned around the lake. This dispersal has a huge influence on the playing together and the timing of the piece. The potential audience perceives the performance differently depending on their position.

However, these types of compositions are not always taken seriously and get less recognition than ‘normal’ compositions. In his talk, preceding a performance of his viola

¹³⁴ The relationship of the acoustic environment and people is an ongoing element in Schafer’s work. In the late sixties he established the *World Soundscape Project* to study this relationship. (Truax, n.d.)

concerto, Schafer made an allusion to the greater remuneration for writing concertos, in comparison to “extravaganzas around a lake”. (Rapoport, 1998: 20)

Providing a space with sound, tuned to the existing sounds of that space, was not only done outdoors. In a 1920 manifesto Erik Satie already advocated *musique d'ameublement*. (Lanza, 2004: 17) His concern was not like Schafer to remove boundaries separating art from life, but to increase daily comfort. At dinner with painter Fernand Léger, Satie would have been annoyed at the loud restaurant's residents orchestra and would -according to Léger- have gotten the idea to write furniture music: music that is a part of the surrounding noise, that would take these noises into account and would try to mask them. (Gillmor, 1988 : 232) “Nous déjeûnions, des amis et lui dans un restaurant. Obligés de subir une musique tapageuse, insupportable nous quittons la salle et Satie nous dit: “Il y a tout de même à réaliser une musique d'ameublement, c'est-à-dire une musique qui ferait partie des bruits ambiants, qui en tiendrait compte. Je la suppose mélodieuse, elle adoucirait le bruit des couteaux, des fourchettes sans les dominer, sans s' imposer. Elle meublerait les silences pesants parfois entre les convives. Elle leur épargnerait les banalités courantes. Elle neutraliserait en même temps les bruits de la rue qui entrent dans le jeu sans discrétion.” (Léger, 1952, p. 137)

This is a different principle than Schafer's. Satie does not want to include environmental noises, instead he wants to conceal them. *Musique d'ameublement* is functional music, music to accompany and improve daily life.

At a picture exhibition at the Galerie Barbazange in Paris, March 1920, Satie's *Musique d'ameublement* was introduced to the public. While people were looking at the pictures, a piano, a trombone and three clarinets - posted in different corners of the room and on the balcony floor (Milhaud, 1953 : 123) - constantly repeated phrases from Thomas's *Mignon* and Saint-Saëns's *Danse Macabre* alternated with simple ostinato patterns. (Gillmor, 1988: 232) Although the audience was instructed to take no notice of the music and to behave as if the music did not exist, the audience kept silent while the music was being played. Satie urged people to talk and to make noise as the music was nothing but background, intended to be heard, but not listened to. (Myers, 1977 : 542-543) Just as Satie's *Vexations*, *Musique d'ameublement* also has a static character owing to the continuous repetition.

2.2.2.7 Electronic spatial experiments

The development of recording and amplification technology made it possible for composers to separate sound and sound source and opened up a new world of possibilities. With the aid of loudspeakers sounds could be projected in a specific direction. As Henry Brant points out: “Loudspeakers can be placed in parts of the hall where live performers cannot work, and can thus add considerably to the versatility of spatial arrangements.” (Brant, 1967 : 236) The projection of the sound is more directed

when the sound originates from a speaker, whereas the sound produced by a live performer is more diffuse. Pieces composed for multiple speakers first originated in studios as the equipment necessary to produce electronic compositions was not affordable for most individuals.

Spatial experiments at music studios¹³⁵

Around the same period [1948-1953] various studios were set up, most of which were connected to a radio or television station that could provide the necessary equipment and technicians. The engineers were in most cases the unheralded geniuses behind the classic electronic music studios as they developed specific, made-to-measure instruments. Nearly every studio focusing on electronic music had its own equipment to create, manipulate and distribute sound in space.

In 1951¹³⁶ Pierre Schaeffer, Pierre Henry and sound engineer Jacques Poullin founded *the Groupe de Recherches de Musique Concrète* at *Radiodiffusion Française* in Paris. (Palombini, 1993 : 18) Poullin invented the *potentiomètre d'espace*, “a device for controlling the trajectory of sounds between four loudspeakers” (Palombini, 1993 : 17), two in front of the audience, one above and one at the rear. (Malham et al, 1995 : 59)

In 1953¹³⁷ Werner Meyer-Eppler, Robert Beyer and Herbert Eimert officially opened their studio at the *Nordwestdeutscher Rundfunk* in Cologne. (Meyer-Eppler, 1949) Whereas *the Groupe de Recherches de Musique Concrète* mainly focused on the arrangement of field recordings and recordings of acoustic instruments and objects, the studio at the WDR concentrated on the production of electronic music using purely electronic processes. Whilst composing the tape version of *Kontakte* [1958] in the WDR studio Stockhausen wanted to create the effect of sound spinning around the listener at various speeds. He attached a loudspeaker on a manually rotated platform and installed four – one for each track – microphones around it. The sound played through the rotating speaker was recorded on four separate tape tracks. When the resulting tapes - each routed to a different loudspeaker installed in a corner of the concert hall - were played the sound spun around the listeners' heads. (Holmes, 2008 : 67)

In Freiburg the *Experimentalstudio der Heinrich-Strobel-Stiftung des Südwestfunks* under the guidance of Hans Peter Haller was established in 1971. (Haller, 1995 : 3) Luigi Nono made an appeal to the technical means of the *Experimentalstudio* and used the *Halaphon*, a

¹³⁵ This section does not provide an exhaustive overview of electronic studios worldwide, but focusses instead on those studios that have played an important role in spatial experiments.

¹³⁶ Pierre Schaeffer had been able to establish an embryonic research facility - *Studio d'Essai*- at *Radiodiffusion Française* in 1942. (Palombini, 1993 : 14)

¹³⁷ In a meeting on the 18th of October 1951 with Meyer-Eppler, Beyer, Eimert, Enkel and other people of the WDR technical staff it was decided to establish a studio at the WDR. (Chadabe, 1997)

device developed by Peter Lawo and Hans-Peter Haller designed to transform instrumental or vocal sounds electronically and distribute these sounds in space. (Haller, 1995 : 78)

Various systems were created to distribute sound in space through multiple loudspeakers. Composer Stan Shaff's and engineer Doug McEachern's *Audium* has been around in various forms since the 1960s. Its most used form consisted of 136 loudspeakers positioned above the heads of the audience seated in concentric circles and immersed in total darkness, emitting an hour and 15 minutes of music created by Stan Shaff. (Elwood, 1976)

In 1974 François Bayle, a former student of Pierre Schaefer, defined the term and concept of the *Acousmonium*, "an orchestra of dozens of different loudspeakers distributed on the stage and around the audience" (Desantos et al, 1997 : 14) at the GRM in Paris. A similar multi-loudspeaker diffusion system, *Gmebophone*, was developed by Christian Clozier in 1973 at the Groupe de Musique Expérimentale de Bourges. (Veitl, 1997 : 121) Other similar systems are BEAST (Birmingham Electro-Acoustic Sound Theatre), set-up under the direction of Jonty Harrison in 1982 at the *Electroacoustic Music Studios* at the University of Birmingham (University of Birmingham, 2012), *TRAILS* (Tempo Reale Audio Interactive Location System) a system to route sounds through space via a multi-loudspeaker network at Centro Tempo Reale in Florence, Italy at the end of the eighties (Chadabe, 1997 : X), the *Spatialisateur*, a modular, real-time spatialization environment, at Ircam, Paris (Vinet, 1999 : 11) and the *Klangdom* installed in 2006 at ZKM, Karlsruhe (Zentrum für Kunst und Medientechnologie Karlsruhe, 2012).

Electronic spatial experiments outside music studios

Already in 1922 Varese insisted that "the composer and the electrician will have to labor together". (Cross, 1968 : 35) For decades composers and technicians worked hand in hand at the electronic music studios, but the advent of cheap computers made it possible for composers to create electronic music at home, without technicians. As Joel Chadabe puts it: "...the technology of electronic musical instruments evolved from large, expensive, institutional systems to small, relatively inexpensive, personal systems." (Chadabe, 1997 : X)

Accordingly, the impact of the remaining studios decreased strongly in the eighties together with the advent of the computer. Whilst the majority shut down, the ones remaining are often connected to an educational institution¹³⁸ where a course in electro-acoustic music is still taught or they have an archival function.

¹³⁸ In the United Kingdom more tape studios remained as the CSE Mode III provided an opportunity to place electronic music firmly within the secondary-school curriculum. (Orton, 1981 : 1)

Working outside the studio created several opportunities. Working time in studios used to be scarce, in a home studio composers no longer have to take into account the calendar and planning of the studio. They are no longer restricted to using a specific set-up, but can create their own. Thanks to the affordable prices of electronics, microcontrollers and computers and the widely available freeware composers are freer to experiment. As a consequence, the creation of alternative constellations that deviate from the traditional concert set-up became much easier.

For example, *Soundtrack [Klankspoor]* [1982], a piece by Godfried-Willem Raes, makes use of magnetic tape outside the music studio and was conceived explicitly for public space. Members of the Logos foundation used a hand-held microphone to capture sounds of the city, during a predetermined route of several kilometres, on a home-built magnetic tape recorder equipped with a reel that could contain up to 5 kilometre of tape. (Darge et al, 1985 : 264) The recorded tape is immediately fixed to the surface of the place where the sound has been recorded seconds earlier, leaving a sound trail through the city. (Logos foundation, 1982) Notations of the exact time and location of that particular part of the sound trail are attached to the magnetic tape. The piece has been performed several times, in Ghent, Belgium and New York, United States, amongst other cities. (Logos foundation, 1982)

The migration out of the concert hall was not limited to public space. Other non-performance spaces gained the interest of composers, in some cases because the space had specific acoustical qualities. For example, under water we experience a different sense of hearing. Sound moves faster and can reach further in water than in air.¹³⁹ Each under water space therefore has different acoustical qualities.

Accordingly, in the beginning of the seventies Max Neuhaus started to place sound structures , a network of hydraulic whistles, in water. The whistles were mounted on the end of flexible tubes and each whistle was surrounded by a cone-shaped reflector to focus the sound in a certain direction. Water under pressure is flowing in the tubes and makes the whistles sound. (Neuhaus, 1971/2011 : 356) Since the mid-seventies Max Neuhaus created several *underwater works* whereby speakers were installed underneath the water surface. (La Barbara, 1977/1994 : 37) These concerts typically took place over night.¹⁴⁰

¹³⁹ The speed of sound in air [dry at 20°C] is 343m/s, in water [at 15°C] it is 1500 m/s.

¹⁴⁰ The concert in Berlin in the summer of 1977 [*Underwater Music III*, Radio RIAS, Berlin] lasted from 11PM until dawn. (La Barbara, 1977/1994 : 37)

Spatial experiments in specifically designed constructions

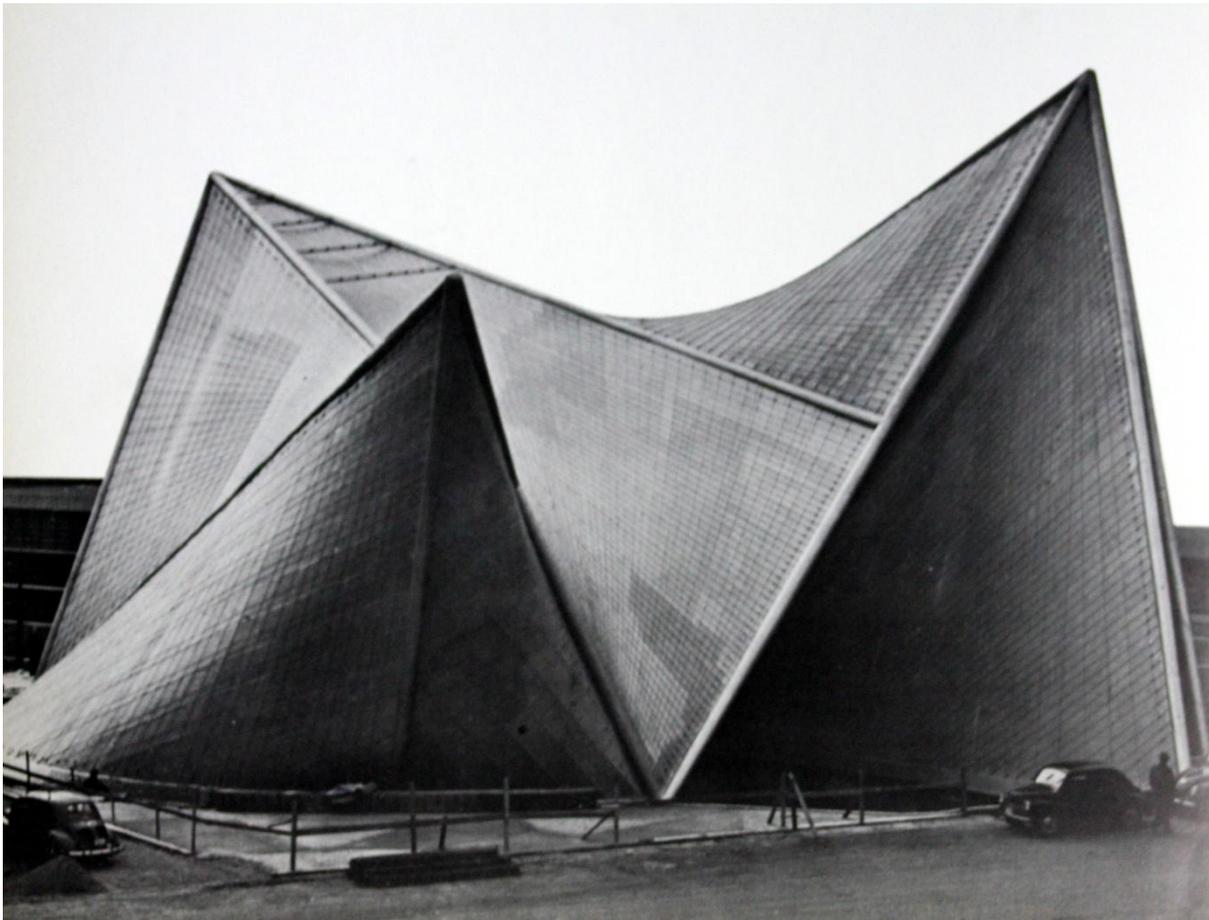


Figure 81 The Philips pavilion, Brussels World Fair, Brussels, Belgium, 1958 (Revault D'Allonnes, 1975)

At the Brussels World Fair of 1958, the Philips pavilion designed by Iannis Xenakis, assistant to Le Corbusier, housed a spectacle of sound and visuals. The tape composition comprising electronically processed sounds of voice, percussion and melody instruments, bells, sirens, electronic tone generators, machines (Chadabe, 1997 : 62) could be heard via more than 400 loudspeakers distributed in space. As the space held around 400 visitors (Blessier et al, 2007 : 186) the actual experience was different for each listener.

Edgard Varèse composed this music at the Philips Laboratories in Eindhoven, the Netherlands. Willem Tak, the lead sound engineer from Philips designed a system so that “The listeners were to have the illusion that various sound-sources were in motion around them, rising and falling, coming together and moving apart again, and moreover the space in which this took place was to seem at one instant narrow and ‘dry’ and at another to seem like a cathedral.” (Blessier et al, 2007 : 186)

At the pavilion Varèse could count on several Philips employees, among them Dick Raaijmakers, to assist him (van Hoogenhuyze, 2008 : 371). Xenakis participated in designing the sound projection system. Together with Le Corbusier he travelled to

Eindhoven to study how the effect of continuous sound movement could be obtained. (Harley, 1994 : 144) The music was recorded on three tracks and the sound travelled along pre-designed paths. The slides and light show of Le Corbusier narrated a tale of the progress of science and showed realistic imagery of Aztec sculptures, portraits of children and people at work, and photographs of skulls, rockets and heavy machinery. Image and sound were performed at the same moment, although they had been created independently of each other. (Harley, 1998 : 56)

Around the same time Stockhausen envisioned a new concert hall: “My idea would be to have a spherical chamber, fitted all round with loudspeakers. In the middle of this spherical chamber, a platform, transparent to both light and sound would be hung for the listeners. They could hear music, composed for such adapted halls coming from above, from below and from all directions.”(Stockhausen, 1959 : 69) Over a decade later, at the Osaka World’s Fair in 1970 Stockhausen could realise his spherical auditorium. Fifty loudspeakers were suspended in ten rings around the audience. (Stockhausen et al, 1996 : 80) The system allowed circular and spiral motions of sound that were controlled manually in a live performance by moving joysticks. (Stockhausen, 1971/1989 : 103) Whilst Varèse composed *Poème électronique* with the architecture of the Philips pavilion in mind, the music performed in the spherical concert hall largely consisted of spatial adaptations of already existing compositions¹⁴¹ and Stockhausen’s newly created piece *Spiral* [1969] for a soloist and short-wave receiver. (Kennedy, 2012)

Various other composers have created similar constructions. Léo Kupper’s sound cupolas, a large number of loudspeakers mounted on a semi-spherical surface above the heads of the audience, have been installed in art galleries, churches or auditoria. For Kupper space is the most important parameter in music, even more important than pitch, rhythm and timbre. (Kupper, 1988 : 61)

To conclude, the dismantling of the Philips Pavilion, Stockhausen’s spherical auditorium and Kupper’s domes illustrate the ephemeral nature of these projects and shows a parallel with the temporary nature of most sound works which are often commissioned for a specific exhibition on a specific location.

2.2.3 Visual elements

The visual elements in sound art are very diverse. As performers are no longer present, the sound producing source has to adopt another form. These forms are very

¹⁴¹ Besides works by Stockhausen, works by composers including Bernd Alois Zimmermann, Boris Blacher, Herbert Eimert, Johann Sebastian Bach and Ludwig van Beethoven were played from the multi-track tape. (Custodis, 2004 : 162)

miscellaneous as the acoustic, electro-acoustic or electronic sound producing elements can be made out of nearly any material and take any shape, large or small.

The visual component of most concerts is traditionally determined by the performer and his or her instrument. In the 20th century, as technology advanced, gradually visual elements were added. Experiments with light, laser, explosives and projection quickly ran into the boundaries of the concert hall. As technology made it possible to reproduce sound infinitely, special performance spaces - both temporary and permanent ones - were created where sound, although still central, was combined with visual stimuli.

2.2.3.1 Light, laser, fire

In the previous century several systems were developed to merge light and sound such as for Schönberg's *Die glückliche Hand* [1908–13] in which both stage action and lighting are precisely coordinated with the music. (Crawford, 1974 : 591) Such experiments built further on the colour organ, a mechanical or electromechanical keyboard-operated instrument combining projected colours with music, as used in the composition *Prométhée* [1908–10] by Aleksandr Skryabin (1872–1915). (Wilfred, 1947 : 249)

Lev Thermen, the inventor of the Theremin, also experimented with combining music with light and he made various prototypes of such light-instruments. Those instruments were introduced during some of the numerous Theremin concerts he performed throughout the Soviet Union in the 1920s. (Nesturkh, 1996 : 57) During the 1930s, Thermen invented the *Terpsitone*, a dance platform equipped with an antenna whereby the movements of the dancer could determine the pitch. The volume could be controlled separately by an operator backstage. (Glinsky, 2000 : 144) Not only sounds were triggered by movement. A bank of coloured lights, each corresponding to a given pitch, was mounted on the wall behind the instrument. (Holmes, 2008 : 22) This visual note indicator served more as a guide for the dancer than as a visual feature.

Three decades later, in 1965, Robert Moog placed twelve 1,5 metre high capacitance antennae on the stage of Lincoln Center in New York during the French-American Festival. The antennae - sensing the proximity of seven dancers - were built especially for the premiere of *Variations V*, a forty-minute audio-visual performance devised by John Cage and Merce Cunningham. (Miller, 2001 : 545) At the base of the antennae photocells were installed. When the dancers interrupted the light to the photocells switching circuitry was triggered in the mixer, feeding six loudspeakers spread around the hall. (Miller, 2001 : 546) In Cage's *Variations VII* [1966] the photocells were not triggered by dancers but by the movement of four composers (David Tudor, David Behrman, Anthony Gnazzo, and Lowell Cross) while they were operating the equipment. (Miller, 2001 : 560) One of those composers, David Behrman, used the same principle for his piece *Runthrough* [1967–68] in which two to four performers use flashlights to

activate the homebuilt photocell mixers and direct the sound to the loudspeakers surrounding the audience. (Holmes, 2008 : 394)

Accordingly, experiments with light and music urged composers to create their own performance spaces. From 1957 onwards Gordon Mumma and Robert Ashley produced two multimedia performances a week, during a period of seven years, in the loft of Milton Cohen in Ann Arbor. The corners of the ceiling were covered with white reflective panels and rotating mirrors made sure that light could be projected all around the room. The audience was seated on the floor or lay down on pillows. (Holmes, 2008 : 96)

La Monte Young created his own space where the light environments of Zazeela – whom he had met in 1962 - were combined with his sine wave based compositions, first on Harrison Street, New York [1979-1985], and since 1993 in Church Street, New York. (MELA foundation, n.d.) From 1966 onwards the *Dream House* gradually evolved from a series of short-term performances/installations in which Young's *Map of 49's Dream The Two Systems of Eleven Sets of Galactic Intervals Ornamental Lightyears Tracery* was performed, to a permanent installation combining electronic sound and light and lasting an extended period of time. (Duckworth, 1995 : 214)

As new inventions are quickly picked up by artists, the possibilities of laser light which can be projected across long distances without losing its intensity tickled the imagination of artists. At the end of the sixties Rockne Krebs, Mike Campbell and Barron Krody constructed rooms filled with mirrors and varying degrees of smoke to intensify the laser beams. (Davis, 1973 : 81) At EXPO 70, a World's Fair held in Suita, Osaka, Japan, laser beams accompanied the electroacoustic music of Toru Takemitsu and lasers works by Japanese artist Keiji Usami were presented at the Japanese pavilion. Xenakis was inspired by this and one year later he utilised two laser beams in his *Polytope of Persepolis* in Iran [1971]. Lasers also played a key role in his *Polytope de Cluny* [1972] and *Le Diatope* [1978]. *Polytope de Cluny* was part of *Les Journees de musique contemporaine de Paris (SIMP)*. Xenakis's largest audio-visual project made use of three laser rays, 600 xenon flash-bulbs and 400 mirrors. The 26-minute performance was repeated four times each day during an initial period of 16 months.¹⁴² The T-shaped vaults of the Cluny Museum, once the scenery for Roman baths, were now turned into a performance space. (Harley, 1998 : 59) The unusual setting, the high ceilings and the use of reflected lasers beams encouraged the audience to lie on the floor and look up. (Revault D'Allones, 1975 : 74-75) The music, a seven-track tape, combined non-Western sounds such as African drums with timbres of the modern orchestra and computer-generated synthetic sounds and

¹⁴² The spectacle was revived in 1974.

was reproduced via multiple loudspeakers scattered throughout the audience. (Harley, 1998 : 60)

Although Xenakis's *Polytope de Cluny* lasted for 16 months, the actual performance was limited to 26 minutes. At the time the direction of the lasers, the orientation of the mirrors and the light patterns were automated and controlled by computers. These binary commands were encoded on the eight tracks of the magnetic tape so that the seven tracks of sound could be coordinated with the visuals. (Harley, 1998 : 60) One could wonder if Xenakis would have let his piece run longer if storage memory constraints were not present.

London based artist Stephen Cripps did not use visual elements to go together with the sound, but instead used them to trigger sound. In 1979 he performed together with percussionist Paul Burwell among the Jason Pollock paintings at the museum of Modern Art, Oxford. The explosives of Cripps caused vibrations that made the Chinese gongs, bells and metal dental tray tremble. "A large explosion in the room – the shock waves are felt, ears start ringing. Smaller explosions send shock waves onto the gongs. Each explosion brings out sounds and tensions from the gongs which are not produced by beaters and sticks etc. The denotations which trigger off the vibrations in the gongs are loud – the sound from the gongs are quiet. Both indoors and outdoors people will feel the shock waves – the ringing in the ears and the sounds from the gongs are heard together – they cannot be separated." (Toop, 1992 : 17) At the same performance a speaker connected to a pre-recorded tape and a microphone slowly distorts when the pile of magnesium in which it is mounted is ignited. Stephen Cripps combined sound, light, chemical reaction, detonations, fire and industrial waste in his art. (Toop, 1992 : 9) Sound and vibration played an important role in his unsaleable works.

2.2.3.2 Projections

Before the use of video, artists experimented with diascope. Sometimes these added images to the sound, such as the images of Le Corbusier at the Phillips pavilion, at other times the images were not purely illustrative. Mauricio Kagel too had an interest in the theatrical side of musical performance and he used other media such as projection to support this. In *Prima Vista* [1962/1964] - for diapositive, undetermined sound sources and two tape recorders - the musicians, a minimum of four, are divided in two groups. Each group controls a preferably remote controlled diascope. The projected image determines what the other group should play. Each group also has a tape recorder, operated with a foot switch, at its disposal. A version of the piece, recorded on tape prior to the performance, is played back from the tape recorders. Performers can deploy black diapositives ad libitum. However, during these intervals the tape should not be stopped. (Schnebel, 1970 : 130) In *Prima Vista* the projections serve a twofold purpose:

they are the instructions for the performers and at the same time form a guideline for the audience to follow the course of the piece.

When in the mid-sixties the Portapak, Sony's first portable video recorder, was introduced to the consumer market, it did not take long before artists such as Nam June Paik started to experiment with the new medium. From that moment onwards composers started to create environments - not unlike La Monte Young's *Dream House* - incorporating sounds and video-images. One of those composers was Josef Anton Riedl who established the *Musik/Film/Dia/Licht-Galerie Group* in 1967. (Schnebel, 1972) His environments usually addressed several senses and their set-up was impressive and demanded multiple technicians and performers who were not performing one piece but a collection of pieces that were performed in succession. The audience could freely enter and leave the performance space. (Schürmann, 1980)

2.2.3.3 Sound-objects

In addition to purely visual extras such as light, lasers and projection, composers have brought visual elements on scene that contributed to the production of sound.

For the performance of *Parade* in 1917 - a production conceived by Jean Cocteau, designed by Pablo Picasso, choreographed by Léonid Massine and with music by Erik Satie - Cocteau intended to integrate several found sound devices by analogy with the found objects in visual arts. However, several technical problems amongst them the lack of compressed air, prevented a proper execution of the idea. (Chadabe, 1997 : 23) Nearly a decade later, George Antheil did succeed in utilising a motorised airplane propeller on stage for the performance of his *Ballet Mécanique* in 1926. (Chadabe, 1997 : 23)

Earle Brown did not utilise an existing object as Antheil did, but commissioned sculptor Alexander Calder to create a new work for his *Calder Piece* [1963-1966]. Calder's sculpture *Chef D'Orchestre* functions both as a conductor as its movement determines the actions of the musicians and as an extra sound source, as the discs and structure of the sculpture are played like gongs by the musicians. When performing the piece the score prescribes that "the percussion section should be arranged in a full circle of instruments with the mobile in the center." (Brown, n.d. a) This set-up prescribed by the composer encourages a different positioning of the audience than in the traditional concert hall. In pictures of the performances the audience is seated around the four percussionists with the sculpture placed centrally. (Brown, n.d. b)

2.2.4 The expansion of sound sources

Sound sources in sound art can take nearly any shape, they can be acoustic, electro-acoustic or electronic. As composers broadened their scope and included non-

instrumental sounds in their compositions or expanded traditional instruments, the confinements of the concert hall were exposed.

2.2.4.1 Environmental sounds

Composers have always been inspired by environmental sounds. Some composers used traditional instruments to mimic sounds, others have built new machines to imitate sounds or abandoned the concert hall to look up these sounds and include them in their composition.

As a business man Charles Ives always worked near Wall Street, New York. He wrote two so called Contemplations: *Contemplation of a Serious Matter or The Unanswered Perennial Question* and *A Contemplation of Nothing Serious or Central Park in the Dark in the Good Old Summer Time*. The latter was written in 1906 when Ives lived at 65 Central Park West. (Betz, 2004 : 213) It pictured the sounds of Central Park you would hear whilst seated on a bench on a hot summer night before industrialisation took over the soundscape of the city. The piece is written for chamber orchestra. Ives deployed the strings to represent the night sounds. This silent darkness is interrupted from time to time by the rest of the orchestra representing the casino over the pond, street singers, newsboys trying to sell their papers, distant pianolas overheard from nearby apartment houses, street cars, a fire engine, an escaping cab horse and a wayfarer's shout. (Ives, 1978) Ives reshaped environmental sounds using traditional instruments. The soundscape of Central Park is translated and interpreted for orchestra. He transferred nighttime Central Park to the concert hall.

Shortly after Ives, the Italian painter and composer Luigi Russolo opted for a different approach. His composition *Risveglio di una città* [1914] portrays the awakening of a city but does not use any traditional instruments to do so. From 1913 until around 1930 futurist Russolo together with his assistant Ugo Piatti, built new acoustic instruments – intonarumori [noise intoners] - whose operation is based on the hurdy-gurdy. (Dennis, 2012) These instruments with onomatopoeic names are constructed to mimic the sounds of the industrialisation and to incorporate noise sounds in music. The composition *Risveglio di una città* reproduces the awakening of a city using seven intonarumori - *Rombatori* [roarers], *Crepitatori* [cracklers], *Stropicciatori* [scrapers], *Scoppiatori* [exploders], *Ronzatori* [buzzers], *Gorgogliatori* [gurglers] and *Sibilatori* [hissers] - and the voice of animals and humans indicated on the score as *Ululatori* [howlers]. (Radice, 1989 : 7) In contrast to Ives, Russolo opted to create new instruments to reproduce the spirit of the industrialisation in the concert hall.

As technology advanced it became possible to record sounds. Pierre Schaeffer was one of the first to record environmental sounds – recordings of a train- on vinyl. In the train station at Batignolles, Schaeffer recorded sounds of locomotive steam, wheel sounds and whistles to create one of his first musique concrète compositions. (Chadabe, 1997 : 27) *Etude aux Chemin de Fer* [1948] was part of a series called *Concert de Bruits* which

included five short studies. In addition to train sounds, other studies used amongst others recorded sounds from toy tops, piano sounds, canal boats and saucepans.

The futurists did not only invent machines to imitate the sounds of industrialisation, but also created compositions in situ. Russian futurist Arseny Avraamov, a pseudonym of Arseny Mikhaylovich Krasnokutsky, conceived a monumental musical work using mainly sounds directly taken from factories and machines. Several of these massive concerts, that Avraamov called *Sinfoniya Gudkov* [*Symphony of Sirens*], were organised. The most impressive realisation took place in 1922 in the harbour of Baku, Azerbaijan and was performed by foghorns from the entire Caspian flotilla, two artillery batteries, several full infantry regiments, hydroplanes, twenty-five steam locomotives and whistles, all the factory sirens in the city and large choirs. Avraamov, positioned on a special built tower, used signalling flags to conduct the piece. Avraamov invited everyone to participate actively in the work through their exclamations and singing. (Molina Alarcón, 2008 : 19)

Symphony of Sirens reflected the use of non-traditional sound sources, the influence of those sounds that determine our everyday aural environment and the potential of music as an experience outside the concert hall.

Max Neuhaus's first soundwalks in 1966 also point out the qualities of our urban aural environment. Neuhaus does not opt for a large scale set-up but takes his audience along on a walk on which stops were made to intensively listen to the environmental sounds. The word 'listen' was stamped on the palm of each participator. Neuhaus wanted to focus on everyday sounds to refocus people's aural perspective. (Loock, 1990 : 130) Instead of bringing these sounds into the concert hall, Neuhaus brought the audience to the sound sources for a demonstration in situ. After the first walks Neuhaus announced the work as Lecture Demonstrations. As he points out: "...the rubber stamp was the lecture and the walk the demonstration." (Neuhaus, 1988, 1990, 2004 : 1)

Some sound sources are too large to fit into the concert hall. For his *Helicopter String Quartet* [1992/1993] Stockhausen transmitted the sound of helicopters and a string quartet located up in the air live into the concert hall. In each of the four helicopters a pilot, a member of the string quartet and a technician are located. Each string instrument is equipped with a contact microphone, one microphone is placed in front of the mouth of the player to amplify his Sprechgesang and one microphone is located outside the helicopter to pick up sounds of the rotor blades. All these inputs are mixed in real time on the ground and broadcasted in the concert hall. Besides the notes for the string quartet, fly patterns are also notated in the score. Stockhausen noted: "Ich hab da fuer 45 Jahre versucht, immer mehr in die Musik hinein zu ziehen, was im Leben geschieht am Hörbarem; und alles zu Musik zu machen... Das ist so ein Traum." (Scheffer, 1995) Stockhausen is fascinated by the sounds of daily life and wants to integrate them in his music. The sound produced outside is being reproduced on four columns of loudspeakers on the stage of the concert hall, each column representing one

string player. Next to the loudspeakers four screens are placed on stage. Each screen shows another string player in close-up. (Scheffer, 1995)

2.2.4.2 Expansion of instruments

Although the use of extended techniques is nothing new (Vaes , 2009), the previous century was marked by many experiments of composers searching for new sounds and thereby leaving the path of conventional playing techniques. An instrument that probably had to undergo the most (mal)treatments was the piano: from Henry Cowell's clusters and inside piano playing to the prepared piano from Cowell's most famous student, John Cage. Where Cowell makes use of fingers to manipulate the strings directly and in most cases does not add any objects¹⁴³, Cage's prepared piano technique calls for objects, made out of various materials, to be placed between or on the strings or hammers to change the timbre of the instrument. With *Contraption IPP 71512* [1991] Trimpin automated Cage's prepared piano techniques. Through a remote controlled MIDI device various manipulations of the piano strings such as mechanically damping, bowing and plucking become possible. (Strouse, 2010 : 40) *Contraption IPP 71512* gets rid of the time-consuming task to remove any preparations physically.

In the 1960s many Fluxus artists mistreated the piano and questioned its role as a musical instrument. Some pieces prescribed putting a vase of flowers on the piano [George Brecht's *Piano Piece*, 1962], washing, waxing and polishing the piano [George Maciunas' eleventh part of the *12 Piano Compositions for Nam June Paik*, 1962] or disassembling and reassembling the piano completely [Mac Low's *Piano Suite for David Tudor and John Cage*, 1961]. Others were more destructive and consisted of acts that made it difficult or impossible to play the piano any longer such as painting the piano or stretching the three highest strings with a tuning key until they break [George Maciunas' third and sixth part of the *12 Piano Compositions for Nam June Paik*, 1962], immersing the piano in a pool filled with water [Mieko Shiomi's *Event for the Twilight*, 1963], crashing, kicking and pushing the piano [Robert Bozzi's *Choices*, 1966], burning the piano, letting it overgrow by nature or drowning it [Anne Lockwood's *Piano Transplants*, 1968-82].

The evolution and questioning of piano playing did not stop after the passage of Cowell, Cage and Fluxus artists. Several artists continued to expand the sound and spatial possibilities of the piano. The Romanian composer Horațiu Rădulescu, for example, places retuned grand pianos vertically on their side. In *A Doini* [1974] seventeen people are each bowing one piano string with very fine rosined thread, causing all open strings of the piano to resonate. (Gilmore, 2003)

¹⁴³ In *The Banshee* the pedal is blocked with an object instead of the feet.



Figure 82 Paul Panhuysen's installation set up the Great Hall National Building Museum in Washington DC, United States. (Kuijper, 2012, p. 50)

Paul Panhuysen did not use nylon thread but attached long steel wires to several strings of two grand pianos from 8 till 19th of August 1990 in the Great Hall National Building Museum in Washington DC. (Kuijper, 2012) He performed by rubbing these strings making use of resin. Pierre Berthet too extended the piano. He attached metal cans spread in space and serving as resonators via 3 to 4 meter long steel wires to the strings. (Berthet, 2000) During a concert the strings are manually brought to vibrate, in an installation setting motors and electromagnetic elements are used to let the strings sound.

Both Berthet's and Panhuysen's string installations¹⁴⁴ have been presented more without than with a piano. What remained of the expansion of the instrument are only its strings. The piano is no longer used as a resonator, but has been replaced by alternatives such as wooden boxes, oil barrels and cans. The string installations occupy the complete space, creating a spatial experience and giving the audience the feeling of wandering around inside an enormous grand piano.

¹⁴⁴ Besides Paul Panhuysen and Pierre Berthet various other artists have created long string installations (see p. 193)

2.3 Conclusion of chapter two

“The big revolutions in music history are these with the power to change performance contexts.” (Schafer, 1981 : i)

The works discussed above demonstrate how composers have run into the limitations of the concert hall and have explored new creative possibilities (see Table 1 p. 143). Experiments with the extension of time, the spatial placement of sound, the addition of visual elements and the expansion of sound sources all clashed with the conventions of a concert hall. Since long composers have expressed their discontent with the traditional concert hall and they have wondered why musical culture is limited to single, four-walled, all-enclosed halls and what developments might be next (Brant, 1967: 236). Schafer regarded the concert hall as “...impediments to the existential changes we would like to achieve ...” (Schafer, 1991 : 159) while Alcides Lanza considered concert halls “museums for the music”. (KPFA, 1969)

When the time of a performance is significantly expanded, new forms necessarily emerge as the audience has to be able to walk freely in and out of the performance space. Consequently, the duration of the performance, the start and finish of the piece, differs for each member of the audience. In addition, extended duration has led to the replacement of the performer by other acoustic, electro-acoustic or electronic sound sources. On top of that, the prolongation of concert duration also influences the content of the music as narrativity loses importance in favour of the non-changing time character of sound. This has resulted in an interest shift from sequence to concurrency or simultaneity.

Spatial experiments are being thwarted by fire regulations and bump into the often fixed design of the concert hall. Similar problems occur when visual elements are introduced. When the audience has to be able to see more than one side of an object or has to be immersed, the stage is no longer a suitable presentation place. Omitting the separation between audience and sound sources opens up new possibilities. As the clear division between the territory of the artist and that of the audience has disappeared, the work is no longer placed on a stage. Instead, the audience is invited to walk around or into the work.

Further experiments concerning the extension of time, new spatial constellations, the addition of visual elements and the exploration of new sound sources consequently no longer take place in the concert hall and imply moving to alternative performance spaces, newly built ones or public space. Because of this evolution the concert form

itself has also lost importance in favour of alternative trends in art such as sound art. Innovations have left the stage of the concert hall for a freer form that cherishes and nurtures experiment. Indeed, the divergent shapes that sound art can take encourage experimentation and innovation.

Not only the limited possibilities of the concert hall with regard to experiments in time, spatialization, interaction, appearance and sound, but also the content of the music that is actually brought on stage strengthen the thesis that innovation has mostly left the concert hall. As a consequence, the majority of performances now presented in concert halls relies on compositions that have been performed before. The concert programme as well as the compositions performed can generally be consulted beforehand. The public knows what to expect.

In contrast to most concerts in the concert hall, sound art still reverts to man's amazement. It is often multidisciplinary, incorporating - besides music - elements of various disciplines such as visual art, architecture and physics. Sound art can be found in places where you least expect it and it explores different methods of sound production and conveyance in various circumstances, with a variety of materials and relationships of measure.

However, the departure from the concert hall did not only open up new possibilities but it has also led to the loss or reduction of several aspects. The social aspect of going to a concert, meeting old friends and making new ones has largely disappeared. Because of the extension of duration and the disappearance of the clear-cut starting time, social contacts are not so easily made. There is no longer the ritual of having a talk and drink before and/or after the concert and meeting fellow music lovers.

To conclude, in the development of music we see a major trend of expansion in several directions that is incompatible with the traditional concert hall, which is itself largely a product of the 19th century. By expounding this analytical-historical analysis, sound art can be better understood as an expanded form of contemporary music.

Chapter 3

Sound art in the social-cultural context

Whereas in the previous chapters we have dealt with defining sound art and pointing out that innovation nowadays mainly takes place outside the concert hall, this chapter focuses on presentation spots beyond the concert hall and shows how sound art is displayed in the social-cultural context. By exposing the advantages and disadvantages of various presentation spots and through analysing the evolution of the presentation and content of group exhibitions focusing on sound the social-cultural context of sound art will be analysed. Lastly, we will look at the historical and current presence of sound art in Belgium.

3.1 Presentation spots

3.1.1 Sound art in museums & galleries

Sound in museums and galleries is not exclusively linked to sound art. Even before the wake of affordable technologies – namely the possibility to record and reproduce sound and more particularly the tape technology that became widely available in the sixties – sound made its entrance in museums and galleries through kinetic works whereby movement caused often unintended noises. (see p. 89) However, it was not until the sixties that sound also started to form the focal point of exhibitions in visual arts institutions traditionally governed by paintings and sculptures. This new openness and interest in sound by art institutions is misleading as many group exhibitions are initiated by an external curator and very few sound works seep through to permanent collections. The relationship between sound art and art institutions is still in its nascent

stages. It is not obvious for museums and galleries to consider sound as a medium per se.

Museums today are confronted with the fact that many of the contemporary art production is no longer suited to be selected, purchased, kept and stored by the museum at least not through the known conventional ways. (Dercon, 1997/1998) The verdict that something does not fit in the collection often turns into an alibi for the fact that the museum's infrastructure does not know how to handle it. (Dercon, 1997/1998) This development is especially perceptible for an ephemeral art form such as sound art.

Sound leakage

When sound is the main component of a work and it is no longer a by-product of mechanical movement, nor is it accompanying visual elements or images, sound leakage becomes a substantial problem. More often than not the sounds of neighbouring works interfere with each other. There is no simple solution to this problem as the infrastructure of most museums and galleries is not tailored to the presentation of sound art. They are not acoustically equipped to present sound works. Sound is not stopped by temporary walls, the type of element mainly used in exhibitions to divide space. Instead, sound spills out into the surrounding area. A single work can therefore colour and dominate the entire exhibition room. The possibility exists that noisier works will overwhelm more silent ones, as was discussed by René van Peer when reviewing the *Sonambiente* exhibition in Berlin. (Van Peer, 1997)

A possible solution to prevent sound leakage would be to provide a separate isolated space for each work as is often done for video works when on display at a museum. This is however a drastic and costly intervention. Instead, curators have come up with alternative solutions to the sound leakage problem.

In their foreword of the exhibition catalogue of *Sound, an Exhibition of Sound Sculpture, Instrument Building and Acoustically Tuned Spaces*, curators Robert Smith and Bob Wilhite discuss the problems that arise when presenting sound works in a visual art gallery space. They suggest that when multiple pieces are presented in one space, they must be played one by one. According to the curators this decreases spontaneity and the amount of time spent at the exhibition. To partly overcome this problem, the curators decided to include an LP as part of the exhibition catalogue and to organise a series of performances on the instruments at display. (Smith & Wilhite, 1979a) The performances became an extension of the exhibition, a necessary addition to discover the true nature of the objects at display.

Influenced by Bob Wilhite, co-curator of the *Sound* exhibition at the Los Angeles Institute of Contemporary Art, Martin Halverson, curator of the *Sonic Art* exhibition at the Art Gallery of the California State College, was inspired to "provide a cassette tape player with headsets to enable gallery viewers to hear the sounds of the art works."

(Halverson, 1982a, p. 2) The works on display at the *Sonic Art* exhibition were primarily objects used for performances¹⁴⁵. As a consequence, several of the selected works could not be presented for the complete duration of the exhibition.

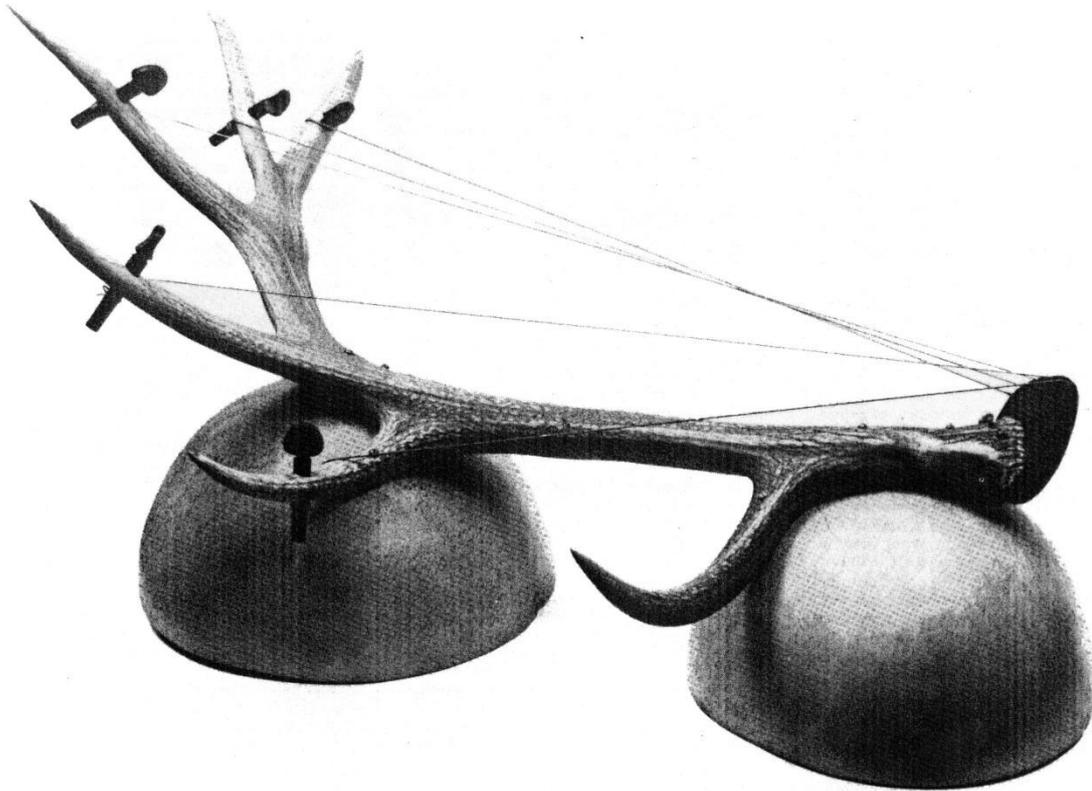


Figure 83 Bill and Mary Buchen's *Bass Elk Harp* was presented at *Sonic Art*, the Art Gallery at California State College, 1982 (Halverson, 1982b, p. 9)

The curators of the exhibition *Volume: Bed of Sound* opted for the play one by one method by using headphones. The exhibition featured a large futon-bed equipped with 58 listening stations and headphones. The audience could listen individually to historical and contemporary tracks, several of which were commissioned for the exhibition. A CD with 43 audio pieces and liner notes by Max Neuhaus was released by MOMA on the occasion of the exhibition. (P.S.1 Contemporary Art Center, 2008) (Henry Art Gallery, 2013b)¹⁴⁶

¹⁴⁵ Only a few performances were organized in the framework of the exhibition due to budget limitations. (Halverson, 1982a)

¹⁴⁶ This type of presentation resembles the usage of headphones and infrared triggers used in many museums.



Figure 84 *Volume: Bed of Sound*, P.S.1, New York, United States, 2000 (MoMA PS1, n.d.)

However, headphones can only be employed in very specific situations. Instead of considering sound leakage as a problem, it can also be considered a challenge for the curator to work with the leakage of sound within the concept of the exhibition, deliberately fusing sound instead of avoiding it. Michael Archer has approached sound leakage that way for the exhibition *Voice over: Sound and Vision in current art*. (Archer, 1998) Curator David Toop took this idea one step further. Toop based his selection of artists for the exhibition *Sonic Boom* on the volume their work produced and on their flexibility. “I decided not to select artists who I thought would suffer badly if their work was infiltrated and swamped by external sounds, or who might insist on imposing oppressive sound levels on everybody else.” (Toop, 2000a, p. 15) New works were especially created for the spaces of the Hayward Gallery, older works were adapted to suit the new context. A team of architects took care of the architectural installation, whilst a sound designer closely worked together with the architects and the artists to make sure that sounds of neighbouring works were successfully combined. (Ferleger Brades, 2000; Toop, 2000c)

The creative approaches of curators Michael Archer and David Toop shed a new light on the phenomenon of sound leakage. Whilst the problem becomes a challenge and even an opportunity for the curator to create matching sound environments, more fragile or dominating works risk to be eliminated from the curatorial short list.

Galleries specialising in sound art (see Table 9, p. 521) or galleries occasionally organising sound art, are a welcome alternative for those more fragile or dominating

works as these galleries often present only one work¹⁴⁷ or several works from the same artist. In this way the problem of sound sewage is by-passed as it is the artist himself who can adjust the sounds of the various works to each other.

Ephemeral art

Sound works are often temporary by nature. Commissioned for a specific place within the framework of an exhibition they can only be heard and seen during the duration of that exhibition. When the exhibition is dismantled, the works of art disappear. What remains is the recollection of the visitor of the work, the critical comments¹⁴⁸ written about the work, photographs, sound-recordings and/or video images and technical plans. Because most ephemeral art forms are not easy to collect and to experience after their dismantlement, they have resisted traditional historical approaches of art. There have been attempts to document sound works, often by releasing an LP, CD or even DVD as part of the exhibition catalogue. However, if the work is spatial and/or dependent on its environments it is very difficult to document it on a 2D medium. Max Neuhaus states that recording the sound of his works is “as silly as taking the paint off the canvas and thinking it’s still the painting”. (Loock & Neuhaus, 1990/1994, p. 124) Neuhaus’s work is embedded in its surroundings and consists of more than solely the auditive output. The social, physical, architectural and acoustical context are Neuhaus’s building blocks. (Loock & Neuhaus, 1990/1994)

Whereas installation art was presented on alternative art locations in the seventies, in the nineties this type of art increasingly found a place in museums and recognised galleries.¹⁴⁹ This is especially true for visual installation art, whereas for sound art it seems to be more difficult to get access to the permanent collection of museums or to be presented in a gallery. The additional difficulty for sound art as opposed to visual arts is due to its focus on sound and sometimes the lack of visual stimuli. In a 2007 lecture at Argos in Brussels, David Toop shared his experiences as a curator of the exhibition *Sonic Boom*. The Hayward Gallery obliged Toop to opt for work that had a strong visual component in addition to its auditive aspect. (Toop, 2007) The fear of the intangible, of purely auditive works has yet to be conquered. This fear is connected to the monetary

¹⁴⁷ Usurp Art Gallery in London includes sound art in their programme. Up till now sound art exhibitions at Usurp were each time limited to one work or to works of the same artist. (Usurp, 2012) Galleries that solely focus on sound art such as Singuhr hoergalerie in Berlin and Diapason in New York mostly present work from one artist. (Binas & Seiffarth, 1998; Diapason Gallery, n.d.)

¹⁴⁸ It is difficult to describe sound works as our concept framework to discuss sound is less extensive and more subjective than to describe visual elements.

¹⁴⁹ In her book *From margin to center: The spaces of installation art* Julie H. Reiss describes the evolution of [visual] installation art in the United States. (Reiss, 1999)

value given to art. As commercial art galleries are in the business of selling art objects and museums often focus on buying art that will increase in value over a period of time, ephemeral art forms are expelled. The lack of tangible elements makes monetary appraisal of sound art even more difficult. As Max Neuhaus states: “Our sense of the monetary value of arts sits firmly on the material instincts of size and weight. The most material thing in my work is air; it’s invisible and weighs practically nothing. This in itself presents some problems in convincing people that there are costs involved in making a sound work – manpower, electronic systems, but, most of all in my case, time.” (Max Neuhaus, 1984/1994, p. 75)

Maintenance

A third aspect that prevents sound art to enter the permanent collection of museums and to be presented in galleries is its maintenance¹⁵⁰. It is a daunting task for a museum or gallery to maintain works that either make use of technology for their operation or that are interactive. Their staff formation usually does not include technical staff with enough knowledge to maintain the works. Everyone who has been to an exhibition where technology or interactivity was involved, will recognise the out of order or in repair signs that grace the position where once the fully functional art work stood. This is not a new phenomenon. When works depend on technology and the creator is not around to do repairs, things can go wrong fast. In his book *Science and technology in art today* Jonathan Benthall calls the exhibition *Software* [1970] at the Jewish Museum in New York “a technical disaster”. (Benthall, 1972, p. 11) Douglas Davis claims “there was also evidence of an unwillingness on the part of galleries and museums to install and maintain properly the next technological art”. (Davis, 1973, p. 77) Davis argues that although exhibitions were announced with great bravura, the pieces were not maintained and ran down one after the other. Davies continues to prove his statement by providing the example of the Smithsonian Institution, Washington, United States, that had imported the *Cybernetic Serendipity* exhibition from the Institute of Contemporary Arts, London, United Kingdom, in 1969, but eventually was unable to install it due to its technical demands. (Davis, 1973)

Works that make use of interactivity are even more vulnerable. If a work is interactive with the audience, the actions of that audience cannot always be predicted. The *Baschet Cristal* by Bernard and François Baschet was presented at the exhibition *Sound art, Klang als medium der Kunst* [2012-2013] at ZKM in Karlsruhe, Germany. During the author’s visit¹⁵¹ to the exhibition the object was replaced by a note stating: “This

¹⁵⁰ This problem is not limited to sound art but extends to all art forms using technology and/or interactivity.

¹⁵¹ 30/12/2012

artwork is currently in restoration and will be presented as soon as possible. We apologize for any inconvenience and thank you for your understanding.”



Figure 85 Sign replacing the *Baschet Cristal* by Bernard and François Baschet at the exhibition *Sound art, Klang als medium der Kunst*, [Karlsruhe, 2012-2013] @ Laura Maes

It seemed as if ZKM took precautions as some interactive works could not - no longer? - be touched. A guide was present to demonstrate a *Sonambient* sculpture by Harry Bertoia or to carefully watch the actions of the visitor while turning the lever that set the *Zwitschermachine "auf und ab"* by Peter Vogel in motion.

The weak point of interactive works is exactly their interactivity. It is easy to press something too hard or to make an unexpected move and to accidentally damage the art work.

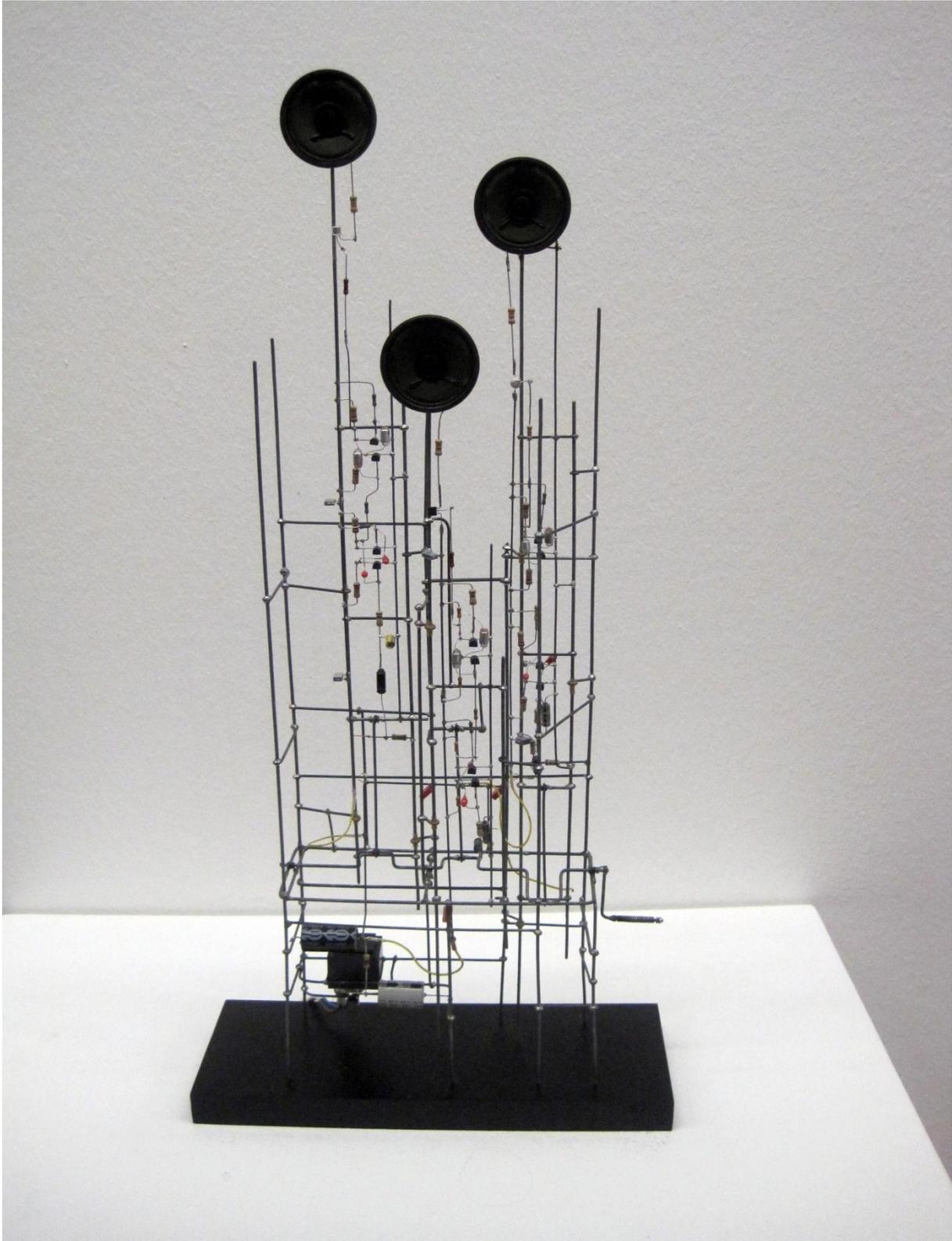


Figure 86 Peter Vogel's *Zwitschermachine* "auf und ab" presented at *Sound art, Klang als medium der Kunst*, [Karlsruhe, 2012-2013] @ Laura Maes



Figure 87 Detail of *Nagoya Soundwall* by Peter Vogel presented at *The Sound of Shadows – retrospective exhibition*, University Gallery, University of Brighton, Faculty of Arts, 2011 @ Laura Maes

As many sound works make use of technology, they become outdated fast and preserving the work for future generations is a tough challenge. A museum should get a detailed technical description of the art work, so as to reconstruct the art work with contemporary materials¹⁵². If a work has been built with hardware or software designed by the artist, it is far more difficult to reconstruct the work. Peter Vogel, for example, makes sound sculptures where the electronics determine the aesthetics of the work. (Grathwohl-Scheffel et al., 2007) Replacing a broken resistor by a new, most probably smaller one, will directly influence the appearance of the art work. This type of sound art is by definition temporary. Even when works are intended to be permanent, they

¹⁵² Even when the museum receives the necessary instructions, things can go wrong fast. Christina Kubisch has shared her experiences in a lecture at the conference *Ephemeral Sustainability* [Bergen, 2012]. After about ten years, she revisits her work *Schlohweiß und Rabenschwarz* [Snow white and raven black] that has since 2001 been part of the permanent collection of the Centre for International Light Art, Unna, Germany. Although Kubisch had provided instructions to make a new copy of the CD containing the sounds every 6 months as well as the sounds themselves that had to be placed on that CD, the museum failed to do so and the work was a mere shadow of its former self. (Schellinx, 2012)

often lose [at least part of] their relevance after a period of time. Max Neuhaus's work has been installed on Time Square since 1977. (see p. 23) The sounds that emerge from underneath the grating are tuned to the surrounding sounds such as the noises of traffic. If within a decade the traffic would for example make completely other noises or make no noise at all, the artwork loses its meaning and only has a historical value.

Understandably, museums have an interest in preserving not only the operation, but also the appearance of the artwork and its value, but most museums cannot live up to those technical demands. The use of interactivity and technology often forms a threshold to the acceptance of sound art in art museums and galleries.

3.1.2 Sound art in public space and alternative locations

In 1974 William Rubin, at that time director of the Museum of Modern Art in New York declared: "The Museum concept is not infinitely expandable." (Alloway & Coplans, 1974, p. 52) According to Rubin the museum was reserved for the high arts - paintings and sculptures-, leaving no room for recent more ephemeral artistic trends such as earthworks and conceptual art. Rubin went as far as proclaiming that this latter group demanded an entirely different museum environment and perhaps a different audience as well. Although museums today have made a shift towards other art forms, this expansion still gives rise to several unanswered problems as the architecture and organisation of most museums did not evolve along.

3.1.2.1 Alternative locations

Do new forms of art require new ways of viewing art? Aesthetic experiences are not limited to those spaces that are specially built for that purpose such as museums or concert halls. Art can also be experienced in places where we might not expect it at first sight. Sound art has been presented in places where visual arts or music have rarely been seen. Amongst others abandoned factories, the attic and corridors of art centres and historical sites replaced the setting of a museum, gallery or concert hall. These new settings offered new opportunities as the artists have to take into account the already present sonic, visual and environmental elements. Music festivals (see Table 8, p.517) and arts centres seem to slowly but surely include sound art in their programme, although this acknowledgement of hybrid forms between music and visual arts is quite slow and sound works are often presented in the margin of the programme.

3.1.2.2 Public space

Besides these alternative locations sound art also has found its way to the public space. Urban centres or nature have become the scenery for art works often entering into a

dialogue with their surroundings. The well-determined pathway stipulated by the curator [mostly] has vanished in public space, whilst the audience expanded from art lovers to inhabitants, commuters and tourists. Sound art in public space confronts and provokes. Passers-by can turn away their eyes, but not their ears.¹⁵³

Another form of public space is not a physical location such as a city, but the internet. The internet can be considered as a recent expansion of public space, although there is a lot of documentation on sound works available online, the amount of sound works designed for the internet remains limited.¹⁵⁴

The presentation of sound art in public space is not exclusive. Many art projects have been integrated in an urban context. This is not a new phenomenon. Leopold I envisioned, in the French tradition, the Leopold park in Ostend, Belgium as a sculpture park.

Public space seems an exquisite place to present sound works as it is possible to confront and challenge the audience unexpectedly. When sound art is placed in public space, the work is not always indicated. When there are no visual elements that tell the passer-by that something out of the ordinary is going on, the work often remains unnoticed. This is the case for the work by Max Neuhaus installed on Times Square, New York. (see p.23) Because Neuhaus has hidden his speakers underneath the ventilation grille of the subway and no indication is present at the location, the artwork more often than not remains unnoticed. Although the sound is clearly present, people do not expect an intangible artwork in such a location and the sound is ignored. The fact that no indication is present at the location is done deliberately. Neuhaus does not want to point the way, but lets the passer-by discover the work on his own terms.

In public space the roles are reversed. The visitors no longer have to stick to the rules of visiting an exhibition, but the artists have to take into account the rules of public space. The artist makes his work available, but cannot force it onto the public. The choice is in the hands of the visitor: a coincidental encounter or a planned visit.

3.1.2.3 Non-art museums

We can find sound art in non-art museums such as musical instruments museums or science museums. Science museums offer a welcome alternative for art museums. The Baschet brothers exhibited four sound sculptures at the Toronto science center as soon

¹⁵³ Although the amount of people walking around with some form of headphones do just this, closing oneself off of the aural outside world to focus on their own created auditive environment.

¹⁵⁴ in addition to artistic internet sound projects (see 3times4 p. 256), several other projects exist that go beyond a purely artistic function. Projects such as the UK soundmap (British Library, 2011) or the library of vanished sounds (NPS, n.d.) want to document sounds that are likely to disappear or have already disappeared from our environment.

as 1969. One of these sculptures demonstrated Chladni figures. When a horizontal sheet of Dural was bowed with a bass viol bow the grains of sand located on the sheet shifted into geometric patterns, revealing a network of nodes and anti-nodes. (F. Baschet, 1999) (see

Chladni figures p. 263)

Almost every science museum presents one or more demonstrations of sound effects. Besides the set-ups demonstrating Chladni figures, an often occurring arrangement are two parabola's placed straight across each other so the sound bridges a large distance. (see p. 258) Some science museums go beyond this presentation of educational set-ups that demonstrate the operation of sound waves and invite artists to create work based on natural phenomena.

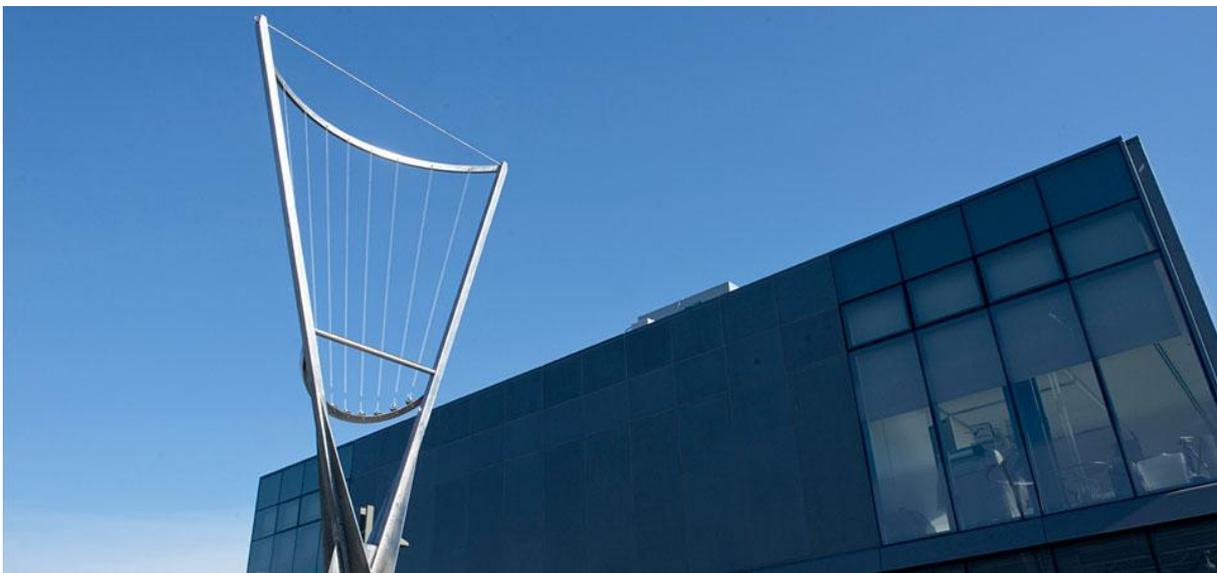


Figure 88 Doug Hollis's *Aeolian Harp* installed on the roof of San Francisco's Exploratorium (Smith & Wilhite, 1979b, p. 7) (Exploratorium, 2013a)

San Francisco's Exploratorium has a different take on teaching science. The museum focuses not solely on science but also on art and human perception. The Exploratorium has a long history¹⁵⁵ of artists-in-residence¹⁵⁶. (Exploratorium, 2013b) Besides the visiting artists, several artists are a member of the staff at the Exploratorium. (Exploratorium, 2013c)

The Exploratorium has been perceived as a creative and stimulating environment by artists. Science museums have the benefit that more technical staff is present than at art museums and that their audience is familiar with interactivity. There can be drawbacks,

¹⁵⁵ Since 1974.

¹⁵⁶ Amongst others sound artists Trimpin and Paul Panhuysen worked at the Exploratorium. (Exploratorium, 1998)

however; as Ned Kahn, whose installations have been presented at science museums, puts it: artistic compromises sometimes have to be made as the educational requirements of the science museum do not always match the sense of mystery valued by artists. (Klein, 2009/2011)



Figure 89 Tristan Perich, *1-bit music*, part of the travelling exhibition *Science & Art* (Museum of Discovery, n.d.)

As science museums seek new ways to engage visitors other museums follow in the Exploratorium's footsteps and present art works or set-up residency programmes.¹⁵⁷ The

¹⁵⁷ *Artist at Pine Needles* is a two to four week residency programme at the Saint Croix Watershed Research Station [SCWRS] operated by the Science Museum of Minnesota since 2002. Writers and visual artists focusing on environmental or natural history topics get the opportunity to interact with environmental scientists. The intention of the artist-in-residence programme is to facilitate links between art, the natural world and

science museum of Minnesota together with the Arkansas Discovery Network developed the travelling exhibition *Science & Art*. (Science Museum of Minnesota, 2013a), an exhibition that focuses on the similarities of science and art and that shows that art can convey scientific ideas. (Museum of Discovery, n.d.)

Musical instruments museums sometimes exhibit sound art. The Musical Instrument Museum in Brussels, Belgium bought the sound installation *Holosound* by Logos Foundation (see p.21). The work is permanently on display.

3.1.2.4 Sonic playgrounds

The playfulness of some sound works has led to the creation of sonic playgrounds. Variations on parabolic reflectors, tuned pipes, variations on drums and xylophones and other acoustic sound works by Bill and Mary Buchen have been installed at science museums and playgrounds since the eighties. (Sonic Architectur, n.d.-b) In Australia Ros Bandt's *Sound Playground* was installed from 1981 up till 1982 in a park in Brunswick, Melbourne. The playground included various musical instruments among which bells, gamelan-like devices, wind and percussive elements. (The University of Melbourne, 2007) German artist Erwin Stache, in cooperation with Joachim Kühnel, is the initiator of the Spielhörplatz, a musical playground that opened in 2012 in Brandis, Germany. In contrast to the earlier playgrounds, the sounds are not solely created acoustically. Playground games such as slides, swings, seesaws and trampolines are equipped with sensors that allow to convert the movements of playing children into sound. (Stache, n.d.-b)

science. (Science Museum of Minnesota, 2013b) Results of the residency have been presented at the local libraries and at the National Park Service visitor centre of the science museum. (Mallman, 2013)

The Phaeno museum, operating in the tradition of the Exploratorium, in Wolfsburg, Germany does not make a difference in exhibiting artworks or non-artworks. The only difference is the indication of the artists's name. Phaeno strives to present a mixture of artistic, scientific and playful installations. (Champion, 2013)



Figure 90 Left: Bill and Mary Buchen, *Big Eyes-Big Ears* (1993-present), rotating tower with parabolic dishes and a periscope. PS 23 Sound Playground, Bronx, New York (Sonic Architectur, n.d.-a)



Figure 91 Right: detail of Ros Bandt's *Sound Playground* (1981-1982), Temple Park, Brunswick (The University of Melbourne, 2007)



Figure 92 Erwin Stache's trampolines at the Spielhörplatz (Stache, n.d.-b)

3.1.3 Sound art in specifically built constructions

Leon-Battista Alberti [1404-1472] proposes in his text *De re aedificatoria* [on the art of building] the merging together of music and architecture based on their common mathematical structures. (Alberti, 1486/1988)¹⁵⁸ Wittkower also refers to this similarity: “...music and geometry are fundamentally one and the same; that music is geometry translated into sound, and that in music the very same harmonies are audible which inform the geometry of the building.”(Wittkower, 1977, p. 9)



Figure 93 Construction of Hans van Koolwijk's *Klankkaatser* (Van Koolwijk, n.d.-c)

Those statements of Leon-Battista Alberti and Rudolf Wittkower in mind, it is a logical evolution to take the blending of architecture and sound to a whole new level. Besides creating separate sound-proof rooms in museums, several artists have tried another track and created a detached specifically built or arranged construction. Precursors of sound art such as Xenakis and Stockhausen erected specific constructions, while La Monte Young equipped an existing room to create his *Dreamhouse*. More recent

examples include Hans van Koolwijk's *Klankkaatser*, a building constructed specifically to reflect the sound generated by five bamboo flutes in a certain way (Van Koolwijk, n.d.-b) and the sonic pavilion *The Morning Line* by Matthew Ritchie in collaboration with architects Aranda\Lasch and structural designers Arup AGU created within the framework of the 3rd Bienal Internacional de Arte Contemporáneo de Sevilla. *The Morning Line*, an eight meter high and twenty meter long pavilion, built of 17 tons of black coated aluminium, included over fifty speakers, steered by an interactive

¹⁵⁸ Of course architecture and music do not only share their mathematical basis but also their usage of space.

computer controlled sound system by the Music Research Centre of York University. (Thyssen-Bornemisza Art Contemporary, n.d.-a, n.d.-b)



Figure 94 Sonic pavilion *The Morning Line* by Matthew Ritchie and Aranda/Lasch, installed in Istanbul, Turkey in 2010 (Thyssen-Bornemisza Art Contemporary, n.d.-a)

3.1.4 Conclusion

Galleries and museums that want to engage in a long term relationship with sound art are still a rare breed. Worldwide there are only a few galleries that focus on sound art (see Table 9, p.521) and very few museums have made investments to properly accommodate sound works. An exception is the Aldrich Contemporary Art Museum that opened a sound gallery in 2004 of which the walls were fitted with sound-dampening fiberglass insulation and the ceiling was equipped with sound-attenuating panels. The museum wanted to accommodate to the needs of sound works that demand a silent environment. (Brewster, 2004/2013) (Freed, 2007) The sound gallery was placed away from other galleries, both to prevent sound escaping as well as unwanted sound entering the space. (Toplin, 2013)

In a 2008 article in the Dutch newspaper NRC Handelsblad sound artists Paul Devens and university lecturer Peter Peters made a plea for a sound art museum in the Netherlands that would encompass not only exhibitions, but also performances, besides an archive and a collection that would document the history of sound art. Devens and Peters say that the reflection of light and sound should be adaptable to the needs of each individual work. The collection would also expand past the walls of the sound

museum into public space. (Devens & Peters, 2008) Up till now, the Dutch sound art museum only remains an idea and has not been realised.

Some sound artists have created their own space, adapted to the needs of a specific work or idea. However, the amount of specifically built constructions remains limited owing to their complexity, limited flexibility and the high price tag.

When works move from art museums, galleries or concert halls to alternative locations, public space and non-art museums, not only the traditional environments are abandoned, but also the rhetoric nurtured by those traditional environments. The experience of visiting a science museum differs greatly from visiting an art museum. There is far less fearfulness to touch something or to try something out. As relationships change, the art experience evolves and new opportunities to communicate with the audience or the surroundings come to light.

3.2 Group exhibitions focusing on sound

3.2.1 From the tangible to the virtual, from the object to the experience

“Give a ticket to a new experience”, this is the motto of the Bongo vouchers sold by the internet company Weekenddesk. Material goods as a present for friends, family and loved ones are being traded in for experiences. The growing success of the Bongo’s gift vouchers (Weekenddesk, n.d.) - allowing you to give a sauna bath or a rafting trip as a present - indicates that experiences have grown more popular than material goods.

This evolution from object to experience cannot only be seen in society as a whole, but also in [visual] arts from the sixties onwards (Lippard, 1973). In visual installations, environments, happenings, but also in sound art, the experience of the visitor has often become the focal point. We have seen a growth in sound art, a hybrid of visual arts and music since the sixties. From that moment onwards, sound art is no longer a part of an exhibition, exhibitions are being set up where sound forms the central point.

3.2.2 Group exhibitions focusing on sound

Finding information about an exhibition held in a museum, is not that difficult. There often is an exhibition catalogue and the museum has an archive. Exhibitions that took place in alternative locations, often organised by temporary collectives are far more difficult to open up. The location does not exist anymore or the collective is not traceable. By browsing into old press reviews and announcements and by contacting former organisers and artists who took part in exhibitions, information for a list of group exhibitions focusing on sound was collected. (see Table 7, p. 395) This list is not exhaustive, but provides a solid overview of exhibitions focusing on sound in North-America and Western-Europe and allows us to spot certain tendencies.

3.2.2.1 Rise of sound art

We have illustrated the growing interest in sound in an exhibition environment by the compilation of a list of group exhibitions worldwide that have sound, sound art or the cross-pollination of sound and art as a curatorial theme. (see Table 7, p. 395) The rise of sound art cannot only be detected through the growing number of group exhibitions focusing on sound, but also through the fact that sound works are often part of new media exhibitions or new music festivals. (see Table 8, p.517)

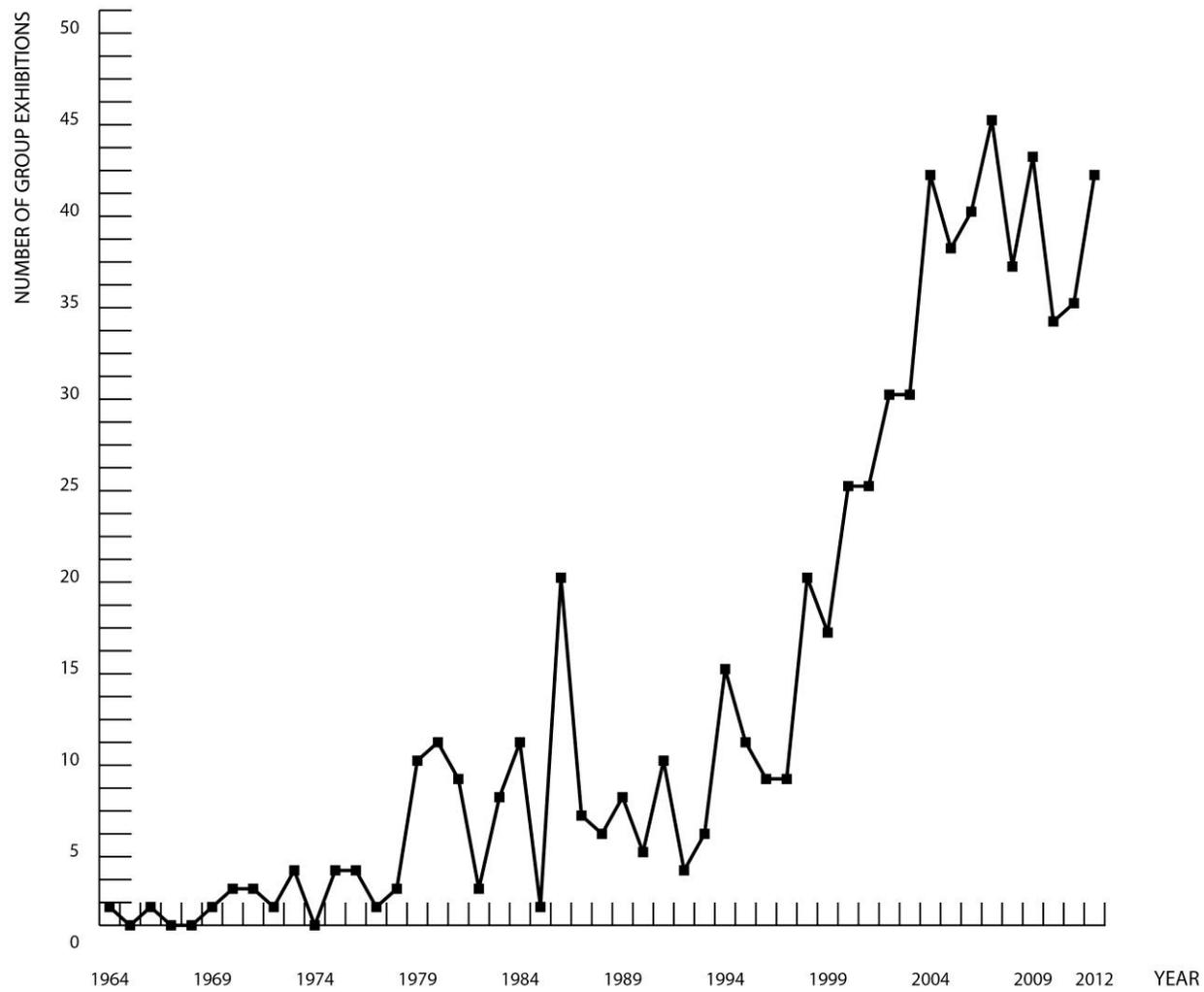


Figure 95 Line chart showing the number of group exhibitions by year (see Table 7 p. 395). Exhibitions that were organized during two years, have only been taken into account for the first year of the exhibition.

In Figure 94 we can notice a steep rise of group exhibitions focusing on sound from the mid-eighties nearly up till now. The sudden increase in 1985 can partly be attributed to the travelling exhibitions *Klangskulpturen '85* and *A Noise in Your Eye: An International Exhibition of Sound Sculpture*. These last five years the upward trend seems to stabilise and we can even notice a slight decline of the amount of group exhibitions, in comparison with the peak of 2007. Whether this evolution is going to continue, will be the subject of research in the forthcoming years. It is however inevitable that the steep rise of sound art will stabilise and eventually decline. By the time the general public will be familiar with sound art and its definition and several prestigious exhibitions will have been organised in big cities, sound artists might have moved on to new things. It is possible that, just like kinetic art was considered “a stale idea” (Benthall, 1972, p. 101) by many practising artists and critics in the seventies, the same evolution is going to happen with sound art. Sound art does after all have a lot in parallel with kinetic art. Both trends rely heavily on technology and technique. They can adopt very divergent forms, can incorporate forms of interaction, attract artists with very different backgrounds and have a hard time finding their place in a museological context.

3.2.2.2 Location and accommodation

The locations where exhibitions have been organised are mostly linked to artists, artist groups or curators active in that region, rather than to a specific infrastructure. It is therefore no coincidence that most group exhibitions can be found in the United States and Germany as these countries also house many sound artists.

The majority of group exhibitions can be found in the United States, closely followed by Germany. Even exhibitions organised outside Germany sometimes have a direct connection with Germany as the Goethe Institute has supported or organised several sound art exhibitions beyond Germany's borders.¹⁵⁹

Other important centres can be found in France, the United Kingdom, Canada and Belgium.

¹⁵⁹ Amongst others *Amplitude of chance* [Kawasaki, 2001] (Minoru Sato & Makiura, 2001) and *Espace Sonore - Espace Silencieux* [Paris, 1984] (U. Block, 1983).

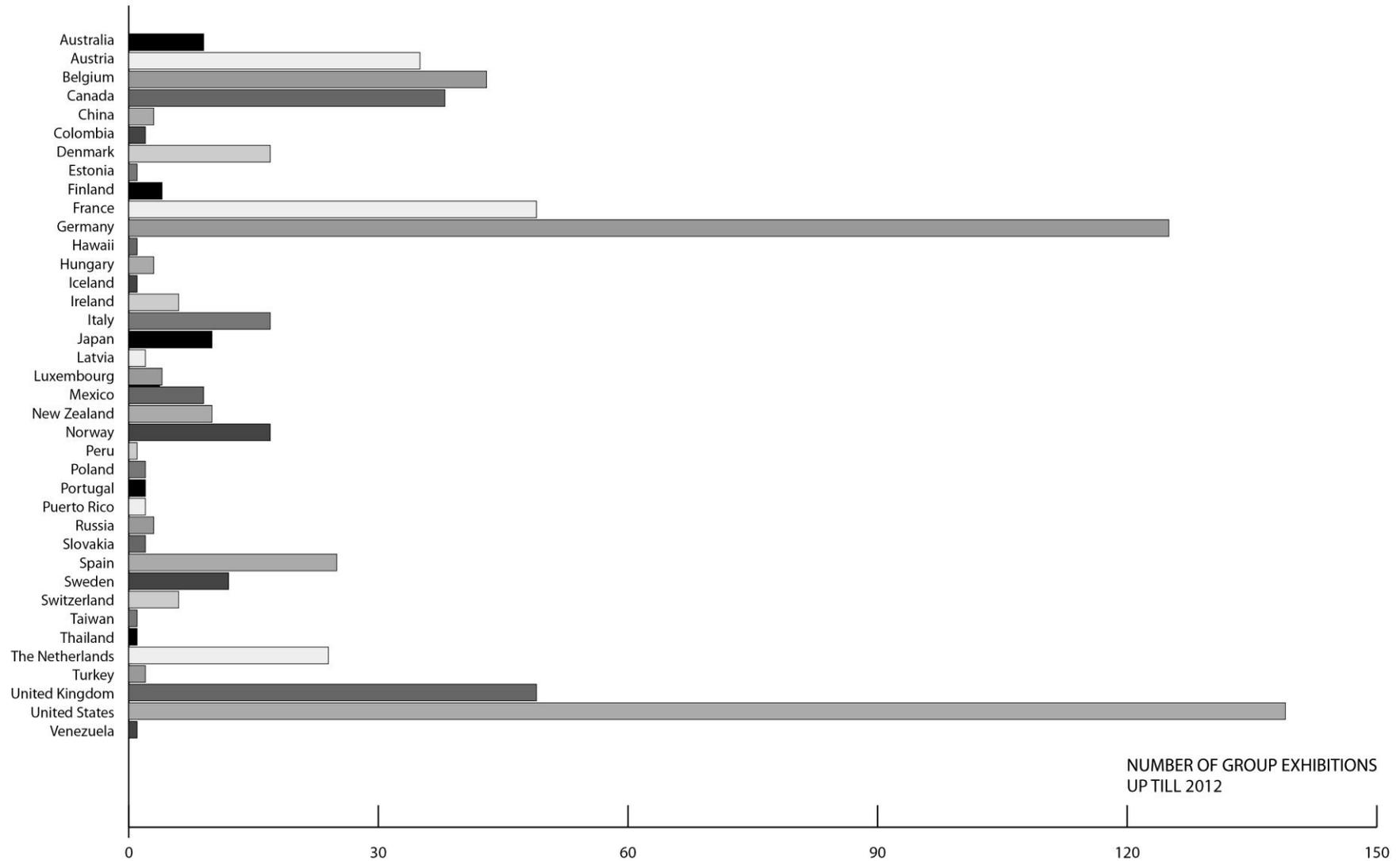


Figure 96 Bar chart showing the distribution of group exhibitions, as drawn up in Table 7, by country.

3.2.2.3 Types of works on display

The social evolution from object to experience is reflected in the type of works presented at sound exhibitions worldwide. There is a clear evolution from objects [sound sculptures and experimental instruments] to experiences [sound installations]. Sound works exhibited in the early years were often adaptations of existing instruments or sound sculptures. Elements such as tubes, rods, strings, pipes or flutes appeared regularly and were still recognisable as such. Even when the works were spatial, such as the long string installations of Terry Fox, Gordon Monahan, Ellen Fullman or Paul Panhuysen, for example (see p.240), the link between existing instrumental parts and these new ones was still apparent. Certain elements of traditional instruments were lifted out of their context, were enlarged or adapted. Traditional resonators were often exchanged for new ones, ranging from steel, duraluminium, cardboard, plastic or fibreglass cones [Baschet] (F. Baschet, 1999) to the room [string installation by Terry Fox] (Smith & Wilhite, 1979b).

Although sound sculptures and experimental instruments are still exhibited at sound exhibitions today, their presence is less numerous. Their place has partly been taken by interactive spatial works.

The content of an exhibition also depends on its location. When Happy New Ears¹⁶⁰ decided to no longer present the sound works at the old factory building 'Woon en Zorg Heilig Hart' and, after three years, decided to create a sound trail in the city instead, not only the location of the exhibition, but also the content of the works on display changed. With the city of Kortrijk, Belgium as the new scenery, the majority of the works displayed were now sound installations, whereas there were fewer sound sculptures and experimental instruments. More possibilities were on offer to start a dialogue with the environment, the city and its inhabitants.

¹⁶⁰ The new music festival that was organized from 1996 up till 2009 in Kortrijk, Belgium



Figure 97 François & Bernard Baschet, exhibition at the Museum of Arts Decoratifs, Paris, France, 1964 (F. Baschet, 1999, p. 105)

3.2.2.4 Set-up

The evolution from [often muted] object to experience, from sound sculptures and experimental musical instruments to sound installations, has also largely influenced the set-up of an exhibition. Works on display at the exhibition *Sehen um zu Hören* at the Städtische Kunsthalle in Düsseldorf, Germany in 1975 were not audible, but formed the basis of the concerts that completed the exhibition programme: “Der betrachter , der durch diese Ausstellung geht, soll die Möglichkeit bekommen, diesen Aspekt unter zwei Bedingungen zu testen: einmal als stumme Ausstellung von Objekten und Instrumenten, die erst das Material zu Konzerten abgeben.” (Baecker, 1975a, p. 10) Setups in which objects are displayed, but are not producing sound such as was the case for the exhibitions *Sehen um zu Hören* (Baecker, 1975b), *Sound, an Exhibition of Sound Sculpture, Instrument Building and Acoustically Tuned Spaces* (Smith & Wilhite, 1979b) and *Sonic Art* (Halverson, 1982b) have a lot of similarities with instruments on display in a musical instrument museum. This type of set-up would nearly be unthinkable nowadays.

3.2.2.5 Interaction

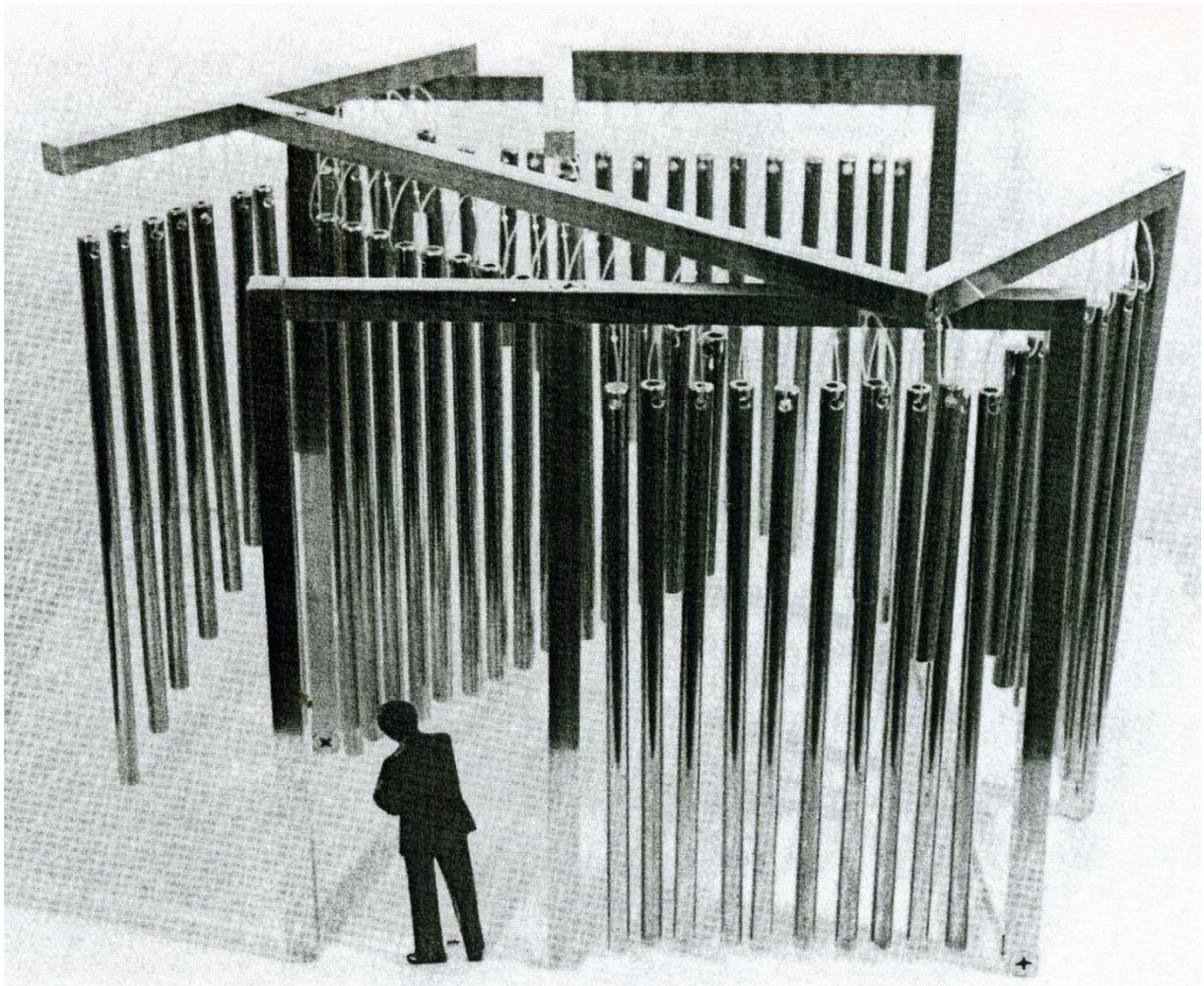


Figure 98 Bruce Fier, *Soundings III* [1979], Sonic Art, the Art Gallery, California State College, San Bernardino (Halverson, 1982b, p. 11)

In the early years interaction was often limited to the visitor striking or playing tubes¹⁶¹, rods¹⁶² or strings¹⁶³, operating bellows¹⁶⁴ or pressing keys¹⁶⁵ as the possibilities of automations were not yet as advanced as today.

¹⁶¹ *Soundings III* [1979] by Bruce Fier consists of several rows of brass tubes that had to be activated by the audience. (Halverson, 1982b, p. 11)

¹⁶² Instructions for Harry Bertoia's sounding sculptures were as follows: "to activate the following three pieces, gently stroke the tips of the rods with fingertips" and "to activate the following pieces, gently cluster all the rods of each piece together in your hands and release. Do not pull any of the rods" (Aesthetic Research Centre of Canada, 1973) A similar work is depicted in Figure 100, p. 197.

¹⁶³ The long-string installations of Paul Panhuysen and Johan Goedhart (see p. 227).

¹⁶⁴ *Pneumaphone* by Godfried-Willem Raes (see p. 112).

“Works of art are not simply valuable objects which on one hand carry a price tag, and, on the other hand, bear a “Do Not Touch” sign; on the contrary, they are to be played with, and one should approach them not only with the eyes and the ears, but with the hands as well. Art becomes once again a social function.” (Bernard F. Baschet, 1975, p. 7)

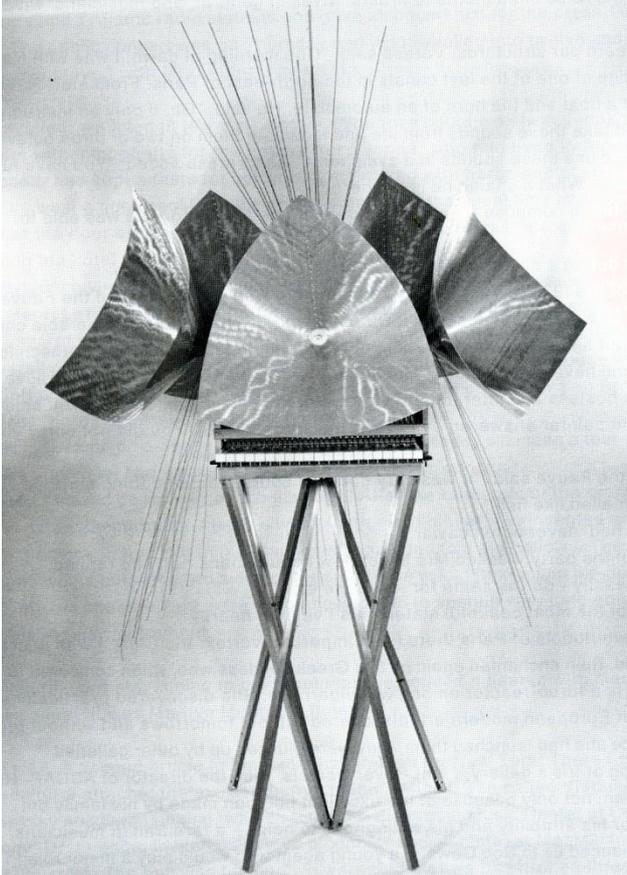


Figure 99 Bernard & François Baschet, *Aluminium Piano*, 1962 (F. Baschet, 1999, p. 97)

The Baschet brothers want to address the game playing instinct in all of us. They state that timidity and reserve disappear when no teachers are present to give advice or to point out mistakes. (B. Baschet, 1975) Although the Baschet brothers strived for a participatory art, this participatory principle was not always a reality. The checklist and operating notes of the exhibition *Sound / Sculpture: 11 artists working in the field of Audio-Kinetic Sculpture*, organised in 1973 at the Vancouver Art Gallery, mentions the following for several of the exhibited Baschet works: “Do Not Touch,

Demonstration upon request.”¹⁶⁶ These warnings might be a precaution taken to prevent more delicate constructions from an overenthusiastic audience. As Bernard Baschet stated: “We must protect the instruments from the eagerness of the curious who, while shy at first, let themselves become carried away by their own sonorous discoveries.”(B. Baschet, 1975, p. 7) What strikes is that caution is expressed in the instructions of works of the Baschet brothers that could be touched: “To activate, Gently Stroke Strings”, “to activate, gently stroke metal rods with fingertips”, “to activate, place hand on either black knob and move just enough to allow the sculpture to sound”

¹⁶⁵ At the end of 1962 the Baschet brothers developed a piano of which notes, the base and the conical soundboards were made out of duraluminium. The piano was exhibited at the Museum of Modern Art in New York. (F. Baschet, 1999) (see Figure 99, p. 196)

¹⁶⁶ *Glass Trombone* [1958] and *Piano with two Ears* [1963] could not be touched, but were demonstrated upon request. (Aesthetic Research Centre of Canada, 1973)

and “to activate, move piece gently by touching rods”. (Aesthetic Research Centre of Canada, 1973, p. 1)



Figure 100 Harry Bertoia, *Sonambient* sculpture, *Sound art, Klang als medium der Kunst*, [Karlsruhe, 2012-2013] @Laura Maes

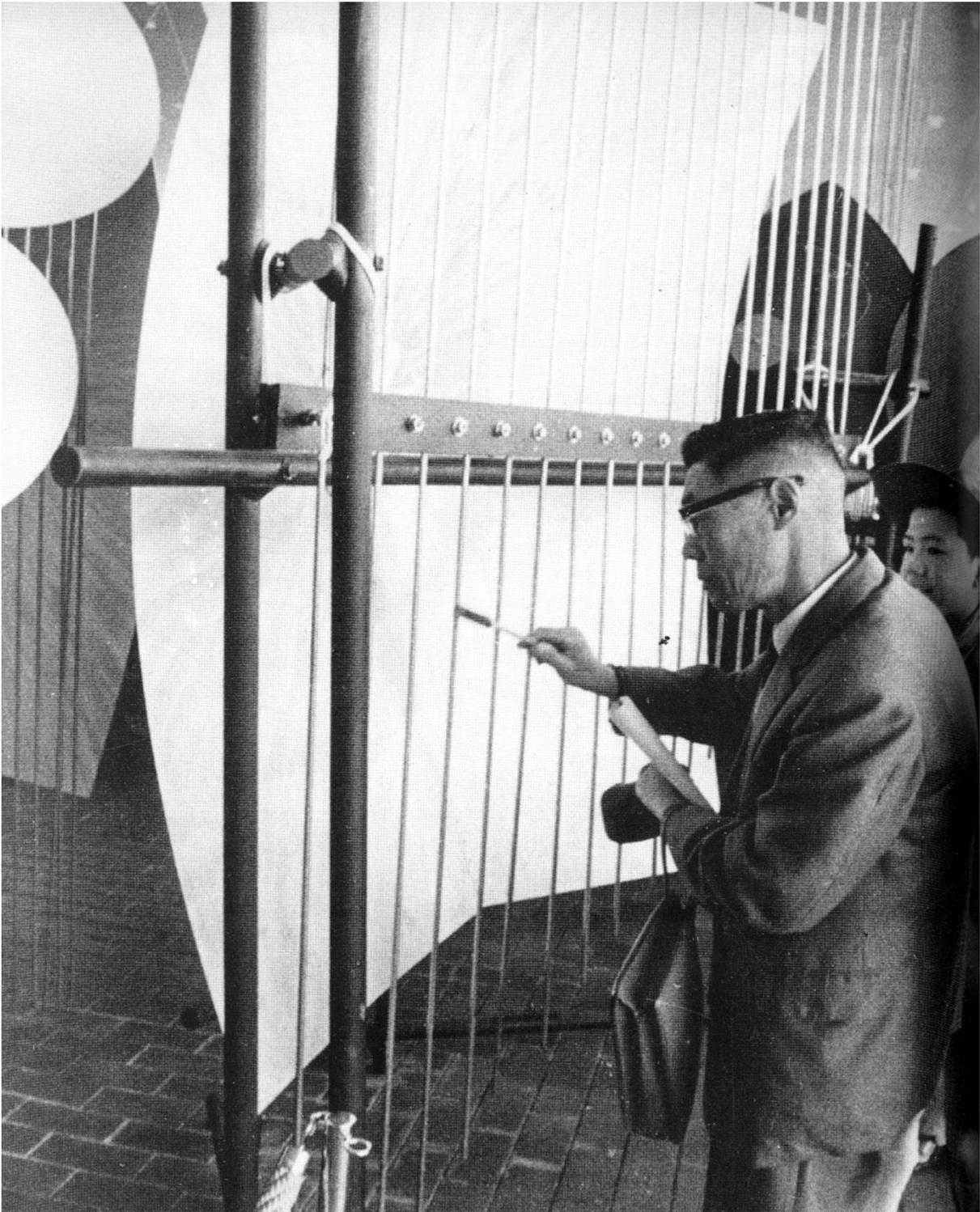


Figure 101 Visitor playing a sound sculpture by the Baschet brothers, Japanese Steel Federation Pavilion, Osaka 70, Osaka, Japan, 1970 (F. Baschet, 1999, p. 121)

Technology facilitated unconscious participation. Visitors no longer had to actively stroke, press, touch, move, hit, bow or turn something, devices such as motion detector sensors made it possible for artists to let the visitor participate unconsciously. The work

Springtime in a small town by Peter Bosch & Simone Simons, installed in 2006 at the Klankenbos in the East of Belgium makes use of such a motion detector. The wooden fence that surrounds the work only has one opening which ensures that when the visitor approaches the work, he or she is in sight of the motion detector that is hidden underneath the artwork.



Through approaching the work the visitor unconsciously activates the work and a composition of rattling wooden boxes comes into being. Once activated, actions of the visitor cannot change or influence the course of the work. In this case the on/off button is replaced by the visitor activating a sensor. In contrast to the interactive acoustic works such as the works by the brothers Baschet mentioned above, the participation of the visitor is restricted to setting the work of art into motion. No two-way interaction is necessary for the operation of *Springtime in a small town*.

Figure 102 Detail of *Springtime in a small town* by Peter Bosch & Simone Simons, Klankenbos, Neerpelt, Belgium @ Laura Maes



Figure 103 Motion detector that sets *Springtime in a small town* into motion @ Laura Maes

to steer or process sound, while various types of sensors make it possible to use nearly all acts of visitors to affect a sound work.

As technology has become affordable and widely available, this has enlarged the possibilities and types of interaction. Sounds of visitors or the environment can be recorded and can be reproduced in various forms or serve as triggers for certain actions. Bio signals can be used

3.3 Mysterious woods and unexpected urban sounds - sound art in Belgium

3.3.1 The Philips Pavilion

At the Brussels World Fair in 1958, the peaked Phillips pavilion designed by Iannis Xenakis, assistant to Le Corbusier, housed a spectacle of sound and visuals. The pavilion has often been listed as one of the forerunners of sound art. (De la Motte-Haber, 1996a; Gibbs, 2007; Brandon LaBelle, 2006) (see Figure 81, p. 156)

As a little boy Godfried-Willem Raes, who later founded the Logos Foundation, was regularly dropped by his parents at the Dutch pavilion during their choir rehearsals. The whole experience made a huge impression on him and influenced his later work. (Raes, 2012)

3.3.2 Logos Foundation

Logos has been at the forefront of experiment since the end of 1968. The organisation was originally established as an artists' collective. From the outset, the blending of media formed a focal point of the organisation, which did not only incorporate musicians and composers, but also visual artists, poets and scientists.

From 1969 onwards the Logos group invited like-minded musicians and collectives and started to organise concerts and events. In 1971 the first edition of the Mixed Media festival took place. The Mixed Media festival was organised for ten successive years. For its fifth edition, in 1975, an exhibition comprising collaborative work by Godfried-Willem Raes, who provided home-built circuits and ceramist Lieve De Pelsmaecker was set up in the corridor of the Zwarte Zaal in Ghent, Belgium. This idea was expanded during the three following editions of the festival. International artists such as Walter Giers, Michel Waisvisz, COUM, Linda Walker, Ulrike & Wolf-Dieter Trüstedt and Hugh Davies were invited to exhibit their work in these so called 'Sonobiles'¹⁶⁷

¹⁶⁷ Sono refers to sound and mobiles refers to moving objects or sounds. (see p. 48)

exhibitions¹⁶⁸ (see p.46). The term Sonomobiles was launched by Logos as a collective noun for these exhibited works combining sound and other media. By shifting the emphasis from the final saleable product to the actively engaged process whereby the visitor has to actively explore the object (Moniek Darge, 1977), the Sonomobiles exhibitions aimed to detach themselves from commercialism.

This participative character is also present in the sound works created in the Logos lab. *Singing bicycles*¹⁶⁹, *Pneumaphones*¹⁷⁰ and *Holosound*¹⁷¹, for example, all demand input from the audience to show how they work.

In the early eighties, when Logos had moved to its new location in the Kongostraat in Ghent, the Logos lab creations were regularly on display at Logos. From time to time sound works by other artists, including Richard Lerman, Martin Riches, Frédéric Le Junter and Peter Bosch & Simone Simons, were exhibited. (Logos Foundation, n.d.) Since 1971 the Logos Foundation has offered a stage to artists exploring sound such as Max Eastley, Michel Waisvisz, Lorenc Barber, Richard Lerman, Hugh Davies, Annea Lockwood, Jon Rose, Paul Panhuysen, Alvin Lucier, Baudouin Oosterlynck, Pierre Bastien, Pierre Berthet, Horst Rickels and Erwin Stache. (Logos Foundation, n.d.) Most of them have in common that they do not only build sound sculptures and installations, but that they also perform on them: a similarity that can also be found in the work of Logos founder Godfried-Willem Raes. Their presentations at Logos were, in most cases, not exhibitions, but performances on home-built installations, sculptures or instruments. With the current concert series *Sound exploration* Logos continues to support music created by sound artists.

¹⁶⁸ 26/01/1976 – 29/01/1976: Mixed-Media VI: tentoonstelling sonomobielen, Koninklijke Academie voor Schone Kunsten, Ghent, Belgium

21/02/1977 – 03/03/1977: Mixed Media VII: sonomobieltentoonstelling, Museum voor Hedendaagse Kunst, Ghent, Belgium

05/02/1978 – 12/02/1978: Mixed Media VIII: tentoonstelling sonomobielen en alternatieve muziekinstrumenten, Oranjehuis, Antwerp, Belgium

¹⁶⁹ The bike of each cyclist is converted into a musical instrument. A loudspeaker extended with a plastic tube is driven by the dynamo of the bike. Each plastic tube will resonate when the cyclist cycles at a specific velocity. Different surfaces provide timbre variations. A minimum of 12 cyclists is required for the happening. (H. White, 2011)

¹⁷⁰ *Pneumaphones* are a collection of pneumatically-driven sound sculptures. (see p. 112)

¹⁷¹ In the *Holosound* installation of Godfried-Willem Raes the reflection of ultrasonic sound beams against the human body generates audible sound. (Raes, 1978) (see Figure 14 p. 23)



Figure 104 Children playing on Logos's *Pneumaphones* that were part of the Nemo project, arts Centre Vooruit, Ghent, Belgium, 2001 @Benn Deceuninck



Figure 105 Logos's *Singing Bicycles* in New York in 1985

This fascination for experimental instrument building shows in the work of Godfried-Willem Raes as well as in the programming at Logos. For the last edition of the Mixed Media festival in 1980, no Sonomobiles exhibition was organised, but an instrument building festival instead.¹⁷² This initiative was reintroduced in 1994. The Automata festival, organised yearly from 1994 to 1996, brought the crème de la crème of experimental instrument builders to Belgium, including Trimpin, Jacques Rémus and Christoph Schlaeger.¹⁷³ (Logos Foundation, n.d.)

At the end of the nineties and in the 21st century exhibitions became rare. The majority of the works produced at the Logos workplace were musical automata, additions to the *Man and Machine [M&M] orchestra*¹⁷⁴ that was showcased at the monthly organised M&M performances. While the Logos concert hall gradually became filled up with the expanding M&M orchestra, the acquisition of an adjoining building at the end of 2011 opened up new opportunities. A first exhibition, including work by Moniek Darge, Helen White and the author was organised during the summer of 2012. In their planning for the forthcoming years Logos intends to organise exhibitions on a regular basis and open up the Logos workshop to sound artists and experimental instrument builders. (Raes, 2012)

Logos is not only important as a production and presentation centre, but has always been a breeding ground for sound artists. Former employees such as Maria Blondeel, Guy De Bièvre, Peter Beyls, Johan Grimonprez and Christoph Fink have continued to create works involving various media after their career at Logos.

3.3.3 Permanent collections

Sound art is often temporary by nature, commissioned for a specific place during a specific time or period. In two places in Belgium sound art can be found which is meant to last permanently or semi-permanently: the Klankenbos in Neerpelt and the Sound Factory in Bruges.

¹⁷² 07-12.02.80: Instrument Building Festival - Xth International Mixed Media Festival

¹⁷³ Automatenfestivals: 24-28.10.1994 / 24-29.10.1995 / 22-26.10.1996

¹⁷⁴ An ensemble combining musical automata, new interfaces to steer these automata, dancers and performers (see p. 353).

3.3.3.1 Klankenbos

The Klankenbos in Neerpelt, run by the educational organisation Musica, houses a collection of three mobile sound works¹⁷⁵ and fifteen sound works spread over and integrated in the provincial Dommelhof domain¹⁷⁶. It is freely accessible from March till October and is not only a unique project in Belgium, but also abroad.



Figure 106 Pierre Berthet, *Houses of Sound* at the Klankenbos, Neerpelt, Belgium

The project took off with the aid of an Interreg subsidy¹⁷⁷. Dutch partner Intro insitu would present sound art during temporary manifestations, whilst Belgian partner Musica would do so in public space. Although the initial idea was not to present these

¹⁷⁵ Moniek Darge: *Muziekdozen* (2005), Baudouin Oosterlynck: *FluisterOren* [2005] & Eric Van Osselaer: *Musiscopes* [2007] (Musica, 2012a)

¹⁷⁶ Pierre Berthet: *Houses of Sound* [2005], Paul Panhuysen: *Kanariestudio* [2005], Horst Rickels: *Het geheim van Horst* [2006], Erwin Stache: *Konversation* [2006], Peter Bosch & Simone Simons: *Springtime in a Small Town* [2006], Hans Van Koolwijk: *Oorsprong* [2007], Hekkenbergarchitects [design] & Paul Beuk [realisation]: *Tacet* [2008], Amy Franceschini & Stijn Schiffeleers / Koen Deprez: *Radio Forest* [2005/2009], Benjamin Samane: *Willow Hut* [2010], Bernward Frank: *Wind Zylinder* [2009], Robert Lambermont: *Oor van Noach* [2010], various sound artists: *Klankatlas* [2011], Staalplaat Soundsystem & Lola landscape architects: *Composed Nature* [2012], Tony di Napoli: *Chaise Résonnante* [2012], Caroline Locke: *Singing Pools* [2012] (Musica, 2012a)

¹⁷⁷ Interreg is a subsidy programme that stimulates cooperation between different regions of the various member countries of the European Union.

works permanently at the provincial Dommelhof domain, it would be a shame to lose the investments made. When the Interreg subsidies came to an end, the idea arose to maintain these installations. They would no longer be supported by Interreg, but through the subsidy Musica receives from the Flemish government and with the support of the council and province. From the very beginning, the artists were asked to make durable works, so it was feasible to present them for a longer period. (Heylen 2012)



Figure 107 Hans van Koolwijk, *Oorsprong* at the Klankenbos, Neertpelt, Belgium @Kristof Vrancken

During the three Interreg years, works by Belgian artist Pierre Berthet, Dutch artists Paul Panhuysen, Horst Rickels, Peter Bosch & Simone Simons, Hans van Koolwijk and German artist Erwin Stache were installed in the woods and mobile installations by Belgian artists Moniek Darge, Baudouin Oosterlynck and Eric Van Osselaer were added to the collection. (Musica, 2012a) The installation *box 30/70* by Bruce Odland & Sam Auinger did not stand the test of time and was dismantled after several vandalism attacks. (PPN, 2010)

In the following years the Klankenbos collection gradually grew with one or two new additions each year. 2012 marks a new era with new artistic director Paul Craenen and the addition of three new international works by Tony Di Napoli, Caroline Locke and Lola landscape architects & Staalplaat. It is also the first time that the Province has

committed itself to supporting a new installation¹⁷⁸, an evolution that can only be applauded.

The physical supervision of the collection is difficult. Natural factors such as wind and rain put sound works to the test and the Klankenbos also has to deal with vandalism and theft. Combined with the fact that, with fifteen sound works spread throughout the Dommelhof domain, most space is taken, the future emphasis will not lie on the expansion of the collection at Dommelhof, but on its maintenance and disclosure to the public. (Craenen, 2012) It is not unthinkable that existing installations will be replaced in the future by new ones or that the Klankenbos will no longer be limited to the Dommelhof domain and will extend its borders and also include permanent works in public space, outside Dommelhof. (Craenen, 2012)

Musica aims to further extend the operation of the Klankenbos with small-scale events around the collection such as performances and temporary exhibitions, guided tours and residencies for students and artists. Although the activities of Musica have a primarily educational character, the Klankenbos collection is targeted at a broad audience of art lovers, schools and families.

3.3.3.2 Sound Factory

In October 2011 the Concertgebouw Bruges opened its Sound Factory. Inspired by the Dutch Klankspeeltuinen¹⁷⁹, the Concertgebouw opted for a similar approach. The collection, accommodated in the Lantern Tower of the Concertgebouw, contains a new interactive work with 150 bell sounds by Aernoudt Jacobs, an interactive installation based on the resistance of human skin by Erwin Stache, a site-specific speaker installation by Esther Venrooy & Olivier Goethals, an interactive sound sculpture by Gijs Gieskes and *Omni*, an interactive interface shaped like a colourful mushroom by Patrice Moullet. This last work is the only work that is also present at the Klankspeeltoin. A collection of 21 carillon bells and a cyber-corner comparable to the one at the Klankspeeltoin complete the Sound Factory. (Sound Factory, n.d.)

In contrast to the Klankspeeltoin, the operation of the Sound Factory is not restricted to workshops. Instead, the Sound Factory is open six days a week and is run by Musea Bruges. It is the intention of the Concertgebouw to reach a broader target group than the Klankspeeltoin and separate workshops are being organised for children and adults. (Vanacker, 2012)

¹⁷⁸ *Decomposed Nature* by Lola landscape architects & Staalplaat (Craenen, 2012)

¹⁷⁹ The Klankspeeltoin located at Muziekgebouw aan 't IJ, Amsterdam, the Netherlands, holds a collection of interactive sound works aimed at primary school children. (Muziekgebouw aan 't IJ, 2011)



Figure 108 Patrice Moullet, *Omni*, Sound Factory, Concertgebouw Bruges © Lien Bonte

The Concertgebouw also aims to create more coherence between their concert programme and the Sound Factory by integrating sound works into their festivals where possible.

Sound Factory is not the first endeavour by the Concertgebouw in the world of sound art. In 2003 Edgard Varèse's *Poème Electronique*, one of the forerunners of sound art, was permanently installed in the highest foyer of the building.

3.3.4 Urban sound trails

Belgium has quite a few sound trails that present sound art in an urban environment. These include both one-off events such as the .WAV project in Bruges in 2002 as well as the yearly sound trails in Kortrijk and Mons.

3.3.4.1 Sounding City

In 1996, the Kortrijk-based Limelight organised the festival Happy New Ears for the first time. From 1999 onwards Happy New Ears became a separate non-profit organisation. In

that same year the festival took its first steps¹⁸⁰ into the world of sound art by inviting sound artists Pierre Bastien, Pierre Berthet and Frédéric Le Junter and musicians DJ Low and Rudy Trouvé to create the brand new production 110m². A small exposition with work by Bastien, Berthet and Le Junter took place on the top floor of the Tacktoeren. From that moment onwards, at least one project around experimental instruments, the so called “nouvelle lutherie”, was included each year in the festival programme.



Figure 109 Dawn Scarfe, *Tree Music*, Klinkende stad – Publiek geluid [Kortrijk, 2012]

In 2002 Willy Malisse from the non-profit organisation Beeldenstorm asked Joost Fonteyne (Happy New Ears)¹⁸¹ to set up an exhibition that connects sound and image. In order to do so, Beeldenstorm and Kling Klang applied for an Interreg subsidy. In 2002 the first edition of the Audioframes exhibition took place at the old factory building ‘Woon & Zorg Heilig Hart’ in Kortrijk. In 2003 the exhibition was organised in Lille and in 2004 the exhibition was partly organised in Kortrijk and partly in Lille.

From the first edition onwards Happy New Ears has invested in the ideal presentation of the selected works by

acoustically isolating the exhibition spaces as much as possible from each other. (Fonteyne, 2012)

For the period 2005-2008 Happy New Ears also made an appeal to Interreg subsidies to finance sound works and concerts in Kortrijk and Lille, a sequel to Audioframes. In Kortrijk the sound works were no longer presented in one location. Instead they were

¹⁸⁰ Previously, in 1997, Happy New Ears had engaged buses to go from Kortrijk to Lille and pay a visit to the Polymachina exhibition, organised by Kling Klang at L’Aeronef. Limelight had invited Pierre Bastien to present his *Mecanium* during the yearly Sinksen festivities. (Fonteyne, 2012)

¹⁸¹ Joost Fonteyne contacted Emmanuel Vinchon [Kling Klang] and Yves Poliart to co-curate Audioframes. (Fonteyne, 2012)

spread throughout the city centre of Kortrijk under the designation Sounding City. The exhibition transformed into a sound trail.

The final edition of Happy New Ears in 2009 did not include a sound trail. The reason for this was partly financial and partly because the new festival¹⁸² took place 6 months later in spring 2010.

The Flanders Festival Kortrijk currently organises a group exhibition under the heading Sounding City every two years. The organisation strives to work more around one specific theme. In between each group exhibition the festival will still include sound art in their festival programme.

The Flanders Festival Kortrijk is also a partner in Resonance¹⁸³, a platform for exchanging expertise and supporting new sound art in the form of performances and documentation.

In addition, the festival invests in permanent audio walks. Walks by David Helbich and Christina Kubisch are available from Kortrijk's tourist office. (Fonteyne, 2012)

3.3.4.2 City sonic(s)

Happy New Ears was not the first Belgian organisation to move to public space. Transcultures has been organising the yearly sound trail City Sonic[s]¹⁸⁴ across Mons since 2003. Although the idea of organising a sound art event in public space had been slumbering in the mind of Philippe Franck (Franck, 2012), it became concrete after a visit to Bruges 2002 (Transcultures, n.d.) where .WAV, a sound trail in the city of Bruges¹⁸⁵, was on display.

¹⁸² Flanders Festival Kortrijk

¹⁸³ A partnership with Stichting Intro/In Situ [Maastricht, the Netherlands] and Singuhr Hörgalerie [Berlin Germany] and associated partners: Lydgalleriet [Bergen, Norway], Skanu Mezs [Riga, Latvia] and Audio Art festival [Krakow, Poland]. From 2012 onwards Le Bon Accueil [Rennes, France] has joined the primary partners. (Fonteyne, 2012)

¹⁸⁴ The name of the festival changed from City Sonics to City Sonic in 2011. The main reason for the change of name was the fact that from 2011 onwards the festival was no longer only in the hands of Transcultures but it was co-produced with Le Manège, also situated in Mons. Another reason to drop the 's' was to get closer to the Arsonic project, a new theatre in Mons set up by Jean-Paul Dessy that will focus on new music and sound art and is expected to open its doors in 2014. (Franck, 2012)

¹⁸⁵ .WAV [15/06 – 15/09/2002] was a project by the temporary non-profit organisation Sensor initiated by Joris De Voogt and with members from Cling Film and Kraak³ on the board of directors. Gert Keunen selected five artists: Pierre Bastien, Eavesdropper, Philip Jeck, Scanner and David Toop. Horst Rickels also created a new installation. Next.Wav presented works by students from Le Fresnoy [Tourcoing, France], Justig Liebig Universität-Institut für Angewandte Theaterwissenschaft [Giessen, Germany] and Rits, Erasmushogeschool [Brussels, Belgium]. (.WAV, 2002)



Figure 110 Veaceslav Druta, *Balancoire*, City Sonics, 2003 @ Ch Bailleau

The first City Sonic[s] took place in June 2003. (Transcultures, n.d.) Since its first edition, City Sonic[s] has focused on sound art in the broadest sense and presented works by both international and Belgian artists. Students have also had the opportunity

to present their work. Like Happy New Ears, City Sonic[s] organises concerts and workshops alongside the exhibition and relatively unfamiliar locations are often included in the trail. Over the years several sub-activities have been launched. Since 2009 the programme has included performances in private gardens [Sonic Garden Party]¹⁸⁶ and workshops aimed towards children [Sonic Kids]¹⁸⁷. Since 2011 workshops for adults [Sonic Formations] have been organised. In 2012 the series Sonic Mix, presenting DJs and young musicians mixing various styles and Sonic Lab, a cross border project Espace[s] Son[s] Hainaut[s] focusing on augmented instruments¹⁸⁸, was launched.

For the 10th edition of City Sonic[s], the epicentre of the festival moved to Brussels with the exhibitions “the inner ear” at L’Iselp and “Sonic Cinema” at various galleries. Two sound trails, one in Mons and one in Huy,¹⁸⁹ and a series of workshops and performances in Mons, Huy and Brussels completed the programme. New for 2012 was Radio Sonic, an online radio project in cooperation with Radio Campus Brussels presenting interviews, sound creations and festival reports.

3.3.5 Art centres, festivals, workshops and concert organisations

Most art centres, workshops and festivals focusing on experimental music or media art and concert organisations focusing on experimental music have occasionally presented sound works.

Festivals such as Artefact [Leuven], Ars Musica [Brussels], the former November Music [Ghent], Oorsmeer [Ghent], the former MAIIS [Brussels], Verbindingen/Jonctions [Brussels], Courtisane [Ghent] and Cimatics [Brussels] have presented sound art as part of their programme. Since 2011 the festival La Semaine du Son is organised in Brussels. (La Semaine du Son, 2012) In 2003 the Flanders Festival Brussels organised the sound art exhibition *Strings*¹⁹⁰.

¹⁸⁶ In 2002 Limelight Kortrijk and Anno 02 organised small performances in or near gardens within the series Secret Gardens. (Van Campenhout, 2002) Occasionally sound art has been presented in this setting such as the installation from Pierre Berthet & ErikM.

¹⁸⁷ Happy New Ears [Kortrijk] organised Sonokids, a festival day aimed at children from 2003 till 2008.

¹⁸⁸ Interreg project with Partners Art Zoyd [Valenciennes, France], Le Manège [Mons], Le Phénix [Valenciennes, France] (Espace(s) Son(s) Hainaut(s), n.d.)

¹⁸⁹ A smaller trail, consisting of works presented at previous editions of City Sonic[s] and completed with several new site specific works, was organised in Huy in the framework of Dédale, a Biennale of contemporary arts in an urban environment. (City Sonic, 2012)

¹⁹⁰ The exhibition was curated by Joost Fonteyne and Yves Poliart. The participating artists were Alvin Lucier, Pierre Berthet, Pierre Bastien, Ellen Fullman, Paul Panhuysen and ErikM. (Poliart, 2012) (BRDF, 2003)

Art centres such as the Vooruit in Ghent, Argos in Brussels, STUK in Leuven, Netwerk in Aalst, and Z33 in Hasselt sporadically make room for the presentation of sound art in their programme.

Furthermore, workshops such as the former Cargo in Ostend, Timelab in Ghent and Foam, Okno, Lab[au] and Imal in Brussels pay attention to sound art. Since 2006 workshop QO-2 has focused on experimental contemporary music and sound art. QO-2 regularly offers sound artists residencies and exhibits sound works. (Eckhart, 2012) With support from the European Commission, QO-2 and its partners¹⁹¹ have set up *Sounds of Europe*, a project around field recordings. (Sound of Europe, n.d.)

Since its creation in 1996, Transcultures has given residencies to sound artists. After the launch of City Sonic[s] this support became more intense. Since 2010 Transcultures is in charge of European Pépinières¹⁹² for young artists of the French speaking community in Belgium and it also supports other European programmes. (Franck, 2012) The Centre Henri Pousseur in Liège offers occasional technical support to sound artists. (Berthet, 2012)

Concert organisations such as Les Halles de Schaarbeek¹⁹³, the now extinct Cling Film¹⁹⁴, Kraak³ and Les Ateliers Claus regularly have presented sound works alongside concerts of experimental music. Metaphon, an organisation founded by members of Noise-Maker's Fifes after the death of Geert Feytons, has organised a series of performances by sound artists playing on home-built instruments.¹⁹⁵ (Metaphon, 2013)

When Brussels, in 2000, and Bruges, in 2002, were the cultural capital of Europe, specific sound art events were organised. During Brussels 2000, Yves Poliart initiated the Nemo project which brought together artists from Belgium, France and the Netherlands¹⁹⁶, who played home-made instruments. Baudouin De Jaer created a composition for these unique instruments. The project was repeated in Ghent at the Vooruit in 2001. The audience could play most of the instruments after the performance. In Bruges the .WAV sound trail was organised. (see footnote 185 p. 207)

¹⁹¹ Music Technology Group [University Barcelona\$ / Sons de Barcelona, Institute for Sonic Arts Research (Ljubljana) and Creative Research in Sound Arts Practice [University London] (Sound of Europe, n.d.)

¹⁹² A 3 month residency programme at Transcultures in Mons focusing on sound and digital arts (Franck, 2012)

¹⁹³ Yves Poliart worked as a curator for Les Halles for several years and presented amongst other things installations by Brussels-based collective Noise-Maker's Fifes and QO-2. (Poliart, 2012)

¹⁹⁴ Cling Film was a record label and concert organisation focusing on experimental music that existed from 1995 till 2003.

¹⁹⁵ In the future Metaphon will further expand its activities as a record label and will focus on [re]releasing historic electronic music. (Jacobs, 2012)

¹⁹⁶ Pierre Bastien, Pierre Berthet, Jacques Brodier, Claudine Denis, Jean Yves Evrard, Patrice Hardy, Slavek Kwi [only in Brussels], Stichting Logos, Laura Maes [only in Ghent], Noise Maker's Fifes, Les Phônes, Laurent Taquin, Totem Contemporain, Max Vandervorst and Michael Weilacher [only in Brussels]. (Poliart, 2012; Wabbes, 2012)

Cling Film organised a sound installation at Kaapstad with 30 national and international artists¹⁹⁷. Kraak³ and Cling Film presented performances and sound works on the Stubnitz boat and at De Republiek, in the context of the .WAV festival.

3.3.6 Galleries and museums

The same problems apply to Belgian museums and galleries as well as to museums and galleries worldwide. (see p. 169) Contemporary art museums and galleries presenting sound art are still an exception in Belgium.¹⁹⁸ Even fewer museums include sound works in their permanent collection. Some museums have organised an exhibition focusing on sound such as *Images du Son*¹⁹⁹ at Espace Nord 251 in Liège, *Beeldende Muziek*²⁰⁰ at the Provinciaal Museum Hasselt or *Nature et Sons*²⁰¹ at the Château de Seneffe, but those remain exceptions.

We do find sound art in museums where we would not expect it. In the musical instrument museum in Brussels the sound installation *Holosound* from Logos Foundation is permanently on display. (Raes, 2012) (see p. 21)

¹⁹⁷ Four train wagons, each filled with a different set of speakers, were placed in a square-like formation. The following artists participated: AdC~/DaC~, Alejandra and Underwood, Benjamin Dousselaere, Beta-Seed, Casual Coincidence, C-drik, Contagious Orgasm, Crawl Unit, Daniel Menche, Das Synthetische Mischgewebe, Goem, Government Alpha, Guilty Connector, Günter Schroth, Imminent, Jazzkammer, Jonathon Kirk, Kasper T. Toeplitz, Kazumoto Endo, Kevueq, KK Null, Klangkrieg, Laura Maes & Kristof Lauwers, Massimo, MSBR, Roel Meelkop, R.H.Y. Yau, Roeland Luyten, Svstriate, TMRX and Xingu Hill. The installation ran from 9/08 till 1/09/2002 and was funded by the National Agency for the Youth in Action Programme of the European Commission.

¹⁹⁸ Gallery CCNOA in Brussels has presented sound art, curated by Guy De Bièvre, within the program *Earwitness* from 2002 till 2007. (CC Noa, n.d.)

¹⁹⁹ 19/04 – 12/05/1985 with amongst others Paul Panhuysen, Max Eastley, John Rose, Smits, Vannoorden, Julius, Dreyblatt, Niblock, Baudouin Oosterlynck and Logos.

²⁰⁰ 08/06-08/07/1984: Festival Beeldende Muziek with David Gibson, Daniel Goode, Phil Niblock, Tom Johnson, Paul Panhuysen & Johan Goedhart (H. Panhuysen, 1985)

27/04-1/06/1986: Festival Beeldende Muziek with amongst others Max Eastley, Terry Fox, het Apollohuis, Julius, Vivenza and Peter Vogel

1/05 – 06/06/1987: Festival Beeldende Muziek with amongst others Walter Faendrich, Felix Hess, Nina Kramer, Leon Van Noorden, Roberto Ollivero, Nico Parlevliet and Godfried-Willem Raes (Vanhoyland, 2012)

²⁰¹ 27/04-26/10/2008: Baudouin Oosterlynck, Paul Panhuysen, Erik Samakh, Christina Kubisch, Bob Verschueren and Pierre Berthet (Berthet, 2012)

3.3.7 Education

Although some conservatories²⁰² and universities²⁰³ in Belgium are or were equipped with electronic music studios, the border with other art forms such as visual arts is rarely crossed. In art schools more experiment seems to be present²⁰⁴. Although no Bachelor's or Master's degree in sound art is available in Belgium, the art form does get attention in some courses²⁰⁵. However, this is often not structurally embedded in the syllabus and content largely depends on the teacher. (see p.27)

Some colleges offering part-time arts education²⁰⁶ give courses in experimental music. The content of these courses does however depend too strongly on the teacher. Part-time arts colleges in Belgium are currently being overhauled. If sound art, experimental instrument building, intermedia and electronics are introduced to these colleges, then the conservatories, which traditionally provide art college teachers, will have to follow.

²⁰² Studio voor Experimentele Muziek at the Conservatory of Antwerp and a studio at the Conservatory of Mons.

²⁰³ IPEM, Ghent

²⁰⁴ In art schools the focus lays on creation, whereas in most subjects at conservatories the emphasis lies on the performance of existing music. This has led to frustration of music students who wanted to create something new. Richard Lerman was expelled from the music department after expressing his rage about the fact that a composition student had to duplicate instead of create. "When I was in graduate school, I had a big argument with the music department. They wanted me to write down notes on paper. That's what they thought a composer was. I thought a composer was a person who made music and made sounds; I didn't care how that was done. They gave me some exams to write. I wouldn't have minded some of the note-writing, except that they never gave me credit for the music I wrote on tape. So one time they gave me an exam that said, 'write a piece in the style of Brahms, using a German text, for cello, mezzo-soprano, and piano.' And I told them what they could do with the exam."(Lerman, 1987/1993, p. 24)

²⁰⁵ The course in radio at RITS [Erasmus Hogeschool] goes beyond radio and also pays attention to more artistic expressions of sound such as sound installations and soundscapes. (EHB, n.d.) Sint Lucas Ghent offers Visual Arts students the possibility to participate in the Audiowerkplaats, a sound lab under the guidance of Esther Venrooy. (Sint-Lucas Beeldende Kunst Gent, 2013)

²⁰⁶ Deeltijds Kunst Onderwijs

3.4 Conclusion of chapter three

In 1976 Brian O'Doherty described the white cube as the “ archetypal image of twentieth century art”. (O'Doherty, 1976/1986, p. 14) Alan Licht wonders whether perhaps the sonic houses, “a building with several rooms, each occupied by a different soundpiece, perhaps all by the same artist or by several different ones”, are “the future of sound art”. (A. Licht, 2007, p. 117) There is no alternative to the “white cube”, the ideal gallery with white walls freed from conventions and without visual distractions - as described by Brian O'Doherty -, for sound art. The variety of presentation spots has however helped to shape the evolution of sound art and the various shapes it can adopt.

In this chapter we have studied the social-cultural context of sound art. We have looked into the main advantages and disadvantages of the various presentations spots: galleries and museums, alternative locations, public space, non-art museums, sonic playgrounds and specifically built constructions. As most galleries and museums were not conceived to present sound, sound leakage forms a substantial problem as sounds of neighbouring works tend to interfere with each other. The ephemeral character of most sound works does not contribute to their acceptance in institutions traditionally governed by visual arts. The temporary nature of many sound works goes hand in hand with the fear for the intangible and the fact that monetary value is strongly associated with tangible objects. Lastly, the maintenance that is required for sound works that either make an appeal on technology for their operation or that are interactive also forms a threshold to the acceptance of sound art in art museums and galleries. Whereas specifically built constructions resolve the problems of sound leakage and ephemerality addressed above, their number remains limited owing to their complexity, limited flexibility and the high price tag. Public space and alternative locations offer interesting opportunities for sound works as the artists have to take into account and incorporate the already present sonic, visual and environmental elements. The presentation of art outside the traditional art institutions also has an effect on the way the works are perceived and experienced as the works are not always consciously visited but can also be encountered by accident. As a result the fearfulness to touch something or to try something out is much lower than in visual arts institutions.

We have investigated the rise of sound art and we have shown how the societal evolution from object to experience has influenced the content of group exhibitions focusing on sound. In the sixties and seventies much more sound sculptures than sound installations were exhibited. Many of these sound sculptures were based on existing musical instruments, enlarging or modifying certain elements. With the rise of

affordable technology to record and reproduce sound the number of sound installations also increased. The affordability and availability of microcontrollers and sensors enlarged the possibilities and types of interaction. Although sound sculptures are still exhibited nowadays, their presence is less numerous and their place has partly been taken by interactive spatial works. Along with this evolution the set-up of an exhibition changed. Whereas in the seventies a group exhibition focusing on sound could contain mainly muted objects, this would nearly be unthinkable today.

Furthermore, we have provided an overview of the presentation spots and conditions of sound art in Belgium and the education on offer.

To conclude, sound art will continue to challenge the traditional role and operation of museums and galleries. Instead of housing and conserving objects of art, museums and galleries become responsible for the execution of artists' ideas. Rather than tucking away sound works in hallways or staircases, museums and galleries will have to adapt and rethink their infrastructure to present sound works. However, museums and galleries are not the most exquisite locations to present sound art. Alternative locations and public space are a much more fostering environment for sound artists owing to their unique characteristics and external influences.

Chapter 4

Sound art in relation to technique and technology

After marking out sound art, studying its musical precursors and analysing its social-cultural context, in this chapter we will focus on the constructions of the art works themselves and study the technique and technology behind the production, redirection, muffling, reflection and conveyance of sound in sound art. Furthermore, the creative use of natural phenomena in sound art is discussed in detail.

4.1 Innovatory arts

When new techniques are developed, it usually does not take long before they appear in the art world. Laser²⁰⁷ light was discovered in 1960. Swedish artist Carl Frederik Reuterswård began planning works based on laser in 1962. American artists Robert Whitman and James Turrell utilised laser light in gallery museum projections in 1967. (Davis, 1973) Nearly immediately after the introduction of the Sony Portapak in 1965 (Moran, 2013) Nam June Paik acquired one of the first portable video recorders available in the United States and used the new medium in his artwork. (Hartney, 2013)

These new techniques are not always used for the same purpose as the one they were originally designed for. Lev Thermen first used the human body as a part of an electronic circuit to set off a simple, invisible burglar alarm, before inventing an instrument based on the same principle that could generate sounds without touching

²⁰⁷ Light amplification by stimulated emission of radiation.

(Glinsky, 2000) and the first musique concrète utilised turntables as musical instruments not [only] as devices to record or play sounds with. (Manning, 2003)

4.2 Surpassing the gadget

In *Science and technology in art today* Jonathan Benthall quotes Alan Sutcliffe, chairman of the Computer Arts Society founded in London in 1969, who expressed his view on art created with a computer: “I felt that any such work deserved a showing and its author a hearing. No matter how trivial, I thought it was significant that someone had used a computer to make something.” (Benthall, 1972, p. 51) In a later phase, Sutcliffe changed his view and took a more critical line towards art utilising a computer. Jonathan Benthall did not share Sutcliffe’s view as he considers that from all graphic displays and print-outs, film animations, interactive systems, architectural designs, music, verse and so forth that have been created using a computer, “little can be taken very seriously as art per se.”(Benthall, 1972, p. 41).

Nowadays, this opinion is no longer in place as technology has infiltrated most art forms and works utilising technology are being taken seriously.

The most interesting works are often the ones where the actual technical means used are fairly simple and where the originality of the underlying idea gains the upper hand. In 1952, the critic Lewis Mumford compared technology to “the walls of a prison” (Davis, 1973, p. 15) as artists feel obliged to use technology. If a work of art is limited to the demonstration of a technique, its meaning will not last. The danger of a high gadget quality lies just around the corner.

4.3 Technique in sound art

In many sound works technique has an important role. This is no coincidence as the booming of the art form is closely related to the availability of technology to record and reproduce sound.

In this chapter the various techniques in sound art to create sound and the various ways in which that sound can be conveyed will be discussed. Lastly, the redirection, reflection or muffling of sound in sound works will be looked into.

4.3.1 Techniques used to create sound

The sound produced by a sound work can be acoustic, electronic or a combination of both. Sound works should not always produce sound, they can reflect or muffle sound of the audience or of the environment. (see p.251)

In a 1975 article François Baschet, half of the brothers Baschet, pleads for the usage of acoustic sound sources and proposes a musical fountain of which the sound and water jets are controlled by the audience or a musical fountain with grain falling from the ceiling filling oscillating buckets or conveying the sound of crystal. (F. Baschet, 1975, p. 14)

Despite Baschet's plea and the practice of the Baschet brothers, the majority of sound works utilises electronic or electro-acoustic sound sources.

For this chapter sound works are grouped at an initial level according to the nature of the sound-producing material such as distinguished in the Sachs-Hornbostel system: idiophones [body of the material], membranophones [membrane], chordophones [string] and aerophones [air column]. A fifth category, sounds that are produced electronically is added: electrophones²⁰⁸.

²⁰⁸ Sachs added the electrophone category to the Hornbostel-Sachs musical instrument classification system in 1940. This category was divided by Sachs into three subcategories: instruments whereby an electric action takes the place of a former mechanical or pneumatic action, electrically amplified acoustic instruments [electromechanical instruments] and instruments that produce sound based on oscillating electric circuits [radioelectric instruments]. (Sachs, 1940, pp. 447-449, 467) This categorization clashes with the original idea behind the Hornbostel-Sachs categorization, namely a classification based on the sound source. Margaret Kartomi debated that when taking into account the point of departure of the Hornbostel-Sachs classification only instruments "that actually produce sound by electrical means" (Kartomi, 1990, p. 173) can be considered

From each main category as identified in the Sachs-Hornbostel system one type of sound-producing material will be looked at in closer detail and various types of activation of this material will be discussed.

4.3.1.1 Types of activation

In sound sculptures and installations the sound can be activated mechanically, electro-mechanically, pneumatically, electro-pneumatically or electronically.

Mechanic activation

Objects can be struck, plucked, bowed or rubbed, causing vibrations in their material. These vibrations are amplified through a resonator, resulting in movement of air that once it hits our eardrum becomes audible. Sound is generated through a mechanical action and no electricity is involved to translate that action into sound.

This mechanical movement can be generated manually by members of the audience, it can be automated or it can be produced by natural elements such as water or magnetism.

Electro-mechanic activation

If the mechanical movement is actuated or controlled by electricity, the sound is created electro-mechanically.

A distinction can be made between electro-magnetic, whereby solenoids produce static fields or motors generate rotating fields, and electro-static, whereby a force is exerted by an electric charge.

Pneumatic activation

In pneumatic sound sculptures and installations the movement of air causes elements such as flutes, pipes or strings to sound.

Electro-pneumatic activation

If the movement of air is controlled by an electric current for example with the aid of solenoid valves, the sound is created electro-pneumatically.

electrophones. As a consequence electrically driven acoustic instruments and electrically amplified acoustic instruments do not belong in the electrophones category but in that category that corresponds to the initial sound source.

Electronic generation

The sound is generated by means of an electronic circuit, either analogue, digital or a combination of both.

4.3.1.2 Idiophones



Figure 111 Pierre Huyghe's *Sans Titre [Le carillon d'après "Dream" de John Cage]* [1997] (Teerlinck, 2008)

Within the idiophones category plates, staves, bars, bells and so on have all been explored in sound installations and sound sculptures. In some cases these creations still resemble existing instruments. (see p. 191) In Pierre Huyghe's *Sans Titre [Le carillon d'après "Dream" de John Cage]* [1997] 288 aluminium tubes are distributed in space, whereby each of the 47 pans that hold the tubes corresponds to one note of a score by John Cage. (Teerlinck, 2008) These tubes are very similar to wind chimes but for their

tuning and spatial distribution. The same applies to Bruce Fier's *Sounding series* in which elements of existing instruments such as aluminium or brass tubes or rods have been enlarged and rearranged in space. (see **Fout! Verwijzingsbron niet gevonden.**, p. **Fout! Bladwijzer niet gedefinieerd.**) (Halverson, 1982b)

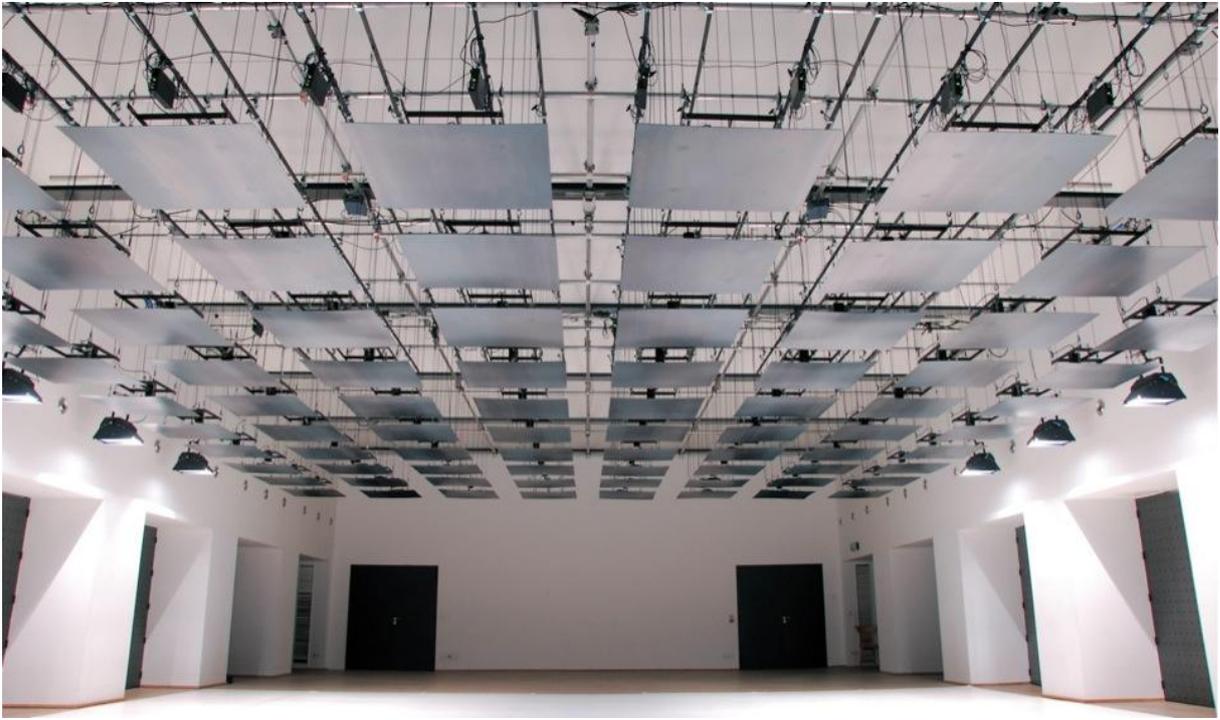


Figure 112 *Staalhemel* by Christoph De Boeck (De Boeck, n.d.-b)



In other cases the sound works are a far cry from existing instruments. In Christoph De Boeck's *Staalhemel* [2009] 80 steel plates form a grid suspended over the heads of the visitors. These steel plates are tapped by small hammers. The speed and spatial placement of the sound depends on the input received from an EEG scanner that measures the brainwaves of the visitor. (De Boeck, n.d.-a)

When the mechanical movement is actuated or controlled by electricity as is the case in De Boeck's *Staalhemel*, the sound options seem inexhaustible as nearly any material, in any form or shape can be brought to sound.

Figure 113 David Byrne, *Playing the Building*, 2009, Roundhouse, London, detail of electromagnet placed on metal pillar @ Laura Maes

This idea has been put into practice by David Byrne. In *Playing the Building* [2005] oscillating motors make metal girders vibrate, while solenoids are used to strike elements such as metal pillars. In addition to motors and solenoids, blowers are employed to force air through electrical conduits or pipes causing flute-like tones. All these elements can be triggered by the audience via the mechanism of the centrally placed organ keyboard.

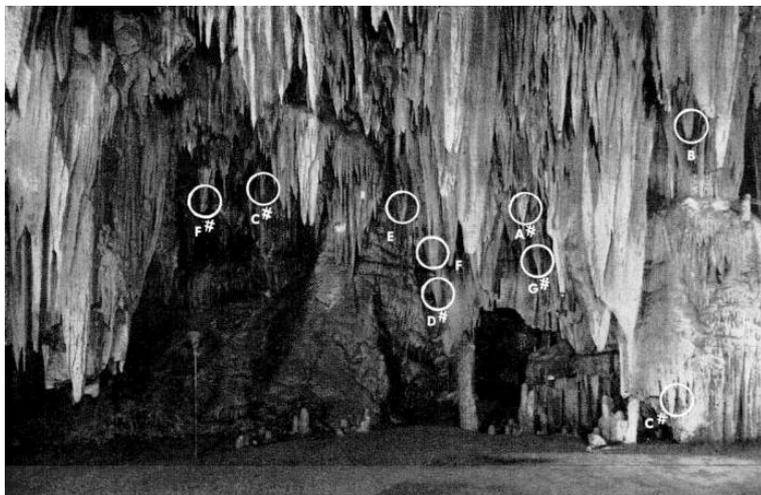


Figure 114 Leland W. Sprinkle, *the Stalacpipe organ*, Luray Caverns, Virginia (Wood, 1957, p. 128)

Not only human made architecture has been converted into a sound work, but also spaces created by nature. In the fifties, Leland W. Sprinkle carefully selected 37

stalactites at the Luray caverns in Virginia, United States for their acoustic properties. The length of each stalactite was adapted by Sprinkle in order to reach the desired pitch. Each stalactite is played by a rubber-tipped plunger triggered by a solenoid, attached to a neighbouring stalactite to not dampen the sound. The stalactites²⁰⁹ can either be actuated manually by playing an organ keyboard or automatically by turning a plastic belt, placed over an aluminium cylinder, into which holes have been melted. (Wood, 1957)

As the above examples demonstrate, all sound-producing materials can in principle be present in sound art. Yet, some type of sound sources are far more explored than others. One of the most explored materials within the idiophones category are rods. The transverse vibrations of these rods are much more complex than for example longitudinal vibrations. This is illustrated by looking at the first overtones of a bar clamped at one end and free at the other. If f_1 is the fundamental, the first overtone has a frequency of $6.27f_1$, while the second overtone has a frequency of $17.55f_1$. (Backus, 1977, p. 72) It is exactly this rich non-harmonic overtone spectrum that makes rods interesting to sound artists.

²⁰⁹ The mechanical tapping of stalactites dates back to the Stone Age. Belgian archaeologist Lya Dams conducted a study of musical stalactites. In the cave system of Nerva, near Malaga Dams's team found that several stalactites carried marks of colour and that the length of some stalactites had been intentionally shortened in ancient times, presumably to vary the sounds. The edges of the folds indicate traces of percussive usage over a certain period of time. (Devereux, 2001)

Mechanic activation

Most interactive sound sculptures by Bernard and François Baschet, are based on the principle of the nail violin whereby metal or glass rods are clamped on one side to a metal solid block [usually up to 1 cm thick]. When the audience touches the rods, either directly or with the aid of a mallet, a keyboard or a typewriter, the small vibrations that are caused in this way are transferred to the metal block where they accumulate and are then transferred to one or more flexible loudspeaker-like radiators in steel, stainless steel, duraluminium, cardboard, plastic or fiberglass or to inflated plastic bladders. (see p. 115) (F. Baschet, 1999)

As the brothers Baschet, Harry Bertoia created numerous sculptures based on the principle of the nail violin. Bertoia gave this large collection of sounding sculptures an umbrella name²¹⁰: *Sonambient*. (see p. 52) These *Sonambient* sculptures came to existence by coincidence. In the Art Gallery Catalog, Marshall University, 1977, Bertoia states: “I accidentally struck one rod when I wanted to bend it. The sound echoed in my mind for a very long time. Then it initiated a deliberate gesture in search of understanding what a group of wires would do – and that process is still going on.” (Schiffer & Bertoia, 2003, p. 177)

Bertoia got the idea to create a sound sculpture out of several standing rods in 1959. In the sixties he produced over a 100 of them. (Schiffer & Bertoia, 2003) Rods of different metals²¹¹ - to create different timbres - are vertically mounted and clamped on a flat metal base. The surface on which the base is placed serves as a resonator. When the tips of the metal rods are gently struck by the audience (Aesthetic Research Centre of Canada, 1973), the rods bump into each other and cause sound. These sounds vary dependent on the material, the length and the thickness of the rods, the type of pedestal on which the rods are mounted and the spacing between the rods. In some sculptures the rods have weighted tops that give rise to more bell-like sounds. (Schiffer & Bertoia, 2003)

²¹⁰ In a 1957 interview with John Willenbecher Harry Bertoia states: “Occasionally I have given titles, but they have been given on demand from Museums or galleries who asked for titles, so I made an effort and gave them titles.” (Schiffer & Bertoia, 2003, p. 8)

²¹¹ “bronzes (silicone, tobin); beryllium copper; nickel alloys; monels; and the newer alloys of similar quality” (Bertoia, 1975, p. 20)

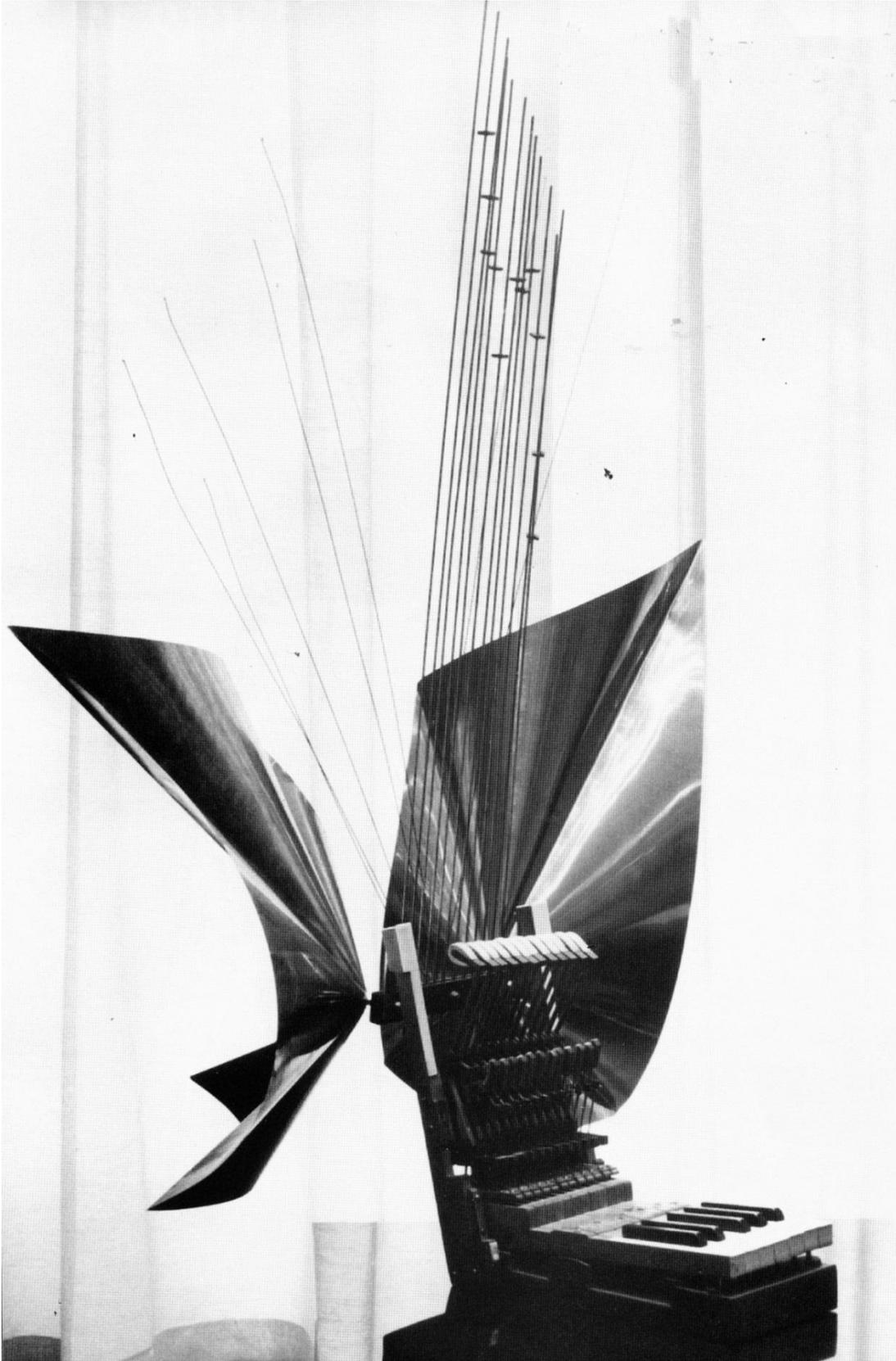


Figure 115 Bernard and François Baschet, *one octave piano sculpture*, 1965, Waddell Gallery, New York The whiskers produced out of piano strings are only attached at one end and function as sympathetic strings creating reverb and overtones. (F. Baschet, 1999, p. 111)

Although the fundamental of long metal rods is subsonic, an array of audible overtones appear.



Figure 116 Left: Harry Bertoia, sound sculpture with seven rows of seven rods [early 1970s] (Schiffer & Bertoia, 2003, p. 182)

Figure 117 Right: Harry Bertoia, sounding sculpture on a square base with four rows of four straight rods and thick weighted tops, copper finished rods and green bronze base (Schiffer & Bertoia, 2003, p. 188)

In 1968-69 Bertoia renovated a barn on his property to house his sound sculptures as well as a recording studio. The *Sonambient* sculptures were not only exhibited but also served as musical instruments. Their sound graced several *Sonambient* records.



Figure 118 View of sound sculptures within the barn [1970s] (Schiffer & Bertioia, 2003, p. 210)

Throughout the years technical improvements focusing on the way the rods were attached to the base were made. In the earliest sounding sculptures the rods were soldered onto the base plate through a cross-mesh screen, whilst in the late 1960s they were soldered directly onto the brass base plate without holes. Around 1970 holes were added to the base plate and by 1972 the holes had been countersunk in order to let the solder flow around the rod. (Schiffer & Bertoia, 2003) These improvements mainly had an impact on the sculpture's sturdiness, not on its sound.

In addition to Harry Bertoia and the brothers Baschet various other sound artists used rods in their work.



Figure 119 Reinhold Pieper Marxhausen (Grayson, 1975, p. 68)

Reinhold Pieper Marxhausen created miniature versions of the nail violin that have to be placed on the head of the listener. The sounds are only audible to the person striking or moving the object. (Grayson, 1975, p. 68) (Aesthetic Research Centre of Canada, 1973)



Figure 120 Detail of the inside of *Balapluie* by Eric Van Osselaer, City Sonics, 2007, Mons, Belgium @ Laura Maes

In *Balapluie* by Eric Van Osselaer the rods are not touched directly by the audience, but through marbles. *Balapluie* consists of a large wooden rectangle that resembles a seesaw. Walking on the rectangle sets the marbles located inside the *Balapluie* into motion. The marbles bump into metal spikes and rods creating sounds similar to the Native American rain stick. (Van Osselaer, 2004)

A similar principle is employed by Ned Kahn's *Pebble Chime* [2006] that uses pebbles instead of marbles to let the rods in the shape of stainless steel nails sound. Instead of wood, such as in the *Balapluie*, a perforated stainless steel structure in which the nails are pressed is used as a resonator. (N. Kahn, 2012a)



Figure 121 Ned Kahn, *Pebble Chime* [2006], Milwaukee Waterfront, Milwaukee, United States (N. Kahn, 2012a)

Electro-mechanic activation

Electro-magnets or motors can also activate rods as is the case in Godfried-Willem Raes's *Toypi*, an automated toy piano whereby the rods are directly activated by solenoids. (see p.385)

Pneumatic activation

Besides being mechanically activated by the audience, some of Bertoia's *Sonambient* sculptures were activated by the wind. (Schiffer & Bertoia, 2003)



Figure 122 Harry Bertoia, *tonals for Standard Oil*, Chicago, United States [1975] (Schiffer & Bertoia, 2003, p. 187)

4.3.1.3 Aerophones

In aerophones sound is produced by using air as the primary vibrating means. This vibrating body of air is enclosed in a hollow tube or other form of air chamber. Nearly all types of aerophones have been explored in sound art, but the largest group are [organ] pipes. Since the early development of sound sculptures and sound installations the ancient trade of organ making has formed a source of inspiration for many sound artists. Not only because of the impressive sounds an organ pipe can produce, but also because of the monumental nature of organ pipes and the religiously charged image of the organ in the Western world. The pipes used in sound works come in various shapes, sizes and materials. The material of the pipe itself is mostly metal, bamboo or wood. The body of the pipe generally takes a cylindrical, conical, or rectangular shape. The end of the organ pipe can be either open or closed. Two basic types of organ pipes can be distinguished: flue pipes and reed pipes. In flue pipes pressurized air enters the pipe through the foot-hole at the base of the pipe. The air is forced out through the slit. As a result the pressure inside the pipe decreases and air is sucked back into the pipe, creating a standing wave. In contrast to flue pipes reed pipes have a moving part, generally a brass tongue. When pressurized air is blown into the pipe the tongue is set into vibration against a hard surface, the shallot. The produced sound is reinforced by a resonator, in most cases a flared pipe. In the free reed pipe this tongue does not beat directly against the shallot, but beats through the shallot. The diaphone or valvular reed is the most complex mechanism. The pressurised air is admitted through the bore. As a result the thin vibrator and the pallet-like disc attached to the free end of the vibrator is set into motion. Consequently, rapid and regular successions of puffs of air are admitted into the organ pipe. (B. Owen, Williams, & Bicknell, 2013) Although all types of pipes and newly invented pipes have been used in sound art, the most common one is the flue pipe.

The air in the pipe is excited into vibration by either natural wind, air compressed by water or air brought to swing by burning gas flames, steam, bellows, vacuum cleaners, balloons, air compressors or mechanical movement.

Pneumatic activation

Natural wind

In Douglas Hollis's *A Sound Garden* [1983], permanently installed at the National Oceanic and Atmospheric Administration [NOAA] campus overlooking Lake Washington in Seattle, the pipes of various lengths are brought to sound by wind. Twelve steel-truss towers, each more than 6 meters tall, support vertical aluminium cylindrical pipes mounted on vanes that move to face the wind. As the wind blows, each vane turns and pushes the pipe windward, producing a deep resonant sound. (J. Kelly, 1985; Roots, 2002)

Douglas Hollis builds his pieces on the site itself. He aims to merge viewer and artwork by incorporating the viewer as well as wind, water, light and topography. “I have attempted in my work to build structures which function as sensory extensions of the body, incorporating the person into the landscape.” (Halverson, 1982b, p. 19) The surroundings contribute to the atmosphere the work of art radiates and to the way it is experienced. In the creation of a site-specific sound work, the artist treats a complete space as one situation that can be entered by the visitor.



Figure 123 *Singing Ringing Tree* [2006] by Mike Tonkin and Anna Liu, near Burnley, United Kingdom (Tonkin Liu, 2011)

A similar type of pipe is used in the *Singing Ringing Tree* [2006]. This sound sculpture - designed by architects Mike Tonkin and Anna Liu - is located on a hill overlooking Burnley in the United Kingdom. The three meter tall sculpture is constructed solely out of galvanized steel cylindrical tubes with a diameter of 114 mm. Twenty-one layers of tubes, 320 in total, are stacked onto each other. Only 25 pipes actually produce sound, covering a range of several octaves. The sound producing pipes are located towards the top of the sculpture as to optimally take advantages of the wind that can attain speeds of 160km/h at that location. Each of these pipes has a different length and therefore produces a different pitch. In contrast to the pipes with solely a visual function, the sound producing pipes are closed at one end and at the underside of each of these 25 pipes a narrow slit of 200mm is situated, not width wise as in a flue pipe, but in the length of the pipe. The length of the sound producing pipes varies and as a consequence

so does the pitch. In contrast to Hollis's *Sound Garden*, the tubes are fixed and are angled at about 12 degrees to face the most frequent wind direction. (Birch, 2007) Therefore the quality and volume of the sound highly depends on the wind direction.

The pipes can also be made of natural materials such as wood or bamboo. The Aeolian bamboo organ is no modern invention but can be traced back to the tribes in the South-East of Asia and on the Pacific islands. (Fischer, 1974) The *Wereld-Windorgel* [*Worldwindorgan*] by the Mass and Individual Moving foundation is a contemporary interpretation of the Aeolian bamboo organ and it exists in several forms. (Stichting Festival Arnhem & Stichting Filmweek Arnhem, 1985) A permanent version of the organ, initially installed in 1975 (Provinciale Zeeuwse Courant, 1975), but after destruction by storm (Provinciale Zeeuwse Courant, 1976) and vandalism (Provinciale Zeeuwse Courant, 1981) a third version was installed in 1983 (Provinciale Zeeuwse Courant, 1983) at the Nolledijk in Vlissingen, the Netherlands. The organ consists of 30 bamboo pipes set up in a way that the audience can walk in between the pipes. Each bamboo pipe has several holes, The sound holes are aligned in different directions to allow sounds to emerge wherever the wind would be coming from.

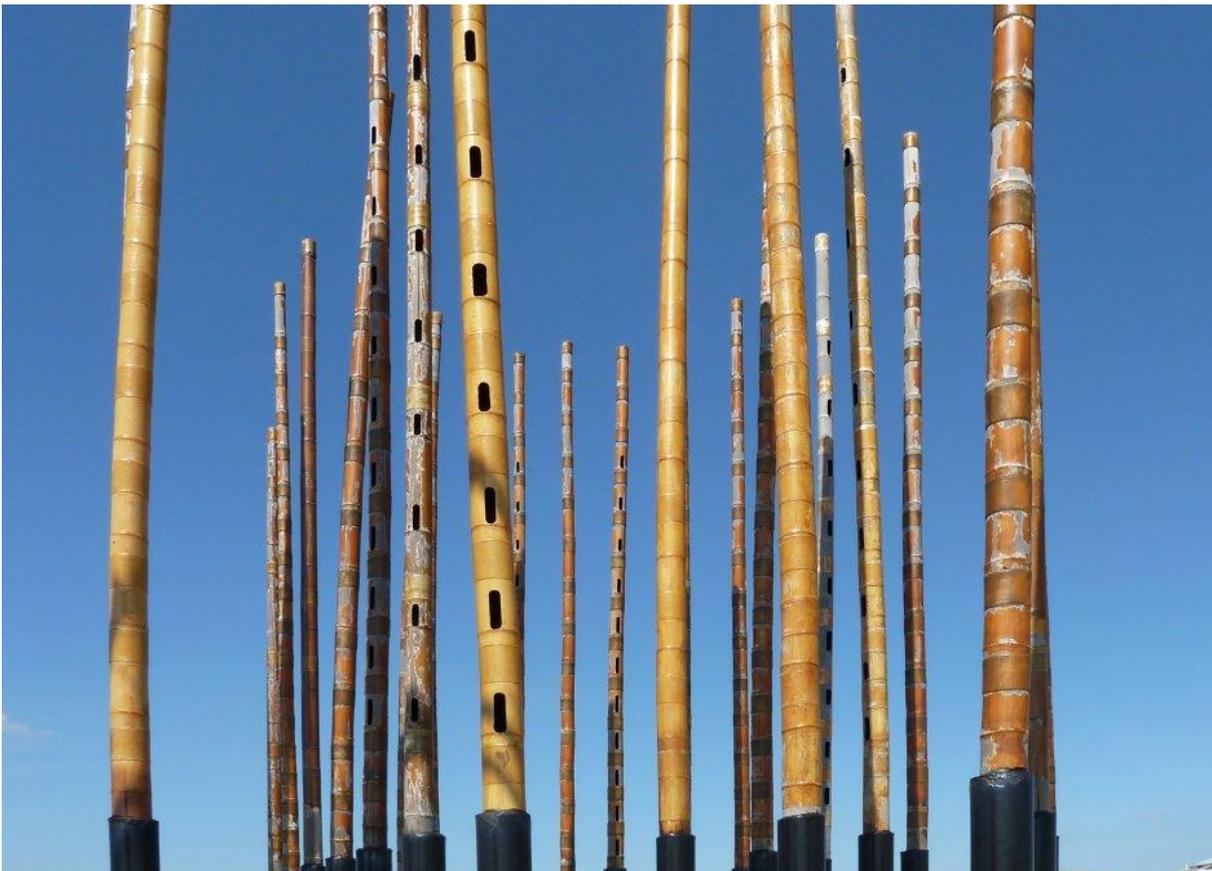


Figure 124 *Windorgel*, Vlissingen, the Netherlands (ZeelandNet, 2013)

Water

Several artists made works in which pipes are activated through air compressed by water. Just as the ancient water organs (see p.120), these contemporary water organs play without human intervention and are permanently or semi-permanently erected.

Along the Mediterranean Sea, in Zadar, Croatia, architect Nikola Bašić installed his sea organ in 2005. The sea organ's mechanism cannot be seen as the 35 pipes are placed underneath stone stairways. Each organ pipe is blown by a column of air. This air is compressed by a column of wave-moved water through a plastic tube which is partly immersed under the sea surface, while the other end of the tube is attached to the foot of a stainless steel organ-type square profile. Nikola Bašić opted for stopped flue pipes because of their rounded timbre and their reliability in an aggressive sea environment. All the pipes are made of stainless steel square profiles.

In the stone stairways notches are made through which the sound reaches the public. The sea organ is about 70 meters long and is divided into 7 sections, each containing five pipes arranged with on average 1,5 meters spacing between each pipe. Each section of five pipes is tuned to either D, G, d, g, h [odd sections] and C, G, c, e, a [even sections], respectively. (Stamac, 2005)

The outcome of the played tones of the sea organ cannot be predicted as it depends entirely on the strength of the waves.



Figure 125 Liam Curtin and John Gooding, Blackpool high tide organ, Blackpool, United Kingdom (Curtin, n.d.)

Although the Zadar Sea organ is often presented as the first sea organ, this is definitely not the case. Another pipe organ activated by waves is the *Blackpool High Tide Organ* by Liam Curtin and John Gooding installed in May 2003 as part of The Great Promenade Show, a series of sculptures situated along Blackpool's New Promenade. The 15 meter tall tidal organ is constructed in core-ten steel. Under the sea, attached to the seawall, eight high density polyethylene pipes are located. Each of these pipes leads to two or three copper pipes. On its turn each copper pipe is connected to an organ pipe made from zinc

and spotted metal, a lead tin alloy. Behind the organ pipes a parabolic surface clad in copper sheet is positioned to reflect the organ sound. The 18 organ pipes are tuned to the harmonic series in B flat. (The great promenade show, n.d.) The principle is similar to the Zadar sea organ. The swell of water at high tide pushes air up the eight seawall pipes and causes the eighteen organ pipes to sound. In contrast to the Zadar sea organ the organ pipes are grouped and not spread around the site.

The *Wave Organ* [1986], located on a jetty that forms the small Boat Harbor in the Marina district of San Francisco by Peter Richards in collaboration with sculptor and stonemason George Gonzales produces far less conventional sound than Zadar's sea organ and Blackpool's high tide organ. Although the principle is similar, Richards makes use of tubes made of PVC and concrete. On the jetty the extremities of these 25 plastic tubes pop up out of the concrete and the stones. Each tube serves as a sound chamber bearing a column of air activated by waves. The pitch of the sounds depends on the length of the air columns. (Exploratorium, 2013d)



Figure 126 Peter Richards & George Gonzales, *Wave Organ*, Marina district, San Francisco, United States (Exploratorium, 2013d)

The organ pipes do not have to be made out of metal. Trimpin created *Sheng High*, an installation based on the Chinese instrument sheng. *Sheng High* consists of 30 bamboo pipes, each with a tuned reed, that are distributed in space. The spectrum of all pipes reaches over two octaves. Each bamboo pipe hangs from a bamboo tripod above a container filled with water. When the bamboo pipe is lowered or raised into the water, the air compressed by water is pushed over the reed and makes it sound. The mechanism to raise or lower the bamboo pipes is controlled by 30 infrared sensors, one for each bamboo pipe. These sensors read a graphic score created with recycled CDs, mounted on the gallery wall. The shiny side of the CD activates the sensor. (Trimpin, 2011c)



Figure 127 Trimpin, several bamboo tripods and part of the CD-wall of Sheng High (Trimpin, 2011c, p. 138)

Burning gas flames

Gas organs do not make use of pressurized air in order to produce sound. Instead, warm air that rises through heat resistant pipes generates sound. At a certain temperature a

more beautiful and richer sound is created. Since sounds are produced by the movement of flames, it is not possible to play fast tunes. (Tadagawa, 1988)

In 1802 Bryan Higgins reported the phenomenon of the singing flame - an effect which Higgins first observed in 1777 - in the *Journal of Natural Philosophy, Chemistry and the Arts*. He positioned glass tubes over a flame produced by burning hydrogen gas and discovered the resulting sound. The sound changed depending on the width, length and thickness of the glass jar or sealed tube. (B. Higgins & Nicholson, 1802) Nearly a century later physicist Georges Frédéric Eugène Kastner published *Les Flammes chantantes* in which he describes his fire organ, the *Pyrophone*, that was presented at the Royal Institution in London at the 13rd of January 1875 (Kastner, 1876) and is currently part of the collection of Musée historique in Strasbourg, France. (Association la flamme Européenne du gaz, 2012)



Figure 128 Andreas Oldörp, *Singende Flammen* [1988], air-raid shelter Hans-Albers-Platz, Hamburg, Germany (Oldörp, n.d.-a) @ Poul Næs

As shown above fire organs are far from a recent discovery. Inspired by the fire organ of Kastner, Andreas Oldörp created his own version. The standard city gas that was used by Kastner is no longer produced because of its high level of poison. Oldörp used hydrogen in his first experiments. Although hydrogen produced an intensive sound, very little light was generated. Oldörp

continued to experiment with other gas mixtures and gases with a higher carbon content until he got a satisfying result, both in sound and light. Nowadays, Oldörp utilises diverse gases such as hydrogen, propane, butane and methane. Sound and light change depending on the gas used. (Schwind, n.d.) The usage of gas to activate organ pipes is appealing to sound artists. The image, resp. the flames, and the sound, resp. the organ-like tones are directly linked to each other.

In several of his installations with singing flames, Oldörp distributed the elements in space. In *Singende Flammen* [1988] created for the air-raid shelter underneath Hans-Albers-Platz in Hamburg, Oldörp installed nine gas burners, each equipped with a glass tube of the same length but with a different diameter. They were placed at regular distances from each other, taking into account the tripartite structure of the space, throughout the 53 meter long narrow passage. The visitor heard a different mixture of

the continuous tones depending on his or her position in the corridor. These singing flames have in common with organ pipes that they are sensitive to changes in temperature, humidity and air pressure. (Steffens, 2002) (Oldörp, n.d.-a)

In order to adapt the continuous tones and to create a less static sound experience, the gas supply of each Bunsen burner has to be variable. In 1993 when Trimpin was an artist in residence at the Pilchuk School of Glass, he had access to colourful Pyrex glass in different shapes and forms. In his *FireOrgan* Trimpin computer-controlled the Bunsen burner inside each Pyrex cylinder in order to vary the size and intensity of the flame. As a consequence not only the organ-like tones change with the flame, but also the light varies between orange, yellow and blue. (Strouse, 2006/2011) The organ can be operated by computer or keyboard. (Trimpin, 1994)



Figure 129 Trimpin, detail of *FireOrgan* (Trimpin, 2011a, p. 75)

Steam

Throughout the years Andreas Oldörp has created several installations fuelled by steam. These works resemble the *Calliope*, a steam blown mechanical organ, patented in 1855. Calliope organs could frequently be found on riverboats. When a key of the keyboard was pressed pressurized steam was shot from the pipes through brass whistles. The resulting sound could be heard over 16 kilometres away. (Kenney, 2005)

Gossip [2001], an installation by Andreas Oldörp, is also based on the usage of steam to blow organ pipes. To create the steam Oldörp heats up water in closed glass bulbs with a methane gas flame. The resulting steam is led via flexible hoses to the organ pipes. The



condensing water in the tubes makes that the steam does not always directly reaches the organ pipe and takes up the function of a valve. (Steffens, 2002) As the condensed water flows back into the glass bulb, it temporarily seals off the oncoming steam and the organ pipe becomes silent. As a consequence no continuous tone is created such as in the singing flames.

Figure 130 Andreas Oldörp, *Gossip*, Klangkunstforum, Berlin, 2001 (Oldörp, n.d.-b)

Mechanical movement

The air can be excited into vibration through a mechanical movement such as the vertical pipes, erected in a radial formation and tuned to a two octave pentatonic scale by Bill and Mary Buchen. The air is brought to vibrate when the open ends of the pipes are slapped with the provided beach sandals or the flat of the hand. The pipes can also be excited pneumatically, by natural wind. *Slapped pipes* is based on the hollowed out bamboo tubes that could be found in bamboo groves in the Solomon Islands of Micronesia and were activated in a similar way. (Sonic architecture, 2012)

Balloons & bellows

The pressurized air to make organ pipes sound can also be delivered by balloons or bellows, vacuum cleaners and air compressors.

The usage of balloons to activate pipes in sound works is rather rare. This is no coincidence. Although balloons can form interesting visual elements, they are very hard to automate. In the few cases balloons have been used, it involved the non-automated version.

Australian artist Rodney Berry used weather balloons with a diameter of more than two meter to let PVC organ pipes sound. The balloons are distributed in space and can deliver air to the pipes for up to 90 minutes before the balloons are deflated and need a

refill. As the balloons provide a continuous air supply, the organ pipes constantly sound. As the diameter of the balloon decreases, different harmonics will sound and a very gradual glissando is obtained. (Berry, n.d.)

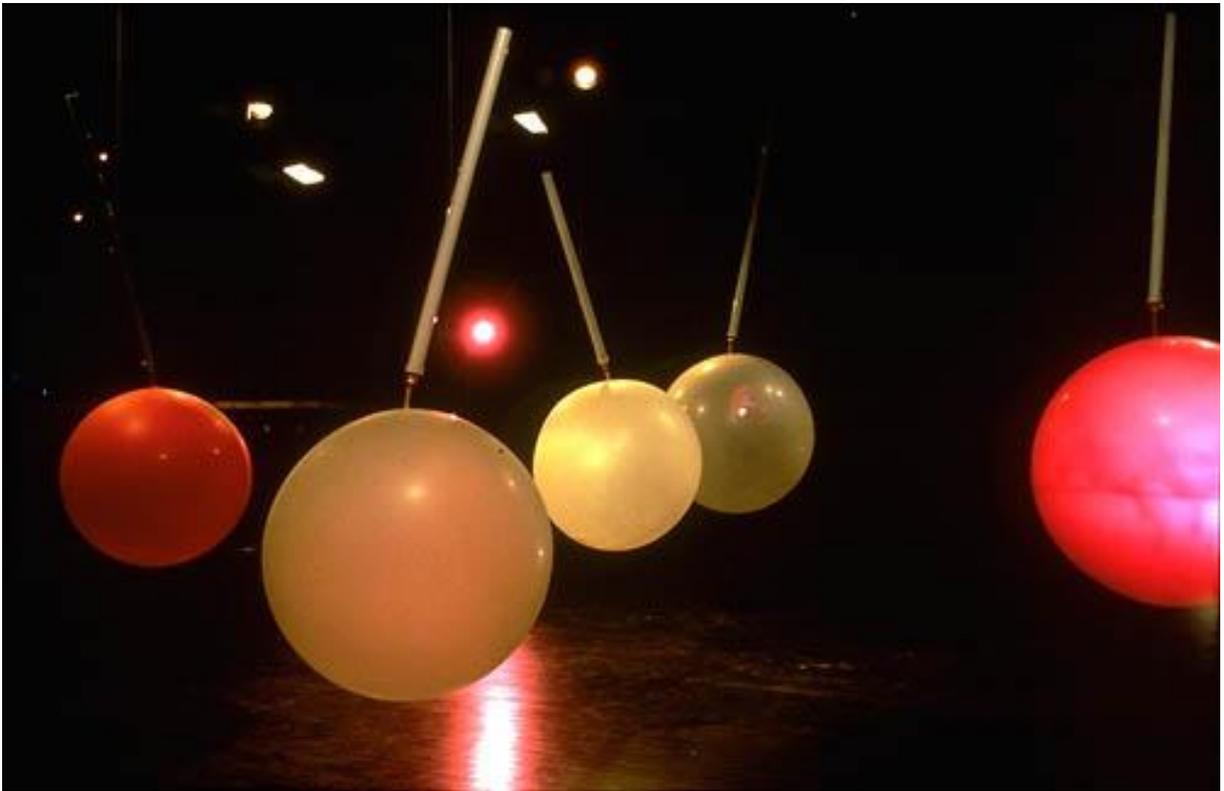


Figure 131 Rodney Berry, *Vital Organ* [1986] (Berry, n.d.)

A bellow is a more convenient way to provide air to the pipes. In *Balaplay* by Eric Van Osselaer the bellow is activated mechanically. As the visitor walks from one side of the *Balaplay*, that takes the shape of a large wooden balance, to the other the bellow located underneath the balance is pressed and the hidden flue pipe inside the balance is brought to sound. (Van Osselaer, 2004)

Electro-pneumatic activation

Vacuum cleaners, air compressors

A bellow can also be used as an intermediary between the pipes and an electrical blower such as a vacuum cleaner or an air compressor. Like balloons, bellows are interesting visual elements and they can be found in a variety of shapes and sizes in sound works.

In *Pneumaphone* by Godfried-Willem Raes the bellows take the shape of large tetrahedron air pillows and are directly pressed by the audience. The air to the bellows is provided by a low pressure air compressor. (see p.106)

Instead of an air compressor, a budget solution is to use a vacuum cleaner to provide air to the organ pipes. In the fountain the brothers Baschet created for the University in

Mexico the wind was produced by an old vacuum cleaner hidden in the cellar. (F. Baschet, 1994)

Electrical blowers can be used to activate a pipe directly without an intermediate bellow. The Dutch artist Hans van Koolwijk made a unique work driven by low pressure air compressors. The visitor can literally step into a pipe with a length of 16 meters and a diameter of 1,9 meters, and experience the turbulent vibrations of the air that is blown in from the side opposite the entrance. Van Koolwijk sends very low frequencies into the pipe, the sound cannot only be heard but especially felt. The effect is not equal throughout the tube but is at its strongest at the labium. (see Figure 107, p. 203) (Musica, 2012b; Van Koolwijk, n.d.-a)

4.3.1.4 Chordophones

In chordophones the sound is produced by vibrating strings. Long-string installations have been vastly explored in sound art. Not only the spatial dimensions of long strings, but also their sound characteristics are appealing to sound artists. As the diameter of the string remains and the length of the string is greatly increased, the tension is less than in conventional string instruments such as the piano or guitar. The fundamental and the lowest overtones disappear while the normal and higher overtones become more accessible. (Davies, 1987) Rather than transverse vibrations of the string, the longitudinal waves, namely the expansion and contraction of the length of the string, are amplified in long string installations.



Figure 132 George Smits, Long string installation utilizing Styrofoam / polystyrene resonators, The Apollohuis, 1984 @ Peter Cox (P. Panhuysen, 1987d, p. 118)

Strings can be bowed, plucked, struck, hammered or be set in vibration through electromagnetism, speakers, wind or water. Different types of strings have been employed in long string installations: steel piano wire, parcel string, monofilament nylon [developed in the fifties for fishing], dental floss, extruded latex [rubber], cotton, waxed wool, steel packing tape, iron wire, various sorts of twine, brass wire, bronze and stainless steel strings. (Davies, 1987, p. 14) (Fullman, 1987; P. Panhuysen, 1987c, p. 105) (Fullman, 1987,

p. 32) (Fullman, 2012)

A vibrating string produces little sound by itself as it is too narrow to move much air. In most acoustic instruments the string passes over a support, a wooden bridge, that is mounted on a wooden soundboard. The vibrations of the strings are communicated via the support to the soundboard. The sound of long strings can be amplified in a similar way. The strings can be attached to architectural elements that amplify their sound acoustically. Balloons, Styrofoam and metal objects such as containers or sheets can be used as a soundboard. Besides these acoustic resonators, the sound of the string can also be electronically amplified.

In many cases long-string installations have multiple functions. The same set-up can be presented as an installation and be used as a musical instrument in a performance.

Pneumatic activation

Wind



Figure 133 Gordon Monahan, *Long Aeolian Piano* [1984], Holownia-Hansen Farm, Jolicure, Canada (Monahan, 1984)

Long strings can be activated by natural wind²¹², reminiscent of the Aeolian harp, an instrument dating back to ancient Greece in which strings are played by the wind. Dependent on the wind-force and direction the harmonic content of the sounds changes constantly. In most cases new versions of the Aeolian harp incorporate electronic amplification (see p. 109), although several acoustic versions have been made.

For *Long Aeolian Piano*, an outdoor installation by Gordon Monahan first developed in 1984, 30 meter long piano wires, oriented at 90 degrees to the prevailing wind, are stretched horizontally. These wires are brought to vibrate by the wind and are strung through the soundboard of an upright piano. At the other end the strings are secured to peg boards. Although the generated sound resembles electronically produced sounds, the installation is completely acoustic. The soundboard of the piano serves as a

²¹² In theory, long string installations could also be activated electro-pneumatically although this has been far less explored.

resonator and the predominant audible tones produced by the wind harp are between 400 and 2000 Hz [the 20th to 100th partial²¹³ of the fundamental frequency of the string]. (Monahan, 1984; Stewart, 2005)

Besides a piano other resonators can be employed. Max Eastley worked with metal resonators (Eastley & Kelley, 1997) while Mario Ciccioli mainly works with plywood resonators for his long string installations. (Istituto Gramma-l'Aquila, 1990)

Mechanic activation

Water

Gordon Monahan has also adapted the Aeolian harp to be played by water instead of wind. In *Aquaeolian Music Room* [1991] sounds are generated by the movement of water over 35 meter long piano wires anchored into the Wupper river. The ends of the wires, emerging from the water, are attached to aluminium sheets that are part of an aluminium and Poly[methyl methacrylate] listening cabin that functions as a resonator. As in Monahan's *Long Aeolian Piano* the sounds are only acoustically amplified. (Monahan, 1991; Stewart, 2005)

Audience

Since 1982 Paul Panhuysen and Johan Goedhart have created numerous long string installations together. Their work is often presented in public space or alternative locations. Architectural highlights are emphasized through the placement of the strings and become part of the art work. The strings cannot be experienced separately from their surroundings. (P. Panhuysen, 1987c, p. 104) As Panhuysen states: "A space always evokes a statement in me. There's always a dialogue. Sometimes a space is so beautiful that I just want to pay tribute to it, just want to emphasize its structure. Sometimes we like to change the idea of a space ... " (P. Panhuysen, 1993, p. 133)

In some of their long string installations Panhuysen and Goedhart attached the strings to musical instruments such as a piano. The strings are brought to sound through a mechanical action, touched by a person. The sounds are amplified through either electric guitar pick-ups (Raes, 2013) or in a later stage electret microphones hung on the strings with plastic thread, an amplification system developed by Leon van Noorden, or piezo-discs. (P. Panhuysen, 1987c)

²¹³ Although the partials of strings are often called harmonic, this is not the case.

Electro-mechanic activation

Electro-magnets

Together with the audience playing the strings of the long-string installations by Paul Panhuysen and Johan Goedhart electro-magnets were used to tap the strings as long as the signal remained below a previously set level. Panhuysen marks that a huge disadvantage of this type of automation were the clicks produced by the electro-magnets when switched on and off²¹⁴. (P. Panhuysen, 1987c)

Motors

Another type of automation of the installations by Panhuysen and Goedhart consisted of motors. Steel flaps rotate on the axes of fairly large motors with reduction gears and alternately strain and release the strings. In a later phase smaller motors, namely cassette recorder motors, were used as they are much more silent. The turning speed of the motors could be regulated. The motors were equipped with various types of materials amongst which rope, elastic, metal wire, nylon and plastic. The position and place of the motor in relation to the string directly influenced timbre and pitch. (P. Panhuysen, 1987c)

Speakers



Figure 134 Pierre Berthet, *Un haut-parleur prolongé* [2003], galerie Surge, Tokyo (Berthet, n.d.-b)

Speakers can also bring a string in vibration. This technique has been explored by several sound artists amongst others Pierre Berthet and Jason Kahn. Electronically created or amplified sound is emitted from loudspeakers - in Berthet's case loudspeakers without a membrane²¹⁵, in Kahn's case piezo-elements - affixed to steel wires. At the other end the steel wires are connected to metal cans that function as a resonator and amplify the sound. (J. Kahn, n.d.) (Berthet, n.d.-c)

²¹⁴ The produced clicks were not only caused by the mechanical movement (see *Ijspaais* p. 304), but also because the e-guitar pick-ups picked up the inductive spikes from the solenoids.

²¹⁵ The loudspeaker thus becomes a moving coil driver.

Electro-magnetic

Alvin Lucier's *Music on a Long Thin Wire* [1977] operates in a similar way as Berthet's installations, but the components of the speaker have been disassembled and the magnet is placed over the metal wire while the wire, extended across the room, is affixed directly to an amplifier.

The end of the wires, placed over a wood, metal or other resonant bridge, are tightened with clamps to table tops or similar platforms and are routed to the outputs of an amplifier, creating a current-carrying loop. At one end of the wire a magnet is positioned so that the wire passes between the poles of the magnet. A sine wave oscillator is connected to the amplifier. The string is set in vibration owing to the interaction between the current in the wire and the magnetic field created by the magnet positioned over the wire. (see *Aeio*, p. 383) On each bridge a contact microphone is attached to amplify the sound produced by the string. The vibrations of the string change depending on the amplitude and frequency of the sine wave oscillator (Lucier, 1977/1995) *Music on a Long Thin Wire* has been presented both as a performance as well as an installation. (Delahanty, 1981)

4.3.1.5 Membranophones

In membranophones the sound originates from the vibration of a stretched membrane or skin, in most cases stretched across a resonator.

Membranophones can be struck or rubbed, but the membrane or skin can also be brought to vibrate pneumatically or electro-pneumatically. Natural base materials such as rubber, synthetics such as Polyethylene terephthalate, metal such as brass or animal skins or bladders can be used as a membrane.

Membranophones are the least explored category of the Sachs-Hornbostel system in sound art. As it is difficult to precisely automate the tension of clamped elastic materials, the membranophones found in sound art are mainly automatisations of drums.

Electro-mechanic activation²¹⁶

Stephan von Huene's *Drum*, commissioned in 1974 for the Exploratorium museum in San Francisco and reworked in 1992, consists of 32 hammers that can be electronically programmed to beat the acrylic membrane. The sound sculpture can reach a maximum

²¹⁶ Little sound art has been created in which membranes are activated mechanically. Bill and Mary Buchen have developed several membranophones with metal membranes such as the *Pompano drum circle* that have to be played by the audience, but these creations are primarily presented and marketed as elements of musical playgrounds. (Sonic architecture, 2012)

amplitude of 90dB and produces a tone that lies somewhere between a bass concert drum and timpani. Jim Tenney composed three pieces, *Wake for Charles Ives*, *Popcorn Effect* and *Tempest*, for the sound sculpture. (La Barbara, 1982/1983) (Von Huene, n.d.)

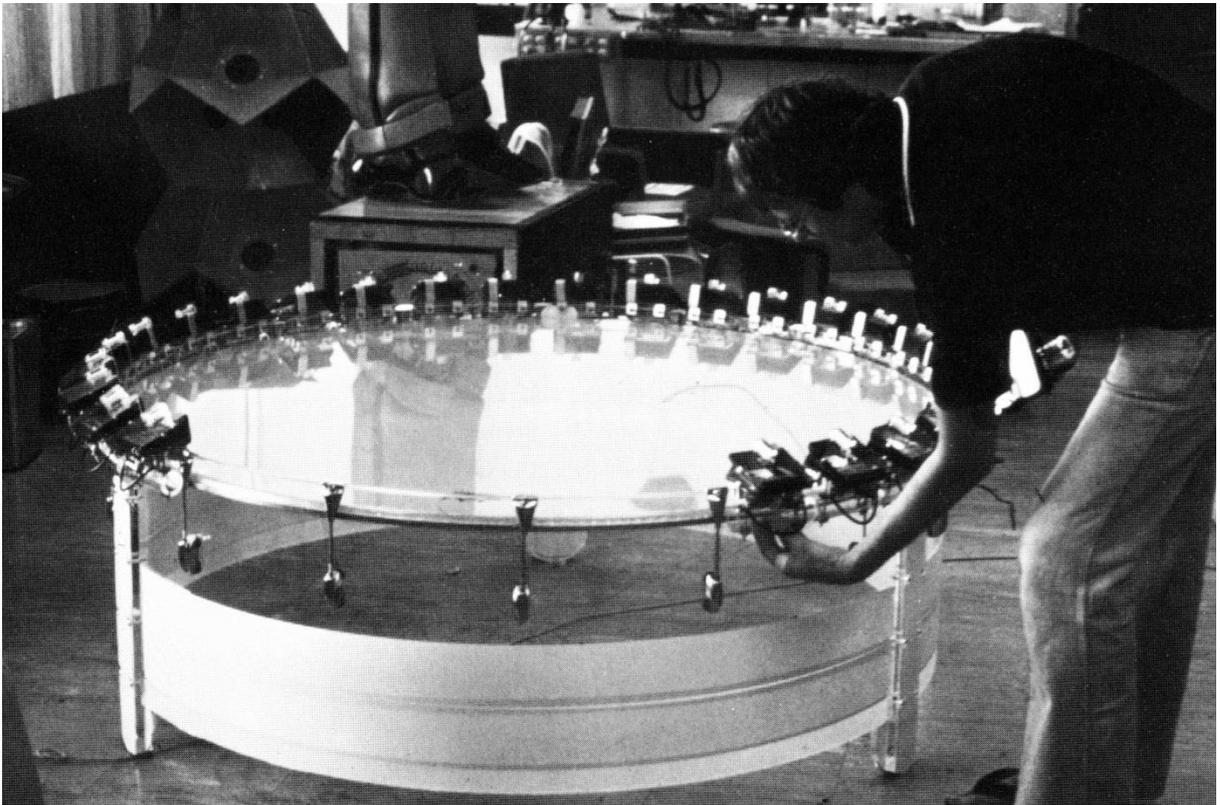


Figure 135 Stephan von Huene, setting up the *Drum* at CalArts in 1975 (La Barbara, 1982/1983, p. 84)

Electro-pneumatic activation



Figure 136 Christof Schläger, one of the 16 membranes of *Branen* [2009] (Schläger, n.d.)

Christof Schläger is one of the few artists who experimented with other types of activation of membranes in sound art. In *Branen* [2009] 16 plastic membranes, each placed over a metal ring, are not

struck, but are brought to vibrated electro-pneumatically²¹⁷. A movable resonance ring made from cardboard is placed behind each membrane. The cardboard ring serves as a resonator and influences the timbre of the sound. The length of the cardboard tube determines the pitch. The compressed air reaches each membrane via a hose. Variations in the provided air pressure directly influence the amplitude of the sound. (Schläger, 2010b, n.d.)

4.3.1.6 Case study: the electro-mechanic and electro-pneumatic automatons of the *Man and Machine* robot orchestra

In an elaborate case study the technique behind the electro-pneumatic and electro-mechanic steering of the various automatons of the *Man and Machine* robot orchestra is discussed in greater depth. (see Appendix 1 p.367)

4.3.1.7 Electrophones

The electrophones category entails all works in which the sound is generated by means of an electronic circuit. (see footnote 208 p.218) As the rise of sound art goes hand in hand with the mechanization of music: the recording, amplification and synthesis of sound, the electrophones category is the largest of all five categories in sound art. Although not exclusively, most works within the electrophones category rely on the usage of loudspeakers.²¹⁸

Reproducing pre-recorded sounds

Loudspeakers can be used to reproduce pre-recorded sounds. These pre-recorded sounds can be any type of sound, ranging from field recordings, to biologically created sounds (see footnote 59 p. 28), to acoustic instrumental sounds and electronically created sounds. These sounds can be stored on various media, amongst others tape players, cassette players, CD players, minidisc players, DAT²¹⁹ players, wav²²⁰ players and computers.

Field recordings, processed or unprocessed, have been vastly explored in sound works. In most sound works deploying field recordings, sounds made in a specific location are reproduced in another location. Changing the auditive landscape of a place leads to a form of alienation.

²¹⁷ Membranes could in theory also be activated pneumatically by natural wind, although it would be much harder to receive a desired auditive result as the direction and force of the air pressure have to be right.

²¹⁸ Exceptions are for example Godfried-Willem Raes's *Talking Flames* (see p.245)

²¹⁹ Digital Audio Tape

²²⁰ Waveform Audio File Format

During the 2012 edition of *Sounding City*, Kortrijk, Belgium, Erik Nerinckx played recordings of the sea of the French coastal city Dieppe in the Trompestraat in the city centre of Kortrijk. Nerinckx confronts the narrow dark alley with the grand sound of the rolling waves. (Maes, 2012)

Amplifying existing sounds

Existing sounds can be amplified and processed if needed. Via contact microphones sounds within a surface can be made audible, while hydrophones make it possible to listen to the underwater sonic world.

Leif Brush's *Terrain instruments* create "systems for listening to the sounds of natural events." (Brush, n.d.-b) With these terrain instruments Brush amplifies the internal cracking of floes, the walking of ants or the sounds of falling raindrops on leaves. Brush makes use of contact microphones attached directly to the material to amplify the vibrations within the material and to make these tiny sounds audible. At times Brush solely amplifies the acoustic sound, at other times the amplified sound is processed electronically. (Brush, n.d.-b)

Not only sounds of nature can be amplified. For Toshiya Tsunoda's installation *Monitor Unit for Solid Vibration* that was part of the *Sound as Media* exhibition, ICC, Tokyo, 2000, Tsunoda placed piezo-ceramic discs on specific locations in the galleries. A single earphone positioned on each location where a contact microphone was placed, allowed visitors to listen to the internal vibrations of the building. Sounds originating from plumbing, ventilation systems and electrical infrastructures were made audible. (Brandon LaBelle, 2006) (Hatanaka, 2000a)

Christina Kubisch's *Electrical walks* based on electro-magnetic sound transmission go one step further as Kubisch exposes and amplifies the unwanted buzzing and drones of amongst others traffic lights, cash machines and anti-theft devices. Her *Electrical walks* are a continuation of her earlier works based on electro-magnetic induction. (see p. 24)

The headphones with built-in coils amplify the electric fields in the nearby environment. Kubisch indicates the most interesting listening spots on a map of the city. (Kubisch, n.d.)

The audible sounds are not always linked to the location of the work. In Bill Fontana's *Sound Island* [1994] sounds recorded via hydrophones and microphones, from a location along the Normandy coast were broadcasted live via wireless communication systems to hidden loudspeakers mounted across the façade of the Arc de Triomphe in Paris, France. (Fontana, 1996) As in Nerinckx's installation (see p.247) Fontana imports sea sounds to an urban environment. The purpose of Fontana's work is not to confront the dense urban landscape with the vastness of the sea, but to use the sounds of the waves to neutralise the traffic noises.

Electronically creating sounds in real-time



Figure 137 Cléa Coudsi & Eric Herbin, *Other side, break* [2007], City Sonics, Mons, Belgium, 2008 @ Laura Maes

Computer programs such as Max MSP, Pure Data, SuperCollider or LiSa allow to create electronic sound in real-time, whether or not linked to external data such as sensors (see *Oorwonde* p. 298), data found online²²¹ or any type of electric signal, ranging from brainwaves (see *Staalhemel* by Christoph De Boeck p.221) over fish emitting electric discharges [Frederik De Wilde & LAb[au]] (LAb[au], n.d.-b) to the electric potential of plant leaves [Mamoru Fujieda] (Toop, 2004a, p. 244)

Instead of computers, electronic sounds can also be generated by synthesizers, by radios or through home-built or modified electronic circuits.

The tangible representation of sound on tape, LP or CD has led to the creative re-interpretation of these media. Record-players with multiple or detachable arms, vinyl race tracks, bicycle powered LP wheels, automated cd drawers and nearly endless tape loops are just a few examples.

²²¹ The sound installation *Maelstrom* (2011) by Daniel Jones and James Bulley draws sound that is uploaded to the internet as its basis. Software organises these audio fragments based on their tonal attributes. The result is reproduced via several speakers hung in a circular formation. (Bulley & Jones, n.d.)

Loudspeaker as an instrument

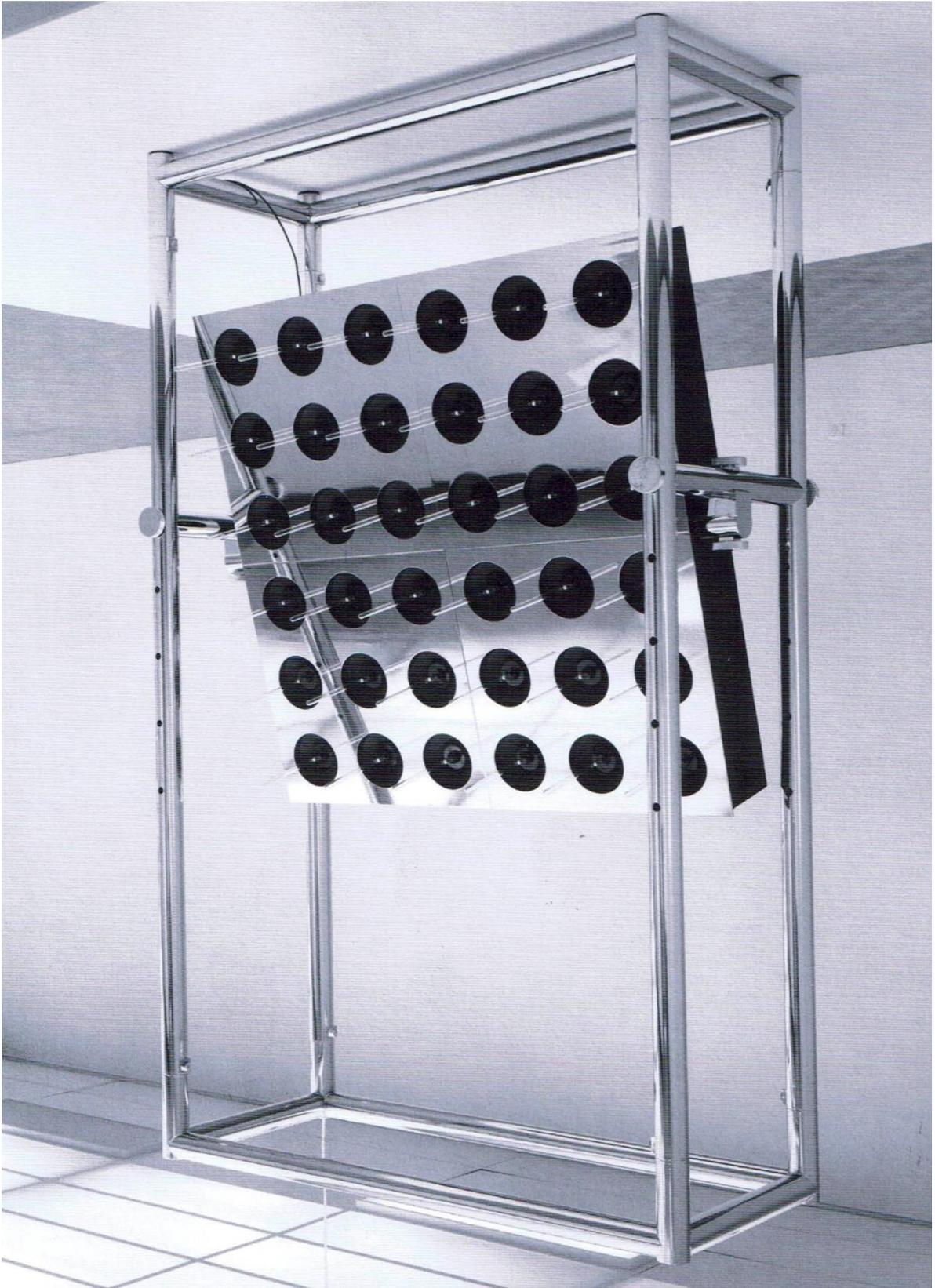


Figure 138 Dick Raaijmakers, *Ideofoon I*, Gemeentehuis Den Haag, The Netherlands, 1973 (Mulder & Brouwer, 2007, p. 95)

The loudspeaker in itself can be used as a sound source. In Dick Raaijmakers's *Ideofoon* series [1970-1971] the physical movement of the cones of loudspeakers sets objects into motion: steel balls within glass tubes, a metal sphere and needles against thin sheets of metal. No audio signal is sent to the speakers, the resulting sound is solely created by the acoustic expanding and folding of the cones and the movement of objects placed onto the cone.

Ideofoon I [1970] consists of 36 identical loudspeakers, each with a 30 cm long glass tube with a diameter of 2 cm containing a small steel ball with a diameter of 1,3 cm perpendicular to its cone. Within the glass tube, at the side of the cone, a metal spring is mounted through which the steel ball leans against at rest. The poles of a battery are connected to the end of a spring and to the regular speaker connection. If the steel ball touches the spring, the cone reacts and expands, moving the ball forward within the glass tube. The 36 loudspeakers are placed in a box that slowly turns on its axis at an angle of 90 degrees. The density of the sound depends completely on the position of the box. The highest density is 300 pulses per second, the lowest 10. (Raaijmakers, 1971) (Mulder & Brouwer, 2007)



Figure 139 Christoph De Boeck, *Language I*, exhibition Sound ON/OFF, Fortlaan 17, Gent, Belgium, 2011 @ Laura Maes

A similar principal is employed 40 years later by Christoph De Boeck. In *Language I* [2011] rhythmic patterns are created by putting each speaker cone under tension for a fraction so that its cone expands. The cones are not extended with objects as is the case in Raaijmaker's *Ideofonen*, but are used in their purest form.

4.3.2 Redirecting sound

Several sound works deploy surfaces or shapes to redirect sound. In Bernhard Leitner's *Sound field IV* [1995] a slab of polished, dark green, finely grained Stone [70 cm x 70 cm x 8 cm] is placed on each of the ten loudspeakers spread on the surface of the room. The slabs are too heavy to vibrate along with the sound, their function is to keep the sounds near the ground. It was Leitner's intention for the sounds not to rise above the knee and to conceive listening up to the knees as if wading through a sound surface. (Traber, 1998)

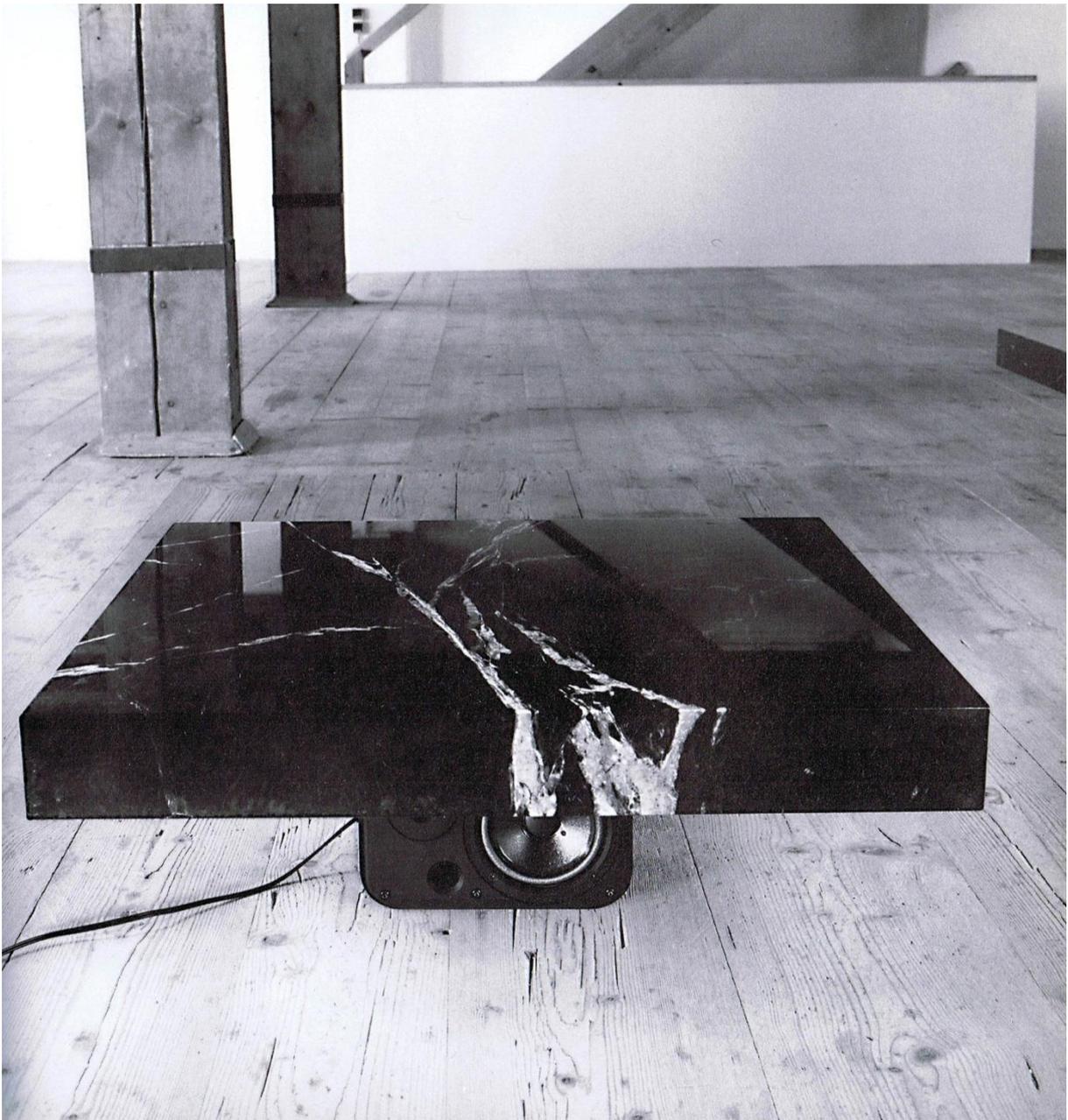


Figure 140 Bernhard Leitner, *Sound field IV*, 1995 (Traber, 1998, p. 177)

Of course sound is not stopped by the slabs and will without doubt rise to the ears. Despite this fact, the slabs still determine the general perception of the installation .

The opposite effect is created in Leitner's *Agoraphon*, an outdoor work commissioned for the exhibition *Mediale* in 1993. Seven hollow columns were placed in a circular formation with a diameter of 22 meters. Each column had a height of 460 cm and an outer diameter of 162 cm. Inside each column a MC-100 loudspeaker was suspended. The hollow columns serve as resonating bodies. (Traber, 1998)



Figure 141 Bernhard Leitner, *Agoraphon*, Deichtorhallen Hamburg – exhibited from February to August 1993 (Traber, 1998, pp. 210-211)

4.3.3 Muffling sound

Rooms can also be equipped with material that absorbs sound as in Michael Asher's installation for the *Spaces* exhibition. (see p.19)

Whereas Asher did not add external sound sources to his work, Eric Orr added the sounds of 16th century Tibetan temple bells. For Orr's installation created for the exhibition *Sounds - 4 LAINOC: sound/environments by 4 Artists* at Newport Harbor Art Museum in 1975, a nearly anechoic cube was created with sides of about 5 meter. The walls of the cube were covered with Microlite and grey rug. The sounds of the Tibetan temple bells were amplified through a specially designed RPR electromagnetic speaker. It was Orr's idea to create a room without sounds where he could add a free standing

volume of sound. Orr compares the silent room with “a blank canvas” and the added sound with “a single stroke of color”. (Orr, 1975)



Figure 142 Construction of Eric Orr’s installation for the exhibition Sounds – 4 LAINOC: sound/environments by 4 Artists at Newport Harbor Art Museum, Newport Beach, United States, 1975 (Orr, 1975)

4.3.4 Reflecting sound

Surfaces and shapes can also service to reflect sound.

For the exhibition *Kijk.....Muziek* [1985] Arnaud De Blauw and Nico Schulte equipped the exhibition space with parabolic and circular walls to reflect the sound of the loudspeakers. (De Gele Rijder, 1985) Parabolic reflectors often reoccur in sound works. (see p.258)

Whereas Asher’s work for the Spaces exhibition solely damps the sound, his work for the La Jolla Museum of Art one year earlier in 1969, combines the damping and reflection of sound. Several walls were constructed in the exhibition room. The existing and new walls were covered with drywall. While the original sound-dampening finish of the ceiling remained untouched, the floor was covered in carpet. In one of the compartments Asher installed a speaker that reproduced a just audible constant tone of 85 Hz delivered by an audio oscillator. The drywall constructions – to dampen the sound

– were combined with two vertically aluminium shields of 122 cm long that served to reflect the sound. (Asher, 1983b)

4.3.5 Conveying sound

In the majority of sound works, sound is conveyed through air. A more direct way of listening can be achieved through bone conduction (see p.273 & *Oorwonde* p. 298). Instead of air sound can be conveyed through solid materials as in Toshiya Tsunoda's installation *Monitor Unit for Solid Vibration* (see p.247) or in David Tudor's *Rainforest* [1973] in which electronic output is channelled through a vibrating object rather than through the usual suspect, the loudspeaker. (Pagé, 1980)

Besides solids, liquids can be used to convey sounds. Max Neuhaus created several underwater works in which sound as well as audience are submerged in water. (see p. 155) Since 2008 *Wet sounds*, a project initiated by Joel Cahen, tours swimming pools. Sounds are transmitted underneath and above the water surface. (Newtoy, 2013)

Lastly sounds can be conveyed through gases. In 1977 Laurie Anderson inserted a rubber diaphragm inflated with heavy gas in a wall. The acoustic lens works on principals similar to optics, the lens focuses sound to a single point. The focus point of the sound can be changed by inflating or deflating the lens and in that way adapting the curvature of the lens. (R. Block et al., 1980)

4.4 Unravelling the mystery: the creative use of natural phenomena in sound art

In this section we focus on the mergence of sound art and applied science and look at how sound works based on natural phenomena go beyond the demonstration of a scientific phenomenon.

4.4.1 From cloaca to mould

Many artists put their fascination for science in an artistic form. *Paricutin Volcano* [1970] by Peter Hutchinson consists of over 200 kilogrammes of bread and mould in a variety of colours, growing on a volcano landscape (Lippard, 1973) Iannis Xenakis used stochastic mathematical techniques in his compositions (Hoffmann, n.d.) and Wim Delvoye developed the *Cloaca* [2000], a machine designed to mimic the human digestive system from mouth to anus (Teeters, 2002).

Not only the visual arts and music world is intrigued by science, many sound artists are inspired by natural phenomena or their scientific interpretation.

Numerous sound works make use of new technologies and techniques. The invention of the reproduction of sound contributed highly to the 'boom' of sound art. Since the last quarter of the nineteenth century [the development of the gramophone], music has been characterized by a new evolution: the mechanization of music²²², starting from three new principles: the recording, amplification and synthesis of sound. Eventually the technological evolutions has reached further than only the reproduction of music, i.e. the creation of sound made possible by technology. In this new phase, that has developed since the middle of the previous century, the basic technology of electronic media has made a contribution to artistic creation.

4.4.2 Sound art and applied science

Sound artists are always seeking new ways to create, to convey or to direct sound.

²²² Some authors, among which Leon Van Noorden, proclaim that the automation of music began from the moment that a human started to play music for someone else. (Van Noorden, 1983)

“In sound art the world returns again to art, art becomes re-anchored in man’s amazement at fundamental natural phenomena, and art begins anew at the point where it must have once begun: from astonishment, curiosity, from attempts at ordering and understanding, ascribing meanings and supplying names.”(P. Panhuysen, 1987b, p. 5)

Often, technique is used in a very elementary form. Many artists base their works on concepts of physics that you would rather expect in a science museum than in an art museum. The borderline can be very thin indeed. (see p. 179) The artists point out the beauty of a natural phenomenon and make it more aesthetically pleasing.²²³ In the following section various natural phenomena and their appliance in sound works will be discussed. There are many more examples of sound artists using science in its most elementary form than the ones mentioned above and the possibilities and combinations of sound and applied science seem nearly infinite.

4.4.2.1 Johnsen-Rahbek effect

For the installation *Gray Matter*, American sound artist Paul DeMarinis based himself on research done by the nineteenth century inventor Elisha Gray, who in 1874 coincidentally discovered the musical bathtub which was based on the principle that electrified objects produce sound and sensation when struck with skin. The friction of the skin along electrically charged surfaces may generate glissandi, scales or even melodies from those surfaces.

DeMarinis connected a zinc bathtub on the floor to the strings of a double bass, attached to the ceiling with steel strings. Running your hand along the steel strings caused a prickly sensation in the skin, which was stronger in some people than in others. DeMarinis placed a tray of lemons in the room of which the fruit, when rubbed along the wire, generated the same tones, weaker but without the unpleasant sting. (Van Peer, 1997)

²²³ There is a real danger that works based on natural phenomena are not taken seriously, similarly to works utilizing technology. (see p.214) The work *Crystal Globe* [1970-71] by Alan Sonfist, whereby crystals vaporize and condense in a container was criticized by an Artforum critic [March 1971] as a “high-school physics project”. (Benthall, 1972, p. 156)



Figure 143 *Gray Matter* by Paul DeMarinis @ Paul DeMarinis

DeMarinis departs from a physical phenomenon, later called the Johnsen-Rahbek effect after two Danish engineers F. A. Johnsen and K. Rahbek who contributed most to the early development of the electrostatic clutch.

DeMarinis lifts the original experiment of Elisha Gray one level higher. Just like Gray, DeMarinis uses an electrified zinc bathtub, he attaches steel strings to it that lead all the way up to the ceiling, where they are connected to the strings of a double bass. Moving your hands along the steel strings makes it possible to actually not only hear the sounds of the bathtub, but also of the double bass. Through adding a second sound source DeMarinis creates a rich chorus sound.

A vibrating electrical field modulates the coefficient of friction of your skin, so that when fingers bow across an electrified surface, you provoke mechanical vibrations. These mechanical vibrations, suitably coupled, give rise to audible sounds (DeMarinis, 1996) wedded to mild electric shocks.

DeMarinis did not restrict himself to one work but made a series of pieces recalling the experiment of Gray among which *Still Life with Guitar*. (E. Osborn, 1999)

4.4.2.2 Parabolic reflectors

An often occurring arrangement in a science museum is formed by two parabolas placed across each other so the sound bridges a large distance.

American artists Bill and Mary Buchen developed several science playgrounds and sound playgrounds²²⁴ for which they made use of parabolic arrangements. Bill and Mary Buchen do not add any elements to the arrangement and their parabolic dishes are the same as the ones we can find in science museums. In 2000 they even made a parabolic bench, consisting of two vertical stainless steel dishes, each with a diameter of nearly 2,5 metres for the Liberty Science Center in Jersey City. (Bill Buchen & Buchen, n.d.)

²²⁴ Among which P.S. 23 in the South Bronx, Green Valley Park Denver, Children's Museum of Richmond Virginia, Seal Point Park San Mateo California, Scott Carpenter Park Boulder Colorado, Liberty State Park New Jersey and Mullay Park New York City. (B. Buchen, 2008)



Figure 144 *Parabolic bench* by Bill & Mary Buchen, part of the sound playground installed in 1993 at P.S. 23, a Bronx elementary school in New York, a set-up similar to their *Parabolic bench* at the Liberty Science Center in Jersey City @ Paul Warchol

Troika, a U.K. based multi-disciplinary art and design collective, created the *Sonic Marshmallows* at Wat Tyler Country Park in Basildon, United Kingdom in 2006. The Sonic Marshmallows consist of one pink and one white reflector that allows people to hear each other's whispers 60 metres over the pond that separates each reflector. Troika was inspired by the early sound mirrors²²⁵ that were built between WWI and WWII as early attempts of detecting approaching enemy planes, as well as by whispering galleries and other acoustic phenomena that are part of older buildings. (Troika, n.d.) Their work is basically the same as Bill and Mary Buchen's parabolic reflectors but wrapped up in a marshmallow jacket.



Figure 145 Troika, *Sonic Marshmallows* [2006] at Wat Tyler Country Park in Basildon, United Kingdom (Troika, n.d.)

In the summer of 2005 Dutch artist Nico Parlevliet presented *Biesbosch Unplugged*, a work based on the parabolic disc in the Dutch National Park Biesbosch in Dordrecht²²⁶. He wanted to expand the audible horizon. A parabolic disc with a width of 3,5 metres

²²⁵ For the past 8 years (Autogena, 2008) Danish-born artist Lise Autogena has been working on Sound Mirrors, a project to transform long forgotten defense technology into a peaceful communication instrument. The North East and South Coast of England locates a series of concrete structures. These acoustic mirrors are remains of acoustic experiments that took place in England. As early as 1915 the first mirrors were built into the face of a chalk cliff.(Scarth & Society, 1999) The mirrors were directed towards the sky and served as early warning systems against the possibility of an airborne invasion.(Autogena, n.d.) Autogena is trying to construct two new acoustic mirrors facing each other across the sea: one mirror in England and one in France. (Arts Council England, n.d.) It is Autogena's intention that people across the Channel will be able to listen to the sky and to communicate with those standing on a listening platform in front of the other mirror across the Channel. (Autogena, n.d.)

²²⁶ The work was part of *de Einder* [the horizon], a project concerned with the experience of open space and seclusion, of finiteness and infinitude in space and time. In 2004 twelve artists worked in the neighborhood of Montsegúr in the French Pyrenees, one year later these same artists worked in the Biesbosch near Dordrecht, the Netherlands. The project wanted to show the influence of the landscape [mountains versus polders] and the social surroundings on the work of the artists. (De Einder, n.d.)

served his goal. Connected to the disc a chair was mounted. Once seated on the chair, the ears of the visitor where situated in the centre of the disc and the view of the visitor was directed towards the disc itself and not towards the landscape. In this way the perception was directed exclusively towards the listening experience. The visitor could rotate the disc 360 degrees, so he could choose what distant place he would amplify acoustically. (Parlevliet, n.d.)



Figure 146 Nico Parlevliet, *Biesbosch Unplugged* @ Jan Barel



Figure 147 Hans van Koolwijk, *Klankkaatsers* @ Hans van Koolwijk

Like Parlevliet, fellow Dutch artist Hans van Koolwijk gave his own interpretation to parabolic reflectors. Van Koolwijk's work does not use reflectors to reflect sound of the audience or of the environment. Instead sounds originate from an acoustic sound source: flutes. In *Klankkaatsers* five parabolic dishes bounce sound from the source to a common point in the centre of the arrangement. When sound reflects off a parabola surface, it will bounce out in a straight line no matter where the sound originally hit the

parabola surface. Four parabolas are placed on cushions filled with air. The parabolic dishes move when the amount of air in the cushion changes. Not only the dishes move, but also the common point in the centre of the arrangement changes according to the position of the parabolas. The fifth parabola, the *oer-Klankkaatser*, arouses a special sensation in the ears of the visitor because high pitches of small flutes are reflected via the parabola to one focal point. When the visitor is situated in the focal point and moves his head, he can let the sound of the *oer-Klankkaatser* whirl through his head.²²⁷

²²⁷ A successor of *Klankkaatsers* was finished in 2010. In a building of nearly ten meters high the sounds created by five bamboo flutes is reflected by the concave walls of the building towards a central focus located at ear level. It is Van Koolwijk's intention to create an experience whereby it seems as if the sound originates between the ears of the visitor. (Van Koolwijk, n.d.-e) (see p.190)

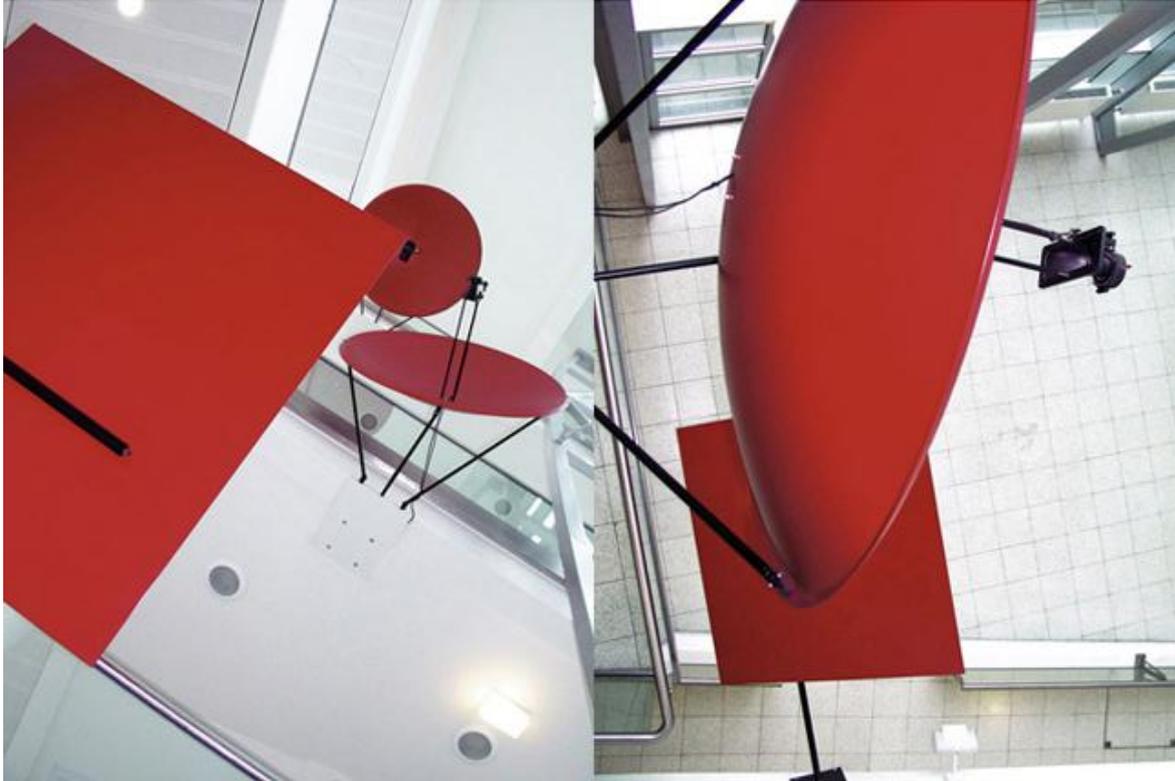


Figure 148 Bernhard Leitner, *Strömungen* [2000], Otto-Wagner-Spital, Pavillon Felix, Vienna, Austria (Leitner, n.d.-d)

Like van Koolwijk, Bernhard Leitner also used an external sound source, not provided by flutes, but by a speaker directed towards each parabolic disc.

Both red parabolic discs serve as acoustic projectors and are directed towards a red square, a metal sheet that serves as a reflector. The sound reproduced by the speaker is reflected by the parabolic disc towards the square reflector that is mounted at a specific angle. (Leitner, n.d.-d)



4.4.2.3 Chladni figures

Figure 149 Ned Kahn, *Sonic Range* [1992], the Exploratorium, San Francisco (N. Kahn, 2012c)

Sound can be visualized on vibrating surfaces. In his 1787 publication *Entdeckungen über die Theorie des Klanges* Ernst Florens Friedrich Chladni presented the results of his experiments. With the aid of a bow he subjected thin metal circular, square, or rectangular plates covered with a thin layer of sand to various sound vibrations. The sand moves on the plate until it settles at the nodal points. The resulting patterns on the plates became known as Chladni figures. Chladni wanted to demonstrate the various modes of vibration of a rigid surface. (Chladni, 1787)

Chladni's experiments have inspired various artists. In *Sonic Range* by Ned Kahn fine copper powder is placed on a membrane. The membrane is set in vibration by sound. The audience can change the frequency and amplitude of the sound. The work was created in 1992 for the Exploratorium in San Francisco to evoke the occurrences during earthquakes. (N. Kahn, 2012c)

4.4.2.4 Liquid Sound Patterns

At the science museum in London an arrangement is exhibited in which a liquid-filled tube is enclosed by a large speaker at one end of the tube. The visitor is invited to use the speaker to play a note within the tube. If you hit on the right frequency the sound will send the liquid splashing about. This effect happens as the sound waves clash inside the tube, creating areas with lots of energy to create the liquid leap. (Science Museum, n.d.)

From 1986 till 1988 Max Neuhaus presented an installation in the lake of the park of Domaine de Kerguéhennec, Locmine, France. On a surface of 120 by 200 meters (Max Neuhaus, 2007) four sound sources activated the surface of the water. (Zacharopoulos, 1987) Carsten Nicolai applied the same principle to water in glass flasks in *Frozen water* [2000]. The loudspeakers are not placed underneath the water containers but in front of them. Subsonic sine waves emitted by the speakers causes the water to vibrate. (Nicolai, n.d.-a) Nicolai used the same principle again in *Interference room* [2012], but added light to the original scientific experiment. A two channel composition of subsonic sounds causes the water to vibrate. Not a speaker, but two exciters transmit variations in air pressure onto the water surface. The sounds, and therefore the transmitted air pressure, is synchronised with a stroboscope to project the created patterns on a screen. (Nicolai, n.d.-b)



Figure 150 Carsten Nicolai, *Frozen water* [2000] (Nicolai, n.d.-a)

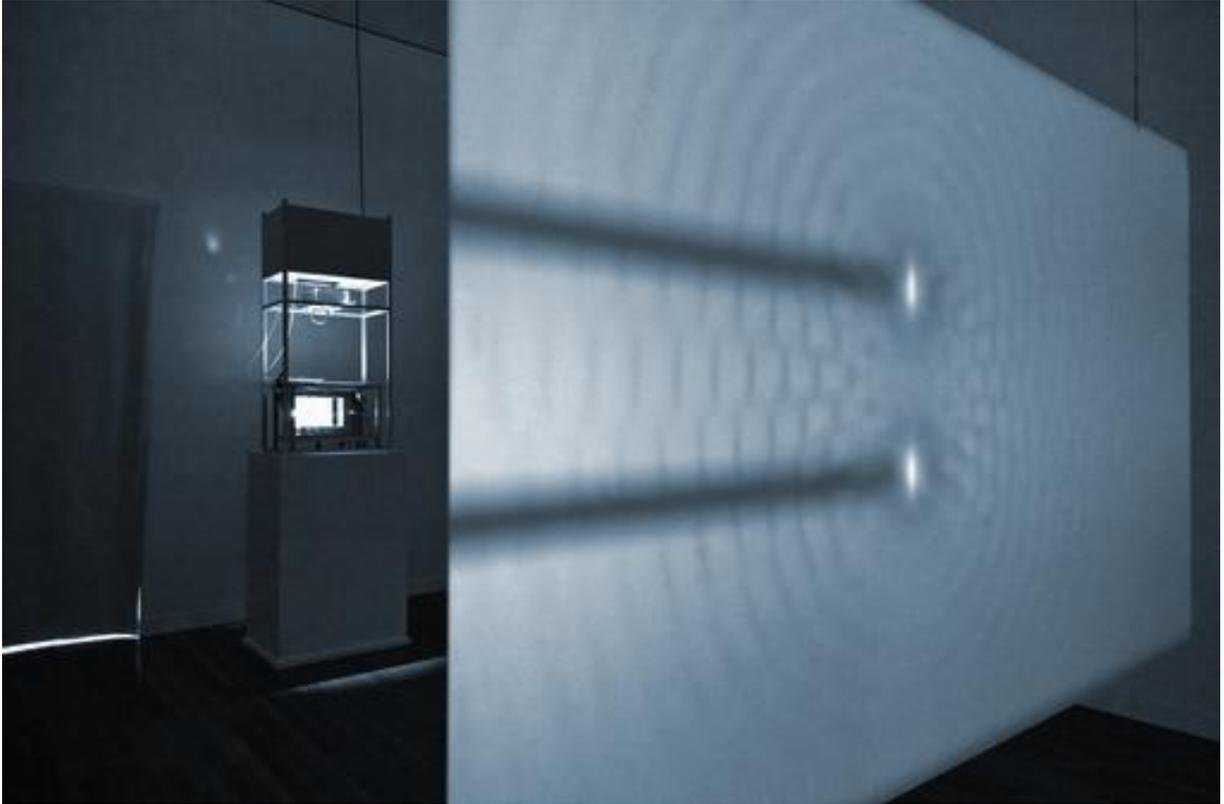


Figure 151 Carsten Nicolai, *Interference room* [2012] (Nicolai, n.d.-b)

The projection of water vibrations has been profoundly explored in *Ondulation* [2002], a three-dimensional composition for water, sound and light, by architect Thomas McIntosh and sound artists/composers Mikko Hynninen and Emanuel Madan. *Ondulation* consists of a basin of 10 meters long and more than five meters wide, filled with 2000 litres of coloured whitish, almost milky, water that is pumped through a plumbing configuration just beneath the surface. Three low frequency loudspeakers are submerged beneath the surface of the basin. The 5 cm deep water in the basin is set into motion through sound. Roughly twenty beams of theatre light are projected onto the surface of the water and reflect the movement of the water onto a projection screen or a white wall. The audio material causes the water to ripple and jump, giving rise to fascinating reflections, always in motion. The projected forms are reminiscent of sine waves. A computer program produces alternating wave patterns: from nearly still to jumping water. The theatre lights change in colour (Venkatasubban, 2004) and focus: sometimes filling the exhibition space with a warm pink glow, sometimes white light focusing on a specific point. The sound is not only produced by the speakers underneath the water surface, but primarily by extra speakers positioned outside the basin. The complete pre-programmed cycle of carefully attuned sound and light lasts 56 minutes

and starts and ends with silence, immobility and almost darkness. (Mavrikakis, 2005) (Redfern, 2005) (Krainak, 2004) (McIntosh, 2009)

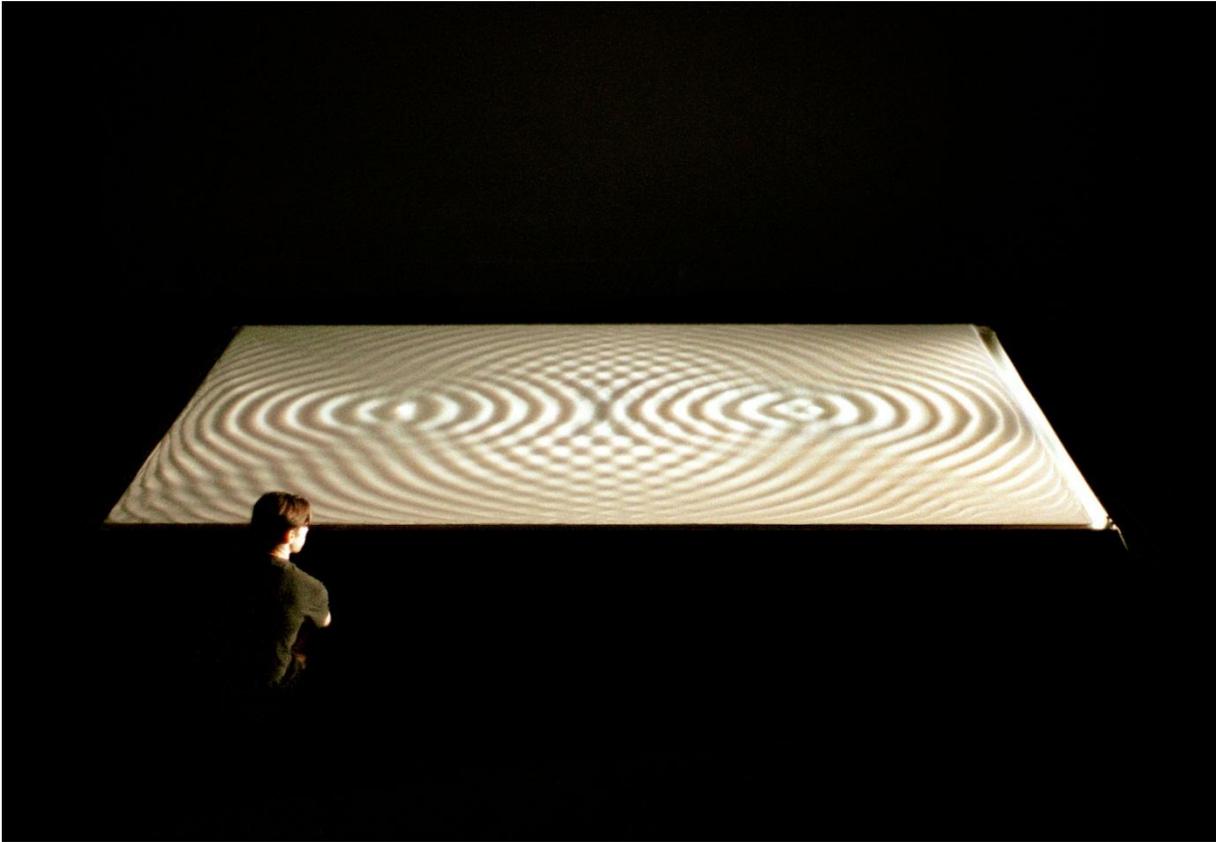


Figure 152 *Ondulation* by Thomas McIntosh, Mikko Hynninen, Emmanuel Madan @ Diana Shearwood

In Ned Kahn's *Seismic Sea* [2009] the natural phenomenon is reduced to its most simple form. No speaker, but the movements of the audience and environment create vibrations in the shallow layer of water contained inside a sealed dish. The dish is mounted on a column that stands on a base plate supported by hundreds of springs. These springs allow the slightest movement on the base plate to have an effect on the vibrations of the water. (N. Kahn, 2012b)



Figure 153 Ned Kahn, *Seismic sea*, Pasadena Museum of California art, 2009 (N. Kahn, 2012b)

Other liquids can be used besides water. For *Protrude, Flow* [2001] Sachiko Kodama and Minako Takeno made use of magnetic fluid, consisting of dissolved ferro magnetic micro-powder in a solvent such as water or oil. One

electromagnet was installed above and five electromagnets beneath a small acrylic dish that holds the magnetic fluid. A microphone in the exhibition space registers the sound of the audience and of the environment. This audio signal is converted to electromagnetic voltage that determines the strength of the magnetic field and as a result also the created patterns. The patterns are captured by a camera and projected onto a screen. (Kodama & Takeno, 2003)

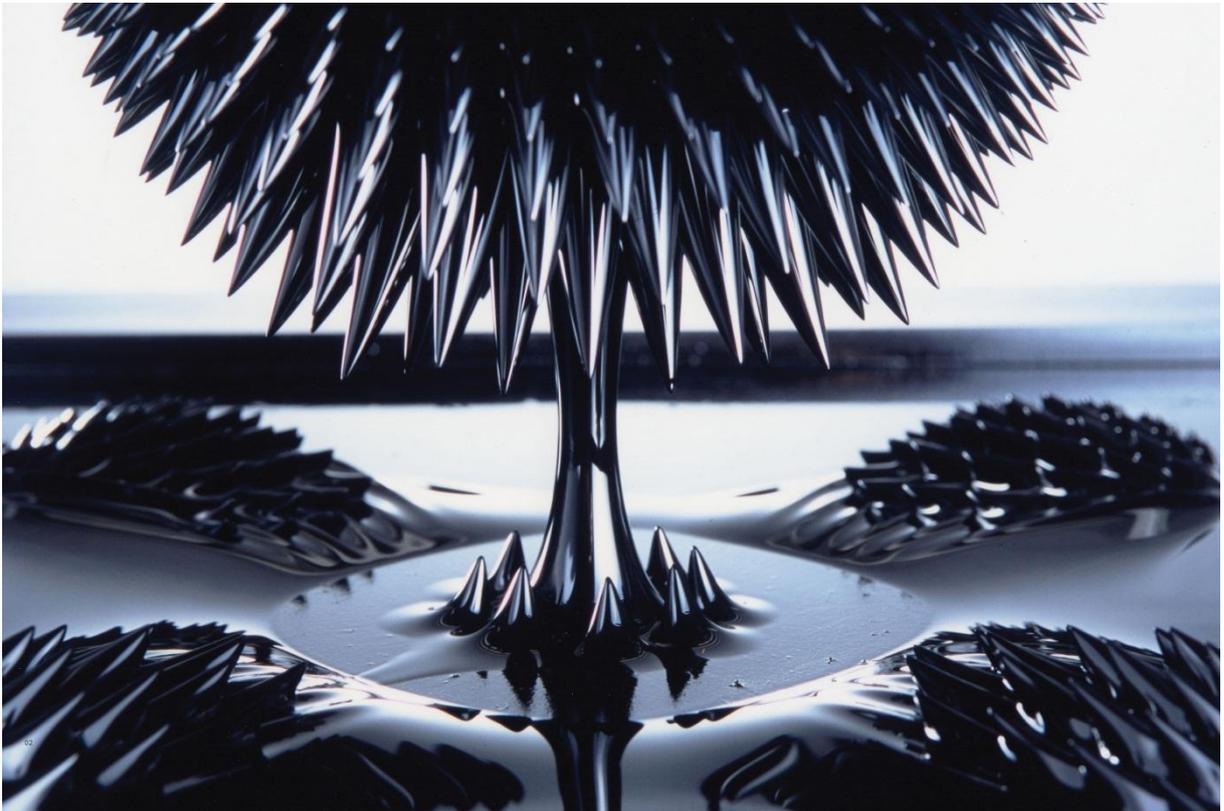


Figure 154 Sachiko Kodama and Minako Takeno, *Protrude, Flow* [2001] @ Yozo Takada

4.4.2.5 Flame Pipe

Besides vibrating surfaces and liquids gas can also be used to visualise sound. Gyorgy Kepes discovered a description of gas flames modulated by music in an old book on opera. (Kepes, 1975) Certain experienced opera singers could make the gas lights of opera houses flutter and strobe when singing certain notes, the Eigen-frequencies of the auditorium. (Earls, 1996)

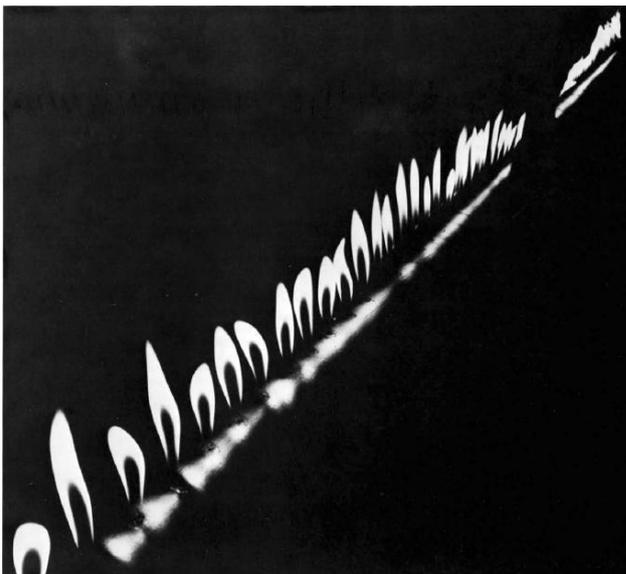


Figure 155 Gyorgy Kepes's *Flame Orchard* presented at *Sound Sculpture - 11 artists working in the field of Audio-Kinetic Art* [Vancouver, 1973] (Grayson, 1975, p. 97)

Kepes worked for several years on *Flame Orchard*, a work of art based on

this principle. *Flame Orchard* consisted of aluminium, copper, propane, transducers and audio equipment. *Flame Orchard*, with music of Paul Earls, was part of the exhibition *Sound / Sculpture - 11 artists working in the field of Audio-Kinetic Art* that took place at the Vancouver Art Gallery in 1973. (Kepes, 1975) A metal box with a length of 404 cm, a height and width of 12,7 cm (Aesthetic Research Centre of Canada, 1973) is filled with propane gas. The box has a top thin metal plate drilled with a grid of small holes. At each side, the box is connected to a loudspeaker. After the gas flow is turned on, the gas is ignited where it exits the holes to make a sea of small flames. (Earls, 1996) By adjusting the frequency and amplitude of the sound emitted by the speakers clear standing waves patterns can be seen in the flames. (Spratt, n.d.) The musical pitches used in the music are the resonant frequencies of the flames themselves and cause them to expand and shrink, vibrate and leap. (Aesthetic Research Centre of Canada, 1973)

4.4.2.6 Doppler Effect

An arrangement to exhibit the Doppler effect consists of mounting a reed on the end of a rotating arm of which the speed can be controlled. The pitch of the produced tone will wobble up and down as the arm rotates. (Spratt, n.d.) The Doppler effect was named after Christian Doppler who was the first to describe the effect in 1842. (Eden, 1992)

Canadian artist Gordon Monahan wanted to animate the typical electronic music concert and use the loudspeaker as a valid electronic instrument. (Monahan, 1982) In an enclosed space three or more players swung loudspeakers attached to two-and-a-half-metre-long cables in a circular way. The loudspeakers are hooked up to sine wave generators and in this way broadcast only simple sine waves. (Stewart, 2005)



Figure 156 *Spatial Sounds [100dB at 100km/h]* [2000] by Marnix de Nijs & Edwin van der Heide @ Rob 't Hart

Nearly two decades after the first performance of *Speaker swinging* in 1982, Dutch artists Marnix de Nijs and Edwin van der Heide have built the interactive installation *Spatial Sounds [100dB at 100km/h]*. (Van der Heide, n.d.) No reed, but a speaker is mounted on a rotating arm with a length of several meters. When the speaker rotates the Doppler effect can be observed. However, the installation of de Nijs and van der Heide is much more than just a demonstration of the Doppler effect. The movement of the visitors and their place in space has an influence on the rotation and on the produced sounds. The arm can spin in both directions, very slow or very fast with a maximum of a hundred km per hour. A sonar sensor on top of the speaker measures the distance between visitors and objects and the speaker. It scans any objects and visitors in the exhibition space. The sensor can detect how close the visitors are and where they are in relation to the arm. The sound is directly related to the speed of the arm and the shape of the room around it. (Van der Heide, n.d.)

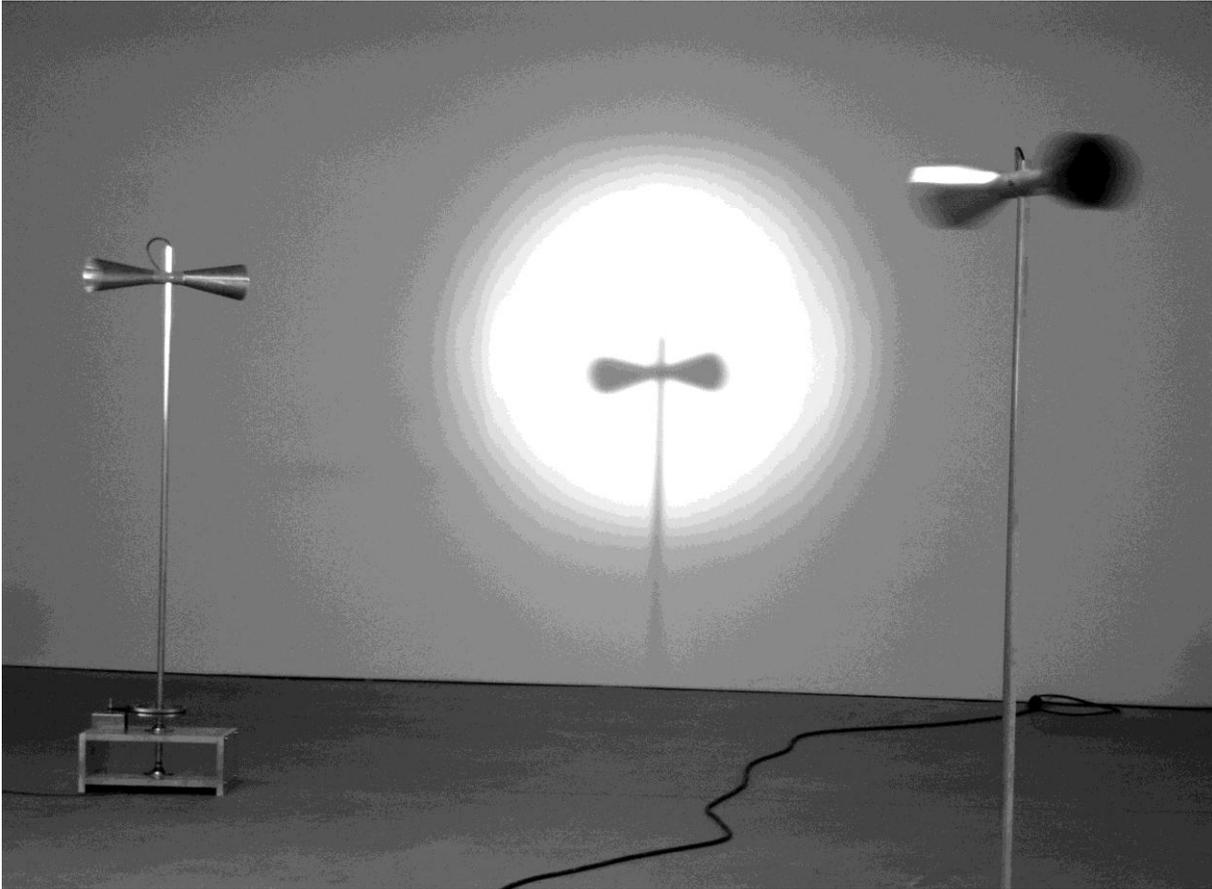


Figure 157 *Phantom melodies* by Arnaud Jacobs @ Arnaud Jacobs

Marnix de Nijs and Edwin van der Heide are not the only artists using rotating speakers in sound art. In *Phantom melodies* Belgian artist Arnaud Jacobs places two speakers opposed to each other on a stand, which can rotate at different speeds and in two directions. Between 2006 and 2008 he made several versions of this work using different transmitted sounds: thousands of common cranes flying up recorded in Khichan, India or field recordings gathered in the Amazon forest, Brazil. The public can walk freely between the stands. (A. Jacobs, n.d.)

4.4.2.7 EchoTube

The science museum in London has a 35-metre-long echo tube on display. Visitors are invited to shout into the tube and listen to their voice bouncing back. There are several shutters that enable you to change the length of the tube and as a consequence also the echo. (Science museum London, n.d.)



Figure 158 *Silophone* by [The User] @ Thomas McIntosh

Silophone is a mainly online art project initiated by the Montréal based arts collective [The User], an artistic collaboration between architect Thomas McIntosh and composer Emmanuel Madan. Silo #5 is an abandoned grain storage facility in the port of Montréal. The building has stood empty since 1994. For the *Silophone* project a structure is used with a length of 200 meters, a width of 16 meters and approximately 45 meters at its highest point. It is constructed entirely of reinforced concrete. The main section of the building is formed of approximately 115 vertical chambers, all 30 meters high and up to 8 meters in diameter. These tall parallel cylinders have special acoustic properties, among which a stunning reverberation time of over 20 seconds. (The User, n.d.-a) The two initiators wanted to bring the public inside to experience the acoustics. However, the Old Port would not allow letting the general public in, so they decided to bring the acoustics of the space outside to the people. (Gray, 2007) The *Silophone* project takes advantage of the exceptional acoustics of this space. From anywhere in the world you can hear your sound being played in the silo. Sounds arrive inside the silo directly via telephone or are uploaded on the *Silophone* webpage or reach the *Silophone* via a microphone located at a sonic observatory a few hundred meters from the Silo. The sound is captured by microphones. Anyone can hear the results by tuning into the live audio stream at the *Silophone* webpage. The sounds can also be heard at the sonic observatory where two loudspeakers are placed. (The User, n.d.-a)

4.4.2.8 Singing Arc

In 1990 Belgian instrument builder and composer Godfried-Willem Raes developed *Talking Flames*, a work based on the principle of the Singing Arc. The work was called *Talking Flames* because visually the sound source of the installation resembled to flames seemingly having a conversation. The flame serves as a digital to analogue converter. The air is brought to vibrate directly, there is no movement like is the case with a loudspeaker. (Raes, 2008)

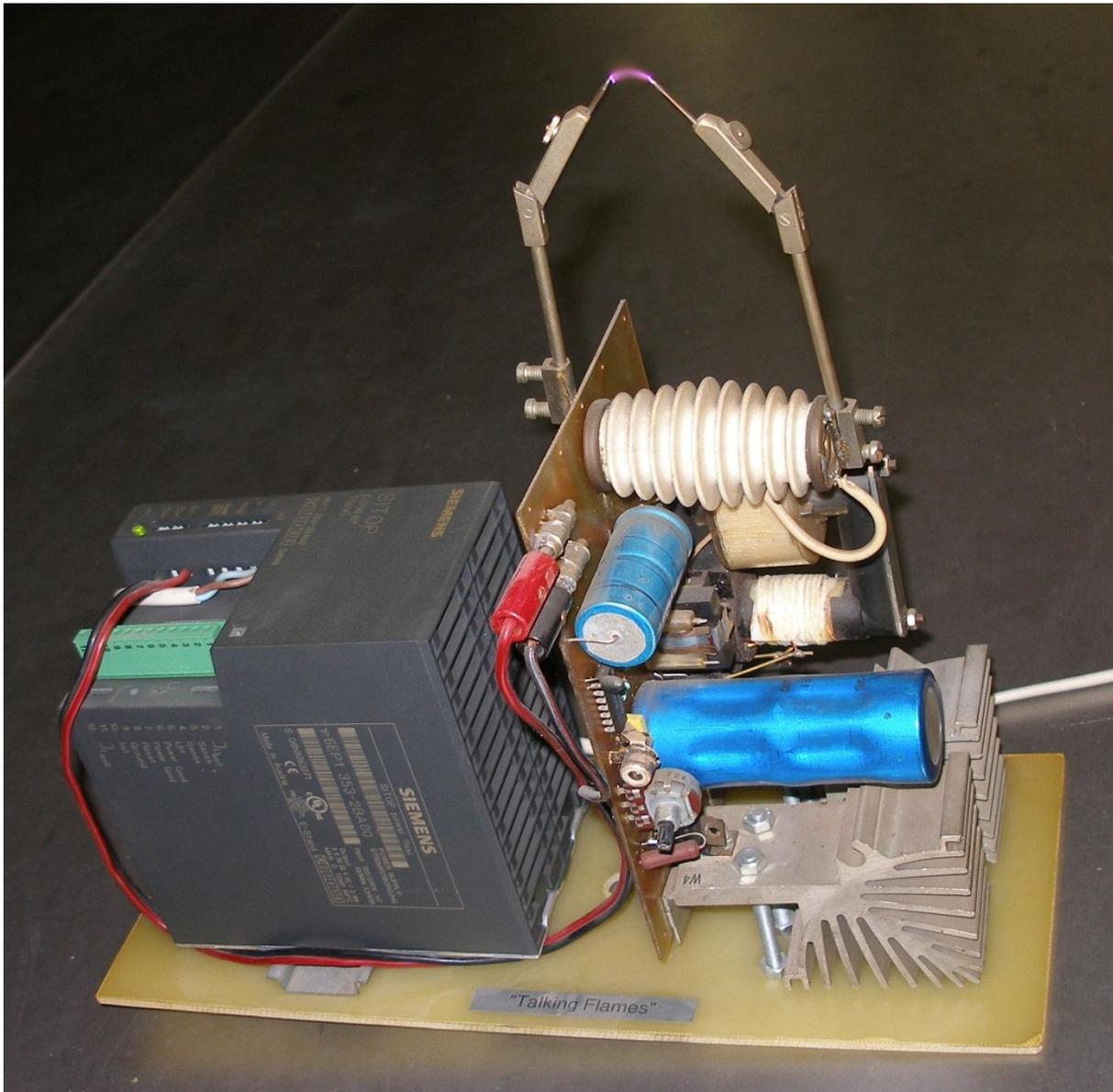


Figure 159 *Talking Flames* by Godfried-Willem Raes @ Godfried-Willem Raes

In 1899 William Du Bois Duddell exploited the [unwanted] high-pitched whistle produced by the electric arc-lamps used at that time for street lighting for musical ends in his singing arc (Davies, 2007), a monophonic electronic keyboard instrument (Davies, 2008). He controlled the whistle with a simple audio oscillator. (Davies, 2007) Duddell

created one of the first electronic instruments, an instrument that was audible at a time when the amplifier and loudspeaker still had to be invented. Duddell's invention never became more than a novelty.

4.4.2.9 Bone Conduction

At the Exploratorium, the San Francisco museum of science, art and human perception *Sound Bite* is exhibited. Upon biting down on a metal rod that is vibrating in response to music, visitors can experience how sound is conducted through their jawbones instead of through their ears. (Dackman, 2006) Instead of putting air to vibrate and convey the sound to the middle ear and finally at the cochlea in the inner ear, the sound reaches the cochlea via direct vibrations of the bones in the head. (Georgia Tech Sonification Lab, n.d.)

In 1978 Laurie Anderson made *the Handphone Table* for MOMA, New York. There exist two versions of the same table. One version is currently part of the collection of the Museum of Contemporary Art, Lyon, France, that bought the work in 1999 from the Sean Kelly Gallery, New York. The other version would be located somewhere in Texas. (Cioffi, 2008) Two listeners can sit at each side of a table. At each end of the table two pairs of slight indentations can be found. Visitors have to place their elbows in these indentations and cup their ears with their hands to be able to hear the sounds. To each indentation a steel rod is connected that leads to a tape deck containing pre-recorded material. (R. Block et al., 1980; Noland, 1999) The pre-recorded material consists of a Fender-Rhodes organ, a piano, a violin and the human voice. The text consists of two sentences: "and I remember you in my bones" together with a reversed line of an old love song written by George Herbert in 1633: "Now I in you without a body move". (R. Block et al., 1980) Anderson created a stereo system through using a pick-up for each elbow. (Noland, 1999) The clear but plain tones of the organ were audible in one ear, the acoustic piano with its singing overtones in the other ear and later the other way round. (R. Block et al., 1980) Sound is conducted from tape through driver, screw, elbow, skull and the cranial cavities effectually become speakers. (H. Bull & Adrian, 1979) Anderson designed *the Handphone table* after a very frustrating evening when she was writing a song on an electric typewriter. After a few pages Anderson looked up to read what she had written only to find that it was impossible to sing. Discouraged, she placed her head in her hands and sits in this position for a while. Suddenly she could hear a deep tone she could not identify: the humming of the typewriter. She decided to create a work exploiting this discovery: *the Handphone table*. (R. Block et al., 1980)

Before Laurie Anderson used bone induction in her installation it was already commonly used in hearing devices²²⁸. In 1939 The Planetarium Theater installed a special sound system for the hearing-impaired. Bone-conduction as well as air-conduction headsets were available. (Walsch, 1998/2010)

Other artists have also made works based on the principle of bone conduction. From the 3rd of October 2007 onwards you can re-experience the air raid of the 13th of February 1945 along the preserved military fortifications of Dresden - The Brühlsche Terrace. The audience is invited to rest their elbows on the railing and to cup their ears. Duck and cover to hear the sounds of the motors of B-25 bombers, the bombardments just above one's head as well as explosions in the distance. Four sound conductors are integrated in the railing. By leaning on the railing the sound is transmitted from the railing via the arm into the inner ear. The sounds are only audible for people touching the rail. The system was developed by Markus Kison in the Digital Media Class at the University of the Arts Berlin. (Kison, n.d.)

The entertainment and even the food industry have also re-discovered bone induction. New applications for amongst others phones²²⁹, bonephones²³⁰, underwater

²²⁸ The technique of bone induction is used in spectacle hearing aids amongst others. The aid is housed within the frames of the glasses. The sound is passed from the hearing aid through the hook of the pair of glasses and into the mastoid bone. The sound passes from the ear through the mastoid bone and into the inner ear. (Half Price Hearing Ltd., 2008)

²²⁹ In 2000 and again in 2003 Japanese firm NTT DoCoMo announced its release of the finger phone. (Lugmayr, 2003) In 2006 NEC TOKIN Corporation marketed a bone conductive receiver/microphone as a mobile phone accessory. (Fujita et al., 2006)

Eventually the Ubi-Wa [Japanese for "Finger ring" and "Speak by finger"] phone was released in 2005. You can listen to a call by simply placing a finger in your ear. (Perry, 2005) In 2004 Sanyo Electric produced the Sanyo TS41 mobile phone. The phone claims to use a bone conduction system, but reviews doubt this and claim it just uses a speaker. (Oryl, 2004) Panasonic developed digital wireless telephones with a bone conduction handset targeted at people with conductive hearing loss and people working in noisy environments. (Panasonic, n.d.) Several companies, among which Aliph (Aliphcom, 2008) and Nextlink (Nextlink, n.d.), develop Bluetooth headset using bone conduction.

²³⁰ Bone phones are headsets that create vibrations against the head. These type of headsets are not covering your ears. Several companies, among which Vonia (Vonia, n.d.), N. Tech (N. Tech, n.d.), Temco (Temco Japan co., n.d.-a), Oiido (Oiido, 2006) and Goldendance (Goldendance co., 2007) produce bone phones.

Back in the seventies the JS&A Group released the bone fone. A scarf with build in speakers that allows you to listen to the radio while exercising. (Pocket Calculator Show, 2002) The name is misleading, as the bone fone did not really convey sound through bone conduction. Speakers were embedded in the flexible part of the shawl. (Modern Mechanix, 2007) Japanese firm Thanko released Vonia, a sports headband with build in bone phones. (Thanko, n.d.) Nippon MMI Technology (Nippon MMI Technology, 2005) and Temco (Temco Japan co., n.d.-b) produced bone conduction speakers for motorcycle helmets.

mp3 players and snorkel radio players²³¹, musical pillows²³², candy²³³ and toothbrushes²³⁴ have been developed.

²³¹ In 2003 Sam James, a design and technology student at Brunel University, created Swim Goggles with built-in MP3 Player that conveys music via bone conduction. (BBC news, 2003) In 2004 Finis releases the SwiMP3, a waterproof mp3 player using bone conduction technology. (Moeckel, 2008) With Amphicons Aqua FM Snorkel you can listen to a radio station while snorkeling. Sound is conveyed via the teeth. (Amphicon, n.d.) Tiger Electronics, the company that has taken over Sound Bites in 1999 (see footnote 233 p.248) developed Pop Radio, a FM radio that lets you listen to your favourite radio station via bone conduction. Pop radio works in the same way as sound bites: a lollipop placed on a holder. (Hasbro, 2008b)

²³² In 2003 Toshiba released a musical pillow that has two built-in bone conduction speakers. Only the person whose head is lying on the pillow can hear the sound. (Akibalive, 2003)

²³³ Hasbro's Sound Bites hit the shelves in the U.S. in 1998. Sound Bites consists of a simple lollipop and a special lollipop holder. When a person puts his teeth on the lollipop the sound vibrations produced by the holder are conveyed through the teeth to the jawbone and then to the inner ear. Several versions of Sound Bites were produced from the Looney Tunes series letting you hear Tweety Bird inside your head, to various guitar riffs and even a version where you could make your own recording. (Hasbro, 2008a) In Japan Sound Bites was released by the company Bandai under the name Silent Shout. (Hasbro, 1998/n.d.)

²³⁴ After further experiments with eating utensils such as forks and pencils (United States Patent, n.d.), at the end of 2006 (G. Owen, 2006) Hasbro, launches a new product based on the same technology: Tooth Tunes, a toothbrush conveying music tunes of exactly 2 minutes via bone conduction. The music is stored in a microchip. (Hasbro, 2008c; United States Patent, n.d.)

4.5 Conclusion of chapter four

In this chapter the sound works themselves were put to closer examination. The production of sound by sound works was classified at an initial level according to the nature of the sound-producing material as proposed by the Sachs-Hornbostel system. One type of sound-producing material from each main category was investigated in greater detail - idiophones (rods), membranophones (plastic membranes), chordophones (long strings) and aerophones (organ pipes) - and various types of activation of this material were discussed. In addition, a large case study revealed the operation of the electro-mechanic and electro-pneumatic automatons of the *Man and Machine Orchestra*. A fifth category, electrophones was more elaborately dealt with as the various usages of loudspeakers in sound art were investigated: to reproduce pre-recorded sounds, to amplify existing sounds, to electronically create sounds in real-time and the loudspeaker as instrument.

Whereas the classification of Sachs and Hornbostel does not cover sound works that redirect, damp or reflect sound, these were discussed separately. Moreover, the conveyance of sound through other substances than air was investigated.

Lastly, the near merger of sound art and applied science was looked into. Through looking at the implementation of various natural phenomena in sound art, we have shown how these sound works go beyond the demonstration of a scientific phenomenon. It is up to the sound artist to continue to amaze and dazzle the audience, discover new combinations of science and sound, dress an existing natural phenomenon up as something new and above all to keep putting poetry into science.

Chapter 5

Artistic practice

We have now defined sound art, studied its musical precursors, its presentation spots and its relation to technique and technology. In this chapter several art works will be discussed that were created by the author within the scope of this thesis. This artistic research is a reflection on the research questions that are tackled in chapter 1 to 4 of this thesis. Defining and demarcating sound art has made up a large part of the theoretic research. This is also reflected in the author's artistic practice as several works were created that balance on the border of sound art and other art forms. This experimentation with art works that fall between several categories helped the author to reflect on the research questions and finally to formulate her own view. Besides exploring the borders of sound art, the author has also experimented with the implementation of various techniques to create and to convey sound in her artistic work.

In the discussion of the artistic works the diagram as described in Figure 9 (see p.14) will serve as a leitmotiv. However, not all steps of this diagram will be discussed for each art work. Instead, the aspects that we intend to highlight will depend on the type of artwork created as well as the technologies involved.

Like many sound artists (Van Peer, 1993), the author works mainly empirically. The author first thinks about an idea she wants to realise and only afterwards looks at the possible means to realise this idea. In more complicated works several ways to execute an idea are tested to finally reach the desired result.

5.1 O_Rex

The performance *O_Rex* goes beyond the concept of a performance in several ways. Various techniques to distribute sound were incorporated in the performance. Live sounds were distributed acoustically through a network of tubes and horns positioned above the heads of the audience, while amplified sounds were distributed through moving horn robots on stage. The roles of audience and performer were partly exchanged as a volunteer from the audience performed the leading figure of the piece. The stage was expanded to make it possible to enclose the audience with stage attributes such as a web of tubes and horns.

Development of concept and idea

The performance *O_Rex* was an initiative of the multimedia theatre group CREW. This collective, under the guidance of Eric Joris, is known for their alternative performance settings. *O_Rex* was their first endeavour to create a performance for a traditional theatre hall. The author was invited to create the sound for the production. The concept of the performance was already tied up prior to the author's joining.



Figure 160 The immersant outside arts centre Vooruit, Ghent, Belgium at the 2007 première @ Crew



Figure 161 The immersant and actor Krijn Hermans on stage @ Crew

O_Rex is based on the mythological figure of Oedipus who symbolises modern man and his tragic fate, being blinded when he can still see and only seeing when he becomes blind. As in all productions by Crew, members of the audience become part of the performance. A person of the audience volunteers to be the immersant, the person who will embody Oedipus on stage. This volunteer is equipped with headphones and video goggles and is immersed in a virtual world to experience his very own performance. The immersant receives instructions while being on stage and becomes part of the performance while the audience watches his or her actions and sees a different show than the one experienced by the immersant. The immersant is not on stage during the complete performance, but also wanders in the theatre's hallways and even outside the building, depending on the instructions he or she receives. The immersant embodies the boundary between reality and fiction, between the self and the outside world. He or she watches while being watched. Next to the immersant one actor and one singer/performer were on stage. The voiceover instructions partly became the narrative.

Laptops drove around on stage²³⁵ and functioned as small video screens. They gave the audience a view of the other world by showing fragments of the images the immersant sees.



Figure 162 Laptops functioning as small video screens @ Crew

The auditive part of the performance required that a part of the sound had to be based on *Oedipus Rex* by Igor Stravinsky, more precisely on the aria of Yokasta.

Although *O_Rex* is based on the tragedy of Oedipus, the performance does not narrate the tale but uses the tragic fate of Oedipus as a metaphor for the human condition.

Gathering research materials

As part of the music had to be based on Igor Stravinsky's *Oedipus Rex*, the score as well as audio recordings were collected. The author chose to distribute sound not solely via speakers. PVC tubes and polyester horns were collected to that purpose.

Various field recordings were made.

²³⁵ The idea to place laptops on wheels is not an invention by Crew, but had amongst others been incorporated in the performance *A Soa(pop)era for Imacs* (1998) by Peter Sinclair & G.H. Hovagimyan. In this piece four laptops are deployed, each positioned on a radio controlled car. (Giroudon, 1999, p. 49)

Set-up of first experiments, Evaluation of first experiments



Figure 163 Maja Jantar distributing sounds through the PVC tubes @ Crew

Together with the singer various extended techniques were experimented with and recorded.

Experiments were conducted whereby the singer spoke through a PVC pipe. At the end of the pipe a horn was positioned. Although the voice of the singer was slightly altered, due to the length of the pipe, this was not disturbing and could be taken into consideration for the actual composition.

Horns were also used in another experiment to redirect sounds from loudspeakers. A horn was placed on top of a loudspeaker in order to redirect the sound coming from that loudspeaker. Experiments were conducted with the position of the horn towards the audience.

Evaluation and adaptation of concept and planning

The idea arose to put the horns on a moveable platform, similar to the moveable laptops.

As the experiment with the PVC pipe and polyester horn provided a good result, it was decided to create a network of pipes and horns.

Development of the art work

This network was positioned above the heads of the audience. All the tubes of this network came together in one central place on stage. Around the extremities of the tubes a small chamber was created that accommodated the tubes and the singer. Together with the singer, Maja Jantar, experiments with the acoustic distribution of various sounds were executed. This acoustic distribution of sound in space is similar to the idea drawn up by Athanasius Kircher in his *Musurgia universalis sive Ars magna consoni et dissoni vol. 2* (Kircher, 1650), whereby acoustic sounds are distributed via long tubes to various locations in the building.

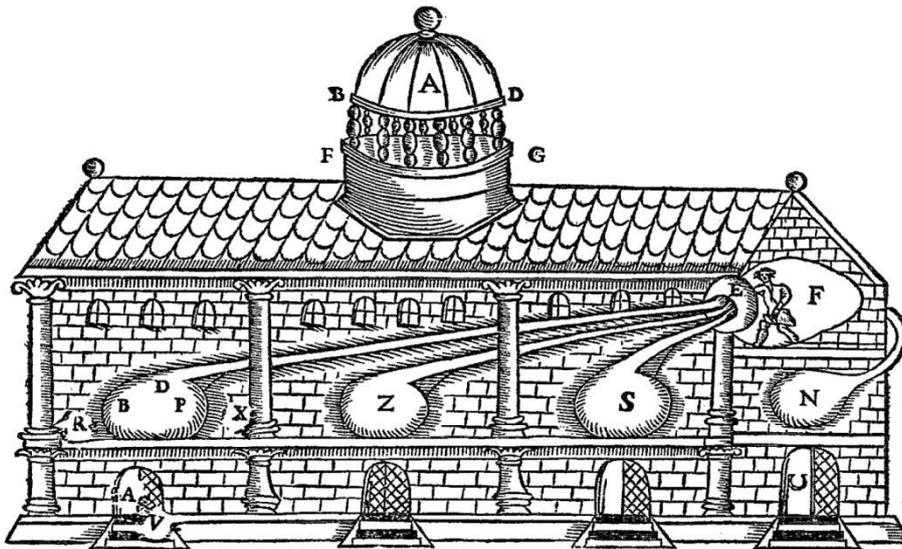


Figure 164 Distribution of sound (Kircher, 1650, p. 296)

At the beginning of the performance the room was wrapped in complete darkness. The singer made small whispering sounds that were distributed through the network of horns leaving the audience clueless about the origin and source of the sound.

The horns and speakers were placed on moveable platforms and a choreography for horn robots was set-up. Through radio technology the sound was transmitted wirelessly to the horn robots. The movements of the horn robots were controlled by similar technology as toy cars that are navigated from a distance. The sound emitted during the robot choreography was based on electronic alterations of Stravinsky's piece. A new arrangement of the aria of Yokasta was created. All instruments (among which guitar, zither, cello, Hammond organ) were played by the author. In addition to acoustic instruments, electronic sounds were incorporated. The aria of Yokasta was sung live by Maja Jantar.

The narratives of the actor on stage were accompanied by recordings of cars passing by. As the tone of the text becomes more imminent, the car sounds build up to nearly white noise, representing the Flood.



Figure 165 Network of horns and tubes @ Crew

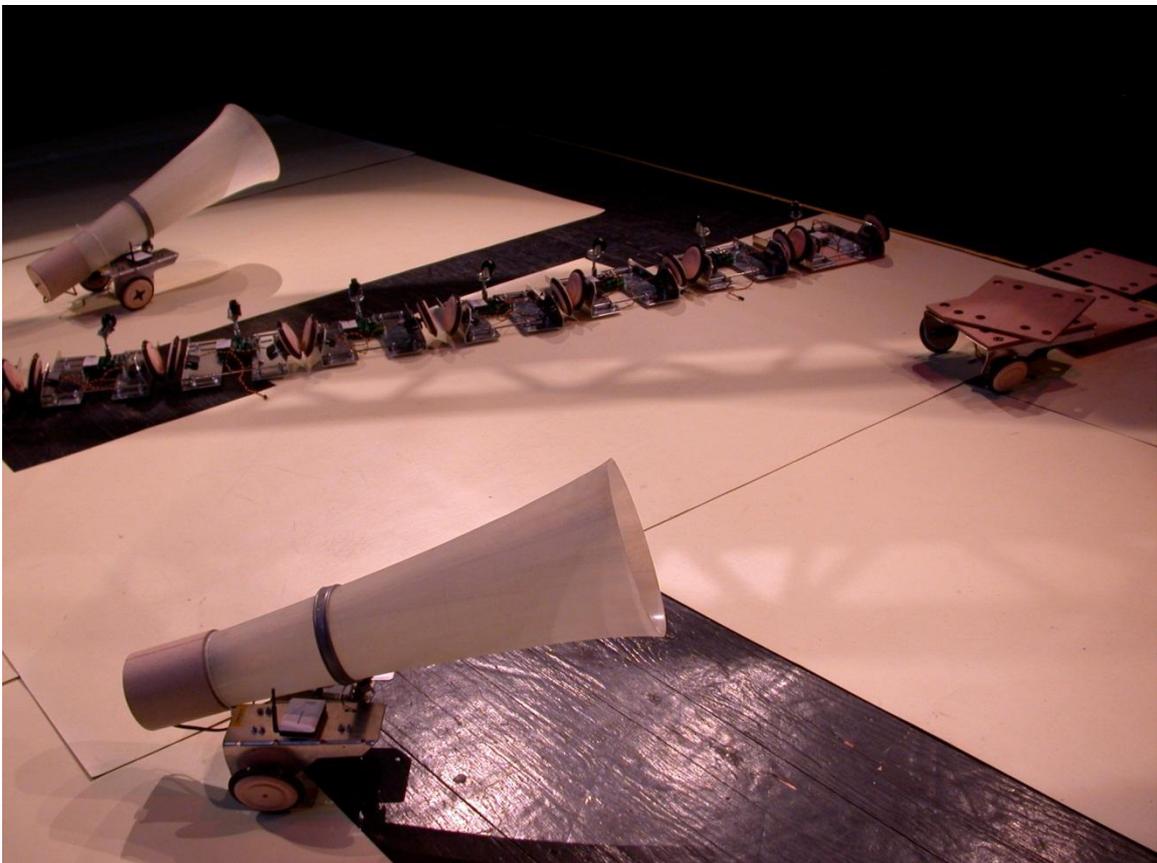


Figure 166 Horn robots @ Crew

Emergence of technical, compositional or aesthetic problems, Finding creative solutions to the problems that emerged

The sound formed the blueprint of the performance. In contrast to the sound aspect of the performance, the visual counterpart had to deal with various technical problems.

First version of the artwork, Presentation to group of peers

The evening prior to the première a try-out took place. Several problems with the technology to control the visuals emerged.

Evaluation of critical discussion and remarks, Adaptation of the art work

Unfortunately time was lacking to make all necessary, mainly technical, adaptations. The work premiered at the Festival of Flanders Ghent. The sound was the only aspect of the performance that was finished and during the performance several technical issues with the visuals emerged.

New presentation

During further presentations of *O_Rex* at the *Spielart Festival* in München, *De Brakke Grond* in Amsterdam and the *International Filmfestival* in Rotterdam these technical problems could not all be handled appropriately and solved completely. Therefore, further presentations of *O_Rex* were cut short.

5.2 3times4

3times4 is a partly physical, partly non-physical installation that converts movement into sound and image reproduced in real-time on the World Wide Web and at the physical location of the installation. In the final result sound and image turned out to be of equal importance, making it hard to classify the work as a sound installation per se.

Development of concept and idea

The initial idea behind *3times4* was to create a sound installation for a physical location as well as for the World Wide Web that would convert movement into sound. The author wanted to experience whether a physical location should always be connected to a sound work or whether it could have a representation on the World Wide Web.

The work was originally created in 2007 for the sound trail *Sounding City*, part of the Happy New Ears festival in Kortrijk, Belgium. When Bram Coeman, the production manager of Happy New Ears, communicated the possible location of the work – a shop window on the corner of the Vlasmarkt – we immediately associated this location with the hair salon that used to be located there. We presumed that the inhabitants of Kortrijk would remember the former hairdresser and decided to base the work on the previous function of the location. In this way the former place would be brought back to life on the location itself, as well as on the World Wide Web.

3times 4 is not the first work with a partial internet presence. Whereas *3times4* reproduces the movement detected at a physical location in sound and image on the World Wide Web, *Silophone* by Thomas McIntosh and Emmanuel Madan is based on sound uploaded by the user that is thereupon played in an abandoned grain elevator in Montreal. The reverberated sounds are audible on the internet as well as on a public location near the silo. (The User, n.d.-b) (see p. 271) In contrast to *3times4* and *Silophone* Jem Finer's *Longplayer* does not depend on external input but utilises code to rearrange pre-recorded sounds. *Longplayer*, initiated at midnight on the 31st of December 1999, intends to create a thousand year long composition. The code of *Longplayer* combines sections of six pieces of music, never repeating the same combination. *Longplayer* can be heard online as well as at several listening posts worldwide. (The Longplayer Trust, 2013)

Gathering research materials

To be able to convert movement into sound, we decided to make use of a webcam

We recorded sounds at our local hair salon with an Edirol R09, at that time the only mobile recording device we had access to.

To reproduce the sound not only on the physical location but also on the World Wide Web, a flash streaming server was used.

Set-up of first experiments, Evaluation of first experiments

The webcam forms the point of departure of the installation as it registers the movements of pedestrians, cars and cyclists. The image of the webcam was divided into twelve surfaces, three times four. To each of these twelve artificial surfaces a hairdresser's sound was assigned.

The first experiments revealed that the technical specifications of the streaming server of the University College Ghent were insufficient. Therefore, a commercial application had to be selected.

During these experiments it quickly became clear that a visual reference was needed to allow the visitor to understand the operation of the work, to play with the work and finally, to master it.

Evaluation and adaptation of concept and planning

The visual reference was kept very minimal and was inspired by the red, white and blue striped barber pole that typically can be found outside hair salons. If movement would be detected in all twelve surfaces simultaneously the red, blue and white barber ribbons would be activated consecutively.

These red-white-blue ribbons of a turning barber pole seem to continuously move up. As an analogue to this optical illusion we decided to add a Shepard tone as the base of the work. A Shepard tone is a sound that is composed of sine waves in successive octaves, placed on top of each other. The acoustic effect is created by attributing a specific volume to each sine wave. In this way an illusion is created whereby the tone keeps moving upwards (or downwards).

Development of the art work

The barber sounds were selected and edited and assigned to a surface of the webcam. Furthermore, the Shepard tone was created digitally and the Flash code was written and tested in the Influxis streaming media platform.

To fill out the complete shop window of the former hair salon MDF plates were cut to the exact size of the window and provided with a small cut-out for the webcam and a larger one for the LCD-display. The MDF plates were painted white. Afterwards blue and red ribbons were added.

Speakers were positioned on the outside of the building.



Figure 167 Painting the MDF plates at the Limelight workspace, Kortrijk, Belgium.

Emergence of technical, compositional or aesthetic problems, Finding creative solutions to the problems that emerged

As the screen interrupted the ribbons, the position of the ribbons on the screen had to be calculated exactly, tested and re-calculated in order to perfectly match with the ribbons on the MDF plates.

First version of the art work, Presentation to group of peers, Evaluation of critical discussion and remarks, Evaluation of problems that emerged

As time was lacking, the work was immediately presented to the audience. Leaving less room for evaluation or critical discussion and possible adaptations.



Figure 168 The first version of *3times4* [Kortrijk, 2007]. In the MDF panel a small hole was made for the webcam. @ Happy New Ears

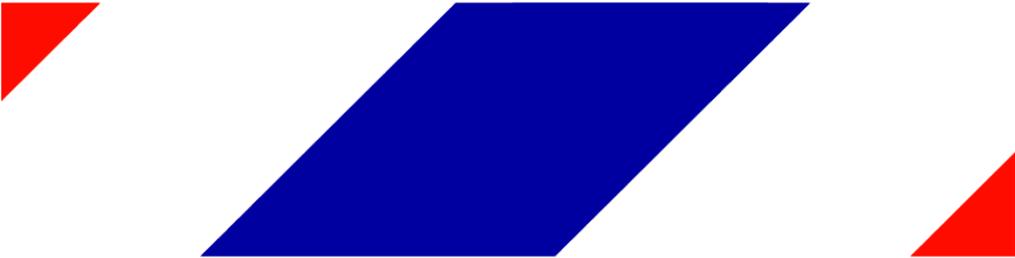


Figure 169 Screenshot of *3times4* [Kortrijk, 2007]

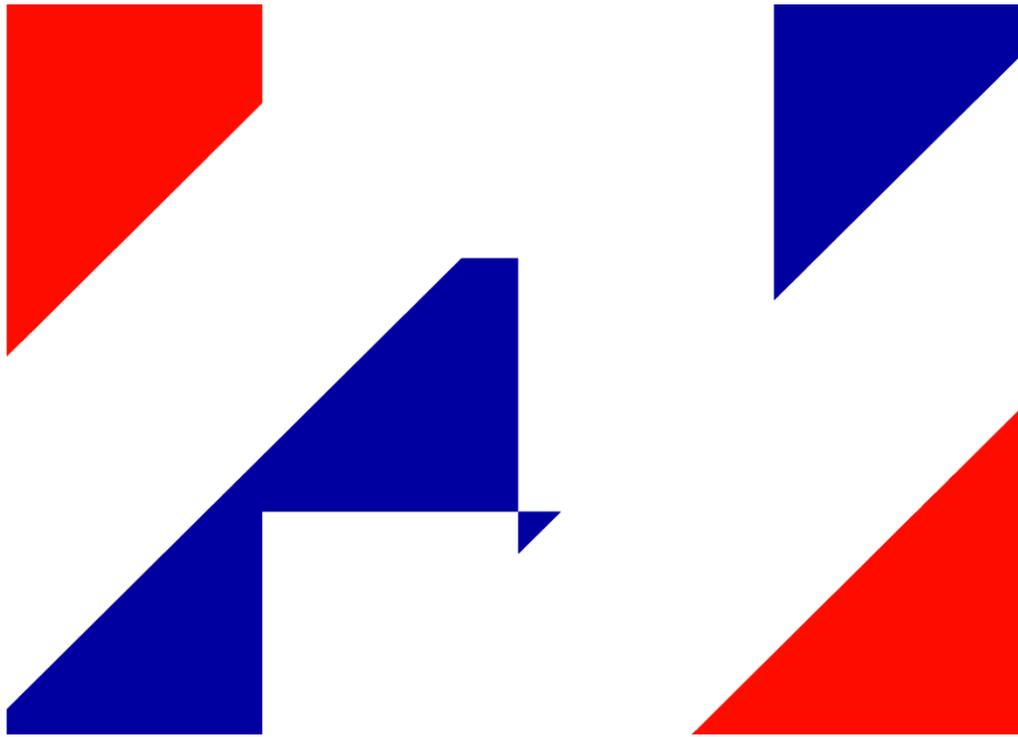


Figure 170 Screenshot of *3times4* [Kortrijk, 2007]

Adaptation of the art work, New presentation, Evaluation of critical discussion and remarks

In 2008 *3times 4* was selected for the *Re:New festival* in Copenhagen, Denmark. This time the inner court of the *Huset i Magstræde* pub formed the location of the work. Although the basic principle of the installation remained the same, the sounds and images were adapted to the new setting. This version of *3times4* invited the visitor or passer-by to create a tune for a pub without music. Instead of a Shepard tone pub sounds, recorded at the Ostend musicless art deco pub 'Hotel Du Parc', formed the basis of the installation. Buzzing voices, the orders of waiters, clapping doors and rustling newspapers formed a continuous layer of sound. On top of this a glass sound – rubbed, bowed or tapped glass – was linked to each of the twelve surfaces. Through moving, the visitor could activate the glass sounds and create his or her own pub music. As the inner court of the *Huset i Magstræde* pub was more isolated than the former location, less environmental sounds were present. The author opted for a more musical approach as the glass sounds had a clear pitch in contrast to the hairdresser's sounds of the first version in Kortrijk.

The initial idea was to work again with a LCD-display and to surround the LCD-display with glasses whereby the top of the glass would be placed onto the window. As in the first version of the work, the visuals of the screen would be completed with the surrounding glass tops.



Figure 171 Screenshot of 3times4 [Copenhagen, 2008]

Twelve glasses were photographed from above and to each of the twelve surfaces a glass top picture was assigned.

Eventually, it turned out the organisation of the festival was not able to deliver a LCD-display. Instead, the image was projected on a screen fixed on the window. Unfortunately the organisation did not provide glasses either and a more tone-downed version of the work was presented.

As in the first version the sounds and images were streamed in real-time onto the internet.



Figure 172 Screenshot of *3times4* [Copenhagen, 2008]

Adaptation of the art work, New presentation

In 2012 a new version of the work was created for the *Light festival* in Ghent, Belgium. The location was initially an orphanage called *de blauwe jongens (the blue boys)*. This building was demolished in 1897 and the National bank was erected on that same location. (Van Aerschot-Van Haeverbeeck, 1976) With the introduction of the euro the National bank closed its doors and at the time of the presentation part of the Conservatory was accommodated in the building.

As in the first version of the work sound and image refer to the former functions of the building, but the work also incorporated its surrounding, the diocese, and the scandal that had controlled the news: the sexual abuse of children.

The Shepard sound was replaced by a soundtrack based on falling coins. To create a richer sound a variety of coins of various currencies were used. To each of the twelve surfaces a different short fragment of the hymn *Christus vincit! Christus regnat! Christus imperat!* sung by a young boy was added.

The visual element consisted of a former note of 1000 BEF on which composer André Ernest Modeste Grétry was depicted. If movement was detected in all twelve surfaces the image of Grétry would be completely replaced by the image of a praying young boy.

If movement occurred in several surfaces visual elements of both Grétry and the orphan would be present.



Figure 173 3times4 was presented during the Lichtfestival [Gent, 2012]. The speakers were positioned underneath the screen as nothing could be attached to the façade of the building.



Figure 174 Screenshot of 3times4 [Ghent, 2012]



Figure 175 Screenshot of 3times4 [Ghent, 2012]

Unfortunately, a new technical problem emerged. The first tests in the Influxis environment did not give their usual outcome and the installation could not be streamed in real-time. Apparently, in October 2011 Adobe had tackled the Flash “flaw” that made webcam spying possible. (Constantin, 2011) The Adobe Flash player was

provided with a safety patch to prevent the unlawful use of webcams on personal computers. Because of this new adaptation, our Flash code no longer worked its magic.

A workaround would probably be to install an old version of the Adobe Flash player. New tests²³⁶ will have to confirm whether this would provide a solution for the communication of the Flash code with the webcam without the intervention of a user by means of a user feedback dialogue or modal window.

²³⁶ These tests were not yet conducted as a monthly fee has to be paid to use the Influxis streaming server.

5.3 Up and Down De Vliet

Up and Down De Vliet, a collaboration with Dutch artist Nico Parlevliet, consists of a fixed split-screen video and soundtrack. The work explores the borders of video art and sound art.

Development of concept and idea

Dutch sound artist Nico Parlevliet had created a split-screen video based on material that he recorded at a lock in a canal, named De Vliet, near Leidschendam, the Netherlands. Two cameras, each placed in a glass box registered the activity of the lock and the rising and dropping water. Parlevliet himself never sonorised the video and asked the author to create the sound for the split screen video.

Gathering research materials

Various field recordings were made. Acoustic sounds were created on amongst others cello, cither, guitar and singing bowls and with a Korg MS20 synthesizer electronic sounds were generated.

Set-up of first experiments, Evaluation of first experiments, Evaluation and adaptation of concept and planning

As the author is very well acquainted with audio editing, no experimental set-ups were conducted.

Development of the art work, Emergence of technical, compositional or aesthetic problems, Finding creative solutions to the problems that emerged

The various sounds were cleaned, cut and edited. A selection was made. The sounds and the movie were imported in Adobe Audition and a composition was created based on the images.

Due to the nature of the work and the author's experience few problems emerged.

First version of the art work, Presentation to group of peers, Evaluation of critical discussion and remarks and of problems that emerged, Adaptation of the art work

A first version of the work was presented to Nico Parlevliet who was very enthusiastic about the result as he himself had struggled with the sonofication of the video.

New presentation

The final version of the work was presented at *Centrum Beeldende Kunst* (Centre for visual arts) in Dordrecht, the Netherlands.



Figure 176 Screenshot of *Up and Down De Vliet*



Figure 177 Screenshot of *Up and Down De Vliet*

5.4 Oorwonde



Figure 178 *Oorwonde*, Usurp art gallery [London, 2012]

Oorwonde (*Ear Wound*) is an art work based on an interactive audio operating table. The visitor turns himself over to aural surgery and hears and feels the soundtrack of a fictitious operation. *Oorwonde* is situated on the intersection of sound art and performance.

The audio perception is extended to a tactile perception. *Oorwonde* makes use of various elements such as loudspeakers, contact speakers, vibrator motors, electro-magnets and piezo-electric discs to convey sound and movement.

Development of concept and idea

The concept of *Oorwonde* is an aural surgery in which the visitor, aka the 'patient', hears and feels the soundtrack of a fictitious operation. The patient can influence various aspects of the sounds and determine the location where the sounds are reproduced.

Oorwonde's focal point is to convey sounds that balance on the border of the audible. To achieve this the sounds are transmitted in various ways. *Oorwonde* further explores the concept of bodily hearing as these various elements are aimed at different body parts. Hearing is no longer restricted to the ears.

Oorwonde is as much a tactile experience as an auditory one as the sound waves emitted are designed to be felt. When standing next to the table the sounds produced can barely be heard. Consequently, *Oorwonde* can only be fully experienced when its surroundings are completely silent. Noise from works nearby would completely destroy the patient's experience of the subtle noises and sensations.

The visual shape of *Oorwonde* reflects its surgical associations. The table is constructed in stainless steel and the lamp producing a clear-cut bundle of white light on the patient's face resembles an operating lamp.

Although at first sight the sound work might induce feelings of terror, and people are often hesitant to take place on the table, the actual experience is a rather pleasant one as in contrast to a real operation, it is the patient who is in full control.

Gathering research materials

The core of *Oorwonde* is a stainless steel table of the type used in industrial kitchens and for post-mortem examinations. The reason for this material is twofold. The stainless steel evokes a cool and icy feeling and conveys the medical association, but besides an aesthetic benefit it also has a technical advantage. Stainless steel is very durable and does not rust. Notwithstanding the very thin steel utilized (< 1 mm), it is possible to weld extensions onto it.

Besides the table various types of speakers, electro-magnets recycled from old signal-horns, piezo-disks and vibrator motors were gathered and material was collected to create a lamp, resembling an operating lamp.

Set-up of first experiments, Evaluation of first experiments, Evaluation and adaptation of concept and planning

The initial idea was to integrate various sound-producing elements into specific places in and on the stainless steel table. During the first experiments electro-magnets, normal speakers, subwoofers, piezo-disks and vibrator motors were tested onto various places of the human body of the author and of several volunteers of the Logos crew.

The outcome of these experiments determined the position of the various sound-producing elements on the table. Their location was chosen on the basis of two things: the sensitivity of the human body and the places with the highest probability of bodily contact.

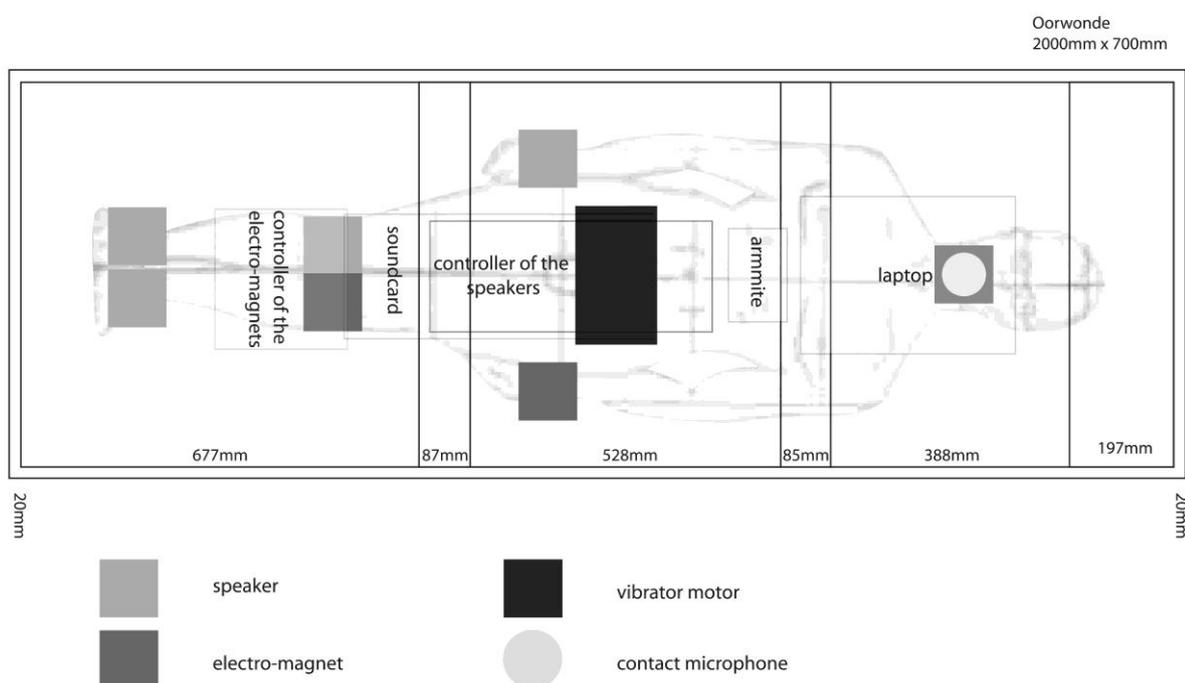


Figure 179 Overview of sound producing elements in and on the table.

Development of the art work, Emergence of technical, compositional or aesthetic problems, Finding creative solutions to the problems that emerged

Nine sound-producing elements were integrated into specific places in and on the table: the neck, the mouth, the buttocks, the palm of both hands, the hollow of both knees and the cavity of both feet.

To suit people of various heights several of the sound-producing elements are moveable. The contact points for the knees are attached to a sliding system and the contact points for the hands can turn 180 degrees. When measuring people's dimensions, we noticed great variation in the distance between the middle of the neck

and the tailbone. Consequently, the contact point at the buttocks had to be larger. After an experiment with a subwoofer that proved to be too fragile, a vibrator motor attached to a circular plate integrated into the table turned out to be an appropriate solution to cover a larger surface.



Figure 180 The bright lamp mounted at the head of the table.

Electro-magnets, recycled from old signal-horns, were used for the left hand, the left knee and the neck element. The electro-magnet integrated into the left knee element is of a type that is different from the electro-magnets at the neck and left hand and therefore gives a different sensation. The vibrations of the electro-magnets are transmitted through moulded rubber shapes. A neck support was welded onto the table and comprises the neck element. As all sound-producing elements had to be housed in elements that matched the table and because stainless steel is a tough

material to process, a creative solution had to be found for the hand and the knee elements: the spoon of a soup spoon was altered and formed the perfect housing of either an electromagnet or a speaker.

The right hand, right knee and both foot elements make use of a speaker to convey vibrations. For each foot element a speaker is glued into a Velcro strap. The speakers are extended with a rubber form to transfer the movements of the cone to the body.

The mouth-piece uses a piezoelectric disc cast in silicone. As this element makes use of bone conduction, the user has to place his or her teeth onto the silicone disc to hear what is emitted. A fresh balloon is placed over the silicone shape for each new patient.

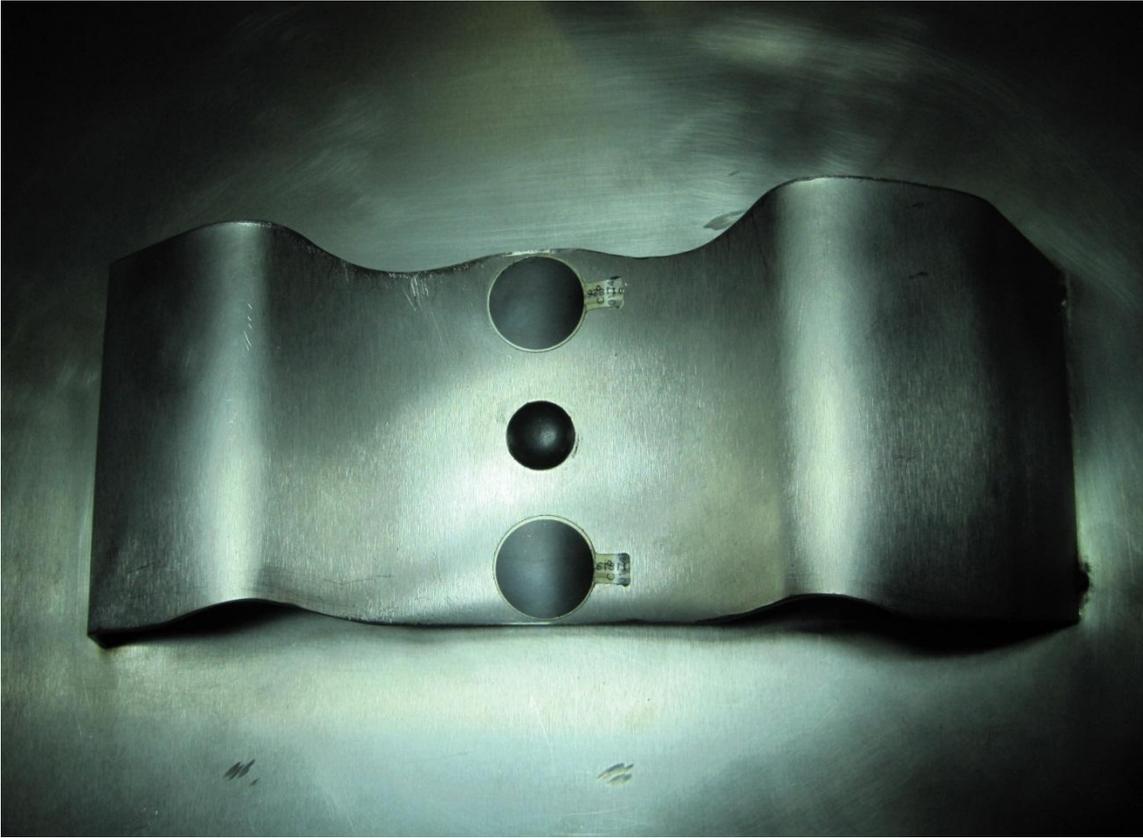


Figure 181 The electro-magnet and two FSRs integrated in the neck element.

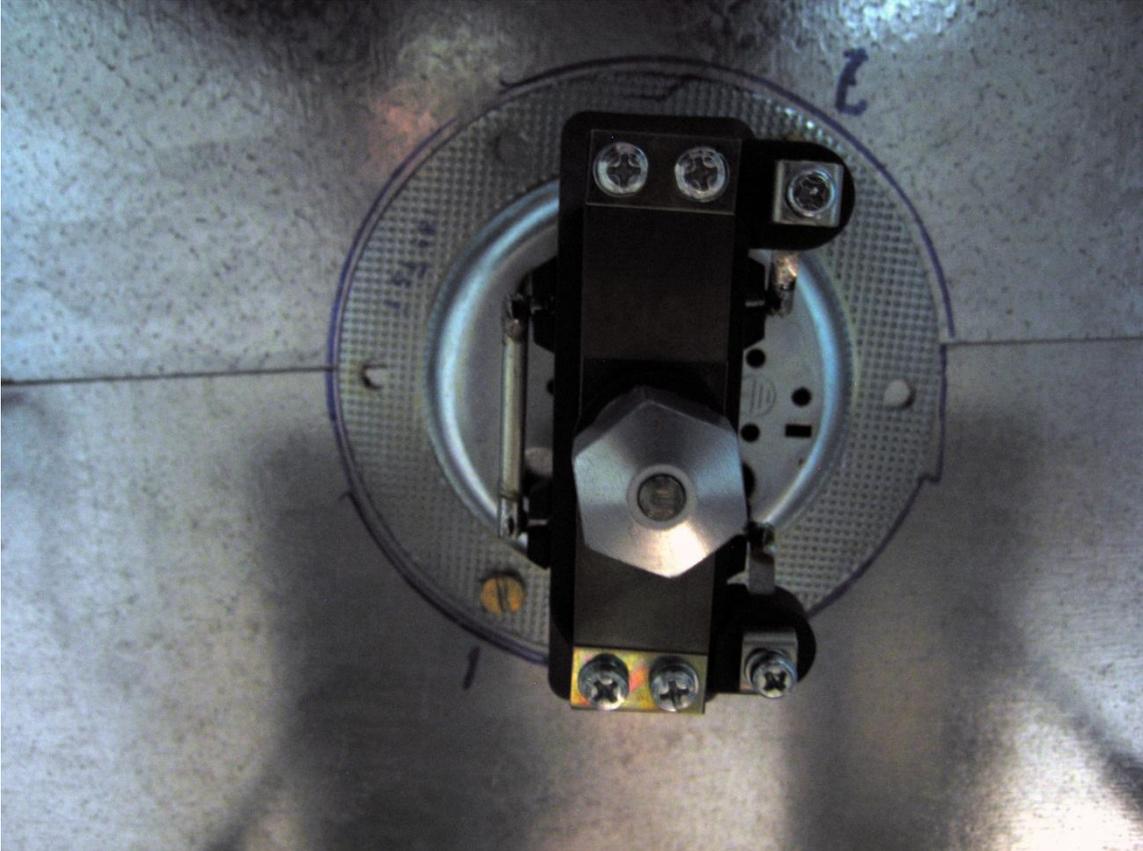


Figure 182 The electro-magnet of the neck element mounted underneath the table.



Figure 183 A balloon covers the mouth element.



Figure 184 The piezoelectric disc of the mouth element cast in silicone.

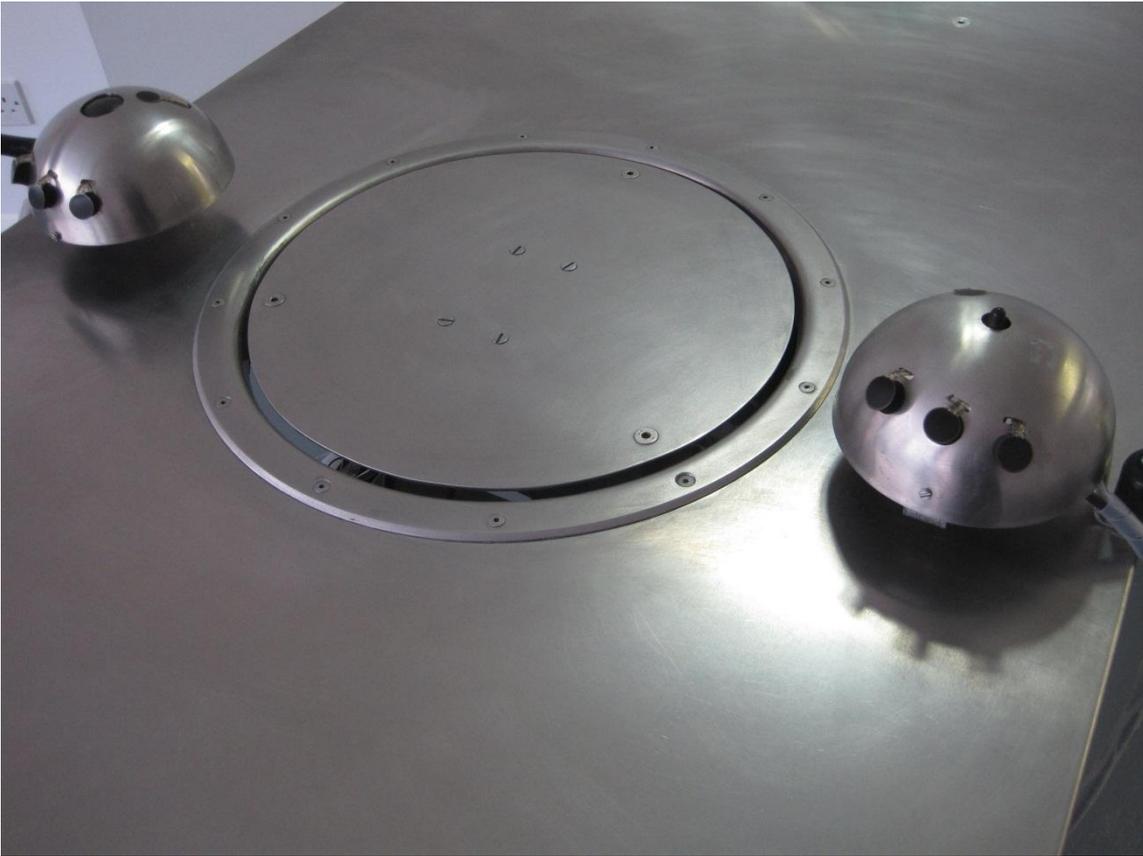


Figure 185 The plate of the buttocks element integrated in the table.

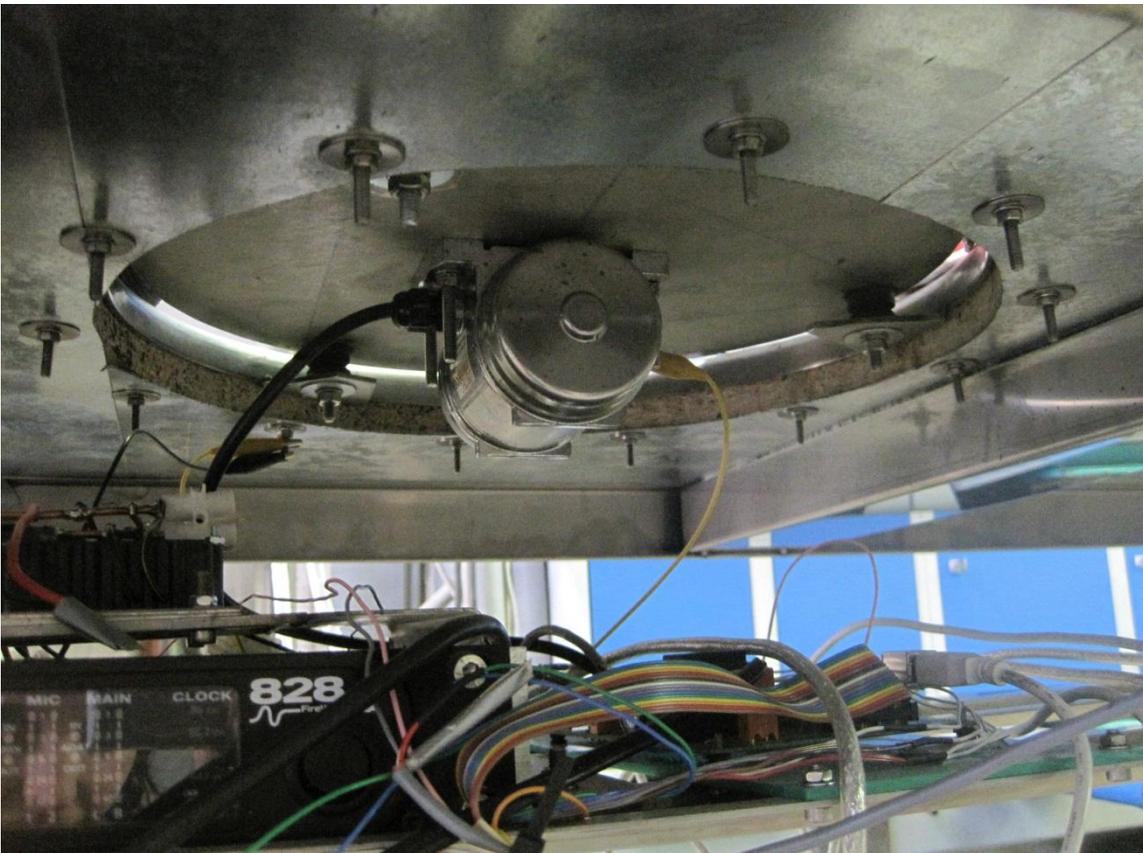


Figure 186 The vibrator motor attached to the plate of the buttocks element.



Figure 187 The electro-magnet and four FSRs integrated in the left hand element.



Figure 188 The electro-magnet used for the left hand element.



Figure 189 The right hand element mounted on the table.



Figure 190 The right hand element without the stainless steel shell



Figure 191 Both knee elements mounted on the sliding system

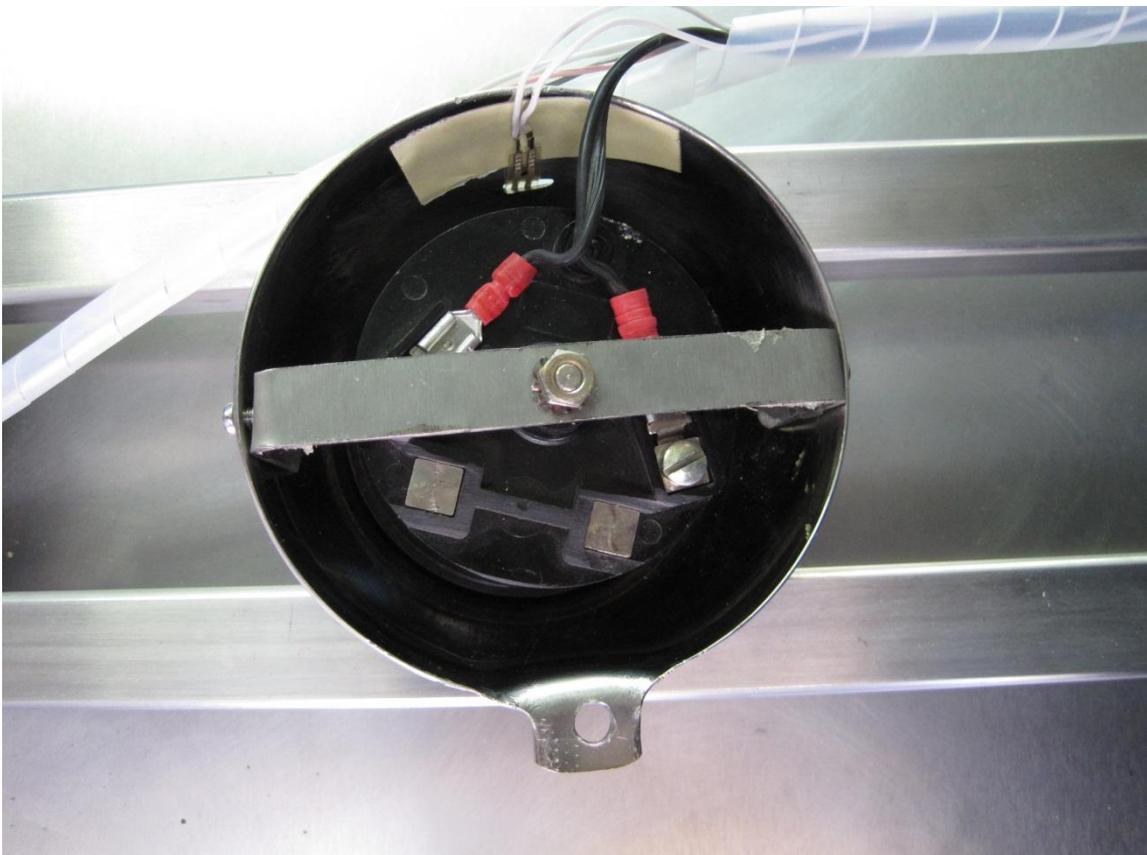


Figure 192 Bottom view of the left knee element.

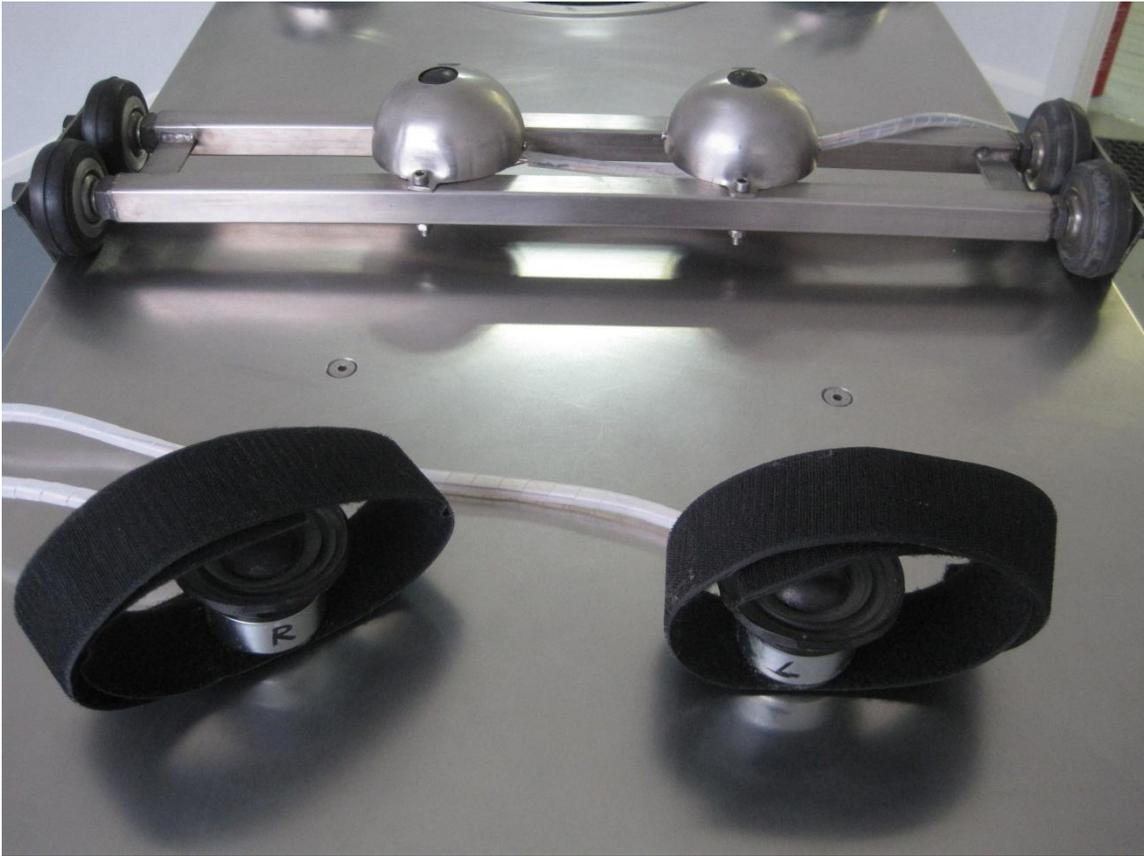


Figure 193 Both foot elements positioned on the table.



Figure 194 One foot element integrated in a Velcro strap

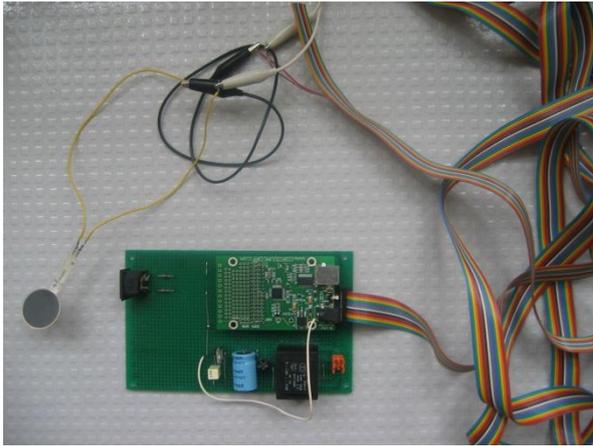


Figure 195 Voltage for ARMmite microcontroller and FSRs.

Underneath the table four bolts hold up two strips of steel that carry all the steering equipment: an 8-channel soundcard, a laptop, a controller for the electro-magnets, a controller for the speakers, a controller for the vibrator motor and an ARMmite microcontroller.

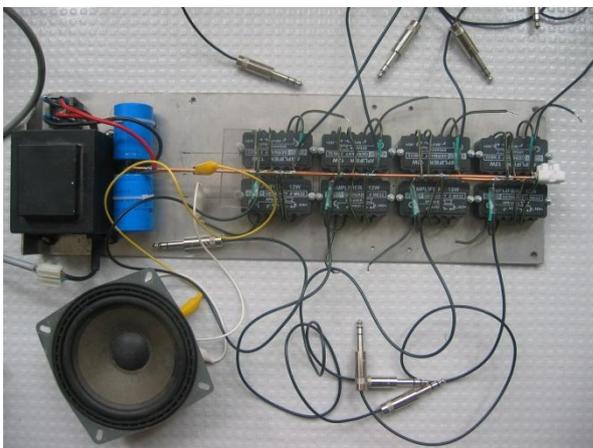


Figure 196 Left: Controller of the speakers.

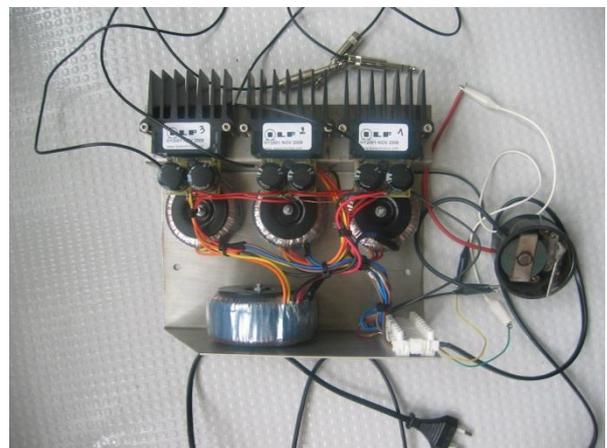


Figure 197 Right: Controller of the electro-magnets

By pushing force sensitive sensors, the patient can activate one or more of the above elements. The sound and movements change according to the pressure exerted. Two force sensitive resistors (FSRs) are placed in parallel on the neck element to detect pressure. Four FSRs can be found on each hand element. An FSR was placed on each knee element as well. The FSRs are used to detect body contact and to measure the pressure applied.

It was essential that the actions of the person lying on the table would not be limited to activating a pre-programmed process, as is often the case with works utilising a motion detector sensor or an on/off button, switch or pedal. Instead, we wanted to provide the visitor with all tools necessary to create a unique composition. Their role is no longer restricted to that of a spectator. A two-way interaction is necessary for the operation of the work. If the visitor is not pressing any FSR, no sounds are emitted. Through pressing the various FSRs the person lying on the table can choose which sound producing sources to activate as each FSR is assigned to one or two specific sound sources. Changing the pressure on an FSR has an immediate impact on the sound produced. For two elements, the right hand and the left foot, the pressure range is

divided into several areas and different pre-recorded sounds are triggered depending on the observed pressure and the according pressure range. For the other elements the pressure measured of the associated FSR is linked to at least one musical parameter. The person lying on the table is inclined to listen, to analyse the effect of his actions and to master the system. The FSRs do not only let the visitor take control of the course of the work but also of his or her perception of the work.

A program in Basic converts the changing voltages from the FSRs into MIDI commands. The MIDI commands are read in Pure Data. The commands either evoke pre-recorded sounds or generate real-time sounds of which various parameters change depending on the pressure exerted.

In the initial mapping of the sensors, sensors were positioned in the neck and on the hand and knee elements. The sensors were not always linked to the sound-producing element on which they were positioned.

Table 3 Initial mapping of the force sensitive resistors

neck: 2 sensors	electro-magnet neck vibrator motor buttocks
left hand: outer sensor	electro-magnet left hand
left hand: inner sensor	speaker left foot
left knee: sensor	electro-magnet left knee
right hand: outer sensor	speaker right hand
right hand: inner sensor	speaker right knee
right knee: sensor	speaker right foot piezoelectric disc mouth

As the sound card that was utilised, is limited to eight audio outputs, the same signal is sent to the speaker at the right foot and the piezoelectric disc. To accommodate the different sound volumes of each medium a resistor was placed in series with the speaker of the right foot.

Oorwonde is a very intimate experience where everything is focused on hearing and feeling. To stimulate this, a very bright lamp comprising 5 x 57 white LEDs is mounted at the head of the table so as to shine directly in the face of the patient who has no other possibility than to close his or her eyes. The light stimulates the patient to concentrate fully on sensing and hearing.

The combination of the simple yet elegant lamp design and the strength of the light produced adds to the medical aura of *Oorwonde*.

First version of the art work, Presentation to group of peers

The first version of the art work was presented at music centre Bijloke during the *Jazz & Sounds festival*, Ghent, Belgium. The confrontation of the table to people with different heights and ages was very insightful.

Evaluation of critical discussion and remarks, Evaluation of problems that emerged

The try-out of *Oorwonde* at music centre De Bijloke (Ghent, Belgium) in March 2010 revealed that the experience of *Oorwonde* is not the same for all users.

Some older people had trouble to hear the very high-pitched sounds. *Oorwonde* not only makes use of infrasound, but also of very high frequencies. Whilst the low frequencies can be felt by everyone, the try-out revealed that the high sounds are not within everyone's reach. From a certain pressure onwards, the neck element produces frequencies of up to 20000 Hz. The sounds are transmitted directly underneath the neck. The combination of the high frequencies and the ongoing pulse of the electro-magnet resembling a heartbeat provide an alienating effect. However, some members of the audience were, due to age or hearing damage, not able to hear these high frequencies.

Another element that influences the experience of the work is the thickness of the clothes the patient is wearing. Visitors are asked to take off their shoes and coats as less textile gives a more intense experience of the work. This is also reflected by the observation that most visitors react strongly to the foot sensations.

For many people the mapping was too complicated to grasp in a ten to fifteen minute session.

Adaptation of the art work

The volume of the high-pitched sounds of the neck element was adapted and a new, easier to grasp mapping was incorporated. Two extra force sensitive resistors were placed on each hand element in order to control all the elements, except the neck and the buttocks, with the hands. To make it easier for the momentarily blinded user to find the sensors, a height difference with the surface of the spoon was created. The three sensors of each hand element were placed on small rubber cushions.

Table 4 Adapted mapping of the force sensitive resistors

neck: 2 sensors	electro-magnet neck
	vibrator motor buttocks
left hand: outer sensor	electro-magnet left hand
left hand: middle sensor	electro-magnet left knee
left hand: inner sensor	speaker left foot
right hand: outer sensor	speaker right hand
right hand: middle sensor	speaker right knee
right knee: inner sensor	speaker right foot
	piezoelectric disc mouth

New presentation

The above mapping (see Table 4) was tested at the second try-out of Oorwonde during *E-dinges* at the Flemish Parliament (Brussels, Belgium) in November 2010.

Evaluation of critical discussion and remarks, Adaptation of the art work

The adaptations gave satisfactory results. It was easier to find the sensors blindly and it turned out to be much more intuitive to operate the elements from the hands. The current mapping makes no use of the sensors located on the knees. A simple program change allows one to go back to the initial mapping.

During the presentation in Brussels a very long person of nearly 2 meters in height tried out the table. The space between the neck element and the lamp turned out to be slightly insufficient.

Oorwonde was adapted so that the neck element was no longer fastened directly onto the table but was extended on a stainless steel plate, providing more room for taller and long-headed persons.

New experiments were conducted with contact speakers. The outcome of these experiments led to the switch of two Visaton SC8 speakers. The speakers of the right hand element and the right knee element were exchanged for contact speakers.

New presentation

The new version of the work was presented during two months at Usurp Art Gallery. During the testing preceding this presentation a new problem occurred. When the table would be used over an extended period of time, a MIDI buffer overflow in Pure Data appeared.

For the presentation at Usurp Art Gallery the set-up was completely automated so that the work could easily be restarted in case any MIDI buffer overflow appeared.

Evaluation of critical discussion and remarks, Adaptation of the art work, New presentation

The author had posted the MIDI problem on the Pure Data mailing list and eventually Miller Puckette, the creator of the software programme, looked into the matter. (Puckette, Maes, & Ingo, 2012)

In the 0.43.3 version of Pure Data the MIDI problem was solved. This version was installed for new presentations at Damp Gallery, Copenhagen, Denmark and at the Logos Foundation, Ghent, Belgium. The MIDI buffer overflow problem did not surface again.

Related practices

Oorwonde is not the first sound work that makes an appeal to sounds outside the range of human hearing, various other artists have explored this field.

The range of human hearing extends from 20 to 20000 Hz. Many sound artists have tried to expand this range through exploring the borders of the audible, either above [ultrasonic] or below [subsonic] human audible range. Whilst we are not able to hear subsonic sounds, they can still form interesting artistic material as we can feel them and they can even be made visible.

Sensation of subsonic sounds

One of the first who came up with this idea were the brothers Baschet who wanted to “inject physical phenomena into art” (F. Baschet, 1999, p. 48) François Baschet dreamt of letting spectator’s seats vibrate simultaneously with the vibrating metal by making a physical connection between the ear and the buttocks. This idea was never executed by the brothers Baschet. Various other artists have put this idea into practice and have extended hearing beyond the ears. To create sensations often subsonic sounds are used.

In a similar fashion to *Oorwonde*, *the Ultrasound of Therapy* from Staalplaat Soundsystem evokes medical associations. This performance integrates works from various artists. Not only the design, but the whole set-up of *the Ultrasound of Therapy* is based on a hospital admission and treatment. At the start of each performance, the spectator has to fill in an admission form providing various demographic data. On the basis of this data a specific treatment is selected. Every member of the audience is escorted by a performer dressed up as a doctor or nurse to a sleeping cubicle where he or she is asked to lie down on a hospital bed, on a stretcher or in a hammock. The treatments range from acoustic sounds produced by two modulated toy music instruments driven by water power to lying down in an electric field with two magnets placed on each side of the head. For some treatments bass shakers, transducers created

to feel low bass sounds, are attached to the bed; other treatments make use of sanding machines mounted underneath the bed or electronically stimulate the muscles of the body of the spectator via adhesive patches. On top of the individual treatments sounds are being reproduced throughout the whole performance space. At the end of the treatment the spectator is asked to write down an evaluation of his or her received treatment. (Staalplaat Soundsystem, n.d.)

One of the artists cooperating on *the Ultrasound of Therapy* is Lynn Pook. Pook has created several sound works where speakers are placed directly onto the human body. In *à fleur de peau* sixteen speakers are hanging from the ceiling. Pook or an assistant tapes the speakers onto the spectator with the aid of Velcro. The speakers are spread over the human body: on the back of each foot, in the spaces behind the knee, in the lumbar region, on the back of each hand, at the elbows, on the shoulder blades, at the neck, on the temples and on the forehead. Pook created the sounds on an analogue modular synthesizer combining sine waves, rectangular waves and sawtooth waves. The location and movement of the sound from one body point to another forms the focal point of the ten-minute-long composition. To be able to fully focus on the sounds transmitted over the body, earplugs are provided. (Pook, n.d.-a) In her later projects Pook continues to work with speakers positioned directly onto the body. In *Pause*, created together with Julien Clauss, the audience has to lie down in hammocks while fourteen speakers scattered over the body produce sounds. (Pook, n.d.-b) Unlike *Oorwonde*, Pook does not integrate the sound producing element in the hammocks. Instead Pook herself or an assistant place the textile covered speakers on the body of the visitors.

Whilst Pook adds speakers directly onto the body, Kaffe Matthews opts for a similar approach to *Oorwonde* and integrates loudspeakers into a bed frame and underneath a mattress. Matthews' wooden framed bed breaths the atmosphere of a comfortable bedroom and the medical aura is hard to find. *Sonic bed* offers space to one or more persons. Matthews' twelve-channel compositions aim to move the bed and to immerse the listener in a bed of sound, not only directed towards the ear, but towards the whole body. (K. Matthews, n.d.-a) In a later phase the number of speakers was extended to fourteen instead of twelve. Eight midrange & tweeter speakers were integrated in the side panels of the bed and six subwoofers were located underneath the mattress. (K. Matthews, n.d.-b) Prior to *Sonic bed* Matthews created an armchair with seven speakers hidden underneath the upholstery. A bench version based on the same concept is permanently installed in Mexico City. (K. Matthews, n.d.-c)

Wendy Jacob did not fail to notice that the sensation of sound opens up possibilities for the hearing disabled. The deaf audience is invited to sit, stand or lie down on a floor-like structure in which several speakers are integrated, to experience the vibrations of the barely audible sound. (Jacob, n.d.)

The idea to feel sound is not new, but the invention of audio transducers made it easier for artists to create works based on the sensation of sound. One of the first to give shape to this was Bernhard Leitner. Leitner created several works in which sounds are aimed directly at the human body. For Leitner, listening is not limited to the ears, but is extended to all parts of the body. (Schulz, 2002) He makes use of various interfaces to bring across his idea of bodily hearing. In *Hand-ton-objekte* two objects consisting of a speaker integrated in a poly acrylate bowl equipped with a handle were aimed at various parts of the human body. (Leitner, n.d.-a) Following this first experiment Leitner created *Ton-Liege*, a reworked wooden deck chair with a subwoofer placed at calf height and another subwoofer directed towards the lower back. (Leitner, n.d.-f) Leitner built further on this idea in *Liege mit 6 Lautsprechern* in which he added one speaker at thigh height and attached another speaker at shoulder height. Two extra speakers were incorporated, not in the chair itself, but placed left and right of the chair slightly above ear level. Leitner's idea was to let sound waves move through the body. (Leitner, n.d.-c) Around the same time of *Liege mit 6 Lautsprechern* he created *Ton-Anzug*, a body suit with a built-in grid that allowed him to attach loudspeakers to various parts of the body. (Leitner, n.d.-e)

Visualisation of subsonic sounds

Various artists have played with the visualization of subsonic sounds, either through placing items on speakers, positioning speakers underneath liquids or through visualizing air pressure fluctuations.

In *Surfaces vibrantes* Xavier Charles places small things such as pinecones and crumpled aluminum foil on subwoofers, the installation consisting of various speakers that each have a different item placed on top of them. (Happy New Ears, 2007) When the speaker emits low frequencies, the cone of the speaker moves back and forth at the speed of the produced frequency. The items placed on top of the speakers move up and down, bump into each other and as a result create percussive sounds.

Alvin Lucier does not place his speakers horizontally but vertically. In *Sound on paper* [1985], a sound installation or performance by Lucier, an audio oscillator produces a wave with a low frequency setting framed paper sheets into vibration. The six sheets of white paper of different weights and densities, are mounted in line with the wall. Behind each sheet of paper a speaker is positioned. The audible sound is mainly the vibrations of the paper. (Lucier, 1985/1995)

Besides using speakers to vibrate solid materials, many sound artists have explored the creation of liquid sound patterns. (see p.264)

Dutch artist Felix Hess takes it one step further as at first sight his installation, *It's in the air*, does not seem to have any relation with sound. However, *It's in the air* makes the movement of air visible. (see p. 41)

Related practices versus Oorwonde

Although *Oorwonde* has not reinvented the wheel, it has added several new elements and insights to the work of its precursors.

In contrast to other works focusing on the sensation of subsonic sounds discussed above, *Oorwonde* is an interactive work. The user cannot only determine the duration of the piece, but can also affect its course. The force sensitive resistors allow the visitor to decide which element is activated. By exerting more or less pressure on the controllers the user can influence one or more parameters of the sound. We have opted for an obvious link between the amount of pressure and the changes in the sound to make it clear to the visitor that their action directly influences sound. More pressure will for example increase the frequency of a sound or the amount of amplitude modulation.

Like Kaffe Matthews, Bernhard Leitner, Wendy Jacob and some treatments of *the Ultrasound of Therapy* we have also chosen to integrate the sound producing elements into and onto the surface on which the user takes place. Whereas the speakers built into Matthews' bed, Jacob's floor or Leitner's chair are aimed towards the whole surface of the object, in *Oorwonde* sound is directed at specific parts of the body. The movement of one sound producing element is limited to a specific point and will not cause the complete table to vibrate. This approach is similar to Lynn Pook's work in which the sound producing elements are aimed towards a specific part of the body.

Oorwonde and *the Ultrasound of Therapy* share their medical concept. In *the Ultrasound of Therapy* this concept is embedded in several components of the work: The use of former hospital beds, and operating tables, the screens separating the beds, the clothing of the artists and guides, the red cross utilised in the logo and the admission procedure and evaluation. This medical aura is less explicitly present in *Oorwonde*. The use of stainless steel, the minimal design of the table and the brightness of the lamp are implicit references to an operating table, but no genuine elements of the medical sector are used. It is the visitor who has to make this association himself.

Presentations of *Oorwonde* have shown that the audience does make the association with an operating table as the medical aura surrounding the work frightens some people and makes them hesitant to lay down on the table. This hesitation has an unforeseen advantage. Some people prefer to watch rather than to participate. As *Oorwonde* is created for one person, this indecisiveness prevents long waiting lines.

Once people have overcome their fear, they are surprised that *Oorwonde* is actually a pleasant experience. It was my intention to combine a fearsome appearance and a quasi-massage like treatment, to make a work of which the design and sensation seem contradictory.

Oorwonde sits at the junction of a sound installation and a one-on-one performance. As with sound art, the perception of the visitor is central and sound is spread in space, although this spatiality is restricted to the human body. The dimension of time is not

completely abandoned, since *Oorwonde* has a well-defined beginning and end, as determined by the visitor. In contrast to most sound works there is a certain development of the musical and tactile material which the visitor is able to influence. The work does not stand completely on its own as it needs some framing. A person is present to guide the visitor and give basic explanations. The creation and presentation of *Oorwonde* has provided insight into the borders of sound art and its intersection with performance art. *Oorwonde* has shown what parameters are substantial to distinguish art forms from one another and has therefore contributed to the development of the analysis tool.

5.5 Glis Glis

Glis glis, a composition with baby sounds, was created in response to a call for sound works (see footnote 41 p. 13). Although *Glis glis* was accepted we would not call *Glis glis*, or most other accepted works, sound works, but compositions.



Figure 198 The image accompanying the submission for the call for sound works depicts various expressions of the sound source.

Development of concept and idea

The author wanted to create a composition solely based on unprocessed baby sounds. By removing these sounds from their former context, they are no longer immediately associated with the sound source.

Gathering research materials

During the first seven months of the author's son's life a large number of audio recordings were made with a Sony PCM-D1. The author opted for this recording device as it is small, can be handled easily, has the possibility to dim all lights to not distract the sound source and delivers good audio quality.

Set-up of first experiments, Evaluation of first experiments, Evaluation and adaptation of concept and planning

As the author is very well acquainted with audio editing, no experimental set-ups were conducted.

Development of the art work, Emergence of technical, compositional or aesthetic problems, Finding creative solutions to the problems that emerged

A selection was made from the many recordings. We opted to mainly use very short fragments of sound. Although some of the sounds might sound digital at first sight, all sounds are unprocessed. While several similar sounds are used such as the deep breathing that precedes a scream, no sound has been used twice.

Many of the sounds utilised can be traced back to a state of being of the sound source. The sound source experiments with his voice to communicate, without being influenced by any social barrier. The composition refers to the base of voice, the foundation of life, yet at the same time appears unearthly.

Due to the nature of the work and the author's experience few problems emerged during the multi-tracking.

First version of the art work, Presentation to group of peers, Evaluation of critical discussion and remarks and of problems that emerged, Adaptation of the art work

A first version of the work was presented to several fellow artists. Some minor adaptations were conducted.

New presentation

The final version of the work was handed in for the call for works for the *Experiments and Intensities series* of the Winchester University Press.

5.6 Tondelier & Tolhuis

Tondelier & Tolhuis show the process of a composition in an installative context.

Development of concept and idea

Tondelier & Tolhuis were created within the framework of TRACK, a contemporary art trail in the city of Ghent, Belgium. The TRACK event comprised six geographical clusters: Citadel, Blandijn, Centrum, Macharius, Tolhuis and Tondelier.

Spectra ensemble was invited to create a musical trail as part of the TRACK programme. On a location in each of the six clusters, sound fragments would be presented during the duration of TRACK. At the end of TRACK these fragments would result in one composition for each cluster.

Together with Joris Blanckaert and Dirk Veulemans, the author was asked to participate in this project. Each participant had to choose two clusters to present their work. As the project was initiated by Spectra, sounds created by members of the ensemble had to be part of the sound fragments and of the final composition. These instrumental sounds could be combined with all types of sounds, but there had to be a link with the specific cluster, the art works presented during TRACK or the city of Ghent.

The author opted for the clusters Tondelier and Tolhuis. In each cluster two specific locations had to be selected to present the sound fragments during the duration of TRACK. These locations were however not free to choose as several conditions had to be taken into account: the location had to be near a place where a TRACK art work was presented and the amplifier and wav-player had to be stored safely. With these conditions in mind we opted for the site at the Gasmeterlaan, just outside the TRACK cafeteria [Tondelier] and the botanical garden Hortus Michel Thiery [Tolhuis].

For both locations violin, viola, cello and percussion would be used as instrumental sound sources. The additional sounds were based on the current or former functions of the location. During more than 100 years the site at the Gasmeterlaan in Ghent [Tondelier] was taken by the *Gasmaatschappij van Gent*. Since the start of the demolition of the former factory buildings in 1981, the ex-factory grounds gradually have received a new purpose. We decided to refer to the former function of the site and to combine the instrumental sounds with noises of escaping gas.

For the Tolhuis location the flow of juices of plants and trees would be combined with instrumental sounds. The plant juices are a reference to the botanical plant and herb garden that had been there since the 1920s and that was reopened for the public in 1987.

Gathering research materials, Set-up of first experiments



During a session with the musicians of the Spectra ensemble, various extended techniques were explored and recorded. For the Tondelier site mainly noise-like sounds were collected, while for the Tolhuis site percussive instrumental sounds were gathered.

Noises of escaping gas were recorded at two gas-powered stoves. The juice flow meter from the Logos foundation was used to record the flow of juices of various plants and trees in two gardens.

Figure 199 The juice flow meter in action.

Evaluation of first experiments, Evaluation and adaptation of concept and planning

The recordings of the musicians and the gas sounds, registered with Schoeps and DPA condenser microphones and AKG contact microphones, delivered good results. The recordings of the juice flow meter were extremely noisy.

Development of the art work, Emergence of technical, compositional or aesthetic problems, Finding creative solutions to the problems that emerged

A lot of noise reduction, filtering and transposing had to be conducted to make the subsonic plant juice sounds audible. The other recordings were selected and edited.

The short sound fragments for Tondelier confront the waste land with its former function. Sounds of slowly escaping gas are combined with noise sounds produced by the strings. The high pitches created by the gas are adopted by violin, viola and cello.

For the Tolhuis site the flow of the juices of plants and trees is made audible and enters into a dialogue with percussive strings and small percussion instruments.

Owing to the author's experience with multitracking, few problems emerged for the creation of the various miniature pieces.

In preparation for the full-length composition of each site, several sessions were organised with the musicians of the Spectra ensemble.

First version of the art work, Presentation to group of peers



The miniature pieces, each between one and two minutes, were presented at their respective site. The sound fragments were played twice an hour and were not announced previously. Although more interactive ideas were formulated the budget and organisational problems limited their realisation.

The sound fragments were changed during the course of TRACK.

Figure 200 The speakers in the tree next to the cafeteria at the Tondelier site.

Evaluation of critical discussion and remarks and of problems that emerged, Adaptation of the art work

Through presenting short sound fragments over a period of time, there was enough time in between to reflect on the created piece and to prepare the final result.

New presentation

During the last weekend of TRACK the final composition of the Tondelier and the Tolhuis site were presented at St. Bavo's Abbey in Ghent. During the live performance of the pieces the cellist's bow was equipped with a gyroscope to measure the rotation of the bow. This data was used to modify the respective recorded gas or juice flow sounds. In the Tolhuis piece dried leaves were placed on a subwoofer. The rustling of these leaves surfaced from time to time as part of the composition.

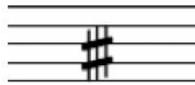
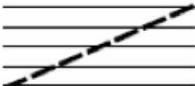
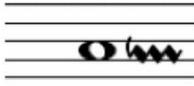
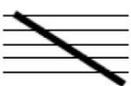


Figure 201 The Spectra ensemble performing *Tondelier* and *Tolhuis* at St. Bavo's Abbey on the 15th of September 2012 @ Karin Borghouts



Figure 202 Close-up of the subwoofer filled with leaves @ Karin Borghouts

Instructions Tondelier & Tolhuis

PONT	TAST	SIDE	BRIDGE
near the bridge	on the fingerboard	on the side of the bridge	on the bridge
			
a quarter tone lower	three quarters of a tone lower	a quarter tone higher	three quarters of a tone higher
			
glissando with nail, without pressing string	wide vibrato range: quarter tone up - quarter tone down	bow: hard pressure left hand: glissando aggressive sound	

Tuning

		
violin	viola	cello

Percussion

- tam-tam, diameter 1 meter
- wooden maracas
- various rattles, rasps and flexatones
- claves
- xylophone
- thunder sheet RVS
- various gummisticks
- 2 bows

Figure 203 Score Tondelier & Tolhuis

♩ = 60 bpm

violin *pp* ② *mp* ①

viola *p* ① *mp* ④ *8vb*

violoncello *p* ② *mp* ④ *ppp*

tam-tam & maracas

cues gas

rub gummistick on tam-tam
alternate between small and large gummistick
do not muffle unless specified

10

vln. *p*

vla. *p*

vlc. *p*

t & m

gas

17

vln. *mf*

vla. *f*

vlc. *mf*

t & m

gas

22

vln. *f* *gliss* ②

vla. *f* 5

vcl. *f* 3

t & m

gas

26

vln. *mf* 6

vla. 6

vcl. *mf* 6 ③ 6 6

t & m

gas

28

vln. *fff* *pp*

vla. *fff* *pp* #e

vcl. *fff* *pp* *pp* side *gliss*

t & m muffle arco

gas

40

vln. *pizz.* *arco* *mf* *f* *p* *mf* *pp*

vla. *pizz.* *arco* *mf* *mp* *mf* *pp* *gliss.* *pizz.* *8vb* ④

vcl. *8vb* ④

t & m *non arco*

gas

47

vln. *mf* *mf* *pp* *tasto*

vla. *mf* *pp* *nail gliss.* *f* *8vb* ④

vcl. *mp* *pp* *tasto*

t & m *hard bow pressure* *screaching cis* *tasto* *muffle*

gas

53

vln. *mp* *mf* *acc.*

vla. *mf* *acc.*

vcl. *mf*

t & m

gas

57

vln. *f* nail gliss *mf* *fff* *p*

vla. *f* *fff* *p*

vlc. *f* *fff* *mp*

t & m

gas

66

vln. nail gliss. *mf* *f*

vla. nail gliss. *mp* *f*

vlc. nail gliss. *mp* *f*

t & m

gas

left hand: very soft pressure
bow: making circular movements from pont. till tast.
stuttering sound

8vb

maracas
continuous gentle turning
cracking sound (cf. a fireplace)

77

vln.

vla.

vlc.

t & m

gas

♩ = 80 bpm

violin *ff* ① ② bow: hard pressure
scraping sound

viola *ff* ② ③ bow: hard pressure
scraping sound

violoncello *fff* ③ ④ *ff* ③ ④ ③ ④ ③ ④ ③ ④

vibraphone

small percussion instruments

7

vln. ① ② bow: fluctuating pressure,
moving between pont. & tast. *mf* ① ②
softer
stuttering sound

vla. ② ③ bow: fluctuating pressure,
moving between pont. & tast. *mf* ② ③
softer
stuttering sound

vlc. ③ ④ ③ ④ ③ ④ ③ ④ ③ ④ *lv.*

vib.

spi

13

vln. *mf* ① ② ① ②

vla. (#) *mf* ② ③ ②

vlc. *p* ① *mf* ③ ④ *f* side
hard bow pressure

vib.

spi thundersheet flexatone thundersheet
small rubber ball

23

vln. ①② hard bow pressure stuttering sound *ff* ①② hard bow pressure scraping sound

vla. ②③ hard bow pressure stuttering sound *ff* ②③ hard bow pressure scraping sound

vcl. *fff* ③④

vib. *lv.*

spi rattle decreasing in speed

31

vln. ② 3 *l.v.*

vla. *mp* ④ *8vb*

vcl. ③ battuta con legno ricochet

vib. gliss. gliss. gliss.

spi plants rasp rattle steady tempo

41

vln. double drumroll on body of violin ②③

vla. ②③ double drum roll on body of viola

vcl. *ff* bang on side of body

vib. gliss. *l.v.*

spi rasp claves flexatone

40

vln. *pizz.* *arco* *mf* *f* *p* *mf* *pp*

vla. *pizz.* *arco* *mf* *mp* *mf* *pp* *gliss.* *pizz.* *8vb*

vcl. *8vb*

t & m *non arco*

gas

47

vln. *mf* *mf* *pp* *tasto*

vla. *mf* *pp* *nail gliss.* *f* *8vb*

vcl. *mp* *pp* *tasto*

t & m *hard bow pressure* *screaching cis* *muffle*

gas

53

vln. *mp* *mf* *acc.*

vla. *mf* *acc.*

vcl. *mf*

t & m

gas

65

vln. ① battuta con legno
ricochet

vla. *mf* *p* ② ③ bow: hard pressure
soft rising scraping sound *pizz.*

vlc. *mf*

vib. l.v. arco

spi rasp

69

vln. *pizz.* ④ ② battuta con legno
ricochet ① ② bow: hard pressure
ff scraping sound

vla. ① ② bow: hard pressure
ff scraping sound

vlc. *pizz.* ② battuta con legno
ricochet ④ *8va* moving slower and slower ② ③ bow: hard pressure
ff scraping sound

vib. ② battuta con legno
ricochet ④ ① *p* *tasto* ③ ④ bow: hard pressure
ff scraping sound

spi flexatone thunder sheet: arco

80

vln. [shaded area]

vla. [shaded area]

vlc. [shaded area]

vib. [shaded area]

spi l.v. scrape plastic comb or glass surface
on thunder sheet

5.7 Ijspaleis

Ijspaleis (Ice Palace) will investigate how a sound sculpture relates to a sound installation. The work will consist of various ice sculptures whose water drops create sound on different surfaces, amongst others thin glass plates and long metal ribbons. The complete work is still under construction.

Development of concept and idea

The author wanted to investigate how a sound sculpture relates to a sound installation and if a group of sound sculptures, where the audience could walk in between, can form a sound installation.

Ijspaleis's initial concept was to put 10 icicles of different lengths in a room at room temperature. Underneath each icicle a glass plate would be hung. The water drops of each icicle would fall on a glass plate of various thickness and form in order to create different tones.

The dripping of water on objects has been employed in many sound works. In *Liquid percussion* by Trimpin MIDI controlled water drops fall in plastic buckets and glass jars generating various pitches that form complex rhythms. (Trimpin, 2011b) Zimoun's work creates sizzling sounds when water drops, originating from 60 medical infusion sets spread in space, fall on the same number of heated metal sheets. (Zimoun, 2013)

Whereas Paul Kos registered the sound of ice melting during *Sound sculpture as* [San Francisco, 1970] (Foley, 1981), Aernoudt Jacobs amplifies the freezing process of water in his sound sculpture *Permafrost* [2009]. (Aernoudt Jacobs, n.d.)

In the visual arts Jane Simpson has equipped several daily objects such as a chandelier or a sewing machine with refrigeration units. (Galerie Simpson, n.d.)

Gathering research materials, Set-up of first experiments

The author worked together with the students of the 2nd Bachelor electro mechanics of the University College Ghent and with their supervisors Christa Labes, Piet Goddemaer and Patrick Depreter. Two prototypes were created. One prototype made use of a water pump to sprinkle the Freon filled copper tubes with water, while the other prototype foresaw a hose filled with water that had to be pulled over the icicle.



Figure 204 Prototype developed by group 1.
 Figure 205 Prototype developed by group 2.

Evaluation of first experiments

The two prototypes turned out to be very ponderous and were a far cry from the elegance and fragility of an icicle as it was technically not possible to wind the copper to a smaller diameter. The idea to let the icicles alternately freeze and thaw resulting in water drops could technically not be realised.

Each group of students had to draw up a budget for the realisation of the total project. Their estimate of the cost for one icicle turned out to be between 3000 and 5000 euro.

Evaluation and adaptation of concept and planning

To get only one sound from one icicle was not very economical, therefore the idea arose to create several dripping points arising from the same sculpture.

The opportunity arose to integrate *Ijspaleis* in the project *492 kilo, an extended piano recital*.

Development of the art work

The new evaporator was developed together with refrigerating engineer Kim Vermeersch. In the *492 kilo* project the ice sculpture would be hung above the piano. Therefore the shape of the piano lid was reflected in the design of the evaporator of the

ice sculpture. Three copper tubes with a diameter of 9,6 mm were soldered together. Three potential dripping points were foreseen in the design of the evaporator. As the development of the prototypes showed that alternately thawing and freezing was not possible, the water drops were added artificially through three water drippers that were mounted in the housing that also comprised the water reservoir, the compressor and condenser. An Amicus board was used to change MIDI commands or the changing voltages from the FSRs into pulses that activate the electro-magnet of each dripper.

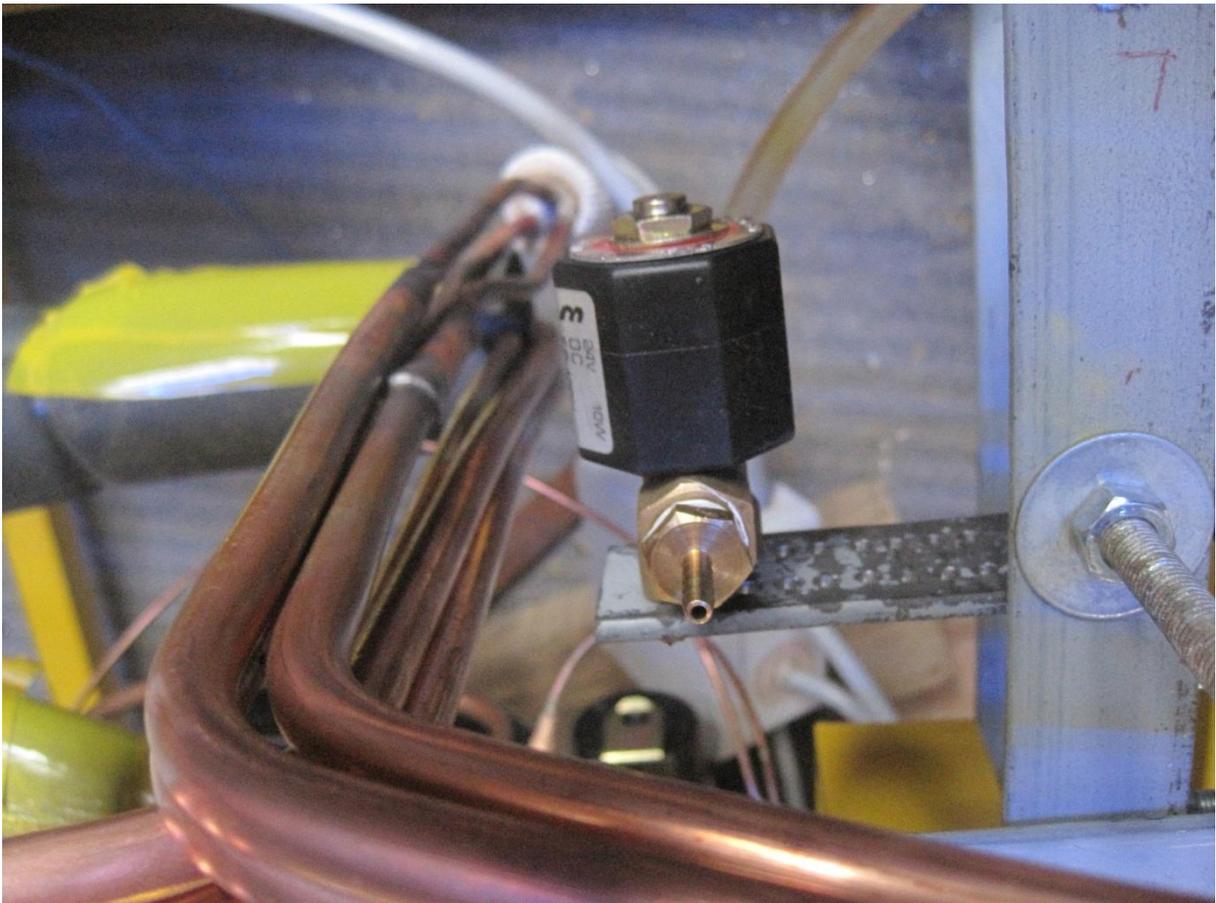


Figure 206 View on copper tubes filled with Freon and one water dripper.

The water drops fall on circular or rectangular Borofloat glass plates with a thickness between 1,1 and 3 mm and create sounds of different frequencies. In the middle of each glass plate a hole is drilled that allows to clasp the glass plate on a stainless steel metal rod. At the end of each rod a piezoelectric disk is mounted that amplifies the sound of the falling droplets on the glass plates. The stainless steel rods add a slight reverb to the sound similar to the operation of a spring reverb.

Underneath the sculpture a polycarbonate form shaped as the lid of the piano collects the water drops. Poly carbonate was chosen above poly acrylate because of its fire-resistant qualities.



Figure 207 First sculpture of *Ijspaleis*.

The electro-magnets could be automated via MIDI commands or they could be controlled via several force sensing resistors installed on the keyboard of the piano. A score indicates when and with what pressure the pianist presses the sensors. The

pressure determines the speed of the falling drops. Next to the sensors that control the water drops a sensor was placed that could control the speed of a small motor mounted near the centrepiece rod. The axis of the motor was equipped with a piece of nylon wire. When the motor would turn, this nylon wire would hit the stainless steel rod.

Emergence of technical, compositional or aesthetic problems

The stainless steel rods had to be fixed to a separate element mounted underneath the black box housing the water drippers, electronics, water reservoir, compressor and condenser.

The main technical obstacle that had to be defeated proved to be the mechanical noise produced by the electro-magnets.

Finding creative solutions to the problems that emerged

Wire was tapped at the end of each stainless steel rod as well as in three stainless steel squares. These squares were slided in a curtain rail. This curtain rail was hung underneath the black box.

Various sound reducing materials were placed in the electro-magnet to decrease the mechanical noise. Eventually Buna rings (small rubber rings) provided a satisfactory result.

First version of the art work, Presentation to group of peers

The first version of the work was presented at the première of *492 kilo* at De Singel, Antwerp, Belgium. After about two weeks of constant cooling the ice has reached its maximum thickness and the sculpture started to drip by itself, eliminating the necessity of the artificial water drippers.

Evaluation of critical discussion and remarks and of problems that emerged, Adaptation of the art work

Some inconsistencies with the code of the Amicus board emerged and the code was optimised.

New presentation

Several new presentations of *Ijspaais* followed as part of the production of *492 kilo*.

492 kilo, an extended piano recital

492 kilo is a performance and installation initiated by pianist Frederik Croene. *492 kilo* questions the role of the pianist and the piano, upturns the concept of a piano recital

and searches for new functions of the instrument. *Ijspaleis* played a key role in the production.

The piano is at times used as a decorative element, sometimes it is extended with a.o. sensors, kinetic sculptures, a midi keyboard, plastic plants, projections, a dripping ice sculpture and piano parts. In each of the eight pieces, contributed by Cathy van Eck, Marianthi Papalexandri-Alexandri, Falk Hübner, Matthew Shlomowitz, Simon Steen-Andersen, David Helbich, Stefan Prins and Laura Maes, the pianist's actions reach much further than touching the keyboard. The creation process and the technical challenges of the production are discussed as well as the new role of the pianist and the piano.



Figure 208 View on iron weight that keeps the keyboard up in the air, the ice sculpture by Laura Maes & plants by Cathy van Eck.

Development of concept and idea

Paul Craenen²³⁷ selected nine artists to contribute material for a new edition of the RTRSRCH journal²³⁸ titled '*Starting with music, continuing elsewhere*'. (Craenen, 2010) All contributors²³⁹ had in common that they live and work in Western Europe²⁴⁰, were born in the seventies and that despite having received a training in classical music, their work took a different turn, integrating theatre, performance, sound art, dance, poetry, film or other disciplines.

Each contributor presented an article, illustrations or scores or any combination, sharing their motivations and sources of inspiration. Extra sonorous elements played a role in all contributions and became a central theme of the journal. From the perspective of their common classical education, the multimedial works presented by these classically trained musicians and composers could be mistaken as 'faits divers', as subversive experiments that only intend to tackle the conventions of classical music. The journal was a first step to counter this prejudice. The contributions show that a new generation of classically educated musicians and composers attempts to redefine their practice and no longer feels bound to one particular medium.

The collection of ideas and practices on paper was a first step. Subsequently, the title of the journal: '*Starting with music, continuing elsewhere*' was put into practice. Forces were combined to re-interpret a very classical theme: the piano recital and to create a production in which sound would remain central, but which would also integrate other disciplines. The basic philosophy of the production was to demonstrate the diverse and adventurous approach of this young generation of Western European music makers and to show a possible future of the piano recital and classical music as a whole.

Method

The idea to create a collective production was initiated by pianist Frederik Croene at the launch of the journal on the 6th of March 2010 at the *Klank Werk Onderneming*²⁴¹ in

²³⁷ Paul Craenen is active as a composer and researcher of intermedial art forms and obtained his PhD in the arts titled 'Composed performers – the music performing body from a compositional perspective' at the Leiden University in 2011.

²³⁸ Journal initiated by the research group Artistic Research, Theory & Innovation (ARTI), Amsterdam School of the Arts, the Netherlands.

²³⁹ Contributors were Cathy van Eck, Frederik Croene, David Helbich, Falk Hübner, Laura Maes, Marianthi Papalexandri-Alexandri, Steven Prengels, Matthew Shlomowitz and Simon Steen-Andersen.

²⁴⁰ Belgium, Denmark, England, Germany, Greece, the Netherlands and Switzerland

²⁴¹ The Klank Werk Onderneming is a polyvalent room used for concerts, lectures, workshops and rehearsals located in Mechelen, Belgium.

Mechelen, Belgium. Most artists were enthusiastic, although not everyone decided to take part. Steven Prengels opted out and instead Stefan Prins was invited to join.

As artists from several European countries participated, bringing everyone together was no sinecure. Two residencies²⁴², preceding the première of *492 kilo*, made it possible to exchange ideas and to work together. Outside these residencies most communication was done by mail.

During the residencies every contributor had prepared a 'piece' for 'piano'. No restrictions were formulated. The composers were free to rephrase the role of the pianist, his instrument or even the very concept of the recital itself. During the residencies all elements were brought together, technical aspects were reviewed and the order of the contributions and the set-up of the stage were determined. One technician was present during both residencies and all presentations.

Eight 'pieces' for 'piano'

All eight composers had a different take on the concept of a piano piece. Several composers explored the inside of the piano. Simon Steen-Andersen's piece prescribes the pianist to play with sticky cluster boards²⁴³ inside the piano as well as on the surface of the keys. Marianthi Papalexandri-Alexandri explored new sound possibilities by adding mechanical constructions to the strings of the piano. Other composers extended the keyboard. Both Matthew Shlomowitz and Stefan Prins added an additional keyboard. Shlomowitz deployed both keyboards and used the additional keyboard to confront traditional piano sounds with animal sounds and heavy guitars. Stefan Prins on the other hand, exclusively utilised the additional keyboard to play sampled inside piano sounds and to trigger the corresponding video images. Laura Maes adapted the existing keyboard of the piano and added force sensitive resistors allowing the pianist to control the dripping of an ice sculpture. Cathy van Eck went one step further. Instead of combining piano sounds with external sound producing elements, she opted to use the piano merely as a piece of furniture. Not only the piano as a sound producing object is questioned, but also the role of the pianist is reconsidered. In Falk Hübner's piece the actions of the pianist do not produce sound. Instead the movements of the pianist - based on movements made during the execution of certain extended techniques - are solely accompanying a soundtrack. The sound producing quality of the pianist's movements is exchanged for their choregraphical potential.

²⁴² The first residence took place at the Pianofabriek in Brussels from 16/08/2011 till 31/08/2011. The second residency just preceded the première and took place at arts centre De Singel, Antwerp from 19/09/2011 till 30/09/2011.

²⁴³ A wooden board with handles covered in tape.

Not only the function of the piano and the pianist are widened, David Helbich's interventions reversed the roles of audience and performer.

Simon Steen-Andersen: Wood and sticky tape

Simon Steen-Andersen's piece *Pretty Sound (Up and Down)* starts off with a slow zoom into the gut of the piano. With a wooden 'cluster board' the player presses and depresses all of the 88 keys of the piano at the same time over and over again. At first the sound remains unamplified and as loud as possible - probably the loudest acoustic sound one will ever get out of a piano. The amplification is slowly turned up while the cluster gets softer and softer until the tones disappear completely and only the sounds of the mechanics of the piano are left, now extremely amplified. The friction of the keys moving up and down, normally inaudible, now sound as soft breathing of the piano itself, trying to catch its breath.

During the continuation of the piece these sounds of piano mechanics are combined with the sounds of the performer's movements. Steen-Andersen searched for several ways to make these movements audible. He has put adhesive tape inside out on the handles of the board, so that a 'sticky' sound is created whenever the hand is lifted away from the handle. Furthermore, contact microphones were attached to the piano pedals, the piano lid, on the wooden cluster board and on the mechanics. Two small boards wrapped in tape are placed on the strings. Whenever the pianist picks them up, a gentle ringing sound can be heard.

It is not always clear what comes first or is more important: the movement or the sound it produces. *Pretty Sound (Up and Down)* balances on the border of a choreography and a piece of music. At one point a distant and fragile chorale, performed with a slide on the strings, sounds through the noises. It gives the title its double meaning: 'pretty sound' as in quite strong and robust, and as in beautiful sound.

Marianthi Papalexandri-Alexandri: Inside kinetics

Marianthi Papalexandri-Alexandri used several kinetic objects created by sound artist Pe Lang for her composition *Untitled iii*. Prior to the execution of the piece the piano has to be prepared. Nylon wires are at one side, via springs, hooked up to a string of the piano, while at the other end the wires are attached to a poly acrylate tube. An interface allowed the pianist to determine the speed at which the tube rotates. In addition to these preparations a motor - positioned between two poly acrylate plates - was placed on the sounding board. The pianist could turn the motor on and off. The last kinetic element consists of a rotating poly acrylate plate positioned next to the pegs tightening the strings.

With the aid of these moving objects, Papalexandri-Alexandri reinterprets the instrument, its sound production and the behaviour of the performer. Together with

the pianist Papalexandri-Alexandri searched for the 'right' sound before determining the position of the kinetic elements. This position changes for each new piano.

The sounds Papalexandri-Alexandri aims for are subtle, quiet and slowly evolving. They do not only demand a very focussed performer, but also an attentive audience. Although Papalexandri-Alexandri is not a fan of amplification, as it is her intention to change the way of listening, for this piece some amplification was used. In most of her pieces the audience is gathered around the piano. In the set-up of *492 kilo* this was physically not possible because of the number of people attending the performances. The challenge was to bring across the same intimate experience, while the distance between sound source and audience was much larger.



Figure 209 Detail of the piano preparations for *Untitled iii* by Marianthi Papalexandri-Alexandri.



Figure 210 Frederik Croene performing *Untitled iii* by Marianthi Papalexandri-Alexandri

Matthew Shlomowitz: Electronic and acoustic merging

Popular Contexts by Matthew Shlomowitz, composed for piano and sampler keyboard, is a collection of five separate pieces, 25-30 minutes long in total. The pieces did already

exist and were not exclusively composed for *492 kilo*. Frederik Croene selected two pieces, *Progressive Clock*, *Alarm Rock* and *Weird Twin*, to be included in the production.

In *Popular Contexts* Shlomowitz places one hand of the performer on the keyboard of the piano and the other hand on the adjacent sampler keyboard. The additional keyboard was placed above the piano keyboard and could, through the use of a pulley, be let down.

The basic concept of *Popular Contexts* is the piano interacting with the 'world' via the sampler. In some pieces the samples are musical (e.g. drum machine and loud electric guitars) while in others they are environmental (e.g. telephone ringing, automated voice mail messages or the sound of a ping-pong game).

Stefan Prins: Unpicking and reconstructing

Prior to composing *Piano Hero #1* Stefan Prins worked together with pianist Frederik Croene and recorded and filmed Croene performing on his piano frame. Prins's piece is based entirely on these sounds and images. During the performance of the piece the pianist takes place behind an 88-key MIDI keyboard. Behind the pianist a projection screen is hung and a webcam is mounted just at eye level.

The signals of the keyboard are fed into a Max MSP patch. When the pianist presses down a key the associate sound and image are evoked. Prins quickly shifts between keys and creates a stuttering wall of inside piano noises. Towards the end of the piece a break is made. Whilst the pianist keeps pressing keys as if his life depends on it, no sound is audible besides the unamplified sound of the moving keys and the heavy breathing of a concentrated pianist. Instead of images of Croene performing on his piano frame, now the back of the pianist is filmed by the webcam in real time and this image is projected on the screen.

Laura Maes: Ice, glass and sensors

Laura Maes extends the piano keyboard by adding four force sensitive resistors, one to each key. The piece *Ice Mirror* combines inside piano sounds and sounds of an ice sculpture.

An amorphous sculpture is hung above the piano at least one day prior to the performance. The sculpture is composed of three copper tubes filled with Freon gas. After about an hour of operation a thin white layer appears on the tubes. This ice layer gradually increases until a thick layer of ice has been formed. Underneath the ice sculpture three glass plates with a thickness between one and three mm are placed. Each plate has a hole drilled in its centre and is mounted on a stainless steel rod. The final element of the construction is a transparent polycarbonate lid hung above the piano, replacing the actual piano lid.

During the performance of the piece it seems as if the ice sculpture starts to melt, instead three water drippers, mounted inside a black box that holds all electronics and mechanics, provide the water drops.

The score prescribes when and how hard the pianist has to press the force sensitive resistors. Three resistors steer water drops, one resistor controls a small cassette motor equipped with a nylon string mounted near the middle one of the three stainless steel rods. If the pianist presses harder more water drops will fall and the motor will turn faster.

The sound of the water drops falling on the glass plates travels through the rod and at the end of the rod a contact microphone is attached. The rod adds a type of reverb comparable to a spring reverb to the water drop sounds.

Ice Mirror combines the frail sound of the water drops and the brutal sound of the motor with inside piano sounds such as glissando's, harmonics and mechanically altered e-bow sounds.

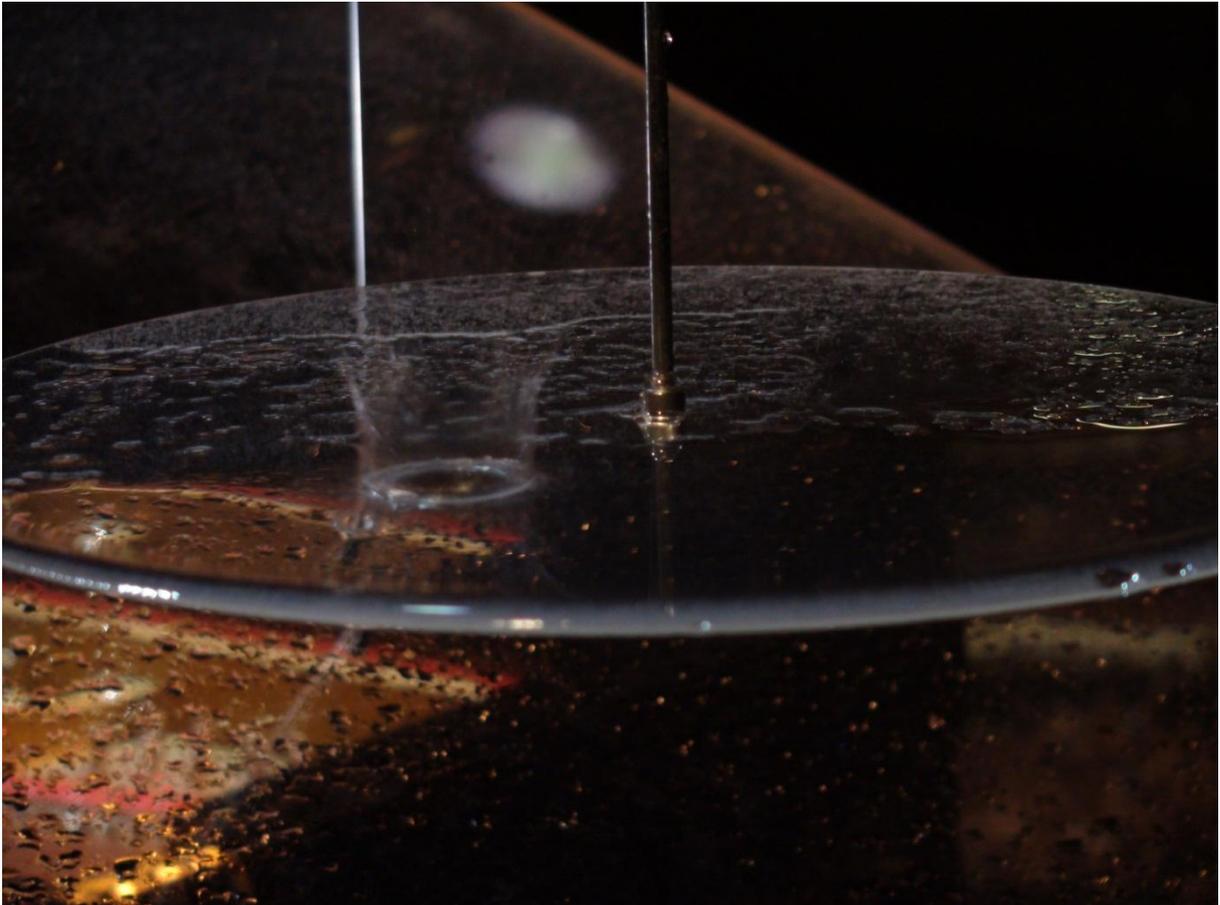


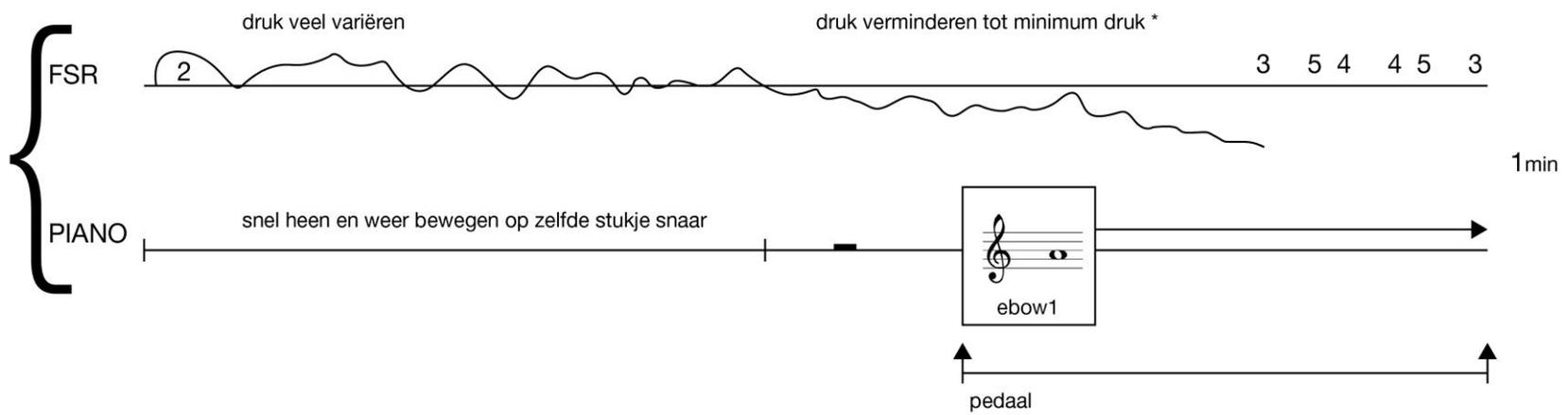
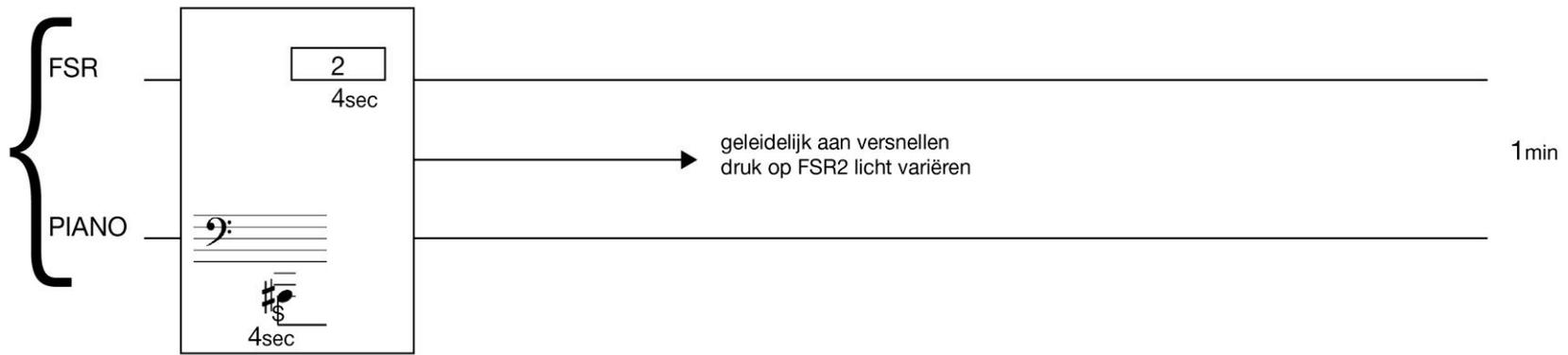
Figure 211 Falling water drop on glass plate.



Figure 212 The sensors allow the pianist to control the speed of the water drops and the motor.

Stappenplan

01. Afwisselend glissando snaar binnenwerk / FSR2 (motor)
traag (4s) -> versnellen
02. Snel heen en weer bewegen op zelfde stukje snaar + FSR2 (druk variëren)
druk FSR2 geleidelijk afnemen tot min. druk
03. ebow1 plaatsen
+ FSR2 min. druk
04. FSR3 5 4 (druppels)
+ ebow1
05. FSR3 4 5
+ ebow1
+ ebow2
06. FSR3 4 5
+ ebow1
+ ebow2
+ sleutels (LH + daarna LH + RH)
+ wahwah (pedaal) traag -> snel
07. FSR2
+ ebow1 verwijderen
08. FSR2 afgewisseld met 3 4 5
09. FSR2
+ebow2 verwijderen
+ snelle glissando binnenwerk
10. FSR2 afgewisseld met 3 4 5 en snelle glissando
11. FSR2 3 4 5 afgewisseld met snelle glissando en bout
12. Harmonieken, bout, FSR3 4 5 afgewisseld

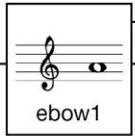


* druk noodzakelijk om motor te laten draaien

ijsspiegel ❶

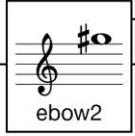
FSR 3 5 4 4 5 3 3 4 5 3 5 4 3 3 5 5 5 4 4 3 5 4 3 5 3 4 5

PIANO



ebow1

PIANO



ebow2

1min

Detailed description: This section shows two piano staves. The top staff is labeled 'PIANO' and contains a box with a treble clef, a single note on the second line (F), and the label 'ebow1'. The bottom staff is also labeled 'PIANO' and contains a box with a treble clef, a sharp sign on the first line (F#), and a single note on the second line (F#), with the label 'ebow2'. Both staves have a long horizontal arrow pointing to the right, indicating a sustained duration of 1 minute.

PIANO

LH

traag bewegen
rond sleutels

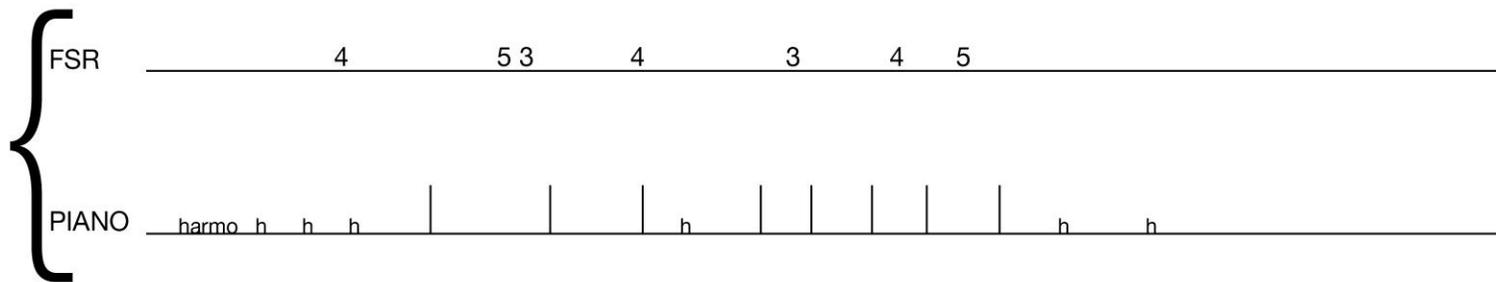
PIANO

RH

pedaal

ijsspiegel ②

Detailed description: This section shows two piano staves with waveforms. The top staff is labeled 'PIANO' and 'LH' (Left Hand). Below it, the text 'traag bewegen rond sleutels' is written. The bottom staff is labeled 'PIANO' and 'RH' (Right Hand). Below the staves, there is a dashed horizontal line with upward-pointing arrows at both ends, labeled 'pedaal' (pedal) on the left and 'ijsspiegel ②' (ice mirror 2) on the right.



ijsspiegel ④

Figure 213 Result of work process with pianist Frederik Croene

Cathy van Eck: Furniture music

Cathy van Eck's *Pièce d'Ameublement* puts the piano back in the 19th century living room. The piano is no longer considered a musical instrument, but is instead used as a piece of furniture. The pianist's actions are seemingly non-musical as they include domestic tasks such as cleaning and rearranging.

Pièce d'Ameublement consists of two parts. In the first part the pianist takes up a sponge and starts to clean the piano. He begins at the keyboard, sometimes seemingly by accident hitting a key and producing sound and slowly moves to the side of the piano, trying to take off the golden letters reproducing the piano brand. In the sponge a wireless microphone is hidden. The sound of this microphone is fed into a Max MSP patch. In the beginning of the piece only the amplified sound of the sponge can be heard. As the piece evolves, the sound gradually changes and more effects are added towards the end of the piece.



Figure 214 Cathy van Eck's bended watering can.

In the second part of *Pièce d'Ameublement* the pianist decorates the piano with plastic plants, a reference of the composer to the role a piano plays in many living rooms. When the piano is decorated with six plastic plants, the pianist takes up a watering can - equipped with a speaker- and starts watering the plants. Between the leaves of three plastic plants microphones are placed. The created feedback is fed into a Max MSP patch and is used to trigger various sounds. The technician manipulates the Max MSP patch to

change the sounds, ranging from abstract sounds to piano tunes, at certain previously determined points in the piece. The piece ends with samples of an etude by Frédéric Chopin.

Falk Hübner: Pianism choreography

Falk Hübner and pianist Frederik Croene worked together for several days. Sounds Croene produced on the deconstructed piano²⁴⁴ were recorded by Hübner and formed the basis of a soundtrack. Hübner isolated movements Croene made to perform on the deconstructed piano and unlocks them from their usual context, the sound. Based on these movements a choreography to accompany the soundtrack was made. As a reference to the deconstructed piano Hübner equipped the stage with various piano parts such as piano frames and wooden hammers and piano keys. These wooden hammers no longer strike the strings of the piano frame, instead they form silenced representations of the piano sound. The instrument is deconstructed, destroyed, and scattered across the stage. The soundtrack, consisting of unprocessed and processed layers of extended piano sounds, functions as an acoustic remembrance to the destroyed instrument.

On the grand piano itself several words²⁴⁵ were projected referring to the deconstructed setting. In the back of the stage excerpts from Croene's text about the dismantled piano, as published in the RTRSRCH journal, were reproduced on a piano frame.

When an imminent sound track develops, the pianist performs pianism movements up in the air, unable to incite the corresponding sounds. During the course of the piece the pianist changes positions on stage. At the end of the piece sound and movement seemingly reunite as the pianist softly touches the strings of a dislocated piano frame while Hübner's soundtrack reproduces similar electronically manipulated sounds.

²⁴⁴ Frederik Croene has been working with the deconstructed piano, namely the inside frame of a piano since 2005.

²⁴⁵ Hope, trash, building standards, rebuild, recovery.

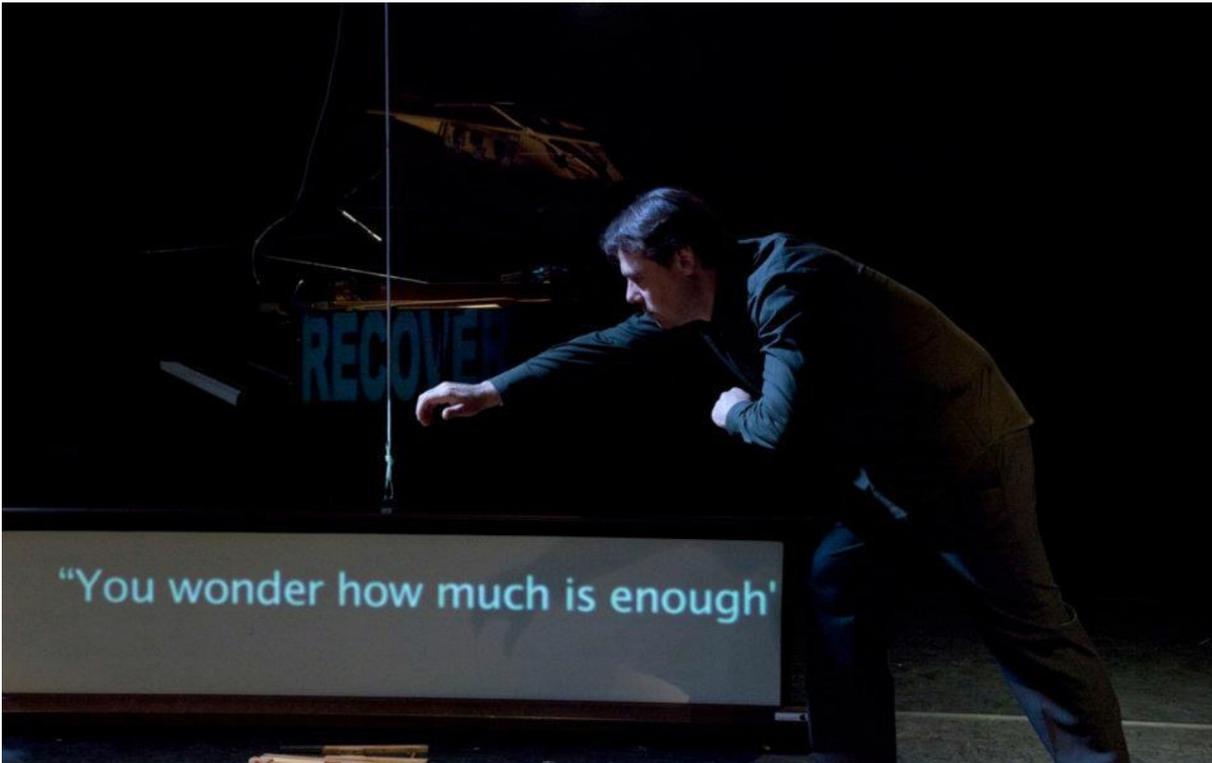


Figure 215 Frederik Croene performing *Wasteland* by Falk Hübner @ Carina Hesper

David Helbich: Observing audience behaviour

During the complete performance of *492 kilo* David Helbich sits behind a desk on stage and observes the audience. He makes notes whilst the pianist is performing and announces the beginning of each 'new piece'. A light on the desk is lit during each intervention.

In the middle of the production a technical break is incorporated. During this break the audience remains seated and Helbich describes the observations he has made and how these observations differ from previous performances. He, amongst others, has counted the number of people that have coughed, closed their eyes, changed seat positions, moved their legs, talked or whispered, checked their mobile phones, yawned, laughed, made noise by looking into the program notes or that have left the concert hall.

Helbich's observations take place during the entire performance. The audience is not only watching the performer, but is also being watched.

Installation

In the early stages of the production the idea arose to present *492 kilo* as an installation. The reasons for this were twofold: various contributions lend themselves to be presented as an installation and several composers have experience with installation work.

The construction and set-up of the installation were created by pianist Frederik Croene, technician Vincent Malstaf and composers Marianthi Papalexandri-Alexandri and Laura Maes during the residency at the Singel in Antwerp. Not all contributions are represented audiotively in the installation.

When presented as an installation the audience can walk around the piano and its various extensions. When someone approaches the piano a sensor notices his or her presence and activates a rotating poly acrylate plate (Marianthi Papalexandri-Alexandri) positioned next to the pegs tightening the strings. This mechanical sound perfectly blends with the falling water drops of the ice sculpture (Laura Maes). Instead of the pianist pressing the sensors, the process is automated and MIDI commands are sent to steer the water drops. The motor is triggered from time to time. A MIDI track was made to occasionally steer fragments of sound and image of Stefan Prins's piece.

The loud and brutal sound of Maes's motor and the sometimes aggressive sounds of Prins both have an impact on the feedback circle of Cathy van Eck's plants and watering can. Each time the motor is triggered or a small fragment out of Prins's piece is played, van Eck's piano sounds start to play.

The production process

Working together apart

From the first day of the residency at the Pianofabriek in Brussels onwards, it became clear that *492 kilo* would be a very challenging production. Bringing people together who all have their own ideas and priorities and creating a common production is not an easy task. Quite a few technical challenges were laying ahead.

Ideally all works would have been finished prior to the residency at the Pianofabriek, each composer would have time to work together with the pianist and time would be reserved to work with everyone together as well. Unfortunately this was not the case. It was economically not feasible to have all composers staying in Brussels for such a long period. On top of that not all works were completely finished.

The original idea was to let pieces overlap and not have a clear separation between each piece. This only partly worked out. Some pieces were produced during the residency (Maes, Alexandri-Papalexandri, Hübner, Helbich), others were already completed prior to the residency (Shlomowitz, Prins, Steen-Andersen). The latter pieces primarily required old fashioned individual practice while the former pieces demanded active cooperation of the performer. The pianist had to be present to experiment, to listen and to search for solutions.

Although time was lacking to work on the integration of all pieces, there were connections between several contributions. Wooden piano hammers decorated the stage for Hübner's choreography, but gained an active role when the pianist picked one up to scrape the bass strings in Maes's piece. Prins's composition also made use of the

sound and image of a wooden hammer against the strings. Prins and Hübner both used projections and sounds created on the piano frame. Marianthi's piece refers to that same piano frame, she does not make use of the keyboard but solely focuses on the strings and soundboard.

Some elements of certain compositions were re-introduced during other pieces. When Cathy van Eck's second part of *Pièce d'Ameublement* was performed and the pianist starts 'watering' the plants, the ice sculpture is lit and water drops fall down.

Helbich's contribution connected all pieces, formed a guideline for the audience and contributed to the overall coherency of the evening.

Technical challenges and pitfalls

The various interpretations of a 'piece' for a 'pianist' caused a wide range of technical conflicts. Prins wanted to hide the grand piano behind the projection screen while Hübner wished to project on that same grand piano as well as on a pile of piano parts. Three composers, Papalexandri-Alexandri, Maes and Steen-Andersen, needed inside piano playing and time consuming preparations.

The position of Maes's ice sculpture and polycarbonate lid above the piano had an impact on the position of the other extensions. To allow the pianist to place van Eck's plastic plants on the piano strings the ice sculpture and lid had to be placed higher. Shlomowitz's keyboard had to be pulled down without touching the lid and the position of Papalexandri-Alexandri's turning poly acrylate tube to which her preparations were attached had to be taken into account as well. The sculpture and lid were repositioned leaving enough room for the tube, the keyboard and the plants. As a result the polycarbonate lid was no longer in the same location as the normal lid of the piano as was the original intention.

The pieces and their extensions did not only influence each other but also determined the order of the pieces. Not all pieces could be played after each other and throughout the performances several switches were made. The production had to take off with the piece by Papalexandri-Alexandri. *Untitled iii* demands a preparation of the piano that takes several hours. This first position also had an advantage. As Papalexandri-Alexandri's piece is very quiet it can profit from the fresh ears of the audience. The order of the other pieces was largely determined by the hardware and software used. The piece of Steen-Andersen had to be placed behind the piece of Maes as for Maes's piece the piano lid had to be removed, while for Steen-Andersen it had to be present. Prins and van Eck's pieces could not be performed in a row as both used Max MSP and several adjustments²⁴⁶ had to be made.

²⁴⁶ Amongst others switching sound cards.

Ideally every piece would have its own dedicated system. Unfortunately this was economically not feasible and during the performance software programs had to be closed and opened. This sometimes caused trouble as Max MSP crashed several times. There was one computer placed on top of the ice sculpture running Pure Data and controlling the water drops and motor. Another computer was positioned under the 88-keyboard and ran Max MSP. A third computer controlled the visuals and the soundtrack of Hübner's piece. All these computers could be remote controlled from one central computer located next to the mixing desk.

Due to budget limitations only one person could be hired to control the software, the mechanics, sound and light. Although a person who united all those capabilities was found [Vincent Malstaf], it was a mistake to assume he could control all these aspects during the set-up, let alone during the performance.

The most difficult aspect of the production was timing. The set-up had to be done in a specific order. First the ice sculpture had to be positioned and hung up. Once this was done the ice sculpture had to be adjusted and tested because once the transparent lid was placed, it was no longer possible to comfortably reach the steering of the sculpture. After the lid was hung the piano could be placed and the position of the sampler keyboard could be determined. The screen could be positioned and the other pulley could be placed. The 88-key piano keyboard as well as the extra stage elements such as the wooden hammers and piano frames could be positioned and the projectors could be installed and tested. Once all elements had received their position on stage, the lights could be hung and positioned. All pieces demanded a different light scheme and all extensions of the piano as well as positions of the pianist on stage should have their specific light set-up. Setting up and adjusting the audio was also time consuming. Four contact microphones had to be placed on a specific location in order to receive the desired sound for Steen-Anderson's piece. Two condenser microphones were used to amplify the inside piano sounds of Alexandri-Papalexandri 's, Maes's and Steen-Andersen's piece. Three contact microphones were positioned at the end of the stainless steel rods to amplify the water drops of the ice sculpture. The microphones and speakers of van Eck's feedback circle had to be positioned and tested. And a separate microphone for Helbich's performance had to be installed.

Performing *492 kilo* on different pianos ran into troubles. Often bars stood in the way of a proper execution and inventive solutions had to be found.

For the second performance the set-up time was limited to one day. This turned out to be pernicious for the quality of the production and for the following presentations two set-up days were taken into account.

The changing role of the pianist- towards a renewed virtuosity

In this production the role and skills of the pianist and of the piano are rephrased and questioned and the concept of a classical recital takes a turn. The emphasis lays no

longer on playing as fast as possible, instead many different qualities are demanded from the performer.

Only two composers, Shlomowitz and Prins, made an appeal to the pianist's classic finger dexterity. But even this dexterity is only faintly based on traditional piano skills as Prins's piece is performed on a midi keyboard and Shlomowitz's piece is played with one hand on the piano and the other hand on a [smaller] keyboard. Stylistic knowledge, a refined touché or sophisticated sound control all become obsolete on a midi keyboard triggering samples of daily life noises or pop culture cliché's [Shlomowitz] or triggering video samples and pre-recorded sounds [Prins]. However, the weight of piano traditions was not strictly reserved for the quizzical title of the project. The reminiscences popped up out of van Eck's watering can producing notes of a Chopin etude. A certain pianistic sensitivity is required to control that etude [at the end of the piece approaching the flowers made the broken chords of the Opus 10 #1 etude going up, to move back with the can made the etude go down again]. Furthermore, contemporary score reading was necessary to perform Prins, Steen-Andersen and Shlomowitz. The seriousness of air piano playing [Hübner] and the delicate [tablet like] touch necessary to trigger the sensors taped to the [muted] piano keys [Maes] are both about playing the piano, but not about hitting the right key at the right moment with the right dynamic. Even Helbich's contribution could not exist if it was not for the obvious protocol that has grown for over more than two centuries around the context of the piano recital.

It is clear that this new generation of composers contemplate the 19th century traditions in a loving, light hearted way. This is precisely what 21st century pianists need. Ignoring the historical majesty of the instrument would be like amputating the dearest part of a pianist's identity. On the other hand, the stubborn faithfulness to the glorious old repertoire is pushing contemporary pianists into the very margins of artistic relevance. In the 1830's it was the coupling of the highly sophisticated piano technology to the bewildering finger dexterity of the pioneering virtuosos that put the piano in the eye of the romantic storm of 19th century progress. (Loesser, 1954) This piano technology however, has reproduced itself in writing machines (Scientific American, 1867) and computer keyboards, succeeding to stay in the middle of attention because of its apparently endless ability to renew itself. (K. Kelly, 2010) Leaving its old partner, the virtuoso pianist with the out of date piano mechanics.

492 kilo wanted to restore the original nexus of the piano and its dedicated chevalier with the ever advancing technology.

Conclusion

Paul Craenen stated in his introduction to the RTRSRCH journal that the various directions in which composers are heading show that contemporary classical music is no longer limited to one medium. New music is fragmented into a wide array of perspectives as to its traditions and innovating instrumental concepts. Young

composers ignore the idea of a fixed set of instruments with established laws [in this production symbolised by the piano] and start by building a new instrument fitting their idea instead of the classical approach the other way around. (Rebhahn, 2012) The basic plea from the pianist towards the composers [write a 'piece' for a 'pianist'] was grounded in the concern not to be left as an anachronism in the margins of artistic relevancy. Surprisingly, the artists embraced the piano phenomenon and incorporated it into new instrumental settings. The classic piano recital received a vitalising kick in the ass.

This production not only shows how composing today is evolving, it also attempts to demonstrate a more utopian approach: collectiveness. The 19th century focus on individualistic accomplishments is one classic tradition which never has been really questioned in full. There are more examples of recitals that present new music and new concepts, but seldom was the starting point so radical as with *492 kilo*. All artists were invited rather recklessly to work together on this production, its overall outlook and even each other's pieces. However, during the production process it became clear that not the composers nor the pianist, but the technical logistics dictated the overall aesthetics of the project. The order of the pieces, the general outlook, even in some cases the sound itself, were merely solutions to the many technological problems encountered. On the concert performances it seemed nearly impossible to steer all the technicalities into a smooth, flawless event. During each transition the risk was present that new, not previously encountered, problems, would pop up. Although technology had dictated artistic decisions, such as the order of the pieces, it had also made possible that seemingly conflicting artistic ideas could exist next to each other.

From the beginning onwards, it was clear that this recital would not be a serial presentation of compositions. The conceptual point of departure of the RTRSRCH journal defined the piano project. Just like graphic design brings unity into a magazine, this project was also in need of an overall design. Not only theatrical aspects such as light and decor contributed to this unity, also the transitions between the pieces were orchestrated, either smoothed out or accentuated when necessary. Disturbing actions of the pianist and various technical changes tend to bring the general tension and excitement of a contemporary piano recital down. We opted to let these changes be a part of the performance instead of unpleasant interruptions.

The technical difficulties were the initiator for the drastic concept change that was taken nearly a year after the première of the production. During future presentations, no concert will take place. Instead *492 kilo* will be set-up as an installation and from time to time the pianist will perform a piece in this installation setting. The installation combines elements of various contributions and fits better in with the original idea of collectiveness. At its current final presentation *492 kilo* returns to its initial point of departure: a collective production extending the possibilities of the classic piano recital in the 21st century.

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5.8 Conclusion of chapter 5

In chapter five the realisation of various art works created within the scope of this research was discussed according to the diagram of the artistic process described in Figure 9 (see p.14). The creation of these works followed a typical trajectory, although depending on the type of art work and the employed technologies, not all steps are elaborated to the same extent in each art work.

The experiments with various techniques to create and convey sound were discussed in detail. The technical, aesthetical or organisational problems that were encountered during the creation process and during the presentations of each art work were also addressed. Whereas most technical problems could be attributed to short circuits, mechanical irregularities or software related problems, in the case of *3times4* the technical problem encountered during the 2012 presentation was related to the rapid technical evolution. Whereas the work had only been developed five years earlier, Flash had adapted their regulations to prevent webcam spying and our application was now considered to be unlawful use of webcams on personal computers.

The presentation and creation of works that explore the borders of sound art and other art forms and that therefore fall between several categories and are difficult to classify, helped the author to reflect on the research questions and to finally formulate her own view.

Conclusion

This thesis provided an answer to the following research questions:

- What are the various shapes and appearances that sound art can adopt?
This question was addressed by describing the great variety of sonic and visual shapes that the art form can incorporate.
- Who are its makers?
This question was addressed through studying the background of the creators of sound art and through investigating how that background can influence the art form.
- What to call it?
A conclusion on how to call the art form was reached through studying the various descriptors that each emphasize a different aspect of sound art and examining the inherent meaning of each descriptor.
- How can we analyse sound art?
Through deducing thirteen parameters significant to sound art and through drawing up various conditions for each parameter, a tool was created that allows us to analyse sound art, to distinguish sound sculptures and sound installations and to analyse the differences between these two above-mentioned clusters.
- What discriminates sound art from other art forms?
This question was addressed through investigating the differences between sound art and sculptures incorporating or referring to sound, kinetic sculptures, visual installations incorporating, reflecting or referring to sound, experimental musical instruments and music.
- What distinguishes sound art from functional music applications and from art with functional purposes?
This question was addressed through investigating the differences between sound art and functional music applications and art with functional purposes.
- What distinguishes sound art from educational arrangements?

This question was addressed through investigating the differences between sound art and educational arrangements in science museums.

- What are its musical forerunners?

Through studying experiments with the extension of time, the usage of space, the incorporation of visual elements and the expansion of sound sources the musical forerunners of sound art were exposed.

- Where has sound art been presented?

This question was addressed through compiling a list of group exhibitions that have sound, sound art or the cross-pollination of sound and art as a curatorial theme and to examine the various presentation spots where the exhibitions took place.

- What are the advantages and disadvantages of presenting sound art in museums and galleries, in public space and alternative locations and in specifically built constructions?

Based on our literature study and the author's own experiences, both as a creator, organiser and visitor of sound art, the suitability of museums and galleries, public space, alternative locations and specifically built constructions for the presentation of sound art was investigated.

- What evolutions can we observe in the presentation of sound art?

This question was addressed through studying the rise of group exhibitions and their location and accommodation. Through analysing the evolution of the type of work at display, the set-up of the exhibition and the incorporation of interactivity; the evolution of the presentation of sound art is mapped.

- How and where is sound art presented in Belgium?

This question was addressed by providing an overview of the current and historical organisations that have presented sound art in Belgium as well as the education on offer.

- What techniques in sound art are used to create sound?

By classifying the production of sound by sound works at an initial level according to the nature of the sound-producing material such as distinguished in the Sachs-Hornbostel system, the production of sound in sound works was investigated. Besides the idiophones, membranophones, chordophones, aerophones and electrophones category, we added the categories redirection, muffling and reflection of sound.

- What techniques in sound art are used to convey sound?

This question was addressed by looking at the different ways to convey sound through various substances.

- How can sound art incorporate natural phenomena?

Through comparing scientific findings or set-ups in science museums with art works based on the same natural phenomena, we have shown how sound art

that relies on a natural phenomena can fully incorporate it as a working component, rather than just being a demonstration of the principle.

In general we can draw several conclusions from this research project. The boundaries of sound art have been investigated extensively. The study and analysis of existing literature and the author's hands-on experience with the presentation of sound art, both as a practitioner as well as an organiser, have enabled us to tackle the above-mentioned research questions. The theoretical approach to the research questions, intertwined with the artistic practice, have explored the same questions, be it from a different perspective. The borders of sound art have been established empirically. As a result a conclusion on its definition could be formulated. The analysis tool on the basis of thirteen parameters that allows us to demarcate sound art and to identify its various clusters, sound sculptures and installations, as well as their internal differences, can help to eliminate the vagueness surrounding the term and can be a useful tool for the study of the art form.

The analysis of the musical precursors of the art form helped us to gain insight in the evolution and the necessity of sound art, while at the same time it allowed us to better understand its new presentation spots, outside the concert hall.

In addition to the social and cultural context of sound art, its relation to technology has been looked into. This relationship is set to continue as technology will evolve rapidly allowing artists to explore new technical possibilities and applying them in their work.

Although this research project has addressed the research questions that were put forward and clarified the vagueness surrounding the art form, much work is left open for future research. This research project has laid the foundation of an analysis tool for sound art, but this tool could be further refined. The list of group exhibitions could be completed and further analysed. Despite the fact that this thesis has provided an overview of techniques and technologies used to create and convey sound, the future challenge lies in the exploration and hands-on testing of new ways, new techniques and technologies to create and convey sound. Sound art is set to evolve further with the rapid evolution of technology and the changing focus of new generations of practitioners.

Appendix 1

The electro-mechanic and electro-pneumatic automatons of the *Man and Machine* robot orchestra

In this large case study, the steering of the electro-pneumatic and electro-mechanic automatons of the *Man and Machine* robot orchestra is discussed in detail. The robot orchestra holds idiophones, aerophones, chordophones as well as membranophones. The automatons are at times presented as an installation whereby the movements of the



audience trigger and influence the frequencies and rhythm of the music, at other times the automatons grace the stage of a concert hall.

This extensive orchestra features over 50 organ-like instruments, monophonic wind instruments, string instruments, percussion instruments, and noise generators.

Figure 216 A part of the *Man and Machine* orchestra set up as an installation during the *Journées d'Informatique Musicale*, Mons, 2012 @Laura Maes

The Orchestra's Origin

The Logos Foundation started in 1968 as a collective of experimental composers and musicians. In the first two decades of its existence, Logos's main focus was on the design and use of analogue, digital, and hybrid electronic sound generation devices. In 1990, the construction of *Autosax*, an automated acoustic saxophone, marked a shift towards a

new era: the design and development of music robots. Over 50 robots have been realised. Together they form an impressive orchestra.

The motivation for Logos's interest and involvement in robotics stems from the view that loudspeakers as sound sources [a necessity for all electronically generated sound] are virtualizations of an acoustic reality. Therefore, they tend to undermine the *raison d' être* of concerts as social rituals.

The dissociation between musicians' gestures and sonic results makes the rhetoric so typical of - if not essential to - live performance nearly impossible. With automated acoustic instruments, virtualization is eschewed in exchange for rich acoustic sound sources under precise computer control; the coupling between gestures and produced sounds is thus inherent.



Figure 217 The *Man and Machine orchestra* at the Logos Tetrahedron @ Troy Rogers & Laura Maes

Precursors

The idea of automating musical instruments is in no way novel. With increased frequency since around the second half of the 18th century, the pursuit of automated musical instruments has fascinated both instrument builders and musicians. Until the

middle of the 20th century, almost all musical automata were either purely mechanical or pneumatic (Kapur, 2005). The mechanics used were discrete: sounds could be programmed to go on or off at fairly precise timings, but nuances, dynamics, and timbral possibilities—and thus the expressive musical potential of these instruments—were extremely limited. The advent of electromechanics and their electronic control possibilities greatly extended the versatility of automated musical instruments. Many of the early attempts achieved only flat approximations of music performed by humans, but contemporary computer-controlled instruments can be designed to offer finer control over musical parameters [e.g., pitch, level, timbre, timing] than humans could ever hope to achieve. These instruments demand the creation of new music written specifically to take advantage of their unique capabilities. The Logos orchestra is situated within this territory.

The Contemporary Field of Musical Robotics

Contemporary developments in the growing field of musical robotics fall into several overlapping categories. Perhaps most familiar to the general public are industrial anthropomorphic robots, developed as human companions and service providers that play music as a way of demonstrating their dexterity and technological advancement. The trumpet-playing Toyota partner robot is an example. (Toyota Motor Corporation, 2003)

Next, there are a number of robots produced specifically as musical automata. They are also anthropomorphic to varying degrees, and seek either to replicate the mechanics of human performance (Solis et al., 2006) (Petersen et al., 2009) or to serve as interactive physical agents for the exploration of human-machine interaction in improvisational musical contexts (Weinberg & Driscoll, 2006). Finally, there are growing numbers of automated acoustic instruments created by composers and sound artists seeking to exploit the unique capabilities of these machines. The Logos *Man and Machine* Ensemble, one of the oldest robotic orchestras, falls squarely in this category.

Various other artists and collectives are also active in the same field. Logos's *Player Piano I* builds further on Trimpin's, with the playing mechanism similarly placed directly onto the keyboard, in contrast to the *Bösendorfer SE* and *Yamaha Disklavier* where the playing mechanism is integrated inside the piano (Coenen, 1992). Trimpin originally designed a player piano to salvage the player-piano music of Conlon Nancarrow, as it is difficult to maintain mechanical player pianos, and Nancarrow's cardboard piano rolls have a limited lifespan. Whereas Nancarrow specified only seven gradations of velocity control [applied to musical characteristics such as crescendo or intensity] for each half

of the keyboard [bass and treble], on Trimpin's player piano each key can be controlled separately (Raes, 1994). In Raes's version, the exact height of each solenoid above the piano key can be adjusted. This adaptation makes it easier to precisely control the velocity sensitivity.

Trimpin's work inspired not only Raes's *Player Piano I*: Similar circuits were used in other instruments of the *Man and Machine* robot orchestra, such as *Harma*, *QT*, *Troms*, *Tubi*, *Vibi*, *Simba*, *Xy*, *Rotomoton*, and *Toypi*.

Trimpin and Raes both focus on acoustically produced sounds and avoid amplified and synthesized sounds (Louie, 2002). Whereas Trimpin's designs lean more towards sound art and they are often presented in exhibition environments, Raes's *Man and Machine* ensemble more frequently will be found on the stage of a concert hall. This is perfectly illustrated by the fact that both creators have made MIDI-controlled water valves. Trimpin integrated 100 of these valves in his installation *Liquid Percussion* (Trimpin, 2011b), in which water drops fall on hand-blown glass vessels. Raes created *Dripper*, an automaton that can control not only the frequency, but also the size of water drops. Raes used this instrument to realize an act of his music-theatre production *TechnoFaustus*. Just like Raes, Trimpin made an automated toy piano. His sound-work *Klavier Nonette* groups nine toy pianos that can play 41 original compositions. To hear and see them play, the spectator drops a quarter in a jukebox and dials in the number of the composition he or she wants to hear (Chang, 2003). Whereas Trimpin makes use of the original toy piano soundboard, Raes created a new free-swinging soundboard constructed out of hardened brass. Both use wooden hammers, but Raes replaced the keyboard and action with a tubular solenoid assembly. On the outside, Trimpin's player pianos look exactly like non-automated player pianos, and the polycarbonate plate and visible electronics give Raes's *Toypi* a futuristic look.

Trimpin gave advice for the construction of a percussion robot and a marimba/bell robot. Together with a drum robot they form the *Karmetik Machine Orchestra* (Karmetik, 2010). This collective of engineers, visual artists, and musicians does not confine themselves to acoustically produced sounds. Loudspeakers were integrated in the drum robot to create an effect like a rotating Leslie speaker, and in performance settings the sounds produced by the robots are amplified. On stage, musicians use custom-built musical interfaces to interact with the automata. In contrast to the *Man and Machine* orchestra, most of these interfaces take the form of a musical instrument equipped with sensors.

Already in 1966 Joe Jones had assembled an automatic orchestra of two dozen instruments. (Davies, 1987) Jones used small electric motors powered by batteries, electricity or solar cells to activate the strings of amongst others violins, guitars, zithers and percussion instruments. His *Music Machines* (see p.52) were sold at a store on North Moore Street that Jones called The Tone-Deaf Music Store. (Hendricks, 1990)

Jacques Rémus's *Concertomatique n°2* is a collection of eleven mechanic automata and comprises, among others, two organs, percussion instruments, a string quartet, and machines with ringed pipes (Rémus, 2011b). Besides *Concertomatique n°2*, Rémus has also created *Carillon n°3*, which consists of 40 automated tubular bells (Rémus, 2011a) and *Les Pic Verts*, a collection of six automated woodblocks (Rémus, 2011c). In contrast to Raes's robots, Rémus's carillon and woodblocks are mainly presented as an installation, whereby the various elements are spread throughout the space. It is not the performer, as is the case in the *Man and Machine* orchestra, but a visitor who interacts with the automata. The performed melodies can be chosen through various interfaces, ranging from a keyboard or microphone to Rémus's own *caméra musicale*, an interface he developed that detects the position and movements of hands and translates those to MIDI commands. (Rémus, 2006)

Christof Schläger's *Electric Motion Orchestra* does not focus on the automation of existing musical instruments, but on the creation of new instruments. Schläger is inspired by the sound world of machines and searches for rhythms and timbres not found in traditional instruments. The orchestra contains 26 automata that all use elements that were originally designed for purposes other than the creation of music, such as doorbells, magnets from weaving machines, sewing machine motors, radiator valves, electric staplers, signal horns, ventilation valves, servomotors, and record player motors. (Schläger, 2010a) Small instruments, such as *Toypi*, are not found in Schläger's orchestra; all his instruments have monumental shapes. Also Matt Heckert's *Mechanical Sound Orchestra* is not based on existing instruments, but instead consist of a collection of newly invented string and percussion instruments. (Heckert, n.d.) Both Raes's, Schläger's and Heckert's orchestras are MIDI-controlled, but the precision of control in Schläger's *Electric Motion Orchestra* and Heckert's *Mechanical Sound Orchestra* is less fine.

In 2000 Eric Singer founded the *League of Electronic Musical Urban Robots* [LEMUR]. This group of musicians, robotics experts, artists, and designers creates MIDI-controlled musical automata, including a xylophone, shakers, Tibetan singing bowls, goat-hoof rattles, gamelan, and guitars. Most of the automata are acoustic, but some, such as the *Guitarbot*, are electrified. Like the *Man and Machine* automata, LEMUR's robots aim to augment the capabilities of human performers, not to replace them. LEMUR's robots also utilize peripheral interface controllers [PICs], microcontrollers used to receive MIDI commands and to control the steering of the electromechanical components. (Singer, Feddersen, Redmon, & Bowen, 2004)

Singer has also built instruments for other people, for example, Pat Metheny has recently travelled the world with the *Orchestrion*. On stage, Metheny is accompanied by over 40 automated instruments, mostly percussion instruments and automated guitars. Metheny uses a guitar interface, a keyboard, or software programs running on his computer (Chinen, 2010) to send MIDI commands to the various automata.

Universities are a breeding ground for new robotic instrument builders. Not only do Ajay Kapur's students at the California Institute of the Arts expand the *Karmetic Machine Orchestra* with modified instruments and new robots, new organizations are also being formed. In 2007, Troy Rogers, Scott Barton, and Steven Kemper, three PhD students at the University of Virginia, founded *Expressive Machines Musical Instruments* [EMMI]. They have built two percussion robots and one monochord robot (EMMI, 2011), and they aspire to create a huge orchestra. (McNeill, 2008) In 2010, Troy Rogers worked at the Logos Foundation.

Founded by MIT alumnae Christine Southworth and Leila Hasan, the *Ensemble Robot* unites artists and engineers. The ensemble comprises five musical automata, all utilizing acoustic sources such as whirlyies, pipes, and strings (Southworth, 2010). As with the *Man and Machine* ensemble, the automata of *Ensemble Robot* frequently play together with musicians, but in contrast to the *Man and Machine* ensemble, the musicians' actions have no influence on the output of the automata. The underground pop world is also not immune to robotic charms. Jason Vance, the driving force, guitarist, and singer of *Captured! by Robots*, is accompanied on stage by a guitar robot, pneumatic horns, and various percussion robots (Captured! By Robots, 2011). The garage rock band *The Trons* go one step further: Only robots populate the stage (The Trons, 2011).

Design

This section illustrates the design principles of various instruments in the Logos *Man and Machine* orchestra. The electronics and actuators are discussed, as well as the frames that hold them.

Principles

The durability, usability, acoustic quality, capabilities, and "readability" of the automata are addressed in the following paragraphs.

Durability

A well-made acoustic instrument is expected to hold up to decades or even centuries of regular usage.

In the tradition of quality acoustic instruments, the instruments of the *Man and Machine* orchestra are designed with longevity in mind. Welded steel frames, over-

specified electronic and electrical components, and high-performance actuators are utilized to ensure maximal lifetime and minimal maintenance.

Usability

The instruments are designed with the intention that any composer who possesses a basic knowledge of sequencing, notation, or other MIDI software, and who is familiar with the specifics of controlling the automata (Raes, 2010b), will be able to write for them.

All of the automata are permanently set up in Logos's tetrahedron-shaped concert hall. Although the instruments are sometimes presented at other venues, they always return to the Logos concert hall, where they stand set up and ready to be used with the simple flip of a power switch.

Acoustic Quality

The orchestra is completely acoustic, and therefore joins a long tradition in the construction of musical automata. Unlike some elements in automated dance organs [orchestrions], where certain elements only have a visual function, the Logos automata have no non-functioning components and no electrical amplification.

Capabilities

Raes's point of departure is that his machines can outperform humans. His intention is not to replace human performers, but to expand musical possibilities. Most automata can play faster, and produce more simultaneous notes, than a human performer could ever achieve, each with precisely controlled dynamics. Most of the orchestra's robots are tuned to twelve-tone equal temperament. Four instruments [*Qt*, *Tubi*, *Xy*, and *Puff*] are tuned to equal-tempered quarter tones. *Sire*, as well as all of the monophonic wind instruments, can be tuned with sub-cent precision and can thus be used with nearly any tuning system.

Readability

The machines are "readable," meaning that the audience can visually comprehend them because they feature as many visible components as possible. Additionally, extensive design and construction information, and even the programming and electronic schemes of the instruments, are published with an open-source license on the Logos Web site.

Frames

All Logos automated instruments are supported by sturdy welded steel frames. AISI304 stainless steel is used for its numerous desirable properties. It is easy to weld and shape, is durable, rust-free, and nonmagnetic, and it is a poor transmitter of acoustic vibrations [which is important for preventing unwanted resonances]. As the automata are heavy [up to more than 250 kg for Qt] and travel regularly, most of the instruments are equipped with sturdy wheels²⁴⁷.

Electronics

PIC microcontrollers are used to control all of the automata. Several varieties of custom printed circuit boards [PCBs] have been developed for various aspects of machine control.

Custom PCBs

On the instruments that utilize solenoids to drive percussive beaters, depress piano or organ keys, or operate valves or tone holes, custom “pulse/hold” circuit boards are used. For instruments [such as pitched and non-pitched percussion instruments] that require a single pulse to drive the solenoid and strike percussively, the over-voltage pulse portion of the board is utilized. The 16-bit timers of the PIC microcontrollers allow for 27-microsecond resolution of the pulse durations for each of the 16 solenoids that are “steered” from a single chip. Lookup tables programmed into the PICs via MIDI system-exclusive commands ensure that the received note velocities [from 1–127] will produce linear gradations of striking forces, from the softest to the loudest possible for the given instrument and striking mechanism. For instruments that do not require velocity control, but instead require that a note-on activates the solenoid and that a note-off releases it [such as for organs without velocity control], the hold circuitry is utilized. For instruments requiring both velocity and duration control [such as the player piano and velocity sensitive organs], both the pulse and hold circuitry are used in combination.

Instruments requiring audio signal generation for mechanical activation, such as the monophonic winds and the electromagnetically bowed string instruments, utilize custom boards based on Microchip Technology’s dsPIC microcontroller to generate the

²⁴⁷ The initial idea behind the orchestra was to position various organs of different registers around the audience. Therefore, the automatons had to be easily transportable and were equipped with wheels.

requisite waveforms. All instruments are equipped with a custom MIDI hub board to buffer the input and distribute MIDI messages to the various actuators and lights.

Actuators

A range of solenoid types is used in the orchestra, carefully chosen according to performance and longevity characteristics. Tubular push and pull, dual-coil push-pull, rotary, and pivoting anchor types are all used, in sizes ranging from the tiny Lucas Ledex push solenoids used in *Toypi* to the large bi-directional slider action August Laukhuff actuators [capable of 6.3-kg pull force] used in *Klung* and *So*.

There is a strong preference for three-phase brushless servos whenever speed or position control is required. These high-performance motors are precisely controllable and have the desirable characteristics of silent operation and extended life cycle. Three-phase alternating current motors, operated with commercial motor controllers, are used to supply wind to the organs. Large stepper motors are used to control the pitch of *Rotomoton* [automated rototoms], while smaller steppers are used, for instance, to raise and lower the swells and to open and close the wind valve on *Harmo* [an automated 440 Hz, six-octave harmonium]. Small, brushed direct current [DC] motors, typically high performance types that have been extracted from tape recorders, are also used in some automata.

Voice coils remain the audio-rate actuators of choice for Logos automata. The Sousaphone's [So's] silicone "lips" are actuated at audio and sub-audio rates by a modified loudspeaker. Compression drivers are outfitted with appropriate acoustic impedance converters to drive the other monophonic wind instruments.

Families

The orchestra is composed of different acoustic instrument families: organ-like instruments, monophonic wind instruments, string instruments, percussion instruments, and noise generators (see Table 5 p.377). Although most of these robots are automations of existing instruments, many of them offer broader musical possibilities than their manual equivalents. The following sections provides an overview of the various robots of the orchestra. For at least one robot from each musical family, the design, construction, expressive capabilities, and limitations will be discussed in detail.

Organ-Like Instruments

The Logos orchestra includes various automated pipe organs that are equipped with flue and reed pipes as well as several free reeds and one instrument based on cavity resonators. The ambitus of the flue pipe organs ranges from bass [*Bourdonola*] to soprano [*Piperola*]. *Qt*, a quarter tone organ, expands the tuning possibilities of the flue pipe section.

An automated organ with reed pipes [*Krum*], an automated organ trumpet [*Trump*], a Vox Humana [*Vox humanola*], and a percussive quarter tone organ [*Puff*] provide a range of timbral possibilities. Control of the wind pressure envelope of each closed wooden flue pipe is being implemented in the brand-new automaton *Bomi*. Two automated accordions - *Ake* and *Bako* [a bass accordion] - and two reed organs - *Harma* and his big brother *Harmo* - constitute the free reed section. *Whisper*, the first instrument based on cavity resonators was constructed in 2013.

Puff, A Quarter Tone Percussive Organ

The mechanism of the *Puff* organ has no equivalent in existing musical instruments. Each of the 84 closed brass pipes of this percussive organ is articulated by an individual solenoid-driven piston with a Pyrex glass housing (see Figure 218). On each stroke of the solenoid, a precisely controllable puff of wind is produced. Because of this approach, a fully polyphonic touch sensitivity is realized. Because of *Puff*'s extended range in the high treble and its quarter-tone tuning, it is particularly well suited for music using



spectral harmony. If enough energy is sent to the solenoids, it is possible to over-blow the pipes [because closed brass pipes are used, the duodecimo will sound].

Although steady notes are impossible by design, flutter-tonguing is possible but can be dangerous if the repetition rate is higher than the mechanics allow.

Figure 218 Piston with Pyrex glass housing, detail of *Puff* @ Troy Rogers & Laura Maes

Table 5 Automated instruments of the *Man and Machine Orchestra*

name of the instrument		short description	year of production	pitch range	tuning	webpage	
organ-like instruments	flue pipes	<i>Bourdonola</i>	an automated pipe organ [8' register, open wood pipes]	1998-2008	C2-D4	12 tone equal temperament [A=440Hz]	http://logosfoundation.org/instrument_gwr/bourdonola.html
		<i>Piperola</i>	an automated pipe organ [open and stopped metal flue pipes]	1998-2007	C4-C8	12 tone equal temperament [A=440Hz]	.../piperola.html
		<i>Puff</i>	an automated percussive organ [brass pipes]	2003-2007	G3-C7	24 tone equal temperament [A=442Hz]	.../puff.html
		<i>Qt</i>	an automated pipe organ [stopped metal flue pipes]	2005-2008	C2-C8	24 tone equal temperament [A=440Hz]	.../qt.html
		<i>Bomi</i>	an automated pipe organ [gedeckt register]	2009-2010	G3-G6	12 tone equal temperament [A=440Hz]	.../Bomi.html
	reed pipes	<i>Vox Humanola</i>	an automated reed pipe organ [Vox Humana register]	1996-2005	C2-G6	12 tone equal temperament [A=440Hz]	.../voxhumanola.html
		<i>Trump</i>	an automated reed pipe organ [modified trumpet register]	1999-2005	G#1-G#4	12 tone equal temperament [A=440Hz]	.../trump.html
		<i>Krum</i>	an automated reed pipe organ [Krummhorn register]	2005-2006	C2-G6	12 tone equal temperament [A=440Hz]	.../krum.html
	free reeds	<i>Harma</i>	an automated reed organ	2000-2005	F1-F6	12 tone equal temperament [A=435Hz]	.../harma.html
		<i>Ake</i>	an automated accordeon	2003-2009	left hand: G0-F#2 / right hand: C#3-A#6	12 tone equal temperament [A=440Hz]	.../ake.html
		<i>Bako</i>	an automated bass accordeon	2006-2008	C1-A3	12 tone equal temperament [A=440Hz]	.../bako.html
		<i>Harmo</i>	an automated reed organ	2009-2010	F0-F8	12 tone equal temperament [A=440Hz]	.../harmo.html
	cavity resonators	<i>Whisper</i>	an automated set of cavity resonators	2013	n/a	not tuned	.../whisper.html

monophonic wind instruments	brass	<i>So</i>	an automated sousaphone	2003-2007	C0-A2	any tuning system [A=440-454Hz]	.../so.html
		<i>Bono</i>	an automated valve trombone	2005-2010	A#0-F#5	any tuning system [A=440-454Hz]	.../bono.html
		<i>Heli</i>	an automated helicon	2007-2008	A#0-G6	any tuning system [A=426-454Hz]	.../heli.html
		<i>Korn</i>	an automated cornet	2008-2010	E3-C7	any tuning system [A=426-454Hz]	.../korn.html
		<i>Horny</i>	An automated French horn	2013	B1-D6	any tuning system [A=426-454Hz]	.../horny.html
	woodwind	<i>Autosax</i>	an automated saxophone	1991-2010	A2-C5	any tuning system [A=426-454Hz]	.../autosax.html
		<i>Ob</i>	an automated oboe	2008-2010	A#3-C7	any tuning system [A=426-454Hz]	.../ob.html
		<i>Fa</i>	an automated bassoon	2009-2011	A#1-G5	any tuning system [A=426-454Hz]	.../fa.html
		<i>Klar</i>	an automated alto clarinet	2012	G2-A#7	any tuning system [A=426-454Hz]	.../klar.html
String instruments	<i>Asa</i>	an automated alto saxophone	2013	C#3-F#7	any tuning system [A=426-454Hz]	.../asa.html	
	<i>Hurdy</i>	an automated hurdy gurdy	2004-2008	E2-E6, depending on the tension of the strings	any tuning system, mechanically moving the tangents	.../hurdygurdy.html	
	<i>Aeio</i>	an automated aeolian cello	2007-2010	C2-G9	by default: 12 tone equal temperament, various tuning systems depending on string overtone series and string material	.../aeio.html	
	<i>Spiro</i>	An automated spinet	2011	A1-E6	12 tone equal temperament or historical tunings [A=440 Hz]	.../spiro.html	
percussion instruments	idiophones	<i>Synchrochord</i>	synchronously driven monochord	2011-2013	D#2-A5	any tuning system, mechanically moving the frets	.../synchrochord.html
		<i>Simba</i>	automated cymbals, bass castanets and tambourine	2007	n/a	not tuned	.../simba.html
		<i>Casta uno</i>	automated castanets	2005	n/a	not tuned	.../casta.html
		<i>Casta due</i>	automated castanets	2007	n/a	not tuned	.../casta.html
		<i>Belly</i>	an automated carillon	2002-2006	455- 3200Hz	specific tuning	.../belly.html
		<i>Vacca</i>	automated cow bells	2005-2006	A2-E6	specific tuning	.../vacca.html
		<i>Vitello</i>	automated cow bells	2005-2006	G#2-D6	specific tuning	.../vitello.html
		<i>Llor</i>	an automated shell carillon	2004	highly inharmonic pitches	specific tuning	.../Llor.html
		<i>Tubi</i>	an automated tubophone	2003-2005	C5-C8	24 tone equal temperament [A=442Hz]	.../tubi.html
		<i>Xy</i>	an automated xylophone	2006-2007	F4-C8	24 tone equal temperament [A=442Hz]	.../xy.html
<i>Klung</i>	an automated anklung	2000-2006	C#3-A4	12 tone equal temperament [A=440	.../klung.html		

		<i>Vibi</i>	an automated vibraphone	2001-2010	C4-C7	12 tone equal temperament [A=442Hz]	.../vibi.html	
		<i>Toypi</i>	an automated toy piano	2008	C5-B7	12 tone equal temperament [A=440Hz]	.../toypi.html	
		<i>Temblo</i>	an automated set of 12 chinese temple blocks	2013	n/a	not tuned	.../temblo.html	
		<i>Rotomoton</i>	automated rototoms	2000-2007	n/a	the tension of the drum skin of each rotomoton can be MIDI-controlled	.../rotomoton.html	
	membr anopho	<i>Troms</i>	automated single skin drums	2000-2004	n/a	not tuned	.../troms.html	
		<i>Snar</i>	an automated snare drum	2006	n/a	not tuned	.../snar.html	
		<i>Player piano I</i>	an automaton designed to be placed on the keyboard of a piano	1994-1995	A0-C8	depends on the tuning of the piano	.../playerpiano.html	
	chordoph ones	<i>PP2</i>	an automaton designed to be placed on the keyboard as well as on the pedals of a piano	2004-2006	A0-C8	depends on the tuning of the piano	.../playerpiano.html	
		<i>HAT</i>	a hit anything percussion robot	2009	n/a	not tuned	.../HAT.html	
	noise generators	mixed	<i>Springers</i>	automated springs, a large siren and shakers	2000-2008	siren: C1-C8	not tuned	.../springers.html
			<i>Thunderwood</i>	automated wood blocks, ratchet, wind chimes, thundersheet and various other nature related sounds	2000-2010	n/a	not tuned	.../thunderwood.html
			<i>Dripper</i>	automated droppers	2002-2005	n/a	not tuned	.../dripper.html
			<i>Flex</i>	dual automated singing saws and flexatone	2002-2007	n/a	any tuning, not always predictable	.../flex.html
<i>Sire</i>			automated sirens	2003-2005	C3-C6	any tuning	.../sire.html	
<i>Psch</i>			automated thunder sheets	2006	n/a	not tuned	.../psch.html	

Harmo, an Automated Harmonium

Harmo is a computer-controlled, six-octave reed organ with touch control, swells, and nine registers (see Figure 219). *Harmo's* point of departure was an old Emile Kerckhoff [1887–1956] suction reed organ. The 305 reeds and the key springs were kept from the original instrument. The bellows was replaced by an electric compressor. The organ was also equipped with two swells and a reflective tremulant mechanism.



Figure 219 The registers and the reflective tremulant mechanism of *Harmo* @Troy Rogers & Laura Maes

As this robot is tuned to 440 Hz, rather than 435 Hz as in *Harma*, it is more suitable for integration into the robot orchestra. Tubular solenoids with a diameter of 20 mm were used to activate the keys. They serve as levers to reduce the required force to push the pallets down. Because the magnets are wider than the distance between the keys [13.5 mm], they were mounted in alternating rows.

Experiments showed that the gradual opening of the dynamic shutters led to interesting sonic results. To achieve this, linear stepper motors with a threaded shaft were used. Although this approach makes a smooth movement possible, some extra noise is caused by the audible stepping frequency. The main advantage of this mechanism is that it draws no current to hold its position. The whole trajectory, from

closed to fully open, takes about 500 msec, a sufficient rate for swell effects. For faster wind pressure changes, a stepper motor-driven wind valve is used.

Various possibilities were explored for the design of the tremulant. The operation of the original tremulant is based on the acoustic reflection of sound on the large cardboard blades of a rotator. This approach makes use of the Doppler effect to create a subtle, but real, vibrato. Because autonomous control over the modulation frequency was desired, the original mechanism had to be redesigned and a reflector mechanism, driven by a variable-speed motor, was built. A low-power, low-noise DC motor from an old cassette recorder is used to drive the reflector.

Because full 73-note polyphony would have required the use of a 45-amp, 12-V DC power supply, and because the compressor would never supply enough wind to make all the reeds sound, the polyphony of *Harmo* is limited to 32 notes.

In contrast to *Harma* [the first automated reed organ], *Harmo* retains its original keyboard. As a consequence, it became possible to play the organ in the traditional way, either combined with automated playing or without. However, no manual alternatives for registration and expression control are planned.

The velocity control is less effective than, for example, on *Bomi*, as the speed by which the valves open in a reed organ is generally much faster than the rather slow build-up of a sound from the reeds.

Monophonic Wind Instruments

Autosax, an automated saxophone developed in 1989, was the first member of the robot orchestra. Various other monophonic wind instruments followed: *So*, an automated sousaphone; *Bono*, an automated valve trombone; *Heli*, an automated Helicon; *Korn*, an automated cornet, *Ob*, an automated oboe, *Fa*, an automated bassoon, *Klar*, an automated alto clarinet, *Horny*, an automated French horn and *Asa*, an automated alto saxophone.

Previous attempts at Logos and elsewhere have, with varying levels of success, created artificial reeds and lips to act as computer-controlled pressure-regulated valves driving air column resonance (Petersen et al., 2009; Solis et al., 2006; Toyota Motor Corporation, 2003; Wolfe, 2011). After many experiments, all of Logos's monophonic winds except the Sousaphone (*So*) were outfitted with compression drivers and acoustic impedance converters that feed the drive signal to the instrument via a capillary, as suggested by Benade [1990] and others.

Ob, an Automated Oboe

A concert instrument made by the Belgian instrument builder F. Debert, probably dating from the first half of the 20th century, is the basis for *Ob* (see Figure 220). The general concept is to realistically automate an existing, unmodified instrument.

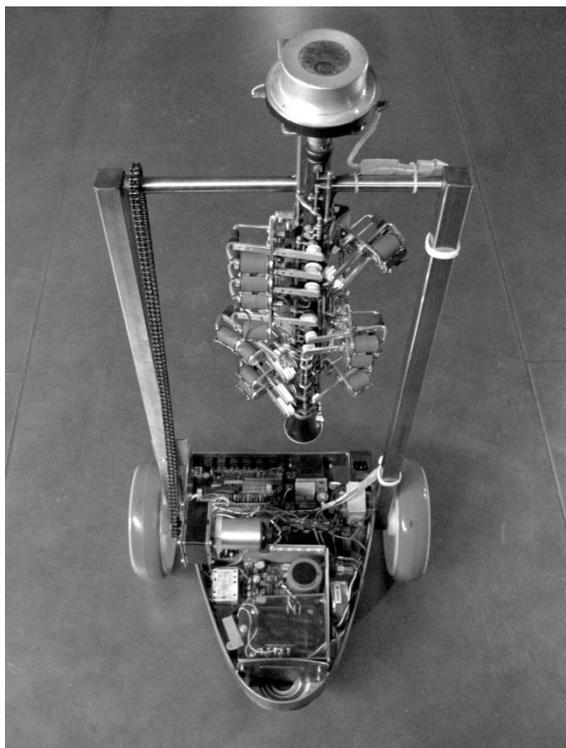


Figure 220Ob @ Troy Rogers & Laura Maes

During the automation of *Ob*, the main concern was the silent operation of the electromechanical control of the levers. The fingerings were simplified in order to use as few solenoids as possible: six were used to close the open holes and seven were used for the essential levers. This simplification was possible because, although some levers are essential for performers, they are far less important in an automated version, as the attack of the tone is guaranteed by the nature of the sound mechanism. In the case of some levers, it was decided to automate the closing pad directly, instead of

implementing a solenoid to activate them in the same manner as human fingers would. Special fingering tables for quarter-tone and other microtonal applications were developed, as were alternative fingerings to achieve different sound colours.

Several experiments were conducted to activate the double reed. Double reeds made of piezoelectric material glued to brass plates did not live up to expectations, as the sound pressure obtained was very low, even when driving the piezo-material well above its rated maximum voltage [35 V]. For a second experiment, a double-faced piece of piezoceramic was bonded to a central brass plate and placed just touching an absolutely flat, thick brass plate with a 4.2-mm diameter orifice. This approach delivered a strong buzz, but with the sound quality depending on the frequency as well as on the applied air pressure. A small, DC motor-driven vacuum-cleaner type of compressor produced the required pressure of about 15 to 30 mBar, but it was very noisy. Because this did not provide the desired results, a third experiment was conducted. A tweeter motor driver, made for driving an exponential horn, was coupled to an acoustic impedance converter modelled after a real reed in a human mouth cavity. The 12-mm-long cylindrical part fits inside the outlet of the RCA pressure driver, without touching the titanium dome inside. The other side fits nicely into the oboe, replacing the reed. The realism of the produced sound becomes highly dependent on the waveform applied to the driver. A trapezoidal wave shape, in combination with the proper articulation [frequency modulation of at least the first two partials above the fundamental as well as some amplitude modulation], delivers the most realistic result.

The entire automated oboe construction was suspended in a cradle so that the instrument is free to move in different inclinations and, in this way, mimic the behaviour of a human oboist. To be able to control and, if desired, to hold a specific inclination, the axis of suspension is provided with a dented wheel driven by a chain and a DC motor with reduction gears. Movement is limited to an angle of about 90°. Multiphonics are not currently implemented in the firmware, although experiments have proven that they can be created via amplitude modulation of the driver signal.

String Instruments



Figure 221 Aeio @Troy Rogers & Laura Maes

At present only four string instruments have been developed: *Hurdy*, a two stringed automated bass hurdy gurdy, *Aeio*, an Aeolian cello, *Spiro*, an automated spinet and *Synchrochord*, an automated monochord.

Aeio, an Automated Aeolian Cello

The problems encountered during the construction of *Hurdy* led to many new ideas and experiments regarding acoustic sound production from bowed strings. In contrast to *Hurdy*, where the string is bowed, the strings on *Aeio* are activated through a magnetic drive (see Figure 221). Therefore, it is not necessary to send complex commands to specify envelopes for bow pressure, bowing speed, finger pressure, and bowing angle to determine the pitch, dynamics, and timbre of the notes.

Aeio has twelve hardened spring steel strings with a diameter of 1.5 mm. The strings are arranged chromatically and each can be individually “bowed” via the electromagnetic system. The soundboard was made from hardened brass mounted in a steel frame.

The strings are tuned from MIDI note 36 to 47, and each string is equipped with a felt-covered, solenoid-driven damper to enhance the expression possibilities. Each string can sound the fundamental, as well as the entire series of slightly inharmonic partials. Therefore, the range covers at least the ambitus of a classical cello, from MIDI notes 36 to 127. *Aeio* utilizes the same principle as an Ebow, but here the strings are brought to vibrate by two electromagnets, driven by a two-phase signal on opposite sides of the string.

The Ebow is an electronic device that generates an electromagnetic field, commonly used to move a string, such as on an electric guitar (Raes, 2010a). All the strings, or any combination of them, can play simultaneously. Vibrato and glissandi, although common on bowed instruments, are impossible on *Aeio*. It is also impossible to play fast staccatos or pizzicatos, as stronger electromagnets would be necessary and the operation depends on the excitation speed of the string, which always takes a certain amount of time.

Percussion Instruments

The orchestra holds a wide range of non-pitched percussion instruments. The *Rotomoton* consists of five automatically tunable and playable rototoms of various sizes. *Troms* has a collection of seven single-skin drums from 7 to 70 cm in diameter. Each drum has different beaters. *Hat* is the only robot that was commissioned for another artist, Aphex Twin. Various objects can be clamped onto this “hit-anything” robot, which will hit whatever is placed on it. *Simba* consists of a bronze bell cymbal, a couple of bass castanets, and a bell-rim tambourine without drum skin. One of the smallest automata, *Snar*, has a snare drum automated with 13 beaters from the inside and two drum sticks from the outside. The most recent percussion instrument, *Temblo* consists of an automated set of 12 chinese temple blocks. One of the percussion instruments is integrated in another automaton: *Casta Uno*, consisting of 15 automated castanets, can be found on top of *Vox Humanola*. A separate automated castanet was built a few years later, *Casta Due*, as it was impractical to take *Casta Uno* in and out of *Vox Humanola* for specific setups.

Automated bells form the largest chunk of the pitched percussion family. For example: *Belly*, consisting of 34 automated brass bells; *Vacca*, consisting of 48 automated cow bells and its smaller brother *Vitello*, consisting of 36 automated cow bells; and *Llor*, the automatisations of 11 stainless steel shells of various diameters and a single antique bronze bell of similar shape. This family also houses two quarter-tone instruments, *Tubi*, an automated quarter-tone tubophone, and *Xy*, an automated quarter-tone xylophone, as well as *Klung*, an automated brass angklung, and *Vibi*, an automated vibraphone.

Two player pianos, as well as a player toy piano, complete the pitched percussion section of the orchestra. The first player piano, *Player Piano I*, was developed in 1994. It is

one of the oldest musical robots of the orchestra. As described previously, its design was based on the player piano of Trimpin (Perkis, 1999), but the sturdiness and reliability of the latter were improved. In 2004 a new type of player piano, *PP2*, was designed. Like its predecessor, the *PP2* is a mechanism that is placed on top of the keyboard of a regular piano.

It uses look-up tables to access a variety of velocity scales found in different brands of grand pianos. Different tables can be uploaded to the instrument. As the velocity sensitivity of a piano depends on its brand and condition, variable look-up tables allow *PP2* to adapt to a specific brand of piano. With this instrument, the repetition rate, and the continuous control of the sustain pedal, exceed the capabilities of a conventional piano. The full 88 polyphony surpasses other player pianos such as Yamaha's *Disklavier*, whose polyphony is limited to 32 notes (Yamaha Corporation, 2011)

Toyipi, an Automated Chromatic Toy Piano

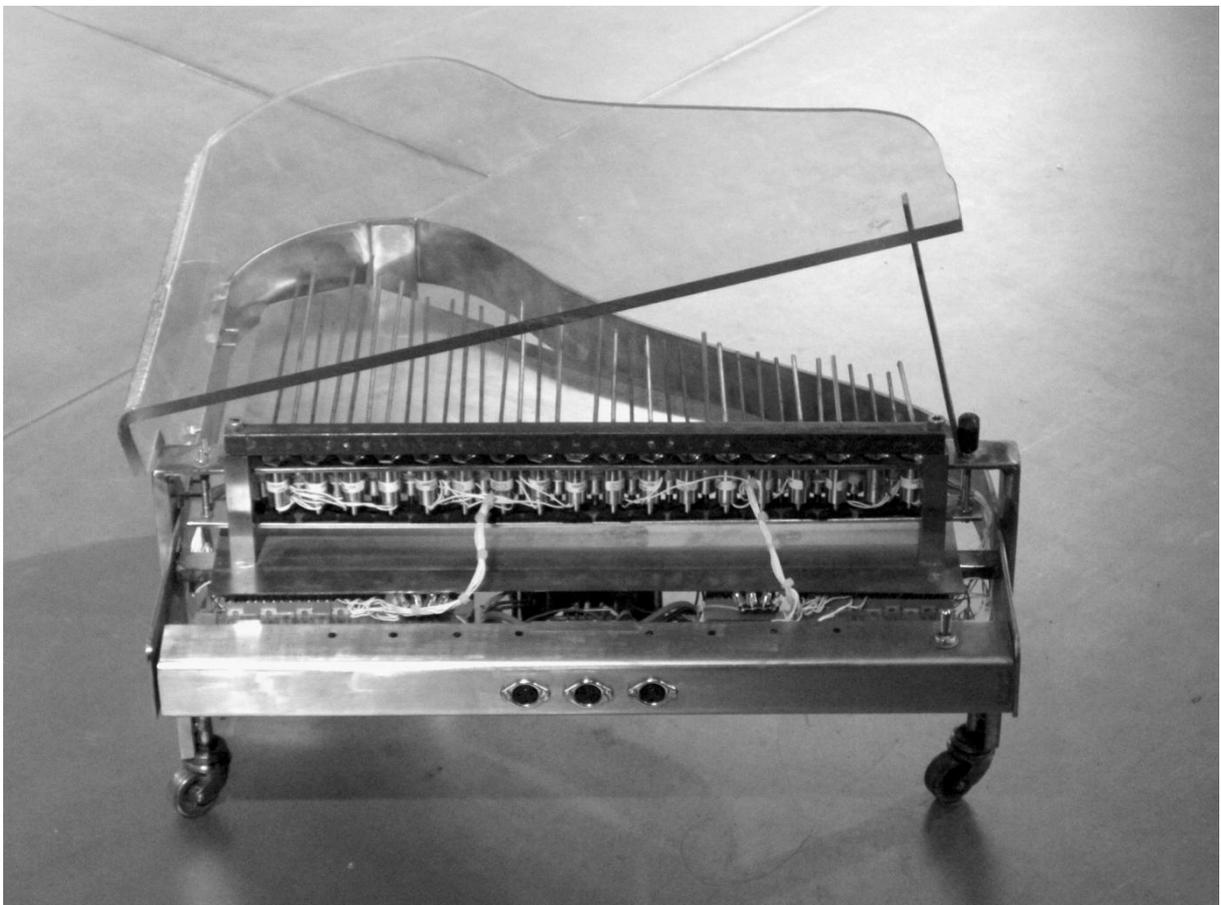


Figure 222 Toyipi @ Troy Rogers & Laura Maes

Toyipi, an automated chromatic toy piano, keeps the idea of the original instrument while doing away with the mechanics (see Figure 222). *Toyipi* was created from a 35-note chromatic toy piano produced by Antonelli in Italy. Once the cover had been lifted, the clamped rods that were mounted on a cast iron bar were carefully removed. A new brass

soundboard was created to replace the original plastic one. To preserve the typical sound, the original small wooden hammers were integrated into the new design. The keyboard and action were replaced by a tubular solenoid assembly. The general shape of the instrument's stainless steel chassis closely follows the typical shape of a normal grand piano. This automaton enables very precise velocity control and extremely fast repetition speeds, opening up new sonic worlds. The maximum sound volume is limited due to the nature of the instrument. As sound volume is inherently connected to the size of the rod assembly, louder sound would dictate thicker as well as longer rods.

Vibi, an Automated Vibraphone

Much similar work of instrument builders preceded Logos's *Vibi* (M. Darge & Soetaert, 1994), and automations of vibraphones, xylophones, or glockenspiel can even be found in the large dance organs [orchestrions] of the interbellum. *Vibi* makes an appeal to these prior experiments and improves them by adding computer control, touch control, and individual dampers for each bar. At least one builder, Tim O'Keefe, has based his automatisation of the vibraphone on Logos's *Vibi*. (O'Keefe, 2009)



Figure 223 Several Lukas Ledex solenoids that drive the beaters of *Vibi* @ Troy Rogers & Laura Maes

The construction of *Vibi* departed from a small model Yamaha vibraphone [type YV-600B, serial number 1977] of which only the tuned aluminium bars and resonators were kept [37 notes, from C4 to C7]. A new electric circuit was designed for the vibrato mechanism, as the original was too noisy and

could not easily be computer controlled. The beaters are driven by Lukas Ledex solenoids mounted under the extremities of the sound bars (see Figure 223). The dampers were made with the same type of solenoids, but rubber and felt pads were mounted on the anchors as dampers. Because the anchors fall back on the felt-covered steel bars by gravity, there is no need to use springs.

Vibi enhances the musical possibilities of a vibraphone. As each individual beater has complete autonomy, the polyphony far exceeds that of a human performer, in which the number of notes that can be played equals the number of sticks. Each bar features individual velocity control and dampers. A new element, damper-holdmode, whereby the felt covered dampers can be pushed against the bars with a continuously variable force, was implemented for the first time in *Vibi*. This mode allows the bars to be struck while being damped to varying degrees.

Each row of resonators has its own rotating shaft. Two stepping motors were provided in order to control the rotational speed of the upper row [corresponding to the black keys of a piano] and the lower row [the white keys of a piano] independently over a wide range.

The ability to change sticks, as musicians are often required to do in contemporary music, was not implemented. This would have required at least another row of solenoids with softer beaters, and there was not enough space under the bars to allow for such an undertaking. Placing the solenoids above the bars would eliminate the possibility of manually playing the instrument in conjunction with the automated player.

Noise Generators

The orchestra has a large section of noise generators, many of which are newly designed instruments. The automaton *Springers* has a selection of shakers, springs, and one siren. *Thunderwood* automates, among other things, various nature sounds such as rain thunder, wind, and woodpeckers. Twelve small automated thunder sheets form *Psch*. Various singing saw or flexatone-like sounds can be produced by *Flex*, which can be considered a realization of Luigi Russolo's fifth category of *intonarumori*: sounds obtained by percussion on materials such as metal, wood, skin, and stone. Another noise machine, described earlier, is *Dripper*, a MIDI-controlled rain machine that can precisely control the size and frequency of each drip. *Sire* is composed of 24 motor-driven sirens. The three-octave range of each siren is controllable with a resolution of 14 bits, which provides many possibilities for microtonal music.

Psch, an Electromechanical Noise Generator

Psch has a variety of small thunder sheets of graduated thicknesses that can be precisely shaken and can create a "reversed cymbal" sound and similar explosive noises, as are typically found in various types of contemporary music (see Figure 224).

The design consists of twelve driving solenoids with individual metal sheets of various thicknesses and sizes. Experiments showed that Martensitic stainless steel produced the most desirable sound. Hasberg and Lamifold stainless steel sheets were used in the final construction of the automaton. The maximum sound level is a function of the size of the sheets or foils used. The noise characteristics are merely a function of the material's thickness and stiffness, and the shaking speed is limited by the mechanical properties of the solenoids.

Psch can produce a steady noise by shaking the sheets at speeds exceeding the mechanical and very low resonant frequency of the pendulum system formed by the combination of sheet and solenoid anchor. Single strokes at high activation forces

produce noise shots. However, when one strokes a thicker sheet, flexatone-like sounds with clear, sliding pitch content can occur.

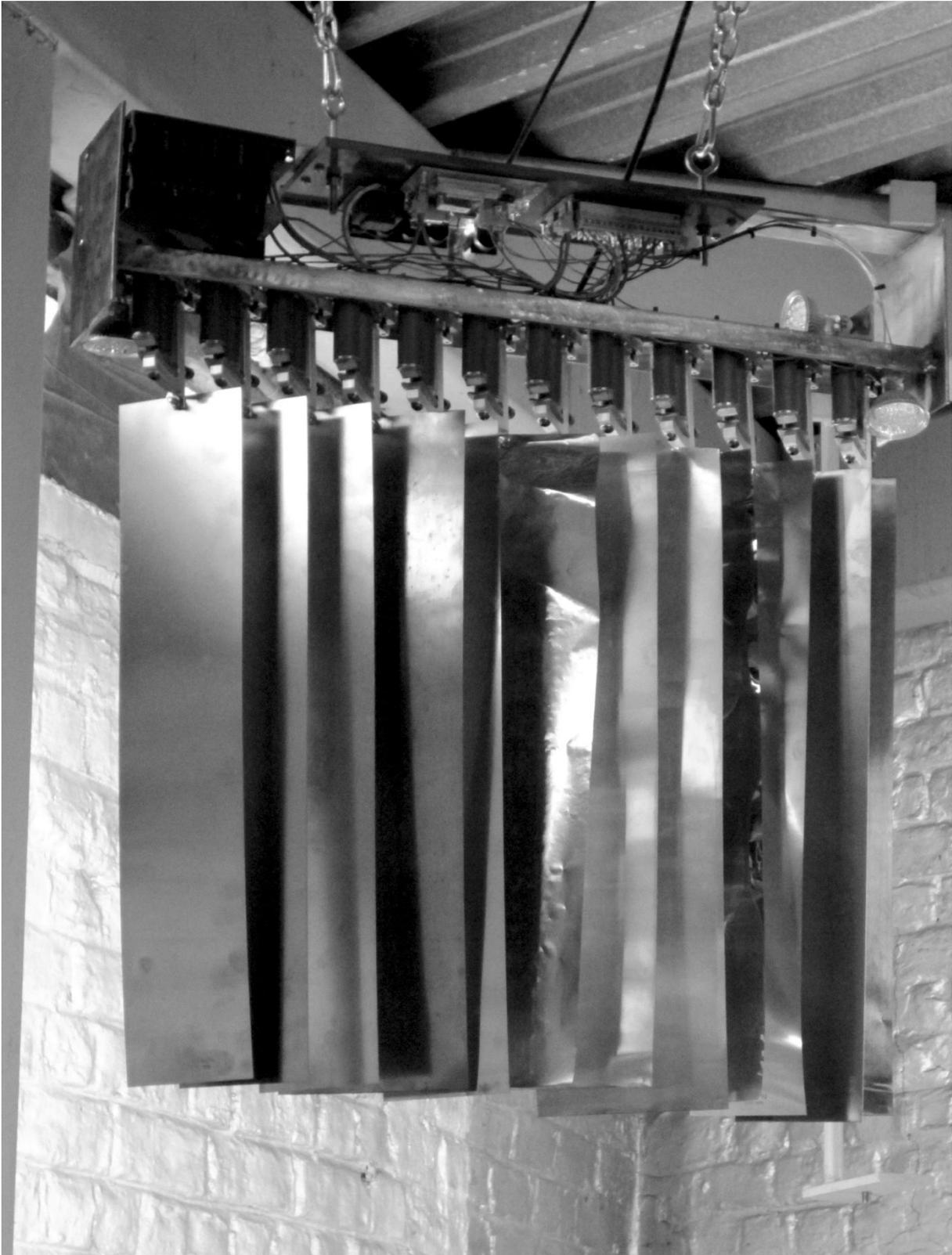


Figure 224*Psch* suspended from the ceiling of the Logos Tetrahedron @Troy Rogers & Laura Maes

Compositions

In addition to performances at external venues, the *Man and Machine robot orchestra* puts on a new thematic program at the Logos Tetrahedron every month. These concerts contain orchestrations of existing compositions and new pieces from Logos members or composers worldwide. A mix of sequenced, algorithmic, and interactive compositions is featured. Nearly all algorithmic pieces written for the orchestra are conceived for live performance, where the course of the piece can be adjusted in real time. Experimental dance is almost always an integral part of the performance.

The *Man and Machine robot orchestra* is designed with the idea of motivating other composers to write for the orchestra. MIDI templates are available to make composing for the orchestra more accessible.

Logos has premiered interactive, algorithmic, and MIDI-file-based pieces from national and international composers (see Table 6).

User Feedback

What makes the Logos orchestra unique is that a group of composers intensively and regularly works with the orchestra, providing the builder with immediate feedback on how to improve the automata.

Table 6 Compositions written for the *Man and Machine Orchestra*

composer	number of pieces: interactive and/or algorithmic [IA] / MIDI file [M]
Mark Applebaum	1 M
Clarence Barlow	3 IA
Scott Barton	2 M
Rainer Boesch	1 M
Joachim Brackx	1 M
Sebastian Bradt	53 M
Barbara Buchowiec	31 M
Warren Burt	4 IA
Peter Castine	1 M
Claude Coppens	1 M
Moniek Darge	3 M
Kris De Baerdemacker	24 M
Joris De Laet	2 IA
Hanne Deneire	1 M
Ellen Denolf	1 IA
Giacomo Di Tollo	2 M
Moritz Eggert	4 M
Hiroshi Fukumara	10 M

Joe Futrelle	1 M
Frans Geysen	1 M
Piotr Groen-Korab	1 M
Carlos Guedes	1 IA
Bernd Haerpfer	1 M
Martin Herraiz	1 M
Dick Higgins	1 M
Aurie Hsu	1 M
Lukas Huisman	6 M
Jonas Jurkunas	2 M
Steven Kemper	1 M
Jonathon Kirk	1 M
Siegfried Koepf	1 M
Juan Sebastián Lach Lau	1 M
Kristof Lauwers	52 IA
Roeland Luyten	2 M
Michael Manion	2 M
David Maranhã	3 M
Rytis Mazulis	1 M
Jelle Meander	4 M
Rene Mogensen	1 M
Fred Momotenko	5 M
Kostas Moschos	1 IA
Knut Müller	1 M
Phill Niblock	1 M
Frank Nuyts	1 M
Abraham Ortiz	1 M
Daniel Pastene	2 M
Adrian Pertout	1 M
Godfried-Willem Raes	61 IA
Jaime Reis	3 IA
Jacques Rémus	3 M
Hans Roels	7 M
Troy Rogers	1 IA
Jeremiah Runnels	1 IA
Stephan Schleiermacher	9 M
Stefaan Smagghe	1 M
Thomas Smetryns	3 M
Ricardo Spiritini	1 M
Bruno Spoerri	1 IA
Yvan Vander Sanden	11 IA
Celio Vasconcellos	2 M
Jasna Velickovic	1 M
Francesca Verbauwhede	1 M
Xavier Verhelst	1 M
Maya Verlaak	1 IA
Dirk Veulemans	3 M
Brent Wetters	2 M
Caroline Wilkins	1 M

Sometimes adaptations of the hardware are necessary to fulfil the composers' requests. For example, the motor of *Vibi*, in its original design, stopped in an arbitrary position, but the final placement of the valves had an influence on the volume of the sounds produced. Position sensors were added to the rotating vibrato mechanism in order to always stop the motor in a position where the resonators are fully opened.

At other times, extra hardware is added. On a composers' request, squeakers were mounted on *Thunderwood* to create a larger variety of non-musical sounds, and audio inputs were added to the brass instruments in order to generate vocal instrumental sounds and multiphonics.

In some cases, adaptations of the software are sufficient. Initially, the woodwind instruments had a new fingering for each note. In the case of repeated notes, the fingering was released after each note and replaced for the following note. These unnecessary movements caused unwanted noises that could easily be avoided. Composer feedback led to an adaptation of the fingering, which is now maintained after each note until a new pitch is played. Not only did this adaptation remove the unwanted noises, but it also greatly improved the resonance.

Sometimes the adaptations increase user-friendliness. Instead of requiring the user to input the wind modulation separately for each note, *Bomi's* tremulant speed is now automatically repeated across notes, and the user only has to determine the modulation frequency as well as the range of pitches to which it applies. A similar adaptation is currently being implemented in the percussion instruments to facilitate drum rolls.

In the following paragraphs we will discuss six compositions demonstrating various ways that the automata can be controlled.

Kristof Lauwers's *Burden Birds* was composed as a soundtrack to a film by Lieve Vanderschaeve in which two birds fly through a mountain landscape, with light and weather conditions in constant flux. The light changes are musically reflected in the shifting overtone structure of the organs *Piperola* and *Bourdonola*, obtained by varying the wind pressure of each. The flapping of the birds' wings is translated into arpeggiated patterns with varying dynamics on *Vibi*, *Puff*, and *Psch* in a manner that emphasizes the essence of each instrument.

Like *Burden Birds*, Sebastian Bradt's *Intron Wenn* explores the novel capabilities of the instruments. At times, Bradt uses extended techniques to produce timbres uncharacteristic of individual instruments. At other moments, Bradt combines these uncommon timbres to create otherworldly composite textures. *Intron Wenn* takes advantage of the instruments' fixed positions to construct spatial gestures.

Xavier Verhelst has created many inventive orchestrations that highlight the unique sound colours of the robot orchestra. *La Romanesca* [from the 1575 Dublin Virginal Book] was a very popular song in the late Renaissance. Verhelst illuminates the different melodic or rhythmic ideas of each section of *La Romanesca* by using different groups of automata.

In Yvan Vander Sandens's *Hyperfolly*, an AKAI Ableton Performance Controller [APC-40], combined with his custom written software PIMP [Pike's Interactive Music Programme], is used to steer the automata. His aim was to use the APC as an integral part of the performance. Each button of the APC is mapped to a specific automaton. The performer's actions resemble those of an action-gamer, leading to a ritualistic

performance wherein the audience tries to grasp the meaning of the performed gestures and their relation to the audible result.

Kristof Lauwers has worked together with Moniek Darge on a series of pieces in which audio signals and gesture data determine the resulting sound. As the title suggests, *Horizon for Three* features, three performers on stage: Moniek Darge, Marian De Schryver, and Zam Ebale. Audio signals from Darge's electric violin and gestures of all three performers were mapped in the software program Pure Data to control the automata in various ways. The pitches played on the violin are mapped to pitches on the organ, piano, and vibraphone. Movements by the performers determine the wind pressure in the organs and the rhythms of the percussive instruments.

Raes's *Schroeder's Second Dream* highlights the advanced capabilities of *Toypi* in an interactive context. The extremely high repetition speeds of *Toypi* are thoroughly explored. The viola mimics the perceived pitches, which are not always equivalent to the scored notes owing to the high inharmonicity typical of toy pianos. The performers' gestures are captured by the *Invisible Instrument*, an array of radar/sonar sensing devices developed at Logos (Raes, 1993, 2010c, 2010d). The captured gestures are mapped to various wind sounds produced by *Thunderwood*. As with all of Raes's compositions, *Schroeder's Second Dream* was realized with the real-time composition programming language General MultiTasker, which was developed at Logos.

Conclusion

Because of its reliability, its usability, and its "readability," we may conclude that the *Man and Machine robot orchestra* lies at the forefront of the development of musical robotics. The orchestra will further expand through the development of more monophonic wind and string instruments, as well as the development of instruments that use ribbons to replace strings, making acoustic, string-like instruments possible without an amplifying soundboard. Along with the addition of new automata, new devices in the field of gesture sensing and recognition will be developed. In this way the orchestra's tone colour will be extended and the control possibilities will reach even further.

Appendix 2

List of group exhibitions

This list provides an overview of group exhibitions²⁴⁸ up until 2012 that have sound, sound art or the cross-pollination of sound and art as a curatorial theme. Exhibitions that solely focus on the depiction of music in visual arts²⁴⁹, on music notation²⁵⁰, radio art²⁵¹ or music history²⁵², as well as internet exhibitions²⁵³ are excluded from this list. Exhibitions in science museums²⁵⁴, parts of exhibitions²⁵⁵ and exhibitions that present the documentation of sound²⁵⁶ are also not included.

²⁴⁸ Exhibitions that present multiple works from more than one artist simultaneously within a certain time period. Therefore, initiatives such as *Espace Sonore - Espace Silencieux* that in 1984 consecutively presented work by Eberhard Blum, Thomas Kapielski, Julius and Thomas Schliesser at the Goethe Institut – Centre Culturel Allemand in Paris are excluded from this list. (U. Block, 1983)

²⁴⁹ Such as the exhibition *Exhibition of Music and Art* [Milwaukee, 1954] (Milwaukee art institute, 1954) or the exhibition *Musique Forme et Couleur* that was organised at Musée des Arts in Cholet, France from 04/12/1987 up till 21/02/1988 and that mainly presented sculptures and paintings with musical themes. (Fauchille, 1987)

²⁵⁰ Such as the exhibition *musikalische Graphik* that took place at the Staatsgalerie Stuttgart from 16/11 up till 17/12/1979. (Schidlowsky & Staatsgalerie, 1979)

²⁵¹ Such as the exhibition *Radio Rethink* that took place from 17/01 up till 13/03/1992 at the Banff Centre, Alberta, Canada and presented new radio art from eight Canadian artists. (Hank Bull, 1993)

²⁵² Such as the exhibition *Acousmatic visions - 50 Jahre Musique concrète und die Groupe de Recherches Musicales [GRM] in Paris von 1948 bis heute in Foto- und Tondokumenten* organised from 24/09 up till 02/10/1998 at the SFB - Haus des Rundfunks in Berlin, Germany within the framework of the *Inventionen* festival. (Folkmar Hein, 2012)

²⁵³ Such as the exhibition *Sound Box 1.0* -organised by Kiasma, the museum of contemporary art in Helsinki – that was presented over the internet during the spring and summer of 1998 (Various, 1998) or Soundmuseum.FM, online museum for sound art (Soundmuseum FM, n.d.)

²⁵⁴ Such as the *Play it by ear* exhibitions organized at the Bay Area Discovery Museum, Sausalito, United States. (Bay Area Discovery Museum, 2003)

²⁵⁵ Such as the section *Sound shards: Chicago's sonic arts* that was part of the exhibition *Art in Chicago, 1945-1995* that was on view at the Museum of Contemporary Art, Chicago, United States from 16/11/1996 up till 23/03/1997. (Warren, 1996)

²⁵⁶ Such as exhibitions that focus on the presentation of LPs and their covers among which the exhibition *The record as artwork: From futurism to conceptual art* organized at various museums and galleries in the United States and Canada in 1977 and 1978. (Celant & Livet, 1977)

Table 7 Overview of group exhibitions

date	year	title of exhibition	location	city	country	artists	reference
03/01 – 25/01	1964	For eyes and ears	Cordier & Ekstrom	New York	United States	Peter Agostini, Allan d'Arcangelo, Paul Brach and Morton Feldman, George Brecht, Alexander Calder, Chrissy, Bruce Connor, Jim Dine, Marchel Duchamp, Herbert Gesner, Joe Jones, Jasper Johns, Aaron Kuriloff, Michael Lekakis, Man Ray, Walter de Maria, Robert Morris, George Ortman, Alfonso Ossorio, Barbro Ostlihn, Robert Rauschenberg, Larry Rivers, Richard Stankiewicz, Takis and Earl Brown, Jean Tinguely, Ruth Volmer, Bob Watts	(Callas, 1964)
4/11 – 4/12	1966	Sound, Light, Silence: Art That Performs	Nelson Gallery, Atkins Museum	Kansas City	United States	Stephen Antonakos, Richard Artschwager, David Jacobs, Al Hansen, William Bollinger, Peter Gourfain, Howard Jones, Herbert M. Gesner, Donald Judd, Josef Levi, Stanley Landsman, Len Lye, John McCracken, Boyd Mefferd, Malcolm Morley, David Novros, Claus Oldenburg, Larry Poons, Mark Rothko, James Rosenquist, Robert Rauschenberg, Frank Stella, Andy Warhol	(Sickman, 1966)
25/10 /1969 – 04/01 /1970	1969/ 1970	Sound	the Museum of Contemporary Crafts of the American Crafts Council	New York	United States	Jon Hassell, Ernst Lurker, Homer Matthews, Eric Orr, James Ranikien, Osco Intermedia, Charles Waldeck, Steven Waldeck, François & Bernard Baschet, Suzanne Benton, Harry Bertoia, Enrique Castro Cid, Frank Elliot, John Harris, Howard Jones, Ann McMillan, Reinhold Marxhausen, Charles Mattox, Halim El Dabh, Attilio Pierelli, Theodosious Victoria, Jason Seeley, Echo Industries Inc., Earle Brown, Elinor Gilbert, Robert Ashley, Allan Bryant, Harold Budd, John Dinwiddie, Gino Piserchio & Bill Allen, Aeon & Terry Wilcox, Tony Price, Bülent Arel & Alice Shields, Alcides Lanza & Jack Weisberg	(KPFA, 1969)
30/04	1970	Sound Sculpture As	Museum of Conceptual Art	San Francisco	United States	Arlo Acton, Allan Fish (aka Tom Marioni), Terry Fox, Mel Henderson, Paul Kos, Peter Macan, Jim Melchert, Peter Mc CannJim McCready, Bill Moth-Smith, Herb Yarno	(Foley, 1981, p. 134) (Kunstradio, n.d.-b) (Marioni, 2007)
May	1970	Sound Tunnel Exhibition	A division of the Municipal Arts	Los Angeles	United States	Mike Ahrens, Steve Anter, Monte Blakely, Jonathan Blau, Kristy Bliss, Barbara Bloom, Henry Brock, Augi Chaum,	(A division of the

			Dept., City of Los Angeles			Susie Coffelt, Ken Elsen, Bill Ernst, Dan Esagro, Diane Farber, Don Garwood, George Garcia, Brett Gollin, Phil Gonzales, Sean Gordon, Robert Holland, Ray Hutchinson, Eric Johnson, Ron Kappe, David Kelly, Maury Lanselle, Deborah Metlay, Michael Polachech, Charlie Saylan, Leslie Shatz, Mal Silberman, Pam Smith, Bill Weisman, Elysa Wermus, Jonathan Pachech, Joan Farber	Municipal Arts Dept.- City of Los Angeles, 1970)
05/03 - 18/04	1971	Geluid < => Kijken	het Stedelijk Museum	Amsterdam	the Netherlands	Ton Bruynèl, Dick Raaijmakers, Peter Struycken	(Martinet, 1971) (Nijhoff, 2007)
09/01 - 30/01	1972	Notes and Scores for Sounds	Mills College Art Gallery	Oakland	United States	Vito Acconci, Charles Amirkhanian, Eric Anderson, Robert Ashley, Andria Brown, Terry Fox, Howard Fried, Nancy Gardiner, Tony Gnazzo, Peter Kennedy, James Melchert, Barbara Smith, John White, Petr Stembera, Robert Berry	(Hanor, 2013)
06/05 - 11/06	1972	Hören, sehen : texte, bilder, environments	Kunsthalle Bremen	Bremen	Germany	John Cage, Dick Higgins, Mauricio Kagel, Hans Otte, Dieter Schnebel, Karlheinz Stockhausen	(Kunsthalle Bremen & Radio Bremen, 1972)
07/02 - 04/03	1973	Sound / Sculpture: 11 artists working in the field of Audio-Kinetic Sculpture	Vancouver Art Gallery	Vancouver	Canada	François & Bernard Baschet, Harry Bertoia, John Chowning, Paul Earls, David Jacobs, Gyorgy Kepes, Reinhold Marxhausen, Charles Mattox, Stephan von Huene, Walter Wright, David Rosenboom	(Siegel, 2007) (Aesthetic Research Centre of Canada, 1973)
March	1973	Sound as Visual/ Visual as Sound	Vehicule	Montreal	Canada	Allan Beale, Joe Bordolai, Ugo Carrega, Jerome Cebelak, Cyne Cobb, Lisa Doolittle, Margaret Dragu, Don Druick, Serge Garant, Gerry Gilbert, Klaus Groh, Thomas Haynes, Otto Joachim, Dennis Lukas, Tom Dean, Gary Lee-Nova, Sandra Legault, Ed Slopek, Cork Marcheschi, Norman McLaren, Ian Murray, Gino Pallidini, Northwest Mounted Valise, Jacques Palumbo, John Plant, Private Party (Gen. Idea), Clive Robertson, Chuck Santon, Pierre Thibaudau, Ron Tunis, Janos Urban, Paul Woodrow, Marjolaine Robert	(Concordia University, n.d.; Murray, 2010)
June	1973	Sound as Visual/	Wayne State	Detroit	United	Allan Beale, Joe Bordolai, Ugo Carrega, Jerome Cebelak,	(Concordia

		Visual as Sound	College		States	Cyne Cobb, Lisa Doolittle, Margaret Dragu, Don Druick, Serge Garant, Gerry Gilbert, Klaus Groh, Thomas Haynes, Otto Joachim, Dennis Lukas, Tom Dean, Gary Lee-Nova, Saundra Legault, Ed Slopek, Cork Marcheschi, Norman McLaren, Ian Murray, Gino Pallidini, Northwest Mounted Valise, Jacques Palumbo, John Plant, Private Party (Gen. Idea), Clive Robertson, Chuck Santon, Pierre Thibaudeau, Ron Tunis, Janos Urban, Paul Woodrow, Marjolaine Robert	University, n.d.; Murray, 2010)
17/10 - 26/10	1975	Sehen um zu Hören. Objekte und Konzerte zur visuellen Musik der 60er Jahre	Städtische Kunsthalle Düsseldorf	Düsseldorf	Germany	John Cage, Giuseppe Chiari, Stephan von Huene, Joe Jones, Mauricio Kagel, Nam June Paik, Dieter Schnebel	(Harten, 1975)
29/11 /1975 - 08/01 /1976	1975/ 1976	New and Rediscovered Musical Instruments	Scottish National Gallery of Modern Art	Edinburgh	United Kingdom	Hugh Davies, John Furnival, Astrid Furnival, Max Eastley, Paul Burwell, David Toop, Joanna Godliman, Anna Lockwood and David Sawyer amongst others	(Gourlay, 2013)
08/12 /1975 - 11/01 /1976	1975/ 1976	Sounds – 4 LAINOC: sound/environments by 4 Artists	Newport Harbor Art Museum	Newport Beach	United States	Michael Brewster, John Doe Co., Michael McMillen, Eric Orr	(Turnbull, 1975)
26/01 - 29/01	1976	Mixed-Media VI: tentoonstelling sonomobielen	Koninklijke Academie voor Schone Kunsten	Ghent	Belgium	Godfried-Willem Raes, Moniek Darge, Michel Waisvisz, Walter Giers, Lieve De Pelsmaeker, Bert Koppelaar, COUM, Jean Paul Van Bendegem, Hugh Davies, Linda Walker projects	(Stichting Logos, 1976)
12/11 - 15/12	1976	bild, raum, klang - 11 internationale Künstler	Wissenschafts zentrum Bonn-Bad Godesberg	Bonn	Germany	Edward Kienholz, László Lakner, Eduardo Paolozzi, Bukichi Inoue, Braco Dimitrijevic, Chihiro Shimotani, Roman Opalka, Peter Sedgley, Stephan von Huene, Eduardo Arroyo, Makoto Fujiwara	(Deecke, 1976)
21/02 - 03/03	1977	Mixed Media VII: sonomobiel tentoonstelling	Museum voor Hedendaagse Kunst	Ghent	Belgium	Stephen Cripps, Action Space, Idaho Company & Worda Biena, David Toop & Paul Burwell, Jos Perriëns & Eric Ferremans, Johan Bots & Eric Ferremans, Hilde Engels & Eric Ferremans, André Coene & Eric Ferremans, Eric Ferremans, Moniek Darge & Godfried-Willem Raes & Eric Ferremans, Godfried-Willem Raes, Ulicke & Wolf-Dieter	(Stichting Logos, 1977)

21/01 – 18/02	1978	Audio Works	Artists Space	New York	United States	Trüstedt Michael Harvey, Larry Miller, Stuart Sherman, Christopher Knowles, Jill Kroesen, Charlemagne Palestine, Liza Bear and William Wegman, David Hykes and Choir, Vito Acconci, Robert Barry, Peter Downsbrough, James Umland, Donald Burgy, Carl Andre, Nancy Blanchard, Bob Wilhite, Alexis Smith, Laurie Anderson, Fern Friedman and Terry Hanlon, Barbara Kruger, John Baldessari, Guy de Cointet, Ant Farm, Nancy Buchanan, Laurel Klick, Douglas Huebler, Barbara Smith, Chris Burden, Tom Recchion, Linda Montano, Cheri Gaulke, John Baldessari, Paul Mc Carthy, Newton and Helen Harrison, John Duncan, Laurel Beckman, George Miller, Tom Radloff, Suzanne Lacy, Tom Jenkins, Alexis Smith, Terry Fox, Ronals Benson, Norma Jean Deak, Bart Thrall, Allan Kaprow, Dr. Earl, Susan Mogul, Michael Smith, Poppy Johnson, Constance de Jong, Mitch Corber, John Zorn, Liza Bear, Nanct Blanchard, Les Levine, Robert Barry, Paul Mc Mahon, Ilona Gryanet, Bruce Fier, Jana Haimsohn, Terry Fox, Julia Heyward, Dennis Oppenheim, Meredith Monk, Diego Cortez, Jim Burton, Leandro Katz, Connie Beckley, Laurie Anderson, Deigo Cortez, Jacki Apple, Richard Nonas, Jack Goldstein, Ian Murray, Music - Language, Charlemagne Palestine, Keith Sonnier, Lawrence Weiner, Bob Wilhite, Reese Williams, Christian Boltansky, Jack Goldstein, Carlos Pazos, Bernar Venet, Demi	(Artists Space, n.d.)
05/02 – 12/02	1978	Mixed Media VIII: tentoonstelling sonomobielen en alternatieve muziekinstrumenten	Oranjehuis	Antwerp	Belgium	Lieve De Pelsmaeker, Wessel-Feremans, Erik Feremans, Moniek Darge, Michel Waisvisz, Godfried-Willem Raes	(Stichting Logos, 1978)
	1979	Ton, in Dokumentation, Skulptur und Installation	Dany Keller Galerie	München	Germany	Laurie Anderson, Aperque, Pinuccia Bernardoni, Michael Brewster, Hank Bull, Norbert Brunner, Georg Decristel, Terry Fox, Bob George, Peter Grass, Jana Haimson, Julia Heyward, Joe Jones, Christina Kubisch, Tom Marioni, Ian Murray, Maurizio Plessi, Fritz Ruprecht, Arleen Schloss, Michael Schuster, Peter Weibel	(Insam, n.d.)

	1979	Ton, in Dokumentation, Skulptur und Installation	Galerie Peligrino	Bologna	Italy	Laurie Anderson, Aperque, Pinuccia Bernardoni, Michael Brewster, Hank Bull, Norbert Brunner, Georg Decristel, Terry Fox, Bob George, Peter Grass, Jana Haimson, Julia Heyward, Joe Jones, Christina Kubisch, Tom Marioni, Ian Murray, Maurizio Plessi, Fritz Ruprecht, Arleen Schloss, Michael Schuster, Peter Weibel	(Insam, n.d.)
12/07 – 25/08	1979	Audio Scene 79 - Ton, in Dokumentation, Skulptur und Installation	Modern Art Galerie	Vienna	Austria	Laurie Anderson, Aperque, Pinuccia Bernardoni, Michael Brewster, Hank Bull, Norbert Brunner, Georg Decristel, Terry Fox, Bob George, Peter Grass, Jana Haimson, Julia Heyward, Joe Jones, Christina Kubisch, Tom Marioni, Ian Murray, Maurizio Plessi, Fritz Ruprecht, Arleen Schloss, Michael Schuster, Peter Weibel	(Insam, n.d.) (Audio Scene '79, n.d.)
14/07 – 31/08	1979	Sound: an Exhibition of Sound Sculpture, Instrument Building and Acoustically Tuned Spaces	Los Angeles Institute of Contemporary Art	Los Angeles	United States	Bob Bates, Alec Bernstein, Michael Brewster, Jim Burton, Emmet Chapman, Ivor Darreg, Paul DeMarinis, John Duncan & Michael Le Donne-Bhennet, Richard Dunlap, Jack Edwards & Stephen Scott & Bish Edwards, Dennis Evans, Bruce Fier, Bill Fontana, Llyn Foulkes, Terry Fox, Arthur Frick, Ron George, Stephen Goodman, Jim Gordon, Jim Hobart, Doug Hollis, Tom Jenkins, Mike Kelley, Christina Kubisch, Ron Kuivila, Joan La Barbara, Alvin Lucier, Tom Marioni, Gerald Oshita, Will Parsons & Grace Bell, Jim Pomeroy, Susan Raxcliffe, Tom Recchion, Prent Rodgers, Stephan von Huene, Yoshimasa Wada, Richard Waters, Bob Wilhite, Karen Wolff & William Kingsbury	(Smith & Wilhite, 1979b)
30/09 – 18/11	1979	Sound: an Exhibition of Sound Sculpture, Instrument Building and Acoustically Tuned Spaces	Project Studios 1	New York	United States	Bob Bates, Alec Bernstein, Michael Brewster, Jim Burton, Emmet Chapman, Ivor Darreg, Paul DeMarinis, John Duncan & Michael Le Donne-Bhennet, Richard Dunlap, Jack Edwards & Stephen Scott & Bish Edwards, Dennis Evans, Bruce Fier, Bill Fontana, Llyn Foulkes, Terry Fox, Arthur Frick, Ron George, Stephen Goodman, Jim Gordon, Jim Hobart, Doug Hollis, Tom Jenkins, Mike Kelley, Christina Kubisch, Ron Kuivila, Joan La Barbara, Alvin Lucier, Tom Marioni, Gerald Oshita, Will Parsons & Grace Bell, Jim Pomeroy, Susan Raxcliffe, Tom Recchion, Prent Rodgers, Stephan von Huene, Yoshimasa Wada, Richard Waters, Bob Wilhite, Karen Wolff & William Kingsbury	(Smith & Wilhite, 1979b)
30/09 –	1979	Sound	P.S.1	New York	United States	Vito Acconci, William Anastasi, Michael Brewster, Bruce Fier, Jack Goldstein, William Hellermann, Kariya Hiroshi,	(The museum of

18/11						Nancy Holt, David Jacobs, Bernhard Leitner, Gary Lloyd, Annea Lockwood, Dennis Oppenheim, Mimi Smith, Norman Tuck, Norman Tripplett White	modern art, 2013b)
01/11 – 30/11	1979	Visual/musical permutations	Room Gallery, University of California	Irvine	United states	Robert Wilhite, Channa HorwitzJoyce Lightbody, a.o.	(Artfacts, n.d.) (Wilhite, n.d.)
19/11 – 01/12	1979	Sound – Medium der Bildenden Kunst	Krinzinger Gallery	Innsbruck	Austria	Laurie Anderson, Aperque, Pinuccia Bernardoni, Michael Brewster, Hank Bull, Norbert Brunner, Georg Decristel, Terry Fox, Bob George, Peter Grass, Jana Haimson, Julia Heyward, Joe Jones, Christina Kubisch, Tom Marioni, Ian Murray, Maurizio Plessi, Fritz Ruprecht, Arleen Schloss, Michael Schuster, Peter Weibel	(Insam, n.d.) (Galerie Krinzinger, n.d.)
21/12 /1979 – 10/02 /1980	1979/ 1980	Space/Time/Sound – 1970s: A decade in the Bay Area	San Francisco Museum of Modern Art	San Francisco	United States	Tom Marioni, Terry Fox, Paul Kos, Howard Fried, Paul Cotton, Jim Melchert, Mel Henderson, Bonnie Sherk, Linda Montano, Darryl Sapien, John Woodall, Stephen Laub, Jim Pomeroy, Richard Alpert, Lynn Hershman, T.R. Uthco, Ant Farm, Peter D'Agostino, Alan Scarritt, Bill Morrison, Suzanne Hellmuth and Jock Reynolds	(Foley, 1981)
	1980	A sound selection: audio works by artists	University of Hartford, Hartford Art School	West Hartford	United States	Micki McGee, Jim Pomeroy, Jim Roche, Martha Rosler, Stuart Sherman, Michael Smith, Mimi Smith, Keith Sonnier, William Wegman, Lawrence Weiner, Reese Williams, Vito Acconci, Laurie Anderson, Beth B, John Baldessari, Marge Dean, Guy De Cointet, Bruce Fier, Bob George, Jack Goldstein, Alison Knowles	(Winner, 1980)
	1980	A sound selection: audio works by artists	Artists Space	New York	United States	Micki McGee, Jim Pomeroy, Jim Roche, Martha Rosler, Stuart Sherman, Michael Smith, Mimi Smith, Keith Sonnier, William Wegman, Lawrence Weiner, Reese Williams, Vito Acconci, Laurie Anderson, Beth B, John Baldessari, Marge Dean, Guy De Cointet, Bruce Fier, Bob George, Jack Goldstein, Alison Knowles	(Winner, 1980)
06/01 – 06/02	1980	Music, Sound, Language, Theater	Eloise Pickard Smith Gallery, Cowell College, University of California, Santa Cruz	Santa Cruz	United States	John Cage, Tom Marioni, Robert Barry, Joan Jonas	(R. White, 1980)
20/01	1980	Für Augen und	Akademie der	Berlin	Germany	William Anastasi, Laurie Anderson, Ay-O, Bernard und	(R. Block et

- 02/03		Ohren – Von der Spieluhr zum akustischen Environment - Objekte, Installationen, Performances	Künste			François Baschet, Connie Beckley, Harry Bertolia, Joseph Beuys, Claus Böhmler, George Brecht, KP Brehmer, Jolyon Bretingham Smith & Eberhard Blum, Earle Brown, John Cage, Giuseppe Chiari, Albrecht D., Hansjoachim Dietrich, Richard Dunlap, Jean Dupuy, Experimentalstudio der Heinrich-Strobel-Stiftung, Bill Fontana, Jana Haimsohn, Richard Hamilton, Juan Hidalgo, Dick Higgins, Stephan von Huene, Joe Jones, Julius, Mauricio Kagel, Allan Kaprow, Milan Knizak, Alison Knowles, Takehisa Kosugi, Jannis Kounellis, Piotr Kowalski, Christina Kubisch, Shigeko Kubota, Bernhard Leitner, Daniel Lentz, Walter Marchetti, Tom Marioni, Robert Morris, Bruce Naumann, Phill Niblock, Dennis Oppenheim, Hans Otte, Nam June Paik, Harry Partch, Liz Phillips, Fabrizio Plessi/Christina Kubisch, Robert Rauschenberg, Man Ray, Luigi Russolo, Sarkis, Erik Satie, Daniel Schmidt, Dieter Schnebel, Konrad Schnitzler, Keith Sonnier, Laurie Spiegel, Takis, Jean Tinguely, David Tudor & John Driscoll & Philip Edelstein & Ralph Jones & Martin Kalve & Bill Viola, Yoshimasa Wada, Robert Watts & David Behrman & Bob Diamond	al., 1980)
14/05 - 24/05	1980	Audio by Artists	Eyelevel Gallery	Halifax Nova Scotia	Canada		(Eyelevel Gallery, n.d.-a)
18/06 - 24/08 /	1980	Écouter par les yeux – objets et environnements sonores	Musée d'Art Moderne	Paris	France	Laurie Anderson, Bernhard & François Baschet, Connie Beckley, K.P. Brehmer, Hans Joachim Dietrich, Jean Dupuy, Robert Filliou, Bill Fontana, Dick Higgins, Stephan von Huene, Joe Jones, Takehisa Kosugi, Bernhard Leitner, Man Ray, Robert Morris, Hans Otte, Eric Satie, Konrad Schnitzler, Keith Sonnier	(Pagé, 1980)
02/08 - 24/08	1980	A sound selection: audio works by artists	Perspectives Gallery, Contemporary Arts Museum	Houston	United States	Vito Acconci, Laurie Anderson, John Baldessari, Marge Dean, Guy de Cointet, Bruce Fier, Bob George, Jack Goldstein, Alison Knowles, Micki McGee, Jim Pomeroy, Jim Roche, Martha Rosler, Stuart Sheiman, Michael Smith, Mimi Smith, Keith Sonnier, William Wegman, Lawrence Weiner, Reese Williams	(Contemporary Arts Museum Houston, n.d.-b)
31/10 -	1980	Music, Sound, Language, Theater	Stedelijk Museum	Amsterdam	The Netherlands	John Cage, Tom Marioni, Robert Barry, Joan Jonas	(R. White, 1980)

14/12							(Nijhoff, 2013)
29/04 – 13/06	1981	Soundworks II	Franklin Furnace	New York	United States	Robert Filliou, Ray Johnson, Image Bank, COUM, A.A. Bronson, Vic d'Or, Dick Higgins and Emmett Williams, Bill & Mary Buchen, Arthea, Sarenco-Verdi, Rod Summers, Tommy Mew, Larry Wendt, Stephen Ruppenthal, Betsy Davids & James Petrillo, Rosa Burke Perez, Cliff Baldwin, Philip Perkins, Lawrence Kucharz, Beth nAnderson, Charles Amirkhanian, Bob Holman, Arleen Schloss, Jackson MacLow, John Giorno, Charley Morrow, Doris Hays, Steve Reigh, Richard Kostelanetz, Carolee Schneemann, Anthony Gnazzo, Dick Higgins, Norman Pritchard, Tom Jonson, Carles Santos, Bliem Kern, Ellen Zweig, Kirby Malone & Marshall Reese, Greta Monach, Svexner Labs, Steve Benson, Doug Lang, Tina Darragh, Jacki Apple, Robert Roposo, Bruce Tausky, Carlo Pittore & Bern Porter, J. Scott G., Victor Henderson, Rachel Rosenthal, Ian Murray, Terri Hanlon, Tony Faiola, Joyce Lightbody, Marilyn Belford, Leif Brush, Rene Bauermeister, Steven Fraccaro, Phill Niblock, Ernest & Marion Robson with Larry Wendt, Tom Marioni, Arleen Schloss, Maurizio Nannucci, Ott Eder, Aperque, Peter Downsborough, Julia Heyward, Laurie Anderson, Joan La Barbara, Terry Fox, Peter Weibel, Bobgeorge, Peter Van Riper, Herwig Kempinger, Otto Eder, Norbert Brunner, A. Wenemoser, Marino Vismara, Albert Mayr, Dragan Ilic, Christina Kubisch & Fabrizio Plessi, Dale Franks, Corsin Fontana, Warni Lehmann, Philip Corner, Crow Dog Family, Annea Lockwood, Spencer Holst & Tui St. George Tucker, Jackson Mac Low, Hannah Weiner, Jerome Rothenberg, Armand Schwerner, Charley Morrow, MacIntosh & Schechner, Hannah Wilke	(Franklin Furnace, n.d.-b) (Franklin Furnace, n.d.-a, n.d.-c; Furnace, n.d.)
20/09 – 23/12	1981	Soundings	Neuberger Museum of Art	New York	United States	Picasso, Braque, Kandinsky, Klee, Miro, Kupka, Arthur Dove, Robert Rauschenberg, Marcel Duchamp, Kurt Schwitters, Francois Baschet, Harry Bertoia, Vito Acconci, Karel Appel, Joe Jones, Guillaume Apollinaire, F.T. Marinetti, Man Ray, Laszlo Moholy-Nagy, Franz Kupka, Jean Tinguely, Morgan Russell, Stanton Macdonald-Wright, Joseph Beuys, Robert Morris, Laurie Anderson,	(Delahanty, 1981)

						Liz Phillips, Bruce Nauman, Alvin Lucier, Max Neuhaus, Meredith Monk, John Cage, Reinhold Marxhausen, Nam June Paik, Max Neuhaus, Bruce Conner, Michael Snow, Hollis Frampton, Joe Moss, Douglas Hollis a.o.	
20/01 – 22/03	1982	Ces musiciens et leurs drôles de machines	Centre Pompidou	Paris	France	Igor Stravinsky, Joe Jones, Eric Satie, Luigi Russolo, Edgar Varese, Harry Partch, Ivan Wyschnegradsky, John Cage, Conlon Nancarrow, Martin Riches, Bernard & François Baschet, Goa & Frank Bourlier a.o.	(Centre Pompidou, n.d.-b) (Sigma, 1980)
30/01 – 15/03	1982	Sonorità prospettiche: suono, ambiente, immagine	Sala Comunale d'Arte Contemporanea	Rimini	Italy	Vito Acconci, Marinus Boezem, Giuseppe Chiari, Terry Fox, Walter Marchetti, Maurizio Marsico, Tim Maul & Fred Szimanski, Roberto Taroni, Maurizio Turchet, Michel Waisvisz, Lawrence Weiner	(Masotti & Masotti, 1982)
13/02 – 14/03	1982	Sonic Art	The Art Gallery at California State College	San Bernardino	United States	Christopher Charles Banta, Bob Bates, Bill & Mary Buchen, Ivor Darreg, Bruce Fier, Cris Forster, Arthur Frick, John Gibbon, Jonathan Glasier, Marlin Halverson, Jim Hobart, Douglas Hollis, Skip La Plante, Philip Loarie, Tom Nunn, Jim Pomeroy, Susan Rawcliffe, Prent Rodgers, Stephen Clay Smeed, Robert Wilhite	(Halverson, 1982b)
April-May	1982	British Soundworks	Franklin Furnace	New York	United States	Audio, Arts Magazine, Stuart Brisley, Gerald Newman, Charlie Hooker and Silvia C. Ziranek	(Judith A. Hoffberg, 1983)
04/04 – 30/05	1982	Sound Corridor	P.S. 1	New York	United States	Sara Garden Armstrong, Bill Buchen, Mary Buchen, Nicolas Collins, William Hellermann, Ron Kuivila, Anthony Martin, Jill Scott, Buster Simpson, Hannah Wilke	(The museum of modern art, 2013c)
15/08 – 27/08	1982	Mit Klang	Galerie Giannozzo	Berlin	Germany	Julius, Martin Riches, Wolfram Erber, Raimund Kummer, Ulrich Eller, Thomas Kapielski, Nils Krüger, Antje Fels, Rolf Langebartels, Raffael Rheinsberg, Karl-Heinz Eckert, Thomas Schulz	(Langebartels, 1982)
23/08 – 19/09	1982	Audio, Tape-Slide, Drawings and Performance	Tate Gallery	London	United Kingdom	Gerald Newman, Ian Breakwell (20 drawings), James Coleman, Patrick Keiller, Phillipe Regniez, Sharon Morris, Sonia Knox, Stuart Brisley, Tim Head, The Art Record (sound works by 24 artists) and Audio Arts (Bruce McLean, Julia Heyward, Rod Summers, Art & Language, Barbara Ess, Dan Graham, Clive Robertson, Yura Adams, David Garland, Tina Keane, Jacki Apple, Adrian Hall, Arleen Schloss, Richard Layzell, Ian Breakwell, Bob	(Tate Archive, n.d.; Various, 1982)

						George, Ian Murray, Hannah O'Shea, Rose Garrard, Gerald Newman, Silvia C. Ziranek, Lawrence Weiner/Peter Gordon, Connie Beckley, Charlie Hooker, Anti Music, Maurizio Nannucci, Hank Bull, David Cunningham, Jack Goldstein, Tom Marioni, David Troostwyk, Dieter Roth, Kerry Trengove, Helen Chadwick, John Carson, Vito Acconci, Stuart Brisley, Les Levine, F. Uwe Laysiepen/Marina Abramovic, Roberta M.Graham, Steve Willats, Elsa Stansfield/Madelon Hooykaas)	
	1983	Seven German Artists Working With Concept & Sound	Galerie Caidoz	New York	United States	Ulrich Eller, Raffael Rheinsberg, a.o.	(Eller, 2013; IFA, 2013)
13/01 – 06/02	1983	Audio by Artists & Radio by Artists	Walter Phillips Gallery	Banff	Canada	Agnetti, Antin, Applebroog, Atkinson, Beuys, Burden, Davis, Fine, Fox, Fuller, Harrison, Komar and Melamid, Kowalski and Burroughs, Levine, Scholssberg, Shannon, Siler, Site, Smyth, Wilke, Acconci, Anderson, Asher, Askevold, Bull and Ready, Collyer and Wiitsalo, Conde and Beveridge, Downsborough, General Idea, Gervais, Graham, Holt, Knowles and Wilson, Murray, Ostrow, Robinson, Sherman, Snow, Sondheim, Troostwyk, Waterman, Watt, Weiner, Willats, Michael Brewster, Ian Murray	(Parkinson, 2013)
11/02 – 13/03	1983	Not Suitable for Framing - Arrangements for Sound and Structure	The Art Gallery at Harbourfront	Toronto	Canada	Norman Andersen, Max Eastley, Don Jean-Louis, Peeter Sepp & Associates, Peter Vogel, Doug Back, Steve Higgins	(Holubizky, 1983)
11/03 – 16/04	1983	Earworks, an exhibition of musical scores and sound art	Grommet Gallery	New York	United States	Olga Adorno, Thomas Albert, Beth Anderson, Eugenia Balcells, John Beaulieu, David Bordon, John Cage, Wendy Chambers, Henry Chariot, Clark Coroshko, Mocky Cherry, Bob Davis, Charles Dreyfus, Dean Drummond, Jean Dupuy, Jean de la Fontaine, Ken Friedman, Georges Gajek, David Garland, The Gerlovins, Jacques Halbert, R.I.P. Hayman, Doris Hays, Melanie Hedlund, William Helleman, Dick Higgins, Eleanor Hovda, Dragan Ilic, Tom Johnson, Philip Kaplan, Mollyne Karnofsky, Alison Knowles, Zygmunt Krauze, Joan Labarbara, Leigh Landy, Mary Jane Leach, Jackson Mac Low, Chris Mann, Judith Martin, Steve McCaffery, Larry Miller, Ilhan Mimaroglu, Luca Miti,	(The Emily Harvey Foundation, n.d.-b)

						Gordon Monahan, Meredith Monk, Carman Moore, Charlie Morrow, Vernita Nemec, Max Neuhaus, Phil Niblock, Ben Packer, Nam June Paik, Charlemagne Palestine, Bern Porter, Jocy de Oliveira, Pauline Oliveros, Arleen Schloss, Laurie Spiegel, Marguerite Strop, Leslie Tillet, Livio Tragtenberg, Peter Van Riper, Yoshi Wada, Peter Wetzler, Christian Xatrec, Yasunao Tone	
12/03 – 10/04	1983	Audio	Moderna Museet	Stockholm	Sweden	Armando D'Angelo, Horacio M. Devitt, Edgardo-Antonio Vigo, Paul Thomas, Allan Vizents m fl. Från Mediaspace, Moniek Darge, Jacques Lizene, Godfried-Willem Raes, Paulo Bruscky, Leonhard Frank duch, Luiz Guardia, Lucio Kume, Guillermo Deisler, Howard Broomfield Hank Bull, Emil Daley, Alex Douglas, Gerald Jupiter-Larsen, David Keane, Lubomyr Melnyk, Honey Novick, Murray Schafer, T.T.P. Tim Wilson, Viggo Clausen, Allan Dewall, Niels Lomholt, Jörgen Nash, Mogens Otto Nielsen, Steen Möller Rasmussen, Carsten Schmidt-Olsen, Marina Abramovic, Kevin Atherton, Joe Banks, Mike Batt, Michael Bright, Paul Carter, Malcolm Clarke, Bob Cobbing, Ivor Cutler, Eric Finlay, Morgan Fisher, William Furlong, Charlie Hooker, David Jarvis, F. Uwe Laysiepen, Herman C. Lelie, John Lennon, John Lord, Michael Mason, Jospet Knutas, Pekka Sire'n, Denise A. Aubertin, Julien Blaine, Henri Chopin, Frederique Harroch/Levy, Nathael Moreau, Pierre Schaefer, Jean Sellem, Lucien Suel, Dimosthenis Agrafiotis, Johan Cornelissen, Diedrick van Kleef, Andre de Koning, Carel Lanthers, Cort Lippe, Marga & Brause Lutscher, Dermot Mahon, Willem de Ridder, Rod Summers, Jan van Toorn, Magnus V. Gudlaugsson, T.E. Paulsson, Sergio Altafini, Vittorio Baccelli, Vittore Baroni, Maurizio Bianchi, Giovanni A. Bignone, Adriano Bonari, G. Achille Cavellini, Bruno Chiarlone, Piermario Ciani, Daniele Ciullini, Vitaldo Conte, Betty Danon, Ronald Foglietti, Giovanni Fontana, Nicola Frangione, Ubaldo Giacomucci, Gianpaolo Guerini, Giannino Di Lieto, Ruggero Maggi, Federica Manfredini, Gincarlo Martina, Albert Mayr, Enzo Minarelli, Mario Rondi, Also Selleri, Adriano Spatola, Sandro Sulpizio, Bruno Talpo, Richard Trythall, Michaele Versari, Marino Vismara, Masami	(Meyer, 1983)

					<p>Akita, Satoshi Ashikawa, Shinji Kanki, Kazuo Uehara, Hiroshi Yoshimura, Kum Nam Baik, Solidarte, Ben Allen, Paul Quigley, Marianne Heske, Knut Wiggen, Andrzej Dudek-Dürer, Tadeuz Kantor, Josef Schajna, Robert Fischer, Gunther Ruch, Ruedi Schill, Pete Horobin, Siim-Tanel Annus, Marte Taska, Grupo Texto Poetico, Carmelo Hernando, Mata, Francesc Torres, John/Anita Amott, Göran Andersson, Malou Berg, Tomas Blom, Christian Bock, Robert Zero Broberg, JanDanielsson, Dan Fröberg, Tomas Mera Garts, Frederik Grundel, Sten Hansson, Curt Hilfon, Sven Holm, Per Holmström, Lennart Hyland, Patrick Håkansson, Leif Iseberg, Bengt-Emil Johnsson, Kristian Jonsson, Lars Jonsson, Kåge Klang, Yvonne Marcus, Peter R Meyer, Rut/Wladimir Meyer, Leo Nilsson, Staffan Olzon, Per Paulsson, Jan K. Persson, Johan Runeberg, Kjell-Arve Ryde'n, Brynn Settels, Marie Sjöberg, Evan Storm, Christer Söderqvist, Ilmar Taska, Claude Thorlin, Mats Victorin, Alexander Wingby, Bruno K.Öijer, Ola Österling, Igor Giboda, Ivan Prjzler, Karel Sevcik, Beth Anderson, Laurie Anderson, Eleanor Antin, Audioplayers, Regina Beck, Morey Bernstein, Johanna M. Beyer, Bill Costley, Ron Crowcroft, Jean-Paul Curtay, Bob Davis, Brian Eno, John Fekner, Wild Man Fisher, Kim Fowley, Terry Fox, David Garland, Louis Giansante, Allen Ginsburg, Malcolm Goldstein, Alex Igloo, Ray Johnson, Allan Kaprow, David Kean, Harry Kipper, Dislokate Klammer, Dutch Knotts, Alison Knowles, Richard Kostelanetz, Mitchell Kreigman, Lawrence Kuchar, Timothy Leary, Alvin Lucier, Scarlatina Lust, Jackson Mac Low, Randy Magnus, George Meek, Mark Melnicove, Tommy Mew, Moondog, Charlie Morrow, Yoko Ono, Tom Pack, Tom Patrick, Carlo Pittore, Bern Porter, Stephen Rice, Arleen Schloss, Jack Schrage, E.T. Simon, Larry D. Smith, Michael Smith, Sonezone, Lon Spiegelman, Jeff Stoll, Carl Stone, Tumio Suda, Tentatively, Hannah Weinar, Larry Went, Philip Williams, Hannah Wilke, David M. Vosh, Dietrich Albrecht, Peter Below, Peter Leonhard Braun, Ulrich Eller, Max Goldt, Klaus Groh, Volker Hamann, Julius, Ferdinand Kriwet, Käthe Kruse,</p>	
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						Henning Mittendorf, Wolfgang Mohrhenn, Wolfgang Müller, Jürgen O. Olbrich, Tom Stark, Klaus Schulze, Holger Turner, Alexander Zeit, Zev, Franz-Milan Wirth, Michael Groschopa, Joseph W. Huber	
23/04 – 16/05	1983	3rd annual audio by artists festival - installations	Centre for Art tapes & Eye Level Gallery	Halifax	Canada	John Greer, Eric Cameron, Rob Johnston, Brad Brace, Gary Conway, Jon Cox, Michael Fernandes, Bruce Campbell, & Douglas Sharpe	(E. Johnson, 2013)
01/05 – 30/05	1983	Sound/Art	The Sculpture Center	New York	United States	Vito Acconci, Connie Beckley, Bill & Mary Buchen, Nicolas Collins, Sari Dienes & Pauline Oliveros, Richard Dunlap, Terry Fox, William Hellermann, Jim Hobart, Richard Lerman, Les Levine, Joe Lewis, Tom Marioni, Jim Pomeroy, Alan Scarritt, Carolee Schneemann, Bonnie Sherk, Keith Sonnier, Norman Tuck, Hannah Wilke, Yom Gagatzi	(The SoundArt Foundation, 1983)
01/06 – 30/06	1983	Sound/Art	BACA/DCC Gallery	New York	United States	Vito Acconci, Connie Beckley, Bill & Mary Buchen, Nicolas Collins, Sari Dienes & Pauline Oliveros, Richard Dunlap, Terry Fox, William Hellermann, Jim Hobart, Richard Lerman, Les Levine, Joe Lewis, Tom Marioni, Jim Pomeroy, Alan Scarritt, Carolee Schneemann, Bonnie Sherk, Keith Sonnier, Norman Tuck, Hannah Wilke, Yom Gagatzi	(The SoundArt Foundation, 1983)
26/06 – 31/07	1983	Hast du Töne - Eine Ausstellung zum Sehen und Hören	Städtisches Museum Abteiberg	Mönchengladbach	Germany	Böhmler, Coerper, Esser, Heimes, Kayser, Kissing, Niebuhr, Pesch La Bosch, Raskin Stichting, Schäffler, Turner	(Kimpel-Fehleemann, 1983)
05/10 – 29/10	1983	Audio Eyes	Artspace	Sydney	Australia	Antimusic, Ros Bandt, Wandy Chambers, Phil Dadson, Esteam, Terry Fox, R. Hefti, Leigh Hobba, David Jones, Vineta Lagdzina, T. Marioni, B. Nicoles, M. Monk, A. Scarritt, L. Spiegel, P. Tyndall, D. Troostwyk, K. Wiese, Zonano, A. Frost, E. Gidney, M. Farehin, B. George & 1-10 Records, M. Ghens, L.A.I.C.A., Logos Duo, Mag Magazine, Monoton, Media Space, C. Morrow & Ear Magazine, Phill Niblock & Experimental Media Found, C. Offord, P. Richards, P. Van Riper & G. DeCristal, Stelarc, Ulay & M. Abramovic, Vision Magazine, S. Schoenbaum & G. Alexander, Stereo Headphones, S. Warrop, Zip, Zona, a.o.	(Garton, 1983)
23/02 – 11/03	1984	Audio for Artists Festival, Contained Sound Sculpture	Centre for Art Tapes	Halifax	Canada	Bruce Barber, a.o.	(McDonald, 2013)

22/11 /1984 - 6/01/ 1985	1984/ 1985	Echo, the images of sound I	Het Apollohuis (Eindhoven), Vleeshal (Middelburg), 0 42 (Nijmegen)	Eindhoven, Middelburg, Nijmegen	The Netherlands	Hugh Davies, Max Eastley, Richard Lerman, Julius, Takehisa Kosugi, Hans-Karsten Raecke, Jon Rose, Godfried-Willem Raes, George Smits, Paul Panhuysen/Johan Goedhart, Leon van Noorden, Joop van Brakel	(P. Panhuysen, 1987d)
13/01 - 10/02	1985	Klangskulpturen '85	Städtische Galerie Würzburg	Würzburg	Germany	Bernard and François Baschet, Gerlinde Beck, Elmar Daucher, Lothar Forster, Herbert Försch-Tenge, Walter Giers, Ludwig Girs, Stephan von Huene, Irma Hünerfauth, Edmund Kieselbach, Joachim Koch, Bernhard Kümmelmann, Alois Lindner, Wolfgang Peter, Hans- Karsten Raecke, Martin Riches, Thomas Rother, Charlotte and Johannes Seidl, Eduard Johannes Gabriel Stoecklin, Takis, Olaf Täuberhahn, Peter Vogel	(Stahmer, 1985)
04/03 - 10/03	1985	Klangskulpturen '85	Kulturforum Bonn	Bonn	Germany	Bernard and François Baschet, Gerlinde Beck, Elmar Daucher, Lothar Forster, Herbert Försch-Tenge, Walter Giers, Ludwig Girs, Stephan von Huene, Irma Hünerfauth, Edmund Kieselbach, Joachim Koch, Bernhard Kümmelmann, Alois Lindner, Wolfgang Peter, Hans- Karsten Raecke, Martin Riches, Thomas Rother, Charlotte and Johannes Seidl, Eduard Johannes Gabriel Stoecklin, Takis, Olaf Täuberhahn, Peter Vogel	(Stahmer, 1985)
28/03 - 12/05	1985	L'oeil musicien - les écritures et les images de la musique	Palais des Beaux-Arts de Charleroi	Charleroi	Belgium	Hanne Darboven, Marcel Duchamp, Lili Dujourie, Jannis Kounellis, André Mees, Giulio Paolini, Erik Satie, Sarkis	(Palais des Beaux-Arts, 1985)
20/04 - 12/05	1985	Images du son	Espace Nord 251	Liège	Belgium	Moniek Darge, Max Eastley, Johan Goedhart, Julius, Richard Lerman, Baudouin Oosterlynck, Paul Panhuysen, Jon Rose, George Smits, Leon Van Noorden, Godfried- Willem Raes This exhibition contained a large part of the works that were also presented at Echo, the images of sound I. (P. Panhuysen, 1987a)	(Robichon, 2013) (H. Panhuysen, 1985)
11/05 - 27/05	1985	Klangskulpturen '85	Kunstverein	Heidelberg	Germany	Bernard and François Baschet, Gerlinde Beck, Elmar Daucher, Lothar Forster, Herbert Försch-Tenge, Walter Giers, Ludwig Girs, Stephan von Huene, Irma Hünerfauth, Edmund Kieselbach, Joachim Koch, Bernhard Kümmelmann, Alois Lindner, Wolfgang Peter, Hans- Karsten Raecke, Martin Riches, Thomas Rother, Charlotte and Johannes Seidl, Eduard Johannes Gabriel Stoecklin,	(Stahmer, 1985)

						Takis, Olaf Täuberhahn, Peter Vogel	
23/05 - 16/06	1985	Kijk.....Muziek	de gele rijder, gemeentemuseum, Kröller-Müller Museum	Arnhem	the Netherlands	Ans Zwart, Wim Streep, Richard Lerman, Cor van Haasteren, Theo van Zadelhoff, Babeth & Boa van den Berg, Asta Olafsdóttir, Maryanne Amacher, Nico Schulte & Arnoud de Bauw, Elska 't Hoen, Carel Landers, Ton van der Meyden, Godfried-Willem Raes, Jon Rose, Julius, Finnbogi Peterson, Roos Theuws, Takis, Paul Panhuysen & Johan Goedhart, Thomas Rother, Torill Nöst, Felix Hess	(Stichting Festival Arnhem & Stichting Filmweek Arnhem, 1985)
24/05 - 07/07	1985	A Noise in Your Eye: An International Exhibition of Sound Sculpture	Arnolfini Gallery	Bristol	United Kingdom	Alvin Lucier, David Keane, David Sawyer, Francois and Bernard Baschet, Hugh Davies, Ken Gray, Liz Phillips, Martin Riches, Max Eastley, Paul and Limpe Fuchs, Peter Appleton, Sonde (Charles de Mestral, Pierre Dostie, Robin Minard, Christopher Howard)	(Laycock, 1985)
07/06 - 16/06	1985	Klangskulpturen '85	Spielboden	Dornbirn	Germany	Bernard and François Baschet, Gerlinde Beck, Elmar Daucher, Lothar Forster, Herbert Försch-Tenge, Walter Giers, Ludwig Girs, Stephan von Huene, Irma Hünerfauth, Edmund Kieselbach, Joachim Koch, Bernhard Kümmelmann, Alois Lindner, Wolfgang Peter, Hans-Karsten Raecke, Martin Riches, Thomas Rother, Charlotte and Johannes Seidl, Eduard Johannes Gabriel Stoecklin, Takis, Olaf Täuberhahn, Peter Vogel	(Stahmer, 1985)
18/06 - 22/06	1985	instrument de MUSIQUE ALTERNATIFS	la galerie Le Silex	Brussels	Belgium	M. Darge, J. Dedeken, T. Flamant, G.W. Raes, Ph. Smeyers	(Galerie Le Silex, 1985)
25/06 - 28/06	1985	Klang - Ereignisse	Hochschule für bildende Künste	Hamburg	Germany	Phil Corner, Marianne Greve, Tilman Küntzel, Tom Johnson, Christian Terstegge, Gerhard Rühm, Ernst Kretzer, Ute Wassermann, KP Brehmer, Rainer Oehms, Claus Böhmer	(Archiv k23, 2013)
06/07 - 22/09	1985	Vom Klang der bilder. Die Musik in der Kunst des 20. Jahrhunderts	Staatsgalerie Stuttgart	Stuttgart	Germany	Josef Albers, Boris Bilinsky, Georges Braque, Felix Del Merle, Augusto Giacometti, Marsden Hartley, Adolf Hölzel, Johannes Itten, Alexander Jawlensky, Wassily Kandinsky, Paul Klee, Frank Kupka, August Macke, Heinrich Neugeboren, Robert Strübin, Nadeshd Udal'Cova, Ossip Zadkine, Adolf Fleischmann, Arman (Armand Fernandez), Serge Charchoune, Ernst Wilhelm Nay, Gunther Uecker, Fausto Melotti, Luigi Veronesi, Günther Fruhtrunk, Karl Duschek, Peter Loew, Jannis Kounellis, Torolf Engström, Jakob Weder, Moritz Von	(von Maur, 1985b)

					<p>Schwind, James McNeill Whistler, Jean Theodore Fantin-Latour, Odilon Redon, Paul Gauguin, Max Klinger, Gustav Klimt, Mikalojus Konstantinas Ciurlionis, Mikalojus Konstantinas Ciurlionis, Edvard Munch, Augusto Giacometti, Max Slevogt, Arnold Schönberg, Egon Schiele, Oskar Kokoschka, Herwarth Walden, Max Oppenheimer, Erika Giovanni Klien, Johannes Itten, Josef Matthias Hauer, Adolf Hölzel, Wassily Kandinsky, Thomas von Hartmann, Franz Marc, August Macke, Alexej Jawlensky, Alexander Sacharoff, Ernst Ludwig Kirchner, Ernst Barlach, Robert Delaunay, Sonia Delaunay, Frank Kupka, Francis Picabia, Wladimir Baranoff-Rossiné, Jean Crotti, Henri Valensi, Joël & Jan Martel, Charles Blanc-Gatti, Etienne Béothy, Marsden Hartley, Morgan Russell, Joseph Stella, Stanton Macdonald-Wright, Pablo Picasso, Juan Gris, Marcel Duchamp, Jacques Villon, Fernand Léger, Albert Gleizes, Le Corbusier (Charles-Eduard Jeanneret), Henri Laurens, Jacques Lipchitz, Ossip Zadkine, Umberto Boccioni, Giacomo Balla, Francesco Cangiullo, Carlo Carrà, Luigi Russolo, Fortunato Depero, Francesca Ballila Pratella, Gino Severini, Filippo Tommaso Marinetti, David Bomberg, William Roberts, Wyndham Lewis, Man Ray, Francis Picabia, Erik Satie, Marcel Duchamp, Georges Ribemont-Dessaignes, Raoul Hausmann, Paul Joostens, Serge Charchoune, Kurt Schwitters, Hannah Höch, Rudolf Bauer, Robert Michel, Johannes Molzahn, Erich Buchholz, Karl Buchheister, Rudolph Belling, Fritz Stuckenberg, Otto Freundlich, Oswald Herzog, Marc Chagall, Iwan Puni (Jean Pougny), Ljubov Sergeevna Popova, Michail Matjusin, Marija Mladimirowna Ender, Jurij Wladimirowitsch Ender, Alexander Michailowitsch Rodcenko, Paul Mansouroff (Pavel Andreewitsch Mansurov), Kasimir Malewitsch, Alexandra Alexandrowna Exter, El Lissitzky (Lasar Markowitsch Lissitzky), Arthur Lourié, Lajos (Ludwig) Kassak, Natalia Goncarova, Michail Larionov, Lajos Kassak, Hans Poelzig, Fidus (Hugo Höppener), Wenzel August Hablik, Hans Scharoun, Johannes Molzahn, Hermann Finsterlin, Wassili Luckhardt, Hermann Finsterlin, Bruno Taut, Erich</p>
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					<p>Mendelsohn, Heinrich Tischler, Jefim Golyscheff, Ewald Dülberg, Piet Mondrian, Theo van Doesburg, Georges Vantongerloo, Vilmos Huszar, Bart Van Der Leck, Jan Sluyters, Louis Saalborn, Johan Miedema, Albert August Plasschaert, Janus De Winter, Oskar Schlemmer, Laszlo Moholy-Nagy, Lothar Schreyer, Kurt Schmidt, Andreas Weininger, Roman Clemens, Herbert Bayer, Karl Peter Röhl, Josef Albers, Alexander Laszlo, Vladimir Baranoff-Rossiné, Ludwig Hirschfeld-Mack, Heinrich Bormann, Ivan Wyschnegradsky, Hermann Goepfert, Nicolas Schöffer, Hans Richter, Viking Eggeling, Oskar W. Fischinger, Walter Ruttmann, Fernand Léger, Leopold Survage (L. Sturzwage), Duncan Grant, Joan Miró, René Magritte, E.L.T. (Edouard) Mesens, Max Ernst, Adolf Wölfli, Ben Nicholson, Stuart Davis, Henri Matisse, Raoul Dufy, Ceri Richards, Hap Grieshaber/Carl Orff, Fritz Heeg- Erasmus, Max Ackermann, Carl Buchheister, Willi Baumeister, Ernst Wilhelm Nay, K.R.H. Sonderborg (Kurt Hofmann), Hann Trier, Alfred Manessier, Gerhard Hoehme, Günther Uecker, Hans Uhlmann, Berto Lardera, Heinz Mack, Burgoyne Diller, Max Bill, Anton Stankowski, Karl Gerstner, Richard Paul Lohse, Friedrich Vordemberge-Gildewart, Horst J. Beck, Hans Hinterreiter, Günther Fruhtrunk, Luigi Veronesi, Robert Strübin, Armin Martinmüller, Walter Kaitna, Lajos Kovács, Jaxk Ox, Jackson Pollock, Robert Indiana, George Segal, Andy Warhol, Roy Lichtenstein, Robert Motherwell, Jasper Johns, Yves Klein, John Cage, La Monte Young, Joseph Beuys, Nam June Paik, Robert Filliou, Benjamin Patterson, George Brecht, Ludwig Gosewitz, Emmett Williams, Dick Higgins, Albrecht D. (Dietrich Albrecht), Dieter Roth, Wolf Vostell, Arnulf Rainer, Günter Brus, Marcel Broodthaers, Hermann Nitsch, Sigmar Polke, Jiri Kolár, Marry Bauermeister, László Lakner, Pic Adrian, Thomas Lenk, Manfred Mohr, Bruno Munardi, Hubertus Gojowczyk, Vincenzo Ferrari, Annelies Klophaus, Gerhard Hoehme, Georg Muche, Terry Fox, Hanne Darboven, K.P. (Klaus-Peter) Brehmer, Phil Corner, Gerhard Rühm, August von Briesen, Luciano Bartolini, Earle Brown, John Cage,</p>	
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						Sylvano Bussoti, Karlheinz Stockhausen, Mauricio Kagel, György Ligeti, Henri Pousseur, Dieter Schnebel, Roman Haubenstock-Ramati, Anestis Logothetis, Milan Grygar, Hartmut Geerken, Leon Schidlowsky, John Dowell, David Tudor, Steve Reich, Jon Gibson, Robert Ashley, Tom Marioni, Phil Corner, Mauricio Kagel, Takis, Jean Tinguely, Joe Jones, Walter Giers, Thomas Lenk, Bernard & François Baschet, Dennis Oppenheim, Pol Bury, Bernhard Leitner, Elmar Daucher, Terry Fox, Jean Weinfeld, Stephan von Huene, Igor Sacharov-Ross, Peter Vogel, Edmund Kieselbach	
20/07 - 31/08	1985	A Noise in Your Eye: An International Exhibition of Sound Sculpture	Mappin Gallery	Sheffield	United Kingdom	Alvin Lucier, David Keane, David Sawyer, Francois and Bernard Baschet, Hugh Davies, Ken Gray, Liz Phillips, Martin Riches, Max Eastley, Paul and Limpe Fuchs, Peter Appleton, Sonde (Charles de Mestral, Pierre Dostie, Robin Minard, Christopher Howard)	(Laycock, 1985)
04/08 - 25/08	1985	Klangskulpturen '85	Leopold Hoesch- Museum	Düren	Germany	Bernard and François Baschet, Gerlinde Beck, Elmar Daucher, Lothar Forster, Herbert Försch-Tenge, Walter Giers, Ludwig Girs, Stephan von Huene, Irma Hünerfauth, Edmund Kieselbach, Joachim Koch, Bernhard Kümmelmann, Alois Lindner, Wolfgang Peter, Hans-Karsten Raecke, Martin Riches, Thomas Rother, Charlotte and Johannes Seidl, Eduard Johannes Gabriel Stoecklin, Takis, Olaf Täuberhahn, Peter Vogel	(Stahmer, 1985)
04/09 - 20/09	1985	Klangskulpturen '85	Refektorium des Karmeliterklost ers	Frankfurt	Germany	Bernard and François Baschet, Gerlinde Beck, Elmar Daucher, Lothar Forster, Herbert Försch-Tenge, Walter Giers, Ludwig Girs, Stephan von Huene, Irma Hünerfauth, Edmund Kieselbach, Joachim Koch, Bernhard Kümmelmann, Alois Lindner, Wolfgang Peter, Hans-Karsten Raecke, Martin Riches, Thomas Rother, Charlotte and Johannes Seidl, Eduard Johannes Gabriel Stoecklin, Takis, Olaf Täuberhahn, Peter Vogel	(Stahmer, 1985)
07/09 - 28/09	1985	Sound/Vision	Plymouth Arts Centre	Plymouth	United Kingdom	Stuart Brisley / Sharon Morris, Audio Arts, Hannah Collins, Charles Garrad, Holly Warburton, Judith Goddard, Gerald Newman, Michael Newman / Paul Richards	(Lingwood, 1985)
29/09 - 13/10	1985	Kultur-Kilometer: Klangstraße	Koningstraße	Stuttgart	Germany	Verband Christlicher Pfadfinder, Roland Gräter, Albrecht Rommel, Logos, Klaus-Dieter Kienzle, Gruppe des Christlichen Jugenddorfwerks, Herbert Göser, Martin	Logos archive

						Schweiker, Karl-Heinz Kleinbach, Gruppe Werkkurs der Evang, Peter Vogel	
01/10 - 26/10	1985	Regarding Today's Art, Sound Art (part 1)- Earsight	Nexus	Philadelphia	United States	John Cage, Laurie Anderson, John Dowell, Robert Moran, David Kettner, Bea Licata, Paul Epstein, Romulus Franceschini, Susan Kaprov, Richard Lerman, Donald Knaack, Jack Ox, William Helle	(Nexus archives, 2013b)
05/10 - 26/10	1985	Sound/Vision	Spacex Centre	Exeter	United Kingdom	Stuart Brisley / Sharon Morris, Audio Arts, Hannah Collins, Charles Garrad, Holly Warburton, Judith Goddard, Gerald Newman, Michael Newman / Paul Richards	(Lingwood, 1985)
17/11 - 28/12	1985	A Noise in Your Eye: An International Exhibition of Sound Sculpture	City art gallery	Huddersfield	United Kingdom	Alvin Lucier, David Keane, David Sawyer, Francois and Bernard Baschet, Hugh Davies, Ken Gray, Liz Phillips, Martin Riches, Max Eastley, Paul and Limpe Fuchs, Peter Appleton, Sonde (Charles de Mestral, Pierre Dostie, Robin Minard, Christopher Howard)	(Laycock, 1985)
15/12 /1985 - 27/01 /1986	1985/ 1986	On the Wall/On the Air: Artists make noise	Massachusetts Institute of Technology	Cambridge	United States	Laurie Anderson, Jacki Apple, Connie Beckley, Jonathan Borofsky, Glen Branca, Bill Buchen, Nicolas Collins, Douglas Davis, John Driscoll, Ellen Fullman, Jack Goldstein, William Hellermann, Dick Higgins, Richard Lerman, Christian Marclay, Jack Ox, Michael Peppe, Ed Toomey, David Weinstein	(Left Matrix, n.d.)
	1986	A Noise in Your Eye: An International Exhibition of Sound Sculpture	Barbican Centre	London	United Kingdom	Alvin Lucier, David Keane, David Sawyer, Francois and Bernard Baschet, Hugh Davies, Ken Gray, Liz Phillips, Martin Riches, Max Eastley, Paul and Limpe Fuchs, Peter Appleton, Sonde (Charles de Mestral, Pierre Dostie, Robin Minard, Christopher Howard)	(Laycock, 1985)
11/01 - 16/02	1986	A Noise in Your Eye: An International Exhibition of Sound Sculpture	Cornerhouse	Manchester	United Kingdom	Alvin Lucier, David Keane, David Sawyer, Francois and Bernard Baschet, Hugh Davies, Ken Gray, Liz Phillips, Martin Riches, Max Eastley, Paul and Limpe Fuchs, Peter Appleton, Sonde (Charles de Mestral, Pierre Dostie, Robin Minard, Christopher Howard)	(Laycock, 1985)
04/03 - 22/03	1986	Sound level	Eyelevel Gallery	Halifax Nova Scotia	Canada	Bruce Barber, Jim Drobnick, Michael Fernandes, Gord Laurin, Micah Lexier, Richard Robertson	(Eyelevel Gallery, n.d.-c)
23/03	1986	The Parking Lot Show	Eyelevel Gallery	Halifax Nova Scotia	Canada	Garry Kennedy, Earl Miller, Alan Pavio, Karin Sundin, Doris Muise	(Eyelevel Gallery, n.d.-b)
17/05 -	1986	Soundwave NYC : audio	City Gallery, Bronx river art	New York	United States	Terry Adkins, Paul DeMarinis, Gerald Lindahl, Bob Natalini, David Weinstein, Nade Haley, Martha & Charles	(Lindahl, Buchen, &

12/07		art series – exhibition & soundgarden	centre & community garden			Bremer, Kobla Mensa Dente	Buchen, 1986)
July	1986	The Sound Show	Randolph Street Gallery	Chicago	United States	Gene Coleman, Dan Richardson, Lou Mallozi, Maria Lo Vullo amongst others	(Corbett, 1996)
	1987	Van Horen, Zien en Zeggen	Studium Generale, Academie Minerva	Groningen	The Netherlands	Horst Rickels, Leon van Noorden, Nico Parlevliet, Paul Panhuysen, Johan Goedhart, Paul de Vos	(P. Panhuysen, n.d.)
01/01 – 10/01	1987	Klanginstallationen	Gesellschaft für Aktuelle Kunst	Bremen	Germany	Christina Kubisch, Paul Panhuysen, Richard Lerman, Robin Minard, Johan Goedhart, Arnold Dreyblatt, Rolf Julius, Takehisa Kosugi	(Gesellschaft für Aktuelle Kunst Bremen, n.d.)
07/04 – 29/04	1987	Geluid her zien: een anthologie over geluid in kunst	Galerie 1, Gerrit Rietveld Academie, Galerie Liesbeth Lips, Shaffy Theater, Stedelijk Museum, Stichting Steim, Galerie D'Theeboom, Time Based Arts, VOID editions, WHS radio	Amsterdam	The Netherlands	Jacoba Bedaux & Rely Tarlo, Cintha Bender & Maria Heykamp, Bow Gamelan, Joep van der Borgh, Max Bruinsma, Günther Demnig, Eva Durlacher, Melissa Gould & Alvin Curran, Stefan Hogenelst, Madelon Hooykaas & Elsa Stansfield, Toine Horvers, Hetty Huisman, Jurgen Meekel, One & Poli, Josette Overhaus, Finnbogi Petursson, Julie Smit, Ivo van Stiphout, Moniek Toebosch, Vivenza, Peter Zegveld	(Huisman, 1987)
01/05 – 14/06	1987	Echo, the images of sound II	Het Apollohuis	Eindhoven	The Netherlands	Hugh Davies, Max Eastley, Richard Lerman, Julius, Takehisa Kosugi, Hans-Karsten Raecke, Jon Rose, Godfried-Willem Raes, George Smits, Paul Panhuysen & Johan Goedhart, Leon van Noorden, Joop van Brakel	(P. Panhuysen, 1987d)
16/09 – 19/09	1987	Klang-Park		Linz	Austria	Gerlinde Beck, Bill und Mary Buchen, Waltraud Cooper, Julius, Edmund Kieselbach, Christina Kubisch, Ron Kuivila, Richard Lerman, Bruce Odland, Paul Panhuysen/Johan Goedhart, Liz Phillips, Thomas Rother, Peter Weibel, Franz Xaver	(Hattinger, Weibel, & Judmayer, 1987)

	1988	Hören und Sehen	Künstlerhaus	Hamburg	Germany	Horst Papenhausen, Christian Terstegge, Ulrich Eller, a.o.	(Papenhausen, n.d.) (Eller, 2013) (Terstegge, n.d.)
May	1988	So und So und So: Geluid Kunst Nederland	various locations	Amsterdam	The Netherlands	Antartica, Cas de Marez, Nicolas Collins, Horst Rickels, Peter Zegveld, Gilius van Bergeijk, Jacques Palinckx, Will Offermans, Dirk Bruinsma, Simone v. Dusseldorp, F. F. Beckmans, Elsa Stansfield & Madelon Hooykaas, Paul Panhuysen & Johan Goedhart, Joop van Brakel, Harry de Wit, Jon Rose, Ray Edgar, Simone Simons & Peter Bosch, Dick Raaymakers, Felix Hess, Greta Vermeulen, Joel Ryan, Heiner Holtappels, Radio Rabotnik T.V., Victor Snijtsheuvel, Mother Tongue prod., Fred Kolman, Jaap de Jonge & Dionys Breuker, Relly Tarlo & Jacoba Bedaux, Toine Horvers, V2-organisatie, David Veldhoen, Moniek Toebosch, Peter Rosendaal, Michel Waisvisz, Yntse Vughts	(Jonker, 1988)
12/05 – 19/06	1988	Klangräume	Stadtgalerie Saarbrücken	Saarbrücken	Germany	Bernard Baschet & François Baschet, Gunter Demnig, Ulrich Eller, Stephan von Huene, Rolf Julius, Christina Kubisch	(Bernd Schulz, 1988) (Uthemann, 2007)
18/05 – 20/05	1988	The Anatomy of Sound	The Clocktower, P.S.1.	New York	United States	Ellen Fullman, Mary Jane Leach, Jackson Mac Low, Robert Poss, David Shea, Yosji Wada	(The museum of modern art, 2013d)
18/08 – 21/08	1988	Audiowerkstatt Berlin	Kongreßhalle Berlin	Berlin	Germany	Robin Minard, Christina Kubisch, Takis Konstantin, Medienkunst/TOMCAT PRODUCTIONS, Stefan Tiedje	(Folkmar Hein, 1989)
12/09 – 17/09	1988	Audio Szenen	various locations	Linz	Austria	Henning Christiansen, Joe Jones, Yoshi Wada, Ron Kuivila, Paul Panhuysen, Logos, Horst Rickels, Hans Peter Kuhn	(Hattinger & Weibel, 1988)
28/09 – 02/10	1988	Parcours sonore	Le Parc de la Villette	Paris	France	Christina Kubisch, Bernhard Leitner, Pierre Mariétan, Alain Milon, Erik Samakh, Jacques Serrano, Benoit Maubrey, Tom Johnson, Agnès Wichegrod	(Aubervilliers, n.d.)
11/03 – 03/04	1989	Raum und Klang	Mathildenhöhe, Gallery Darmstadt,	Darmstadt	Germany	Pierre Mariétan, Christina Kubisch, Walter Fähndrich, Hans Otte, Paul Panhuysen and Johan Goedhart	(Fähndrich & Mariétan, 1989)

27/04 – 29/04	1989	Music/Mapping New York	G.F.R. The Clocktower, P.S.1.	New York	United States	Sam Bennett, Monty Cantsin, The Fred Hopkins / Diedre Murray Duo, Malcolm Goldstein, Guy Klucevsek, George Lewis, David Linton, David Myers, Zeena Parkins, Alva Rogers, Susan Stenger, Carl Stone, Peter Zummo	(The museum of modern art, 2013e)
13/08 – 24/09	1989	Moments sonores	Tochigi Prefectural Museum of Fine Arts	Utsunomiya	Japan	Takayasu Ito, WAY (Yasushi Amako, Takayuki Kazizaki, Yasuaki Kobatake, Naoto Nakagawa, Rintaro Watanabe), Tatsuji Ushijima, Kenichi Kanazawa, Takehisa Kosugi, Akio Suzuki, Mitsuki Tanabe, Akinori Tsuboi, Kazumichi Fujiwara, Yukio Fujimoto, Shigehiko Hongo, Kann Masuda, Yoji Matsumura, Tetsuo Yokoo, Hiroshi Yoshimura, Luigi Russolo, Joe Jones, Milan Knizak, Takako Saito, Emmett Williams, La Monte Young, David E. Thompson, Ken Friedman & Mike Weaver, Felix Hess	(Sugimura, 1989)
07/09 – 01/11	1989	Klanginstallationen	C.U.B.A.-Cultur	Münster	Germany	Paul Panhuysen & Johan Goedhart, Hugh Davies, Joe Jones, Nico Parlevliet, Ulrich Phillipp, Bertin Strothjohann	(Buntjer & Hirt, 1989)
14/12 /1989 – 15/07 /1990	1989/ 1990	Installationen	Theater Galerie Fletch Bizzel	Dortmund	Germany	Norman Anderson, Paul Panhuysen, Johan Goedhart, Nico Parlevliet, Arnold Dreyblatt, Hugh Davies, Terry Fox, Joe Jones	(Hanke-Lindemann & Pasterny, 1989)
	1990	Été roman	Église de St. Pierre	Melle	France	M-H Tronic, Christina Kubisch, a.o.	(Ville de Melle (Deux-Sèvres), n.d.)
	1990	Formen hören-- Klänge sehen	Neckarwerke	Esslingen	Germany	Thomas Arns, Prof. Dr. Erhard Karkoschka, Ralf Bühler, Ulrich Eller, Klaus Fessmann, Angelika Flaig, Walter Giers, Edmund Kieselbach, Christina Kubisch, Jack Ox	(Kröz, 1990)
09/06 – 25/06	1990	585 m3 - Drie Confrontaties tussen Beeld en Geluid	Zaal de Unie	Rotterdam	The Netherlands	V2, Ron Kuivila, Michiel Duvekot & Arthur Sauer	(V2, n.d.-b)
29/09 – 29/11	1990	Liuteria straordinaria	Museo di Santa Caterina d'Alessandria, L'Aquila	Rome	Italy	Mario Ciccio, Rinaldo Pellizzari, Johannes Dimpfleier, Fratelli Format, Matteo Fraternali, Francesco Pennisi	(Istituto Gramma-l'Aquila, 1990)
June - Dece- mber	1991	Zeitklang/Klangzeit in Landschaft und Architektur	various locations	Wuppertal	Germany	Gordon Monahan, Alvin Curran, Johannes Wallmann	(Lenz & Johannes, 1992)

01/06 – 31/07	1991	The Reincarnation of Generator	Generator	New York	United States	Arcane device, Alvin Lucier, CHOP SHOP, Gordon Monahan, Laura Kikauka, Mary & Bill Buchen & Ron Kuivila	(Generator, n.d.)
29/06 – 30/06	1991	Sonic Perception	Kawasaki City Museum	Kawasaki	Japan	Tatsuji Ushijima, IFS, Anna Munster, Minoru Sato(m/s), Mamoru Fujieda	(Minoru Sato, 2013)
06/07 – 18/08	1991	Lydbilleder I	Museet for Samtidskunst	Roskilde	Denmark	Ursula Block, Henning Christiansen, William Sørensen, Lars Graugaard, Lars Trier, Alison Knowles, Pierre-André Arcand, Stephan Huene, La Young, Roland Albrecht, Philip Corner, Robert Filliou, Eric Andersen, Max Eastley, Hugh Davies, Piotr Nathan, Milan Knížak, Ingve Zakarias, Claus Bøhmmler, Christian Marclay, Marianne Greve, N.W., Peters, K.P., Brehmer, Mogens Otto Nielsen, Ute Wassermann, Niels Vørsel, Berndt Jasper, Steen Carlsen, Ernst Kretzer, Ken Friedman, Georg Krefeld, Lotte Lilholt, Nobert Stockheim, Ib Tranø, Annegrete Kraul, Jens Kløft, Henning Frimann, Laurie Anderson, Hans Arp, Harry Bertoia, Joseph Beuys, John Cage, Jean Dubuffet, Marcel Duchamp, Bill Fontana, Terry Fox, Bernard Heidsieck, Joe Jones, Allan Kaprow, Yves Klein, Hermann Nitsch, Yoko Ono, Nam Paik, A.R., Penck, Dieter Roth, Gerhard Rühm, Kurt Schwitters, André Thomkins, Wolf Vostell, Lawrence Weiner, Emmett Williams, Peter Jørgensen	(Kullberg, 2013) (Bech, 2006)
23/08 – 08/09	1991	Entropy	Generator	New York	United States	Tim Sweet, G.X. Jupitter Larsen, Luigi-Bob Drake, Mariano Airaldi, Roxy Middquendorf & Scott Konzelmann	(Generator, n.d.)
October	1991	SoundCulture: Invisible Cities/Impossible Objects	various locations	Sydney	Australia	Paul DeMarinis, Minoru Sato	(SoundCulture, 2004)
04/10 – 27/10	1991	Rubato, sechs Künstlerinnen und Künstler im Grenzbereich der bildenden Kunst zur Musik	Galerie Brötzinger Art	Pforzheim-Brötzingen	Germany	Marianne Greve, Stefan Limmroth, Horst Papenhausen, Gundula Plesch, Christiane Terstegge, Martin Turner	(Gerlach, 1991)
11/10 –	1991	Monahan / Kikauka	Generator	New York	United States	Gordon Monahan, Laura Kikauka	(Generator, n.d.)

16/11							
14/12	1991	Music for Eye & Ear	Emily Harvey Gallery	New York	United States	Olga Adorno, Eric Andersen, Ay-O, Philip Corner, Jean Dupuy, Albert M. Fine, Henry Flynt, Ken Friedman, Daniel Goode, William Hellermann, Dick Higgins, Alice Hutchins, Joe Jones, Citizen Kafka, Milan Knizak, Alison Knowles, Jackson Mac Low, Larry Miller, Charlotte Moorman, Nam June Paik, Ben Patterson, Takako Saito, Carolee Schneemann, Paul Sharits, Yasunao Tone, Ben Vautier, Yoshi Wada, Bob Watts, Emmett Williams, Christian Xatrec, La Monte Young & Marian Zazeela	(The Emily Harvey Foundation, n.d.-a)
03/08 - 21/08	1992	SOUNDWatch '92	Artspace	Auckland	New Zealand	Wendyhouse, Christina Kubisch, John Cousins, Jack Body & David Crossan	(Cousins, 1992)
04/10	1992	Klanggarten international	Barmer Anlagen	Wuppertal	Germany	Limpe Fuchs, Peter Kiefer, Marc Pira, Johannes Wallmann, Bill Fontana, Tom Johnson, Albert Mayr, Daniel Ott, Paul Panhuysen	(Lenz & Johannes, 1992)
Autumn	1992	Amphion, Klanginstallationen in Köln & Potsdam	a former chocolate factory, a bunker, the orangery of Sanssouci park, a grain silo	Cologne & Potsdam	Germany	Christina Kubisch, Terry Fox, Toine Horvers, Rolf Julius, Annebarbe Kau, Hans-Peter Kuhn	(Loosen, 1994a)
27/05 - 30/05	1993	76 h zeitgleich: Klanginstallationen - Langzeitkonzerte	Kunsthau Essen	Essen	Germany	Pierre Bastien, Waldo Riedl, Terry Fox & Claudine denis, Roland Ehlert, Paul Panhuysen, Phil Niblock, Rely Tarlo & Jacoba Bedaux, Karl-Heinz Mauermann, Michael Vorfeld	(Kunsthau Essen, 2010)
02/06 - 25/07	1993	Lydbilleder II	Museet for Samtidskunst	Roskilde	Denmark	Hans van Koolwijk, Laura Kikauka, Gordon Monahan, Joe Jones, Tomas Uebelherr, Lars Graugaard, Klaes Hoek, Gunnar Wille, Nanna Nilson, Jørgen Teller, Jakob Højmark, Paul Panhuysen, Marian Palla, Eberhard Blum, SUMMER ASSAULT, Henning Frimann, Peter Jørgensen	(Kullberg, 2013) (Bech, 2006)
09/06 - 20/06	1993	The Swift Sound of Things: Cage & Co.	P.S.1	New York	United States	John Cage, Merce Cunningham, Jasper Johns, Margaret Leng Tan, Robert Rauschenberg	(The museum of modern art, 2013f)
15/07 -	1993	Klangobjekt Krems	Klangraum Krems	Krems	Austria	Paul Panhysen, Horst Rickels & Viktor Wentick, Erwin Redl, Matt Heckert	(Aichinger, 2013)

17/07							
November	1993	SoundCulture Japan '93	Theatre X, Kiryu Yurinkan, the Kawasaki City Museum, Art Forum Yanaka, the Tokyo Bunka Kakikan	Tokyo	Japan	Mamoru Fujieda, Douglas Kahn and Frances dyson, Chris Mann, Phil Dadson, Mineko Grimmer	(SoundCulture, 2004)
	1994	Site As Music	various locations	San Francisco	United States	Ed Osborn, Michael Olexo and Brenda Hutchinson, Lynn Kirby, a.o.	(San Francisco arts commission, 1994) (Ed Osborn, 2013)
04/03 – 01/04	1994	Reverberations: Sculpture and Installations with Sound	Spaces Gallery	Cleveland, Ohio	United States	Susan Dallas-Swann & Gerald Horn & Jamy Sheridan, Luigi-Bob Drake, Matt Heckert, Ed Osborn, Jim Hirschfield	(Vincent, 2009)
15/04 – 30/04	1994	SOUNDWatch '94	Artspace	Auckland	New Zealand	Jacki Apple, Benoit Maubrey, Phil Dadson, Paul Swadel, Michael Saup, Mineko Grimmer, Nigel Helyer a.o.	(South Island Art Projects, 1993)
28/04 – 03/06	1994	Erratum musical: entre sons et images, entre entendre et voir = zwischen klang und bild, zwischen hoeren und sehen	Institut Français	Bremen	Germany	Joseph Beuys, Christian Boltanski, John Cage, Marcel Duchamp, Rolf Julius, Milan Knizak, Christina Kubisch, Dieter Roth, Gerhard Rühm, Antoni Tàpies, Jean Tinguely, Franz Erhard Walther	(Schraenen & Bremen, 1994) (Galerie Böer, 1994)
03/06 – 15/08	1994	Zeitgleich	Kunsthalle Tirol	Hall in Tirol	Austria	Robert Adrian X, Ros Bandt, John Blake, Andres Bosshard, Bill Fontana, Matt Heckert, Horst Hörtner & Gerfried Stocker, Concha Jerez & Jose Iges, Bernhard Loibner, Helmut Mark, Roberto Paci Daló, Stoph Sauter, Sodomka & Breindl & Math Lawrence Weiner	(Kunstradio, 2000)
06/06 – 10/06	1994	Sonidos in extremis	Facultad de Bellas Artes	Cuenca	Spain	Javier Ariza, Kepa Landa, Ricardo Echevarría, Luis garcía Ochoa	(Centro de creacion experimental)

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25/06 – 18/09	1994	Klingende Dinge	Schloß Ottenstein	Ottenstein	Austria	Bill & Mary Buchen, Nicolas Collins, Waltraut Cooper, Paul DeMarinis, Laura Kikauka, Alvin Lucier, Gordon Monahan, Paul Panhuysen, Martin Riches, Peter Vogel	(Galerie Schloss Ottenstein, 1994)
15/07 – 23/07	1994	Lend Me Your Ears: Sound City Spaces		St. John's	Canada	Ernie Althoff, Ros Bandt, Andres Bosshard, Leif Brush, Bill and Mary Buchan, Andrew Culver, Charles de Mestral & Paul Mercier, Hubert Durocher, Pierre Dostie, Marcel Dubuc, Steve Heimbecker, Keith Hui, Pierre Marietan, Montreal St. Patrick's Society, Reinhold Marxhausen, Ed Osborn, Andre, Pappathomas	(Brush, n.d.- a)
22/07 – 27/08	1994	Erratum musical - Zwischen Hören und Sehen - Zwischen Bild Und Klang	Galerie Claudia Böer	Hannover	Germany	Joseph Beuys, Christian Boltanski, John Cage, Marcel Duchamp, Rolf Julius, Milan Knizak, Christina Kubisch, Dieter Roth, Gerhard Rühm, Antoni Tàpies, Jean Tinguely, Franz Erhard Walther	(Galerie Böer, 1994)
12/08 – 14/08	1994	220V Klankpark	Museumpark	Rotterdam	The Netherlands	Ron Kuivila, Ennio Bertrand, X-Space, Francisco López, Ken Montgomery, John Hudak, Laboratory of Art & Technology, Alex Adriaansens, Jan-Peter Sonntag	(V2, n.d.-a)
21/08 – 16/10	1994	Die Stillen: Klangräume – Klanginstallationen – Klangwelten	Skulpturenmus eum Glaskasten	Marl	Germany	Jakob Altmeyer, Henning Christiansen, Ulrich Eller, Terry Fox, Felix Hess, Toine Horvers, Rolf Julius, Andreas Köpnick, Christina Kubisch, Hans Peter Kuhn, Hans Otte, Akio Suzuki, Peter Vogel,	(Loosen, 1994b)
27/08 – 04/12	1994	Synesthesia: sound & vision in contemporary art	San Antonio Museum of Art	San Antonio	United States	Laurie Anderson, Jill Bedgood, Jennifer Bolande, Jonathan Borofsky, Steve Brudniak, George Cisneros, Gerry Frost, William Hellermann, Howard Jones, Leonard Kemp, Jonn Kessler, Milan Knizak, Joe Lewis, Christian Marclay, Claudia Matzko, Alberto Mijangos, Nam June Paik, Alan Rath, Tobin Richter, Kay Rosen, Ben Schonzeit, Patrick Schuchard, Alan Sonfist, William Stone, Edmond R. Sutherland III, Enrique Zavala, Patrick Zentz	(Bacigalupi, 1994)
09/09 – 01/10	1994	Lento – Eigenzeit: Ausstellung & Installationen	MeX, Kunsthaus Essen, Münster c.u.b.a.-cultur	Dortmund, Essen & Münster	Germany	Bernd Conrad, Doris Halfmann, Tilman Küntzel, Nico Parlevliet, Martin Riches, Christian Terstegge, Hugh Davies, Sigrid Lange, Max Eastley, Paulo Feliciano, Paul Panhuysen, Harald Kubiczak, Anke Schulte Steinberg	(Brand, Hirt, Riedl, & Westermann , 1994)
03/11 – 19/11	1994	SOUND & NATURE, oder die Sehnsucht nach der Stille	Klangraum Krems	Krems	Austria	Mayumi Miyata, Toshio Hosokawa, Takehisa Kosugi, a.o.	(Aichinger, 2013)
	1995	Radio Art	Artspace	Auckland	New Zealand	Chris Cree-Brown, Philip Dadson, Juliet Palmer, Greg	(Artspace

						Wood, Michael Hodgson, John Ioane	(NZ, 2012)
	1995	BrueckenMusik 1	Deutzer Brücke	Cologne	Germany	Eliane Radigue, Nicolas Collins, Alvin Lucier	(Koch, 2007)
16/02 – 12/03	1995	Time & Space, Sound & Silence, Presence & Void	Galeria Arsenal	Bialystok	Poland	Paul Panhuysen, Tilman Kuntzel	(Galeria Arsenal, n.d.; Narewska, 2013)
08/04 – 03/06	1995	Lydbilleder III	Museet for Samtidskunst	Roskilde	Denmark	Paul Panhuysen, Eva Koch, Ulrich Eller, Morten Carlsen	(Kullberg, 2013) (Bech, 2006)
25/05 – 30/06	1995	SoundArt 95	Public space	Hannover	Germany	Laurie Anderson, Audio Ballerinas, Sam Auinger, Auryl Quartett, Andres Bosshard, Louis-Philippe Demers, Ulrich Eller, Walter Fähndrich, Achim Freyer Ensemble, Hans Gierschik, Robert Jacobsen, Rolf Julius, Mauricio Kagel, Peter Kiefer, Christina Kubisch, Hans Peter Kuhn, Bernhard Leitner, Dhora Leka, Phil Minton, Jürgen Morgenstern, David Moss, Bruce Odland, Paul Panhuysen, Jürgen Rehmer, Jon Rose, David Rokeby, Bob Rutman, R. Murray Schafer, Mark Trayle, Timm Ulrichs, Bill Vorn, Ulrike Wallis, Red White	(Kunstaspekt e, n.d.)
26/05 – 22/08	1995	Sound in Space - Adventures in Australian Sound Art	Museum of Contemporary Art	Sydney	Australia	Stephen Adam, Arf Arf, Ernie Althoff, Ian Andrews, Gavin Angus-Leppan, Joan Brassil, Robert Britton, Warren Burt, Densil Cabrera, Paul Carter, Damien Castaldi, Joseph Celli, Roz Cheney, David Chesworth, Carolyn Connors, Panos Couros, Brenda L Croft, Simon Crosbie, Sherre DeLys, Frances Dyson, Nola Farman, Kerry Fletcher, Anna Gibbs, George Gittoes, Joan Grounds, Nigel Helyer, Joyce Hinterding, Sarah Hopkins, Kiti-uu, Derek Kreckler, Sopheia Lerner, Rainer Linz, The Loop Orchestra, Jonathan Mills, Pauline Oliveros, Bob Ostertagh, Cathie Payne, Ion Pearce, Alistair Riddell, Jodi Rose, Rik Rue, Anna Sabiel, Ashley Scott, Carmelita Simonata, Social Interiors, Yuji Sone, Wayne Stamp, Amanda Stewart, Margaret Trail, Jane & Philip Ulman, Deborah Vaughan, Martin Wesley-Smith, Charlotte Whittingham, Andrew Yencken	(Michael & Ewington, 1995)
30/06 – 28/07	1995	Innovative Instruments	Nexus	Philadelphia	United States	Ranjit Bhatnagar, Catastrophe (Jeffery Byrd, Dal Troyer), Mineko Grimmer, WM Houck, Cynthia Norton, Robert Roesch, Dan Senn, Caroline Sivin	(Nexus archives, 2013a)
02/07	1995	Klangskulpturen,	Ludwig	Koblenz	Germany	Vito Acconci, William Anastasi, Laurie Anderson, Michel	(Perrier,

- 24/09		Augenmusik	Museum			Aubry, Ben (Vautier), Joseph Beuys, Angela Bulloch, Pol Bury, John Cage, Patrice Carré, Elmar Daucher, Marcel Duchamp, Robert Filliou, Maurice Henry, Gary Hill, Rebecca Horn, Joel Hubaut, Joe Jones, Rolf Julius, Yves Klein, Christina Kubisch, Marie-Jo Lafontaine, Alvin Lucier, Man Ray, Christian Marclay, Robert Morris, Bruce Nauman, Baudouin Oosterlynk, Dennis Oppenheim, Nam June Paik, Ben (Benjamin) Patterson, Robert Rauschenberg, Erik Samakh, Sarkis, Nicolas Schöffer, Takis, Jean Tinguely, Günther Uecker, Peter Vogel, Vortex, Wolf Vostell, Gilberto Zorio	1995)
08/07 - 01/10	1995	Murs du Son	Villa Arson	Nice	France	John M. Armleder, Michel Aubry, Robert Barry, Pascal Broccolichi, Lars Fredrikson, Liam Gillick, Jérôme Joy, Richard Kongrosian, Ludovic Lignon, Éricc Maillet, Maurizio Nannucci, Kristin Oppenheim, , José Antonio Orts, Erik Samakh, Isabelle Sordage, Nathalie Talec	(Vienne, 1995)
13/10 - 05/11	1995	Infrasound: Stadt Geräusche	Various locations	Hamburg	Germany	Claus Böhmler, Chen Zhen, Michel Dector & Michel Dupuy, Peter Fend, Jochen Gerz, Noritoshi Hirakawa, Ivana Jokl, Louise Lawler, Ken Lum, Rupprecht Matthies, Kristin Oppenheim, Pipilotti Rist, Hinrich Sachs, Sam Samore, Nicola Torke, Matta Wagnest, Heimo Zobernig	(Sans & Günther, 1995)
13/03 - 10/04	1996	Architecture de Son, Architecture de l'Air	Le Confort Moderne	Poitiers	France	Kazue Mizuhima, Paul Panhuysen, Pierre Bastien	(Le Confort Moderne, n.d.)
03/04 - 13/04	1996	SoundCulture 96	various locations	San Francisco	United States	Wang Po Shun, Ellen Band, Bureau of Inverse Technology (Jim Campbell & Wang Po Shu), Ed Osborn, Trimpin, Bruce Cannon, Krystyna Bobrowski, Dan Senn, Landa Townsend, Ron Kuivila, Jack Ox & Spinnet, Tom Stanton, Tracey Cockrell, Eiko DoEspirito-Santo, Julaine Stephenson, Larnie Fox, Nigel Helyer, Paul DeMarinis, Bill & Mary Buchen, Masami Akita, John Waterman, Kim Cascone, Alvin Curran, Ian Pollack & Janet Silk, Tim Perkis & Philip Perkins & Bill Thibault	(Ed Osborn, 1996)
09/08 - 08/09	1996	Sonambiente - festival für hören und sehen	various locations	Berlin	Germany	Laurie Anderson, Sam Auinger / Bruce Odland, Llorenç Barber, Andres Bosshard, Henning Christiansen, Nicolas Collins, Paul DeMarinis, Louis-Philippe Demers / Bill Vorn, Gunther Demnig, Ulrich Eller, Brian Eno, Terry Fox, Paul Fuchs, Hans Gierschik, Gün, Josefine Günschel, Matt	(De la Motte-Haber, 1996c)

						Heckert, Felix Hess, Gary Hill, Stephan von Huene, Robert Jacobsen, Arsenije Jovanovic, Rolf Julius, Mauricio Kagel, Christina Kubisch, Hans Peter Kuhn, Ron Kuivila, Bernhard Leitner, Götz Lemberg, Beate Lotz / Dirk Schwibbert, Alvin Lucier, Christian Marclay, Benoît Maubrey, Robin Minard, Fatima Miranda, Gordon Monahan, David Moss, Max Neuhaus, Ed Osborn, Roberto Paci Dalò/Isabella Bordoni, Nam June Paik, Charlemagne Palestine, Paul Panhuysen, Yufen Qin, Martin Riches, Don Ritter, Jon Rose, Nicola Sani / Mario Sasso, Sarkis, Leo Schatzl, Dieter Schnebel, Sodomka/Breindl, Laetitia Sonami, Kyra Stratmann, Akio Suzuki, Ana Torfs, Mark Trayle, Trimpin, Peter Vogel, Red White, Young Farmers Claim Future	
05/09 – 03/11	1996	Sounds from Elsewhere	Muu Gallery & Gallerian Ulkopuolella	Helsinki	Finland	Simo Alitalo, Ed Osborn, Garnet Willis, Julaine Stephenson, Harri Holppi, Robin Minard, Mathias Fuchs & Sylvia Eckerman, Nigel Helyer, Gabrielle Adler, Ken Gregory	(Audiolabo, n.d.)
21/09 – 23/11	1996	The Shape of Sound	Exit Art - The First World	New York	United States	Lynda Abraham, Wieland Bauder, David Hatchett, Joe John, Justin Ladda, Jaron Lanier, David Lewis, Paul Lewis, Charlie Morrow, Warren Neidich, Ursula von Rydingsvard, Lynn Sullivan, Jorge Tacla, Antenna Tool & Die Co., Byzar, Brian Eno, David First, Nicolas Collins, Robert Poss, Infant Reader, MultiPolyOmni, Ben Neill, Cultural Alchemy	(Exit art, n.d.)
10/10 – 27/10	1996	Sonic Perception vol.5 ²⁵⁷	Kawasaki City Museum	Kawasaki	Japan	Toshihiko Furuya, Michiyo Miyama, Achim Wollscheid	(Minoru Sato, 2013; Minoru Sato, 1996)
11/10 –	1996	TO HEAR IS TO SEE – Art in electronic	Palacio de Exposiciones,	Medellin	Colombia	Robert Adrian X and Rupert Huber, AKKORD-Z (Sebastian Brandt and Robert Filler), Sam Auinger, Claus Bach,	(Kunstradio, n.d.-a;

²⁵⁷ *Sonic Perception vol.2*, organised in March 1995 is not included in this list as only installation work by Achim Wollscheid was exhibited. Also *Sonic Perception vol. 3*, that took place in March 1996 is not included as the exhibition presented one collaborative installation by Toshiya Tsunoda, Hiroyuki Iida and Jio Shimizu. *Sonic Perception vol. 5* (1998), *vol. 6* (1999), *vol.7* (2000) and *vol. 8* (2003) were not included in this list as they either presented performances or the work of one artist. (Minoru Sato, 2013)

20/10		space, for example on radio art and sound sculpture	EXPOuniversidad		Christian Bachler Leo Kreisel-Strauss, Peter Battisti, Gottfried Bechtold, Gudrun Bielz, Moucle Blackout, Isabella Bordoni and Roberto Paci Dalò, Andres Bosschard, Warren Burt, Selim Catkin, Lucas Cejpek, Seyda Cesur, Martina Cizek and Wolfgang Musil, Matthew Claire, Marilyn Collins, Sylvia Eckerman and Mathias Fuchs, René Eisenegger and Richardas Norvila, endlich katzenersatz, Julian Feyerabend and Oskar Hummer, Rainer Ganahl, Dinah Geiger, Michael Geyersbach, Melih Görgün, Dulce Gomez, Rainer Gottemeier, Richard Graf, Dora Guzman, Herwig Hammerl and Gerd Menia, Reinhard F. Handl, Reni Hofmüller, Harald Huskava, Georg Jappe, Concha Jerez and José Iges, Arsenije Jovanovic, Margret Kreidl, Nobuo Kubota and Mark Sutherland, Julie Larssen, Reinhold Leitner, Mirko Maric, Helmut Mark, Norbert Math, Christina Meissner and Michael Geyersbach, Rafael Méndez, Kaye Mortley, Frie Moschitz, Dmitriy Nikolaev, Richardas Norvilla and Oleg Kornev, Klaus Obermaier, Catalina Peralta, Bostjan Perovsek, Claudia Plank and Hans Werner Poschauko and Andreas Karner, PLUS (Roberto Sarmiento and Gilles Charalambos), Hannes Priesch, PROTON GROUP (Agnieszka Waligorska and Pekka Siren), Natalia Pschenitschnikowa, Daping Qin, RBW21 (Fritz Fro and Gue Schmidt), Tulio Restrepo, Luis Romero, Katharina Riese, Winfried Ritsch, Friedrich Rotter, Naomi T. Salmon, Luz Maria Sánchez, Elisabeth Schimana, Gue Schmidt, Stephan A. Schmidt, Wolfgang Seierl, Andrea Sodomka and Martin Breindl, Wolfgang Sohm, Robert Spour, Erwin Stache, Ivana Stefanovic, Johannes Stöckler, Rod Summers, Mark Sutherland, Jo Thomas, Liesl Ujvary, Christine Ulm, Patricia Van Dalen, Daniel Velasco, German Vinogradov, Babette Werth and Claudia Herr, Anja Wiese, Oscar Wiggl, Yeti talks to yogi (Borges,	Schmidt, 2002)
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						Feyerabend, Fro, Otero), Robert Zahornicky, Lidia Zielinska	
December	1996	Musik und Licht	Podewil	Berlin	Germany	Christian Terstegge, Maria Blondeel, Christina Kubisch, Andreas Oldörp, Elzbieta Sternlicht, a.o.	(Straebel, 1996)
	1997	BrueckenMusik 3 ²⁵⁸	Deutzer Brücke	Cologne	Germany	Malcolm Goldstein and John Cage, Hans W. Koch, Horst Rickels	(Koch, 2007)
02/02 – 03/03	1997	Ear as eye, drawing by composers	L.A.C.E.	Los Angeles	United States	Brandon LaBelle and Steve Roden, Jaap Blonk, Anna Homler, Speculum Fight, Robert Dansby, FIN, amongst others	(Moon, 2013)
19/02 – 08/03	1997	TO HEAR IS TO SEE – Art in electronic space, for example on radio art and sound sculpture	Europäisches Kulturzentrum Thüringen (EKT)	Erfurt	Germany	Robert Adrian X and Rupert Huber, AKKORD-Z (Sebastian Brandt and Robert Filler), Sam Auinger, Claus Bach, Christian Bachler Leo Kreisel-Strauss, Peter Battisti, Gottfried Bechtold, Gudrun Bielz, Moucle Blackout, Isabella Bordoni and Roberto Paci Dalo, Andres Bosschard, Warren Burt, Selim Catkin, Lucas Cejpek, Seyda Cesur, Martina Cizek and Wolfgang Musil, Matthew Claire, Marilyn Collins, Sylvia Eckerman and Mathias Fuchs, René Eisenegger and Richardas Norvila, endlich katzenersatz, Julian Feyerabend and Oskar Hummer, Rainer Ganahl, Dinah Geiger, Michael Geysersbach, Melih Görgün, Dulce Gomez, Rainer Gottemeier, Richard Graf, Dora Guzman, Herwig Hammerl and Gerd Menia, Reinhard F. Handl, Reni Hofmüller, Harald Huskava, Georg Jappe, Concha Jerez and José Iges, Arsenije Jovanovic, Margret Kreidl, Nobuo Kubota and Mark Sutherland, Julie Larssen, Reinhold Leitner, Mirko Maric, Helmut Mark, Norbert Math, Christina Meissner and Michael Geysersbach, Rafael Méndez, Kaye Mortley, Frie Moschitz, Dmitriy Nikolaey, Richardas Norvilla and Oleg Kornev, Klaus Obermaier, Catalina Peralta, Bostjan Perovsek, Claudia Plank and Hans Werner Poschauko and Andreas Karner, PLUS (Roberto Sarmiento and Gilles Charalambos), Hannes Priesch, PROTON GROUP	(Kunstradio, n.d.-a; Schmidt, 2002)

²⁵⁸ The second edition of BrueckenMusik only presented works by Phill Niblock.

						(Agnieszka Waligorska and Pekka Siren), Natalia Pschenitschnikowa, Daping Qin, RBW21 (Fritz Fro and Gue Schmidt), Tulio Restrepo, Luis Romero, Katharina Riese, Winfried Ritsch, Friedrich Rotter, Naomi T. Salmon, Luz Maria Sánchez, Elisabeth Schimana, Gue Schmidt, Stephan A. Schmidt, Wolfgang Seierl, Andrea Sodomka and Martin Breindl, Wolfgang Sohm, Robert Spour, Erwin Stache, Ivana Stefanovic, Johannes Stöckler, Rod Summers, Mark Sutherland, Jo Thomas, Liesl Ujvary, Christine Ulm, Patricia Van Dalen, Daniel Velasco, German Vinogradov, Babette Werth and Claudia Herr, Anja Wiese, Oscar Wiggli, Yeti talks to yogi (Borges, Feyerabend, Fro, Otero), Robert Zahornicky, Lidia Zielinska	
04/03 – 27/04	1997	Schall und Rauch	Haus der Kulturen der Welt	Berlin	Germany	Jutta Ravenna, Gerhard Behles & Penko Stoitchev	(Technische Universität Berlin, n.d.)
09/04 – 28/04	1997	TO HEAR IS TO SEE – Art in electronic space, for example on radio art and sound sculpture	Biblioteca Luis Angel Arango	Bogotá	Colombia	Robert Adrian X and Rupert Huber, AKKORD-Z (Sebastian Brandt and Robert Filler), Sam Auinger, Claus Bach, Christian Bachler Leo Kreisel-Strauss, Peter Battisti, Gottfried Bechtold, Gudrun Bielz, Moucle Blackout, Isabella Bordoni and Roberto Paci Dalò, Andres Bosschard, Warren Burt, Selim Catkin, Lucas Cejpek, Seyda Cesur, Martina Cizek and Wolfgang Musil, Matthew Claire, Marilyn Collins, Sylvia Eckerman and Mathias Fuchs, René Eisenegger and Richardas Norvila, endlich katzenersatz, Julian Feyerabend and Oskar Hummer, Rainer Ganahl, Dinah Geiger, Michael Geyersbach, Melih Görgün, Dulce Gomez, Rainer Gottemeier, Richard Graf, Dora Guzman, Herwig Hammerl and Gerd Menia, Reinhard F. Handl, Reni Hofmüller, Harald Huskava, Georg Jappe, Concha Jerez and José Iges, Arsenije Jovanovic, Margret Kreidl, Nobuo Kubota and Mark Sutherland, Julie Larssen, Reinhold Leitner, Mirko Maric, Helmut Mark, Norbert Math, Christina Meissner and Michael Geyersbach, Rafael Méndez, Kaye Mortley, Frie Moschitz, Dmitriy Nikolaev, Richardas Norvilla and Oleg Kornev, Klaus Obermaier, Catalina Peralta, Bostjan Perovsek, Claudia Plank and Hans Werner Poschauko and	(Kunstradio, n.d.-a; Schmidt, 2002)

						Andreas Karner, PLUS (Roberto Sarmiento and Gilles Charalambos), Hannes Priesch, PROTON GROUP (Agnieszka Waligorska and Pekka Siren), Natalia Pschenitschnikowa, Daping Qin, RBW21 (Fritz Fro and Gue Schmidt), Tulio Restrepo, Luis Romero, Katharina Riese, Winfried Ritsch, Friedrich Rotter, Naomi T. Salmon, Luz Maria Sánchez, Elisabeth Schimana, Gue Schmidt, Stephan A. Schmidt, Wolfgang Seierl, Andrea Sodomka and Martin Breindl, Wolfgang Sohm, Robert Spour, Erwin Stache, Ivana Stefanovic, Johannes Stöckler, Rod Summers, Mark Sutherland, Jo Thomas, Liesl Ujvary, Christine Ulm, Patricia Van Dalen, Daniel Velasco, German Vinogradov, Babette Werth and Claudia Herr, Anja Wiese, Oscar Wiggli, Yeti talks to yogi (Borges, Feyerabend, Fro, Otero), Robert Zahornicky, Lidia Zielinska	
09/05 – 31/05	1997	EarArt sound Media exhibit	1078 Gallery	Chico California	United States	Elise Kermani, Peter Chamberlain, Mike Kendall, Ted Apel a.o.	(Kermani, n.d.) (Chamberlain, n.d.) (Kendall, n.d.) (BEMF, n.d.)
22/05 – 29/06	1997	Klangkunst-Festival UND	Bellevue-Saal	Wiesbaden	Germany	Felix Hess, Rolf Julius, Hans Peter Kuhn, Yufen Qin, Monika Rohrmus, Axel Schweppe	(Schulze-Reichenberg, 1997)
26/06 – 31/08	1997	Muziek zonder musici	De Ijsbreker	Amsterdam	The Netherlands	Harald Kubiczak, Trimpin, Frédéric Le Junter, Ulrich Eller, Ad Van Buuren, Pierre Bastien	(Van Peer, 2001)
31/01 – 22/03	1998	BrueckenMusik 4	Deutzer Brücke	Cologne	Germany	Bettina Gruber, Kyra Stratmann, Terry Fox	(Koch, 2007)
31/01 – 22/03	1998	Voice over: Sound and Vision in current art	Arnolfini	Bristol	United Kingdom	Tacita Dean, Jeremy Deller, Stan Douglas, William Furlong, Joseph Grigely, Lucy Gunning, Bethan Huws, Juan Muñoz, Ross Sinclair	(Archer, 1998)
08/02 – 06/03	1998	Reverb	At the Brewery Project	Los Angeles	United States	Wendy Adest, Carl Bronson, Doug Hammett, Jonathan Herder, Brandon LaBelle, Joyce Lightbody, Rachelle Mark, Daniel Marlos, T. Kelly Mason, Steve Roden, David Schafer, Leonard Seagal, Mark Stritzel, Ted Svenningsen, Dani Tull, Marnie Weber	(O'Brien, 2007)

05/03 – 04/05	1998	Musiques en scène 98	Musée d'Art Contemporain de Lyon	Lyon	France	Terry Allen, Michel Aubry, Sylvia Bossu, Laurie Anderson, Etienne Bossut, Angela Bulloch, Patrice Carré, Gunther Demnig, Peter Eötvös, Agnès Geoffray, Rebecca Horn, Pierre Huyghe, Rolf Julius, Christian Marclay, Robin Minard, Yann Norry, Marylène Negro, Max Neuhaus, Paul Panhuysen, Adrien Qezari, Sarkis, Jean-Marc Vivenza, Peter Vogel	(Genevois & Orléans, 1998)
21/03 – 26/04	1998	Feedback I	Klangturm	St. Pölten	Austria	Götz Lemberg, Sofa Surfers & Monoscope	(Klangturm, n.d.-g)
04/04 – 17/05	1998	Voice over: Sound and Vision in current art	Hatton Gallery	Newcastle	United Kingdom	Tacita Dean, Jeremy Deller, Stan Douglas, William Furlong, Joseph Grigely, Lucy Gunning, Bethan Huws, Juan Muñoz, Ross Sinclair	(Archer, 1998)
02/05 – 01/06	1998	Feedback II	Klangturm	St. Pölten	Austria	Maja Spasova, Trimpin	(Klangturm, n.d.-g)
12/05 – 30/09	1998	TO HEAR IS TO SEE – Art in electronic space, for example on radio art and sound sculpture	Asociación Cultural Humboldt	Caracas	Venezuela	Robert Adrian X and Rupert Huber, AKKORD-Z (Sebastian Brandt and Robert Filler), Sam Auinger, Claus Bach, Christian Bachler Leo Kreisel-Strauss, Peter Battisti, Gottfried Bechtold, Gudrun Bielz, Moucle Blackout, Isabella Bordoni and Roberto Paci Dalò, Andres Bosschard, Warren Burt, Selim Catkin, Lucas Cejpek, Seyda Cesur, Martina Cizek and Wolfgang Musil, Matthew Claire, Marilyn Collins, Sylvia Eckerman and Mathias Fuchs, René Eisenegger and Richardas Norvila, endlich katzenersatz, Julian Feyerabend and Oskar Hummer, Rainer Ganahl, Dinah Geiger, Michael Geysersbach, Melih Görgün, Dulce Gomez, Rainer Gottemeier, Richard Graf, Dora Guzman, Herwig Hammerl and Gerd Menia, Reinhard F. Handl, Reni Hofmüller, Harald Huskava, Georg Jappe, Concha Jerez and José Iges, Arsenije Jovanovic, Margret Kreidl, Nobuo Kubota and Mark Sutherland, Julie Larssen, Reinhold Leitner, Mirko Maric, Helmut Mark, Norbert Math, Christina Meissner and Michael Geysersbach, Rafael Méndez, Kaye Mortley, Frie Moschitz, Dmitriy Nikolaev, Richardas Norvilla and Oleg Kornev, Klaus Obermaier, Catalina Peralta, Bostjan Perovsek, Claudia Plank and Hans Werner Poschauko and	(Kunstradio, n.d.-a; Schmidt, 2002)

						Andreas Karner, PLUS (Roberto Sarmiento and Gilles Charalambos), Hannes Priesch, PROTON GROUP (Agnieszka Waligorska and Pekka Siren), Natalia Pschenitschnikowa, Daping Qin, RBW21 (Fritz Fro and Gue Schmidt), Tulio Restrepo, Luis Romero, Katharina Riese, Winfried Ritsch, Friedrich Rotter, Naomi T. Salmon, Luz Maria Sánchez, Elisabeth Schimana, Gue Schmidt, Stephan A. Schmidt, Wolfgang Seierl, Andrea Sodomka and Martin Breindl, Wolfgang Sohm, Robert Spour, Erwin Stache, Ivana Stefanovic, Johannes Stöckler, Rod Summers, Mark Sutherland, Jo Thomas, Liesl Ujvary, Christine Ulm, Patricia Van Dalen, Daniel Velasco, German Vinogradov, Babette Werth and Claudia Herr, Anja Wiese, Oscar Wiggli, Yeti talks to yogi (Borges, Feyerabend, Fro, Otero), Robert Zahornicky, Lidia Zielinska	
21/05 – 28/06	1998	White Noise	Kunsthalle Bern	Bern	Switzerland	Lutz Bacher, Hervé Graumann, Jaki Irvine, Christian Marclay, Liza May Post, Bridget Riley, Erik Steinbrecher, Gillian Wearing	(Fibischer, 1998)
29/05 – 13/09	1998	Crossings. Kunst zum Hören und Sehen	Kunsthalle Wien	Vienna	Austria	Mario Airò, Richard Artschwager, Edek Bartz, Jean-Michel Basquiat, Joseph Beuys, Angela Bulloch, John Cage, Henning Christiansen, Martin Creed, Jeremy Deller, Stan Douglas, Daniel Egg, Angus Fairhurst, Jochen Gerz, Douglas Gordon, Franz Graf, Dan Graham, Russell Haswell, Carl Michael von Hausswolff, Dick Higgins, Gary Hill, Noritoshi Hirakawa, Stephan von Huene, Hendrik Hakansson, Lee Jaffe, Mike Kelley, Jon Kessler, Milan Knizák, Bernhard Leitner, Arto Lindsay, Hans Peter Litscher, Charles Long, Alvin Lucier, Christian Marclay, Paul Miller, Bruce Nauman, Max Neuhaus, Flora Neuwirth, Olga Neuwirth, Nicolas Jasmin, Albet Oehlen, Yoko Ono, Nam June Paik, Paul Panhuysen, Cathrin Pichler, Michelangelo Pistoletto, Stephen Prina, Alan Rath, Gerwald Rockenschaub, Sarkis, Christoph Steinbrener, Wolfgang Stengel, Ned Sublette, Peter Weibel, Lawrence Weiner	(Pichler, 1998)
13/06 –	1998	Voices	Witte de With	Rotterdam	the Netherlands	Vito Acconci, Judith Barry, Geneviève Cadieux, Janet Cardiff & George Bures Miller, Jochen Gerz, Gary Hill,	(Witte de With, n.d.)

23/08						Pierre Huyghe, Kristin Oppenheim, Moniek Toebosch	
15/06 - 28/06	1998	Off-Sònic	Museu d'Art Contemporani de Barcelona	Barcelona	Spain	Carsten Höller, Unitat Específica de Distribució, Bill Vorn, Tommi Grönlund & Petteri Nisunen	(MACBA, 2012)
03/07 - 20/10	1998	EarMarks	Massachusetts Museum of Contemporary Art - MASS MoCA	North Adams	United States	Sam Auinger, Alvin Curran, Roswitha von den Driesch, Jens-Uwe Dyffort, Ulrich Eller, Melissa Gould, Christine Kubisch, Ron Kuivila, Klaus Lebkucher, Bruce Odland, Ed Osborn	(Roufail, 2013)
11/07 - 31/08	1998	Audio Art - Kunst in Der Stadt 2	various locations	Bregenz	Austria	Peter Courtemanche/Lori Weidenhammer, Bill Fontana, William Furlong, Jérôme Joy, Helmut Mark, Victorine Müller, Roberto Paci Dalò, Simon Patterson, Stoph Sauter, Franco Vaccar	(Expansionist Art Empire, n.d.)
26/07 - 30/08	1998	Feedback IV	Klangturm	St. Pölten	Austria	Andres Bosshard, Dan Neiss, Andreas Okopenko, Karlheinz Essl & Regina Freimüller	(Klangturm, n.d.-g)
06/09 - 18/10	1998	Feedback V	Klangturm	St. Pölten	Austria	Wolfgang Riva, Brian Eno, Douglas Jipson, Christopher Juul	(Klangturm, n.d.-g)
12/09 - 01/11	1998	Voice over: Sound and Vision in current art	Nottingham Castle Museum	Nottingham	United Kingdom	Tacita Dean, Jeremy Deller, Stan Douglas, William Furlong, Joseph Grigely, Lucy Gunning, Bethan Huws, Juan Muñoz, Ross Sinclair	(Archer, 1998)
17/09 - 01/11 /	1998	Voices	Fundacio Joan Miro	Barcelona	Spain	Vito Acconci, Judith Barry, Geneviève Cadieux, Janet Cardiff & George Bures Miller, Jochen Gerz, Gary Hill, Pierre Huyghe, Kristin Oppenheim, Moniek Toebosch	(Witte de With, n.d.)
16/10 - 18/10	1998	The Eye and The Ear	Duende	Rotterdam	The Netherlands	Jonny Owen Clark, Paul Devens, William Engelen, Rolf Langebartels, Roel Meelkop, Angelika Oei & R.A. Verouden, Menno Rubbens, Arthur Sauer, Jan Peter E.R. Sonntag, Apolonija Sustersic, Shin-ichi Yanai	(Broeckman, 1998)
03/12 /1998 - 02/01 /1999	1998/ 1999	Sound - an audio art exhibition	Refusalon Gallery	San Francisco	United States	Bill Fontana, Joe Bloggs, Paul DeMarinis, Lewis DeSoto, Gustavo, Dough Harvey, horea, Guy Hundree, Brandon Labelle, Ati Maier, Tom Marioni, Guy Overfelt, Steve Roden, Steve Peters, Heather Sparks, Adam Sinykin, Jake Tilson, Totemplow, Illana Zuckerman.	(Refusalon, 2013)
	1999	BrueckenMusik 5	Deutzer Brücke	Cologne	Germany	Stephan Wunderlich, Peter Cusack, Roberto Paci-Dalñ, Hans-Ulrich Humpert, Robert Poss, Siegfried Koepf	(Koch, 2007)
	1999	Encuentro de arte		San Miguel	Mexico	Rolf Julius, Luz María Sánchez, Fernando Ortega	(Rocha

		sonoro - exhibicion		Allende			Iturbide, n.d.-a)
	1999	Acoustic shadows : soundworks by artists	Site Gallery	Sheffield	United Kingdom	Johannes Maier, Shirley MacWilliam, J Ainley & Rodger Brown, Gerhard Stäbler, Chloë Brown, Lindsey Adams, Robert Girling, Martin Rogers, Jürgen Kierspel, Penny McCarthy, Craig Richardson	(Rogers, 1999)
12/02 - 11/04	1999	Musiques en scène	Musée d'Art Contemporain de Lyon	Lyon	France	Robert Ashley, Janet Cardiff, Ian Carr-Harris, Collage JukeBox/Jérôme Joy, Paul DeMarinis, Raymond Gervais, Joe Jones, Alvin Lucier, Christian Marclay, Charlotte Moorman, Charlemagne Palestine, Peter Sinclair & G.H. Hovagimyan, Michael Snow, Wolfgang Staehle, Doug & Mike Starn, Stephen Vitiello, Bill Vorn, La Mounte Young & Marian Zazeela	(Giroudon, 1999)
20/02 - 04/04	1999	Voices	Le Fresnoy	Tourcoing	France	Vito Acconci, Judith Barry, Geneviève Cadieux, Janet Cardiff & George Bures Miller, Jochen Gerz, Gary Hill, Pierre Huyghe, Kristin Oppenheim, Moniek Toebosch	(Witte de With, n.d.)
13/03 - 20/03	1999	SoundCulture 99	Auckland Art Gallery , Archill Gallery , George Fraser Gallery , Artspace, Lopdell House Gallery	Aotearoa	New Zealand	Te Ku Te Whe & Terry O'Connor, John Ioane, Akio Suzuki, Heri Dono, Ultra Red & Susan Otto, Pamela Z, John Lyall, Nigel Helyer & Simo Alitalo, Ed Osborn, Nelia Justo, Philip Dadson, Social Interiors, Relay, Billy Apple & Jonathan Besser, Rata / Bernard Makoare, Trimpin	(SoundCulture, 1999)
21/03 - 25/05	1999	Feedback Special	Klangturm	St Pölten	Austria	Andres Bosshard, Katarina Matiasek & Robin Rimbaud, Maja Spasova, Götz Lemberg, Dan Neiss, Brian Eno, Douglas Jipson, Christopher Juul, David Rokeby	(Klangturm, n.d.-c)
10/04 - 06/05	1999	Music 4 Eye and Ear: International Sound Sculpture Festival	Various locations	Toronto	Canada	Sandor Ajzenstat, Janet Cardiff, Don Dickson, John Gzowski, Garnet Willis, Marla Hlady, Rick Hyslop, Laura Kikauka, Tilman Kuntzel, Gordon Monohan, Martina Oehmsen, Daniel Olson, Reinhard Reitzenstein, Gayle Young, David Rokeby, David Tudor, John D.S. Adams, Peter Vogel, Linda Fisher, Philip D'arcy Gray, Nobuo Kubota	(Young, 2012)
30/04 - 30/05	1999	Toys'n'Noise	O.K. Centrum für Gegenwartskunst	Linz	Austria	Patrick Baumüller, Konrad Becker/Public Netbase, Andres Bosshard, Cargnelli/Szely, Catcha, Shu Lea Cheang, Jennifer + Kevin McCoy, Ulrich Eller, Peter Hollinger, Robert Jacobsen, Kristin Lucas, David Moises, Max Moswitzer, Bunko Owatari featured by	(O.K. Centrum für Gegenwartskunst, n.d.)

						Mana Furayama, Merja Puustinen + Andy Best, Kathleen Ruíz, Leo Schatzl, Voice Crack	
13/05 – 04/07	1999	Klang-Kunst-Festival UND II	Bellevue-Saal	Wiesbaden	Germany	Alien Productions, Thorsten Goldberg, Christina Kubisch, Akio Suzuki	(Schulze-Reichenberg, 1999)
04/06 – 30/11	1999	Klangzeichen	Klangturm	St Pölten	Austria	Dieter Truestedt, Gernot Ursin & Wolfgang Krsek, Dan Neiss, Johannes Baar- Baarenfels & Rupert Huber, Peter Vogel, Toshio Iwai, Jutta Ravenna, Frances-Marie Uitti & Michael Redolfi & Tom Pohanka, Andreas Heinecke, Audio Research & Olga Neuwirth	(APA-OTS, 1999)
29/07 – 25/09	1999	El espacio del sonido: el tiempo de la mirada	Koldo Mitxelena Kulturunea	San Sebastian	Spain	Robert Adrian, Laurie Anderson, Philip Corner, Esther Ferrer, Joe Jones, Rolf Julius, Christina Kubisch, Lugań, Max Neuhaus, José Antonio Orts, Peter Vogel, Wolf Vostell, Qin Yufen	(Iges et al., 1999)
28/08 – 07/11	1999	Sounds like art	Yerba Buena Center for the Arts	San Francisco	United States	Beth Custer, Matt Heckert, Trimpin, Marina Rosenfeld	(Absolutearts, 2012)
01/10 – 21/10	1999	SSSHHHHH Soundbiennale	Soundshop, Nikolaj Udstillingsbygning, the department store "Magasin"	Copenhagen	Denmark	Alarm112, Jørgen Teller, Anders Elberling, J.Brandt-P., William Louis Sørensen, Ewa Jacobsson, Lee Ranaldo, Jannik Kirk Sørensen, Per Buhl Acs, Lars Agersbæk and Henrik Astrup, Eric Andersen	(Teller, Sørensen, Elberling, & Poulsen, 1999)
05/11 – 22/12	1999	Lydbilleder V ²⁵⁹ Fylkingen	Museet for Samtidskunst	Roskilde	Denmark	Carl Hausswolff, Kent Tankred, Johannes Bergmark, Sten Hanson, Thomas Liljenberg, Gunnel Petterson, Anders Blomqvist, Teddy Hultberg, Mats Lindström, Rolf Enström, Leif Elggren, Amit Sen, Josef Doukkali, Ann Rosén, Tore Nilsson	(Kullberg, 2013) (Bech, 2006)
12/11 – 14/11	1999	Drift - Three days of Sound Art + Acoustic Ecology	Various locations	Glasgow	United Kingdom	Gregg Wagstaff, Justin Bennett, Rob Kennedy, Stephen Hurrell, John Levack Drever, Millenium Urban Soundscape Project, Dallas Simpson, Calum Stirling, Rob Kennedy	(New Media Scotland, n.d.)
02/12 /1999	1999/ 2000	Lost in Sound - exposición	Centro Galego de Arte	Santiago de Compostella	Spain	Alberto Barreiro, Belén Montero, Dídac P. Lagarriga, Dora García, Fermín Moreno, Francesc Ruiz, Gebhard	(Oliveira, 2000)

²⁵⁹ *Lydbilleder IV* was a solo exhibition and is therefore not included in this list.

- 12/03 /2000			Contemporánea			Sengmüller, Gerald van der Kaap, Jan-Peter E.R.Sonntag, José Ramón Ais, Juan Lesta, Martín Pena, María Ruido, Montse Rego, Xoán Anleo	
	2000	festival internacional de arte sonoro - Humor y Aliento ²⁶⁰	Ex-Teresa Arte Actual Guillermo Santamarina	Mexico	Mexico	Maurzio Nannucci, Minoru Sato and Jio Shimizu, Paul DeMarinis, Krystina Bobrowsky, Kelly Davis, Jorge Maccci, Mario Marcelo Mary, Slavek Kwi	(Rocha Iturbide, n.d.-b)
	2000	TO HEAR IS TO SEE – Art in electronic space, for example on radio art and sound sculpture	Emisora de la Universidad Veracruzana	Xalapa	Mexico	Robert Adrian X and Rupert Huber, AKKORD-Z (Sebastian Brandt and Robert Filler), Sam Auinger, Claus Bach, Christian Bachler Leo Kreisel-Strauss, Peter Battisti, Gottfried Bechtold, Gudrun Bielz, Moucle Blackout, Isabella Bordoni and Roberto Paci Dalo, Andres Bosschard, Warren Burt, Selim Catkin, Lucas Cejpek, Seyda Cesur, Martina Cizek and Wolfgang Musil, Matthew Claire, Marilyn Collins, Sylvia Eckerman and Mathias Fuchs, René Eisenegger and Richardas Norvila, endlich katzenersatz, Julian Feyerabend and Oskar Hummer, Rainer Ganahl, Dinah Geiger, Michael Geysersbach, Melih Görgün, Dulce Gomez, Rainer Gottemeier, Richard Graf, Dora Guzman, Herwig Hammerl and Gerd Menia, Reinhard F. Handl, Reni Hofmüller, Harald Huskava, Georg Jappe, Concha Jerez and José Iges, Arsenije Jovanovic, Margret Kreidl, Nobuo Kubota and Mark Sutherland, Julie Larssen, Reinhold Leitner, Mirko Maric, Helmut Mark, Norbert Math, Christina Meissner and Michael Geysersbach, Rafael Méndez, Kaye Mortley, Frie Moschitz, Dmitriy Nikolaey, Richardas Norvilla and Oleg Kornev, Klaus Obermaier, Catalina Peralta, Bostjan Perovsek, Claudia Plank and Hans Werner Poschauko and Andreas Karner, PLUS (Roberto Sarmiento and Gilles Charalambos), Hannes Priesch, PROTON GROUP (Agnieszka Waligorska and Pekka Siren), Natalia Pschenitschnikowa, Daping Qin, RBW21 (Fritz Fro and	(Kunstradio, n.d.-a; Schmidt, 2002)

²⁶⁰ The first edition of the festival presented solely concerts. (Rocha Iturbide, n.d.-b)

						Gue Schmidt), Tulio Restrepo, Luis Romero, Katharina Riese, Winfried Ritsch, Friedrich Rotter, Naomi T. Salmon, Luz Maria Sánchez, Elisabeth Schimana, Gue Schmidt, Stephan A. Schmidt, Wolfgang Seierl, Andrea Sodomka and Martin Breindl, Wolfgang Sohm, Robert Spour, Erwin Stache, Ivana Stefanovic, Johannes Stöckler, Rod Summers, Mark Sutherland, Jo Thomas, Liesl Ujvary, Christine Ulm, Patricia Van Dalen, Daniel Velasco, German Vinogradov, Babette Werth and Claudia Herr, Anja Wiese, Oscar Wiggli, Yeti talks to yogi (Borges, Feyerabend, Fro, Otero), Robert Zahornicky, Lidia Zielinska	
	2000	BrueckenMusik 6	Deutzer Brücke	Cologne	Germany	Peter Behrendsen, Maria Blondeel and Michael Vorfeld, Jens Brand, Ron Kuivila, John Mc Alpine, Paul Panhuysen, Jay Schwartz	(Koch, 2007)
11/01 – 16/01	2000	I Am Sitting in a Room: Sound Works by American Artists 1950-2000	Whitney Museum of American Art	New York	United States	John Cage, Alvin Lucier, Nicolas Collins, Bruca Nauman, Bil Fontana, Alison Knowles, Annea Lockwood, Glenn Gould, Alvin Lucier, Steve Reich, Paul Miller, Philip Glass, Laetitia Sonami, Ellen Fullman, Terry Riley, David Tudor, Christian Marclay, Jim O'Rourke, Maryanne Amacher, Robert Ashley, David Behrman, Gordon Mumma, Charlotte Moorman, Nam June Paik, Paul DeMarinis, Gordon Monahan, Terry Fox, Ikue Mori, Vito Acconci, Laurie Anderson, Dara Birnbaum, Cecil Taylor, Tony Oursler, Mike Kelley, Lou Reed, Glenn Branca, Tony Conrad, Pauline Oliveros, Bob Bielecki and Connie Kiełtyka, Ken Nordine, Coyle and Sharpe, William S. Burroughs and Brion Gysin, Negativland, Gregory Whitehead, Charles Amirkhanian, Pamela Z, Edwin Torres, Joan La Barbara and Kenneth Goldsmith, Thomas Schmit, George Brecht, James Tenney, George Maciunas, Emmet Williams, Thomas Schmit, Joe Jones, Jackson Mac Low, La Monte Young, Philip Corner, Dick Higgins, Yasunao Tone, Takehisa Kosugi, Emmett Williams, Robert Walls and Larry Miller	(Stark, n.d.)
23/01 – 19/03	2000	Audible light	Museum of modern art	Oxford	United Kingdom	Bruce Gilbert & Edward Graham Lewis, Tommi Grönlund & Petteri Nisunen, Carl Michael von Hausswolff, Ann Veronica Janssens, Ann Lislegaard, Carsten Nicolai	(Bowron, 2000)

28/01 – 12/03	2000	Sound Art - Sound as Media	NTT Intercommunication Centre (ICC)	Tokyo	Japan	Max Eastley, David Toop, Carl Michael Von Hausswolff, Peter Hagdahl, Christoph Charles, Carsten Nicolai, Marc Behrens, Ikeda Ryoji, Sato Minoru, Tsunoda Toshiya, Shimizu Jio, Jane Dowe, Brandon LaBelle	(Hatanaka, 2000b)
11/02 – 16/04	2000	Musiques en scène: Installations sonores	Musée d'Art Contemporain de Lyon	Lyon	France	Dumb Type, Granular Synthesis, Micha Laury	(Giroudon, 2000)
10/03 – 19/03	2000	Lyon Cité Sonore	Various locations throughout the city	Lyon	France	Nicolas Reeves/laboratoire NXI GESTATIO, Michel Redolfi, Patricia De Kuiper, Llorenç Barber, Stefano Colleti, Jean-Bernard Lemoine, Dominique Barthassat, Bernard Gortais, Yann Orlarey, Guillaume Hutzler, Hans Peter Kuhn, Denys Vinzant, Pierre Alain Jaffrennou, Robin Minard	(Giroudon, 2000)
04/04 – 31/04	2000	TO HEAR IS TO SEE – Art in electronic space, for example on radio art and sound sculpture	Osterreichisches Kulturinstitut	Istanbul,	Turkey	Robert Adrian X and Rupert Huber, AKKORD-Z (Sebastian Brandt and Robert Filler), Sam Auinger, Claus Bach, Christian Bachler Leo Kreisel-Strauss, Peter Battisti, Gottfried Bechtold, Gudrun Bielz, Moucle Blackout, Isabella Bordoni and Roberto Paci Dalò, Andres Bosschard, Warren Burt, Selim Catkin, Lucas Cejpek, Seyda Cesur, Martina Cizek and Wolfgang Musil, Matthew Claire, Marilyn Collins, Sylvia Eckerman and Mathias Fuchs, René Eisenegger and Richardas Norvila, endlich katzenersatz, Julian Feyerabend and Oskar Hummer, Rainer Ganahl, Dinah Geiger, Michael Geysersbach, Melih Görgün, Dulce Gomez, Rainer Gottemeier, Richard Graf, Dora Guzman, Herwig Hammerl and Gerd Menia, Reinhard F. Handl, Reni Hofmüller, Harald Huskava, Georg Jappe, Concha Jerez and José Iges, Arsenije Jovanovic, Margret Kreidl, Nobuo Kubota and Mark Sutherland, Julie Larssen, Reinhold Leitner, Mirko Maric, Helmut Mark, Norbert Math, Christina Meissner and Michael Geysersbach, Rafael Méndez, Kaye Mortley, Frie Moschitz, Dmitriy Nikolaev, Richardas Norvilla and Oleg Kornev, Klaus Obermaier, Catalina Peralta, Bostjan Perovsek, Claudia Plank and Hans Werner Poschauko and Andreas Karner, PLUS (Roberto Sarmiento and Gilles Charalambos), Hannes Priesch, PROTON GROUP (Agnieszka Waligorska and Pekka Siren), Natalia	(Kunstradio, n.d.-a; Schmidt, 2002)

						Pschenitschnikowa, Daping Qin, RBW21 (Fritz Fro and Gue Schmidt), Tulio Restrepo, Luis Romero, Katharina Riese, Winfried Ritsch, Friedrich Rotter, Naomi T. Salmon, Luz Maria Sánchez, Elisabeth Schimana, Gue Schmidt, Stephan A. Schmidt, Wolfgang Seierl, Andrea Sodomka and Martin Breindl, Wolfgang Sohm, Robert Spour, Erwin Stache, Ivana Stefanovic, Johannes Stöckler, Rod Summers, Mark Sutherland, Jo Thomas, Liesl Ujvary, Christine Ulm, Patricia Van Dalen, Daniel Velasco, German Vinogradov, Babette Werth and Claudia Herr, Anja Wiese, Oscar Wiggli, Yeti talks to yogi (Borges, Feyerabend, Fro, Otero), Robert Zahornicky, Lidia Zielinska	
14/04 - 19/11	2000	Liquid sound	Klangturm	St. Pölten	Austria	Dan Neiss, Mia Zabelka, Ione, Phil Niblock, Kurt Lang Götz Lemberg, Andreas Heinecke, Werner Jauk	(Klangturm, n.d.-e)
27/04 - 18/06	2000	Sonic Boom	Hayward Gallery South Bank London	London	United Kingdom	Angela Bulloch, Paul Burwell, Disinformation, Heri Dono, Max Eastley, Brian Eno, Paulo Feliciano & Rafael Toral, Greyworld, Stephan Von Huene, Ryoji Ikeda, Philip Jeck, Thomas Köner, Christina Kubisch, Chico MacMurtrie, Christian Marclay, Russell Mills & Ian Walton, Mariko Mori, John Oswald, Pan Sonic, Project Dark, Lee Ranaldo, Scanner & Katerina Matiassek, Paul Schütze	(Toop, 2000c)
16/05 - 31/05	2000	TO HEAR IS TO SEE – Art in electronic space, for example on radio art and sound sculpture	University del Claustro de Sor Juana 3. Biental Latinoamericana de Radio	Mexico City	Mexico	Robert Adrian X and Rupert Huber, AKKORD-Z (Sebastian Brandt and Robert Filler), Sam Auinger, Claus Bach, Christian Bachler Leo Kreisel-Strauss, Peter Battisti, Gottfried Bechtold, Gudrun Bielz, Moucle Blackout, Isabella Bordoni and Roberto Paci Dalo, Andres Bosschard, Warren Burt, Selim Catkin, Lucas Cejpek, Seyda Cesur, Martina Cizek and Wolfgang Musil, Matthew Claire, Marilyn Collins, Sylvia Eckerman and Mathias Fuchs, René Eisenegger and Richardas Norvila, endlich katzenersatz, Julian Feyerabend and Oskar Hummer, Rainer Ganahl, Dinah Geiger, Michael Geysersbach, Melih Görgün, Dulce Gomez, Rainer Gottemeier, Richard Graf, Dora Guzman, Herwig Hammerl and Gerd Menia, Reinhard F. Handl, Reni Hofmüller, Harald Huskava, Georg Jappe, Concha Jerez and José Iges, Arsenije	(Kunstradio, n.d.-a; Schmidt, 2002)

						Jovanovic, Margret Kreidl, Nobuo Kubota and Mark Sutherland, Julie Larssen, Reinhold Leitner, Mirko Maric, Helmut Mark, Norbert Math, Christina Meissner and Michael Geyersbach, Rafael Méndez, Kaye Mortley, Frie Moschitz, Dmitriy Nikolaey, Richardas Norvilla and Oleg Kornev, Klaus Obermaier, Catalina Peralta, Bostjan Perovsek, Claudia Plank and Hans Werner Poschauko and Andreas Karner, PLUS (Roberto Sarmiento and Gilles Charalambos), Hannes Priesch, PROTON GROUP (Agnieszka Waligorska and Pekka Siren), Natalia Pschenitschnikowa, Daping Qin, RBW21 (Fritz Fro and Gue Schmidt), Tulio Restrepo, Luis Romero, Katharina Riese, Winfried Ritsch, Friedrich Rotter, Naomi T. Salmon, Luz Maria Sánchez, Elisabeth Schimana, Gue Schmidt, Stephan A. Schmidt, Wolfgang Seierl, Andrea Sodomka and Martin Breindl, Wolfgang Sohm, Robert Spour, Erwin Stache, Ivana Stefanovic, Johannes Stöckler, Rod Summers, Mark Sutherland, Jo Thomas, Liesl Ujvary, Christine Ulm, Patricia Van Dalen, Daniel Velasco, German Vinogradov, Babette Werth and Claudia Herr, Anja Wiese, Oscar Wiggli, Yeti talks to yogi (Borges, Feyerabend, Fro, Otero), Robert Zahornicky, Lidia Zielinska	
02/07 – 30/09	2000	Volume: Bed of Sound	P.S. 1	New York	United States	Muhal Richard Abrams, Vito Acconci, Maryanne Amacher, Laurie Anderson, David Behrman, Ed Champion, John Cale, Joel Chadabe, Chop Shop, Chris & Cosey, Cibo Matto, Beth Coleman, Nicolas Collins, Tony Conrad, ¡Cubanismo!, Alvin Curran, Chris Cutler, Paul DeMarinis, Tod Dockstader, John Duncan, Fischerspooner, Yamataka Eye, Ellen Fullman, Carl Michael von Hausswolf, Matt Heckert, John Hudak, Impossible Music, I-Sound, Phil Kline, Keenan Lawler, Arto Lindsay, Alvin Lucier, Christian Marclay, Kaffe Matthews, Genken Montgomery, Ikue Mori, Butch Morris, Walter Murch, Phil Niblock, Carsten Nicolai/Noto, Genesis P-Orridge, Bob Ostertag, Pan Sonic, Zeena Parkins, Lou Reed, Vernon Reid, The Residents, Rist. Pipilotti, Ugo Rondinone, Frank Rothkamm, Ben Rubin, Adriana Sà, Ryuichi Sakamoto, Michael J. Schumacher, Howard Shore, Sonic Youth,	(The museum of modern art, 2013g)

						Steinski, Carl Stone, Lauren Weinger, David Weinstein	
05/07 - 15/07	2000	Sound Symposium: Visions of Sound - Millennium Project - exhibition	various locations	St. John's	Canada	Diane Landry, Lori Clarke, Laiwan and Lori Freedman, Trimpin, John Little, Ted Apel, Ellen Band, Don Dickson, Ken Gregory, Greg Locke, Harold Klunder, Grant Strombeck	(Clark Wherry, 2013)
06/07 - 13/08	2000	Architektur und Klang - "raumklangformscha ll"	Architekturmus eum Schwaben	Augsburg	Germany	Christina Kubisch, Bernhard Leitner, Kas Oosterhuis, Kyra Stratmann, Pierre Duitelleux, Christian Müller-Tomfelde, Frank den Oousten & Jordi Janer	(Architektur museum der Technischen Universität München, n.d.)
28/07 - 03/09	2000	Sound Sculpture: Integrating Sound and Sight	Grimsby Public Art Gallery	Grimsby	Canada	Don Dickson & Paul Pinola, Bentley Jarvis, Robert Mason & Eugene Martynec, Garnet Willis, Nobuo Kubota	(Young, 2000)
11/08 - 24/09	2000	TO HEAR IS TO SEE - Art in electronic space, for example on radio art and sound sculpture	Museo de la Ciudad de Querétaro	Querétaro	Mexico	Robert Adrian X and Rupert Huber, AKKORD-Z (Sebastian Brandt and Robert Filler), Sam Auinger, Claus Bach, Christian Bachler Leo Kreisel-Strauss, Peter Battisti, Gottfried Bechtold, Gudrun Bielz, Moucle Blackout, Isabella Bordoni and Roberto Paci Dalo, Andres Bosschard, Warren Burt, Selim Catkin, Lucas Cejpek, Seyda Cesur, Martina Cizek and Wolfgang Musil, Matthew Claire, Marilyn Collins, Sylvia Eckerman and Mathias Fuchs, René Eisenegger and Richardas Norvila, endlich katzenersatz, Julian Feyerabend and Oskar Hummer, Rainer Ganahl, Dinah Geiger, Michael Geyersbach, Melih Görgün, Dulce Gomez, Rainer Gottemeier, Richard Graf, Dora Guzman, Herwig Hammerl and Gerd Menia, Reinhard F. Handl, Reni Hofmüller, Harald Huskava, Georg Jappe, Concha Jerez and José Iges, Arsenije Jovanovic, Margret Kreidl, Nobuo Kubota and Mark Sutherland, Julie Larssen, Reinhold Leitner, Mirko Maric, Helmut Mark, Norbert Math, Christina Meissner and Michael Geyersbach, Rafael Méndez, Kaye Mortley, Frie Moschitz, Dmitriy Nikolaev, Richardas Norvilla and Oleg Kornev, Klaus Obermaier, Catalina Peralta, Bostjan Perovsek, Claudia Plank and Hans Werner Poschauko and Andreas Karner, PLUS (Roberto Sarmiento and Gilles	(Kunstradio, n.d.-a; Schmidt, 2002)

						Charalambos), Hannes Priesch, PROTON GROUP (Agnieszka Waligorska and Pekka Siren), Natalia Pschenitschnikowa, Daping Qin, RBW21 (Fritz Fro and Gue Schmidt), Tulio Restrepo, Luis Romero, Katharina Riese, Winfried Ritsch, Friedrich Rotter, Naomi T. Salmon, Luz Maria Sánchez, Elisabeth Schimana, Gue Schmidt, Stephan A. Schmidt, Wolfgang Seierl, Andrea Sodomka and Martin Breindl, Wolfgang Sohm, Robert Spour, Erwin Stache, Ivana Stefanovic, Johannes Stöckler, Rod Summers, Mark Sutherland, Jo Thomas, Liesl Ujvary, Christine Ulm, Patricia Van Dalen, Daniel Velasco, German Vinogradov, Babette Werth and Claudia Herr, Anja Wiese, Oscar Wiggli, Yeti talks to yogi (Borges, Feyerabend, Fro, Otero), Robert Zahornicky, Lidia Zielinska	
15/09 – 15/10	2000	Resonancias	Museo Municipal de Málaga	Málaga	Spain	Laurie Anderson, Hugh Davies, Esther Ferrer, Christina Kubisch, Bernhard Leitner, Lugán, Max Neuhaus, Paul Panhuysen, Peter Vogel, Wolf Vostell, Qin Yufen	(Ccapitalia, n.d.)
29/09 – 01/10	2000	TO HEAR IS TO SEE – Art in electronic space, for example on radio art and sound sculpture	Sala de Exposiciones JAI-ALAI	Querétaro	Mexico	Robert Adrian X and Rupert Huber, AKKORD-Z (Sebastian Brandt and Robert Filler), Sam Auinger, Claus Bach, Christian Bachler Leo Kreisel-Strauss, Peter Battisti, Gottfried Bechtold, Gudrun Bielz, Moucle Blackout, Isabella Bordoni and Roberto Paci Dalò, Andres Bosschard, Warren Burt, Selim Catkin, Lucas Cejpek, Seyda Cesur, Martina Cizek and Wolfgang Musil, Matthew Claire, Marilyn Collins, Sylvia Eckerman and Mathias Fuchs, René Eisenegger and Richardas Norvila, endlich katzenersatz, Julian Feyerabend and Oskar Hummer, Rainer Ganahl, Dinah Geiger, Michael Geyersbach, Melih Görgün, Dulce Gomez, Rainer Gottemeier, Richard Graf, Dora Guzman, Herwig Hammerl and Gerd Menia, Reinhard F. Handl, Reni Hofmüller, Harald Huskava, Georg Jappe, Concha Jerez and José Iges, Arsenije Jovanovic, Margret Kreidl, Nobuo Kubota and Mark Sutherland, Julie Larssen, Reinhold Leitner, Mirko Maric, Helmut Mark, Norbert Math, Christina Meissner and Michael Geyersbach, Rafael Méndez, Kaye Mortley, Frie Moschitz, Dmitriy Nikolaev, Richardas Norvilla and Oleg Kornev, Klaus Obermaier, Catalina Peralta, Bostjan	(Kunstradio, n.d.-a; Schmidt, 2002)

						Perovsek, Claudia Plank and Hans Werner Poschauko and Andreas Karner, PLUS (Roberto Sarmiento and Gilles Charalambos), Hannes Priesch, PROTON GROUP (Agnieszka Waligorska and Pekka Siren), Natalia Pschenitschnikowa, Daping Qin, RBW21 (Fritz Fro and Gue Schmidt), Tulio Restrepo, Luis Romero, Katharina Riese, Winfried Ritsch, Friedrich Rotter, Naomi T. Salmon, Luz Maria Sánchez, Elisabeth Schimana, Gue Schmidt, Stephan A. Schmidt, Wolfgang Seierl, Andrea Sodomka and Martin Breindl, Wolfgang Sohm, Robert Spour, Erwin Stache, Ivana Stefanovic, Johannes Stöckler, Rod Summers, Mark Sutherland, Jo Thomas, Liesl Ujvary, Christine Ulm, Patricia Van Dalen, Daniel Velasco, German Vinogradov, Babette Werth and Claudia Herr, Anja Wiese, Oscar Wiggli, Yeti talks to yogi (Borges, Feyerabend, Fro, Otero), Robert Zahornicky, Lidia Zielinska	
08/10 /2000 – 30/12 /2001	2000/ 2001	Visual Sound, Part 1 & Part 2	Mattress Factory	Pittsburgh	United States	Patrice Carré, Terry Fox, Rolf Julius, Takehisa Kosugi, Christina Kubisch, Hans Peter Kuhn, Robin Minard, Akio Suzuki, Junko Wada, Qin Yufen	(Mattress Factory, 2012)
13/10 – 10/12	2000	Music in Art: Off the Record	Samek Art Gallery, Bucknell University	Lewisburg	United States	Jim Lambie, George Condo, Christian Marclay, Archie Rand, Jack Whitten and others	(Bucknell University, 2000)
26/10	2000	extrasensory sound art event 3	291 Gallery	London	United Kingdom	Paul Hopton, Experiment 1, Elaine Robertson, Alan Peacock, Bill Urmenyi, Alberto Duman, Olivier Alary	(Darren & Vicky, 2000)
28/10 /2000 – 28/01 /2001	2000/ 2001	S.O.S.: scenes of sounds	Tang Teaching Museum and Art Gallery, Skidmore College	Saratoga Springs	United States	Laurie Anderson, Robert Arneson, Alan Berliner, Wallace Berman, Nick Cave, Rafe Churchill, Alex Gregory, Joseph Grigely, Ann Hamilton, Rebecca Horn, Thomas David Kehoe, Martin Kersels, Barbara Kruger, Annette Lemieux, Christian Marclay, Beverly Mastrianni, Gordon Monahan, Bruce Nauman, Nam June Paik, Alan Rath, David Rokeby, Stephanie Rowden, Gebhard Sengmuller, Laurie Simmons, Jeff Talman, Javier Tellez, Stephen Vitiello, Andy Warhol	(Tang Teaching Museum, 2009)
10/11	2000	Kreuzberger		Berlin	Germany	Mario Verandi, Sascha Kranz, Daniel Plewe and Daniel	(TU Berlin,

- 12/11		Klangwerkstatt - klanginstallationen				Teige	n.d.)
10/11 - 23/11	2000	TO HEAR IS TO SEE - Art in electronic space, for example on radio art and sound sculpture	Rhizom im Labor	Graz	Austria	Robert Adrian X and Rupert Huber, AKKORD-Z (Sebastian Brandt and Robert Filler), Sam Auinger, Claus Bach, Christian Bachler Leo Kreisel-Strauss, Peter Battisti, Gottfried Bechtold, Gudrun Bielz, Moucle Blackout, Isabella Bordoni and Roberto Paci Dalò, Andres Bosschard, Warren Burt, Selim Catkin, Lucas Cejpek, Seyda Cesur, Martina Cizek and Wolfgang Musil, Matthew Claire, Marilyn Collins, Sylvia Eckerman and Mathias Fuchs, René Eisenegger and Richardas Norvila, endlich katzenersatz, Julian Feyerabend and Oskar Hummer, Rainer Ganahl, Dinah Geiger, Michael Geysersbach, Melih Görgün, Dulce Gomez, Rainer Gottemeier, Richard Graf, Dora Guzman, Herwig Hammerl and Gerd Menia, Reinhard F. Handl, Reni Hofmüller, Harald Huskava, Georg Jappe, Concha Jerez and José Iges, Arsenije Jovanovic, Margret Kreidl, Nobuo Kubota and Mark Sutherland, Julie Larssen, Reinhold Leitner, Mirko Maric, Helmut Mark, Norbert Math, Christina Meissner and Michael Geysersbach, Rafael Méndez, Kaye Mortley, Frie Moschitz, Dmitriy Nikolaev, Richardas Norvilla and Oleg Kornev, Klaus Obermaier, Catalina Peralta, Bostjan Perovsek, Claudia Plank and Hans Werner Poschauko and Andreas Karner, PLUS (Roberto Sarmiento and Gilles Charalambos), Hannes Priesch, PROTON GROUP (Agnieszka Waligorska and Pekka Siren), Natalia Pschenitschnikowa, Daping Qin, RBW21 (Fritz Fro and Gue Schmidt), Tulio Restrepo, Luis Romero, Katharina Riese, Winfried Ritsch, Friedrich Rotter, Naomi T. Salmon, Luz Maria Sánchez, Elisabeth Schimana, Gue Schmidt, Stephan A. Schmidt, Wolfgang Seierl, Andrea Sodomka and Martin Breindl, Wolfgang Sohm, Robert Spour, Erwin Stache, Ivana Stefanovic, Johannes Stöckler, Rod Summers, Mark Sutherland, Jo Thomas, Liesl Ujvary, Christine Ulm, Patricia Van Dalen, Daniel Velasco, German Vinogradov, Babette Werth and Claudia Herr, Anja Wiese, Oscar Wiggli, Yeti talks to yogi (Borges, Feyerabend, Fro, Otero), Robert Zahornicky, Lidia	(Kunstradio, n.d.-a; Schmidt, 2002)

						Zielinska	
09/12	2000	Sound	China Contemporary Art Gallery	Beijing	China	Li Zhenhua, Zhang Hui, Wang Wei, Shi Qing	(Tang & Lin, 2012)
	2001	BrueckenMusik 7	Deutzer Brücke	Cologne	Germany	Esther Ferrer, Johannes Fritsch, Rolf Julius, Ana Maria Rodriguez, Claudia Schmacke, Richard Teitelbaum	(Koch, 2007)
	2001	Acoustic shadows : soundworks by artists	Villa Merkel, Galerien der Stadt Esslingen	Esslingen am Neckar	Germany	Johannes Maier, Shirley MacWilliam, Gerhard Stäbler; Chloë Brown, Lindsey Adams, Robert Girling, Martin Rogers, Jürgen Kierspel, Penny McCarthy, Craig Richardson	(Rogers, 1999)
	2001	Audiolab 1	Mudam Luxembourg	Luxembourg	Luxembourg	Alejandra & Aeron, Vladislav Delay, Rupert Huber, Henrik Plenge Jakobsen, Monolake (Robert Henke), RadioMentale (Jean-Yves Leloup & Éric Pajot)	(Mudam Luxembourg, n.d.)
	2001	festival internacional de arte sonoro - Eso...	Ex-Teresa Arte Actual Guillermo Santamarina	Mexico	Mexico	Carsten Nicolai, Phill Niblock, Ricardo Nicolayevsk, Ake Parmerud, a.o.	(Rocha Iturbide, n.d.-b)
11/01 - 17/02	2001	Now Playing: Audio in Art	Susan Inglett Gallery	New York	United States	Christian Marclay, Ann Hamilton a.o.	(J. Simon, 2006) (Paula Cooper Gallery, n.d.)
24/01 - 04/02	2001	Dangerous Waves: art of sound	School of the Museum of Fine Arts	Boston	United States	Ron Kuivila, Doug Henderson, Liz Phillips & Anney Bonney	(The School of the Museum of Fine Arts, 2001) (Jacobson, 2004)
14/02 - 10/03	2001	Between Sound and Vision	Gallery 400, College of Architecture and the Arts, University of Illinois	Chicago	United States	Eric Anderson, Jeremy Boyle, Philip Corner, Heri Dono, David Dunn, Dick Higgins, Joe Jones, Alison Knowles, Brandon LaBelle, Phill Niblock, Paul Panhuysen, Minoru Sato, Charlotte Moorman, Carolee Schneemann, Dan Senn, William Stone, Yasunao Tone, Trimpin, Yoshi Wada, Achim Wollscheid, a.o.	(Gallery 400, n.d.)
15/03	2001	extrasensory sound art event 4	291 Gallery	London	United Kingdom	John Bartholomew, Immedia, Pontus Jogi, Jim Y Wood	(Darren & Vicky, 2001)
21/03 -	2001	ART>MUSIC	Museum of Contemporary	Sydney	Australia	Christian Marclay, Charles Long, Julian Dashper, Ronnie van Hout, Gerwald Rockenschau, Kathy Temin, Georgina	(Museum of Contempora

24/06			Art			Starr, Lee Ranaldo, Thurston & Marco Fusinato, John Armleder, Pipilotti Rist, Sydney Stucki & Stefan Altenburger, Daniel Pflumm, Carsten Nicolai, Angela Bulloch, Mike Kelley, Tony Oursler, David Patton, Anna Schneider, Rodney Graham, Ron Terada, Jon Campbell, Mutlu Cerkez, A Constructed World (Jacqueline Riva and Geoff Lowe)	ry Art, 2004)
April-May	2001	Inner Ear : A Festival of Sound Installations	The Walper Gallery, Kitchener City Hall Rotunda, The Forsyth Factory, The Kitchener-Waterloo Art Gallery, KOR Gallery & Studios (Kitchener).	Ontario	Canada	Bluemouth Inc., Stephen O'connell, Lucy Simic, Sabrina Usher, Richard Windeyer, Darren Copeland, Jean-Pierre Gauthier, Paul Gentile, Bentley Jarvis, Stefan A. Rose, Michael Snow, Peter Von Tiesenhausen, William Brent, The Ccmc, Hanna Domagala, Jesse Dymond, Helena Grdadolnik, Mike Hadden, Daryl Jamieson, Matt Johnston, Nicole Peirce, Caitrin Stokman, Ryan Trew, Dave Washburn, Noel Webb, Elena Wiersma	(E-Artex administrator, 2012a)
10/05 - 01/07	2001	Klang-Kunst-Festival UND III	Bellevue-Saal	Wiesbaden	Germany	Alexander R. Titz, Christoph Lahl, Robin Minard, Ullrich Eller	(Schulze-Reichenberg, 2001)
14/06 - 16/09	2001	Salons de Musique	Musée d'Art Moderne et Contemporain de Strasbourg	Strasbourg	France	Michel Aubry, Audiolab (Alejandra y Aeron, Monolake, Radio Mentale, Rupert Huber, Rebecca Bournigaut), Collective Jukebox 3.1, Stéphane Dafflon, Hendrik Krawen, Albert & Markus Oehlen, Gerwald Rockenschaub, Ugo Rondinone	(Parsy, 2001)
14/07 - 21/08	2001	Sound 2 - installations	Mustard Seed Garden	Beijing	China	Qiu Zhijie, Li Chuan, Li Yong, Shi Qing, Rania Ho, Wang Peng, Wang Wei	(Mustard Seed Garden, 2006)
14/07 - 30/09	2001	Summer of Sound at the Henry	Stroum Gallery	Seattle	United States	Jesse Paul Miller, Susan Robb, Bill Fontana, Rodney Graham	(Henry Art Gallery, 2013a)
14/07 - 30/09	2001	Volume: Bed of Sound	Henry Art Gallery	Seattle	United States	Vito Acconci, Tod Dockstader, Walter Murch, Muhal Richard Abrams, Laurie Anderson, Chris & Cosey, Survival Research Laboratories, Ryuichi Sakamoto, Sonic Youth, Butch Morris	(Henry Art Gallery, 2013b)
18/07	2001	pHonic	Physics Room	Christchurch	New Zealand	rigasZieds, audiorom, Arcangel Constantini, Andi	(Radioqualia,

- 12/08				h		Freeman & Jason Skeet, zzkt	n.d.)
20/07 - 26/08	2001	Amplitude of Chance	Kawasaki City Museum	Kawasaki	Japan	Mariko Asai, Peter Duimelinks, Toshihiko Furuya, Michiyo Miyama, Achim Wollscheid, Toshiya Tsunoda, Roel Meelkop, Brandon LaBelle, Jio Shimizu, Charly Steiger, Shinichi Yanai	(Minoru Sato & Makiura, 2001)
06/09 - 14/09	2001	Audiolab	Centre Georges Pompidou, Foyer, Cinéma 2	Paris	France	Alejandra & Aeron, Monolake, Radio Mentale, Rupert Huber et Rebecca Bournigault	(Centre Pompidou, n.d.-d)
11/10 - 17/10	2001	extrasensory: sound . light . space	291 Gallery	London	United Kingdom	John Forster, Dave Carter and Joe Watson, Simon and Lars Blown, Etienne Clement, Dave Carter, Ulrike Leyens, Fntasmagramma, Alan Peacock	(Staalplaat, n.d.)
26/10 - 21/12	2001	Audible Imagery: Sound and Photography	The Museum of Contemporary Photography, Columbia College	Chicago	United States	Laurie Anderson, M.W. Burns, Takehito Koganezawa, Jay LeFor, Ann Lislegaard, Christian Marclay, Carsten Nicolai, Gebhard Sengmüller, Gary Simmons, Stenia Vasulka	(Museum of contemporary photography, 2009)
29/10 - 04/11	2001	TO HEAR IS TO SEE – Art in electronic space, for example on radio art and sound sculpture	ACC Galerie	Weimar	Germany	Robert Adrian X and Rupert Huber, AKKORD-Z (Sebastian Brandt and Robert Filler), Sam Auinger, Claus Bach, Christian Bachler Leo Kreisel-Strauss, Peter Battisti, Gottfried Bechtold, Gudrun Bielz, Moucle Blackout, Isabella Bordoni and Roberto Paci Dalò, Andres Bosschard, Warren Burt, Selim Catkin, Lucas Cejpek, Seyda Cesur, Martina Cizek and Wolfgang Musil, Matthew Claire, Marilyn Collins, Sylvia Eckerman and Mathias Fuchs, René Eisenegger and Richardas Norvila, endlich katzenersatz, Julian Feyerabend and Oskar Hummer, Rainer Ganahl, Dinah Geiger, Michael Geyersbach, Melih Görgün, Dulce Gomez, Rainer Gottemeier, Richard Graf, Dora Guzman, Herwig Hammerl and Gerd Menia, Reinhard F. Handl, Reni Hofmüller, Harald Huskava, Georg Jappe, Concha Jerez and José Iges, Arsenije Jovanovic, Margret Kreidl, Nobuo Kubota and Mark Sutherland, Julie Larssen, Reinhold Leitner, Mirko Maric, Helmut Mark, Norbert Math, Christina Meissner and Michael Geyersbach, Rafael Méndez, Kaye Mortley, Frie Moschitz, Dmitriy Nikolaev, Richardas Norvilla and Oleg Kornev, Klaus Obermaier, Catalina Peralta, Bostjan	(Kunstradio, n.d.-a; Schmidt, 2002)

						Perovsek, Claudia Plank and Hans Werner Poschauko and Andreas Karner, PLUS (Roberto Sarmiento and Gilles Charalambos), Hannes Priesch, PROTON GROUP (Agnieszka Waligorska and Pekka Siren), Natalia Pschenitschnikowa, Daping Qin, RBW21 (Fritz Fro and Gue Schmidt), Tulio Restrepo, Luis Romero, Katharina Riese, Winfried Ritsch, Friedrich Rotter, Naomi T. Salmon, Luz Maria Sánchez, Elisabeth Schimana, Gue Schmidt, Stephan A. Schmidt, Wolfgang Seierl, Andrea Sodomka and Martin Breindl, Wolfgang Sohm, Robert Spour, Erwin Stache, Ivana Stefanovic, Johannes Stöckler, Rod Summers, Mark Sutherland, Jo Thomas, Liesl Ujvary, Christine Ulm, Patricia Van Dalen, Daniel Velasco, German Vinogradov, Babette Werth and Claudia Herr, Anja Wiese, Oscar Wiggli, Yeti talks to yogi (Borges, Feyerabend, Fro, Otero), Robert Zahornicky, Lidia Zielinska	
03/11 – 16/12	2001	Record All-Over	Musée d'art moderne et contemporain (MAMCO)	Genève	Switzerland	Alexandre Bianchini, Pierre Bismuth, Lee Bul, Janet Cardiff & George Bures Miller, Jeremy Deller, Sam Durant, Rodney Graham, Martin Kersels, Ann Lislegaard, Christian Marclay, Eva Marisaldi, Adrian Piper, Pipilotti Rist, Sidney Stucki, Mungo Thomson	(Centre for Contemporary Images, n.d.)
03/11 /2001 – 31/01 /2002	2001/ 2002	Art & Music	Galerie Anton Meier & Galerie Marlene Frei	Genève, Zürich	Switzerland	Laurie Anderson, Patrice Baizet, Jonathan Borofsky, Anton Bruhin, John Cage, Lorenzo Cambin, Giuseppi Chiari, Rudy Decelière, Morton Feldmann, Peter Fischer, Urs Frei, Johannes Gachnang, Hervé Graumann, Peter Green, Edu Haubensak, Joe Jones, Milan Knizak, Matteo Laffranchi, Christian Marclay, Nanne Meyer, Yoko Ono, Jack Ox, Robin Page, Ben Patterson, Frédéric Post, Peter Roesch, Dieter Roth, Gerhard Rühm, Takako Saito, Hans Schärer, Mieko Shiomi, Hugo Suter, André Thomkins, Tom Wasmuth, Suse Wiegand, Emmett Williams	(Galerie Anton Meier & Galerie Marlene Frei, 2002)
09/11 – 15/11	2001	TO HEAR IS TO SEE – Art in electronic space, for example on radio art and sound sculpture	Klanggalerie im Kultursalon	Berlin	Germany	Robert Adrian X and Rupert Huber, AKKORD-Z (Sebastian Brandt and Robert Filler), Sam Auinger, Claus Bach, Christian Bachler Leo Kreisel-Strauss, Peter Battisti, Gottfried Bechtold, Gudrun Bielz, Moucle Blackout, Isabella Bordoni and Roberto Paci Dalò, Andres Bosschard, Warren Burt, Selim Catkin, Lucas Cejpek,	(Kunstradio, n.d.-a; Schmidt, 2002)

						Seyda Cesur, Martina Cizek and Wolfgang Musil, Matthew Claire, Marilyn Collins, Sylvia Eckerman and Mathias Fuchs, René Eisenegger and Richardas Norvila, endlich katzenersatz, Julian Feyerabend and Oskar Hummer, Rainer Ganahl, Dinah Geiger, Michael Geyersbach, Melih Görgün, Dulce Gomez, Rainer Gottemeier, Richard Graf, Dora Guzman, Herwig Hammerl and Gerd Menia, Reinhard F. Handl, Reni Hofmüller, Harald Huskava, Georg Jappe, Concha Jerez and José Iges, Arsenije Jovanovic, Margret Kreidl, Nobuo Kubota and Mark Sutherland, Julie Larssen, Reinhold Leitner, Mirko Maric, Helmut Mark, Norbert Math, Christina Meissner and Michael Geyersbach, Rafael Méndez, Kaye Mortley, Frie Moschitz, Dmitriy Nikolaey, Richardas Norvilla and Oleg Kornev, Klaus Obermaier, Catalina Peralta, Bostjan Perovsek, Claudia Plank and Hans Werner Poschauko and Andreas Karner, PLUS (Roberto Sarmiento and Gilles Charalambos), Hannes Priesch, PROTON GROUP (Agnieszka Waligorska and Pekka Siren), Natalia Pschenitschnikowa, Daping Qin, RBW21 (Fritz Fro and Gue Schmidt), Tulio Restrepo, Luis Romero, Katharina Riese, Winfried Ritsch, Friedrich Rotter, Naomi T. Salmon, Luz Maria Sánchez, Elisabeth Schimana, Gue Schmidt, Stephan A. Schmidt, Wolfgang Seierl, Andrea Sodomka and Martin Breindl, Wolfgang Sohm, Robert Spour, Erwin Stache, Ivana Stefanovic, Johannes Stöckler, Rod Summers, Mark Sutherland, Jo Thomas, Liesl Ujvary, Christine Ulm, Patricia Van Dalen, Daniel Velasco, German Vinogradov, Babette Werth and Claudia Herr, Anja Wiese, Oscar Wiggli, Yeti talks to yogi (Borges, Feyerabend, Fro, Otero), Robert Zahornicky, Lidia Zielinska	
07/12 – 16/12	2001	Sound in Art	Galéria Priestor for Contemporary Arts	Brastilava	Slovakia	Marc Behrens, Monogramist T.D., Marko Peljhan, Susan Philipsz, Marjetica Potrč, Carina Randløv, Egill Sæbjörnsson, Scanner+Tonne	(Priestor, n.d.)
07/12 /2001 –	2001/ 2002	Resynthesis	Betty Rymer Gallery	Chicago	United States	Aaron Curry, Steve Roden, Brandon Labelle, Trevor Paglen, Olivia Block, Jeremy Boyle, Richard Chartier, Andra S. McCartney, Seth Cluett, John Cage	(E-Artex administrato r, 2012b)

23/01 /2002							
	2002	BrueckenMusik 8	Deutzer Brücke	Cologne	Germany	Bettina Bachem, BMB Con, Franz Hauzinger, Klaus Osterwald, Melvyn Poore, Heinz Weber	(Koch, 2007)
	2002	festival internacional de arte sonoro - Eso...	Ex-Teresa Arte Actual Guillermo Santamarina	Mexico	Mexico		(Rocha Iturbide, n.d.-b) (Mex art database, n.d.)
	2002	Audiolab 2	Mudam Luxembourg	Luxembourg	Luxembourg	Doug Aitken & Steve Roden, Laëtitia Bénat, Curd Duca, Cameron Jamie, Dorine_Muraille, To Rococo Rot, Xavier Veilhan & David Artaud	(Mudam Luxembourg, n.d.)
	2002	Audiolab	Nordic Institute for Contemporary Arts - NIFCA				(Lang, 2004)
	2002	Audiolab	Palais de Tokyo	Paris	France		(Lang, 2004)
09/02 - 25/04	2002	Frequencies [Hz] – audio-visual spaces	Schirn Kunsthalle Frankfurt	Frankfurt	Germany	Mark Bain, Franz Pomassl, Mika Vainio, Ryoji Ikeda, Ultra-red, Carsten Nicolai, Hessischer Rundfunk hr2	(E-flux, 2002)
06/03 - 18/05	2002	New York , New Sounds, New Spaces	Musée d'Art Contemporain de Lyon	Lyon	France	David Abir, Laurie Anderson, Molly Davies, Jody Elff, John Hudak, Erik Nauman, Terry Nauheim, Susan Philipsz, Michael J. Schumacher, Stephen Vitiello, Jarryd Lowder, Janine Higgins, Zeena Parkins, Laetitia Sonami, Pauline Oliveros, William Parker, Phill Niblock	(Musée d'Art Contemporain de Lyon, n.d.)
13/03 - 16/03	2002	File sound art	City Space	Birmingham	United Kingdom	Jordan Baseman, Neil Chapman, Tim Olden, Fat, Andrew Dodds, Barbara Barron, Cumulus, Dreams of Tall Buildings, Jeremy Wulff, Karin Kihlberg, Mark Wilkinson, Norwegian Lady, Reuben, Henry Rokasayers, Rooney, Richard Whitelaw, The Hideous Green, The Young Baron, Ben Neal, MC Graham, Flaming Fire, Carya Amara, Ernesto Diaz-Infante, Felix Kubin, Aidan Baker, Sawako Kato Christopher Delaurenti	(Earthrid, n.d.)
23/03 - 06/04	2002	Two Sound Installations	Diapason	New York	United States	Michael J. Schumacher, Kim Cascone	(Diapason, n.d.-e)
04/05 -	2002	Sonic Process: A New Geography of sounds	Galerie sud, level 1 MACBA	Barcelona	Spain	Doug Aitken, Martí Guixé, Mike Kelley and Scanner, David Shea, Flow motion and Kowdo Eshun, Coldcut, Gabriel	(MACBA, n.d.)

30/06						Orozco and Tosca, Mathieu Briand, Renée Green	
15/05 – 25/05	2002	TO HEAR IS TO SEE – Art in electronic space, for example on radio art and sound sculpture	Kulturzentrum Kammgarn- Forum Vebikus	Schaffhause n	Switzerland	Robert Adrian X and Rupert Huber, AKKORD-Z (Sebastian Brandt and Robert Filler), Sam Auinger, Claus Bach, Christian Bachler Leo Kreisel-Strauss, Peter Battisti, Gottfried Bechtold, Gudrun Bielz, Moucle Blackout, Isabella Bordoni and Roberto Paci Dalò, Andres Bosschard, Warren Burt, Selim Catkin, Lucas Cejpek, Seyda Cesur, Martina Cizek and Wolfgang Musil, Matthew Claire, Marilyn Collins, Sylvia Eckerman and Mathias Fuchs, René Eisenegger and Richardas Norvila, endlich katzenersatz, Julian Feyerabend and Oskar Hummer, Rainer Ganahl, Dinah Geiger, Michael Geysersbach, Melih Görgün, Dulce Gomez, Rainer Gottemeier, Richard Graf, Dora Guzman, Herwig Hammerl and Gerd Menia, Reinhard F. Handl, Reni Hofmüller, Harald Huskava, Georg Jappe, Concha Jerez and José Iges, Arsenije Jovanovic, Margret Kreidl, Nobuo Kubota and Mark Sutherland, Julie Larssen, Reinhold Leitner, Mirko Maric, Helmut Mark, Norbert Math, Christina Meissner and Michael Geysersbach, Rafael Méndez, Kaye Mortley, Frie Moschitz, Dmitriy Nikolaev, Richardas Norvilla and Oleg Kornev, Klaus Obermaier, Catalina Peralta, Bostjan Perovsek, Claudia Plank and Hans Werner Poschauko and Andreas Karner, PLUS (Roberto Sarmiento and Gilles Charalambos), Hannes Priesch, PROTON GROUP (Agnieszka Waligorska and Pekka Siren), Natalia Pschenitschnikowa, Daping Qin, RBW21 (Fritz Fro and Gue Schmidt), Tulio Restrepo, Luis Romero, Katharina Riese, Winfried Ritsch, Friedrich Rotter, Naomi T. Salmon, Luz Maria Sánchez, Elisabeth Schimana, Gue Schmidt, Stephan A. Schmidt, Wolfgang Seierl, Andrea Sodomka and Martin Breindl, Wolfgang Sohm, Robert Spour, Erwin Stache, Ivana Stefanovic, Johannes Stöckler, Rod Summers, Mark Sutherland, Jo Thomas, Liesl Ujvary, Christine Ulm, Patricia Van Dalen, Daniel Velasco, German Vinogradov, Babette Werth and Claudia Herr, Anja Wiese, Oscar Wiggli, Yeti talks to yogi (Borges, Feyerabend, Fro, Otero), Robert Zahornicky, Lidia Zielinska	(Kunstradio, n.d.-a; Schmidt, 2002)

05/06 – 29/06	2002	Convergence- new audiovisual experiences online and offline	New Media Centre	London	United Kingdom	Julian Baker, Pelado, Stanza, Boredom Research, Andy Forbes, Squidsoup, Jey Malaiperman, Andrew Allenson, Rechord, Irirealists, Amy Alexandra, Karsten Scmitt, ixi, Golan Levin, Meso, Leafcutter John, Michaelmedia, Ian Andrews, Antionne Schmitt, Andy Wilson, Soda, Backeria, Rain Ashford, Adam Rogers, Michael Van Der Haagen, Biran Judy, Jim Andrews, Peter Luining, Sub Meta	(Cybersonica , n.d.-b)
05/06 – 08/09	2002	Lydbilleder VI – Pionerer : Else Marie Pade og Rune Lindblad	Museet for Samtidskunst	Roskilde	Denmark	Rune Lindblad, Else Pade, Carl Hausswolff	(Kullberg, 2013) (Bech, 2006)
09/06 – 25/08	2002	Resonanzen I	Stadtgalerie Saarbrücken	Saarbrücken	Germany	Paul DeMarinis, Rolf Julius, Andreas Oldörp, Ed Osborn, Miki Yui	(Bernd Schulz, 2002b)
14/06 – 07/07	2002	Cuarto Festival Internacional de Arte Sonoro - Habitat Sónico- exhibition	Ex Teresa Arte Actual, MUCA-ROMA, Galería La Colección Jumex	Mexico	Mexico	Amanda Gutiérrez, Arturo Castillo, Mario de Vega, Ivonne Domenge, Max Easley, Matt Wand; Inés Wickmann, Rosa Barba, Julio Sergio Ayala, Jorge Garibaldi Ortega, Iván Monroy, Luz María Sánchez, Hugo Lugo, Suuuuuuumanifiesto, David Castro Sopeña, Rey Paria, Vanesa Gocksc, Roberto de la Torre, Hugo Navarro, Goethe David Pontón	(Aguilar, n.d.)
15/06 – 15/09	2002	.wav	Various locations	Bruges	Belgium	Brian Eno, Coldcut, David Toop, DJ Low, Eavesdropper, Heiner Goebbels, Horst Rickels, Philip Jeck, Pierre Bastien, Scanner and students from Erasmushogeschool Brussel - Departement Rits, Le Fresnoy and Justus Liebig Universität - Institut für Angewandte Theaterwissenschaft	(.WAV, 2002)
21/06 – 31/10	2002	Sound in the Landscape	Omi International Arts Center, The Fields Sculpture Park	New York	United States	Mary and Bill Buchen, Jeffrey Lependorf, Mathew McCaslin, Jeff Talman, Paulo Vivacqua, Joshua Selman	(Omi International Arts Center, n.d.)
22/06 – 15/09	2002	Jack, Cinch & XLR : images amplifiées	Le Crestet Centre d'Art	Crestet	France	John Cage, Tacita Dean, Jeremy Deller, Douglas Gordon, Graham Gussin, Richard Kongrosian, Christian Marclay, Alexandre Perigot, Dario Robleto, Inez Van Lamsweerde, Gillian Wearing	(Chambon, 2013)
28/06 –	2002	Sign Waves/Sound Travels 2002: Sign	Art System Gallery, Centre	Toronto	Canada	Nicholas Longstaff, David Eagle	(New adventures

30/06 & 02/07 - 06/07		Waves - Phase One	Island				in sound art, n.d.-a)
05/07 - 13/07	2002	Sound Symposium: Visions of Sound - exhibition	various locations	St. John's	Canada	Gwen Boyle, Greg Locke, Simo Alitalo, Neil Rosenberg, Doug Taylor, Diana Burgoyne, Gayle Young, Rita McKeough, Bentley Jarvis	(Clark Wherry, 2013)
06/07 - 31/08	2002	The music in me, chapter 1: concerting an exhibition	Gesellschaft für Aktuelle Kunst	Bremen	Germany	Dave Allen, Aline Bouvy, John Gillis, Pavel Braila, Veaceslav Druta, Orfeus, Fanfare Ciocirlia / Asphalt Tango Production, Tony Cokes, Douglas Gordon, Alexander Gyoerfi, Annika Eriksson, Mircea FLORIAN, Illegal Art ,Petra Klusmeyer, Mike Kelley / Destroy All Monsters, Michael Lapuks, Dainius Liskevicius, Ralf Marschalleck / Joachim Tschirner, Andrei Monastirskii, Jonathan Monk, Wolfgang Müller / Die Tödliche Doris, °TMARK, Susan Philipsz, Alexander Petrelli, PLANETART, Bob & Roberta Smith / The Ken Ardley Playboys, Eran Schaerf, Ross Sinclair, Alexei Shulgin / 386 DX, SKART, Annika Ström, SUPERFLEX, Ned Sublette, Lawrence Weiner & The Persuasions, Gediminas and Nomedas Urbonas, Young-Hae Chang, Marc Voge / YOUNG-HAE CHANG HEAVY INDUSTRIES	(GAK, n.d.)
13/07 - 27/10	2002	Rouge Phosphène	Centre Régional d'art contemporain	Sète	France	Jean-Philippe Antoine, Carl Michael Von Hauuwolff, Tommi Grönlund et Petteri Nisunen, Carsten Höller, Carsten Nicolai, Leif Elggren, Russell, Monika Nyström	(Crac, n.d.)
09/08 - 01/09	2002	Cling Film installation	Kaapstad, Bruges 2002	Bruges	Belgium	AdC~/DaC~, Alejandra and Underwood, Benjamin Dousselaere, Beta-Seed, Casual Coincidence, C-drik, Contagious Orgasm, Crawl Unit, Daniel Menche, Das Synthetische Mischgewebe, Goem, Government Alpha, Guilty Connector, Günter Schroth, Imminent, Jazzkammer, Jonathon Kirk, Kasper T. Toeplitz, Kazumoto Endo, Kevueq, KK Null, Klangkrieg, Laura Maes & Kristof Lauwers, Massimo, MSBR, Roel Meelkop, R.H.Y. Yau, Roeland Luyten, Svstriaate, TMRX, Xingu Hill	
17/08 - 29/09	2002	Sign Waves/Sound Travels 2002: Sign Waves - Phase Two -	Chemistry Building, Toronto Island	Toronto	Canada	Darren Copeland, Bentley Jarvis, Vivienne Spiteri and Rob Godman, Michael Davey and Delwyn Higgins	(New adventures in sound art,

		an exhibition of sound installations	Filtration Plant, Centre Island				n.d.-b)
08/09 – 17/09	2002	Variable Resistance, Ten Hours of Sound from Australia	San Francisco Museum Of Modern Art	San Francisco	United States	Oren Ambarchi, Robbie Avenaim, Philip Samartzis, David Brown, Jim Knox, Thembi Soddell, Darrin Verhagen, Pimmon, Délire amongst others	(San Francisco Museum of Modern Art, 2013; various, 2002)
15/09 – 24/11	2002	Resonanzen II	Stadtgalerie Saarbrücken	Saarbrücken	Germany	Christina Kubisch, Bernhard Leitner, Martin Riches, Steve Roden, Andres Bosshard, Erwin Stache	(Bernd Schulz, 2002b)
28/09 – 15/12	2002	Look at the Music / SeeSound - exhibitions	Gallery Tjörnedalagården, Kabusa Konsthall, Ystads konstmuseum, Neon Gallery	Øresund region	Denmark	Åke Hodell, Anton Corbijn, Peter Brötzmann, Itsy Bitsy Teenie Weenie..., Covered Up (Staalplaat, FMP, Mego, Quakebasket, Silence, Firework editions, Geert-Jan Hobijn, Martin Kann/Bob Hund, Hedwig Eberle, Axel Dörner, Sten Sandell, Jan-Bertil Andersson, Jim O'Rourke, Christian Marclay, Martin Kippenberger, Ann Blom, amongst others), Christian Marclay	(Neon Gallery, n.d.-a)
05/10 – 26/10	2002	Bernhard Günther, Fred Szymanski	Diapason	New York	United States	Bernhard Günther, Fred Szymanski	(Diapason, n.d.-c)
16/10 /2002 – 06/01 /2003	2002/ 2003	Sonic Process: A New Geography of sounds	Centre Pompidou	Paris	France	Doug Aitken, Martí Guixé, Mike Kelley and Scanner, David Shea, Flow motion and Kowdo Eshun, Coldcut, Gabriel Orozco and Tosca, Mathieu Briand, Renée Green	(MACBA, n.d.)
03/11 – 11/11	2002	Audioframes	fabriekspand Woon & Zorg Heilig Hart	Kortrijk	Belgium	386DX, Pierre Bastien & Karel Doing, Xavier Charles, Philippe Cortens, Anouk De Clercq, Brian Eno, Manu Holterbach, Derek Jarman, Christian Marclay, Bart Maris, Philippe Monvaillier, Dominique Petitgand, Semiconductor, Alain Terlutte, Edwin van der Heide & Marnix de Nijs, Bram Vreven	(Happy New Ears, 2007)
14/12 /2002 – 08/02 /2003	2002/ 2003	Sound Art?	Librairie Florence Loewy	Paris	France	Goran Vejvoda, Pierre Belouin, Frédéric Post, Ramuntcho Matta, Jeremy Deller	(Librairie Florence Loewy, n.d.)

20/12 /2002 – 05/01 /2003	2002/ 2003	Stad/Klank/Beweging	various locations	Maastricht	The Netherlands	Bram Vreven, Paul Coenjaarts & Arno Op den Camp, Andries van Rossem, Rod Summers, Bert Lemmens & Edwin Maas, Bernadette Huybers, Patrick-Henri Burgaud, Nelis Paashuis, Hans Kockelmans, Sumire Nukina, Diana Ramaekers, Wil Peerboom, Kaspar König, Pé Okx, Bart Maris, Christof Schläger, Juul Sadée, Martien Groeneveld, Kaspar König, Paul Coenjaarts en Arno Op den Camp	
	2003	BrueckenMusik 9	Deutzer Brücke	Cologne	Germany	Guy De Bièvre, Alvin Curran, Barbara Hindahl, Mario Van Horrick and Petra Dubach, Harald Muenz, Valerian Maly and Klara Schilliger	(Koch, 2007)
	2003	Audiolab 3	Mudam Luxembourg	Luxembourg	Luxembourg	Sutekh, Frank Scurti, David Toop, The Customers (Daniel Pflumm & Kotai), Thomas Brinkmann, Domotic, AGF, Rébecca Bournigault, Circle around the Zero (Emre Sevindik)	(Mudam Luxembourg, n.d.)
17/01 – 09/03	2003	Boom Box, the art of sound	the Mills Gallery at the Boston Center for the Arts	Boston	United States	CJ T Cartiglia & Joshua Hydeman, Tracey Cockrell, Christy Georg, United States of Belt, Ravi Jain, Sean Langlais, John Mallia, Jessican Rylan, Dirk Adams, Walker, Jeff Warmouth, David Webber, Ellen Wetmore	(Stephen, n.d.)
18/01 – 21/02	2003	L'Objet Sonore	Eyedrum Art and Music Gallery	Atlanta	United States	Marshall Avett, Xavier Charles, Xan Deeb, Will Eccleston, John Mallia, Chantelle Minarcine, Kevin Jacques, Douglas Repetto, Charlie Smith, Catherine Bechard and Sabin Hudon	(Eyedrum, 2009)
22/02 – 04/05	2003	Extended play: art remixing music	Govett-Brewster Art Gallery	New Plymouth	New Zealand	Andrea Bowers, Candice Breitz, Mutlu Cerkez, Jeremy Deller, Marco Fusinato & Thurston Moore, Rodney Graham, Sean Kerr, Hilary Lloyd, Christian Marclay, Michael Parekowhai, Stephen Prina, Pipilotti Rist, Kati Rule, Scanner, Ricky Swallow, Kathy Temin, Ronnie van Hout	(Burke & Rees, 2003)
25/02 – 15/03	2003	Exposition polymachina	Théâtre de l'Agora	Evry	France	Alain Terlutte, Marie Bouchacourt, Pierre Bastien, Denys Vinzant	(Cendres la rouge, n.d.)
07/03 – 30/03	2003	Sonic Self: Sound and Video Art Immersions	Chelsea Art Museum	New York	United States	Romeo Doron Alaeff, James Avatar, Damian Catera, Chantal Claret, Ian Couch and Mighty Robot AV, Chris Cullinan/The Filter Kingz Chronic Electronic Orchestra, DanceTube, Digitelle & Carlos Granda, DJ ECON, Scotto Myckleburst, Kazuo Kawasumi, Japa Keenon, Amy Kool/Valerie Barnes, Jerzy Kubina, Dennydaniel, Mornignwood, Rosalind Schneider,	(Chelsea art museum, 2002, n.d.)

						Threat/Spiff Wiegand & Margarita Wojtek Ulrich, Monika Weiss, Samuel Zakuto/Oliver Ray, Krzysztof Zarebski/Krystyna Jachniewicz	
18/03 – 21/05	2003	Sonic Process: A New Geography of sounds	Podewil	Berlin	Germany	Doug Aitken, Marti Guixé, Mike Kelley and Scanner, David Shea, Flow motion and Kowdo Eshun, Coldcut, Gabriel Orozco and Tosca, Mathieu Briand, Renée Green	(MACBA, n.d.)
22/03 – 25/05	2003	UNDER COVER – lyd/ kunst i sociale rum	Museet for Samtidskunst	Roskilde	Denmark	Rosan Bosch, CoMa, Rune Fjord Jensen, Thierry Geoffroy, Carl Michael von Hausswolff, Brandon LaBelle, Katarina Matiassek, Ane Mette Ruge, Scanner, Stephen Vitiello, Wonderphone	(Kullberg, 2013)
01/04 – 12/04	2003	x-tract SCULPTURE MUSICALE – installationen	Podewil	Berlin	Germany	On Kawara, Rolf Langebartels, Charly Nijensohn/Ar Detroy, Charlemagne Palestine, Hildegard Westerkamp	(Podewil, n.d.)
05/04 – 17/05	2003	Now Playing	Blue Coat Gallery	Liverpool	United Kingdom	Brice Dellsperger, Volker Eichelmann, Jonathan Faiers, Roland Rust, Graham Gussin, Christian Marclay	(Blue Coat, 2013)
10/04 – 12/04	2003	[Sonic] square #7 – Into the World	Kaaitheaterstudio	Brussels	Belgium	Luuk Bouwman, Tara Herbst & Nicolas Sieben, Emily Jacir, Els Opsomer, random_inc. featuring Ran Slavin & Eran Sachs, Florian Schneider, Star 2000, Ultra-red, Jeroen Van der Stock	(Square vzw, n.d.)
23/04 – 01/11	2003	Audiolab 2	Musée national d'art moderne	Paris	France	Cameron Jamie, Doug Aitken & Steve Roden, AGF, Laetitia Bénat, To Rococo Rot, Xavier Veilhan and David Artaud	(Centre Pompidou, n.d.-a)
30/04 – 26/10	2003	TO HEAR IS TO SEE – Art in electronic space, for example on radio art and sound sculpture	Klangturm St.Poelten	St. Poelten	Austria	Robert Adrian X and Rupert Huber, AKKORD-Z (Sebastian Brandt and Robert Filler), Sam Auinger, Claus Bach, Christian Bachler Leo Kreisel-Strauss, Peter Battisti, Gottfried Bechtold, Gudrun Bielz, Moucle Blackout, Isabella Bordoni and Roberto Paci Dalo, Andres Bosschard, Warren Burt, Selim Catkin, Lucas Cejpek, Seyda Cesur, Martina Cizek and Wolfgang Musil, Matthew Claire, Marilyn Collins, Sylvia Eckerman and Mathias Fuchs, René Eisenegger and Richardas Norvila, endlich katzenersatz, Julian Feyerabend and Oskar Hummer, Rainer Ganahl, Dinah Geiger, Michael Geysersbach, Melih Görgün, Dulce Gomez, Rainer Gottemeier, Richard Graf, Dora Guzman, Herwig Hammerl and Gerd Menia, Reinhard F. Handl, Reni Hofmüller, Harald Huskava,	(Kunstradio, n.d.-a)

						Georg Jappe, Concha Jerez and José Iges, Arsenije Jovanovic, Margret Kreidl, Nobuo Kubota and Mark Sutherland, Julie Larssen, Reinhold Leitner, Mirko Maric, Helmut Mark, Norbert Math, Christina Meissner and Michael Geyersbach, Rafael Méndez, Kaye Mortley, Frie Moschitz, Dmitriy Nikolaey, Richardas Norvilla and Oleg Kornev, Klaus Obermaier, Catalina Peralta, Bostjan Perovsek, Claudia Plank and Hans Werner Poschauko and Andreas Karner, PLUS (Roberto Sarmiento and Gilles Charalambos), Hannes Priesch, PROTON GROUP (Agnieszka Waligorska and Pekka Siren), Natalia Pschenitschnikowa, Daping Qin, RBW21 (Fritz Fro and Gue Schmidt), Tulio Restrepo, Luis Romero, Katharina Riese, Winfried Ritsch, Friedrich Rotter, Naomi T. Salmon, Luz Maria Sánchez, Elisabeth Schimana, Gue Schmidt, Stephan A. Schmidt, Wolfgang Seierl, Andrea Sodomka and Martin Breindl, Wolfgang Sohm, Robert Spour, Erwin Stache, Ivana Stefanovic, Johannes Stöckler, Rod Summers, Mark Sutherland, Jo Thomas, Liesl Ujvary, Christine Ulm, Patricia Van Dalen, Daniel Velasco, German Vinogradov, Babette Werth and Claudia Herr, Anja Wiese, Oscar Wiggli, Yeti talks to yogi (Borges, Feyerabend, Fro, Otero), Robert Zahornicky, Lidia Zielinska	
08/05 – 14/06	2003	Al Lado Del Silencio	Sala Metrònom	Barcelona	Spain	Rolf Julius, Ed Osborn, Ute Safrin, Akio Suzuki	(Obiols, 2003)
15/05 – 27/06	2003	Before and After Sound	e/static	Turin	Italy	Terry Fox, Christina Kubisch, Hans Peter Kuhn, Rolk Julius, Akio Suzuki, Steve Roden, Patrice Carre, Paolo Piscitelli, Miki Yui	(E/static, 2003)
June	2003	Freq_out 1	Charlottenborg Place	Copenhagen	Denmark	JG Thirlwell, Finnbogi Pétursson, Benny Jonas Nilsen, Jana Winderen, Brandon LaBelle, Petteri Nisunen, Tommi Grlund, PerMagnus Lindborg, Hans Sydow, Jacob Kirkegaard, Mike Harding, Kent Tankred, Franz Pomassl, Carl Michael von Hausswolff	(Freq_out, 2004a)
19/06 – 21/06	2003	sound installation exhibition	Deluxe Gallery	London	United Kingdom	Birgitta Cappelen, Fredrik Olofsson & Anders-Petter Andersson, Alan Peacock, Nicole Cuschieri, Thibaud de Barmon, Medio, Mona Vatamanu & Florin Tudor, Neal	(Cybersonica, 2003)

						Coady and Earl Stanley, Nerve Theory, Markus Michael Quarta, Martin Stacey, Stuart Pound & Rosemary Norman, The Luna Nera Group, The Sancho Plan in Tokyo Plastic, Herwig Weiser	
28/06 – 18/08	2003	City sonics	Various locations	Mons	Belgium	Emilio Lopez-Menchero, Leo Kupper, Eric Van Osselaer, Guy-Marc Hinant, Alex Geddie, Dominique Leroy, DJ Olive, Arno Fabre, Bobvan, Todor Todorof, Charlemagne Palestine, Pierre Bastien, Roberto Paci Dalò, Roald Baudoux, Alain Fleischer, Jean-Paul Dessy, Emmanuel Giraud	(Philippe Frank, n.d.)
11/07 – 28/09	2003	Sounding Spaces: nine sound installations	NTT InterCommunication Center	Tokyo	Japan	Alvin Lucier, Christina Kubisch, David Cunningham, Akihiro Kubota, Rafael Toral, Edwin van der Heide, Richard Chartier & Taylor Deupree, Alejandra & Aeron, Inada Kozo (Superseat)	(ICC, n.d.)
27/07 – 31/08	2003	5th annual Sound Travels: Sign Waves	St. Andrew-by-the-Lake, Centre Island	Toronto	Canada	Garnet Willis, Alvin Lucier, Listening gallery (Stefan A. Rose)	(New adventures is sound art, n.d.)
19/08 – 13/09	2003	Audible New Frontiers	the Physics Room	Christchurch	New Zealand	Philharmonic, Richard Francis, John McCallum, Radioq u a l i a, Rachel Shearer, Wendyhouse	(Physics room, n.d.)
06/09 – 14/09	2003	33 RPM: Ten Hours of Sound from France	San Francisco Museum Of Modern Art	San Francisco	United States	Pierre Schaeffer, Michel Chion, Luc Ferrari and Jean-Claude Risset, a.o.	(SFMOMA, 2012)
20/09 – 02/11	2003	Audiolab 3	Experimenta Design, Torreão Nascente da Cordoaria Nacional	Lisbon	Portugal		(Experimenta Design, n.d.)
27/09 – 03/10	2003	Strings	hall de l'école d'architecture de la cambre	Brussels	Belgium	Alvin Lucier, Ellen Fullman, Pierre Berthet, Pierre Bastien, Paul Panhuysen, ErikM	(BRDF, 2003)
03/10 – 12/10	2003	Parcours 4	Goederenloods NMBS	Kortrijk	Belgium	Noise-Maker's Fifes, Machine Cent'ed Humanz, Pierre Berthet & Patrick Delges, STEIM, Erwin Stache	
04/10 – 05/10	2003	Audioframes – Sonic Landscapes “intimité sonore”	L'Usine des relevages des eaux	Lille	France	Jean-Louis Accetone, Pierre Bastien, Bertrand Boulanger, Marie Bouchacourt, Jacques Brodier, Raoul Binot & Thierry Devaux, Vincent Dujardin, Jean-Pierre Duplan,	(Happy New Ears, 2007)

						Benoit Deuxant, Rémy Dursin, Alain De Fillippis, Hirsute, Manu Holterbach, Jérôme Jeanmart-Jeranium, Jean-François Laporte, Lucky Kitchen, Thierry Madiot, Robin Minard, Bart Maris, Baudouin Oosterlynck, Jacques Rémus, Antoine Rousseau & Alain Chautard, Alain Terlutte, Deny Vinzant, Bram Vreven	
10/10 - 02/11	2003	The Sound of Video – Voice and Rhythm in Audiovisual Art	LAB	Copenhagen	Denmark		(TSov + Komponent, 2003)
November - February	2003/ 2004	Audiolab 3	Cité de la Musique	Paris	France		(Fevre, 2003)
19/11 - 17/12	2003	SuperSonic	RX Gallery	San Francisco	United States	Matt Heckert, Larnie Fox, Aaron Ximm, Joe Colley, Kurt Bigenho	(RX gallery, 2003)
05/12 /2003 - 10/01 /2004	2003/ 2004	Pop Rocks	Caren Golden Fine Art	New York	United States	Jesse Amado, Fia Backstrom, Ray Beldner, iona rozeal brown, William Cordova, Moyra Davey, Thomas Eller, Erik Hanson, Ryan Humphrey, Christian Marclay, Reuben Lorch-Miller, Gean Moreno, Ed Osborn, John Parker, Dario Robleto	(C. Golden, 2003)
	2004	BrueckenMusik 10	Deutzer Brücke	Cologne	Germany	Peter Behrendsen, Tiziana Bertoncini, Uli B...ttcher, Hayden Chisholm, Erhard Hirt, Seth Josel, Peter Kiefer, Hans-Peter Kuhn, Stefan Kurt, Thomas Lehn, David Moss, Joker Nies, Markus Schmickler, Peter Simon, Chao-Ming Tsung	(Koch, 2007)
10/01	2004	Sound Generation: Recording – Tradition – Politics	Experimental Intermedia, OfficeOps	New York	United States	Sound performances and art works by Ben Owen, Radio Ruido, Tom Roe, Matt Mikas, 31 Down, Greyg Filistine, Cornucopia, Marc McNulty, Ken Montgomery, Damien Catera, David Daniell, James Elliott, Teleseen Mark Bain	(Officeops, n.d.)
16/01 - 17/02	2004	The art of listening	Università “La Sapienza”, Facoltà di Architettura and RAM	Rome	Italy	Michelangelo Pistoletto, Annie Ratti, Bruna Esposito, Cesare Pietrousti, Massimo Bartolini, Mario Airò, John Körmeling, Vettor Pisani, Gert Robijns	(Zerynthia and RAM, 2007a)
13/02 -	2004	Blind Sight	Centrespace VRC Dundee	Dundee	United Kingdom	Derrick Guild, Gerald Mair, Farmhand, Moira Payne, Robert Dow, El Search, Don Paterson, Eddie Summerton,	(Dahlsten, 1994)

28/02			Contemporary Arts			Tracy MacKenna & Edwin Janssen, Arthur Watson, Mike Windle, Matt Dalziel & Louise Scullion, Beverley Hood, Dave Liddell, Neil McIntee, Mark Wallace, Luke Fowler, Andy Wake, Duncan Marquiss, Torsten Laushmann, Graeme Roger, The Weedjs, Norman Shaw, Mark Vernon, Kevin Henderson, Pauli Ahoelto & Julle Juntunen, Black Peider & Anssi 8000, Annika Dahlsten & Jukka Hiltunen, Juha Allan Ekholm, gM4, Ollipekka Kangas, Otto Kasvio, Leena Kela & Suvi Parrilla, Valter Kokot, Jani Lehto, Tuuli Lempa, Paivi Mauna & Janne Lappalainen, Tatu Metsähähti, O Samuli A, Timo Palumäki, Outi-Illusia Parviainen, Sami Pennanen, Psycho Bears, Vesa Puhakka, Jani Purhonen, Joni Pyysalo, rihmasto, ros-ka, Suonihuksisto	
10/03 – 17/04	2004	Sound and Vision	Kanaal factory	Antwerp	Belgium	Annie Ratti, Mo Becha , Alberto Garutti, David Neirings, Bruna Esposito, Massimo Bartolini, Mario Airò, William Engelen, John Körmeling, Gert Robijns	(Zerynthia and RAM, 2007c)
19/03 – 14/05	2004	Sound of Place/Place of Sound	Sun Valley Center for the Arts	Sun Valley	United States	Steve Roden, Olivia Block, Loren Chasse, David Dunn, Bill Fontana, Richard Lerman, Kaffe Mathews, Michael Barton Miller, Jesse Paul Miller, Seth Nehil, Max Neuhuas, Ed Osborn, Steve Peters, Jane Philbrick, Douglas Ross, Stephen Vitiello	(Sun Valley Center for the arts, n.d.)
24/03 – 15/04	2004	Sound Migration: an Exhibit of Sound Art and Music	Pacific Design Center	Los Angeles	United States	Bernie Krause, Pauline Oliveros, Stephen Vitiello, Fred Frith, Marina Rosenfeld, Pamela Z, a.o.	(Pacific Design Center, n.d.)
26/03 – 18/04	2004	.jpeg bild.ton.maschine	Künstlerhaus Bethanien	Berlin	Germany	Audiolab 3 (AGF, Thomas Brinkmann, The Customers (David Pflumm & Kotai), Domotic, Franck Scurti, Sutekh, David Toop), Edition EN/OF, Jack Goldstein, Renée Green, Carl Michael von Hausswolff, Friedrich Jürgensen, Mark Leckey, Liquid Architecture & Kendell Geers, Katarina Löfström, Christian Marclay, Daniel Pflumm, Mathias Poledna, Sanguineti Schneider, Mika Taanila, Mika Vainio, Jorinde Voigt	(Lang, 2004)
30/03 – 01/05	2004	New sound, New York festival – Sound Cube	The Kitchen	New York	United States	Olivia Block, Shelley Hirsch, illustrious Company: Martyn Ware/Vincent Clark, Miya Masaoka, Steve McCaffrey, Charles Morrow, Phill Niblock, Michael J. Schumacher, Scanner, Stephen Vitiello, Pamela Z.	(The Kitchen, n.d.)
02/04	2004	Blind Sight	Titanik galleria	Turku	Finland	Derrick Guild, Gerald Mair, Farmhand, Moira Payne,	(Dahlsten,

- 25/04						Robert Dow, El Search, Don Paterson, Eddie Summerton, Tracy MacKenna & Edwin Janssen, Arthur Watson, Mike Windle, Matt Dalziel & Louise Scullion, Beverley Hood, Dave Liddell, Neil McIntee, Mark Wallace, Luke Fowler, Andy Wake, Duncan Marquiss, Torsten Laushmann, Graeme Roger, The Weedjs, Norman Shaw, Mark Vernon, Kevin Henderson, Pauli Ahopelto & Julle Juntunen, Black Peider & Anssi 8000, Annika Dahlsten & Jukka Hiltunen, Juha Allan Ekholm, gM4, Ollipekka Kangas, Otto Kasvio, Leena Kela & Suvi Parrilla, Valter Kokot, Jani Lehto, Tuuli Lempa, Paivi Mauna & Janne Lappalainen, Tatu Metsähähti, O Samuli A, Timo Palumäki, Outi-Illusia Parviainen, Sami Pennanen, Psycho Bears, Vesa Puhakka, Jani Purhonen, Joni Pyysalo, rihmasto, ros-ka, Suonihuksisto	1994)
03/04 - 08/05	2004	Sound Site	Triangle project space	San Antonio	United States	Guillermo Galindo, Jorge Haro, Daniel Lara, Jorge Reyes, Manuel Rocha Iturbide, Nicolás Varchausky, Paulo Vivacqua	(Triangle Project Space, n.d.-a)
10/04 - 25/04	2004	Digital, International Sound Art Event in Helsinki - MorrowSound™ Cube	MUU Mediabase	Helsinki	Finland	Olivia Block, Shelley Hirsch, illustrious Company: Martyn Ware/Vincent Clark, Miya Masaoka, Steve McCaffrey, Charles Morrow, Phill Niblock, Michael J. Schumacher, Scanner, Stephen Vitiello, Pamela Z.	(MUU Mediabase, 2004)
24/04 - 26/06	2004	Rock's Role (After Ryoanji)	Art in General	New York	United States	Ed Tomney, Stephen Vitello, Rilo Chmielorz, Mike Hallenbeck, Michael Sunami, Masahiko Sunami, Maggi Payne, John Hudak, Gabriel Burian-Mohr, Future Remix, David Matorin, David Galbraith, Damian Catera, Brenda Hutchinson, Bernhard Gal, Barbara Held, Andrew Neuman, Michael J. Schumacher	(Art in general, n.d.)
29/04 - 05/06	2004	The sound of space	66 East, Centre for Urban Culture	Amsterdam	the Netherlands	Flatliners (Adar Friedberg, Daniel Atai, Neal Gibbs), Mark Bain, Raviv Ganchrow, Research & Development (Daniel Olsson, Jonas Topooco, Robert Olzon), Seamus Cater & Roddy Schrock, Tom Parkinson	(66 east, n.d.)
30/04 - 02/05	2004	For a long time... A festival of music, sound installation, and environmental performance	The Center for the Arts, Wesleyan University, Middletown,	Middletown	United States	Phill Niblock, John Hudak, and Michael Pestel a.o.	(Center for the arts, n.d.)

06/05 – 01/08	2004	Treble	Connecticut SculptureCenter	New York	United States	Anton Vidokle & Cristian Manzutto, Joseph Beuys, Francis Alÿs & Rafael Ortega, Grady Gerbracht, Erik Hanson, Jim Hodges, Joseph Grigely & Amy Vogel, Jorge Macchi, Euan MacDonald, Emmanuel Madan, Terry Nauheim, Max Neuhaus, Cornelia Parker, Andrea Ray, Dario Robleto, Steve Roden, David Schafer, Matt Tallichet, Mungo Thomson, Brad Tucker, Stephen Vitiello, Paulo Vivacqua	(SculptureCenter, n.d.)
13/05 – 16/06	2004	LIVE- exposition	Palais de Tokyo	Paris	France	Arnaud Maguet, Daniel Pflumm, Chicks on Speed, Sidney Stucki, Vincent Epplay, Gerwald Rockenschaub, Alexander Györfi, Richard D. James, ErikM, Janine Gordon, Stereo Total, Vincent Epplay, Annika Ström, Hsia Fei Chang, Carles Congost, Hanayo, Tobias Bernstrup, Arnaud Maguet, Martin Creed, Kyupi kyupi, DJ Spooky	(Palais de Tokyo, n.d.) (Sans, 2004)
20/05 – 30/08	2004	Shhh . . . Sounds In Space	Victoria & Albert Museum	London	United Kingdom	Cornelius, David Byrne, Elizabeth Fraser, Faultline, Gillian Wearing, Jane and Louise Wilson, Jeremy Deller, Leila Arab, Roots Manuva and Simon Fisher Turner	(Victoria and Albert Museum, 2012)
26/05 – 05/09	2004	Sonic Atmospheres – Ostseebiennale der Klangkunst	various locations along the coast		Germany	Peter Ablinger, Ulrich Eller, Bill Fontana, Christina Kubisch, Hans Peter Kuhn, Benoît Maubrey, Thomas Schulz	(Metzger, 2004)
29/05 – 18/07	2004	Space to Face	Westfälischer Kunstverein	Münster	Germany	Robert Lippok, Susan Philipsz, Peter Schumbrutzki, Stephen Vitiello	(Westfälischer Kunstverein, n.d.)
June	2004	Soundworks: For those who have ears	Art Trail	Cork	Ireland	Viv Corringham, Janek Schaeffer, Anthony Kelly & David Stalling, Lee Welch, Stanza, Danny McCarthy, Charlotte Hug, Slavek Kwi, Jennifer Walshe, Dinahbird, Neil C Smith, Felicity Ford, Linda Buckley, Fergus Dowling, Harry Moore, Joven Kerekes, Lee Welsh, Maia Ursted, Tom Ryan, David Chapman, Richard Crow, Mick O' Shea, Jopo Stereo, Jennifer Youell, Dennis McNulty, Julie Forrester, Jane Anderson, Aine Phillips, Sean Taylor, Morgan the Bouncer (K O Brien/G ua Laoghair), Gloria Monteleone, Stuart Coughlan, Beattie	(Forrester & McCarthy, 2005)
03/06 – 29/08	2004	Play it again – interactive sound installations	Neon Gallery	Brösarp	Sweden	Anders-Petter Andersson, Birgitta Cappelen, Fredrik Olofsson, Daniel Skoglund, Rikard Lundstedt, Erik Sandelin, Magnus Torstensson, Jacob Kirkegaard	(Neon Gallery, n.d.-b)

20/06 – 25/07	2004	City sonics	Various locations	Mons	Belgium		
21/06 – 25/06	2004	Soundworks	UCC Music Department, St. Vincent's Church	Cork	Ireland	Charlotte Hug, Slavek Kwi, Jane Anderson, Christos, Michas+Petros Lafazanidis, Deborah Dallyn, David Stalling & Anthony Kelly, Frances Murphy, Lee Welch, Brian Doyle, Caroline Hopkins, Thomas Norten, David Cahapman, Jenifer Youell, Megs Morley, Peter Morgan, Tom Flanagan, Ciaran O'Driscoll, Roger Gregg	(UCC, n.d.)
25/06 – 03/10	2004	Off the record / Sound Arc	ARC, Musée d'art Moderne de la Ville de Paris	Paris	France	christophe van huffel & motif_r, Florian Hecker, Goran Vejvoda, Claude Lévêque a.o.	(Musée d'Art Moderne de la Ville de Paris, n.d.)
08/07 – 18/07	2004	Sound Symposium: Visions of Sound – exhibition	various locations	St. John's	Canada	Paul Panhuysen, David Rokeby, Gayle Young, Philip Blackburn, Michael Waterman, Ken Montgomery, Manlicher Carcano	(Clark Wherry, 2013)
09/07 – 01/08	2004	KlangRaum- RaumKlang, Aspekte Internationaler Klangkunst	various locations	Cologne	Germany	S. Alitalo, T. Ankersmit, M. Bain, A. Bosshard, J. Brand, F. Dombois, M. Eastley, F. Eckhardt, M. Goldowski/N. Bewernitz, Chr. Kubisch, S. Mann, E. Osborn, B. Schülke, P. Simon, M. Wellman, M. Yui	(Kiefer & Voss, 2004)
25/07 – 05/09	2004	6th annual Sound Travels: Sign Waves	St. Andrew-by-the-Lake	Toronto	Canada	Bentley Jarvis, Stefan Rose, the listening gallery, Toronto Island sound map	(New adventures in sound art, 2004)
14/08	2004	Die lange Nacht des Hörens – Multisensorial – exhibition	unsicht-Bar Berlin	Berlin	Germany	Ursula Wunsch, Janina Göldner & Akampa de Pedroza de Lima, Wolfram der Spyra, Thomas Gerwin	(Inter art project, n.d.-a)
21/08	2004	Soundwalk	East Village Arts District	Long Beach	United states	Alan Nakagawa, Albert Ortega, Bobby June, D. Jean Hester, Eric Strauss, Everlovely Lightningheart, FLOOD, Gary Raymond, Glenn Bach & john kannenberg, Gregg Egg, hop-frog, j.frede James Adams, Jeremy Drake, Kadet Kuhne, Kate Harding, Leticia Castaneda, Loren Nerell, Mitchell Brown , Noah Thomas, Phaul, Sander Roscoe Wolff, S.E. Barnet & Hillary Mushkin, smsgap, Spastic Colon , Steven Soria, Sumako, Surrealestate, Yong Soon Min, Allan de Souza	(FLOOD, 2013a)
22/08	2004	Parcours sonore	Parc de la	Paris	France	Jacques Rémus, Jean-François Laporte, Patrice Moullet,	

			Villette			Pierre Berthet	
04/09 – 24/09	2004	Stare über Berlin	Märkisches Museum & Podewil	Berlin	Germany	Christina Kubisch, Jens-Uwe Dyffort & Roswitha Von Den Driesch, Jutta Ravenna, Wolfgang Müller, Manfred Kroboth, Jutta Konjer, Tilman Kuntzel	(Kuntzel, n.d.-b)
04/09 – 25/09	2004	Barry Weisblat, Eliane Radigue	Diapason	New York	United States	Barry Weisblat, Eliane Radigue	(Diapason, n.d.-d)
09/09 – 10/10	2004	Sonic Difference: Resounding the World	Moores Building Contemporary Art Gallery, Biennale of Electronic Arts Perth	Perth	Australia	Garth Paine, Shawn Decker, Ed Osborn, Simo Alitalo, Amy Youngs	(Sonic Objects, n.d.)
22/09 /2004 – 03/01 /2005	2004/ 2005	Sons & lumières: une histoire du son dans l'art du Xxe siècle	Centre Pompidou	Paris	France	Joseph Beuys, Boris Bilinsky, John Cage, Stuart Davis, Arthur Dove, Marcel Duchamp, Oskar Fischinger, Rodney Graham, Duncan James Grant, Brion Gysin, Raoul Hausmann, Gary Hill, Wassily Kandinsky, Paul Klee, František Kupka, Ben F. Laposky, Alexander László, Christian Marclay, Piet Mondriaan, Bruce Nauman, Yoko Ono, Georgia O'Keeffe, Nam June Paik, Francis Picabia, Jackson Pollock, Robert Rauschenberg, Hans Theo Richter, Luigi Russolo, Arnold Schönberg, Paul Sharits, Bill Viola, James Whitney, John Whitney Sr., La Monte Young, Marian Zazeela	(Duplaix & Lista, 2004)
22/09 /2004 – 17/01 /2005	2004/ 2005	Ecoute (Listen)	Centre Pompidou	Paris	France	Vincent Epplay, Douglas Edric Stanley, Antoine Denize, Rolf Julius, Peter Vogel, Robin Minard	(Centre Pompidou, n.d.-c)
08/10 – 24/10	2004	Audioframes – expo geluidsinstallaties & video	fabriekspand Woon & Zorg Heilig Hart	Kortrijk	Belgium	Kortrijk: Alejandra & Aeron, Pierre Bastien & Robert Wyatt, boutique vizique, Moniek Darge, Anouk De Clercq, Emmanuel Giraud, Ryoji Ikeda, Baudouin Oosterlynck, Horst Rickels, Hans van Koolwijk, Els Viaene, Bram Vreven	(Happy New Ears, 2007)
	2004	Audioframes – expo	Tri Postal & sound trail across the city	Lille	France	Pierre Bastien, Falter Bramnk, Pascal Battus, Xavier Charles, Oliver Carpentier, Kim Cascone, Jean-Christophe Camps, Cyclociné, Jean-Pierre Duplan, Veaceslav Druta,	(Happy New Ears, 2007)

						Jack Dangers, Arno Fabre, Jean-Luc Guionnet, Eric La Casa, Yvan Clédat, Douglas Gordon, Manu Holterbach, Frédéric Le Junter, Jean-Yves Leloup, Emilio Lopez-Menchero, Robin Minard, Thierry Madiot, Metamkine, Baudouin Oosterlynck, Qubo Gas, Jacques Rémus, Michel Redolfi, Christof Schläger, Strapontin, Erwin Stache, Li-Ping Ting, Bram Vreven, Edwin van der Heide, Verboeven, Rousseau, Chautard	
October	2004	Freq_Out 2	Henie Onstaf Kunstsenter	Oslo	Norway	JG Thirlwell, Finnbogi Pétursson, Benny Jonas Nilsen, Jana Winderen, Brandon LaBelle, Petteri Nisunen, Tommi Grlund, PerMagnus Lindborg, Maia Urstad, Jacob Kirkegaard, Mike Harding, Kent Tankred, Franz Pomassl, Carl Michael von Hausswolff	(Freq_out, 2004b)
14/10 – 30/10	2004	Blind Sight	Royal Scottish Academy	Edinburgh	United Kingdom	Derrick Guild, Gerald Mair, Farmhand, Moira Payne, Robert Dow, El Search, Don Paterson, Eddie Summerton, Tracy MacKenna & Edwin Janssen, Arthur Watson, Mike Windle, Matt Dalziel and Louise Scullion, Beverley Hood, Dave Liddell, Neil McIntee, Mark Wallace, Luke Fowler, Andy Wake, Duncan Marquiss, Torsten Laushmann, Graeme Roger, The Weedjs, Norman Shaw, Mark Vernon, Kevin Henderson, Pauli Ahopelto & Julle Juntunen, Black Peider & Anssi 8000, Annika Dahlsten & Jukka Hiltunen, Juha Allan Ekholm, gM4, Ollipekka Kangas, Otto Kasvio, Leena Kela & Suvi Parrilla, Valter Kokot, Jani Lehto, Tuuli Lempa, Paivi Mauna & Janne Lappalainen, Tatu Metsahahti, O Samuli A, Timo Palumaki, Outi-Illuusia Parviainen, Sami Pennanen, Psycho Bears, Vesa Puhakka, Jani Purhonen, Joni Pyysalo, rihmasto, ros-ka, Suonihuksisto	(Royal Scottish Academy, n.d.) (Dahlsten, 1994)
17/10 – 28/11	2004	Thinking out loud	Heide Museum of Modern Art	Melbourne	Australia	Christian Marclay, Ed Osborn, Tony Oursler, Jana Sterbak	(Heide Museum of Modern Art, 2004)
28/10 – 01/11	2004	SoundART Cologne 2004 – Klangkunst	Große Rheinsaal der Koelnmesse	Cologne	Germany	Jens Brand, Rolf Julius, Katja Kölle, Thomas Köner, José Antonio Orts, Christoph Schläger, Ralf Schreiber, Peter Simon, Jan-Peter E. R. Sonntag, Erwin Stache, Hubert Steins, Carl Vetter	(Art Cologne, 2004)
30/10	2004	Lydbilleder VII – Site	Museet for	Roskilde	Denmark	Hans Peter Kuhn, Akio Suzuki, Terry Fox, Junko Wada	(Kullberg,

- 19/12		& Sound	Samtidskunst				2013) (Bech, 2006)
08/12 - 18/12	2004	Big Noise	Artspace	Sydney	Australia	Deborah Baker, Jon Hunter, Ivan Lisyak, Peter Newman, David O'donoghue, Jasper Streit, Karen Young, Annamarie Uren	(Artspace Sydney, 2013a)
	2005	BrueckenMusik 11	Deutzer Brücke	Cologne	Germany	Maria De Alvear, Sam Ashley, Pierre Bastien, Jaap Blonk, Beth Griffith, Hlynur Hallson, Eva-Maria Kollischan, Deborah Richards, Bettina Wenzel	(Koch, 2007)
13/02 - 22/05	2005	Visual Music	Museum of Contemporary Art	Los Angeles	United States	Daniel Vladimir Baranoff-Rossiné, Mikalojus Eiuilionis, Arthur Dove, Marsden Hartley, Wassily Kandinsky, Paul Klee, František Kupka, Stanton Macdonald-Wright, Mikhail Matiushin, Georgia O'Keeffe, Francis Picabia, Man Ray, Morgan Russell, Alfred Stieglitz, Léopold Survage, Helen Torr, Henry Valensi, Stephen Beck, Jordan Belson, Mark Boyle and Joan Hills, Larry Cuba, Charles Dockum, Oskar Fischinger, Viking Eggeling, Hy Hirsh, Ludwig Hirschfeld-Mack, Len Lye, Zdenik Pešánek, Elias Romero, Hans Richter, Walter Ruttmann, Dan Sandin, Single Wing Turquoise Bird, Harry Smith, Alfred Stieglitz, James Whitney, John Whitney, John Whitney, Jr., Thomas Wilfred, Joshua White, Cindy Bernard and Joseph Hammer, Jim Hodges, Nike Savvas, Jennifer Steinkamp and Bryan Brown, Leo Villareal	(Hyun, 2005; MOCA, n.d.)
19/02 - 19/03	2005	Percussion Music	Solway Jones Gallery	Los Angeles	United States	William Anastasi, John Cage, Paul DeMarinis, Channa Horwitz, Tom Marioni, Ben Patterson, Alan Rath, Steve Reich, Steve Roden	(Solway Jones Gallery, 2005)
24/02 - 26/03	2005	TO HEAR IS TO SEE – Art in electronic space, for example on radio art and sound sculpture	YYZ Artists' Outlet	Toronto	Canada	Robert Adrian X and Rupert Huber, AKKORD-Z (Sebastian Brandt and Robert Filler), Sam Auinger, Claus Bach, Christian Bachler Leo Kreisel-Strauss, Peter Battisti, Gottfried Bechtold, Gudrun Bielz, Moucle Blackout, Isabella Bordoni and Roberto Paci Dalo, Andres Bosschard, Warren Burt, Selim Catkin, Lucas Cejpek, Seyda Cesur, Martina Cizek and Wolfgang Musil, Matthew Claire, Marilyn Collins, Sylvia Eckerman and Mathias Fuchs, René Eisenegger and Richardas Norvila, endlich katzenersatz, Julian Feyerabend and Oskar Hummer, Rainer Ganahl, Dinah Geiger, Michael Geysersbach, Melih	(Kunstradio, n.d.-a)

						Görgün, Dulce Gomez, Rainer Gottemeier, Richard Graf, Dora Guzman, Herwig Hammerl and Gerd Menia, Reinhard F. Handl, Reni Hofmüller, Harald Huskava, Georg Jappe, Concha Jerez and José Iges, Arsenije Jovanovic, Margret Kreidl, Nobuo Kubota and Mark Sutherland, Julie Larssen, Reinhold Leitner, Mirko Maric, Helmut Mark, Norbert Math, Christina Meissner and Michael Geyersbach, Rafael Méndez, Kaye Mortley, Frie Moschitz, Dmitriy Nikolaey, Richardas Norvilla and Oleg Kornev, Klaus Obermaier, Catalina Peralta, Bostjan Perovsek, Claudia Plank and Hans Werner Poschauko and Andreas Karner, PLUS (Roberto Sarmiento and Gilles Charalambos), Hannes Priesch, PROTON GROUP (Agnieszka Waligorska and Pekka Siren), Natalia Pschenitschnikowa, Daping Qin, RBW21 (Fritz Fro and Gue Schmidt), Tulio Restrepo, Luis Romero, Katharina Riese, Winfried Ritsch, Friedrich Rotter, Naomi T. Salmon, Luz Maria Sánchez, Elisabeth Schimana, Gue Schmidt, Stephan A. Schmidt, Wolfgang Seierl, Andrea Sodomka and Martin Breindl, Wolfgang Sohm, Robert Spour, Erwin Stache, Ivana Stefanovic, Johannes Stöckler, Rod Summers, Mark Sutherland, Jo Thomas, Liesl Ujvary, Christine Ulm, Patricia Van Dalen, Daniel Velasco, German Vinogradov, Babette Werth and Claudia Herr, Anja Wiese, Oscar Wiggli, Yeti talks to yogi (Borges, Feyerabend, Fro, Otero), Robert Zahornicky, Lidia Zielinska	
25/02 – 18/03	2005	Suite	Great Eastern Hotel	London	United Kingdom	Daniel Liden and George Walker, Josette Chiang, Ximena Garrido-Lecca, Taryn Takahashi, Marcus Woxneryd	(Art Happens, n.d.; Debatty, 2005)
05/03 – 26/03	2005	Tom Hamilton, Michael J. Schumacher	Diapason	New York	United States	Tom Hamilton, Michael J. Schumacher	(Diapason, n.d.-b)
23/04 – 01/05	2005	InnerEars, a series of sound installations	various locations	Kitchener, Ontario	Canada	David Rokeby, John Greyson and David Wall, Ron Kuivila, Ian Newton and Jascha Narveson, Mary-Catherine Newcomb and Leslie Wyber and Peter Hatch, John	(Open ears festival of music and

						Wynne, Tony Round	sound, 2005)
28/04 – 01/05	2005	Sonic art exhibition	Dana Center, Science museum & Encompass, The Old Truman Brewery	London	United Kingdom	I Am The Mighty Jungulator, Golan Levin, Stanza, SOMETH;NG, Troika, Anthony Elliott, Amjad Chaudry & Vijkesh Bhatt, Dave Lawrence & Joanna Hoffman	(Cybersonica , 2006b)
29/04 – 01/11	2005	Saison 2005	Klangturm	St. Pölten	Austria	Kurt Hörbst, Martin Parker, Wolfgang Fuchs, Michael Bradke, a.o.	(Sobotka, 2005)
07/05 – 25/06	2005	Aural Cultures	The Banff Centre – Walter Phillips Gallery	Banff	Canada	ARCHIVE (Chris Kubick and Anne Walsh), Jeremy Deller, Kenneth Doren, Kevin Ei-ichi deForest, Annie Martin, Christian Marclay, Daniel Olson, Santiago Sierra, Don Simmons, Su-Mei Tse	(Sawyer, 2005)
13/05 – 29/05	2005	Variations on a Silence:Projects for a recycling plant	Re-tem Tokyo Plant	Tokyo	Japan	Yasunao Tone, Christian Marclay, Kazuya Kondo, Pol Malo, 710.beppo, Kei Hirakura	(Re-tem Tokyo Plant, n.d.)
19/05 – 20/05	2005	Sound facts – artworks	Museo internazionale e biblioteca della musica di Bologna, Galleria Neon, Cinema Lumière	Bologna	Italy	Tanja Schlander, Björn Ross, Jacob Nielsen, Michael Morkolth, Brandon LaBelle, Lars Hansen	(Sound facts, n.d.)
21/05 – 25/09	2005	Itinerarios del sonido	Various locations	Madrid	Spain	Vito Acconci, Jorge E. Eielson, Julio Estrada, Luc Ferrari, Bill Fontana, Susan Hiller, Christina Kubisch, Fernando Milán, Kristin Oppenheim, João Penalva, Adrian Piper, Francisco Ruiz de Infante, Daniel Samoilovich, Trevor Wishart	(Centro Cultural Conde Duque, n.d.)
25/05 – 16/07	2005	What sound does a color make?	Eyebeam Center for Art and Technology	New York	United States	Scott Arford, Jim Campbell, D-Fuse (Kerri Elmsly, Mike Faulkner,Matthias Kispert and Andy Stiff), Granular Synthesis (Kurt Hentschlager and Ulf Langheinrich), Gary Hill, Thom Kubli, Nam June Paik and Jud Yalkut, Robin Rimbaud (a.k.a. Scanner) in collaboration with D-Fuse, Fred Szymanski, Atau Tanaka, Steina and Woody Vasulka, Stephen Vitiello	(ICI, n.d.)
12/06 –	2005	City sonics	Various locations	Mons	Belgium	Christophe Bailleau, Boris and Aliocha Van Der Avoort, Eric van Osselaer, Régis Cotentin, Isa Belle, Manuela	(City Sonics, n.d.)

31/07						Morgaine, Stevie Wishart and Joan Grounds, Philippe Moëgne-Loccoz and Hervé Bailly-Basin, Emmanuel Lagarrigue, Jon Wozencroft, Eric Pellet, Veaceslav Druta, Jérôme Deuson, Sébastien Roux, Phill Niblock, Christophe Bailleau and Julie Maréchal, Colin Ponthot, Yann Rocher and Emmanuel Rio, Pip Chodorov and Lionel Quantin, Biosphere, Christophe Honoré and Jean Couturier, Jean Couturier, Lionel Quantin, Gilles Mardirossian, SWR/HR, Daniel Dobbels, Shameh, Pfadfinderei and Modeselektor, Emilio López-Menchero, Patrick Corillon	
21/06 – 01/07	2005	Art Trail Soundworks	various locations	Cork	Ireland	Charlotte Hug, Derek Shiel, Neil C Smith, Dinah Bird and Jopo Stereo, Viv Corringham Martin Sims	(Cork city council, n.d.)
23/06 – 11/09	2005	Visual music	Hirshhorn Museum and Sculpture Garden	Washington, D.C	United States	Daniel Vladimir Baranoff-Rossiné, Mikalojus Eiuilionis, Arthur Dove, Marsden Hartley, Wassily Kandinsky, Paul Klee, František Kupka, Stanton Macdonald-Wright, Mikhail Matiushin, Georgia O’Keeffe, Francis Picabia, Man Ray, Morgan Russell, Alfred Stieglitz, Léopold Survage, Helen Torr, Henry Valensi, Stephen Beck, Jordan Belson, Mark Boyle and Joan Hills, Larry Cuba, Charles Dockum, Oskar Fischinger, Viking Eggeling, Hy Hirsh, Ludwig Hirschfeld-Mack, Len Lye, Zdeněk Pešánek, Elias Romero, Hans Richter, Walter Ruttmann, Dan Sandin, Single Wing Turquoise Bird, Harry Smith, Alfred Stieglitz, James Whitney, John Whitney, John Whitney, Jr., Thomas Wilfred, Joshua White, Cindy Bernard and Joseph Hammer, Jim Hodges, Nike Savvas, Jennifer Steinkamp and Bryan Brown, Leo Villareal	(Hirshhorn Museum, 2005; MOCA, n.d.)
24/06 – 26/06	2005	SoundART Traumzeit 2005	Pumpenhalle	Duisburg	Germany	Katja Kölle, José Antonio Orts, Hubert Steins, Jens Brand, Christof Schläger, Ralf Schreiber, Peter Simon, Jan-Peter E. R. Sonntag, Erwin Stache, Carl Vetter, Thomas Köner, Rolf Julius	(Sound art, n.d.)
01/07 – 31/07	2005	Six sites for Sound	Alma Enterprises, MOT, Fortescue Avenue	London	United Kingdom	Jem Finer, o.blaat (Keiko Uenishi), Michael J. Schumacher	(MOT international, n.d.)
24/07 –	2005	7th annual Sound Travels: New	St. Andrew-by-the-Lake	Toronto	Canada	Katie Kehoe, Richard Windeyer, Micheline Roi, Toronto island sound map, listening gallery	(New adventures

04/09		adventures in sound art Sign Waves installations					in sound art, 2005)
30/07 – 21/08	2005	Sound Art Lab 2005 vol.2 sun and escape	Osaka Harbor Red Brick Warehouse	Osaka	Japan	Umeda Tetsuya, Horio Kanta, Mohri Yuko, Yubisui Nagaharu	(OSAKA arts- aporia, n.d.)
20/08	2005	Soundwalk	East Village Arts District	Long Beach	United States	dam Willetts, Alan & Carolyn Lechusza, Albert Ortega, Andrea M. Dominguez, Ava Mendoza, Bijan Rezvani, Stanley & Jason Perecko, Bob Bellerue, Bobby June, Bruce Friedman & Scott Fraser, Carlos Giordani, Carrie Yury, D. Jean Hester, David Kendall, Eric Kabisch, Everlovely Lightningheart, FLOOD, Gary Raymond, Glenn Bach, Harry Um, Helga Fassonaki, hop-fro , j.frede, James Adams, Jed Smith, Joe Winter, Jonathan Bueno, john kannenberg, Joseph Negro, Kadet Kuhne, Leticia Castaneda, Lucy H.G., Madelyn Byrne, Michael Mufson & Molly Faulkner, Marcos Fernandes, Mark X. Farina, Mark M. McLaren, Melissa Longenecker, Mem1, Michele Jaquis, Mike Brown, Mitchell Brown, MluM, mt, Nicole C. Russell, Nina Waisman, Patricio Wolovich, phog masheeen, Redux, Robert Adam Malin, Ron Saunders, Mackenzie Bristow & Joe Tepperman, Sabine Pinkepank, Sander Roscoe Wolff, Scott Vance, Shiteasters, smgsap, Steve Roden, Sumako, Surrealestate, Susie Leonard, The Unwrinkled Ear, Tim Coster, William Leavitt & Spencer Savage, xtine , Zear	(FLOOD, 2013b)
30/08 – 05/09	2005	In Resonance	Bumbershoot Arts Festival, Seattle Center	Seattle	United States	Climax Golden Twins, Christoph Cox, Jim Haynes, Eyvind Kang, Jesse Paul Miller, Thurston Moore, Steve Peters and Christine Wallers, Steve Roden, Marina Rosenfeld, Toshiya Tsunoda, Stephen Vitiello, Jennifer West	(Krajewski, 2005)
September	2005	Sound Out	various locations	Cork	Ireland	Max Eastley, Christina Kubisch, Scanner, Akio Suzuki	(National Sculpture Factory, 2005)
09/09 – 21/10	2005	Audio Files	USF Contemporary Art Museum	Tampa	United States	Céleste Boursier-Mougenot, Christian Marclay, Stephen Vitiello	(Contemporary Art Museum,

10/09 – 29/10	2005	unsilently	Contemporary Artists Center	North Adams	United States	Steve Bradley, Che Chen, Chop Shop, Joshua Churchill, Joe Colley, Cria Cuervos, Frans De Waard, Blake Edwards, Brent Fariss, David Gross, Benjamin Gwilliam, Mike Hallenbeck, Jeff Jerman, Jason Kahn, Nick Knouf, Labycz/Spirkut Duo, Stephane Leonard, Roel Meelkop, Thomas Moore, My Fun, Matthew Sansom, Svstriae, David Wolf, Kelly Xintaris, Nick Zammuto	n.d.) (Sansom, 2005)
24/09 – 20/11	2005	B!AS – International Sound Art Exhibition	Taipei Fine Arts Museum	Taipei	Taiwan	Christina Kubisch, Edwin van der Heide, Paul DeMarinis, Alejandra & Aeron, Marc Behrens, Maywa Denki, Tina Frank, Karl Kliem, Kurokawa Ryoichi, Takagi Masakatsu	(Absolute Arts, 2012)
24/09 – 09/10	2005	Klinkende stad	various locations in the city	Kortrijk	Belgium	Pakt!, Staalplaat Soundsystem, Artificiel, Aernoudt Jacobs, Bart Vandevijvere & Spectra Ensemble, Lab[au], Thomas Köner, Alain Terlutte	(Happy New Ears, 2005)
	2005	Les Chants Mécaniques	Tri Postal	Lille	France	Peter Bosch & Simone Simons, Jean-Marcel Bisson, Boutique Vizique, Alain Chautard & Antoine Rousseau, Jean-Pierre Duplan, Tod Dockstader, Marnix De Nijs, Hirsute, Michael Northam, Ralf Nuhn & Cécile Colle, Raymond Scott, Traumabikini	(Happy New Ears, 2007)
13/10 – 20/11	2005	Sounds like drawing	The Drawing Room	London	United Kingdom	Beth Campbell, Joseph Grigely, Conor Kelly, Kaffe Matthews, Tom Marioni, Terry Nauheim, Carsten Nicolai, Robin Rhode, Steve Roden	(Drawing Room, 2003)
October	2005	freq_out 3	The Communist Party HQ	Paris	France	JG Thirlwell, Finnbogi Pétursson, Benny Jonas Nilsen, Jana Winderen, Brandon LaBelle, Petteri Nisunen, Tommi Grönlund, PerMagnus Lindborg, Maia Urstad, Jacob Kirkegaard, Mike Harding, Kent Tankred, Franz Pomassl, Carl Michael von Hausswolff.	(Freq_out, n.d.-a)
02/11 – 23/11	2005	White Noise	White Box	New York	United States	Airport War, Alexis Bhagat, Ben Owen, BRUCE MCCLURE, Damian Catera, Ellie Ga, Jeffrey Joe Nelson, JIM O'ROURKE, Joshua Fried, Julien Poirer, LoVid, Matt Bua, Matt Mikas, Matvei Yankelevich, Michelle Nagai, Radio Ruido, The Dust Dive, Tianna Kennedy, Tom Roe	(White Box, 2013a)
04/11 – 31/12	2005	What sound does a color make?	Wood Street Galleries	Pittsburgh	United States	Scott Arford, Jim Campbell, D-Fuse (Kerri Elmsly, Mike Faulkner, Matthias Kispert and Andy Stiff), Granular Synthesis (Kurt Hentschlagel and Ulf Langheinrich), Gary Hill, Thom Kubli, Nam June Paik and Jud Yalkut, Robin Rimbaud (a.k.a. Scanner) in collaboration with D-Fuse, Fred Szymanski, Atau Tanaka, Steina and Woody Vasulka,	(ICI, n.d.)

						Stephen Vitiello	
05/11 /2005 – 15/01 /2006	2005/ 2006	Playing John Cage	Arnolfini Gallery	Bristol	United Kingdom	Alvin Curran, Ryoji Ikeda, Rolf Julius, Tagaki Masakatsu, Kaffe Matthews, Carsten Nicolai, Akio Suzuki, Michael Prime, Gavin Bryars, Michael Parsons, Mieko Shiomi, Christian Wolff, John Cage	(Arnolfini, n.d.)
10/11 – 18/12	2005	Her Noise	South London Gallery	London	United Kingdom	Kim Gordon & Jutta Koether, Emma Hedditch, Christina Kubisch, Kaffe Matthews, Hayley Newman	(South London Gallery, n.d.)
24/11 – 04/12	2005	In-sonora I	Espacio Menosuno	Madrid	Spain	Mikel Arce, Íria Cagigao, Ainara del Campo, Íñigo López	(In-sonora, 2013b)
24/11 /2005 – 11/02 /2006	2005/ 2006	Thank you for the Music	Sprüth Magers Munich	Munich	Germany	John Armleder, John Baldessari, Matthew Barney, Bruce Conner, Jeremy Deller, Thomas Demand, Simon English, Cerith Wyn Evans, Sylvie Fleury, Robert Frank, Liam Gillick, Douglas Gordon, Dan Graham, Andreas Gursky, Stefan Hirsig, David Lamelas, Robert Mapplethorpe, Christian Marclay, David & Albert Maysles, Jonas Mekas, Simon Moretti, Paul Morrissey, Raymond Pettibon, Hedi Slimane, Thaddeus Strode, Wolfgang Tillmans, Banks Violette	(Sprüth Magers, n.d.)
02/12 – 18/12	2005	INFRActures: Translations between the Sonic, Spatial and Temporal	V2	Rotterdam	The Netherlands	Edwin van der Heide, Cevdet Erek, mxHz.org and STEALTH.[u]ltd	(V2, n.d.-c)
	2006	BrueckenMusik 12	Deutzer Brücke	Cologne	Germany	Akio Suzuki, An Seebach, Paul Demarinis, The Hub, Anton Lukoszevieveze, Esther Venrooy, Anne La Berge, Volker Straebel, Jozef Novotny, Giovanni Fontana	(Koch, 2007)
25/01 – 15/02	2006	Daily Noise – 22 days of sound art	LeRoy Neiman Gallery, Columbia University	New York	United States	Scanner, RadioMentale, Alejandra & Aeron, Goran Vejvoda, Michel Guillet , Jopo Stéreo, Aki Onda , _ER_A_D_A_G_E_, Serge Comte, William Furlong, Globi, Ryoji Ikeda, Stephen Vitiello, Aymeric de Tapol, Joan Schuman, Mark Vernon, Eva, Zoe Irvine, Christian Zanési, Alan Dunn & Jeff Young, Tonic Train, Pete Stollery, SI_COMM, Tereza Neuma, Dinahbird, Chris Watson, Project Dark, Alex Hamburger, Remedios Ayala + Paco Balbuena, Frederick Galiay, Mika Vainio, Vincent Epply, Cela Étant, Loris Gréaud, David Toop, Trio Cutty Sark,	(Vibrofiles, n.d.)

						Dominique Petigand, Alice de Brémont D'ars, Cyril Iepetit, Jean-Yves Leloup / Jean-Philippe Renoult, AKE HODELL, TAPE BEATLES, Goran Vejvoda, Vincent Laubeuf, Sylvain Marquis, Fred Drake, Ray Ortega, Donovan, Lou Harrison, Peter Dunn, Harold Budd/Clive Wright, Linda Sibio, Frank Zincavage, Teo Urban, Marie Lorenz, Roxanne Bartlett, Brent Lewis, Deborah Iyall and Clive Wright , Noah Purifoy, Gram Rabbit, The Sibley, Elia Arce, Ted Quinn, Guy Debord, Clark Coolidge , Laurie Anderson, Charles Amirkhanian, Guillaume Apollinaire, Louis Aragon, Antonin Artaud, Robert Ashley, Samuel Beckett, Charles Bernstein, Jaap Blonk, Christian Bok, Marcel Broodthaers, LF Celine, Jean Cocteau, Augusto DeCampos, Walter Demaria, Marcel Duchamp, Francois Dufrene, Morton Feldman, Richard Foreman, Kenneth Gaburo, Jack Goldstein, Abbie Hoffman, Hitler Jonnie, James Joyce, Klaus Kinski, Yves Klein, Joan LaBarbara, Lauren Lesko, Alan Licht, Marshall McLuhan, Charlotte Moorman, Otto Muehl, Takayuki Nakano, Ogden Nash, Ladislav Novak, John Oswald, Kristin Oppenheim, Michael Peppe, Bern Porter, Man Ray, Jim Roche, Gerhard Ruhm, Erik Satie, Michael Snow, Brian Stefans, Reese Williams, Nelson Electric Chaircut, Ferris blood, Kaihatsu Yoshiaki, Zoe Irvine, Claudia Wegener, Juan Cruz, Boyle Family, Foreign Investment, Terry Riley amongst others	
02/02 – 18/03	2006	What sound does a color make?	Center for Art and Visual Culture, University of Maryland	Baltimore	United States	Scott Arford, Jim Campbell, D-Fuse (Kerri Elmsly, Mike Faulkner, Matthias Kispert and Andy Stiff), Granular Synthesis (Kurt Hentschlagel and Ulf Langheinrich), Gary Hill, Thom Kubli, Nam June Paik and Jud Yalkut, Robin Rimbaud (a.k.a. Scanner) in collaboration with D-Fuse, Fred Szymanski, Atau Tanaka, Steina and Woody Vasulka, Stephen Vitiello	(ICI, n.d.)
03/02 – 03/05	2006	Sonic Scenery – Music for Collections	Natural History Museum of Los Angeles County	Los Angeles	United States	The Sun Ra Arkestra, Ozomatli, Autolux, Jon Hassell, Matmos, David J, Stephen Hartke, Nels Cline, Languis and Nobody	(Natural History Museum of Los Angeles County, 2006)

11/02 – 26/02	2006	Echoes From the Mountains – suoni in alta quota	Various locations	XX Olympic Winter Games, Susa Valley	Italy	Joe Diebes, Enrico Glerean, MorrowSound Cube (Charlie Morrow, Olivia Block, Steve McCaffery, Miya Masaoka, Scanner, Vlada Tomova), Stephen Vitiello, Zimmerfrei	(E-flux, 2006)
08/03 – 14/05	2006	Formes musicales et installations sonores	Musée d'Art Contemporain de Lyon	Lyon	France	Pascal Frament and Jean-François Estager and H-C. Caget and J-L. d'Aléo, Claire Renard and Esa Vesmanen, Blaise Adilon and Ensemble In & Out and Thierry Ravassard	(MAC, n.d.)
10/03 – 14/03	2006	Manifesto bianco	Diapason	New York	United States	Annie Ratti, Bruna Esposito, Michael Schumacher, Dan Graham, Phill Niblock, Stephen Vitiello, Vito Acconci	(Zerynthia and RAM, 2007b)
10/03 – 02/04	2006	Sonic Presence	Bergen Kunsthall	Bergen	Norway	Finnbogi Pétursson, Stephen Vitiello, Bernhard Lang, Susan Hiller, Janet Cardiff	(Bergen Kunsthall, n.d.)
18/03 – 29/04	2006	DEAF “From the audible to the visible”	Galerie Frank Elbaz	Paris	France	Saâdane Afif, Davide Balula, Peter Coffin, Marcelline Delbecq, Rainier Lericolais, Christian Marclay, Kaz Oshiro, Meredyth Sparks, Agnès Thurnauer, Kelley Walker	(Galerie Frank Elbaz, n.d.)
24/03 – 02/04	2006	Exit festival – Lumières sonores	Maison des Arts	Créteil	France	Terry Riley, Jimmy Lakatos & Julien Roy, Thomas McIntosh, Troika, Edwin van der Heide, Someth;ng, Alexandre Burton, Jacques Rémus, amongst others	(Girardeau, 2006)
31/03 – 02/07	2006	AUDIO, A proposal of Francis Baudevin	Cabinet des estampes	Geneva	Switzerland	Francis Baudevin, Christian Marclay, Jack Goldstein, La Monte Young, amongst others	(Cabinet des estampes, 2006)
27/04 – 01/11	2006	Klangfarben-Farbklänge	Klangturm	St. Pölten	Austria	Bernhard Gal, Elisabeth Schimanas, Rio Mauerle, Michael Bradke, a.o.	(ORF, n.d.)
08/05 – 26/05	2006	Encompass Sonic Art Exhibition	Phonica Records	London	United Kingdom	atoyfactory, Audioshaker, Fijuu, Wojceich Kosma, Michael Markert, Philip Marston, Shosei Oishi, Someth;ng, Squidsoup, Troika, untitled sound objects, Herwig Weiser, Philip Worthington, Jens Wunderling	(Cybersonica , 2006a)
12/05 – 27/05	2006	Mistral Acoustic Sound – exhibition	Artspace	Sydney	Australia	Ernie Althoff, Robbie Avenaim, Vicky Browne, Phil Dadson	(Artspace Sydney, 2013b)
18/05 – 22/05	2006	Re: Sound	Mid Pennine Gallery	Burnley	United Kingdom	Helmut Lemke, Lee Patterson and Ben Gwilliam, Max Eastley, Claus van Bebber, Steve Rhoden, Susan Matthews, the Automated Noise Ensemble amongst others	(S. Matthews, 2013)
20/05 –	2006	What sound does a color make?	Govett-Brewster Art	New Plymouth	New Zealand	Scott Arford, Jim Campbell, D-Fuse (Kerri Elmsly, Mike Faulkner, Matthias Kispert and Andy Stiff), Granular	(ICI, n.d.)

16/07			Gallery			Synthesis (Kurt Hentschlagel and Ulf Langheinrich), Gary Hill, Thom Kubli, Nam June Paik and Jud Yalkut, Robin Rimbaud (a.k.a. Scanner) in collaboration with D-Fuse, Fred Szymanski, Atau Tanaka, Steina and Woody Vasulka, Stephen Vitiello	
25/05 – 08/10	2006	Sonoric Perspectives – Ostseebiennale der Klangkunst	various locations along the coast		Germany	Simone Aaberg Kærn, Peter Ablinger, Auinger / Odland, Jens Brand, George Brecht, Johan Cage, Philip Corner, Arnold Dreyblatt, Fraucke Eckhardt, Ulrich Eller, Bill Fontana, Terry Fox, Sve-Åke Johansson, Rolf Julius, On Kawara, Thomas Köner, Christina Kubisch, Bernhard Leitner, Finnbogi Pétursson, Dieter Schnebel, Thomas Schulz, Johannes S. Sistermanns, Peter Vogel, Tim White-Sobieski and Brian Eno	(Metzger, 2006)
01/06 – 16/07	2006	Sonambiente	various locations	Berlin	Germany	Reinhard Blum/Uwe Bressnik, Jan-Peter E.R. Sonntag, Werner Reiterer, Maurice van Tellingen, Kris Vleeschouwer, Tilman Küntzel, Bernhard Leitner, Seppo Gründler, Janet Cardiff/George Bures Miller, Rolf Julius, Hans Peter Kuhn, Katja Kölle, Maria Blondeel, Dave Allen, Susan Hiller, Donatella Landi, Candice Breitz, Julian Rosefeldt, Robert Jacobsen, Alvin Curran, GUT & RIST aka GUTARIST, Jens Brand, Nicolas Collins, Stephen Vitiello, Robin Minard, Achim Wollscheid, Terry Fox, Joanna Dudley, Artur Zmijewski, Bernhard Leitner, Heinz Weber, Aernout Mik, Ulrich Eller, Robert Em Achleitner, Martin Bellardi/Anne Delakowitz, Oliver Bokan, Nathan Butler, Marlies Fuchs/Annabella Supper, Michael Graeve, Marcus Michael Kšubler, Young-Sup Kim, Satoshi Morita, Iris Rennert/Oliver Friedli, Denise Ritter, Stefan Roigk, Marcel Sšgesser, Martin Schšne, Sigtryggur Berg Sigmarsson, son:DA (Miha Horvat/Metka Golec), Dan St. Clair, Philipp Stadler, Lara Stanic, Stefan Zintel, [dy'na:mo], Christina Kubisch, Georg Klein / Steffi Weismann, David First, Ricardo Miranda Zúñiga, Alfred Behrens, Andreas Oldörp, Edwin van der Heide, studenten van Hochschule für Grafik und Buchkunst Leipzig, Ricardo Miranda, Carsten Nicolai, Miki Yui, tamtam [Sam Auinger/Hannes Strobl], Helen Mirra, Michael Muschner, Finnbogi, Bernhard Gál, Building Transmissions & Douglas Park	(De la Motte-Haber, Osterwold, & Weckwerth, 2006)

07/06 – 10/06	2006	klanglabor:zeit – exhibition	Galerie Nord	Berlin	Germany	Hartmut Andryczuk, Dorine Crass, Adam Geczy, Thomas Gerwin, Helmut Hartwig, Stephan Krass, Hermann V. Schmitt, Valeri Scherstjanoi, Ida Thonsgaard, Anna Werkmeister	(Inter art project, n.d.-d)
23/06 – 30/07	2006	City sonics	various locations in the city	Mons	Belgium	Yann Rocher & Carl Seleborg & Grégoire Carpentier, Bertrand Lamarche & Erik Minkkinen, Pierre Belouin, François Cys & Eric van Osselaer, Pierre Laurent Cassière, Optical Sound, students of ESAPV, Pierre Belouin, Alexis Destoop, Jérôme Poret, Nicolas Bralet, Lydwine Van der Hulst, Charles Pennequin, Daniel Foucard, Jérôme Game, Ane Lan, Pascal Broccolichi, Régis Cotentin, Temla Rice, Guy Marc Hinant, Alexander Mac Sween & Francis Flament, Kingsley NG, Josep-Maria Balanyà, Peter Maschke & Geert Feytons & Frédéric de Wilde, Cléa Coulsi, François Martig, Oblaat (Keiko Uenishi)	(City Sonic, n.d.-b)
06/07 – 27/07	2006	City Sonics	various locations	Avignon	France	Isa Belle, Christophe Bailleau & Martine Viale, Régis Cotentin, Jérôme Deuson, Alain GeronneZ, Eric D’Agostino & Laurence Vielle, Pascale Tison	(City Sonic, n.d.-b)
23/06 – 06/08	2006	Arsenal: artists exploring the potential of sound as a weapon	Alma Enterprises	London	United Kingdom	Rod Dickinson, Thomas Altheimer, Mattin, allsopp&weir, Tillmann Terbuyken, Thomas Baldischwyler, Jasmin Jodry, Mo Stoebe, Giorgio Agostoni, Pablo Gav, Steve Goodman	(Alma Enterprises, n.d.)
30/06 – 02/09	2006	Thank you for the music (London beat)	Sprüth Magers London	London	United Kingdom	Saadane Afif, John Armleder, John Baldessari, Ellen Cantor, Sean Dack, Walter Dahn, Jeremy Deller, Cerith Wyn Evans, Sylvie Fleury, Liam Gillick, Dan Graham, Andreas Gursky, Stefan Hirsig, Christian Holstad, David Lamelas, Los Super Elegantes, Robert Mapplethorpe, Christian Marclay, David & Albert Maysles, Jonas Mekas, Jonathan Monk, Simon Moretti, Paul Morrissey, Dave Muller, Phillipe Parreno, Raymond Pettibon, Zbigniew Rogalski, Steven Shearer, Hedi Slimane, Meredith Sparks, Mika Taanila, Wolfgang Tillmans, Keith Tyson, Xavier Veilhan, Lawrence Weiner, Charlotte Zwerin	(Sprüth Magers Berlin London, n.d.)
07/07 – 15/07	2006	Sound Symposium: Visions of Sound – exhibition	various locations	St. John’s	Canada	Ivika Kivi & Sulo Kallas, Tom Hamilton, Kathryn Burns, Janet Cardiff	(Clark Wherry, 2013)
08/07	2006	8th annual Sound	Ward’s Island &	Toronto	Canada	Barry Prophet, Robert Mulder and Kristi Allik	(New

- 01/10 /		Travels: Sign Waves Outdoor Sound Sculptures	Centre Island				adventures in sound art, 2006)
14/07 - 10/09	2006	TO HEAR IS TO SEE – Art in electronic space, for example on radio art and sound sculpture	Municipal Museum/Napol eon-House	Győr	Hungary	Robert Adrian X and Rupert Huber, AKKORD-Z (Sebastian Brandt and Robert Filler), Sam Auinger, Claus Bach, Christian Bachler Leo Kreisel-Strauss, Peter Battisti, Gottfried Bechtold, Gudrun Bielz, Moucle Blackout, Isabella Bordoni and Roberto Paci Dalò, Andres Bosschard, Warren Burt, Selim Catkin, Lucas Cejpek, Seyda Cesur, Martina Cizek and Wolfgang Musil, Matthew Claire, Marilyn Collins, Sylvia Eckerman and Mathias Fuchs, René Eisenegger and Richardas Norvila, endlich katzenersatz, Julian Feyerabend and Oskar Hummer, Rainer Ganahl, Dinah Geiger, Michael Geysersbach, Melih Görgün, Dulce Gomez, Rainer Gottemeier, Richard Graf, Dora Guzman, Herwig Hammerl and Gerd Menia, Reinhard F. Handl, Reni Hofmüller, Harald Huskava, Georg Jappe, Concha Jerez and José Iges, Arsenije Jovanovic, Margret Kreidl, Nobuo Kubota and Mark Sutherland, Julie Larssen, Reinhold Leitner, Mirko Maric, Helmut Mark, Norbert Math, Christina Meissner and Michael Geysersbach, Rafael Méndez, Kaye Mortley, Frie Moschitz, Dmitriy Nikolaev, Richardas Norvilia and Oleg Kornev, Klaus Obermaier, Catalina Peralta, Bostjan Perovsek, Claudia Plank and Hans Werner Poschauko and Andreas Karner, PLUS (Roberto Sarmiento and Gilles Charalambos), Hannes Priesch, PROTON GROUP (Agnieszka Waligorska and Pekka Siren), Natalia Pschenitschnikowa, Daping Qin, RBW21 (Fritz Fro and Gue Schmidt), Tulio Restrepo, Luis Romero, Katharina Riese, Winfried Ritsch, Friedrich Rotter, Naomi T. Salmon, Luz Maria Sánchez, Elisabeth Schimana, Gue Schmidt, Stephan A. Schmidt, Wolfgang Seierl, Andrea Sodomka and Martin Breindl, Wolfgang Sohm, Robert Spour, Erwin Stache, Ivana Stefanovic, Johannes Stöckler, Rod Summers, Mark Sutherland, Jo Thomas, Liesl Ujvary, Christine Ulm, Patricia Van Dalen, Daniel Velasco, German Vinogradov, Babette Werth and Claudia Herr, Anja Wiese, Oscar Wiggli, Yeti talks to yogi (Borges,	(Modesti, 2012)

						Feyerabend, Fro, Otero), Robert Zahornicky, Lidia Zielinska	
23/07 – 03/09	2006	8th annual Sound Travels: Sign Waves Indoor interactive Installations	St. Andrew-by-the-Lake Church, Centre Island	Toronto	Canada	Lori Beckstead, Andra McCartney, Listening Gallery, Reena Katz	(New adventures in sound art, 2006)
23/08 – 26/09	2006	VIBRA: Audio Lima Experimental: Exposición Audiogeneradores	Centro Fundación Telefónica	Lima	Peru	Marnix De Nijs and Edwin van der Heide, Valentin Yoshimoto, Audiotransito Reflex	(Jo-Anne Green, 2006)
02/09 – 08/10	2006	Östersjöbiennalen för Ljudkonst: Sonoric Perspectives	Ystads Konstmuseum	Ystad	Sweden	Rolf Julius, Christina Kubisch, Sven-Åke Johansson, Frauke Eckhardt, Benoit Maubray, Bill Fontana, John Cage, George Brecht, Sven-Åke Johansson, Hanna Hartman, Bernhard Leitner, Rolf Julius, Jens Brandt, Johannes Sistermanns, Peter Vogel, Madelene Oldeman	(Ystads kommun, 2012)
02/09 – 08/09	2006	Starfield Simulation #31– sound installations	Scaniaparken	Malmö	Sweden	Andreas Bertilsson, Johannes Heldén, Abinadi Meza, Henrik Rylander	(Gillberg, 2011)
09/09 – 14/10	2006	Invisible Geographies: New Sound Art from Germany	The Kitchen	New York	United States	Jens Brand, Christina Kubisch, Stefan Rummel, Jan-Peter E.R. Sonntag	(One art world, 2010)
14/09 – 11/11	2006	What sound does a color make?	Metropolitan State College for Visual Art	Denver	United States	Scott Arford, Jim Campbell, D-Fuse (Kerri Elmsly, Mike Faulkner, Matthias Kispert and Andy Stiff), Granular Synthesis (Kurt Hentschlager and Ulf Langheinrich), Gary Hill, Thom Kubli, Nam June Paik and Jud Yalkut, Robin Rimbaud (a.k.a. Scanner) in collaboration with D-Fuse, Fred Szymanski, Atau Tanaka, Steina and Woody Vasulka, Stephen Vitiello	(ICI, n.d.)
23/09 – 08/10	2006	Klinkende Stad	various locations in the city	Kortrijk	Belgium	John Luther Adams, Paul DeMarinis, Clea Coudsi, het Pakt!, Wim Lots, Annemie Maes, Thomas McIntosh & Mikko Hynninen & Emmanuel Madan, Anne Niemetz & Holger Foerterer, Sam Odland & Bruce Auinger, Louis Quillet & Pleix, Lynn Pook, Luea Ritter & Vincent Malstaff, CM von Hausswolff & Thomas Nordanstad, Zeroth, Héhé collectif, Swummoq	(Happy New Ears, 2006)
28/09 –	2006	In-sonora II – instalaciones	Espacio Menosuno	Madrid	Spain	Miguel Álvarez-Fernández, Stefan Kersten, Asia Piascik, Jesús Jara, Juan Sorrentino	(Arte Sonoro,

08/10							2006)
07/10	2006	Soundwalk	East Village Arts District	Long Beach	United states	3:1, Aaron Drake, Albert Ortega, Alessondro Bosetti, Arcanum, Barbez, Betsy Lohrer Hall, Bryan Ijeoma, Carlos Giffoni, Carlos Giordani, Carrie Yury, Christiaan Cruz, D. Jean Hester, Danial Nord, David Rothbaum, Doug Pearsall, Eric Kabisch, Eric Strauss, Erin & Matt Scott, FLOOD, Gary Raymond, Glenn Bach, Hans Fjellestad, Harry Um & Edmond Cho, Helga Fassonaki, hop-frog, Ian Henderson, j.frede, James N. Orsher, Jazzkammer, Jeremy Helton & Kyle Wilson, Joseph Negro, Joe Tepperman & Laura Steenberge, john kannenberg, Jonathon Grasse, Jorge Martin, Kabir Carter, Kevin Paul, Marcos Fernandes, Metal Rouge, Michael Grodsky & Robert Drummond, MluM, Noah Thomas, Phillip Curtis, Phillip Stearns & Lewis Keller, phog masheeen, Ron Saunders & Mackenzie Bristow, RS-232, smgsap, Substrate, Sumako, Surrealestate	(FLOOD, 2013c)
19/10 – 18/11	2006	Ear Appeal	WUK Kunsthalle Exnergasse	Vienna	Austria	Rashad Becker, Justin Bennett, Benjamin Bergmann, Elisabeth Grübl, Arthur Köpcke , Genesis P-Orridge , Ultra-red, Ruzska Roskalknikowa, Paula Roush/msdm, Mika Taanila , Annette Weisser	(WUK Werkstätten - und Kulturhaus, 2006)
20/10 /2006 – 21/01 /2007	2006/ 2007	The Invisible Show	Museo de Arte Contemporánea de Vigo	Vigo	Spain	Vito Acconci, Joseph Beuys, Louise Bourgeois, James Lee Byars, Janet Cardiff, Martin Creed, Luísa Cunha, Ceal Floyer, Rodney Graham, Raoul Hausmann, Juan Hidalgo, Joan Jonas, On Kawara, Antoni Muntadas, Bruce Nauman, Luigi Russolo, Julião Sarmento, Kurt Schwitters, Michael Snow, Stephen Vitiello	(Museo de Arte Contemporánea de Vigo, 2006)
29/10 /2006 – 29/01 /2007	2006/ 2007	Music Is A Better Noise	P.S.1	New York	United States	Barbara Ess, Rammellzee, Alan Vega, Richard Aldrich, Kai Althoff, Devendra Banhart, Bjorn Copeland, Kim Gordon, Rodney Graham, Tim Kerr, Jutta Koether, Mark Leckey, Christian Marclay, Thurston Moore, Chuck Nanney, Delia Gonzalez and Gavin Russom, Meredyth Sparks, Don van Vliet, Raw Sewage, Olaf Breuning, Mark Leckey, Klara Liden, Ara Peterson, Mika Tajima, amongst others	(MoMA PS1, 2012)
01/11 – 05/11	2006	SoundARTCologne 2006	Kristallsaal Koelnmesse	Cologne	Germany	Pierre-Laurent Cassière, Werner Cee, Roswitha von den Driesch & Jens-Uwe Dyffort, Marianne Greve, Hanna Hartman, Jan Jacob Hofmann, Robert Jacobsen, Timo	(Soundart, n.d.)

						Kahlen, Hans Otte, Burkard Schmidl, Peter Vogel, Miki Yui	
04/11 – 18/11	2006	Jacob Kirkegaard, Steve Heimbecker	Diapason	New York	United States	Jacob Kirkegaard, Steve Heimbecker	(Diapason, n.d.-a)
11/11 – 23/12	2006	decoupage (f l)	Blank	Turin	Italy	Vincenzo Cabiati, Carlos Casas, Terry Fox, Paolo Inverni, Rolf Julius, Hans Peter Kuhn, Dominique Petitgand, Paolo Piscitelli, Akio Suzuki, Miki Yui	(E/static, n.d.-a)
Janua ry	2007	freq_out		Chiang Mai	Thailand	JG Thirlwell, Finnbogi Petursson, Benny Jonas Nilsen, Jana Winderen, Brandon LaBelle, Maia Urstad, Jacob Kirkegaard, Kent Tankred, Franz Pomassl, Carl Michael von Hausswolff	(Freq_out, n.d.-b)
19/01 – 28/01	2007	The Air is Wet With Sound	Rekord Galleri	Oslo	Norway	Haroon Mirza, Tori Vrånes, Jacob Kirkegaard, Anna Saernblom, Calum Stirling, Camille Norment, Elisabeth McAlpine, Theo Burt, Kari Cavén, Tora Dalsend & Sverre Gullesen	(Rekord, n.d.)
31/01 – 24/02	2007	[silence]	Gigantic Artspace	New York	United states	David La Spina, Douglas Henderson, Douglas Repetto, James Woodfill, Jeroen Diepenmaat, Juan Matos Capote, Lee Ranaldo, LoVid, Matthew Burtner, Michael Graeve and Christoph, Dahlhausen, Michelle Rosenberg, Pablo Helguera, Pierre Huyghe, Stephen Vitiello, Tarikh Korula and Tianna Kennedy	(Gigantic artspace, n.d.)
01/02 – 03/03	2007	Découpage (f d)	Blank	Turin	Italy	Patrice Carré, Arnold Dreyblatt, Rolf Julius, Thomas Köner, Christina Kubisch, Steve Roden, Luca Vitone	(E/static, n.d.-b)
22/02	2007	Freq_out 7	Mucsarnok Kunsthalle	Budapest	Hungary	Tommi Grolund/Petteri Nisunen, Finnbogi Petursson, Franz Pomassl, BJNilsen, Jacob Kirkegaard, Mike Harding, Kent Tankred, JG Thirlwell, PerMagnus Lindborg, Jana Windere, Maia Urstad, Brandon LaBelle	(Freq_out, n.d.-c)
13/02 – 30/03	2007	The Sound of Things: Unmonumental Audio	New Museum	New York	United States	Anthony Burdin, Vito Acconci, Trisha Donnelly, Paul Elliman, Andy Graydon, Language Removal Services, Ulrike Müller, Nautical Almanac, Keith Obadike, Pauline Oliveros, Susan Philipsz, Seth Price, Stefan Tcherepnin	(New Museum, n.d.)
14/02 – 29/04	2007	Klang im Bild – Das Phänomen der Musik in der Bildenden Kunst der Moderne	Opelvillen	Rüsselsheim	Germany	Josef Albers, Herbert Bayer, K P Brehmer, Angela Bulloch, John Cage, Phil Corner, Hanne Darboven, Johannes Deutsch, Lyonel Feininger, Günther Fruhtrunk, Walter Giers, Hermann Goepfert, Gerhard van Graevenitz,	(Opelvillen, n.d.)

		und der Gegenwart				Gerhard Hoehme, Wassily Kandinsky, Paul Klee, Takehito Koganezawa, Jiri Kolar, Peter Loew, Heinz Mack, Ernst-Wilhelm Nay, Heinrich Neugeboren, Carsten Nicolai, Gerwald Rockenschau, Karl Peter Röhl, Kurt Schmidt, Günther Uecker, Jorinde Voigt	
03/03 – 15/04	2007	SOUND//BYTES: electronic and digital soundworlds	Edith-Russ- Haus	Oldenburg	Germany	Jens Brand, Carl Michael von Hausswolff, Yunchul Kim, Thomas Köner, Christina Kubisch, Akitsugu Maebayashi, Kaffe Matthews, Micromusic, Annina Rüst	(Edith-Russ- haus für medienkunst , n.d.)
04/03 – 13/04	2007	What sound does a color make?	University of Hawaii Art Gallery	Mānoa	Hawaii	Scott Arford, Jim Campbell, D-Fuse (Kerri Elmsly, Mike Faulkner, Matthias Kispert and Andy Stiff), Granular Synthesis (Kurt Hentschlager and Ulf Langheinrich), Gary Hill, Thom Kubli, Nam June Paik and Jud Yalkut, Robin Rimbaud (a.k.a. Scanner) in collaboration with D-Fuse, Fred Szymanski, Atau Tanaka, Steina and Woody Vasulka, Stephen Vitiello	(ICI, n.d.)
14/03	2007	Lydbank	Sparebanken Vest	Bergen	Norway	Leon Milo, Jørgen Larsson, Maia Urstad, Jana Winderen, Thorolf Thuestad and Jørgen Træen	(Lydgalleriet , n.d.-h)
18/03 – 22/04	2007	Sirens – an evolution from water, through water, to water	66 East	Amsterdam	The Netherlands	André Avelås, Mark Bain, Ralph Borland, Alec Finlay & Chris Watson, Raviv Ganchrow, Max Neuhaus	(Cubicle design, n.d.; General Public, 2008)
23/03 – 31/03	2007	Musique/visuelle 2007	Philharmonie	Luxembourg	the Grand Duchy of Luxembourg	Wolfgang Mitterer, Robert Henke, Erwin Stache, Martin Riches, Fränk Zimmer, Jens Brand	(Philharmonie, 2009)
30/03 – 22/04	2007	LARM - sound art installations	Kulturhuset	Stockholm	Sweden	Andrea Creutz & Lise Skou, Marianne Decoster-Taivalkoski, Solvej Dufour Andersen, Sachiko Hayashi, Hekla Dögg Jónsdóttir, Ursula Nistrup, Camille Norment, Anna Karin Rynander, Maia Urstad	(LARM, n.d.)
03/04 – 15/04	2007	NOISELESS: Akio Suzuki + Rolf Julius	MOMAK	Kyoto	Japan	Akio Suzuki, Rolf Julius	(MOMAK, 2007)
14/04 – 19/06	2007	Sound in Art Art in Sound	Minnesota museum of American art	Sint Paul	United States	J. Anthony Allen, Christopher Baker, Leif Brush, Shawn Decker, Matthew Garrison, Mike Hallenbeck, Helena Keeffe, Abinadi Meza, Jack Pavlik, Anne Wallace, Cheryl Wilgren Clyne	(Minnesota museum of American art, n.d.)
24/04 –	2007	InnerEars Sound Installations	various locations	Ontario	Canada	Steve Heimbecker, Michael Waterman, Sarah Peebles, Kenny Doren, Christian Calon and Chantal Dumas and	(Open ears festival of

29/04						Don Sinclair, Jascha Narveson and Grace Kary, Matt Rogalsky	music and sound, 2007)
11/05 – 13/05	2007	KRAFT-WERKE - neue Klangbiennale des Hessischen Rundfunks	Funkhaus am Dornbusch	Frankfurt	Germany	students from HfG Offenbach: Thilo Kraft, Timo Klos, Altan Eskin, Nikolas Brückmann, Anne Imhof, Patrick Raddatz, Peter Müller, Mikko Hilgert, Thilo Kraft and Christian Strobel, Jörg Maier-Rothe, Thomas Weyand, Marc Nothelfer	(HfG Offenbach, n.d.)
18/05 – 05/06	2007	Then the silence increased	Chapman Gallery, University of Salford	Salford	United Kingdom	Steve Roden, Kevin Austin, Danny Mc Carthy, Arsenje Jovanovic, Mark Wastell, Lawrence English, Jean Jacques Palix, Sascha Demand, Susanne Kessler & Petra Eichler, Jaap Blonk, Johannes S. Sistermanns, Jez Riley, RoN Schmidt, Harald Busch, Hainer Wörmann, Neil Carver, Lovid Lovid, Rafael Flores, Kirsten Reynolds, Patrick Stevens, John Jasnoch, Alexandre Decoupigny, Henning Schweichel, Lin Chi-Wie, Davide Balula, Simon Whetham, Claus van Bebber, Matthew Welton, Petri Kuljuntausta, Bob Levene, Bryce Beverlin, David Toop, Giovanni Sciarrino, Jaanika Peerna & David Rothenberg, Christopher Gladwin, Dieter Schlenso, Anthony Alston, Alan Williams, Jeph Jerman, Marco, Rob Gawthrop, Phil Minton, Coryn Smethurst, Kathleen McGowan, Peter Cusack, Donatella Berra, Nina Nasilli, Juha Valkeapää, Tony TREHY, Chris Whitehead, Helmut Lemke, Ben Gwilliam, Spencer Graham, Richard McCann, Gael Moissonnier, Daniel Barrett, Michael Vorfeld, Elisabeth Gwilliam, David Knott, Phil Davenport, Max Eastley, Jerry Gordon, Lee Patterson, Chris Butler, Steve Oliver, Markus Soukup, Manos Tsangaris, Gintas K, Coryn Smethurst, Kerry Morrison, Iris Ollschewski, Colin Fallows & John J. Campbell, Michael Hill, Matt Wand, Hervé Perez, Steve Hunt, Joe Devlin	(Gwilliam, 2007)
18/05 – 29/06	2007	Soundwaves: Sonic Art Exhibition	Kinetica Museum	London	United Kingdom	Pierre Bastien, Arcángel Constantini, Max Eastley, Julie Freeman, Andy Huntington, Lu Clarke and Jaye Ho, Martin Hesselmeier and Karin Lingnau, Michael Markett, Gavin Morris, Rob Mullender, Martin Riches, Spaceman Technologies, Peter Vogel	(Kinetica Museum, n.d.)
26/05 –	2007	Black Light/White Noise	Contemporary Arts Museum	Houston	United States	Sanford Biggers, Louis Cameron, Kianga Ford, Kira Lynn Harris, Sach Hoyt, Arthur Jafa, Jennie C. Jones, Yvette	(Contempora ry Arts

05/08			Houston			Mattern, Camille Norment, Kambui Olujimi, Karyn Olivier, Nadine Robinson, SoundLab (Beth Coleman and Howard Goldkrand), George Lewis (in collaboration with Douglas Ewart and Douglas Irving Repetto), Tom Lloyd, aBenjamin Patterson	Museum Houston, n.d.-a)
01/06 – 23/09	2007	Silence. Listen to the Show	Fondazione Sandretto Re Rebaudengo	Turin	Italy	Adel Abdessemed, Vito Acconci, Doug Aitken, Victor Alimpiev, Aphex Twin, Micol Assael, John Baldessari, Samuel Beckett, Johanna Billing, Marcel Broodthaers, John Cage, Janet Cardiff e George Bures Miller, Enrico Castellani, Martin Creed, Roberto Cuoghi, Jeremy Deller, Sussan Deyhim, Trisha Donnelly, Ceal Floyer, Gleen Gloud, Henrik Hakansson, David Hammons, Terence Hannum, William Hunt, Joris Ivens, Hassan Khan, Louise Lawler, Arto Lindsay, Christian Marclay, Matmos, Momus, Meredith Monk, Takeshi Murata, Carsten Nicolai, Luigi Nono, Kristin Oppenheim, Pan Sonic, Diego Perrone, Susan Philipsz, Stefano Pilia, Mika Ronkainen, Julian Rosefeldt, Anri Sala, Tino Sehgal, Johannes Stjärne e Ola Simmons, Karlheinz Stockhausen, Alberto Tadiello, Enzo Umbaca, Gillian Wearing, Artur Zmijewski	(Fondazione Sandretto Re Rebaudengo, n.d.)
17/06 – 16/09	2007	Im Auge des Klangs I - The Eye of Sound I	Museum Schloss Moyland	Bedburg-Hau	Germany	Maria de Alvear, Joseph Beuys, Alvin Curran, Marianne Greve, Christina Kubisch, Ronald Kuivila, Benôit Maubrey, Andreas Oldörp, Tony Oursler, Stefan Schneider, Ralf Schreiber, Erwin Stache, Miki Yui	(Stiftung Museum Schloss Moyland, n.d.)
22/06 – 25/06	2007	Expo Plymouth – sound installations	Tinside Lido & New Cooperage building & Western King Point	Plymouth	United Kingdom	Louise K Wilson, Jane Edden, School of Fish, Jon Pigott, Ben Dawson, Emily Alexander & Philip Marston, Simon Whitehead & Barnaby Oliver, Jane Grant & John Matthias, David Moss, Osamah Salem & Patrick Sanan, Lee Nutbean & Andy Way & Mark Cunaliffe, Leslie Deere, Hanna Tuulikki, Dominique Mitchel, Barrie J Davies, Holly Rumble, Sarah Angliss, Oscillatorial Binnage, Jon Aveyard & Paul Stapleton, Selina Taylor, Fudge	(Sonic arts network, n.d.)
22/06 – 29/07	2007	City sonics	various locations	Mons	Belgium	Impala Utopia (Colin Ponthot & Jérôme Abel), Dominique Petitgand, Todor Todoroff, Ramuntcho Matta, Marc Jolibois & Sébastien Llinares, Julien Poidevin, Marie de Gaulejac, Stéphane Kozik, Hélène Baucy, Sylvain Daval, Pascal Broccolichi, Jack Vandenbroele, Lynn Pook &	(City Sonic, n.d.-c)

						Julien Clauss, Yvat, Cléa Coudsi & Eric Herbin, ENSA Bourges Enseignant, Radio Free Robots, Pierre Belouin, Anne Penders, Eric Van Osselaer & François Cys	
30/06 - 09/09	2007	Thomas Köner, Jürgen Reble, Jan-Peter E.R. Sonntag, Ryoji Ikeda	de Vleeshal & de kabinetten van de Vleeshal	Middelburg	The Netherlands	Thomas Köner, Jürgen Reble, Jan-Peter E.R. Sonntag, Ryoji Ikeda	(De Vleeshal, n.d.)
01/07 - 15/09	2007	Soinu dimentsioa : erakusketa = Dimensión sonora : exposición = Sound dimension : exhibition	Koldo Mitxelena Kulturunea	Donostia-San Sebastián	Spain	Alien Productions, Mikel Arce, Andres Bosshard, Ramón González-Arroyo, Gary Hill, Tom Johnson, Donatella Landi, Bernhard Leitner, Alvin Lucier, Baudouin Oosterlynck, Paul Panhuysen, Manuel Rocha Iturbide, Isidoro Valcárcel Medina	(Gipuzkoako Foru Aldundia - Tlfnoa, 2012)
01/07 - 01/10	2007	9th annual Sound Travels	Ward's Island & Centre Island, St. Andrew-by-the-Lake Church	Toronto	Canada	Barry Prophet, Lori Beckstead and David Rose, Don Sinclair and Darren Copeland, Chantal Dumas and Christian Calon and Don Sinclair, the "Listening Gallery	(New adventures in sound art, 2007)
06/07 - 08/07	2007	Traumzeit-Festival Duisburg 2007: Künstler-Arbeiten SoundART 2007	Landschaftspark Duisburg Nord	Duisburg	Germany	Werner Cee, Roswitha von den Driesch and Jens-Uwe Dyffort, Robert Jacobsen, Pierre-Laurent Cassière, Marianne Greve, Hanna Hartman, Jan Jacob Hofmann, Timo Kahlen, Burkard Schmidl, Miki Yui	(Traumzeit, n.d.)
11/07 - 30/09	2007	Sound of Music	Broelmuseum	Kortrijk	Belgium	Art & Language, Davide Balula, Robert Barry, Angela Bulloch, John Cage, Ellen Cantor & John Cussans, Pier Giacomo & Achille Castiglioni, Cocktail Designers, Anton Corbijn, François Curlet, Jeremy Deller, Erik M, Cerith Wyn Evans, Michel François, Pierre Huyghe, Scott King, Mark Leckey, Rainier Lericolais, Christian Marclay, Vera & François Molnar, Dennis Oppenheim, Optical Sound, Susan Philipsz, Allen Ruppersberg, La Monte Young, Marian Zazeela	
12/08 - 19/08	2007	BrueckenMusik 13	Deutzer Brücke	Cologne	Germany	Edwin van der Heide, Lutz Fritsch, Martin Riches	(Koch, 2007)
01/09 - 28/10	2007	Soundsculpture	Neon gallery	Brösarp	Sweden	Lina Selander, Åsa Stjerna, Liv Strand, Daniel Palmberg, Stina Karlsdóttir Westrin, Enrico Glerean, Derek Holzer, Camilla Sørensen	(Neon gallery, n.d.-c)
07/09	2007	Klangkunstfest Mitte	Galerie Nord	Berlin	Germany	Maryna Shaparenko & Caspar Abocab, Thomas Gerwin,	(Inter art

- 16/09		>LANDSCHAFT< - Glaskasten - exhibition				Wolfgang Heyder, Ralf Hoyer, Uta Kohrs, Max E. Keller, Giovanni Longo, Seiji Morimoto, Raymon E. Müller, Siegfried Schütze, Susanne Stelzenbach, Peggy Sylopp	project, n.d.- e)
07/09 - 16/12	2007	Ensemble	Institute of Contemporary Art, Philadelphia	Philadelphia	United States	Terry Adkins, Doug Aitken, Darren Almond, John M. Armleder, Fia Backström, Harry Bertoia, Céleste Boursier-Mougenot, Angela Bulloch, Martin Creed, David Ellis, Mineko Grimmer, Tim Hawkinson, Jim Hodges, Evan Holloway, Pierre Huyghe, Paul Ramirez-Jonas, Nina Katchadourian, Martin Kersels, Jon Kessler, Katja Kölle, Yoko Ono, Dennis Oppenheim, Michelangelo Pistoletto, Carolee Schneemann, Noah Sheldon, Yoshi Wada, Angela White, amongst others	(Institute of Contempora ry Art, 2013)
14/09 - 21/10	2007	City Sonics	Various locations	Luxembourg	the Grand Duchy of Luxembourg	Tony Conrad, Francisco Lopez, Pierre Alferi, Dominique Petitgand, Ange Leccia, Kim Cascone, Aric Van Osselaer, Pierre Belouin, Pascal Broccolichi, Régis Cotentin, Dj Olive, Alexis Destoop, Jean-Paul Dessy, Todor Todoroff, Alexander Mac Sween, amongst others	(Le Gouverneme nt du Grand- Duché de Luxembourg - Ministère de l'Education nationale et de la Formation professionne lle, 2007)
15/09 - 30/09	2007	Klinkende Stad	various locations	Kortrijk	Belgium	Christina Kubisch, Audiostore & Eavesdropper, Maria Blondeel, Joanna Dudley, Arno Fabre, Aernoudt Jacobs & Francisco Lopez, Roman Kirschner, Laura Maes, François Martig, Erwin Stache, Jeroen Uyttendaele, Edwin van der Heide, Bart Vandevijvere & Laurent Rigaut	(Couvreur, 2007)
16/09 /2007 - 24/02 /2008	2007/ 2008	Voice and Void	Aldrich Contemporary Art Museum	Ridgefield	United States	Rachel Berwick, Joseph Beuys/Ute Klophaus, John Cage, Janet Cardiff and George Bures Miller, VALIE EXPORT, Anna Gaskell, Asta Gröting, Christian Marclay, Melik Ohanian, Hans Schabus, Nedko Solakov, Julianne Swartz, Cerith Wyn Evans	(The Aldrich Contempora ry Art Museum, 2013)
22/09	2007	Soundwalk	East Village Arts District	Long Beach	United States	Aaron Drake, Adam Overton, Albert Ortega, Allie Bogle and Mike Chang, Andrew Bucksbarg and Charlie Hoyt, Arcanum, Autumn Hays, Bicycle Bell Ensemble, Braden	(FLOOD, 2013d)

						Diotte, Carrie Yury, Lindsay Ljungkull and Marya Alford, Charles Erwin, Christiaan Cruz, Daniel Corral, David Kendall, David Drodge, Doug Pearsall, Elonda Billera, Erin Scott, Fret De Wilde, FLOOD, Fluorescent Grey, Gary Raymond, GirlCharlie and Monica Ryan, Hans Tammen, hop-frog, James N. Orsher, Jeff Foye and Gordon Winiemko, Jim McAuley, Joe Potts, John Kannenberg, Josh Goldman, Kate and Lee Harding, Kate Henningsen, Kevin Paul, Lewis Keller & Cat Lamb, Lindsay Foster, Luis Garcia and Matt Bridges, Madelyn Byrne, Ellen Weller and Randy Hoffman, Mannlicher Carcano, Markle and Strauss, midnight gardeners, Miha Ciglar, MLuM, Nicole C. Russell, Nina Waisman, Noah Thomas, Phillip Curtis, Phillip Stearns, phog masheeen, Redux, Robert Strong, RS-232, Sabine Pinkepank, Sander Roscoe Wolff, smgsap, Surrealestate, Thomas Anthony McDermott, Tom Skelly, Tom Sky, Tristan Shone, Tropic of Cancer, Yann Novak & Gretchen Bennett	
22/09 - 30/12	2007	Soundwaves: The Art of Sampling	Museum of Contemporary Art	San Diego	United States	Stephen Beck, Tim Bavington, Céleste Boursier-Mougenot, Helen Cohen, Collective Foundation, Jean-Pierre Gauthier, Sean Duffy, Christian Marclay, T. Kelly Mason & Diana Thater, Julio César Morales, Dave Muller, Dario Robleto, Steve Roden, Alyce Santoro, Stephen Vitiello	(Museum of Contemporary Art San Diego, n.d.)
29/09 - 14/10	2007	SKAN	Former chicory and macaroni factory opposite Arkadia park	Riga	Latvia	Jekabs Volatovskis & Peteris Brinins, Tommi Groenlund & Petteri Nisunen, John Griznich & Maxim Shentelev, Thomas Koener, Voldemars Johansons, Evelina Deicmane, Jacob Kirkegaard & Leif Elggren, Gas of Latvia	(RIXC, 2007)
11/10 - 11/11	2007	Les Chants Mécaniques	Maison Folie de Moulins, Malterie, Ustl. Lille	Lille	France	Artificiel (Alexandre Burton, Jimmy Lakatos, Julien Roy), Erwin Stache, Paul DeMarinis, Arnaud Paquotte, Don Ritter, Irmin Schmidt & Kumo, Manu Holterbach	(Lille la nuit, n.d.) (Happy New Ears, 2007)
12/10 - 30/12	2007	Sounding the Subject: Selections from the Pamela and Richard	MIT List Visual Arts Center	Cambridge	United States	Eija-Liisa Ahtila, Stan Douglas, David Hammons, Nam June Paik, Pipilotti Rist	(MIT List Visual Arts Center, n.d.)

		Kramlich Collection and the New Art Trust					
13/10 – 08/11	2007	In-sonora III – instalaciones	Espacio Menosuno, medialab prada, off limits	Madrid	Spain	Alberto C. Bernal, Fernando García, Andres Montes , Adela Sanchez, Xavier Alcacer, Edith Alonso & Antony Maubert, Isaac Cordal, Angel Faraldo, Israël Melero, Pablo Valbuena	(In-sonora, n.d.-a)
01/11 – 26/11	2007	White noise II: art works by emerging sound artists	White box	New York	United States	Ed Tomney, Eva Sjuve, James Fei, Kabir Carter, Kato Hideki, Michael Northam	(White Box, 2013b)
10/11 – 22/12	2007	This is the time (and this is the record of the time)	Blank	Turin	Italy	Michael Dean, Ettore Favini, Massimo Grimaldi, Paul Hendrikse, Tehching Hsieh, Albin Karlsson, Goran Petercol, Dominique Petitgand, Luca Vitone	(E/static, n.d.-c)
01/12 – 23/12	2007	Juleutstilling	Lydgalleriet	Bergen	Norway	Lise Herland, Audun Eriksen, Kristoffer Myskja, John Hegre, Jørgen Traeen, Lasse Marhaug, Atle Selnes Nielsen, Bjørnar Habbestad, Espen Sommer Eide, Jørgen Larsson	(Lydgalleriet , n.d.-b)
10/01 – 08/02	2008	Sonoric Ecologies – Ostseebiennale der Klangkunst	Botschaften der Nordischen Länder	Berlin	Germany	Peter Conrad Beyer, Ulrich Eller, Lisa Fjellman, Dennis Graef, Thomas Gerwin, Astrid Hagenguth, Eunhye Hwand, Mathias Kristersson, Les Femmes Savantes, Ingo Schulz, Mona Petersson, Jacob Riis, Anna Wessman, Walter Zuborg	(Metzger, 2008)
17/01 – 01/03	2008	Two Places	Ormeau Baths Gallery and the University of Limerick	Belfast, Limerick	Ireland	Michael Alcorn, Eoin Brazil, Kieran Ferris, Barbara Freeman, Anthony Kelly, Slavek Kwi, Gráinne Mulvey, Pedro Rebelo, Jürgen Simpson, David Stalling, Paul Wilson	(Moriarty & Ormeau Baths Gallery, n.d.)
20/01 – 30/03	2008	Sound of Music	Marres	Maastricht	The Netherlands	John Cage, La Mounte Young & Marian Zazeela, Pierre Huyghe, Allen Ruppersberg, Cerith Wyn Evans, George Brecht, Art & Language, Véra & François Molnar, Jan Vercruyssen, Robert Barry, Angela Bulloch, Dennis Oppenheim, Laurent Montaron, Achille & Pier Giacomo Castiglioni, François Curlet & Michel François, Manon De Boer, Jeremy Deller, Ellen Cantor & John Cussans, Scott King, Elodie Pong, Meredyth Sparks, Ryan Gander, Babak Ghazi, Black Noise	(Marres, n.d.)
26/01 – 06/04	2008	VOLUME(S)	Casino Luxembourg, Forum d'art contemporain	Luxembourg	Luxembourg	Davide Balula, Chris Bors, Julie Freeman, Iain Forsyth + Jane Pollard, Andy Huntington & Drew Allan, Yoshimasa Kato & Yuichi Ito, Olivier Millagou, The Plug, Steven Shearer, Troika, Naama Tsabar	(Casino-Luxembourg , 2012)

13/02 – 19/04	2008	To hear is to see – Art in the sphere of electronics, presented through the example of radio- art and sound sculpture – Expanded version	Triangle project space	San Antonio	United States	Robert Adrian X and Rupert Huber, AKKORD-Z (Sebastian Brandt and Robert Filler), Sam Auinger, Claus Bach, Christian Bachler Leo Kreisel-Strauss, Peter Battisti, Gottfried Bechtold, Gudrun Bielz, Moucle Blackout, Isabella Bordoni and Roberto Paci Dalò, Andres Bosschard, Warren Burt, Selim Catkin, Lucas Cejpek, Seyda Cesur, Martina Cizek and Wolfgang Musil, Matthew Claire, Marilyn Collins, Sylvia Eckerman and Mathias Fuchs, René Eisenegger and Richardas Norvila, endlich katzenersatz, Julian Feyerabend and Oskar Hummer, Rainer Ganahl, Dinah Geiger, Michael Geysersbach, Melih Görgün, Dulce Gomez, Rainer Gottemeier, Richard Graf, Dora Guzman, Herwig Hammerl and Gerd Menia, Reinhard F. Handl, Reni Hofmüller, Harald Huskava, Georg Jappe, Concha Jerez and José Iges, Arsenije Jovanovic, Margret Kreidl, Nobuo Kubota and Mark Sutherland, Julie Larssen, Reinhold Leitner, Mirko Maric, Helmut Mark, Norbert Math, Christina Meissner and Michael Geysersbach, Rafael Méndez, Kaye Mortley, Frie Moschitz, Dmitriy Nikolaev, Richardas Norvilla and Oleg Kornev, Klaus Obermaier, Catalina Peralta, Bostjan Perovsek, Claudia Plank and Hans Werner Poschauko and Andreas Karner, PLUS (Roberto Sarmiento and Gilles Charalambos), Hannes Priesch, PROTON GROUP (Agnieszka Waligorska and Pekka Siren), Natalia Pschenitschnikowa, Daping Qin, RBW21 (Fritz Fro and Gue Schmidt), Tulio Restrepo, Luis Romero, Katharina Riese, Winfried Ritsch, Friedrich Rotter, Naomi T. Salmon, Luz Maria Sánchez, Elisabeth Schimana, Gue Schmidt, Stephan A. Schmidt, Wolfgang Seierl, Andrea Sodomka and Martin Breindl, Wolfgang Sohm, Robert Spour, Erwin Stache, Ivana Stefanovic, Johannes Stöckler, Rod Summers, Mark Sutherland, Jo Thomas, Liesl Ujvary, Christine Ulm, Patricia Van Dalen, Daniel Velasco, German Vinogradov, Babette Werth and Claudia Herr, Anja Wiese, Oscar Wiggli, Yeti talks to yogi (Borges, Feyerabend, Fro, Otero), Robert Zahornicky, Lidia Zielinska	(Triangle Project Space, n.d.- b)
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23/02 - 16/03	2008	Sirens	Lydgalleriet	Bergen	Norway	André Avelås, Mark Bain, Ralph Borland, Alec Finlay & Chris Watson, Raviv Ganchrow, Max Neuhaus	(Lydgalleriet , n.d.-k)
31/03 - 04/04	2008	sound installations	Café Room at Brooklyn Lyceum	New York	United States	Micah Silver, Chris McIntyre, Olivia Block, Doug Henderson, Zeena Parkins & Doug Henderson, Leif Inge, Marina Rosenfeld, Stephen Vitiello, Miguel Frasconi, Al Margolis, Stefan Moore, Michael Schumacher, Amnon Wolman, Carl Stone, Jason Kahn, Alan Licht, Eric Nauman	(Mata festival, n.d.)
19/04 - 08/06	2008	Voice and Void	Galerie im Taxispalais	Innsbruck	Austria	Rachel Berwick, Joseph Beuys / Ute Klophaus, Janet Cardiff and George Bures Miller, John Cage, VALIE EXPORT, Anna Gaskell, Asta Gröting, Christian Marclay, Melik Ohanian, Hans Schabus, Nedko Solakov, Julianne Swartz, Cerith Wyn Evans	(Galerie im Taxispalais, n.d.)
24/04 - 02/11	2008	musik:macht:medien	Klangturm	St. Pölten	Austria	Hannes Raffaseder, Hans Tschiritsch, Irene Suchy & Markus Wintersberger, Compagnie Smafu & medienwerkstatt06	(Klangturm, n.d.-d)
27/04 - 26/10	2008	Nature et Sons	domaine du château de Seneffe	Seneffe	Belgium	Bob Verschuere, Christina Kubisch, Baudouin Oosterlynck, Paul Panhuysen, Erik Samakh, Pierre Berthet	(Domaine du château de Seneffe, 2008)
09/05 - 10/05	2008	Test Tone – sound and image	Musikhuset Aarhus	Aarhus	Denmark	Scott Arford, Nicole Cohen, Leif Elggren, Lawrence English, CM von Hauswolff & Thomas Nordanstad, Jacob Kirkegaard, Brandon LaBelle, Steve Roden, Annette Stahmer, Tanja Vujanovic, James Webb	(Brandon LaBelle, n.d.)
17/05 - 05/07	2008	Sound of Music	Espace 36	Saint Omer	France	John Cage, La Monte Young & Marian Zazeela, Pierre Huyghe, Allen Ruppersberg, Cerith Wyn Evans, George Brecht, Art & Language, Véra & François Molnar, Jan Vercruyssen, Robert Barry, Angela Bulloch, Dennis Oppenheim, Laurent Montaron, Achille & Pier Giacomo Castiglioni, François Curlet & Michel François, Manon De Boer, Jeremy Deller, Ellen Cantor & John Cussans, Scott King, Elodie Pong, Meredyth Sparks, Ryan Gander, Babak Ghazi, Black Noise	(Espace 36, n.d.; Teerlinck, 2008)
05/06 - 01/10	2008	10th annual Sound Travels	various location	Toronto	Canada	Chantal Dumas, Allik & Mulder, Peebles & King & Borros & Cruickshank, Jennifer Schmidt, Colin Asquith, and Terry Nauheim	(New adventures in sound art, 2008)
06/06	2008	Music To My Eyes	F.U.E.L.	Philadelphia	United	Kate Tessa Lee, Betsey Biggs, Jessica Feldman, Preston	(The f.u.e.l.)

- 28/07			Collection		States	Poe, Ed Osborn, Seth Kim-Cohen, Jennifer Schmidt, John Kannenberg	collection, n.d.)
22/06 - 29/06	2008	BrueckenMusik 14 ²⁶¹	Deutzer Brücke	Cologne	Germany	Takehisa Kosugi, Hiroko Ichihara and Shinichi Yanai, Yukio Fujimoto	(Brueckenmusic, n.d.)
22/06 - 27/07	2008	City Sonic	Various locations	Mons	Belgium	Christian Vialard, Denys Vinzant, Cléa Coudsi & Eric Herbin, Impala Utopia, Cécile Cozzolino & Séverine Faramond, Emmanuelle Vincent, Yann Rocher, Christophe Bailleau & Julie Maréchal, Perrine Joveniaux,	(City Sonic, n.d.-d)
01/07 - 05/07	2008	Tuned City – installations	Various locations	Berlin	Germany	Sam Auinger & magma architecture, Mark Bain and b&k, Arno Brandlhuber, Jens-Uwe Dyffort / Roswitha von den Driesch, Raviv Ganchrow, Nik Hummer, raumlaborberlin, Will Schrimshaw, John Grzinich, Julien Clauss, Aernoudt Jacobs, Akio Suzuki, Ulrich Eller, Brandon LaBelle	(Tuned City, n.d.)
01/07 - 14/07	2008	Sirens – an evolution from water, through water, to water	General Public	Berlin	Germany	André Avelãs, Mark Bain, Ralph Borland, Alec Finlay & Chris Watson, Raviv Ganchrow, Max Neuhaus	(General Public, 2008)
03/07 - 13/07	2008	Sound Symposium: Visions of Sound – exhibition	various locations	St. John’s	Canada	Millie Chen & Warren Quigley, Tanja Hemm, Kristen Roos, Gayle Young, Reinhard Reitzenstein	(Clark Wherry, 2013)
04/07 - 06/07	2008	Expo Brighton	Lighthouse & The Basement	Brighton	United Kingdom	Sarah Angliss, Parkinson Saunders, Lgamble, Solaference, Paul Starling, Goldsmiths Electronic Orchestra, Neo-Futurist Collective, Iris Garrelfs, ARCO collective, Nine Owls in a Baguette, Bathysphere, Eugene Perera, Quartet Electronische, Audialsense, Mark Benton , Seth Brignell, Andi Chapple, Leslie Deere, Andrew Dolphin, Thomas Hall, Linda Himbert, Kristina Howell, Manishima Ico, Tim Manning, Dawn Scarfe, Holger Zschenderlein & Chris Rose, Felicity Ford and Mundane Appreciation, Bret Battey, Jen-Kuang Chang, Cécile Chevalier, Celia Eid, Nick Cope & Tim Howle, Heather Phillipson, Tilman Küntzel and Esther Johnson	(Küntzel, n.d.-a)
17/07	2008	Sonic Self, an	Chelsea Art	New York	United	David Marcus Abir, Mikhaïl Acrest, Paul Amlehn and	(Chelsea art

²⁶¹ *Brueckenmusic 15* is not part of this overview as only works by Maryanne Amacher were exhibited. (Brueckenmusic, n.d.)

- 30/08		exhibition exploring sound-related art	Museum		States	Robert Fripp , Damian Catera, DJ Olive, Phil Dadson, Fiorentina De Biasi, Anna Frants and CylandMedialab, Ivan Govorkov and Elena Gubanova, Timur Kuyanov, Melissa Lockwood, Lisa Moren, Shelby Voice and Virgil Wong, Romeo Alaeff, Christian Austin, Natalie Bewernitz and Marek Goldowski, Dmitri Bulnigin, Phil Dadson, Denny Daniel, Jarret Egan, Hasan Elahi, Anna Frants, Frankie Hutton, Steve Jones, Andrea Juan, Kit Krash, Anna Kolosova, Katka Konecna, Amy Cohen Banker and Amy Kool and Nigel Dickie, Olga M, Scotto Mycklebust, Alexandra Lerman, Natalia Lyakh, Eugene Rodriguez, Mirosław Rogala, Dmitri Shubin, Maria Sharafutdinova, Kirill Shuvalov, Srinivasan, Pawel Wojtasik and Jarek Zajac	museum, 2012)
19/07 - 12/10	2008	Sound of art : Musik in der Bildenden Kunst : les grands spectacles III	Museum der Moderne	Salzburg	Austria	Luigi Russolo, John Cage, Nam June Paik, a.o.	(Jo-Anne Green, n.d.)
13/08 /2008 - 05/01 /2009	2008/ 2009	Looking at music	The museum of modern art	New York	United States	Laurie Anderson, The Beatles, Wallace Berman, David Bowie, John Cage, Captain Beefheart (Don Van Vliet), Lucinda Childs, Bruce Conner, Devo, Ray Johnson, Joan Jonas, Bruce Nauman, Yoko Ono, Nam June Paik, Otto Piene, Steve Reich, The Residents, Jack Smith, Michael Snow, Robert Whitman, Robert Wilson	(The museum of modern art, n.d.-b)
15/08 - 17/08	2008	AS - Feria de Arte Sonoro - exposition	La Respuesta	San Juan	Puerto Rico	Rebecca Adorno, Rosamary Berríos Hernández, Luis Rafael Berríos Negrón & Eric Adamsons Bodo, G. Nemyr Canals, Carola Cintrón Moscoso, Papo Colo, Jorge "Rito" Cordero, Celso González, Elveen González, numé/Tony González Walker, AHD (Ariel Hernández Domenech) & Error 01 (Germán Vázquez), Karlo Andrei-Ibarra, Charles Juhász-Alvarado & Fabián Vélez, Teo Freytes, Adál Maldonado, Natalia Martínez, Raphael Montañez Ortiz, Jacob Morales Marchosky, Omar Abdulio Peña Forty, Jacob Morales Marchosky, Omar Abdulio Peña Forty, Araceli Pino, Marisol Plard, Joel "Yoyo" Rodríguez, Francisco J. Torres, José Luis Vargas & José Luis Baerga, Rafael A. Vargas Bernard, W&N (Walter "Tito" Fernández & Nani Alvarez)	(Ladner, n.d.)
29/08	2008	Festival Klanken aan	Muziekgebouw	Amsterdam	The	Ray Lee, Arno Fabre, Mogens Jacobsen, Mendel Hardeman	(Muziek

- 07/09		't IJ	aan 't IJ & Pakhuis de Zwijger		Netherlands		Centrum Nederland, n.d.)
06/09 - 12/10	2008	Interface – ljud, ord och bild	Ystads konstmuseum	Ystad	Sweden	Ulrich Eller, Lisa Fjellman, Mathias Kristersson, Mona Petersson, Jakob Riis, Anna Wessman, Raed Yassin	(Ystads kommun, 2013)
13/09 - 28/09	2008	Klinkende Stad	various locations	Kortrijk	Belgium	de klankspeeltuinen, Clea Coudi & Eric Herbin, Stefaan Quix, Mieke Lambrigts, Michael Graeve, Ludo Engels, Jakob Kirkegaard, Aifoon, Minoru Sato, Steve Roden, Sofia Bustorff, The Freq_out Orchestra, Hans-Peter Kuhn, eRikm, students of Sint Lucas Gent	(Happy New Ears, 2008)
19/09 - 09/11	2008	Sound:Space	South Hill Park	Bracknell	United Kingdom	Max Eastley, Wil Bolton, Dawn Scarfe, Katherine Skeldon, Johanna Hallsten, Ellen Sylvarnes, Andrew Dodds	(Franklin, 2008)
20/09	2008	Soundwalk	East Village Arts District	Long Beach	United States	Aaron Drake, Adam Fong, Amy Ling Huynh, Andrew Johnson, Bekkah Walker, Betsy Lohrer Hall, c.t. anderson, Carlin Wing, Clay Chaplin, D. Jean Hester, David P. Earle, Double Blind, Eric Lindley & Dave Mickey, Eric Strauss, FINISHING SCHOOL COLLECTIVE, FLOOD, Francene Kaplan, G. Douglas Barrett, Gary Raymond, Gintas K, Hans Tammen, inLimen, j.frede, Jeff Foye and Gordon Winiemko, Jeff Rau, Joe Cantrell, Joe Newlin, Joe Tepperman, John Kannerberg, John P. Hastings, Jose Juarez and Divine Brick Research Projects, Julia Holter, Lewis Keller & Phillip Stearns, Karen Crews & Carl Off, Madelyn Byrne, Randy Hoffman & Ellen Weller, Mark Trayle, Megan Madzoeff, Metal Rouge, MluM, Object Control, Ori Barel, OTONOMIYAKI, Phil Curtis, phog masheeen, Reduced Listening Ensemble, Robert Martin & John M. Kennedy, Robert Malin, Robot Repair Projects, S.S. "SEATBELT" McLean, Sander Roscoe Wolff & Matthew O'Donnell, Small Drone Orchestra, smsgap, Steve Craig, Stuart Sperling, SUBLAMP, Super Minerals, The Hop-Frog Collectiv & Friends, The Carolyn Duo, Vincent Olivieri, UEM, Yann Novak	(FLOOD, 2013 ^o)
27/09 /2008 -	2008	The Marfa Sessions – Sounds across town: Marfa, Texas	Various locations	Marfa	United States	Kaffe Matthews, Nina Katchadourian, Christina Kubisch, Deborah Stratman & Steven Badgett, Steve Roden & Stephen Vitiello, Steve Rowell, Simparch	(The Marfa sessions, n.d.)

01/02 /2009							
02/10 /2008 – 24/01 /2010	2008/ 2009/ 2010	The Morning Line: Sevilla	Centro Andaluz de Arte Contemporáneo	Seville	Spain	Bryce Dessner, David Sheppard & Evan Ziporyn, Lee Ranaldo, Jónsi & Alex, Thom Willems, Mark Fell & Roc Jiménez de Cisneros, Bruce Gilbert, Chris Watson, Florian Hecker	(Thyssen- Bornemisza Art Contempora ry, n.d.-b)
08/10 – 06/11	2008	In-sonora IV – instalaciones	Espacio Menosuno, medialab prado, IED Madrid, Off Limits	Madrid	Spain	Alfredo Morte, Juan Caño, Eduardo Chao, Alejandro González Novoa, Alicia Grueso, Pedro Palhares, Unai Requejo, La Trintxera, Colectivo en Construcción, Bruno Mateos, Younes Baba-Ali, Escoitar.org	(In-Sonora, 2013c)
10/10 – 26/10	2008	Sound of Music	Tri Postal	Lille	France	John Cage, La Mounte Young & Marian Zazeela, Pierre Huyghe, Allen Ruppersberg, Cerith Wyn Evans, George Brecht, Art & Language, Véra & François Molnar, Jan Vercruyssen, Robert Barry, Angela Bulloch, Dennis Oppenheim, Laurent Montaron, Achille & Pier Giacomo Castiglioni, François Curlet & Michel François, Manon De Boer, Jeremy Deller, Ellen Cantor & John Cussans, Scott King, Elodie Pong, Meredyth Sparks, Ryan Gander, Babak Ghazi, Black Noise	(Khazam, 2008; Teerlinck, 2008)
17/10 – 15/11	2008	Internationales Klangkunstfest farb_laut – exhibition	Galerie Nord	Berlin	Germany	Christina Kubisch, Adam Geczy, Thomas Gerwin, Hauke Harder, Douglas Henderson & David Brody, Seiji Morimoto, Wolfgang Spahn	(Inter art project, n.d.- c)
29/10 – 02/11	2008	SoundART 2008	WDR Funkhaus	Cologne	Germany	Thomas Taxus Beck, William Engelen, Thomas Gerhards, Rolf Giegold, Christina Kubisch, Nicole Pawlowski, Gerriet K. Sharma, Peter Simon, Johannes S. Sistermanns, Jan-Peter E.R. Sonntag, Peggy Sylopp & Giovanni Longo, tamtam (Sam Auinger & Johannes Strobl)	(SoundART, n.d.-a)
09/11 /2008 – 23/02 /2009	2008/ 2009	Im Auge des Klangs II – The Eye of Sound II	Museum Schloss Moyland	Bedburg- Hau	Germany	Anja Kempe, Susanne Kutter, Tina Tonagel	(Museum Schloss Moyland, n.d.)
18/11 /2008 –	2008/ 2009	The headphones show	Abrons Arts Center	New York	United States	Vito Acconci, Andre Avelas, Betsey Biggs, Viv Corringham, Barbara Ess, Christina Kubisch, Abinadi Meza, Tristan Perich, Seth Price	(Abrons Arts Center, 2012)

09/01 /2009							
18/11 /2008 – 17/01 /2009	2008/ 2009	Co-Circuit	galerie Schirman & de Beaucé	Paris	France	Cécile Beau, Sébastien Caillat, Cléa Coudsi & Eric Herbin	(Schirman et de Beaucé, n.d.)
20/11 – 31/11	2008	Holiday in Arcadia	Lydgalleriet	Bergen	Norway	Catherine Bolduc, Jean Carn & Larry Levan, Mai Hofstad Gunnes & Ryuichi Sakamoto, Bjørn-Kowalski Hansen, Kristin Nordhøy, Martin Skauen, Sex Tags, Øystein Aasan	(Lydgalleriet , n.d.-g)
27/11 – 30/11	2008	Audio Forensics	IMT Gallery	London	United Kingdom	Libero Colimberti, Jan Hendrickse, Simone Izzi, Nitin Lachhani, Luc Messinezis, Maria Papadomanolaki, Vytis Puronas, Mark Shorey, Mark Wrigh	(Electra, 2008)
04/12 – 23/12	2008	Piksel 08 – code dreams	Lydgalleriet	Bergen	Norway	Tristan Perich & Kunal Gupta & Katie Shima, Jan Carleklev, Ben Bogart, Martin Aaserud	(Lydgalleriet , n.d.-j)
12/12 /2008 – 22/02 /2009	2008/ 2009	Sound Time Material	Château des Adhémar – Centre d'art contemporain	Montélimar	France	Sylvia Bossu, Jannis Kounellis, Bernhard Rüdiger & Gilles Grand, Anri Sala, Benjamin Seror	(Les Châteaux de la Drôme, 2008)
16/01 – 15/02	2009	Composers in space	Lydgalleriet	Bergen	Norway	Bjørn Erik Haugen, Arnt Håkon Ånesens, Bjørn Thomas Melhus, Therese Birkelund & Jørgen Karlstrøm, Raymond Ingar Berge, Henrik Marstrander	(Lydgalleriet , n.d.-c)
05/02 – 28/03	2009	Every Sound You Can Imagine	New Langton Arts	San Francisco	United States	William Basinski, Wallace Berman, John Cage, Cornelius Cardew, Bruce Conner, Alvin Curran, Paul Dresher, Morton Feldman, Philip Glass, Ryoji Ikeda, Gyorgy Ligeti, Christian Marclay, Barry McGee, Phill Niblock, Carsten Nikolai, Raster-Noton, Steve Reich, Terry Riley, Steve Roden, Karlheinz Stockhausen, Morton Subotnick, Miko Vainio. Stephen Vitiello, Iannis Xenakis, a.o.	(New Langton Arts, 2009)
27/02 – 29/03	2009	Sound – a Subtropics 20 sound art exhibition	Bass museum of art	Miami beach	United States	Alvin Lucier, Gustavo Matamoros, David Dunn, George Lewis & Douglas Ewart & Douglas Repetto, Alison Knowles, Tomas Schmit, Brenda Hutchinson, Duane Brant, Chris Mann, Russell Frehling, Lou Mallozzi, Tom Hamilton, Phill Niblock, Armando Rodriguez, Davey Williams, Richard Kostelanetz, Steve Peters & Rene Barge	(Granger, 2013)
20/02	2009	Drones and	Lydgalleriet	Bergen	Norway	Phill Niblock, Eliane Radigue, Brian Eno, Jim O'Rourke,	(Lydgalleriet

- 20/03		Headphones				Jacob Kirkegaard, Merzbow, Leif Elggren, Maeror Tri, Steve Roach, Robert Rich, Stars of the Lid, Tangerine Dream	, n.d.-e)
29/03 - 21/06	2009	Auftakt – Klang und Ton in der Gegenwartskunst	Museum Villa Rot	Burgrieden – Rot	Germany	Peter Ablinger, Kurt App, VALIE EXPORT, Rolf Giegold, Rolf Julius, Stefan Kälin, Christina Kubisch, Peter Land, Via Lewandowsky, Carsten Nicolai, Jürgen Palmtag, Björn Schülke, Oliver Sturm	(Museum Villa Rot, n.d.)
30/03 - 30/05	2009	Anlage	Galerie Mario Mazzoli	Berlin	Germany	Agostino Di Scipio, boris d hegenbart-matsui, Douglas Henderson, Michael J. Schumacher	(Galerie Mario Mazzoli, 2009a)
04/04 - 14/06	2009	Sound of Music	Turner Contemporary	Margate	United Kingdom	Art & Language, Robert Barry, Johanna Billing, Black Noise, Manon de Boer, George Brecht, Angela Bulloch, John Cage, Ellen Cantor & John Cussans, Francois Curlet & Michel Francois, Jeremy Deller, Cerith Wyn Evans, Ryan Gander, Babak Ghazi, Pierre Huyghe, Scott King, Vera & Francois Molnar, Laurent Montaron, Dennis Oppenheim, Allen Ruppertsberg, Meredyth Sparks, Jan Vercruyse, La Monte Young & Marian Zazeela	(Teerlinck, 2008; Turner Contemporary, n.d.)
04/04 - 20/06	2009	Sound by Artists	Galerie Frédéric Giroux	Paris	France	Pierre Belouin, Dominique Blais, Pierre-Laurent Cassière, Emmanuel Lagarrigue, Arnaud Maguet, Michel Paysant, Jérôme Poret	(Galerie Frédéric Giroux, 2009)
13/04 - 04/07	2009	Music for a long time (e/static 1999-2009),	Blank	Turin	Italy	Andrea Caretto and Raffaella Spagna, Simone Mussat Sartor, Rolf Julius, Hans Peter Kuhn, Steve Roden, Junko Wada, Miki Yui a.o.	(E/static, n.d.-f)
17/04 - 24/05	2009	(h)ear XL	Kunstencentrum Signe	Heerlen	The Netherlands	Gill Arno, Steve Roden, Stephen Vitiello, Paul Devens, Raviv Ganchrow, chacha, Ronald van der Meijs, Erwin Stache, William Engelen, Slavek Kwi, Pierre Berthet	(kunstencentrum Signe, n.d.)
17/04 - 17/06	2009	Sounds Like Art	Draíocht	Dublin	Ireland	David Bickley, Jenny Brady, Maeve Collins, Michael Doocey, Aileen Lambert, Paul McAree, Fiona Reily	(Draíocht, n.d.)
24/04 - 01/11	2009	musik bewegt!	Klangturm	St. Pölten	Austria	Otto Beck, Alois Huber, Martin Dürauer, Matthias Husinsky, Julian Rubisch, Julia Kadanka, Verena Rauscher, Sandra Seitz, Barbara Neuteufel	(Klangturm, n.d.-f)
25/04	2009	Future of Sound – installations	Arnolfini	Bristol	United Kingdom	Blackout Arts, Rod MacLachan & V.I., Kathy Hinde, squidsoup, Wrap 3	(Future of Sound, 2008)
25/04	2009	Soundings – Nordic	Museet for	Roskilde	Denmark	Espen Lomsdalen, Linn Halvorsrød, Marie Muller, Tisha	(Det

- 07/06		Sound Art	Samtidskunst			Mukarji, Mette Sand Hersoug, Morten Skröder Lund, Dodda Maggy, Nanna Hellberg, Nestori Syrjälä	Kongelige Danske Kunstakademi, 2009)
26/04 - 07/06	2009	Several Silences	The Renaissance Society - The University of Chicago	Chicago	United States	Lewis Baltz, Troy Brauntuch, Manon de Boer, Paul Dickinson, Ryan Gander, Geissler and Sann, Gran Fury, C.M. von Hausswolff, Harold Mendez, Jonty Semper, Harry Shearer	(The Renaissance Society, n.d.)
09/05 - 28/06	2009	Klangstaetten / Stadtklaenge	various locations	Braunschweig	Germany	Joanna Dudley, Katja Kölle, Andreas Oldörp, Edwin van der Heide, Bernhard Gál, Georg Klein, tamtam (Sam Auinger & Hannes Strobl)	(Allgemeiner Konsumverein e.V., n.d.-a)
22/05 - 05/07	2009	ZUPER KLASSIK FREAKY AVANTGARDE!	Lydgalleriet	Bergen	Norway	Bjørnar Habbestad, Petri Henriksson, Steinar Sekkingstad, Magnús Pálsson, Maia Urstad, Hilde Hauan Johnsen, Alwynne Pritchard, Thorolf Thuestad, Jørgen Larsson	(Lydgalleriet, n.d.-n)
06/06 - 14/06	2009	Botanic Sounds	Gothenburg Botanical Garden	Gothenburg	Sweden	Francisco Lopez, Jana Winderen, Brandon LaBelle, Chris Watson, Christine Odlund, Linda Tedsdotter, Henrik Hakansson	(Botanic Sounds, n.d.-a)
10/06 - 25/07	2009	Wall II Sound	Le Bon Accueil	Rennes	France	Sébastien Roux, Cocktail Designers+ Fehler, Taylor Deupree, Richard Chartier...	(Le Bon Accueil, 2009)
10/06 - 30/11	2009	Looking at music - side 2	The museum of modern art	New York	United States	Laurie Anderson, Beth B, Judith Barry/Richard Kern, Jean-Michel Basquiat, Ericka Beckman, Blondie, Coleen Fitzgibbon, Bob Gruen, Richard Hell and The Voidoids, James Nares, Glenn O'Brien, The Ramones, Patti Smith, Sonic Youth, Suicide, Talking Heads, Television	(The museum of modern art, n.d.-a)
14/06 - 31/10	2009	11th annual Sound Travels	various location	Toronto	Canada	Barry Prophet, Kristi Allik/Robert Mulder, Kenneth Emig, Viv Corringham, Kevin T. Allen, Stefan Ros	(New adventures in sound art, 2009)
25/06 - 26/07	2009	City Sonic	Various locations	Mons	Belgium		
03/07 -	2009	SoundART - Traumzeit-Festival	Landschaftspark Duisburg Nord	Duisburg	Germany	Thomas Taxus Beck, William Engelen, Thomas Gerhards, Rolf Giegold, Nicole Pawlowski, Gerriet K. Sharma, Peter	(SoundART, n.d.-f)

05/07						Simon, Johannes S. Sistermanns, Jan-Peter E.R. Sonntag, Peggy Sylopp & Giovanni Longo, tamtam (Sam Auinger & Johannes Strobl)	
04/07 – 30/08	2009	Artes Musicales	Landcommande rij Alden-Biesen	Bilzen	Belgium	Manon De Boer, Pierre Berthet, Aliocha & Boris Van der Avoort, Olga Neuwirth, Pierre Bastien, Andreas Angelidakis, Olivier Deprez, Yves Coussement, Bart Stolle, Koen Broucke, Christoph Girardet, Johanna Billing, Leo Copers	(Instituut voor beeldende, 2009)
11/07 – 27/09	2009	Sounds to Tabakalera	Tobacco factory	San Sebastián	Spain	Achim Wollscheid, Pe Lang, Will Schrimshaw, Marcello Liberato, Leerraum [], SONE (Christophe Havard, Hughes Germain, Yannick Dauby), Juan José Aranguren, Patxi Araujo, Mikel Arce, Edwin Van der Heide	(Tabakalera, n.d.)
21/07 – 01/08	2009	Re/presenting music	Galerie Mario Mazzoli	Berlin	Germany	Martin Daske, Mario Verandi, Guido Canziani-Jona, Clara Maïda, Panayiotis Kokoras, Marcelo Toledo, Marco Visconti-Prasca	(Galerie Mario Mazzoli, n.d.-b)
23/07 – 02/08	2009	Ton:Art 2009	Galerie Margit Haupt	Karlsruhe	Germany	Daniel Dominguez, Matthias Schneiderbanger, Vincent Wikström, Florian Vitez, Tobias Wächtershäuser, Juan Alzate Romero, Patrick Borgeat, Daniel Dominguez, Grainface, Thomas A. Troge, Rita Torres, Sebastian Schmidt, Vito Zuraj, Lätschen Derry, Luke Styles, Damon Thomas Lee, Wang Jue	(Ton:art, n.d.-c)
25/07 – 15/08	2009	Sound Escapes	SPACE	London	United Kingdom	Peter Cusack, Simon Elvins, Fédération Internationale des Chasseurs de Sons, Nikolaus Gansterer, Stephen Gill, Dan Holdsworth, Jacob Kirkegaard, Camille Norment, Dawn Scarfe, Thomson & Craighead	(SPACE, 2010)
14/08 – 12/09	2009	Internationales Klangkunstfest 09 _tiefKLANG - exhibition ²⁶²	Nordraeume at S-Bahnhof Gesundbrunnen	Berlin	Germany	Martin Daske, Thomas Gerwin, Shingo Inao, Tilman Kuentzel, Claudia Robles, Ute Safrin, Wolfgang Spahn, Veit-Lup	(Inter art project, n.d.- b)

²⁶² The 2010 edition “Gefühlter Augenblick” only showed work by Thomas Gerwin. The exhibition of the 2011 edition “Spuren” only presented scores and the exhibition during the 2012 edition “Stimmen der Zeit” did not include art works, instead 5 listening stations with historic voices were presented. (Gerwin, 2013)

28/08 – 27/09	2009	Vinyl	Lydgalleriet	Bergen	Norway	Christian Marclay, Flo Kaufmann, Janek Schaefer, Otomo Yoshihide	(Lydgalleriet, n.d.-m)
28/08 /2009 – 10/01 /2010	2009/ 2010	SEE THIS SOUND. Promises in Sound and Vision	Lentos Kunstmuseum Linz	Linz	Austria	Mary Ellen Bute, Viking Eggeling, Oskar Fischinger, Ludwig Hirschfeld-Mack, Peter Kubelka, Lia, Len Lye, Norman McLaren, Rudolf Pfenninger, Hans Richter, Walter Ruttmann, Martin Arnold, John Baldessari, Manon de Boer, Josef Dabernig, Ekkehard Ehlers, VALIE EXPORT, Jack Goldstein, Douglas Gordon, Jutta Koether, Peter Kubelka, Louise Lawler, Constanze Ruhm, Michael Snow, Imogen Stidworthy, Ryszard Waśko, John Baldessari, Gottfried Bechtold, George Brecht, John Cage, Tony Conrad, Martha Graham, George Maciunas, Christian Marclay, Robert Morris, Pauline Oliveros, Yoko Ono, Nam June Paik, Atsuko Tanaka, La Monte Young, Laurie Anderson, Jordan Belson, Ira Cohen, Tony Conrad, Brion Gysin, Bernhard Leitner, Jonas Mekas, Christian Philipp Müller, Max Neuhaus, David Rokeby, Nina Stuhldreher, TeZ, Ryszard Waśko, James Whitney, La Monte Young, Marian Zazeela, Dan Graham, Heidrun Holzfeind, Judith Hopf, Michaela Melián, Adrian Piper, Mathias Poledna, Józef Robakowski, Deborah Schamoni, Matt Stokes, Hans Weigand, Kevin Cummins, Jeremy Deller, Kerstin von Gabain, Andrew Gowans, Derek Jarman, Wolfgang Müller, Peter Saville, John Baldessari, John Cage, VALIE EXPORT, Gary Hill, Rudolf von Laban, Golan Levin, Zachary Lieberman, Carsten Nicolai, Nam June Paik, Steina Vasulka, Peter Weibel, Herwig Weiser, Jud Yalkut, Andrea Fraser, William Furlong, Carl Michael von Hausswolff, Louise Lawler, Alvin Lucier, Dennis Oppenheim	(Lentos, n.d.)
04/09 – 25/10	2009	23'17"	Mains d'Œuvres	Saint-Ouen	France	Dominique Blais, Pascal Broccolichi, Dominique Petitgand, Jérôme Poret	(Mains d'Œuvres, n.d.)
04/09 –	2009	SOUNDSEEING – Klänge zum	Kunsthaus Kloster	Hörstel	Germany	Ralf Schreiber, Erwin Stache, Kai Niggemann	(Cuba Cultur, n.d.-a)

01/11		Angucken	Gravenhorst				
25/09 – 28/11	2009	Corps Sonore - Architecture and sound	Archizoom EPFL	Lausanne	Switzerland	Pascal Amphoux, Michel Bonvin, Art Clay, Enrico Costanza, EXYZT (François Wunschel & Pier Schneider), Sabine von Fischer, Luca Forcucci, Thierry Fumey, Stephen Gill, Florian Hecker, Alexandre Joly, Christina Kubisch & Ellen Fellmann, Bernhard Leitner, Christian Marclay, Yves Mettler, Max Neuhaus, Carsten Nicolai, Frédéric Post, Tamara de Wehr	(Ecole Polytechnique Fédérale de Lausanne, 2011)
01/10 – 04/10	2009	Botanic Sounds II	Gothenburg Botanical Garden	Gothenburg	Sweden	BJNilsen, Per Svensson, Jana Winderen	(Botanic Sounds, n.d.-b)
01/10 – 17/10	2009	Klangkunst – A German Sound	Festspielhaus Hellerau	Dresden	Germany	Rolf Julius, Franz Martin Olbrisch, Christina Kubisch, Ulrich Eller, Tilman Küntzel, Frauke Eckhardt, Hans W Koch, Jens Brand, Jens-Uwe Dyffort, Roswitha von den Driesch, Erwin Stache	(Deutscher Musikrat gemeinnützige Projektgesellschaft mbH, n.d.)
02/10 – 08/11	2009	Apparatus	Lydgalleriet	Bergen	Norway	Erwin Stache, Martin Riches	(Lydgalleriet , n.d.-a)
03/10	2009	Soundwalk	Throughout the area encompassed by Broadway, Atlantic Avenue, Ocean Boulevard, and Elm Street with a sound corridor on 1st Street that will connect the East Village and Pine Avenue	Long Beach	United States	Aaron Drake, After School Program, Alexander Jarman, AMO, Amy Ling Huynh, Andrea Dominguez, Bekkah Walker, Braden Diotte, Caroline Chang & Kyoung Kim, Clowns and Fetuses, D. Jean Hester, Divine Brick Research Sound Projects, Double Blind, Elisabeth McMullin & Kegan McGurk, Erin Scott, Eric Strauss, FLOOD, Flora Kao, Francene Kaplan & Ryan Hunt, Gary Raymond, G. Douglas Barrett, Gintas K, HOLLOW BODIES, HumanEar, j.frede, Iris Lancery & Cyril Marche, Jeff Boynton, Jeff Rau, Joe Newlin, John Kannenberg, Joseph Tepperman & Dorian Wood, Julia Holter, Justin Varis & Kevin Ponto, Kadet Kuhne, Karen Crews and Brian Hendon, Kari Rae Seekins, Leah A. Rico, Lewis Keller, Machine Head, Madelyn Byrne, Randy Hoffman & Ellen Weller, Mark Cetilia & Jon Coulthard, Michele Jaquis, Mitchell Brown, MLuM & Luis Moreno, MPG Interactive Arts, Noah Thomas, Object Control, Ori Barel & Gil Omry Barel, OTONOMIYAKI, Paula Mathusen, phog masheeen, Phil Curtis, Phillip Stearns,	(FLOOD, 2013f)

						Redux, Sander Roscoe Wolff, Scott Cazan, Small Drone Orchestra, smsgap, Song-Ming Ang, Steve Craig, Steve Roden, Steven Speciale, Stuart Sperling, Tamara Mason, The Hop-Frog Kollektiv & Friends, The Carolyn Duo, Tom McDermott, UEM, Warren-Crow + Warren-Crow	
02/11 – 22/11	2009	White Noise III: Pandora's Sound Box	White box	New York	United States	A g n i e s z k a K u r a n t, Carlo Zanni, Davide Bertocchi, Diango Hernandez, Matthieu Laurette, Michaël Aerts, Olaf Breuning, Oswaldo Macia, Pierre Bismuth, Tanja Ostojic, Vadim Vosters	(White Box, 2013c)
02/11 /2009 – 10/01 /2010	2009/ 2010	In-Sonora V - instalaciones	various locations	Madrid	Spain	Patxi Araujo, Dissonoiseix, Kyop Jeong, Leonel Moura, Mario Sarramián, Pablo Serret de Ena, Lima Sonora, Rachel Stolf, Der Wexel, Ad van Buuren, Toktek, David Cossin, Peter Ablinger, Julio Adán, Maite Labiaga, Patricia Leguina, Jorge Rodriguez, Javier Rubín	(In-Sonora, n.d.-b)
07/11	2009	SoundART 2009.2	WDR Funkhaus	Cologne	Germany	Christina Kubisch, Peter Simon	(SoundART, n.d.-b)
07/11 – 19/12	2009	Squaring & evidence	Galerie Mario Mazzoli	Berlin	Germany	Serge Baghdassarians & Boris Baltschun, Shingo Inao	(Galerie Mario Mazzoli, 2009b)
19/11 – 22/11	2009	Piksel09 exhibition	Lydgalleriet	Bergen	Norway	Ben Woodeson, Angie Atmadjaja, Gijs Gieskes, Carlos Tricas, Wolfgang Spahn & Thomas Gerwin, Ricardo Oliveira Nascimento & Ebru Kurbak & Fabiana Shizue, Dream Addictive & Carmen González & Leslie Garcia, Arnfinn Killingtveit,	(Piksel, n.d.)
26/11 – 31/12	2009	Klangkunst – A German Sound	Philharmonie Lodz	Łódź	Poland	Rolf Julius, Franz Martin Olbrisch, Christina Kubisch, Ulrich Eller, Tilman Küntzel, Frauke Eckhardt, Hans W Koch, Jens Brand, Jens-Uwe Dyffort, Roswitha von den Driesch, Erwin Stache	(Deutscher Musikrat gemeinnützige Projektgesellschaft mbH, n.d.)
28/01 – 21/03	2010	The Amazing Acoustaphotophonog rammitron	MCLA Gallery 51	North Adams	United States	Joshua Churchill, Paul de Jong, Lesley Flanigan, Christy Georg, Mark Mulherrin, Ed Osborn, Tristan Perich, Ven Voisey, Nick Zammuto	(Massachusetts College of Liberal Arts, 2013)
05/02 – 05/03	2010	re(((SOUND)))	Cecille R. Hunt Gallery, Webster	St. Louis	United States	Martin Atkins, Maria Blondeel, Kieth Bueckendorf, Seth Cluett, Mark Early, Jeremy Ghost Ice, Robert Goetz, Helena Gough, Joe Gilmore, Eric Hall, Thomas Harris,	(McEwen Ehnes, 2010)

			University			Daniel Hockenson, Patrick Hunt, Emilie LeBel, Jay Lizo, Ed Osborn, Tony Renner, Steve Roden, Jodi Rose, Patrick Savage, Micah Silver, Nicolas Wiese, a.o.	
18/02 - 20/03	2010	Camere X: Vocation - solo suono	RAM	Rome	Italy	Thomas Köner, Liliana Moro, Brandon LaBelle	(Zerynthia and RAM, n.d.-b)
09/03 - 20/03	2010	Klangkunst – A German Sound	Goethe Institute	Rome	Italy	Rolf Julius, Franz Martin Olbrisch, Christina Kubisch, Ulrich Eller, Tilman Küntzel, Frauke Eckhardt, Hans W Koch, Jens Brand, Jens-Uwe Dyffort, Roswitha von den Driesch, Erwin Stache	(Deutscher Musikrat gemeinnützige Projektgesellschaft mbH, n.d.)
17/03 - 17/04	2010	Space with Sound	Martin Art Gallery, Muhlenberg College	Allentown	United States	Steve Roden, Steve Peters, Seth Cluett	(Muhlenberg College, n.d.)
21/03 - 24/10	2010	SOUNDSEEING II - Klänge zum Angucken - installationen	Kunsthau Kloster Gravenhorst	Hörstel	Germany	Hubert Stein, Olaf Pyras, Karl-Josef Dierkes	(Cuba Cultur, n.d.-b)
16/04 - 01/11	2010	Aliens – Eine Reise in unbekannte welten	Klangturm	St. Pölten	Austria	Frederick Bake, Thomas Wagensommerer, Matthias Husinsky, Julian Rubisch, Hannes Raffaseder, Institut für Medienproduktion	(Klangturm, n.d.-a)
17/04 - 20/06	2010	update_3 - body sound	Zebrastraat	Ghent	Belgium	Vito Acconci, Céleste Boursier-Mougenot, Manon de Boer, Anouk de Clercq, Didier Faustino, Mike Kelley/Scanner, Emmanuel Lagarrigue, Chris Marker, Bruce Nauman, Noto (Carsten Nicolai), Owada (Martin Creed, Adam McEwen, Keiko Owada), Ugo Rondinone, Semiconductor, Mika Vainio	(Liedts, 2010)
22/04 - 13/06	2010	ARTe SONoro - exhibition	various locations	Madrid	Spain	Ryoji Ikeda, Carsten Nicolai, Angela Bulloch, Andrés Ramírez Gaviria, Jason Kahn, Minoru Sato, Chris Watson, Llorenç Barber, Katja Kölle, Martin Riches & Masasahiro Miwa, Steve Roden, José Iges & Concha Jerez, Dan St. Clair, Dawn Scarfe, Escoitar.org, Angeles Oliva & Toño Medina	(Martín, 2010)
24/04	2010	Klinkende Stad	Various	Kortrijk	Belgium	Maria Blondeel, Leo Copers, Christophe De Boeck, Pauwel	(Festival van

- 09/05			locations			De Buck, Boris Debackere & Steven Devleminck, Aernoudt Jacobs, Annemie Maes & Bill Bultheel, Stefaan Quix, Jeroen Vandesande, Esther Venrooy & Hans Demeulenaere, Els Viaene en Plan B Performance, Visual Kitchen	Vlaanderen Kortrijk, n.d.-a)
26/04 - 02/05 & 05/07 - 15/07	2010	Klangkunst – A German Sound	KLANG!-Container	Hamburg	Germany	Rolf Julius, Franz Martin Olbrisch, Christina Kubisch, Ulrich Eller, Tilman Küntzel, Frauke Eckhardt, Hans W Koch, Jens Brand, Jens-Uwe Dyffort, Roswitha von den Driesch, Erwin Stache	(Deutscher Muskrat gemeinnützige Projektgesellschaft mbH, n.d.)
08/05 - 25/07	2010	Play On	Adam Art Gallery	Wellington	New Zealand	Julian Dashper, Michael Parekowhai, Ava Seymour, Slave Pianos, Terry Urbahn	(Adam art gallery, n.d.-b)
11/05 - 14/05	2010	+3dB Contemporary Sound Art Festival - Sound Installation ²⁶³ Exhibition	2B Gallery	Budapest	Hungary	Neon & Landa (Leon Spek and Nanda Milbreta), Hans W. Koch, Gergő Nagy	(Magyar Képzőművészeti Egyetem, 2010)
22/05 - 22/11	2010	The Morning Line: Istanbul	Eminou Square	Istanbul	Turkey	Structure created by Matthew Ritchie in collaboration with Aranda\Lasch, Daniel Bosia and Arup AGU and with sounds by Batuhan Bozkurt, Bryce Dessner & David Sheppard & Evan Ziporyn, Cevdet Erek, Mark Fell & Roc Jiménez de Cisneros, Ghostigital, Bruce Gilbert, Carl Michael von Hausswolff, Florian Hecker, Erdem Helvacioğlu, Jónsi & Alex, Mehmet Can Özer, Lee Ranaldo, Yasunao Tone, Chris Watson, Thom Willems, Jana Winderen, Peter Zinovieff	(Thyssen-Bornemisza Art Contemporary, n.d.-a, n.d.-d)
17/06 - 17/07	2010	Unraveling tape	Noma gallery	San Francisco	United States	Bonnie Banks, Aaron Finnis, Jacqueline Gordon, Kieran Daly & Isaac Linder, San Francisco Tape Music collective	(Noma gallery, n.d.)
19/06	2010	Klangkunst – A	Konzerthaus	Berlin	Germany	Rolf Julius, Franz Martin Olbrisch, Christina Kubisch,	(Deutscher

²⁶³ The first edition of the festival only included an installation by Shinji Kanki and is therefore not included in this list. (Magyar Képzőművészeti Egyetem, 2009)

		German Sound	Berlin "Tag der Musik"			Ulrich Eller, Tilman Küntzel, Frauke Eckhardt, Hans W Koch, Jens Brand, Jens-Uwe Dyffort, Roswitha von den Driesch, Erwin Stache	Musikrat gemeinnützige Projektgesellschaft mbH, n.d.)
24/06 – 25/07	2010	Blow Up: Exploding Sound and Noise (London-Brighton 1959-69)	Flat Time House	London	United Kingdom	AMM, Better Books, Bob Cobbing, DIAS, Coleridge Goode, Joe Harriott, James Joyce, Jeff Keen, John Latham, Annea Lockwood, Gustav Metzger, John Stevens, Val Wilmer amongst others	(Flat Time House, n.d.)
25/06 – 05/09	2010	Good vibrations	Klankenbos	Neerpelt	Belgium	Sarah Geirnaert, Yuri Suzuki, Hubert Steins, Maria Blondeel, Caroline Locke, Rely Tarlo, Daan Brinkmann, Art of failure, Shannon Bells & Mogens Jacobson	(Van Horne, 2010)
29/06	2010	City of Sounds	Q-02	Brussels	Belgium	Stéfan Piat, Natalia Kolesova, Gunther Truijen, Filip Daniels, Nemanja Ladjic & Wouter Huis	(Q-02, n.d.-b)
02/07 – 10/07	2010	Sound Symposium: Visions of Sound – exhibition	various locations	St. John's	Canada	Annie Dunning, Diane Landry, Frank Pahl	(Clark Wherry, 2013)
06/07 – 17/07	2010	The Sound Playground	Fortyfive downstairs	Melbourne	Australia	Ros Bandt & Albert Mishriki, Rod Cooper, Emma Lashmar, Rowan McNaught	(Fortyfivedownstairs, 2010)
06/07 – 24/07	2010	Previously on Optical Sound	Galerie Frédéric Giroux	Paris	France	Black Sifichi, Ototoï, J.G. Thirlwell, Barbara Breitenfellner, Rebecca Bournigault, Pascal Broccolichi, Pierre-Laurent Cassière, Jérôme Poret, Sophie Sommerlatt, Marjolaine Bourdua, Cathryn Boch, Emeline Girault, Cendrillon Bélanger, Philippe Perreaudin, Claire Moreux, Lydie Jean Dit Pannel, Serge Comte, Loïg R, Goran Vejvoda, Ian Simms, Emmanuel Lagarrigue, Nicolas Simonin, Jill Gasparina, Frederic Nogray, Frédéric Post, Alain Declercq, Stéphane Sautour, Claude Lévêque, Rainier Lericolais, Christian Vialard, Guillaume Ollendorf, Simon Fisher Turner, Isabella Turner, Sébastien Roux, Eddie Ladoire, Lionel Marchetti, Black Sifichi, Norscq, Cocoon aka Christophe Demarthe, Stéphane Thidet, David Michael Clarke, Anabelle Hulaut, Philippe Lepeut, Christophe Bailleau, Olivia Louvel, Thierry Weyd, Samuel Ruchot, Julien Sirjacq, Cécile Babiole, Gilles Berquet, Mirka Lugosi, Mathias Delplanque, Alia Daval, Dorota Kleszcz, François Ronsiaux, Wild Shores, Hervé Trioreau, Laurent Faulon,	(Galerie Frédéric Giroux, n.d.)

						Claire Moreux, Davide Bertocchi, Alexandre Bianchini, Dominique Blais, Vincent Epplay, G�r�me Nox, Scanner	
18/07 - 25/09	2010	12th annual Sound Travels	various location	Toronto	Canada	Barry Prophet, Rose Bolton, Stefan Rose, Satoshi Morita, Darren Copeland	(New adventures in sound art, 2010)
29/07 - 08/08	2010	Ton:Art 2010	Galerie Margit Haupt	Karlsruhe	Germany	Holger Ballweg, Patrick Borgeat, Diana Cardoso, L�tschen Derry, Daniel Dominguez Teruel, Sebastian Moser, Laura Oyewale, Sebastian Schmidt, Matthias Schneiderbanger, Michael Vierling, Florian Vitez, Tobias W�chtersh�user, Vincent Wikstr�m	(Ton:art, n.d.-a)
07/08 - 10/10	2010	Object Lessons: A Musical Fiction	Adam Art Gallery	Wellington	New Zealand	Fitts & Holderness, DJ \$1 Record aka Bryce Galloway, Caroline Johnston, Torben Tilly & Robin Watkins, and Ronnie van Hout	(Adam art gallery, n.d.-a)
13/08 - 15/08	2010	FAS 2010 Feria de Arte Sonoro	Espacio Arana	San Juan	Puerto Rico	Rebecca Adorno, Jorge "Rito" Cordero, Calin Dover Tarrats, Berta Jottar y Ad�l, Araceli Pino, Nora Ponte, Melissa Raymond & Ren� Sandin, Jorge Rivera, Vimarie Serrano, Rafael A. Vargas Bernard	(El-status, n.d.)
20/08 - 12/09	2010	Klangkunst – A German Sound	Bachhaus Eisenach	Eisenach	Germany	Rolf Julius, Franz Martin Olbrisch, Christina Kubisch, Ulrich Eller, Tilman K�ntzel, Frauke Eckhardt, Hans W Koch, Jens Brand, Jens-Uwe Dyffort, Roswitha von den Driesch, Erwin Stache	(Deutscher Musikrat gemeinn�tzige Projektgesellschaft mbH, n.d.; Netzwerk Neue Musik, n.d.)
26/08 - 21/11	2010	Sounds of Architectural Space	Arsenale Isolotto	Venice	Italy	Annie Ratti, H. H. Lim, Alberto Garutti, Michelangelo Pistoletto, Vito Acconci, Jimmie Durham	(Zerynthia and RAM, n.d.-d)
27/08 - 12/09	2010	City Sonic	Various locations	Mons	Belgium		
03/09 - 02/10	2010	Condotti cronoarmonici	Galerie Mario Mazzoli	Berlin	Germany	Alessandro Bosetti, Guido Canziani-Jona, Paolo Invernari, Roberto Pugliese & Tamara Repetto, Michele Spanghero	(Galerie Mario Mazzoli, 2010)
10/09	2010	Klangi	Ars Nova	Turku	Finland	Simo Alitalo, Sophie B�lair Cl�ment, Nigel Helyer, Rolf	(ABOA

- 31/10						Julius, Christina Kubisch, Robin Minard, Pessi Parviainen	VETUS & ARS NOVA, n.d.)
24/09 /2010 - 09/01 /2011	2010/ 2011	In-Sonora VI	Various locations	Madrid	Spain	Cod.Act (Andre & Michel Décosterd), ON! (Orgullosos nerds) (Jorge Champredonde, Laura Molina, Gwenn Joyaux), Alberto C. Bernal, Pedro Torres, Lars Lundehave Hansen, Guim Camps Parera, Mohamed Kacimi & Unai Requejo, DDM (Daniela Di Maro & Roberto Pugliese), Carolina Caycedo, Lucia Aspesi, Pablo Sanz & Juan Cantizzani	(In-Sonora, n.d.-c)
02/10	2010	Soundwalk	Throughout the area encompassed by 3rd St, Linden Ave, Ocean Boulevard, and Elm Ave	Long Beach	United States	Alan Nakagawa, Ashton Amores, Brian Carlson, Clowns and Fetuses, Craque, David Casey, Dean Hovey, Doug Hart, Erin Scott, Francene Kaplan, Gary Raymond, glenn bach, gintas k, HOLLOW BODIES, Igor Amokian, Jeremy Quinn, Joseph Tepperman, Dorian Wood & Leah Harmon, Justin A. Varis, Karen Crews & MluM, Sabine Pinkepank, Marc Thorman, Wheels, Naomi Lucille Kagaya & Stephanie Cheng Smith, N4CM, Ori Barel, Paul Naughton, Phillip Stearns, Scott Cazan, Seth Weiner, Small Drone Orchestra, smsgap, Steven Speciale (Loyola High School), The Dirty Chaps, wikiGong.com	(FLOOD, 2013g)
27/10 - 07/11	2010	SoundART 2010	Praetorium/Arc häologische Zone	Cologne	Germany	Peter Ablinger, Marc Behrens, Florian Dombois, Paul Panhuysen, Denise Ritter, Serge Baghdassarians & Boris Baltschun, Monika Golla & Nikolaus Heyduck, Helmut Lemke, Paul Plamper, Kirsten Reese, Martin Riches, Therapeutische Hörgruppe Köln (Tobias Beck, Tobias Grewenig, Svann Langguth, Dirk Specht)	(SoundART, n.d.-c)
11/12 /2010 - 30/01 /2011	2010/ 2011	4'33" [Resonance network presentation]	Intro In Situ	Maastricht	The Netherlands	Pierre Berthet, Esther Venrooy	(Intro In situ n.d.)
11/12 /2010 - 20/02 /2011	2010/ 2011	TONSPUR_expanded ∞ Der Lautsprecher	freiraum quartier21 INTERNATIONA L	Vienna	Austria	Tyler Adams, Janet Cardiff & Georg Bures Miller, Matthias Deumlich, Jean-Pierre Gauthier, Sabine Groschup, Douglas Henderson, Gary Hill, Rolf Julius, Friedrich Jürgenson, Timo Kahlen, Bernhard Leitner, Clemens Leuschner, Via Lewandowsky, Benoît Maubrey, Robin Minard, Gordon Monahan, Werner Reiterer, Dawn Scarfe,	(TONSPUR, n.d.)

						Ignaz Schick, Robert Schwarz, son:DA, Charles Stankieveh, Maurice van Tellingen, Stephen Vitiello	
20/01 – 12/03	2011	Decay	Galerie Mario Mazzoli	Berlin	Germany	Pe Lang, Marianthi Papalexandri-Alexandri, Brandon LaBelle, Andy Graydon	(Galerie Mario Mazzoli, 2011b)
21/01 – 18/02	2011	Frownland – immagini in movimento, con suoni	Blank	Turin	Italy	Thomas Köner, Phill Niblock, Carlos Casas, Paolo Piscitelli	(E/static, n.d.-e)
16/02 – 30/05	2011	Looking at music 3.0	The museum of modern art	New York	United States	the Beastie Boys, Kathleen Hanna and Le Tigre, Keith Haring, Christian Marclay, Steven Parrino, Run DMC, a.o.	(The museum of modern art, 2013a)
26/02 – 10/07	2011	Soundseeing III	Kunsthau Kloster Gravenhorst	Hörstel	Germany	Andreas Oldörp, Rolf Julius, Miki Yui, Pierre Berthet, students of the Sang Myung-University, Seoul	(Kunsthau Kloster Gravenhorst, n.d.-a)
08/04 – 09/04	2011	Son	Auditorio Nacional de Música	Madrid	Spain	Julio Adán, Jesús Jara, ON! (Orgullosos Nerds) (Jorge Champredonde , Laura Molina, Gwenn Joyaux)	(In-Sonora, 2013e)
15/04 – 30/10	2011	Klang.Land.Schaft	Klangturm	St. Pölten	Austria	Hannes Raffaseder, Christiane Resch-Raab, Astrid Drechsler, Barbara Neunteufel, Julian Rubisch, Klaus Temper, Matthias Husinsky, Max Wittmann, Daniel Pazderka, Max Lorenz	(Klangturm, n.d.-b)
07/05 – 22/05	2011	Klinkende Stad	Various locations	Kortrijk	Belgium	Maia Urstad, Paul Devens, Pierre Berthet, Esther Venrooy & Ema Bonifacic	(Festival van Vlaanderen Kortrijk, n.d.-c)
13/05 – 02/07	2011	Sound OF(F)	Gallery Fortlaan 17	Ghent	Belgium	Christoph De Boeck, Tom Kok, Jan Willem Deiman, Kok & Deiman, Joey Kötting, Vincent & Lawrence Malstaf	(Galerie Fortlaan 17, n.d.)
17/05 – 05/06	2011	Italian art 503ob e listened to	NCCA – National Centre for Contemporary Arts	Moscow	Russia	Martux_M, Alberto Garutti, Riccardo Benassi, Michelangelo Pistoletto, Bianco-Valente , Alfredo Pirri, Annie Ratti, Emilio Prini, Donatella Landi, ZimmerFrei , Cesare Pietroiusti, Massimo Bartolini, Mario Airò, Alberto Tadiello, Liliana Moro, Vettor Pisani, canecapovolto , Donatella Spaziani	(Zerynthia and RAM, n.d.-c)

01/06 – 27/10	2011	Items May Shift	The Tree Museum	Gravenhurst	Canada	Ken Gregory, Anitra Hamilton, Mike Hansen, Gordon Monahan, Sarah Peebles, E.C. Woodley	(The Tree Museum, 2012)
02/06 – 06/08	2011	Biorhythm: Music and the Body	Eyebeam	New York	United States	Alex Dowling & Sinead Meaney, David Handford, HertogNadler, Javier Jaimovich, Kaffe Matthews, Niall Coghlan, Papermen, Reactable Systems, Reality Inspectors, Satoshi Morita, Scenocosme	(Eyebeam, n.d.)
09/06 – 17/07	2011	Gone with the Wind	Raven Row	London	United Kingdom	Max Eastley, Takehisa Kosugi, Walter Marchetti	(Raven Row, n.d.)
17/06 – 17/07	2011	Extensions	Korskirken & USF VERFTET	Bergen	Norway	Alvin Lucier, Stefan Rummel, Pierre Berthet	(Lydgalleriet, n.d.-f)
18/06 – 20/08	2011	Corrosia! Ongehoord, Kunstenaars verbeelden het onhoorbare	Corrosia	Almere Haven	The Netherlands	Erfan Abdi, Joeri Bultheel, Juan Cantizani, Pablo Castro, Bardo Frings, Ivan Henriques, Matteo Marangoni, Pablo Sanz, Rutger Muller, Sander Haakman, Joris Gielen, Eric Magnee, Olivier Schreuder, Stan Verberkt, Michael de Gans, Geert Schaap, Marcus Spaapen, Aernoudt Jacobs, Christoph de Boeck	(de Graaff, n.d.)
28/06 – 29/07	2011	CAMERE #15 Artsound	RAM	Rome	Italy	Vladimir Tarasov, Vadim Zakharov, Leonid Tishkov	(Zerynthia and RAM, n.d.-a)
04/07 – 10/07	2011	Tuned City Tallinn – installations	Various locations	Tallinn	Estonia	Lukas Kühne, Raul Keller, eyland 07 (René Rissland, Jürgen Lehmeier) & Florian Tuercke, Unsworn Industries, Pierre-Laurent Cassière	(Tuned City, 2011)
06/07 – 19/08	2011	On Shuffle	Lehmann Maupin	New York	United States	Billy Childish, Kim Gordon, Kalup Linzy, Ryan McNamara, Tony Oursler, Dave Muller, Dario Robleto, Stephen Vitiello	(Lehmann Maupin, 2013)
16/07 – 03/09	2011	13th annual Sound Travels	various location	Toronto	Canada		(New adventures in sound art, 2011)
15/08 – 25/08	2011	Ton:art 2011	Galerie KUNST ransit	Karlsruhe	Germany	Michael Vierling, Sebastian Moser, Vincent Wikström, Benoît and the Mandelbrots, Patrick Borgeat, Benjamin Graf, Dominik Kleinknecht, David Hofmann, Juan Alzate Romero, Patrick Borgeat, Holger Ballweg, Esther Alzate Romero, Matthias Schneiderbanger, Vincent Wikström, Friedemann Dupelius, Bernd Härpfer, Claudia Thumm	(Ton:art, n.d.-b)

27/08 – 11/09	2011	City Sonic	Various locations	Mons	Belgium		
10/09 – 15/10	2011	Automata a cappella	Galerie Mario Mazzoli	Berlin	Germany	Daniel Depoutot, Edgardo Rudnitzky, Kristoffer Myskja, Jens Hikel, Lorenzo Scotto di Luzio	(Galerie Mario Mazzoli, 2011a)
23/09 – 15/10	2011	Minimal	USF VERFTET	Bergen	Norway	Joyce Hinterding, Tristan Perich, Peter Vogel	(Lydgalleriet, n.d.-i)
23/09 /2011 – 20/08 /2012	2011/ 2012	La Fabrique Sonore, Expérience Pommery #9	Domaine Pommery	Reims	France	Allora & Calzadilla, Cory Arcangel, Assume Vivid Astro Focus, Pierre Bastien, James Beckett, Dominique Blais, Pierre-Laurent Cassière, Peter Coffin, Félicie d'Estienne d'Orves, Dzine, Kuntzel & Degas, Seulgi Lee, Thomas McIntosh, Robin Meier & Ali Momeni, Théo Mercier, Marnix de Nijs & Edwin van der Heide, Emilie Pitoiset, Bertrand Planes, Delphine Reist, Jacques Remus, Roman Signer, Koki Tanaka, James Webb, Cerith Wyn Evans, a.o.	(Beaujard, n.d.)
24/09 – 18/12	2011	Simple Interactions. Lydkunst fra Japan	Museet for Samtidskunst	Roskilde	Denmark	Yuji Dogane, Yokio Fujimoto, Atsuhiko Ito, Soichiro Mihara & Hiroko Mugibayashi & Kazuki Saita, Atsushi Nishijima, Jio Shimizu, Toshiya Tsunoda, Tetsuya Umeda, Miki Yui	(Museet for Samtidskunst, 2011)
01/10	2011	Soundwalk	Throughout the area encompassed by 4th St, Linden Ave, 1st St, and Elm Ave	Long Beach	United States	Alan Lechuza, Alan Nakagawa, Alex Braidwood, Clowns and Fetuses, Colin Woodford, Craque, David Cox & Kim Walker, David Kendall, Dirty Chaps, bRUTAL pOODLE, Erin Scott, Gary Raymond, GIL KUNO & MARCOS LUTYENS, gintas k, Igor Amokian, Impossible Moon, Inouk Demers, joshua erkman, Kenneth Cameron, LavishWomb, Linda Ravenswood, Mark Trayle, Karen Crews & MluM, Nat Evans, Pedestal and the All Girl Band, Phillip Stearns, phog masheeen, Push The Button, Roxanne Varzi, Sadie Siegel, Southern California Soundscape Ensemble, Steven Speciale, Therisse Martinez, Tom McDermott, Wheels, Wikigong, Winston Berger, Winter Jenssen, Xavier Leonard, Yoon Chung Han	(FLOOD, 2013h)
14/10 –	2011	Resonance Riga	former tobacco factory	Riga	Latvia	Evelīna Deimčmane, Esther Venrooy, Pierre Berthet, Maia Urstad, Stefan Rummel	(RIXC, 2011)

06/11							
15/10 - 04/03 /2012	2011/ 2012	Invisible fields – geographies of radio waves	Arts Santa Mònica	Barcelona	Spain	Trevor Paglen, Rafael Lozano-Hemmer, Thomas Ashcraft, Timo Arnall, Anthony DeVincenzi, Joyce Hinterding, Semiconductor, Job Ramos, Clara Boj and Diego Díaz, Matthew Biederman, Rasa Smite & Raitis Smits (RIXC), Irdial Records, Guifi.net, Plataforma Cero LABoral, Luthiers Drapaires	(Arts Santa Mònica, n.d.)
22/10 - 03/12	2011	Silence. Silent?	Galerie Mario Mazzoli	Berlin	Germany	Christina Kubisch, Robin Minard	(Galerie Mario Mazzoli, 2011c)
23/10 - 04/12	2011	Ecoutez Voir !	Centre d'art contemporaine de Pontmain	Pointmain	France	Wilfrid Almendra, Vasco Araujo, Delphine Lecamp, Christian Marclay, David Michael Clarke, Pierrick Sorin	(Centre d'art contemporai ne de Pontmain, 2011)
28/10 - 06/11	2011	Grande Exposition d'art sonore	APO33	Nantes	France -	Brandon Labelle, Jason Kahn, Achim Wollscheid, Kasper T Toeplitz, Francisco Lopez, Apo33 (Pickett & Ottavi & Poidevin & Leroy), a.o.	(APO33, 2011)
03/11 - 14/11	2011	Klangkunst – a mobile exhibition on 'sound art' in Germany today	Goethe-Gallery, Goethe-Institut Hong Kong	Hong Kong	China	Jens Brand, Hans W. Koch, Roswitha Von Den Driesch, Jens-Uwe-Dyffort, Frauke Eckhardt, Ulrich Eller, Rolf Julius, Christina Kubisch, Tilman Küntzel, Franz Martin Olbrisch, Erwin Stache	(Deutscher Musikrat gemeinnützi ge Projekt- gesellschaft mbH, n.d.; Mask9.com, 2011)
04/11 - 07/11	2011	Call & Response	James Taylor Gallery	London	United Kingdom	Jo Thomas, Robert Van Heumen, Ralph Steinbrüchel, Eric La Casa, Tom Slater, Jacob Kirkegaard, John Levack Drever & Lawrence Upton, Jeremy Keenan, Dawn Scarfe, Kaffe Matthews	(Call & response, n.d.)
05/11 - 06/11	2011	SoundART 2011	Funkhaus Wallrafplatz	Cologne	Germany	Jens Brand, Pierre Laurent Cassière, Thomas Gerhards, Robert Jacobsen, Rolf Julius, Tilman Küntzel, José Antonio Orts, Martin Riches, Peter Simon, Hubert Steins, Miki Yui, Therapeutische Hörgruppe Köln	(SoundART, n.d.-e)
11/11 - 20/11	2011	BXL-NYC Spatialized. Multicha nnel sound	Q-o2, iMAL, okno	Brussels	Belgium	Marina Rosenfeld, Barry Weisblat, Michael J. Schumacher, Stefaan Quix, Ludo Engels, Mieke Lambrigts	(Q-O2, n.d.- a)

		installations					
18/11 – 23/11	2011	Cyberfest – sound art program – Lingua Franca: from Voice to Noise ²⁶⁴	ART re. FLEX Gallery	St. Petersburg	Russia	Jim Bell, Maria Chavez, Michael Delia, Chantal Dumas, Bryan Eubanks, Richard Garet, If, Bwana (Al Margolis), Andre Eric Létourneau (a.k.a. Benjamin Muon), Katherine Liberovskaya, Daniel Neumann, Phill Niblock, Kristin Norderval, Andrea Parkins, Leslie Ross, Keiko Uenishi, Byron Westbrook	(ART re. FLEX Gallery, 2011)
06/12 /2011 – 20/01 /2012	2011/ 2012	Resonant Bodies	Ecole Régionale des Beaux-Arts	Besançon	France	Phill Niblock, Seth Cluett, Francis Baudevin, Jung Hee Choi	(Frac Franche-Comté, n.d.)
09/12 – 30/12	2011	Resonance in Maastricht	Jan van Eyck Academy	Maastricht	The Netherlands	Evelina Deicmane, Paul Devens, Maia Urstad.	(Schellinx, 2011)
11/01 – 11/02	2012	Klangkunst - A German Sound	Galerie 5020	Salzburg	Austria	Jens Brand & Hans W. Koch, Roswitha Von Den Driesch & Jens-Uwe Dyffort, Frauke Eckhardt, Ulrich Eller, Rolf Julius, Christina Kubisch, Tilman Küntzel, Franz Martin Olbrisch, Erwin Stache	(Deutscher Musikrat gemeinnützige Projektgesellschaft mbH, n.d.)
12/02	2012	SOUNDCORRIDORS: Sound Engaging Architecture	Roulette	New York	United States	Daniel Neumann, Maria Chavez, Alfredo Marin, Zeljko McMullen, Doron Sadja, Tristan Shepherd, Mario Diaz de Leon, Ben Vida, Sabisha Friedberg	(Roulette, 2013)
17/02 – 19/02	2012	freq_out 8	Moderna Museet	Stockholm	Sweden	Christine Ödlund, Finnbogi Petursson, Jacob Kirkegaard, Jana Winderen, Maia Urstad, Tommi Grönlund, Petteri Nisunen, Franz Pomassl, PerMagnus Lindborg, J.G. Thirlwell, Kent Tankred, Brandon LaBelle	(Freq_out, n.d.-d)
17/02 – 06/05	2012	Membra Disjecta for John Cage	quartier21/MuseumsQuartier Wien	Vienna	Austria	Milan Adamciak , Tyler Adams, Stephen Addiss, Robert Ashley, Sam Ashley, Conny Blom, William Brovelli/Margaret Leng Tan, Arturas Bumsteinas, Christopher Chew/Margaret Leng Tan, Nicolas Collins ,	(Quartier21/MuseumsQuartier Wien, n.d.)

²⁶⁴ Previous editions of the Cyberfest festival did not include a sound art program, but presented a media exhibition that included some sound works.

						Philip Corner, Alvin Curran, Arnold Dreyblatt, David Dunn, Peter Graham, Sabine Groschup, Milan Grygar, Franz Hautzinger, Pierre Hebert, Gary Hill, Steven Holl, Svetozar Ilavsky, Hilary Jeffery, GX Jupiter-Larsen, Ray Kass, Hassan Khan, Barbara Klemm, Alison Knowles, Richard Kostelanetz, Petr Kotik, Joan La Barbara, Brandon LaBelle, Alan Licht, Alvin Lucier, Christian Marclay, Benoit Maubrey, Jeremy Millar, Gordon Monahan, Charlie Morrow, David Moss, Morgan O'Hara, Marian Palla, Paul Panhuysen, Ben Patterson, Michael Prime, George Quasha, Lee Ranaldo/Zeger Reyers, Keith Rowe, Blahoslav Rozboril, Frank Scheffer, Jiri Sigut, Jan Steklik, Volker Straebel, Richard Teitelbaum, The Lazy Anarchists, Yasunao Tone, Kris Vleeschouwer, Hong-Kai Wang, Christian Wolff, Gerlinde Wurth	
24/02 – 01/04	2012	Resonance works	Lydgalleriet (Skostredet 16)	Bergen	Norway	Maia Urstad, Paul Devens	(Lydgalleriet , n.d.-l)
07/03 – 29/04	2012	In-Sonora VII	Various locations	Madrid	Spain	Pablo Serret de Ena, Alfredo Morte, Aula Experimental de Música (Aurora Aroca, José Barrera, Alisha Buttke, Miguel Cantero, Alberto Carretero, Arturo Cepeda, Miguel Chambergó, Jesús Durán, Cristina Fernández, Agustín Ferrero, Álvaro Hernández, Hermes Luaces. Pablo Martín Coble, Israel Martínez, Jorge Mekas, Yeray Portillo, David Redondo, Anatol Rivero, Mario Sarramián, David Vendrell), Jorge Champredonde, Laura Molina, Lisandro Fernandez, ARSGAMES, Rosario Etcheverry, Osvaldo Cibils, Colectivo Eztul, MUNMA & ENGRAM, Narcoleptica, La Orquesta Mundana, Bárbara González Barrera, La Sonidera, Daniel del Río y Jorge Vicario, AM&CO, MÚSICA PREPOST, ARCHIPIEL, Andrea Pazos, Flo Kaufmann, Zimoun, Marcos Calvari, Yamila Ríos, Sergio Luque, Pablo Daniel Fabbro, Pablo Bachmann, Mauricio Rivera Henao, Matias Giuliani, Lasse-Marc Riek, Hugo Paquete, Cristian Soto, Artur Matamoro Vidal, Tomas Rawski, Annabelle, Pablo A. Padilla Jargstorf, Mery, Luz María Sánchez, Guillermo Marconi, Florent Colautti, Edu Comelles, Denise Alves-Rodrigues	(In-Sonora, 2013d)

16/03 /2012 – 06/01 /2013	2012/ 2013	SoundArt. Klang als Medium der Kunst	ZKM, Zentrum für Kunst und Medien	Karlsruhe	Germany	Peter Ablinger, Tyler Adams, Maryanne Amacher, Cory Arcangel, José Vincente Asuar, Serge Baghdassarians, Jens Barth, Bernard Baschet, Joachim Baur, Harry Bertoia, Joseph Beuys, Jens Brand, Ludger Brümmer, John Cage, Janet Cardiff, Georga Bures Miller, Stephen Cornford, Chris Cunningham, Paul DeMarinis, Matthias Deumlich, Götz Dipper, Max Eastley, Ulrich Eller, Luc Ferrari, Walter Giers, Sabine Groschup, Shilpa Gupta, Hanna Hartman, Carl Michael von Hausswolff, Edwin van der Heide, Caroline Heider, Douglas Henderson, Gary Hill, Ryoji Ikeda, Anna Jermolaewa, Sergi Jordà, Rolf Julius, Timo Kahlen, Georg Klein, Christina Kubisch, Kalle Laar, Bernhard Leitner, Anestis Logothetis, Julia Logothetis, Alvin Lucier, Christian Marclay, Kaffe Matthews, Benoît Maubrey, Soichiro Mihara, Kazuki Saita, Robin Minard, Haroon Mirza, Gordon Monohan, Anthony Moore, Bruce Nauman, Anselm Venezian Nehls, Tarik Barri, Max Neuhaus, Carsten Nicolai, Pauline Oliveros, Daphne Oram, Nam June Paik, Marco Preitschopf, Roberto Pugliese, Kirsten Reese, Werner Reiterer, Steve Roden, Sabine Schäfer, Joachim Krebs, Michael Saup, Dawn Scarfe, Grégory Lasserre, Anaïs met den Ancxt, Dieter Schnebel, Cornelia Sollfrank, Ed Sommer, Jan-Peter E.R. Sonntag, Joulia Strauss, Akio Suzuki, Takis, TBA21, Günther Uecker, Timm Ulrichs, Julijonas Urbonas, Peter Vogel, Bram Vreven, Peter Weibel, Jean Weinfeld, John Wynne, Rim Wainwright, Iannis Xenakis, La Monte Young, Marian Zazeela, Broken Music (Claus Böhmler, KP Brehmer, Henning Christiansen, Mauricio Kagel, Milan Knizák, Christian Marclay, Piotr Nathan, Nam June Paik, Reiner Ruthenbeck, Tomas Schmit), het Apollohuis, Tonspur (Georg Weckwerth, Peter Szely, David Moss, Peter Weibel, Friederike Mayröcker & Bodo Hell, Gary Hill, Gerhard Rühm), Unheard Avant-Gardes (Hans Sydow, Christina Ann Sydow, Christian Hvalsøe Leifelt, Erkki Kurenniemi, Christian Yde Frostholt, Åke Hodell, Eric Andersen, HC Gilje, Else Marie Pade, Ane Mette Ruge, Jørgen Plaetner, Mogens Jacobsen, Morten Søndergaard, Martin Luckmann), Hörstationen (John Cage, R. Murray Schafer,	(Zentrum für Kunst und Medien, 2012)
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						Brian Eno, Annea Lockwood, Bill Fontana, Hildegard Westerkamp, Francisco López, Ultra-red, Chris Watson, Hanna Hartman, Pierre Schaeffer, Hermann Kesser, Pierre Henry, Herbert Brün, Walther Ruttmann, Bernard Parmegiani, Raoul Hausmann, Arseni Awraamow, Barry Bermange, Ferdinand Kriwet, Franz Mon/Tera de Marez Oyens, Miki Yui, Christoph Korn, Oswald Egger/Iris Drögekamp, Institut fuer Feinmotorik, Vito Acconci, Brandon La Belle, Michael Schumacher, Donatella Spaziani, Alberto Tadiello, Achim Wollscheid, Philip Jeck, Eva Weinmayr, Thomas Meinecke/Move D, Rolf Dieter Brinkmann, Carlfriedrich Claus, Laar/Zeitblom, Ammer & Console, Claus van Bebber, Amiri Baraka/KID 606, Valeri Scherstjanoi/Lesser, Loopspace, Sung Hwan Kim/dogr, Wolfgang Müller, Robert Lax/Tarwater, Bebe & Louis Barron, Raymond Scott, Cluster, Pan Sonic, Curd Duca, Otome Yoshihide, Toshimaru Nakamura, Oval, Helena Gough, Ursula Bogner, James Tenney, Throbbing Gristle, Merzbow, Yasunao Tone, Black Dice, Language Removal Service, Kevin Drumm, Ilios, KTL, Mario de Vega)	
17/03 – 26/08	2012	SOUNDSEEING IV - Klänge zum Angucken - exhibition	Kunsthau Kloster Gravenhorst	Hörstel	Germany	Gerd Gerhardt, Paul Plamper, Martin Riches	(Kunsthau Kloster Gravenhorst, n.d.-b)
30/03 – 25/06	2012	Visualizar el sonido	LABoral Centro de Arte y Creación Industrial	Gijón	Spain	Semiconductor, FABRICA, Daniel Palacios, Pascal Broccolichi, Zimoun, Benjamin Maus & Andreas Nicolas Fischer, Ryoichi Kurokawa, David Letellier, Lucía Rivero, Daniel Romero	(LABoral, n.d.)
19/04 – 01/11	2012	Stimmen	Klangturm	St. Pölten	Austria	Wolfgang Alfery, Ronald Dlapka, Astrid Drechsler, Sebastian Hopfner, Matthias Husinsky, Michael Jaksche, Julia Kadanka, Peter Kutin, Christiane Resch-Raab, Barbara Rubisch, Julian Rubisch, Ewald Teuschl, Maria Weber, Lukas Wilfinger, a.o.	(Klangturm, n.d.-h)
28/04 – 03/06	2012	Soundings 2 – Nordic Sound Art graduate show	Museet for Samtidskunst	Roskilde	Denmark	Martinka Bobrikova, Oscar de Carmen, Cecilia Jonsson, Signe Lidén, Christian Mastrup, Joonas Siren, Elin Øyen Vister, Lauri Wuolio	(Det Kongelige Danske Kunstakademi, 2012)

28/04 – 13/05	2012	Klinkende Stad	various locations	Kortrijk	Belgium	Chris Watson, Jana Winderen, Christoph De Boeck & Patricia Portela, Leif Brush, Guy De Bièvre & Sofia Von Bustorff, Erik Nerinckx, Alvi Curran, Dawn Scarfe, David Helbich, Bent Sørensen, Evelina Deicmane, Stefan Rummel	(Festival van Vlaanderen Kortrijk, n.d.-b)
01/05 – 16/06	2012	John Duncan, Carl Michael von Hausswolff	Galerie Mario Mazzoli	Berlin	Germany	John Duncan, Carl Michael von Hausswolff	(Galerie Mario Mazzoli, 2012)
13/05 – 30/05	2012	ARTE SONoro OFF - instalaciones	Various locations	Madrid	Spain	Pablo Serret de Ena, Dinastía Trini, Alfredo Morte, Gabriel Castaño, Julio Adán, Julia Varela Arribas	(In-Sonora, 2013a)
15/05	2012	Netaudio festival - sound art	Roundhouse	London	United Kingdom	8-channel audio programme (Sarah Boothroyd, Tom Slater, Robert Van Heumen, Jeremy Keenan, Matt Lewis, Kaffe Matthews, Ralph Steinbruchel, Eric La Casa, Jacob Kirkegaard), Sonic Maze (D'Inscie, Void Vector, Dan Scott, Monomatic, Andrew Back, Sara Heitlinger, Incidental, Jodi Rose, Simon Katan, Andrea Bozic & Robert Pravda & Julia Willms, Marko Batista & Natasha Musevic a.k.a. Dot, Robertina Šebjanič & Luka Frelih)	(Netaudio, n.d.)
19/05 – 01/07	2012	HORIZONIC: Unfolding Space through Sound Art	LÁ Art Museum	Reykjavik	Iceland	Amund Sjölie Sveen, Ása Stjerna, Catrin Andersson, Dodda Maggý, Elin Øjen Vister, Goodiepal, Halldór Úlfarsson, Iben Mondrup, Jessie Kleemann, Kristín Björk Kristjánsdóttir/Kira Kira	(Horizonic, n.d.-b)
07/06 /- 23/11	2012	The Morning Line: Vienna	Schwarzenberg platz	Vienna	Austria	Asfast, Auxpan, Benzo & Richardas Norvila, Kollektiv/Rauschen, J. G. Thirlwell, Carl Michael von Hausswolff, Jana Winderen, Zavoloka & Kotra	(Thyssen-Bornemisza Art Contemporary, n.d.-c)
09/06 – 17/06	2012	Fri Lyd - installations	Den Frie	Copenhagen	Denmark	Rolf Aamot, Artificiel, Aernoudt Jacobs, Cléa Coudsi & Eric Herbin, Stijn Demeulenaere	(Den Frie, 2012)
15/06 – 29/07	2012	HORCH!/LISTEN! – Klanginstallationen, konzerte, künstlergespräche – ein wochenende mit neuer musik am	Akademie Schloss Solitude	Stuttgart	Germany	Ellie Abrons, Adam Fure, Ashley Fure, David Brynjar Franzson, Marianthi Papalexandri-Alexandri	(Akademie Schloss Solitude, 2012)

		Schloss - Klanginstallationen					
16/06	2012	INCIDENTAL MUSIC: Site Specific Installations & Performances	Fragmental Museum	New York	United States	Richard Garet, Doron Sadja, Tristan Shepherd, Andrea Parkins, Bethany Ides & Erin Yerby, Netta Yerushalmy, Ed Bear	(Fragmental Museum, n.d.)
16/06	2012	KLANKSON II – sound rooms	Les Ateliers Claus	Brussels	Belgium	Aifoon, Duane Pitre, Toma Gouband & Mathieu Calleja, Roberta Gigante, Peter Keene	(Les Ateliers Claus, 2010)
20/06 – 26/08	2012	O Novo Officio	Museu Coleção Berardo	Lisbon	Portugal	Alvin Lucier, Black Dice, Charlemagne Palestine, Edgard Varèse, Erik Satie, Excepter, Fala Mariam, Gavin Bryars, Jandek, John Cage, Le Corbusier, Leon Theremin, Lou Reed, Luigi Russolo, Marcel Duchamp, Maurice Martenot, Olivier Messiaen, Sei Miguel, William Basinski, Yves Klein	(Museu Coleção Berardo, 2013)
30/06	2012	Klang Orte Berlin - m I – prenzlauer berg installations	Aedes Campus, Pfefferberg	Berlin	Germany	Peter Cusack, Daisuke Ishida, Sam Auinger, students of UDK sound studies, Max Baginski, Kyan Bayani, Anna Bogner, Klaus Hamlescher, Guillermo Lares, Martin Lutz, Conrad Rodenberg, Sonja Heyer, Emilia Badalà	(Berlin sonic places, n.d.-a)
09/07 – 15/07	2012	Sound Symposium: Visions of Sound - exhibition	various locations	St. John's	Canada	Scenocosme, Michael Waterman & Kay Burns, Ian Birse & Laura Kavanaugh	(Clark Wherry, 2013)
11/07 – 14/07	2012	Uncommon Resonance: Speaker as a sound object.	various locations	Copenhagen	Denmark	Ted Apel, James Nesfield, Paula Matthusen, Laura Maes, Martin Rumori, Peter Batchelor	(SMC, n.d.)
14/07 – 28/09	2012	SonicPLACE	Intersection for the Arts	San Francisco	United States	Jennifer Parker, Lyès Belhocine, Benjamin Carpenter, Chris Cravey, Drew Detweiler, Derek Franz, Jasen Levoy, Andre Marquetti, Sudhu Tewari, Leslie Thompson, Oliver Whitcroft,	(MEDIATE Art Group, 2013)
18/07 – 20/07	2012	Darge, White, Maes	Logos Foundation	Ghent	Belgium	Moniek Darge, Helen White, Laura Maes	
04/08 – 31/08	2012	14th annual Sound Travels	various location	Toronto	Canada	Michael Trommer, Ryo Ikeshiro, Tristan Whiston & Moynan King	(New adventures in sound art, 2012)

18/08	2012	Klang Orte Berlin - m III – tempelhof airfield-installations ²⁶⁵	Tempelhof Airfield	Berlin	Germany	Max Eastley, Valeria Merlini, Olaf Schäfer, Peter Cusack, Radio Aporee, Udo Noll	(Berlin sonic places, n.d.-c)
23/08 – 16/10	2012	City Sonic Brussels	Various locations	Brussels	Belgium		(City Sonic, n.d.-a)
25/08 /2012 – 06/01 /2013	2012/ 2013	Sounds Like Silence	Hartware MedienKunstVerein	Dortmund	Germany	Dave Allen, Heinrich Böll, Manon de Boer, Jens Brand, Klaus vom Bruch, John Cage, Cage Against the Machine, Martin Conrads, Martin Creed, Merce Cunningham, Paul Davis, Guy Debord, Christopher DeLaurenti, Einstürzende Neubauten, Carl Michael von Hausswolff, Jens Heitjohann, Pierre Huyghe, Jonathon Keats, Yves Klein, Kollektive Aktionen, Christoph Korn, Shigeko Kubota, Brandon LaBelle, Henning Lohner, Christian Marclay, Ciprian Mureşan, Bruce Nauman, Max Neuhaus, Nam June Paik, People Like Us (Vicki Bennett), Hein-Godehart Petschulat, Robert Rauschenberg, Matt Rogalsky, Matthieu Saladin, Harald Schmidt & Helge Schneider, Petri Söderström-Kelley, Mladen Stilinovic, Ultra-red, Stephen Vitiello, Gillian Wearing, Dick Whyte, amongst others	(Hartware MedienKunstVerein, 2012)
31/08 – 16/09	2012	City Sonic	Various locations	Mons	Belgium		(City Sonic, n.d.-a)
01/09	2012	Soundwalk	Throughout the area encompassed by 4th St, Linden Ave, 1st St, and Elm Ave	Long Beach	United States	Alan Dunn, Noise 4 (the) Common Man, Alan Nakagawa & Joseph Tepperman, Brien Engel & Douglas Lee, Clowns & Fetuses, CSULB Laptop Ensemble, Dirty Chaps, Eric Strauss and Gregg Garcia, F. Myles Sciotto, Francene Kaplan, Gary Raymond, gintas k, glenn bach, Harrison Adams, Impossible Moon, Inouk Demers, John Brumley, Jordan Hill, Joshua Dickinson & Muhammad Hafiz Wan	(FLOOD, 2013i)

²⁶⁵ The second event of *Klang Orte Berlin* is not included in this list as only one installation was presented. (Berlin sonic places, n.d.-b)

						Rosli, LavishWomb, Marc Weidenbaum, MLuM, Pedestal & the All Girl Band, Phillip Stearns, Dan Tesene & Gene Kogan, phog masheeen, Roy Anthony Shabla & Nader Ghassem lou, Sander Roscoe Wolff, Seth Shafer, Talking So Much Plastic, Tom Zear, Tom McDermott, wheels, wikiGong	
05/09 – 02/12	2012	More Than Sound	Bonniers Konst hall	Stockholm	Sweden	Tarek Atoui, Malin Bång, Hans Berg & Nathalie Djurberg, Ayşe Erkmen, Carl Michael von Hausswolff, Susan Hiller, Matti Kallioinen, Haroon Mirza, Susan Philipsz, Scanner (Robin Rimbaud)	(Bonniers Konsthall, n.d.)
06/09 – 07/10	2012	City Sonic	Huy	Various locations	Belgium	Eric Van Osselaer, Colin Ponthot, Jules Nerbard, Gauthier Keyaerts, Sonja Schleiter, Philippe Cavaleri & Jonathan de Winter, Stéphane Kozik & Perrine Joveniaux, a.o.	(Transcultures - manège.mons, n.d.)
08/09 – 21/10	2012	HORIZONIC: Unfolding Space through Sound Art	Ystads konstmuseum	Ystad	Sweden	Amund Sjølie Sveen, Åsa Stjerna, Catrin Andersson, Dodda Maggý, Elin Øjen Vister, Goodiepal, Halldór Úlfarsson, Iben Mondrup, Jessie Kleemann, Kristín Björk Kristjánsdóttir/Kira Kira	(Horizonic, n.d.-c)
20/09 – 23/09	2012	Sound City Days – international biennial of sound art	various locations	Košice	Slovakia	Christina Kubisch, Paul Panhuysen, Bernhard Gál, Michal Rataj, Dawn Scarfe, Pierre-Laurent Cassière, Tomomi Adachi	(Košice - Európske hlavné mesto kultúry 2013, 2012)
21/09 – 27/09	2012	Shozyg – installations & soundscape	St. James's Hatcham Church	London	United Kingdom	James Bulley, Daniel Jones, Jockel Liess, Ben Lyford, Dawn Scarfe, Jeremy Keenan, Tom Richards, Tom Slater, Robert Jack, Matt Lewis, Kathrine Sandys, Jake Williams, Nabil Ahmed, Marcus Leadley, Emmanuel Spinelli, Tom Slater, Jake Williams, Portia Winters	(Goldsmiths University of London, 2012)
02/10 – 21/10	2012	Klangstaetten / Stadtklaenge '12 - zwischen Puff und Kloster	various locations	Braunschweig	Germany	Annie Goh, Daisuke Ishida, Damian Rebgetz, Ellen Flügge, Heiko Wommelsdorf, katrinem, Marco Montiel-Soto, Philipp Kullen, Thomas Koch, Thomas Wochnik	(Allgemeiner Konsumverein e.V., n.d.-b)
03/11 – 04/11	2012	SoundART 2012	Funkhaus Wallrafplatz	Cologne	Germany	Mila Burghardt, Anna Fotiadou, Jan Hoelt, Robert Jacobsen, Peter C. Simon, Hubert Steins, Frequenzwechsel (Tobias Beck, Tobias Grewenig, Volker Hennes, Matthias Neuenhofer, JiHyun Park, Martin Rumori, Susanna Schoenberg, Dirk Specht),	(SoundART, n.d.-d)

15/11 – 14/12	2012	HORIZONIC: Unfolding Space through Sound Art	École supérieure d'arts & médias de Caen/Cherbourg	Caen	France	Amund Sjølie Sveen, Asa Stjerna, Catrin Andersson, Dodda Maggý, Elin Øjen Vister, Goodiepal, Halldór Úlfarsson, Iben Mondrup, Jessie Kleemann, Kristín Björk Kristjánsdóttir/Kira Kira	(Horizonic, n.d.-a)
24/11 – 08/12	2012	Cyberfest – sound art program – At Heaven's Door	ART re. FLEX Gallery	St. Petersburg	Russia	Alexandra Dementieva, Laurie Spiegek, Nick Edwards, Don Slepín, Mark Hannesson, Alex Pleninger, Hans Tammen, Kurvenschreiber, amongst others	(ART re. FLEX Gallery, n.d.)
08/12 – 10/03	2012	Watch That Sound	Netwerk	Aalst	Belgium	Pierre-Laurent Cassière, Stefaan Dheedene, João Onofre, Mira Sanders, Sarah van Sonsbeeck	(Netwerk, n.d.)

The above list is not exhaustive.

Appendix 3

List of music festivals whose programming includes sound works

Music festivals whose programming includes an autonomous exhibition, such as the former *Happy New Ears* festival, are included in appendix 2. Music festivals that present several sound works, not presented as an autonomous exhibition, but as part of the festival programme are included in the list below. New Media festivals or festivals that focus on art and technology²⁶⁶ are not included.

Table 8 Music festivals whose programming includes sound works

period	name of festival	city	country	reference
1921 ²⁶⁷ - current	Donaueschingen Musiktage	Donaueschingen	Germany	(SWR, 2013)
1922 ²⁶⁸ - current	ISCM World New Music Days	differs	differs	(ISCM, 2004)
1947 ²⁶⁹ - current	Gaudeamus Muziekweek	Utrecht	The Netherlands	(Gaudeamus Muziekweek, n.d.)
1979 - 1983	Klang- und Spielstrasse	Essen	Germany	
1981 ²⁷⁰ - current	Musica Nova	Helsinki	Finland	(Musica nova Helsinki, n.d.)
1982 - 2010	Inventionen	Berlin	Germany	(F. Hein, 2013)
1984 - 1987	Festival beeldende muziek	Hasselt, Eindhoven	Belgium, The Netherlands	(Kenis, 1986) (Kenis, 1985) (Kenis, 1987) (Kenis, 1987) (H. Panhuysen, 1985)
1989 - current	Subtropics	Miami	United States	(Subtropics, 2012)

²⁶⁶ For example, DEAF [Rotterdam, The Netherlands], STRP [Eindhoven, The Netherlands], Ars Electronica [Linz, Austria], or Transmediale [Berlin, Germany].

²⁶⁷ It is unclear from what point onwards the programme of the festival included sound art.

²⁶⁸ It is unclear from what point onwards the programme of the festival included sound art.

²⁶⁹ It is unclear from what point onwards the programme of the festival included sound art.

²⁷⁰ It is unclear from what point onwards the programme of the festival included sound art.

1991 - current	Ultima - Oslo contemporary music festival	Oslo	Norway	(Ultima, n.d.)
1992 - current	Musiques en scène	Lyon	France	(GRAME, n.d.)
1993 - current	November Music	Den Bosch	The Netherlands	(November Music, n.d.)
1993 - current	Audio art festival	Cracow	Poland	(Choloniewski, n.d.)
1995	Audio & Vision - Festival der grenzüberschreitenden Künste zur "Kunstwald"	Herne	Germany	(Schläger, 1995)
1995	The Six Exquisites International Sound Art Festival ²⁷¹	Tacoma	United States	(Newsense Intermedium, n.d.-a)
1997, 2000	Sonic Residues - A festival of electroacoustic music and sound art events	Melbourne	Australia	(Paine, n.d.) (Paine, 2000)
1998 - current	Zèppelin	Barcelona	Spain	(Sonoscop, n.d.-a) (Sonoscop, n.d.-b)
1998 - current	send + receive: a festival of sound	Winnipeg	Canada	(Send + receive, n.d.)
1999 - current	Open Ears, festival of music and sound	Kitchener	Canada	(Open ears, n.d.-a) (Open Ears, n.d.-b)
2000 - 2008	Outer Ear Festival of Sound ²⁷²	Chicago	United States	(Experimental Sound Studio, n.d.) (Experimental Sound Studio, 2007)
2000 - 2009	Toon-festival	Haarlem	The Netherlands	(Toonfestival, n.d.)
2000 - 2010	Instal	Glasgow	United Kingdom	(Instal, n.d.)
2000 - current	Liquid Architecture	Melbourne	Australia	(Liquid architecture, n.d.)
2002 - 2009	Cyberonica	London	United Kingdom	(Cyberonica, n.d.-c) (Cyberonica, n.d.-d) (Cyberonica, n.d.-a)
2002 - 2010	La Nuit Bleue	Arc-et-Senans	France	(La Nuit Bleue, n.d.)
2002 - current	Maerzmusik	Berlin	Germany	(Berliner Festspiele, n.d.)
2002 - current	Soundplay	Toronto	Canada	(New adventures in sound art, n.d.-c)
2003 - current	Unsound festival	Cracow	Poland	(Unsound, 2008)
2003 - current	Borealis festival	Bergen	Norway	(Borealis festival, 2013)

²⁷¹ The 2nd (1997) and 3rd (1999) edition of this festival are not included in this overview as the festival programme only included performances and workshops. (Newsense Intermedium, n.d.-b, n.d.-c)

²⁷² *In the Eye of the Ear Sound Art Festival*, the festival preceding the *Outer Ear festival of Sound*, was organised in 1995, 1996 and 1998. Despite the name, the festival was presented in a theatre space and the programme mainly contained performances. (Szewczyk, n.d.)

2004	Overgaden Sound art festival	Copenhagen	Denmark	(Overgaden sound art festival, n.d.)
2004 - 2009	Octopus festival	Paris	France	(Octopus, n.d.)
2004 ²⁷³ - 2011	Starfield simulation	Malmö	Sweden	(Gillberg, 2011)
2004 - 2011	Festival Paesaggidisuoni	Tuscani	Italy	(Comune di Tuscania Assesorato alla Cultura, n.d.)
2004 - current	La semaine du son	various cities	France, Belgium	(La semaine du son, 2008)
2005 - 2008	PX_Piombino_eXperimenta	Piombino	Italy	(Extempore, 2005) (Piombino_eXperimenta, n.d.)
2005 - 2012	Re:Flux festival de musique et d'art sonore	Moncton	Canada	(Re:Flux festival de musique et d'art sonore, 2013)
2005 - current	SPOR festival	Aarhus	Denmark	(Spor, 2013)
2006 - 2008	Musiques de Rues: Nouveau Territoire des Arts Sonores	Besançon	France	(Macommune, n.d.) (Musiques de Rues, 2008) (Musiques de Rues, n.d.-a) (Musiques de Rues, n.d.-b)
2008	Les Voix Magnétiques	Lille	France	(Association Bazar, n.d.)
2009	Sonorama	Besançon	France	(Culture Besançon, n.d.)
2009	HyperSounds	Madrid	Spain	(Advanced Music International Press Department, n.d.)
2009 - current	Sonica	Ljubljana	Slovenia	(MOTA, n.d.)
2010 - 2011	Soundwaves	Brighton	United Kingdom	(Soundwaves Festival, n.d.)
2011 - current	Sounds Like Audio Art Festival	Saskatoon	Canada	(Sounds like audio arts festival, 2013)
2012	SKÁLAR Sound Art Festival	Seyðisfjörður	Iceland	(Skaffell, 2012)

The above list is not exhaustive.

²⁷³ *Starfield simulation* started in 2002, but the first two years no sound installations were presented.

Appendix 4

List of galleries and museums devoted to sound

Table 9 Galleries and (art) museums devoted to sound

period	name of gallery or museum	city	country	reference
1978 - 1986	Galerie Giannozzo	Berlin	Germany	(Quobo, n.d.)
1981 - current	Gelbe Musik	Berlin	Germany	(Lang, 2004)
1986 - 2007	Kunstverein Giannozzo	Berlin	Germany	(Art Association Giannozzo, 2013; Quobo, n.d.)
1989 - 1992	Generator sound art gallery	New York	United States	(Generator, n.d.)
1993 - 2009	Avatar Art Audio	Quebec	Canada	(Avatar, n.d.)
1996 - 2000	Studio Five Beekman	New York	United States	(Schumacher, n.d.)
2001 - 2010 ²⁷⁴	Diapason	New York	United States	(Diapason Gallery, n.d.)
1999 - 2007	Galerie Rachel Haferkamp	Cologne	Germany	(Haferkamp, 2009)
1996 - current	Singuhr-Hörgalerie	Berlin	Germany	(Binas & Seiffarth, 1998)
1998 - current	Klangturm	St Pölten	Austria	
1999 - 2001	Klangkunstforum Park Kolonnaden	Berlin	Germany	(HVB immobilien, n.d.)
1999 - current	e/static	Torino	Italy	(E/static, n.d.-d)
2000 - 2010	T-u-b-e klanggalerie	München	Germany	(T-u-b-e, n.d.)
2000 - 2009	Engine 27 Sound Gallery	New York	United States	(Engine 27, n.d.)
2004 - 2007	Klak! Klangmuseum	Kassel	Germany	(Kasselkultur07, 2007)
2005 - 2007	Sound art museum	Rome	Italy	(Zerynthia & RAM, 2007)
2007 - 2012	Lydgalleriet	Bergen	Norway	(Lydgalleriet, n.d.-d)
2007 - current	Le Bon Accueil	Rennes	France	(Le Bon Accueil, n.d.)
2008 - current	Audio visual arts (AVA)	New York	United States	(Audio visual arts, n.d.)
2009 - 2010	LEOS (Lieu d'exposition	La Tour-du-Pin	France	(Le centre du son, 2010)

²⁷⁴ In 2010 *Diapason* moved to another location. Instead of presenting sound works, their focus has shifted to the organisation of workshops and residencies for sound artists. (Diapason, n.d.-f)

	d'oeuvres sonores)				
2009 - current	Galerie Mario Mazzoli	Berlin	Germany	(Galerie Mario Mazzoli, n.d.-a)	
2010 - current	SoundFjord	London	United Kingdom	(SoundFjord, 2013)	
2011 - current	Spazioersetti	Udine	Italy	(Spazioersetti, 2011)	
2012 - current	Akusmata - sound art gallery	Helsinki	Finland	(Akusmata, n.d.)	
2012 - current	ØSTRE - Hus for Lydkunst og Elektronisk Musikk	Bergen	Norway	(Østre, n.d.)	

The above list is not exhaustive.

Appendix 5

List of permanent collections

Table 10 Overview of permanent collections

period	name of gallery or museum	city	country	reference
1999 - current	Klankspeeltuin, Muziekgebouw aan 't IJ	Amsterda m	the Netherlands	(Muziekgebouw aan 't IJ, 2011)
2000 - current	Klangpark im Kurpark	Vlotho	Germany	(Vlotho, n.d.)
2005 - current	Klankenbos	Neerpelt	Belgium	(Musica, 2012a)
2011 - current	Sound Factory	Bruges	Belgium	(Sound Factory, n.d.)
2012 - current	Spielhörplatz	Brandis	Germany	(Stache, n.d.-a)

The above list is not exhaustive.

Appendix 6

Lectures, exhibitions & performances, publications

List of lectures

26/04/2013	Sounding sound art <i>docARTES</i> Orpheus Institute, Ghent, Belgium
08/04/2013	Sound art in public space <i>seminar Interactive Streets</i> Zadkine Human Technology, Rotterdam, the Netherlands
03/10/2012	Sounding sound art <i>FORUM with Arne Quinze & Laura Maes</i> Bibliotheek Kris Lambert, Oostende, Belgium
10/04/2011	Sounding sound art <i>European platform for artistic research in music - Sounds, searchings, sharings</i> Faculty of Music, University of Arts, Belgrade, Serbia
03/06/2010	Interactivity puts a focus on listening <i>Sound, Sight, Space and Play 2010</i> Music, Technology and Innovation Research Centre, De Montfort University, Leicester, United Kingdom
27/05/2010	Oorwonde, an interactive audio operating table <i>39th Annual AMIS Meeting</i> Library of Congress, Washington DC, United States
06/05/2010	Geluidskunst <i>Update_3: Body Sound - Sound and Image in Art</i> Zebrastraat Kunstenplatform, Ghent, Belgium
08/12/2009	Klinkende kunst <i>Seminarie Muziekhistorisch en analytisch onderzoek</i> University College Ghent, Conservatory, Ghent, Belgium
22/05/2009	Sound sculptures and installations as potential new instruments <i>38th Annual AMIS Meeting</i> Stearns Collection, University of Michigan, Ann Arbor, United States

- 03/03/2009 Geluidskunst
De avond van Nico Parlevliet
Centrum Beeldende Kunst, Dordrecht, the Netherlands
- 02/12/2008 Klinkende kunst
Seminarie Muziekhistorisch en analytisch onderzoek
University College Ghent, Conservatory, Ghent, Belgium
- 08/11/2008 Unraveling the mystery: the creative use of natural phenomena in sound art
Artech 2008, 4th International Conference on Digital Arts
Universidade Católica Portuguesa, Porto, Portugal
- 17/10/2008 Organ techniques used in sound sculptures & sound installations
Organs in Art/Organs as Art
CUNY Graduate Center, City University of New York, New York, United States
- 04/07/2008 Sound art
Plug and Play for the Muses
University College Ghent, Conservatory, Ghent, Belgium
- 30/04/2008 Klinkende kunst
KunstenOnderzoeksForum
University College Ghent, campus Bijloke, Ghent, Belgium
- 20/02/2008 Hulpdisciplines in geluidskunst
MAO-seminarie: De integratie van 'hulpdisciplines' in een artistiek onderzoeksproject, het verband tussen artistiek onderzoek en andere onderzoeksvelden
Orpheus Institute, Ghent, Belgium
- 15/02/2008 Klinkende kunst
IPEM Thinktank
University Ghent, IPEM, Ghent, Belgium
- 13/02/2008 muziek en grafische kunst
Bachelor in beeldende kunst 2
Katholieke Hogeschool Limburg, Hasselt, Belgium
- 11/02/2008 mechanische muziekinstrumenten
Bachelor Elektromechanica 2
University College Ghent, Faculty Science & Technology, Ghent, Belgium
- 18/12/2007 Klinkende kunst
Dag van het Artistiek Onderzoek
Orpheus Institute, Ghent, Belgium
- 02/06/2007 Sounding art
PhD Music Students Conference
University of Edinburgh, Edinburgh, United Kingdom
- 04/12/2006 Klinkende kunst
Seminarie onderzoeksmethodologie
University College Ghent, Conservatory, Ghent, Belgium

List of exhibitions & performances

- 26/04/2013 Oorwonde
Orpheus Institute
Orpheus Institute, Ghent, Belgium
- 28/03/2013 Tondelier & Tolhuis – performance
Miry hall
IPEM 50 - Week van de Hedendaagse Muziek, Ghent, Belgium
- 15/09/2012 Tondelier & Tolhuis – performance
St. Bavo's Abbey
Track, Ghent, Belgium
- 21/07 - 16/09/2012 Tondelier & Tolhuis - installation
Gasmeterlaan & Tuin van Kina
Track, Ghent, Belgium
- 18/07 – 20/07/2012 Oorwonde
Logos Foundation
Logos Foundation, Ghent, Belgium
- 11/07 – 14/07/2012 Oorwonde
Damp gallery
Uncommon Resonance: Speaker as a sound object, 9th Sound and Music Computing Conference, Copenhagen, Denmark
- 24/02 – 22/04/2012 Oorwonde
Usurp art gallery
Usurp art gallery, London, United Kingdom
- 26/01 - 29/01/2012 3times4
Geraard de Duivelstraat, Campus De Wijnaert
Light festival, Ghent, Belgium
- 13/11/2011 492 kilo – installation
Theater Artemis
November Music, Den Bosch, the Netherlands
- 11/11 – 12/11/2011 492 kilo, an extended piano recital
Theater Artemis
November Music, Den Bosch, the Netherlands
- 18/03/2011 Oorwonde
Campus Nederpolder
Artistic Research in Progress, Ghent, Belgium
- 09/10/2011 492 kilo, an extended piano recital
Concertgebouw
Concertgebouw, Bruges, Belgium
- 30/09/2011 492 kilo, an extended piano recital
Arts Centre De Singel
Arts Centre De Singel, Antwerp, Belgium
- 01/10 - 06/10/2011 492 kilo – installation
Arts Centre De Singel
Arts Centre De Singel, Antwerp, Belgium
- 04/12/2011 492 kilo, an extended piano recital
Theater aan het Vrijthof

30/11 - 11/12/2011 *Theater aan het Vrijthof, Maastricht, the Netherlands*
 492 kilo - installation
 Theater aan het Vrijthof
Theater aan het Vrijthof, Maastricht, the Netherlands

20/11/2010 Oorwonde
 The Flemish Parliament
E-dinges, Brussels, Belgium

22/03/2010 Oorwonde
 muziekcentrum Bijloke
Jazz & Sounds festival, Ghent, Belgium

21/07/2009 Portification (in cooperation with Miguel Cardoso), presentation
 at the summer course
 Casa da Musica
6th Sound and Music Computing Conference, Porto, Portugal

03/03/2009 Up & down the Vliet
 Centrum Beeldende Kunst
Centrum Beeldende Kunst, Dordrecht, the Netherlands

30/01 - 01/02/2008 O_Rex
 Rotterdamse Schouwburg
'Exploding Cinema' - International Filmfestival, Rotterdam, the Netherlands

25/01 - 26/01/2008 O_Rex
 De Brakke Grond
De Brakke Grond, Amsterdam, the Netherlands

19/05 - 23/05/2008 3times4
 Huset i Magstræde & the worldwide web
Re:New festival, Copenhagen, Denmark

19/11 - 20/11/2007 O_Rex
 Muffathalle
Spielart Festival, München, Germany

29/09/2007 O_Rex
 Arts centre Vooruit
Flanders Festival Ghent, Ghent, Belgium

14/09 - 30/09/2007 3times4
 Corner of the Vlasmarkt and the Lekkerbeetstraat & the
 worldwide web
Klinkende Stad, Happy New Ears, Kortrijk, Belgium

List of publications

A1

- Maes, L., Rogers, T., & Raes, G.-W. (2011). *The Man and Machine Robot Orchestra at Logos*. *Computer Music Journal*, 35(4), 28-28.

A2

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