SOUND GENERATION

edited by alexis bhagat & gregory gangemi

dummy
lfirst page.
Essentially we're going to
install hundreds of these seismic
sensors

into the building, so the whole
building
ecomes a giant microphone. All that
sounds will
be brought down to

kind of a control matrix system
where the auto
mated live mix will be played
into two pu

blic elevator cabins. The elev
ator becomes the listening chamber. Th
ey're interesting cabins beca

use you enter on the street on one
11111111.000o.99998w9

contents

about this book

The pages bound here are reconstructed traces of a conversation involving some two dozen voices, a conversation that focused upon sound as shaped and deployed by two generations of artists who have seized upon developments in phonography and synthesis to bring forth new forms of sonic art.

We would like to make clear that book you are holding in your hands is a map and not a history of sound art, though we had set out in search of a history. Our aim: a broad survey of contemporary sonic arts practices with focus on the role of recording technology, the relationship of sonic arts to traditional artistic disciplines, and the political ramifications of individual artist's processes. What we gathered was a dizzying 400+ pages of interviews, as we invited artists working both in sound art and experimental music contexts, at various stages in their careers, widely spaced across the territory we aimed to traverse. Sifting through those raw transcripts, a history seemed more elusive than when we began.

> *A comprehensive geneology of the class of art-object is out of the question; the idea that the constructional sustainers (the frameworks used as a support for art-objects) originate from a system of fundamental postulates is difficult to even imagine, let alone to trace. However, some boundaries and divisions within the art-area could be mapped out and, without attempting any systematic analysis, the attempt might be made to assign fairly definite positions to some of the concepts in this area: this, rather than hypothesize about a comprehensive geneology which would consist of tracing more than what is here considered applicable.*

And so we cut up the 400+ pages of interviews, and allowed the fragments to cluster and crystallize into the chapters which here follow. Considerations of personal history and training coalesced into "Beginnings." The sound art/music question and other issues of taxonomy became "Categories & Contexts." "Cinema & Radio," "What Is Sound? & Who Is Listening?" and "Composition" deal with self-evident topics. "Recording & Playback," on the other hand, points to how wide the definitions of microphone and speaker may be stretched by artists. "Distribution" goes into depth with the history of Generator Sound Art, a storefront performance space in New York's East Village, and discusses physicalization of sound in a variety of distribution contexts. "Sites of Performance" takes note of two tropes—appearance and immersion—through the work of Brenda Hutchinson and Francisco Lopez. The next three chapters are imaginary roundtables. "Bridges As Bells" puts Jodi Rose, who wanders the world listening to bridges, next to Mark Bain, who "treat[s] architecture as a bell." "The Soundscape" puts acoustic-ecology pioneer Hildegard Westerkamp next to the duo O+A. In "Rhythm/Power," Gregory Whitehead, tobias c. van Veen and Grey Filastine talk about danger, authority and beats.

The three essays which follow the Colloquy further explore questions of context, technology, perception and power.

[NEED MORE HERE] [ipso facto after two hundred end of the world how about it this is wait give me not two hundred sixty just sixty no eighty, seventy or eighty words ipso facto after two hundred end of the world how about it this is wait give me not two hundred sixty just sixty no eighty, seventy or eighty words this is it just about enough space, okay final copy to go in here, after the end of the world, don't you know that yet?]

ACKNOWLEDGMENTS:

The editors would like to thank all of the contributors to Sound Generation for taking the time to share their experiences and perspectives with us, and for dealing with the many revisions of this text. Among the contributors, we would especially like to thank Ken Montgomery and Annea Lockwood for their intellectual generosity. We also would like to thank Experimental Intermedia, OfficeOps, Diapason Sound Gallery and Free103point9 for their support in the fundraisers for this publication, as well as all the performers at Aspects of Jupiter and Crystal Hearing. We must especially thank Tianna Kennedy for making these events possible. We also must thank Jason Quarles of Chronoplastics for his participation in the curatorial selections and for his interviews. Finally, we thank those individuals without whom this book never would have gone to press: Luisa Giugliano, for introducing the two of us to each other in the first place; Ben Meyers, for the immediacy with which he understood our project and for the very long time that he has shepherded us; Erika Biddle for her insights; and Atom Bobbette for catalyzing the completion of this book.

Could you tell me about the beginning?

Artist: How far back do you want to go?

Wherever or whenever you locate the beginning. We'd like to designate an origin, to keep us from becoming lost.

Artist: Well, origins are a tricky subject. Are you looking for something authoritative?

Authority prohibits conversation. This is a conversation.

Artist: Can you tell me something before we start?

We've already started.

Artist: Point taken. Now that we've started, could you tell me where you locate the origin?

BEFORE BEGINNING: ORIGIN

The origin of the entire terrain is an occurrence on a hot July day in 1877 in Menlo Park, New Jersey. Thomas Edison was singing "Mary Had A Little Lamb" into the first phonograph. Maybe. We're not certain that everything is so simple, but that remains the most useful origin for the territory in question.[1]

Artist: Nothing is so simple. Of course, you could not be making a book like this without that recorder of yours.

Have you heard that "there is no difference between what a book talks about and how it is made?"[2]

Artist: Have you heard that "sound is the closest thing to a diagram of thought, in the sense that, to actually hear it and apprehend it, you have to simultaneously forget and remember, instant by instant?"[3]

Have you already forgotten what we'd asked you? Or are you ready to begin now?

1 "Edison understood. A month later he coined a new term for his telephone addition: phonograph. On the basis of this experiment, the mechanic Kruesi was given the assignment to build an apparatus that would etch acoustic vibrations onto a rotating cylinder covered with tinfoil. While he or Kruesi was turning the handle, Edison once again screamed into the mouthpiece—this time the nursery rhyme 'Mary Had a Little Lamb.' They moved the needle back and let the cylinder run a second time —and the first phonograph replayed the screams.... 'Speech has become, as it were, immortal.'" Kittler (21)

2. Deleuze & Guattari (4)

3. Marina Rosenfeld, ARTFORUM

BEGINNING

janek shafer: Basically, I was born an inventor.

francisco lopez: I was born in Madrid, in Spain.

pamela z: I've been doing music all my life. I knew from a pretty young age that that was going to be my area.

janek: I always said to my dad that I wanted to be an inventor when I grew up, and it turns out that I am.

christopher delaurenti: When I was 11, my only music teacher—my father—gave me piano lessons. Once, rather than perform my weekly assignment, I asked to play a piece of my own, "Daybreak in the People's Republic of China." I pinned the sustain pedal to the floor and improvised, slowly pressing and trawling along the black keys with a few dissonant dips into the white keys. My father, a restaurant pianist, listened as he listens to all music, with eyes closed and fixed attention. "That wasn't good," he decreed, "but it wasn't bad." Since then, tactile, corporeal improvisation has remained the root of my music.

tobias c. van veen: Saying anything on beginnings tends to give wrong impressions as there have been so many. Yet, as this concerns sound, and technology, I do wish to say that I took Suzuki violin from when I was seven. It gave me an appreciation for learning by ear. I never learned to read note music. I learned to hear music. Becoming a DJ was made easier as I was used to hearing things and playing them back, to repeating cycles, loops, phrases, to connecting my ears to my fingers almost in the absence of visual clues.

pamela: In high school I was doing music and writing songs. I played guitar and also sang in concert choir. And then I went to college, where I studied classical voice, bel canto. At the same time I was beginning this burgeoning career as a singer/songwriter.

hildegard westerkamp: I studied music—piano and flute—in Germany.

When I went into music studies, it was because I really loved music. I barely got in, because I wasn't such a great pianist. I had a horrific experience studying music: I wasn't "up" for that level of playing at all. I wasn't interested in practicing so much. When I emigrated, I had had it up to here with music studies, and wasn't going to continue.

brenda hutchinson: I studied music. Composition. First at Carnegie-Mellon in Pittsburgh and in graduate school at UC-San Diego (1977–1979). Before beginning grad school, I did a summer course in electronic music at Stanford, where I realized pretty quickly that the places where you had access at that time—IRCAM, MIT and Stanford—were white man's land. There was no way for me to sustain any kind of relationship there. It was pretty much closed to me.

ed osborn: I played French horn as a kid, though getting braces basically put an end to that. I listened to WXPN in Philadelphia a lot when I was growing up; at the time it played a great deal of experimental music and I got turned on to lots of things I would never have heard elsewhere. I ended up studying music, first at Wesleyan, with Ron Kuivila and Alvin Lucier,[1] and later did graduate studies at Mills College. Between college and graduate school I started doing things that had sound but weren't music—that's how I thought of them at the time, the "not-music" things. When I got to graduate school, I really started blending sound and visual practices in my work. I was enrolled in the music program but spent a lot of my time in the art department; both areas offered a great deal but I would have felt a little constrained being exclusively in either one.

richard lerman: At college, I studied composition and music theory, but I was always into doing electronic music. This was very early in the game. I graduated college from Brandeis University in 1966, and I stayed at Brandeis for graduate school because they had the studio and I was able to just work there. But then I had a fight with the Music Department. They asked me to write pieces in the style of Brahms, and I basically told them they could just stick it. They weren't recognizing what I was doing in electronic music, which is why I was there, so I jumped ship. Earlier I had been making films, so I got a master's degree in filmmaking. There's always been this kind of funny space where I wonder, "What am I?" A musician? A filmmaker? Finally at some point I just decided that I'm just someplace in the middle. I work with sound and I work with performance, and with music and with visual things, and that's just what I'm going to do.

ken montgomery: I studied poetry —

1 Alvin Lucier, composer, American, b. 1931. In 1960, Lucier was awarded a Fulbright and went to Rome, where he attended performances by John Cage, Merce Cunningham, and David Tudor. He returned from Rome in 1962 to take up a position at Brandeis University in New York as director of the University Chamber Chorus. At a 1963 Chamber Chorus concert at Town Hall, Lucier met Gordon Mumma and Robert Ashley, who would later form the Sonic Arts Union along with Lucier and David Berman. In 1970, Lucier left Brandeis for Wesleyan University, where he has taught since. • Significant works: *Music for Solo Performer* (1965), *Vespers* (1968), *I am sitting in a room* (1970), *Music on a Long Thin Wire* (1977), *Clockers* (1978) • Ronald J. Kuivila, composer/sound-artist, American, b. 1955

ken: Yeah, poetry, and I thought: "This is not very practical" and then I switched to journalism: "This is too dry." Then in 1978 I came to New York to study filmmaking and thought, "This is great, it's a combination of poetry and writing and the soundtrack, everything combined!"

But in film class I really felt that I was out of place because all of my attention was on the soundtrack. Generally, the very last thing filmmakers do is the soundtrack. That's what you put on at the end, and you find sound that fits the images. For my films I knew what the soundtrack would be before I shot the film.

phill niblock: I started doing film in 1965. Mostly working with other people, but beginning to do stuff of my own. There're six films with soundtracks, but none of them with my music. One of them is actually Sun Ra. One with Max Neuhaus.[2]

ken: The sound was so central to me! Then one time I ran into this great electronic musician from Philadelphia, Charles Cohen,[3] and he said "Why don't you just buy a synthesizer and make sounds? Why do you go to film school?" It was just a simple statement that he made at a cafe. That's all it took. I left film school, saved up and bought a Korg MS-20 analog synthesizer. I sat at home with cheap electronics, some PIAA kits and a reel-to-reel tape recorder and began making soundtracks for myself. Eventually I constructed songs and soundscapes, mixed them to cassettes and sent them around to friends.

jeph jerman: I am basically just a collector of sounds.

marc mcnulty: Starting on my own? 1988 or 1989. Playing around with shortwave radios, finding hidden sounds. I wasn't necessarily trying to find the musicality of them. It was more like that "*Ah-ha*" factor of *oh my god! what is that? And where is it coming from?* It was a mystery, all these abstract sounds coming from all over the world and coming out of this little box. I'd hook my tape player up to it. Then I evolved to a four-track and to effects, and piling effects on effects.

claudio chea: My first real encounter with experimental music came from a series of conversations with Francis Schwartz,[4] a very talented composer. He has a lifetime of interesting ideas on sound and composition. I come from a film background. My first electronic project was creating visuals for a group called Macroporno, where I met Jorge.

jorge castro: We started out with very cheap electronics, like microphones and pedals and white noise from the radio, just fucking around with whatever came out.

2 *The Magic Sun* (1966–68) 17 minutes. Filmed by Phill Niblock, featuring Sun Ra and his Solar Arkestra. Filmed in a high-contrast black and white 16mm. • *Max* (1966–68) 7 minutes. Filmed by Phill Niblock, edited by David Gearey. An image collage film / portrait of Max Neuhaus, with a collage sound track by Max Neuhaus. Black and white 16mm film.

3 Charles Cohen, composer, American, b. 1945. Based in Philadelphia, Charles Cohen, has been composing and performing electronic music since 1971. He specializes in collaborative, cross-disciplinary projects with theatre, dance, music, and media artists, and is especially interested in live performance and improvisation. His instrument is the Buchla Music Easel, a rare integrated analog performance instrument made by synth pioneer Don Buchla.

4 Francis Schwartz, composer, American, b. 1940. Francis Schwartz was the Dean of the Humanities College of the University of Puerto Rico from 1995 to 1999, where he established an electronic music laboratory and an Experimental Arts Workshop.

I put it on tape and edited the good parts.

claudio: One thing lead to another and Jorge and I started working together on a sound collaboration, Cornucopia, that hasn't stopped producing ever since.

bruce odland: Sam and I have been working together with the tubes since 1991.

sam auinger: We were invited to do a sound installation at the Trajan's Forum in Rome. We came there with an idea, but when we heard the actual site, it didn't make any sense anymore because it was so messed up from all the traffic around. You know, the Italians really like to go around with their little scooters. *Rrrreaa-rrreaa*. They really like this. They do this with great machismo. So, it's really very loud there.

grey filastine: I started the Infernal Noise Brigade by calling together some people about two months in advance of the WTO meeting that was here in Seattle on November 30th, 1999. I just had a feeling that something big was going to happen, and I knew that it would need a strong soundtrack, and the ability to move people around in the streets without giving orders or barking through bullhorns. I wanted to do it in a more fluid manner, to be able to just GO and bring a few hundred people from here to there, just because the energy is powerful.

annea: The River Archive began because I really love the sound of flowing water. It's really complex. It's endlessly satisfying. It constantly changes. Yet, it has a continuum, a sonic continuum, which is very beautiful. The details are beautiful. Rivers can do a lot more with pitch and rhythm than I could ever dream of.

francisco lopez: I worked in entomology for a number of years. After doing some work in taxonomy (and actually describing several new species of ants), I did my PhD on ant-foraging ecology during the late 80s–early 90s in Spain, Senegal and Brazil. Since then I've been working on ecosystem dynamics, carrying out research projects and post-graduate teaching in Spain, Costa Rica and Cuba. This field is in fact more cybernetics than biology, which obviously turns me into quite an unusual kind of biologist. Quite a fruitful field for someone like me with a playful attitude, no concern at all about "truth," and a deep interest in the eternal question of what "reality" is. Now, the most important influence of this work in biology on my work with sound is not that I have a good bunch of recordings of insects, frogs, and stuff like that, but the fact that I realized over the years that I've actually unconsciously learned more from nature than from music on how to make music (at least my

version of it). My personal taste for certain sonic textures, structures, pace, use of silence, extreme dynamics of both frequency and loudness... all these weird things come from an extensive exposure to natural sound environments. Much more interesting and fruitful than studying music methods or software.

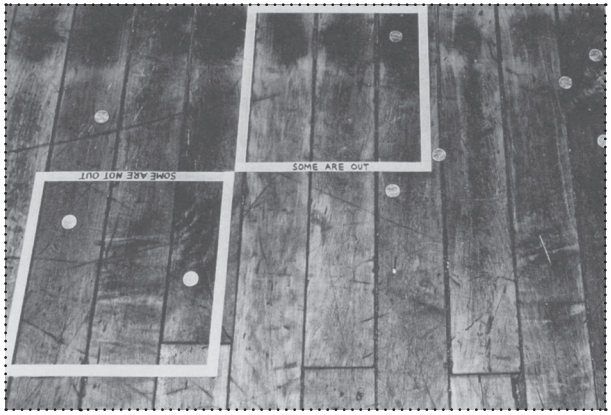
maryanne amacher: In my first sound works I developed the idea of sonic telepresence, pioneering the use of telecommunication in sound installations. While a Fellow at the Center for Advanced Visual Studies, Massachusetts Institute of Technology (1972–76) I developed a number of projects for solo and group shows in collaboration with the visual artists Scott Fisher, Luis Frangella, and the architect Juan Navarro Baldeweg.[5] In the telelink installations for "CITY-LINKS" 1-22 (1967–) the sounds from one or more remote environment (in a city, or in several cities) are transmitted in real-time to the exhibition space, as an ongoing sonic environment. I create the "CITY-LINKS" installations using real-time telelinks, transmitting the sounds from microphones which I place at the remote locations. I introduced the concept of an environment-oriented spatial sound sculpture (created by combining and modulating several remote sound environments) in solo and group shows at the Museum of Contemporary Art, Chicago and the Walker Arts Center (1974).[6] The adventure is in receiving live sonic spaces from more than one location at the same time—the tower, the ocean, the abandoned mill. Remote sounding environments enter our local spaces and become part of our rooms. I was particularly interested in the experience of "synchronicity"—hearing spaces distant from each other at the same time—which we do not experience in our lives.

jodi rose: I think the first moment starting this journey here was idle curiosity on the bus, looking up at the ANZAC Bridge during its construction. I looked at the bridge cables and thought, "I'd like to play that someday. I wonder what it sounds like?"

mark bain: Essentially, I'm using architecture as kind of bell and then striking it.

5 Scott Fisher, artist/technologist, American, b. 1951. Virtual reality pioneer, founding Director of Virtual Environment Workstation (VIEW) Project at NASA's Ames Research Center. • Luis Frangella artist/painter, Argentine, 1944–1990 • John Cage "Lecture on the Weather" (1975), composed in collaboration with Luis Frangella and Maryanne Amacher. Composition for 12 speaker-vocalists-instrumentalists (preferably American men who have become Canadian citizens), tapes and a film. Commissioned by the Canadian Broadcasting Corporation in observance of the bicentennial of the United States of America. • Juan Navarro Baldeweg, Artist/Architect, Spanish, b. 1939

6 Maryanne Amacher, "Three Sounding Environments," Walker Arts Center, September 28–November 3, 1974. "Hearing Space Day by Day," "No More Miles" (with Luis Frangella), "Everything in Air."


SOME ARE OUT
SOME ARE NOT OUT

From the very beginning of our research and discussions with artists and composers, we found ourselves mired in an excess of general and specific terms: new music, noise music, concrete music, experimental music, organized sound, sound art, klangkunst, soundscape, phonography, radio art, sound collage, sound sculpture, ear-film and of course many more.

Why so many terms? And why the tendency to equate the audible to other senses?

CATEGORIES AND CONTEXTS

lou mallozzi: When you look at the historical antecedents for this work, of course there are musical ones, but there are also ones in other places: in cinema, in sculpture, in installation, in performance, and literature as well. Let's say that, in many cases, the streams through which people are arriving at this work are not musical streams. Since many artists working with sound have interests that flow out of those streams, there is the feeling of an imperative to differentiate themselves from purely musical concerns, and to position themselves or their work in these other areas. The work then is perceived in a different way. It gets listened to not as music, but through other frames of reference.

It's partly a historical gesture, and I would have to say that the taxonomic issue is tricky because a lot of the sound work that people do can, in fact, be thought of as music or be lent musical considerations. Another confusing fact is that some of us do at times make work that is quite musical and at other times isn't at all musical. That's my case, for example. I think that there are several things like this, which from a taxonomic perspective may be a little frustrating for someone who really wants categories.

Another part of the issue is that musical culture has looked at all sonic production and tried to subsume it under the aegis of music.[1]

pamela z: The sound art and sound installation world is more rooted in the

1 Douglas Kahn refers to this "equation of artistic practices with sound as music" as "the musical conceit." Kahn, "The Sound of Music."

visual art world. A lot of sound artists do not want to call themselves composers and don't want to call their work music. I used to rebel against that because I would say sound art is music! My definition of music is like the Cagean definition, where music doesn't have to have Western melodies or harmonic structure or rhythm or any of that. It just has to be sound that you've organized in some way. That to me is music.

lou: Even taking a kind of Cagean perspective toward music, that kind of very open-ended perspective, centered on the perceiver rather than the maker—not even centered on the object but centered in the perceiver's mind or the perceiver's consciousness—still it configures itself as music within so-called musical concerns.

pamela: But I do understand their reticence because music is a very loaded term and it means a lot to a lot of people. As soon as you say "music," it distracts people from what you're actually doing, because they're basically busy comparing your work to what they think music is supposed to be.

lou: There are artists of course who don't have those musical concerns and they don't want their work to have to be talked about that way or perceived that way. They prefer it to be thought about and experienced in a different way and therefore they will go to great lengths to differentiate themselves from the rhetoric of music.

Or call it "sound art" simply for the sake of convenience?

pamela: Yes, I noticed that about certain pieces I've done. If I say, "this is music," the audience will spend the first half of the performance being confused: "How can this be called music?" But if I say, "this is a piece of sound art," well, then they don't have any expectations of what that's supposed to be. So they'll just listen to it for what it is, because they aren't concerned with whether or not music is supposed to have a beat that you can dance to, or supposed to have a melody that you can sing, or whatever thing that they're stuck thinking that music is supposed to do. Because for everybody in the world, music is supposed to do something. It's a religion for people. Even people who are not musicians, especially people who are not musicians, feel very strongly and possessive about the purpose that music is supposed to fulfill in their lives. And music that doesn't fulfill that, to them, is wrong.

lou: So it becomes understandable, especially when you're sorting out the beginnings of a field of work. Because we're dealing with a relatively small field here that's had its concentration in relatively recent histories, it is understandable that it would happen this way. It's not very different from the earliest days of video art in the

seventies, when many video artists went to great lengths to differentiate what they were doing from television.

We cannot agree that these practices themselves are so recent: The poverty of art history masks the trajectories of sonic art, and so each generation appears as if from a fog. Russolo, for example, wrote the "Art of Noises" in 1913 and Cage spoke of the "all-sound music of the future" in 1937. Nevertheless, the way in which artists working in an art-world context have been channeled into a consolidated category—i.e, "sound art"—for the purposes of museum exhibition presents a clearer analogy to "video art."

ed osborne: In the last ten years sound-based work has been featured regularly in a variety of visual art exhibition contexts.[2] Even if sound art is not always an entirely comfortable fit in those contexts, it has become familiar enough that it can be shown in a gallery or museum without raising too many eyebrows. Video and computer media work was in somewhat the same situation some years back, and now no one thinks twice about it. The same is becoming true of sound work.

lou: I think it's that not-quite-comfortable fit that is of interest to artists.

mark bain: I try to work in a variety of ways. I don't strictly call myself a sound artist. I prefer to utilize whatever media's best to convey an idea. I'm mostly interested in the conceptual aspect of things and less about technique. The technique is only a vehicle to push the conceptual and experiential.

For example?

mark: For example, when I was studying at MIT I found that the resonance of buildings and the resonance of bodies correlate to each other, that there is a point where frequencies applied to the body can affect the inner ear and in turn affect your balance system. You can tune that frequency in and provoke an experience where suddenly the architecture becomes fluid and in motion. Its this perceptual strangeness which gets utilized.

lou: Sonic imperatives toward reconfiguring perception are not going to comfortably fit into musical categorization.

2 1995–2005, a partial list: WRO (*Wizualne Realizacje Okolomuzyczne / Sound-Basis Visual Art Festival*) Established 1989. Since 1995, the focus has expanded and the festival was renamed to the WRO Media Art Biennial. http://wrocenter.pl • *Sonic Boom.* Hayward Galley, London, 2000. Curated by David Toop • *Volume: Bed of Sound* July–September 2000. Included works by over sixty artists, spanning three decades, presented through headphones installed into the frame of a massive bed. • *Sound Spaces* (9 sound installations), ICC, Tokyo, July 11–September 28th, 2003. Works by Alvin Lucier, Christina Kubish, David Cunningham, Akihiro Kubota, Rafael Toral, Edwin Van Der Heide, Richard Chartier & Taylor Dupree, Alejandra & Aeron, Superseat. • *Treble*, Sculpture Center, New York, May 16th–August 1st, 2004. Works by Francis Alys & Rafael Ortega, Joseph Beuys, Grady Gerbracht, Joseph Grigely + Amy Vogel, Erik Hanson, Jim Hodges, Jorge Macchi, Euan Macdonald, Emmanuel Madan, Max Neuhaus, Terry Nauheim, Cornelia Parker, Andrea Ray, Dario Robleto, Steve Roden, Daniel Schafer, Jude Tallichet, Mungo Thomson, Brad Tucker, Anton Vidolke + Chrisian Manzutto, Stephen Vitiello and Paulo Vivaqua. • *New Sound New York* (2004 revamping of *New Music New York*, 1979)


TESLA
Radio

In moving beyond the perimeter of musical concerns, two traditions have been indispensible – cinema, the premier mechanical artform, and radio, the original electronic artform. In this chapter, we contrast the cinematic to the radiophonic in order to better define both, and to find specific instances where artists make use of these traditions, as both foundation and framework.

CINEMA AND RADIO

lou mallozzi: We were talking before about borrowing terminology from one sense to describe another. I actually think that our perceptual mechanisms are not so distinct, and that the other reason that we borrow terms is because they describe more accurately what is happening when we perceive. Even though we are perceiving primarily sound, I am not convinced that these other senses are not at work. Listening to a radio work that is a cinema for the ear, you might be listening to it more the way that you watch a film.

ken montgomery: I have created many octophonic concerts for performing in total darkness, or with the audience blindfolded and surrounded by speakers. I think of it as sound theatre because it is like a theater without actors or sets, or like a film without images. There's definitely a development and theme in my work that can be cinematic: the listening experience induces internal imagery and stories that can be startling different for each person.[1]

Is it really useful to call this sort of work "cinema"? Even within film traditions, the recording of live theater is distinguished from a visual language of cinema. Doesn't cinema imply a certain set of visual conventions?

lou: Cinema for the ear is still cinema. Let's say cinema is a term for describing an experience of time rather than a situation where an image has to be projected and a sound associated with that image. Then we can in fact say that this is not really music: this is actually a cinematic experience.

1 Ken Montgomery and Conrad Schnitzler also used the term "Dramatic Electronic Music" to distinguish their work from minimal music or space music.

Perhaps you could clarify the tradition here: What are some of examples of this type of cinematic sound work?

lou: One of the earliest examples would be *Weekend* (1932), by Walter Ruttman, a filmmaker from Berlin.[2] He really thought of this as an "audio film," a film with no image, only a soundtrack. It was first "screened" in a movie theater.

Another interesting historical example would be the works of Michel Chion, a musique concrete composer from France. He is mostly known in the US as a film theorist with a focus on sound, through his book, *Audio Vision*,[3] which deals with film sound. He refers to his musique concrete works as cinema for the ear, and may have coined the term.

My own work, *Pass* (2000), part of the Infrathin exhibition in Chicago, was definitely cinematic. Prior to that, there're my three pieces on *Radiophagy*.[4] Really, I think of all my radio works as cinematic.

Might it not be more useful to describe these works as radiophonic rather than cinematic? Radio is crucial to keep in mind here, for while the development of phonography provided a new sonic material, radio broadcasting immediately necessitated and generated new forms of non-musical or extra-musical sound composition, and continues to do so today.

Could you sketch out a brief trajectory of radio art for us?

gregory whitehead: A few scraps from Marinetti; a fairly extensive body of work in Germany, which derives from Dada and sound poetry; Glenn Gould and his stunning radio fugues; a handful of elusive plays from Öyvind Fahlström[5]; some Fluxus things. In America, possibly the most remarkable radio artists existed before radio was invented. I'm thinking about Melville, Whitman and Poe. Gertrude Stein is profoundly radiophonic, but never tasted the airwaves, as far as I know. There is Orson Welles, of course, and the American monologists Jean Shepherd and his noir echo, Joe Frank, and even the early Laurie Anderson, who had a very radiophonic soul, as do The Residents, The Mothers of Invention, and anything Zappa. There's a composition by Sorel Hays which blew me away when I first heard it, "A Celebration of No."[6]

And what about John Cage?

gregory: People always ask, but what about Cage? And yes, Cage did produce several strong radio plays. But behind Cage is someone whose work is intensely radiophonic, even though he never produced anything for broadcast beyond a couple of interviews, and that's Marcel Duchamp. Duchamp, the grand trickster,

2 Walter Ruttman, German, 1887–1941. *Weekend* (1930), composed and edited on MagTrack / Optical Sound Film. Republished as a CD by Cinéma pour l'oreille (1994). Reinterpreted by various artists on "Ruttman Weekend Remix," Intermedium Records (2000)

3 Chion, Michel, Claudia Gorbman and Walter Murch, *Audio Vision*. New York: Columbia University Press (1994)

4 Infrathin, Gahlberg Gallery, College of DuPage, Glen Ellyn, IL, 2004 • *Radiophagy*, three radiophonic works by Lou Mallozzi, 1990–1996. Penumbra Records

5 *Hear* "Birds in Sweden" (1983) and "The Holy Torsten Nilsson" (1966); Teddy Holtberg, *Öyvind Fahlstrom on the Air: Manipulating the world*, Svierges Radio Forlag/ Fylkingen, Stockholm, 1999. For the wider context of Fahlstrom's milieu, see Magnus Haglund, "The Ecstatic Society, THE WIRE #210, August 2001. (26-31)

6 Sorrel Doris Hays, American, b. 1941. *Celebration of No.* 17:00 min Horspiel. West German Radio (WDR), 1983 • One scrap missing from Gregory's list that we feel is worth mentioning is Clement Adler's experiment in telepresence at the 1881 Paris Electrical Exhibition. This work utilized neither radio nor recording but instead installed 80 telephone transmitters across the stage at the Paris Opera and connected them by wires to telephone receivers in a suite of four rooms in a local hotel where visitors could pick up a receiver for each ear and listen to the live transmission. An important precursor to Maryanne Amacher's work in *Music for Sound-Joined Rooms*.

with his astonishing sense for the erotics of language-play, the position of the other in the presence of the thing spoken, the art of jumping the gap, minding the gap. We tend to forget it amidst all the buzz and blather, but all radio art is born from Eros. It's not the only drive—there is also Thanatos—but Eros is always in there, even if hiding, as a pulse, a throb, a sudden flow of energy. And today, artists like Anna Friz, Sherre Delys, Eurydice Aroney, The Books, DJ Rupture, Miguel Macias, Hermann Bohlen, Mark Burman, and the gangs at Free 103.9, Third Coast Festival, Deep Wireless—all looking for fresh ways to mind the gap, and find that pulse.

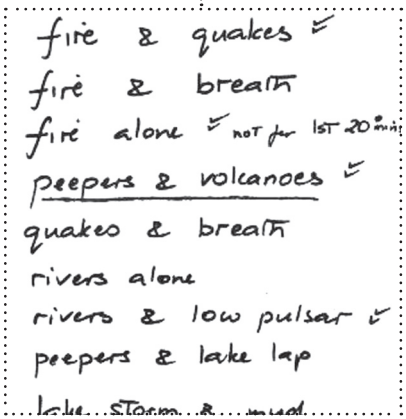
All the best pieces that have jumped out at me over many years radiate that deep sense of pulse, the root charge, or the electronic "free radicals," that push out in various ways, not necessarily literally. It's really more a question of pace, the ability to tap into a kind of hypnotic tempo. To me one of the most powerful radio pieces ever is also one of the most technically simple—one man's voice with a few simple sounds in the background—Antonin Artaud's "To Have Done with the Judgement of God,"[7] essentially a prolonged cry from an open wound. I mean, there is Artaud being eaten alive by rectal cancer, while at the same time he's in an institution which is electrocuting him, so he's being charged and chewed. You can hear that in his voice, and it's an absolutely riveting rant that embraces the very essence of radio, yet it's so simple. It's not a formula or a format. It's not something you could superimpose anywhere else, because it has to do with his singular body—an electrified woundscape.

You're making us think of Tesla with his coil, and people standing around it with their hair standing up.

gregory: Yes, Tesla, who of course was greatly influenced by Galvani's experiments,[8] making dead frogs jump. The idea of making the dead come to life, that aspect of what it means to electrify, and the relationship between electricity and the nervous system, and the fact that we hear sound through a hole in the head, all of this ties together into an incredibly rich conceptual space, and when I say that radio art is still very much in the future, I say that because, compared to so many other materials, there aren't many people out there exploring it, just a few scouts that have gone out, and put little flags here and there. It's like the map is sort of there, as a ghost image, but of course all the contours that you add, the relief, that sense of depth and all that, that's still to come. That's what makes working in the sort of marginal field of radio art exciting, the sense that there is still a lot of wilderness out there. I worry that podcasting and digital streams will foreclose on the wilderness, or the wildness, before we even know what's out there. Such new media may have their own interest, but the nature of the space is very different.

7 *To Have Done With the Judgement of God* (1948) was to have been Artaud's major radiophonic work, if its broadcast had not been suppressed at the last moment, due to its scandalous, blasphemous nature. Artaud (who apparently played Fantomas on the radio earlier in his life) risked his final work on the transmitting capabilities of modern media. Radio, like the plague, would directly attack the nervous system of the socius. Yet there were also inner psychic risks. Perhaps he realized the futility, or at least the unwieldiness, of the thousands upon thousands of pages of diaries he wrote at Rodez in Paris; perhaps he thought that their essence should be condensed into a single recording, which could then be played back at will, even during sleep, so that his deliria would then re-enter consciousness, transformed into the crystalline Apollonian coldness of dreams....—Allen Weiss, *Pressures of the Sun*

8 Luigi Galvani, physicist/physician, Italian, 1737–1798. Galvani is generally credited with the discovery of bioelectricity. In 1771, he discovered that the muscles of dead frogs twitched when struck by a spark, setting into motion the reversal of theories of animation effected by air or fluids. Galavani's friend and intellectual adversary, Alessandro Volta, inventor of the first battery, named the production of direct current from chemical action "galvinism" in honor of Galvani's experiment.


fire & quakes
fire & breath
fire alone not for 1st 20 min
peepers & volcanoes
quakes & breath
rivers alone
rivers & low pulsar
peepers & lake lap
lake storm & mud

COMPOSITION

In this chapter, we examine expanded practices of composition in terms of intention, authority, and material. Touching on the ideas of musique concrète and the legacy of John Cage, we contrast the "divergent interests" of recording and synthesis, and their distinct traditions of composition: a composition of precise control versus a composition of organized surprise.

christopher delaurenti: I don't use the term "sound artist" myself: I much prefer "composer" because that encompasses where I'm coming from. All composers are my ancestors.

Could you talk about what it means to be a composer to you?

chris: To quote Russell Garcia,[1] the composer has always been a gray eminence lurking in the background. No one really knows what he or she does, except for taking a bow after the piece. Maybe they look nerdy or unimpressive, and people wonder "Oh, did that person book the gig?" I think in many respects, to be a composer is to be a hermit.

My music chronicles my love affair with sound. Being a composer is performing the act, if you will, of loving sound. For me, that means piecing together bits of audio in a painstaking way. Hours and hours per day, for weeks or months. Composers of yore would sit or stand at a music desk or plunk at the piano, plotting notes on paper. Here I am, plotting my notes on an old 8-track tape deck, or on the computer.

1 Russell Garcia, American, b. 1916. Child prodigy, trumpeter, composer. Best known for film and television soundtracks, including *The Time Machine* (1960).

2 Teitelbaum in Kostelanetz, *John Cage.*
3 Chadabe (18)

You feel it's equivalent to plot your notes on an 8-track tape deck as to plot them on paper?

chris: There are certain differences. The technology now really regulates how the work proceeds, how the work will sound, and in some cases even the content.

Back in the 1970s, Richard Teitelbaum noted a duality, which he referred to as "increasingly divergent interests":

> *[After 1950] the establishment of tape studios in Paris, Cologne, Milan, New York City and elsewhere [enabled] composers to create finished works directly on tape, utilizing both electronically generated signals and live sounds recorded through microphones. In both cases, the sounds [could] be further processed by electronic modifications or tape manipulations. With the aid of such new musical resources, composers have pursued two increasingly divergent interests—the first leading toward invention and discovery of "any and all sounds that can be heard," the second towards "precise control over musical materials beyond the limits of the human performer."*
>
> *To facilitate such control, particularly over rhythmic problems, sophisticated programming devices… and high-speed digital computers have been employed, enabling the composer to specify precise values of frequency, amplitude, duration and succession of all sound events. Such devices produce a completed tape composition requiring little or no edition. Milton Babbitt's* Ensembles for Synthesizer *is an eminent example of works in this genre.'*[2]

These divergent interests play out as two traditions – one of recording and improvisation, another of synthesis and control. Milton Babbitt sums up the latter tradition quite well: "I realized there was a tremendous discrepancy between what we could specify and what could be done by performers." Discovering the Mark II synthesizer, "the notion of having complete control over one's composition, of being complete master of all you could survey... it seemed a practical solution, a musical solution."[3]

Does a divergence remain?

hildegard westerkamp: Yes, I think so. You have that stream where people were trying to reproduce something live, who also want to explore the electronic medium itself. Then, you have people like us who like to go out recording and using the sounds of the world to work with. I think that sort of Stockhausen-Pierre Schaeffer duality is still there.

Like notation, recording constitutes a qualitative advance, and in its innate potential is the negation of notation. Recording is a third form of memory. It remembers not mechanics or schemes, but actual performances. More important than this, it can remember—and reproduce—any sound that can be made.

For the Bourgeois Composer, the dream of access to all sound for musical manipulation, and the dream once again to become a performer, were dramatically realized in 1949, when Pierre Schaeffer and others at RTF in Paris pioneered the form known as "Musique Concrète." This form consisted in the manipulation, organization and assembly only of recorded sounds – and significantly, as soon as the tape recorder became the fundamental tool, these sounds tended to be mundane sounds, everyday sounds and not recordings made of musical instruments.[4]

hildegard: Pierre Schaeffer[5] developed a whole treatise on what he called *l'objet sonore*, the sound object, which had to do with processing recorded sounds, as opposed to Stockhausen[6] who was generating electronic sounds. The sound object is a small unit of recorded sound. Schaeffer developed a theoretical framework of how to categorize sound—a complex task, literally a type of objectification of sounds, given that he was dealing with very much alive, recorded sound.

marc mcnulty: I had one professor, Hilton Jones, who introduced me to the works of Stockhausen, Pierre Henry[7] and Schaeffer and musique concrète-type work. After class he would hand me this pile of LPs, and say, "Go home, you need to hear this stuff." He showed me that there is actually a large body of knowledge to work from. So it was fascinating to take these records from the late fifties, some of them from the forties, of these people kind of in the same place that I was at the moment. But for them the technology was just awe-inspiring. Being able to cut and splice tape was incredible for someone in the fifties, but I was doing it because it was the simplest way for me to work with sound non-musically, because I don't have a formal background in composition or anything close to that.

When I first heard Pierre Henry, I was totally blown away! To use concrete sounds or language to take the place of tone structure; to create rhythms and an experience of time from ordinary sounds; it was fascinating because it was this new language, but I didn't know the language. It was like listening to a radio station from Russia: I have no idea what I'm hearing, but I'm fascinated by what is being conveyed. There's something in there I can't quite reach.

So did your process change when you started listening to musique concrète?

4 Cutler (31,33).

5 Pierre Schaeffer, French, 1910–1995.

6 Karlheinz Stockhausen, German, 1928–2007.

7 Pierre Henry, French, b. 1927. Co-founder, with Pierre Schaeffer, of the Group de Recherche e Musique Concrete (1949)

marc: It actually did change my work. I became more formalized. I would go out seeking sounds, not specifically, but I would record environments and catalog them, and go back through them and try to find those particular points that struck me as conveying something. A lot of it I hear as if I'm listening to a story or poetry or something, where there are certain phrases that seem to convey something far beyond my normal grasp of the language. I would excerpt out those parts. It became this process of filtering through seemingly ordinary things for extraordinary events, sonic events.

> *These recorded sounds were to be the raw material of a new music, sound sources to be electrically and mechanically altered beyond recognition to create new sounds, sounds that had never been heard before, sounds freed from the meanings of all previous musical vocabulary. It seemed as though here at last was a tabula rasa, a new medium in which to forge new composers and a new aesthetic.*[8]

hildegard: What was so interesting, from the soundscape perspective, was that Schaeffer did NOT want the listener to recognize the original sound source. It was meant to be musical material for abstract compositional purposes.

> *Perhaps the most important concept advanced by Pierre Schaeffer was that of the acousmatic. The term was originally applied to initiates in the Pythagorean cult who spent five years listening to lectures from the master, delivered from behind a screen (so that the lecturer could not be seen) while sitting in total silence. Acousmatic listening may therefore be defined as the apprehension of a sound-object independent of a knowledge of or appreciation of its source. This means not only that we will ignore the social or environmental origins or intention of the sound, but also its instrumental origin.*[9]

hildegard: When we began to record here, and create, for example, a portrait of Vancouver called *The Vancouver Soundscape*, we made probably the first attempts to process sounds slightly, not in order to obscure but to bring out certain aspects of the sounds which were attractive.[10]

That really interested me, because on the one hand you have the real sound, and on the other you have the processed sound, which is exactly what happens in listening. Your interpretation, your imagination changes and processes sound. Like where you are sitting near a creek, and the sound is so busy that you start hearing voices in it, you imagine sounds. There's an acoustic imagination. Processing sounds has always taken me into that abstract arena of the imagination. That's the edge with

8 Cutler (32)

9 Wishart (67). See "Acoustics" in Cox and Warner (76-81)

10 *Vancouver Soundscape 1973, Vancouver Soundscape 1996.* www.sfu.ca/~truax/vanscape.html

which I like working.

You compose installations from recordings, and compose concert music. Could you talk about the differences?

annea lockwood: Well, in terms of that old dead issue of whether they're both music, I haven't thought about it since I encountered Cage in my early twenties: All aural experience is music. But there are significant differences in the two ways of working and in the experience. What I miss in concert music is the long timespan you can work with in installation; as opposed to the expectation in a concert hall that the experience will be immediate, and have a defined perceptible shape. A beginning and end.

sam: We've been so completely shaped by the Western culture where the music came as kind of a mixture of a representation between ecclesiastical and royal power. And this always had to do with appearance, with a start and an ending. Our inherited forms are completely connected with this idea—to package it.

How do you navigate these differing sets of expectations?

annea: Where I'm most comfortable, when I'm doing concert music, is when I'm coming up with an improvisatory structure: managing to find a concept and a framework in which the musician can explore a palette of sounds quite freely, and the musicians can explore themselves quite freely. I'm LEAST comfortable in a situation in which I'm asked to create all the sounds, shape all the sounds, and define what happens to them myself. When I was in my 20's, I saw that as a totally ego-centered activity that I wanted to move away from.

To give an example of composition where I collaborate with the performer, there's *Ear-Walking Woman*, which I made for the pianist Lois Svard.[11] In *Ear-Walking Woman*, what I did was to give Lois a bunch of tools: three rocks, oval stones which rock beautifully on the strings and keep rocking for a long time; a convict's bowl-gong; some bubble wrap, very large-size bubble wrap, which she puts on the bass strings; a heavy ball that is just the right weight to roll across the bass strings; ceramic pestle that she works on the tuning pins; a superball mallet; a lot of dimes, which are classic John Cage preparations. This piece is all prepared piano. I gave her an incomplete score, where I made a series of "phrases." About ten phrases, and in each one, I tell her, "Start with this sound, this is the action you make."

Instructions for use?

annea: Yes. But in each sound-activity, I ask her to listen to the details of the

11 Lois Svard, American, pianist, b. 1947, professor, Bucknell University. Svard's affinity for American experimental music has led her to commission, premiere, and record works by many experimental composers such as Robert Ashley, William Duckworth, Alvin Lucier, Elodie Lauten, Kyle Gann, and others. In addition to performing as a soloist, Svard has appeared with Chamber groups such as the Cassatt String Quartet, and with dancer Peter Boal, former principal dancer with the New York City Ballet. • *Ear-Walking Woman*, DVD (68:00 min). Innovera Studios, 2005

sound. When details emerge that she hasn't heard before, which they always do, she should follow them up. See where they go. The score is just an Ariadne's Thread. She should keep following aurally what happens with these sounds as they shift. Just a slight change in the weight of the hand, or a shift of angle of the hand, will change them. All these little variables change the sound, and I ask her to become supersensitive to those shifts, to follow them up and explore them. And when she's ready, move onto the next phrase. So, it's highly collaborative.

Because you are giving up control and intention?

hildegard: I talk about this in my article "Linking Soundscape Composition and Acoustic Ecology."[12] The whole point of this kind of work, which always includes some message about the environment and listening itself, is that you can't have too much intentionality. Because when you go out recording you cannot anticipate exactly what kind of recording you are going to bring into the studio. And you realize that what you heard out there while recording is quite different than what you hear in the studio. To me, the recorded material is absolutely essential. It needs to be listened to repeatedly. The whole process then of getting to know your materials is what comes to shape the form and the content of the piece in its detail. Repetitive listening in the studio gives you a whole other perspective, right? Suddenly you hear things you didn't even realize that you had recorded. Those are the surprises, which are so absolutely wonderful. Picking up on those surprises, and using them as language to speak back about the environment, is what shapes the piece.

For example, when I was working on this piano piece, *Like A Memory*,[13] I had the general idea of connecting the sounds of an abandoned, old, industrial environment, with a kind of opposite: the classical music I grew up with. I was hearing certain classical phrases in the piece, a quote from a composer, and I was hearing many of the sounds I'd recorded and processed. But, how that would move from beginning to end, I had no idea.

janek schafer: Accidents have always been key from the beginning. We begin with accidents and make them our own.

hildegard: It's like brainstorming. You're working with everything at the same time, with way too much material, and you have to pick and choose.

janek: The more you open yourself up to accident and chance, the better. If you are only very safe, it's not so rewarding to perform.

12 Hildegard Westerkamp. "Linking Soundscape Composition and Acoustic Ecology." *Organised Sound* 7:51-56 (2002). Cambridge University Press

13 Westerkamp, *Like A Memory*. Composition for piano and two digital soundtracks, commissioned by Jamie Syer and the Valhalla Summer School of Music, Silverton, British Columbia. Premiered at Valhalla on August 16, 2002.

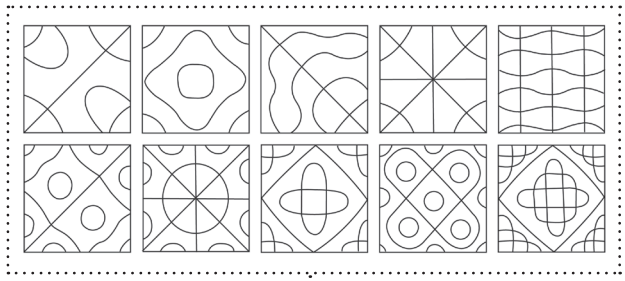
"Composer colleague Michael Rosenberg stated recently... 'Soundscape composition is the intent of an artist to musicalise a recording of a certain location at a certain time. The artist works on the assumption that aesthetic values can be ascribed to that soundscape or to elements of it.'

"Although I do not altogether disagree with this definition, it only mentions one aspect of soundscape composition: that of the composer's intent. It fails to mention a most important other aspect: the power of the sound materials themselves to shift that intent by virtue of their inherent meanings, as well as through discovery and surprise in the compositional process. To compose with environmental sound implies a relationship—a dialogue—between composer and recorded materials, just as there is a relationship between soundscape and listener in daily life. No matter what the composer's intent may have been from the start, the materials inevitably speak with their own language, whose deeper meanings may only emerge with repeated listening and sound processing. And that in itself has the power to shift the composer's intent."

hildegard: It's dangerous, because you can get easily overloaded by the many possible choices, and at some point you want to be the designer: this works, this needs to be thinned, this needs to be denser. It's always a balance between a very sharp, selective perception and letting things go for a while, letting coincidence play itself out for a while.

Are there any more precise words than "chance" for this compositional relationship to accident?

janek: I improvise.



WHAT IS SOUND? WHO IS LISTENING?

The discussion of sound often presumes three distinct fields—musical sounds or tones; speech, song and utterance; and noises. These distinctions have their uses, but are ultimately arbitrary. Attempting to move beyond these distinctions and consider sound-in-itself, we first confront our inherited notions of musical sound. In order to produce a compositional material, musical scales effect a drastic reduction of the spectrum of sound. Yet musical scales do in fact convey a great deal about the behavior of sound waves and listening bodies, and we attempt here to sort out inherited wisdom from limitations to be overcome. And as sound-in-itself is fundamentally in the bodies and minds of listeners, our discussion also touches on psychoacoustics and perception.

maryanne amacher: Imagine a "time before music"—a world without music, so different from the world we are in, where we have so much recorded music and every possible form of so many sounds. Imagine ancient beings listening long before music appeared on the earth. No one knows exactly what they were listening to: some say that is how all the legends and myths got started, that they were listening to their own voices. These were virtual sounds, existing in their minds only. They had no music, and the young nerve cells were restless, so they began producing sonorities and rhythms inside their minds to satisfy them. Mind became an instrument they played, creating the colors and rhythms of voices and stories. For there was nothing outside to match neural rhythms and movements, no corresponding shapes to complement their patterns of "aliveness" (as music provides). And the young receptors needed partners complementing their existence. So then it just develops, that's what's happening. Music is a form of neurophonic exercise. It's difficult to say much more than that, because none of this has really been studied that much. Psychoacoustics, all the kinds of responses we make to sounds, have been regarded

in most music as something odd. There's very little attention paid in music schools to the field of psychoacoustics or even to acoustics itself, to the study of actually what sound is in the whole spectrum, how you can go into the spectrum and get out its energy, and make all kinds of interactions so that it starts singing.

sam auinger: There is just no knowledge about sound in our society. We have no real words to talk about it. So, for many people sound is like a miracle. Everyone has a basic idea of gravity, but why don't we have a basic idea about sound? Everybody wonders why cities are humming, but they have no idea that the lowest audible frequencies have a wavelength of 16 meters, and these lowest frequencies act like water, they just swim around together!

richard lerman: The speed at which sound travels through any given material also varies, though I don't think that that is terribly meaningful except maybe in water, where the speed varies a great deal depending on the temperature and pressure.[1]

bruce odland: I was talking to these lighting designers at NYU, and they didn't even realize that the wavelengths of sound were different wavelengths. They would think of it like light, where the shadow for all frequencies is the same. They didn't realize that low tones bend around corners and high tones don't.[2]

sam: The thing is, we have so few descriptive aural terms, but it all comes down to the overtone series. The first three or four overtones are constantly being read out by our brains as something harmonious.

bruce: One through twelve actually.

sam: I know, but I mean the first are really very obvious, then it gets much more complex.

It may be helpful, while embarking on the discussion of waves, harmonics and overtones, to offer some definitions of these terms:

> *Simple harmonic motions occur practically everywhere in the universe: vibrations of the constituents of the atoms, of the atoms as a whole in a crystal, of elastic bodies, etc., can all be described in terms of harmonic motion. But there is another more powerful reason for considering simple harmonic motion as the most basic periodic motion of all: It can be shown mathematically that any kind of periodic motion, however complicated, can be described as a sum of harmonic vibrations.*

1 Approximate speed of sound at sea level, depending upon pressure and other factors: In air: 0º C – 331 m/s; 32º C – 351 m/s. In fresh water: 0º C – 1400m/s; 32º C – 1510 m/s. Variation of the speed of sound in ocean water is the principle behind acoustic topography and acoustic tomography (temperature mapping.)

2 Typical visible spectrum—400-700 nm (.0000004 m—.0000007 m). Typical audible spectrum .017 m—17 m.

One single tone of frequency f1 will give rise to additional pitch sensations when it is very loud. These additional tones, called aural harmonics, correspond to frequencies that are integer multiples of the original frequency: 2f1, 3f1, 4f1, etc...

The lowest possible frequency of a vibrating string... is called the fundamental frequency. Note that all other possible frequencies are integer multiples of the fundamental frequency. They are called the upper harmonics of f1. The first harmonic is identical to the fundamental frequency; the second harmonic f2 is the upper octave of f1; the third harmonic f3 is the 12th (a fifth above the octave); the fourth harmonic f4 is the 15th (double octave). Upper harmonics are also called overtones.[3]

bruce: Proportions. Resonance. It goes back to Kepler. It goes back to Pythagoras. It goes back to the way sound travels. It's just plain physics.[4] My theory is that human hearing evolved to hear what was there in physics. Just as we evolved balance to deal with gravity, sound and other waves perform in a certain way. They double, they triple, they quadruple. Half-a-wave does not exist in nature. Only full waves exist in confined space. So, if you're going to evolve to survive, to perceive your surroundings, your hearing equipment better pick up on that.

But, I want to come back to how the overtones couple with the brain. People are hard-wired for harmony. That's the same as saying they're hard-wired to hear the physics of sound as an information-bearing medium, to hear the simple and perfect harmonic ratios such as occur in standing waves and harmonic resonances found in nature. People are not hard-wired to hear our scale that we use now, because that's a fucking scale, that's a convenience-mart scale that we've adapted in order to get the intellectual fun of modulating quickly from key to key in acoustically dead concert spaces. The equal distribution of dissonance throughout the entire scale there is not a fun thing to hear in a resonant space such as a gothic cathedral or a cave. In those spaces you need intervals with the least dissonance, such as the ratios of just intonation.

A few more definitions.

Let us define a scale as a discrete set of pitches arranged in such a way as to yield a maximum number of consonant combinations (or minimum number of dissonances) when two or more notes of the set are sounded together. With this definition, it is possible to generate at once two scales in an almost unequivocal way, depending on whether all consonant intervals are to be taken into account, or whether only the "perfect" consonances are to

3 *** need to check this reference with Greg

4 For an interesting critique of the heritage of Pythagoras and Kepler which Bruce Odland advances, see "Pythagoras, Fourier, Helmholtz" in Wishart's *On Sonic Art*: "The philosophy of the musical practice based upon establishing elementary relationships between stable vibrating systems has a very ancient and respectable pedigree. Pythagoras himself is believed to have first noted the fact that there is a simple relationship between the lengths of vibrating strings and the perceived quality of musical consonance between them. Given two strings of the same material at constant tension, then, if one is stopped exactly halfway along its length it will produce a note sounding one octave above the other string. The octave itself is qualitatively perceived to be the most stable or consonant of musical intervals. With a length ratio of 3:2, the musical interval of a fifth is perceived which is also very stable and consonant. In general, the relative consonance of an interval is seen to be directly relatable to the simplicity of the ratios of lengths of string or columns of air which produce it. This was not only the first important contribution to music theory but also had a significant role to play in the development of a scientific view of the world. It was the first clear demonstration that qualitative aspects of nature could be reduced (apparently) to simple numerical relationships. This general view has been exceedingly fruitful but on occasions misleading. It led directly to the concept of the Harmony of the Spheres, one of the most persistent and misleading conceptions ever to animate the human mind: the heavenly bodies

were assumed to be transported around the earth on giant spheres whose motion generated a heavenly music, governed in some way by the Pythagorean laws of proportion."

5 Roederer 153

6 Helmholtz 319

7 Kahn & Whitehead, *Wireless Imagination* (ix)

be considered. In the first case, we obtain the just scale, in the second, the Pythagorean scale.[5]

As regards musical effect, the difference between the just and the equally-tempered (Pythagorean) intonations is very remarkable. The justly intoned chords, in favorable positions, possess a full and as it were saturated harmoniousness; they flow on, with a full stream, calm and smooth, without tremor or beat. Equally-tempered or Pythagorean chords sound beside them rough, dull, trembling, restless. The difference is so marked that everyone, whether musically cultivated or not, observes it at once.[6]

bruce: The four-dimensional world of hearing is always coupled to space and time through the ears, which cannot close.

The absence of obstructive anatomical features such as earlids would seem to assure a direct and unmediated pathway for acoustic phenomena.[7]

gregory whitehead: The ear is a hole in the head, a hole full of delicate flora and fauna that we spend a lifetime blowing out, then we go deaf and die.

bruce: Perception of space and the basic relation to the world around us is centered in the ear, and the sense of balance is contained within the inner ear. These two powerful senses of orientation—hearing and balance—coexist quite closely. But why did we evolve a hard-wired preference for hearing overtone ratios? Perhaps our appreciation of whole-number multiple resonance is merely a reflection of how sound behaves in nature, how standing waves build up in confined space. Just as the ability to sense minor phase delays protected us from flying objects, and tracked both predators and prey, perhaps ability to hear overtones helped us orient to the space around us. For instance, walking in the dark, we can sense the size and shape of the space around us through its resonance because any confined space is still going to behave according to the rules of the physics of sound, and produce room tones and reflections revealing its size and shape. When you walk through an acoustical structure with your eyes closed, you're hearing the waveform of your body reflecting from the surrounding materials, you're reading out the resonance of the space you are in. You stop before you hit a wall, before you run into something, or before you fall into empty space. The way we perceive space is highly related to the ability to hear harmonics.

But we do much more than "read-out." We're talking about sensation, perception, and not clinical data. Yes, we can sense the size and shape of a dark space, but we can also project whispering demons into a dark space. Let us not

forget the acoustic imagination! Sound is governed by physics, but hearing is not reducible to physics.

janek schafer: When I listen to sound it creates a space in my head, either a room or a journey.

maryanne: In my work, there are tones that our ears create in response to musical intervals or other tones being produced in the room, creating these sort of other spaces. You have the actual tones, the acoustic tones that are sounding in the room, and then you have the sounds that the ears are creating at the same time.

This is something happening in all music, but when notation began, people stopped paying attention to this. I think when people say that a performance "brings out all these colors" of the tones, that's because the performers know how to play to really enhance the response tones in human beings. I would like to realize this in a very conscious manner. I designed a program to research these effects, so that I could know that if I choose a certain interval, this low D# is appearing, and then I can examine how it's appearing in my ears in many different situations, and then map it. To do this consciously becomes something very powerful and emotional, where ultimately you are standing as another being in the whole sonic dimension of music—and you're participating in creating it—experiencing vividly what your ears are capable of.

What I was first talking about, that's called the first order in psychoacoustics; that's the mechanical response that the ear creates (which also occur a few seconds after death—there's been a good bit of study at Johns Hopkins University on that). But the second-order effects are the neurological phenomena, which detail the shaping. That's why the various tuning systems, whether they're tuned to the octave or the fifth, the stopping points there create these different shapes, which have also been shown in experiments, that we actually perceive. It's the same operation that occurs with the missing fundamental in the music world. You know that you might not hear it as a tone but you definitely experience it.[8]

Other sounds that we don't hear as a tone but definitely experience include infrasound.

mark bain: Supposedly our hearing goes from 20hz to 20,000hz. The exciters I make are active below the range of hearing, in what's called infrasound. I can get them down to around 1hz to 60hz or whatever. They essentially put this sine wave into whatever you attach them to. The thing is, when you have an engine that's only pulsing at say 10hz or something, all it's audibly doing is kind of clicking, so it's not really the heavy infrasound that I'm looking for particularly. Really it's a very low

8 For an introduction to First Order and Second Order effects in psychoacoustics, see the discussion of combination tones, difference tones, beats and the missing fundamental in Roederer (25–44).

frequency. What I'm interested in is more about how to run cycle rates of about say 40hz, something that has some tonality to it, and then run another oscillator at say 42hz. When they combine they subtract each other and you get a third frequency or a harmonic. And this heterodyning[9] is where the interesting sounds and effects come from.

It seems that low tones have powerful physical effects. What is it about low tones that makes them so mysterious and compelling?

gregory: Of course, sound is conducted ultimately by your skeleton: it shakes your bones! Your bones do as much hearing as anything else, and that is what explains the tremendous emotional power of sound, the potential for captivation and hypnosis, taking the listener into another zone.

tobias c. van veen: Bass tones directly affect the body, turn the body into a dancing-ear. Any raver will tell you that different types of music make you see different colors and patterns and experience different bodily sensations, moods—the music is not only synaesthetic, kinaesthetic, but synthaesthetic. Some bass tones have this typical sort of frightening effect on you; they make you uncomfortable. On the other hand, there are "warm" bass tones, which ambient music uses. And for what reason is there this whole ethics of bass tones? The dirty, deep, growling, unhuman sounds...

...as opposed to the oceanic, immersive, return-to-the-womb bass?

tobias: There's something primordial about bass tones, preconscious. There's liberation and a danger there, and so far I think we've only peeped at the edge of it.

mark: Well, I was doing some research when I was studying here at MIT and found some publications in relation to vibration resonance and structures, and also the relation of vibration to the body. As I mentioned before, I found that the resonance of buildings and the resonance of bodies correlate to each other: resonance can affect the inner ear and your balance system. It also relates to how structures behave. So at some frequencies you can actually produce the frequency of pain in a person and that correlates to the frequency of destruction of the building. There's definitely a connection with them.

bruce: Your body, being somewhat proportional, also has resonant frequencies within it and these are going to behave according to the laws of physics, not according to the convenience of a piano tuner's nightmare!

9 Heterodyning is a method by which oscillations of different frequencies are combined to set up a beat.

sam: That goes back to the second problem we are interested in, which was called the alphabet of sound.

This alphabet is like the basis of a symbolic language?

sam: We are thinking more about archetypal sounds, like water sounds.

> *What was the first sound heard? It was the caress of the waters. Water in motion, as in cascades or sea waves, has an effect in some respects similar to music.*[10]

annea: In reference to water sounds, it seems there's this nice combination, often in deeper, fast-moving waters, of low-frequency information and high-frequency information. And, I've often thought that that high-frequency information engages the scanning part of the brain's operation. And that the low-frequency information entrains the body and relaxes it. So there's a nice combination there, both parts of the body's wishes being satisfied there.

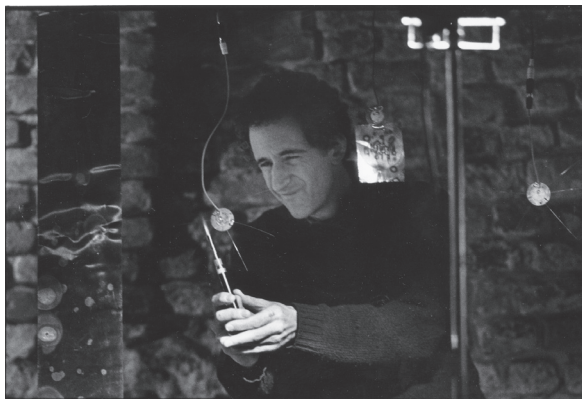
sam: Archetypes like water sounds speak to everybody. Then there are sounds that just talk to certain cultural environments. For example, in China, where they have such a knowledge of gongs, they constructed special gongs to represent harmonic tunings. Once the Emperor tried to tune all of the sounds of China by sending a certain type of gong through the regions, in order to tune each official place with this tone. This tuning was not only representative of the Emperor, but represented a connection between the planet and the royal power.[11]

Are these culturally specific archetypes somehow connected to specific regimes of power?

gregory: Absolutely, like in this country, the most fundamental broadcast is the flat tone of the emergency broadcast system, that sustained unbroken *oooooooo*, and when you hear that it really gets your attention because we're trained that it's the tone that's played before a major announcement is going to be made. It's quite chilling, this sharp, very tight frequency tone. There is something very fundamental there, and like with so many fundamental things, there is a hanging sense of dread.

10 Shafer (15)

11 "To the Chinese mind it was self-evident and indisputable that the perfect State could only be maintained by remaining in alignment with celestial order. Therefore the functions of State were also associated with a tone. […] The offices of Emperor, Empress, Minister, and so forth, therefore each possesses their own special tone which was attuned to a particular cosmic Tone. The key in which the music of a rite was performed was consequently also influenced by the tone of the officiating office." • "The term *huang chung* (yellow bell) referred both to the foundation tone of Chinese music and, in the symbolic sense, to divine rulership."—David Tame (41)



For artists working with recorded sounds, the assemblage of microphone-recorder-speaker becomes an instrument and a prosthetic, an expressive machine and an extension of the body. Yet different speakers "speak" differently; different microphones "hear" differently: One cannot consider this assemblage as impartial. In this chapter, we examine recording devices and techniques that artists employ, from piezo discs that transduce sounds directly from materials, to methods of filtering and amplifying that are at play in the act of recording, to forms of processing that may be applied to initial recordings. Here is an introduction to a technical tradition with "phonographic concerns," where all the materials of the world become potential microphones and potential loudspeakers.

It's all done with tape recorders. Consider this machine and what it can do.
—William S. Burroughs

RECORDING AND PLAYBACK

chris delaurenti: I think it was Marcelo Radulovich[1] who coined the term. Phonography refers to field recordings. Field-recording pieces come in several varieties: One is the straight-up, unprocessed recording. To me, that's really hard, to record something with no edits, no post-recording processing. I've only done three or four where the natural sound, untampered, is interesting and musical enough. That's really rare. More common are mildly edited field-recordings; like Bernie Krause, who layers field recordings together.[2] Then there are heavily edited and heavily processed field recordings, like I do with my aural safaris. The editing is obvious. Polyphony. Many layers. Dead-stops and silences.[3] You can hear the gear, or handling the microphone: all that stuff you're not supposed to hear on TV or on a pristine nature recording. I believe all those sounds also have a musical value when well-composed.

1 Marcelo Radulovich, American (born in Chile), b. 1964. Extensive discography since 1994; founder and moderator of phonography.org.

2 Bernie Krause, American, b. 1938. In the late 1960's, Krause began his work in bioacoustics and environmental recording, much of it accomplished with original techniques for recording, analyzing, and presenting habitat- and species-specific sounds. His album, *In a Wild Sanctuary*, is considered the

first recording to use environmental sounds as both a central component of orchestration and as an environmentalist statement. He has contributed to the soundtracks of many feature films, including *Apocalypse Now*, *Dr. Doolittle*, *Invasion of the Body Snatchers*, and *Rosemary's Baby*.

3 aural safari #6: Live in New York at the Republican National Convention Protest September 2–August 28, 2004 (2004–2005) • aural safari #5: *Two Secret Wars* (2003) unreleased • aural safari #4: *Adrift in NYC* (2002) • aural safari #3: *Your 3 minute Mardi Gras* (2001) • aural safari #2: *N30: Live at the WTO Protest November 30, 1999* (1999-2000) • aural safari #1: *cocaine* (1999)

How does phonography relate to musical concerns?

chris: It depends on the listener. For me phonography is the search for a circumstance when I can sit back, listen to the music of the world, and with luck, record it for others to hear.

Did the act of going out and recording in an environment become an activity that you were fascinated by in itself?

marc mcnulty: Definitely. At first it was with a simple micro-cassette player where the quality was atrocious, but part of what was interesting about it was that there were these terrible artifacts left over from the tape. It was such a narrow bandwidth recording, so there were no really low frequencies, and all these high frequencies. Trying to work with that back in the studio was really interesting, because what I would end up doing was slowing down those segments to bring out the lower frequencies to exaggerate them, which I think I still do a lot in my work, to slow down a particular sound to find a pattern or rhythm within that. Not necessarily something that would cycle and repeat, but something that suggests some kind of continuity. Like when you're reading, there's a starting point and it develops, then it ends in some kind of denouement.

claudio chea: All my work is born out of a process of conceptualization, a brainstorm. The second step is the field recording. I record different types of environments for my pieces. What I hear through my headphones while I'm recording becomes my obsession from that moment until the piece is mastered. I always know when I'm out recording what is going to work and what is not, so I usually make very long recording sessions, an exercise in patience. I wait for the right moment in the sound of what I'm capturing. There have been times when everything sounds definitely right from the moment I press the record button of my DAT, and there are times when after 30 minutes of continuous recording I am frustrated and end up erasing everything.

grey filastine: I work with a group called the AudioFiles Collective, a group which comes together very infrequently. There're three of us involved. One of us lives in Brazil. All three of us have, over the course of years, traveled in South Asia making hidden recordings with our own microphones. And then we sat for a winter, spending months cutting up these recordings and boiling down hours of material into a 45-minute collage. We set a bunch of rules at the outset, since you could go in any direction with this. There was a danger of going in a direction where we just made dance music with an "exotic" sound over it, which a lot of people do. That kind of thing is offensive to me. I believe in the free exchange of things and cultural

borrowings. But the sound of non-Western, especially Indian, music has been used by people who know nothing about it, just to create an exotic flavor. I don't think it's very fair that the music is just exported in this way. So, one of our rules was that we didn't use anything unless it came from those recordings. No beats, unless we made a beat from a piece of noise that happened to exist, in that aural environment, in that location. We could make a beat out of the way a wheel on a railcar was hitting that rail, but that's the only kind of beat we could make. The other rule was that the sounds had to be in the public sphere, and that limited it to almost no music.

Your music often involves natural sounds and the sounds of daily life.

francisco lopez: It has a direct connection with that, but it doesn't have a specific message, any specific thing to say about that. The more I have this kind of interaction with the world for creation—collecting the materials from the world to create—the more I feel at a loss when it comes to explaining what this connection is. But the more I lose the meaning of all these things, the better I feel. I feel like it's expanding actually, and in that sense I'm moving more and more away from rationality. That's my personal experience, what can I do?

You're trying to free the sound from any representational function?

francisco: Absolutely. Of course sometimes I would say, usually in the liner notes, this was recorded in such-and-such a place, but there's no intention of doing a representation of a place, nor any intention of keeping this connection.[4] I don't share the fascination that a lot of people have, in the experimental community especially, of knowing that a certain sound comes from a certain really amazing fact, or place, or object or organism. Of course there are fascinating things in the world, that's for sure, but to me the world of sound has a value as an entity by itself. We're talking about a different world when we talk about that, and that's what really fascinates me.

What is your objective when you position yourself and the microphone in relation to a specific sound event? Is there an intention of any sort?

jeph jerman: The only thing that affects my process is what happens after I press record on the tape deck. I look for ways to record in which the recording device is as un-intrusive as can be. So the cords aren't tangled up in the thing making sound, if I'm using contact mics, or you can't hear the motor running on the tape deck, which is almost impossible. If you take as a given that any recording is not a true representation of what it's a recording of and go from there, then it doesn't really matter.

4 This contradictory approach is exemplified in the opening of the liner notes of *La Selva* (1998) which starts off with a left and a right: "La Selva is an immersion into the sound environments of a tropical rain forest in the Caribbean lowlands of Costa Rica. An astonishing natural sonic web created by a multitude of sounds from rain, waterfalls, insects, frogs, birds, mammals and even plants, through a day cycle during the rainy season. A powerful acousmatic broad-band sound environment of thrilling complexity. And above all, a tour de force of profound listening."

"Much against a widespread current trend in sound art and the customary standard in nature recordings, I believe in the possibility of a profound, pure, 'blind' listening of sounds, freed (as much as possible) of procedural, contextual or intentional levels of reference. What is more important, I conceive this as an ideal form of transcendental listening that doesn't deny all what is outside the sounds but explores and affirms all what is inside them. This purist, absolute conception is an attempt at fighting against the dissipation of this inner world."

Yet, your works have these very specific, referential titles. Take, for instance, Ants in Milk-Vetch.[5]

jeph: It's ants crawling around in these pods. They chew a hole and crawl inside in order to eat the seeds. That particular recording is so attention-grabbing, I think, because of the frequency range of those cheesy mics that I used. They're Radio Shack Lavalier mics which they use on television, you know, on talk shows. So, you can tell what it is, tell that it's a field recording, but also tell that I'm not trying to produce some scientific nature recording.

Microphones are not neutral: Different microphones "hear" differently, filtering and shaping the sound received by the recorder. Very often, this shaping is a limitation imposed upon phonographers, a given they find themselves working around. But you make your own piezo microphones. Could you tell us how you began?

richard lerman: I've arrived at this work with piezos in different ways. One way is purely physical: that is, there are so many different kinds of piezo materials one can get. And sometimes it's just a matter of trying a bunch of them and seeing what works best, experimenting in the studio, looking for the sound I really want. If I just ran a mic and the piezo devices into a mixer, I would get some nice sound, but it wouldn't be the sound that I really want. It would be a little sharper. So I build my own pre-amps, which work for the way that I want to get that sound across.

The piezo disc is made out of different kinds of material. If you could look at the crystalline structure of it, it would look the same way as a magnetic structure. However, they behave differently. What happens with a piezo is, when it bends it produces a small voltage. And if you can get at that voltage and you can amplify that voltage, it will basically act as a microphone, because it's responding to the sound, to the pressure that it has received from some object or from being struck or something. Now that's really not too different than a "real" microphone, which responds to vibrations in the air. The piezo basically would behave the same way, except that if you had it in the air it doesn't do so well because it's really thick. When you contact it to a device the vibrations are moving through that device into the piezo, and therefore it's similar to a microphone diaphragm: it's doing the same thing. If you take a look at how it behaves electronically, the voltage that a piezo puts out is actually quite high compared to a microphone, which puts out a very low voltage. You need to therefore build a special pre-amp to get the best out of it. That pre-amp, well that's the kind of work I've been building since I started doing electronic music. Even before that. When I was sixteen I said this is what I want to do when I grow up. Back in 1964, when I was at Brandeis, there were no synthesizers. The studio

5 aarc 1/8: "Ants in Milk-Vetch." aarc tapes were monthly recordings of natural sound or sounds of nature acting on human structures, released on C-60 tapes by Jerman through 2001.

that I worked in at Brandeis basically had twelve oscillators, a tape loop player that could play four loops. We had some filters, we had a reverb unit with the springs in the ceiling, you know we had all this stuff.[6]

hildegard westerkamp: When I made my very first piece, *Whisper Study*,[7] we did not even have a mixer! I don't know if mixers existed, but we didn't have one. We edited by cutting tape. We had three very good, very big, Ampex reel-to-reel stereo tape recorders. They were 1/4", but half-track, not quarter-track, so that the two tracks covered the whole tape. We had one machine that had four tracks, which used 1/2" tape. On this we could do some multi-tracking, with four tracks.

richard: The studio at Brandeis was being directed at the time by Alvin Lucier, and the technical person was Tony Gnazzo. Tony left during my junior year and, basically by default, I became technical director of the studio. I was totally unqualified to do so, I'd only just begun to learn to solder. I said, "I'm going to start to learn this stuff," so I learned, but in my own way. So I would take a sound source, record it, begin to process it with tape recorders, and splicing and tape loops, you know all these things. And that's how I learned to make electronic music. But at some point I realized that listening to a tape in front of two loudspeakers is not always terribly exciting.

For me, it was wonderful that David Tudor and John Cage would come by and work with Alvin at times. David was incredibly encouraging to me about building equipment. David was essentially my mentor, even though I didn't have that much direct contact with him. He was my mentor through the way he worked and experimented. So I'd take, for example, very long dried grass, like six feet long. If you put a little piezo chip into the grass in a certain way and hang it, you could actually make this hay, this long piece of grass, behave like a loudspeaker.

Now the loudspeaker has length to it, about six feet long, and you walk by it. It has a position in space. David Tudor did a piece like this in "Rainforest,"[8] and what he did in "Rainforest" is pump sound into objects using different kinds of transducers, and re-amplify it and bring that sound into the room. So this becomes something like a filter. This is a physical filter in that the material itself becomes the filter.

> *The echo is not merely a repetition of what was worth repeating in the bell, but partly the voice of the wood; the same trivial words and notes sung by a wood-nymph.*[9]

In the case of the hay, because of its properties of being very dry and very thin, it really amplifies the high frequencies, and filters out the low tones.

6 For more information on the mechanics of piezos in general, and Richard's in particular, visit http://www.west.asu.edu/rlerman/

7 Hildegard Westerkamp, *Whisper Study,* Tape composition of "very quiet sounds" and voice. 10:42. (1975, 1979) Included in the compilation *Celebrating Electroacoustic Music at Simon Fraser University 1965-2005,* Cambridge Street Records (CSR 0501), 2005

8 David Tudor, American, 1926-1996. "[In *Rainforest*,] the microphones are releasing the sound of the objects—you put the sound through a physical material ... [and] you release the harmonic content which the material gives to it." (From an interview by John Fullerman, 1985) • *Rainforest I* was commissioned by Merce Cunningham in 1968 for a dance of the same name. The "enduring version" is *Rainforest IV* (1975). • See *Interview with David Tudor* by Teddy Hultberg, http://www.emf.org/tudor/Articles/hultberg.html

Other materials must amplify very low tones?

jodi rose: I'm still working on getting microphones that get the range of frequencies that I want when I'm recording the bridges. The ones I've been using which are really easy and great to use are the Schaller Oyster Piezo Pickups or transducers. They're good, but don't get much of the low frequency.

mark bain: One thing I had to develop for my work was a special low-frequency recording system. I use a combination of motion sensors, infrasonic microphones and earthquake sensors used for seismology studies. Normally these are used for data collection and registering natural infrasound and earth motion events. I've converted them for sound use incorporating very high-gain pre-amps and things like that.

In a sense, a piece of architecture has its own sound traveling through it. When I use these recording systems you just plant them into different locations and you can extract this micro-sound out of them, the naturally occurring micro-events that are resident within. Because I can boost the signal on them a lot, you can really just tap into it and listen to the architecture, or land sites or bridges or whatever. It's like this whole weird world of sound that's traveling through materials.

maryanne amacher: I do installations and they do involve architecture; an entire building or series of rooms provides a stage for the sonic and visual sets of my installations. I produce these works that are built from "structure borne" sound, that is, sound propagated through walls, floors, rooms, corridors. Acousticians distingush this from the "airborne" sound distributed by loudspeakers only. This really is very critical because it is nothing like any music you could ever experience on a CD.

In my *Music for Sound-Joined Rooms* and Mini Sound series I use the architectural features of a building to customize sound, visual, and spatial elements, creating multi-dimensional environment-oriented experiences, anticipating virtual immersion environments. As the audience moves through new scenes being created by the "Sound Characters" they navigate the expanded dimensions of a sonic world which is staged throughout the architectural site, an entire building or its rooms. The idea is to create an atmosphere that gives the drama of being inside a cinematic closeup, a form of "sonic theater" in which architecture magnifies the sensorial presence of experience. Rooms, walls, and corridors that sing.

Creating the detailed sound design is very much like scripting a sonic choreography. In some episodes sound sweeps through the rooms; in others, converging tonal colors interact as spatial presences, intricately joining adjacent rooms; in still others a particular sound-shape is emphasized to animate the aural image of a distant

room. Architecture especially articulates sonic imaging, magnifying color and spatial presence. The rooms themselves become speakers producing sound which is felt throughout the body as well as heard.

All my work in this area is simply experiential, simply to go to these different spaces. At the Kunsthalle Krems in Austria, I worked approximately a month learning the acoustics in the various conditions of the place, learning it experientially, and knowing that I could put something, for example, in the crypt you would hear in a certain way in the huge main hall.[10] And what kind of connection did I want? To make a sweeping-through? Or did I want to make a harmonic connection?

That building had a very different characteristic than the building in Tokushima where you could make very direct, very tactile sounds above, and below you could go out to this totally magical place.[11] I don't know if it was because of the curve and the small passageway out to this amphitheater, but what appeared was so incredible. As you walked up this passageway you confronted this hologram: like the sound seemed to grow, and get stronger, but it was because of the placement of the speakers that were not in that area, but outside. That's the really interesting thing in my work—to find situations like that.

A similar thing happened at the Casa Serralves in Portugal. I went there to investigate it briefly, and happened to find some very strange places to put a loudspeaker so that as you went up the steps in one area it was completely as though you were walking into the sound but the speaker was way off in what used to be a pantry. Somehow it got conducted through the structure.

So this is what we're looking for, and we experience none of that with sound and air. The wavelength for middle c in air is four feet, four inches, but when it's traveling through stone or wood it's anywhere from nineteen to twenty-two inches. And so that same actual physical wavelength, then, is much enhanced. If it's very quiet, going through the structure the sound takes on a sense of presence, a being. And when it's very powerful people will often ask why it doesn't hurt their ears. All I can say is that it's traveled, it's not trapped any longer. As long as there's room enough for the actual wave-shapes. In these spaces people are very liberated. When there's room people start dancing, jumping, it's very liberating. Of course you're not seated, that's another very restricting thing that's been part of the tradition, or you're not at a club where you're jammed against someone else. I have no way to understand why it's so liberating, but it is just amazing.

If a building could act as a speaker, could it act as a microphone as well?

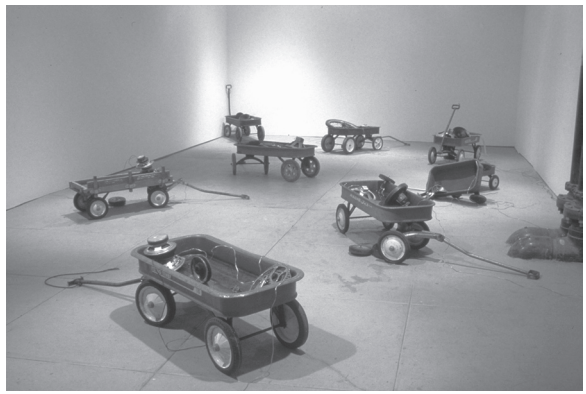
mark: My brother and I are producing a public project in Seattle.[12] They're building a new city hall, and we're installing a permanent sound piece there.

10 *A Step into It: Imaging 1001 Years* (1995). Kunsthalle-Krems, Krems, Austria

11 *Synaptic Island* (1992). 21st Century Cultural Information Museum. Tokushima, Japan.

12 Mark and John Bain, *Acoustic Democracy Project*—proposal for Seattle City Hall. Unfortunately, this project was not realized.

Essentially we're going to install hundreds of these seismic sensors into the building, so the whole building becomes a giant microphone. All that sound will be brought down to kind of a control matrix system where the automated live mix will be played into two public elevator cabins. The elevator becomes the listening chamber. They're interesting cabins because you enter on the street on one side and then you go up and exit through the other side, so they're a threshold into the building, a mechanical threshold. In a sense, you have these few moments trapped in a box that you get to experience the sound of the structure of the building, auditioning the building before you make the entrance.



DISTRIBUTION

Tell us about some of the possibilities of distribution which you have explored in bringing your work to an audience? And by distribution we mean everything from the most elementary decisions about how to recognizably bring your work out into the world, to relationships with museums, galleries, venues, recording labels, broadcasters, you name it.

lou mallozzi: It really does depend on the work itself. The work helps to determine what its distribution possibilities are going to be. If you do a recorded piece on CD, then you enter into the world of "How do I distribute this CD?" You have to make certain decisions: Do I want to try to get this work out as a limited-edition object? Do I want to put it out into some world of music where there are mechanisms at work—record labels, distributors, journals that print reviews? All that depends on the work.

With work that lives well on CD, i.e., that someone could listen to in their living room or on headphones or in the car, if there will be enough people interested in it, then I put a CD into distribution. With installation, on the other hand, there are many levels of problems, like the way that a sound goes through a loudspeaker. What a recording sounds like in that particular loudspeaker, in that kind of configuration, in that given space, is all highly specific.

ken montgomery: Many of my sound compositions can't be reproduced on a CD because they were designed for an octophonic speaker sound environment. In 1999, Felix Knoth interviewed me on his radio program in Hamburg. When I

arrived, he asked me for a CD to play to open the show. Since I had been working exclusively on octophonic pieces at the Spritzenhaus I had brought several sets of CDs designed to be mixed together, but I didn't have a stereo CD. Felix was amazed that, especially at this point in time when everyone burns their own CDs, I didn't have a "normal" stereo CD that I could play on the radio. At that moment I realized how far away I had gotten from the universal standard for listening to audio.

lou: If I could give you a stereo CD with the audio for an installation on it, and you play it in your house instead of through the particular loudspeakers in their particular architectonic setting, it's not going to sound at all how the piece is supposed to. Because the piece may be somewhat about the phenomenology of the playback situation, right? Therefore, the distribution, so to speak, of that installation can only really occur in a site-specific way. The piece can be done in a gallery and then sold to someone and set up somewhere else in a private setting or it could be presented in a public space where it could only exist in that place.

maryanne amacher: There should be real buildings dedicated to artists and sound installations, because people can have these experiences there that are totally liberating, and they can not have these experiences in their own home. It is impossible no matter how many speakers you have. It's not simply a question of multi-channels or spatialization. It's really a whole matter of physics, it's a matter of structure and sound, how sound relates and what happens in the structures that makes a transformative experience that doesn't happen with the current loudspeakers we have.

Distribution then includes creating spaces for an audience to have these specific listening experiences. Was this your intention when you established Generator Sound Art?

ken: Generator did have a DIY kind of distribution function, but this was only one aspect. I really didn't know what Generator would become when I opened it in 1989. It was truly an experiment. Generator was a home for the Generations Unlimited record label project started by Conrad Schnitzler, David Prescott and myself in 1986. We released cassettes and LPs of underground non-academic experimental music with an international focus. Selling and distributing the records was very difficult. I was convinced that if there were a place where people could actually go to hear the music, we might be able to sell a few more copies. Generator Sound Art Gallery in New York's East Village became the place to hear many kinds of experimental music, sound and noise. Sound artists sent me tapes and records from all over the world. At that time you couldn't find another place in New York

City or America where you could hear the music and noise that found its way to the Generator, and I was ambitious enough to want to introduce it to anyone who walked in off the street.

Through Mail Art and the cassette network I had correspondences with people in other parts of the U.S., Canada, Europe and Japan, but I didn't know many people in New York City. I wanted to find out if there were other people here in New York who were interested in this music.

Were there any models you were informed by?

ken: In the early 80's I was inspired by the self-produced cassettes and LPs I found at Staalplaat in Amsterdam and Gelbe Musik in Berlin.[1] Word of mouth, postal networking, music zines and books brought me into contact with many ideas and people. John Cage and Conrad Schnitzler had the biggest influence in my work. It was conversations with Conrad that planted the seed for starting Generator and it was his experience in the music world, the art world, and in life that guided me to make Generator the first sound art gallery in New York. I built an octophonic sound system at Generator specifically for conducting Conrad's 8-channel Cassette Concerts which he sent to me from Berlin. At Generator I met many artists and people extremely enthusiastic about music/sound and noise. I organized concerts and exhibitions and sound installations. Because it was so loose, because I was operating on the fly, I could spontaneously invite people to do what they wanted at Generator. It was very intuitive. The schedule at Generator quickly became very full. Artists traveling from Europe would come to New York City looking for a place to play, and I was often lucky enough to be the only place that offered them a gig. So there were performances by many artists before they were well known.[2] While I did have a predilection towards noise, non-traditional instruments and electronic music, I was open to what was new, genuine, or what wasn't being supported by established venues.

The word went out that there was a place in New York City where you could send a cassette of your music, the stranger the better, and it would go on the wall for people to listen to. Generator attracted artists or outsiders from anywhere in the world who obsessed about some sound/noise/music thing: there were instrument builders, analog synthesists, mail artists, and "kitchen artists" (this is what Conrad Schnitzler called people who used pots and pans, synthesizers, appliances or whatever was available to them to make music immediately and directly). Suddenly, kitchen artists had a venue! Some just came out of the woodwork; others had been working for years and were thrilled to discover a venue in the real world. Many people could only dream of having their music in a shop.

1 Founded in 1982, Amsterdam's Staalplaat is a diverse forum for soundartists, an "organization-network" that includes a music label, a record shop / audio gallery, a mail-order and distribution company and an online publication. http://www.staalplaat.com • Part gallery, part record store, Berlin's Gelbe Musik (Yellow Music) was founded by Ursula Block in 1981. The store takes it name from a variety of 20th-century Chinese popular music which was suppressed during the Cultural Revolution. For more information, an interview with Ursula Block is online at http://www.radiodays.org/program_detail.php?programID=93

2 Soviet France, Merzbow, Phauss, Z.Karkowski, David First, Arcane Device and many others.

Generator could be different things to different people. It could be a place to read the latest zines and listen to new music, a place to buy unusual music, a place to hear concerts or sound exhibitions or a place to hang out and meet interesting people. The Rainbow Café next door made the best Turkish coffee which fueled many conversations at the Generator.

Musik in the Dark[2] was one of the best events at Generator though it was probably the least attended. That was a weekly series of Conrad Schnitzler's Cassette Concerts which I mixed live through the 8-channel sound system in total darkness. It's a really dramatic thing to sit in the dark and be immersed in Conrad's music. Conrad fabricated large metal sculptures before abandoning the plastic arts for the invisible world of sound. His music often lacks conventional melody and rhythm so people often find it difficult to listen to. It can be quite intense and is wildly spatial. People either left within the first few minutes or else they stayed to the end and didn't want to leave. After concerts the dedicated would hang around to talk about their listening experience. The differences between one person's response and the next were stark. I remember after one concert someone came up to me saying they felt like they had been in a fiery hell, or a dungeon or factory with sweat and hot metal pounding the walls. The next person told me they experienced the bliss of floating in neon through smooth precise machinery. Performing Conrad's music is always really inspiring. It inspires me to give my audience the same high level of listening experiences.

Performing Conrad's music over and over, I learned how to dynamically change the same piece with each performance. There is a lot of room for experimentation which is what Conrad intended. I incorporated Conrad's compositional methods and tools into my own work and I composed concerts for the octophonic sound system at Generator. His way of composing and layering sound, while paying attention to the movement of sound in space has been a constant in my work since the 80's. Musik in the Dark concerts hooked me on immersive sound experiences.

How do you sell a piece that is designed for an octophonic soundsystem to people who want to experience your work at home or on headphones?

ken: Hard question. That's something that stopped me from producing CDs for a long time. It seemed impossible. Even cityscapes and field recordings lost their depth when I heard them through 2 speakers. In 1998 I began making packages of CDRs with instructions to play them through 4 separate CD players.[3]

Well, the emergence of "Surround Sound" (Dolby, DTS) technology as a norm promises to finally translate quadraphonic and octophonic compositions to the living room for intimate listening at home. The popular mp3 format has even added dimensions with its new mp3surround format (mp3s), enabling even the

2 www.harvestworks.org/creativec/Montgomery/Musicinthedark/index.html. For more on Conrad Schnitzler, see *The Wire*, May 2006

3 From the DRONESKIP-CLICKLOOP liner notes:

"Icebreaker was presented as an installation at Generator Sound Art Gallery in 1992 for 6 weeks. Octophonic live mix in total darkness.

"Close your eyes. Why should sound composing bother to refer to traditional music instruments? Must there be a visual element to sound? The Crush-a-matic is a sound-making device. But Icebreaker is not about instrumentation or composing or presentation. It's about creating an experience through listening. The Icebreaker was used as a starting point to record and manipulate sounds which were then fed through 8 speakers placed in a circle facing the center of a dark room. You are in the center. There is a chair and some cushions but you are free to walk around or do as you please. The room is more than dark. It is black. You can't see your hand in front of your face. Whether you want to close your eyes or not is your choice. The sounds originating from the Crush-a-matic begin to engulf you. They come from various points in space and move around you, through you, over you, past you, inside you. You hear many things and they might be very different from what I hear or what the next person hears. You may detect the sounds of ice being crushed or the humming of the engine but you will hear alot of other things too. And they might remind you of memories or inspire fantasies, or you might get bored.

transmission of sound "installations."

francisco lopez: I'm very interested in the question of the physicalization of sound. Mp3s are a good example here. An mp3 is a lower-quality version of something that existed before in a different format. It is a good format to transfer information, and for a lot of people this loss of quality doesn't matter. I can use the radio as an example as well. Imagine you're driving and you're listening to the radio in your car: Most people can of course recognize the melody of a song off the radio, and it seems to be the same thing if you're listening to it on the car-radio or anywhere else; but there's an essential difference. For me, the most important thing is the phenomenological difference, the really textural, physical difference of the sound in the different spaces and the different sound systems or the different conditions for listening. Both melody and rhythm actually turn our perception away from the physicality of the sound. So when you're not dealing with melody or rhythm you can perceive the physical aspects of sound much more clearly. For many sounds, and certainly for the kinds of sounds that I often use, you can perceive that very clearly. In a live show, I can radically transform a recording that I have on a CD in such an amazing way that you wouldn't believe it's the same recording. I'm very interested in this physicalization.

Let's step away from considerations of physicality and instead think about the mp3, and the worldwide web itself, as an unprecedented channel for distribution. Digital audio files are infinitely reproducible and transportable to the point of pure liquidity. Mail-art, aiming for a promiscuous interchange of creativity, took the production and distribution of copies to absurd length, with utopian dreams of connecting the world through an endless movement of envelopes. Let's focus on how mp3s and web distribution have carried on some of these mail-art traditions, and fostered dialogue and sharing.

Could you tell us about your web-label, tiln?

marc mcnulty: I originally started tiln because I knew that there was no possible way I was the only person following these kind of pursuits. It was an idea to try to bring together some kind of collective of like-minded individuals. I started sending out emails to a lot of the lists, saying, "Send me your mp3 work!" I wanted to make something more interesting than mp3.com, where your work became the possession of mp3.com. It could be re-used for any purpose. It could be re-purposed. That didn't necessarily worry me, because I didn't really think that anyone would be too fascinated with what I was doing, but I thought of it in the broader picture for other artists. It completely puts them in a small compartment, and if, for example, someone became the artist of the week or something like that, their work would not be

And that's ok too."

—Ken Montgomery

Ken Montgomery DRONESKIPCLICKLOOP (4 CDR set) Generator Sound Art, 2001 • Ken Montgomery, Icebrekaer, 3" CD, Staalplaat, 2001 • Icebreaker (1992 re-mix) included in the compilation Minimall, Tellus (Tellus CD27), 1993

theirs any longer, and that was a problem for me. The bottom line at tiln was "your work is your work."

I hosted tiln from a server in my apartment with just a cable modem, which was pretty cool for a while. I built it from an old PC I had, and put a nice big hard drive in it. It was good, but managing it and keeping it up to date wasn't something that I could do myself, so I kind of allowed it to self-manage. I didn't intend for tiln to become a large entity, but within a year-and-a-half or so, there came to be about 40 artists, who were all beginning to work with each other! That was really the most interesting part to me, that cross-pollination of all these people from these remote places all over the world, just being able to have this place to say, "this is what I have done, what do you think?"

The label that you manage, Platelunch, makes actual cds, whereas tiln doesn't. How does a conventional label differ from a web-label?

marc mcnulty: I don't even know if the term "web-label" is accurate for tiln, because there's no contract that anyone enters into, there's no formality. As much as possible, I would take whatever anyone would send to me and put it up on tiln. I was trying hard not to act as a curator.

Platelunch,[4] on the other hand, was a genuine label started by Norbert Schilling in Germany in 1997, which already had a vision to start with. Norbert's original focus for Platelunch was to be a Conrad Schnitzler label, which it was for the first year or so. The two or three original cds were of Conrad's work, which was pretty amazing for a small label starting out to have a recognized artist, that they would be able to, for lack of a better word, sell product. It's not like starting out a label of your own and just trying to push your own work, or trying to push a compilation of unknown artists, or something like that, which sometimes are the most fascinating, but they don't get enough exposure because the media takes a blind eye to what it perceives as naive.

When Norbert was running the label we were emailing back and forth to each other, as I had become interested in a lot of Schnitzler's earlier synthesizer works. Norbert made me an offer to take care of things for North America and Canada and Asia. It really became this fascinating kind of friendship. Norbert passed away in 1999 and all of Platelunch suddenly fell onto me. His mother sent the entire stock and everything over to me—like seven or eight thousand cds! It was a whole adventure to just figure out what I was going to do with this!

It seems like what you're doing with tiln and Platelunch, in their economic or distributive capacity, counteracts monopolization.

marc: I'm fascinated by how intricate this monopolization is! I'm fascinated by how people are so willing to subjugate themselves to the way things have always been done and just keep doing it that way. I'm just fascinated that someone would give up their free will. What is in question here is our free will, and that hearkens back to tiln and Platelunch and all that. Tiln and Platelunch are simply trying to be what happens when groups of writers and artists get together and confer on things.

ken: In 1999, Scott Konzelmann, aka Chop Shop, and I created yet another incarnation of Generator Sound Art on the Web. We wanted to think about intentionally providing a resource for dedicated sound artists. We began by making available recordings of past Generator sound events and by producing new recorded works by sound artists who have stayed in contact with us over the years and new artists that we meet. Generator Sound Art Inc. gives artists the freedom to be as creative as they like and the opportunity to collaborate on the production.

How does sound art fit in with the context of the commercial art gallery? Isn't sound somehow resistant to commodification?

ed osborn: There are some kinds of sound work that are resistant to commodification which rarely end up in any kind of gallery, commercial or otherwise. The commodification of visual art is based on a common economic model: there are objects, the objects are sold. The hard part with sound is that it's an unusual thing to sell in this kind of context. Sound is material that doesn't only occupy space; it actively intrudes in a space and then disappears. Something happens and then it's over. This kind of thing is not very practical to sell as a commodity, at least when it is not called "music." Its functioning isn't conducive to this. Where sound is attached to objects, particularly objects that appear as if they belong in an art context, then the fact that the object has sound as part of it is less of a commercial impediment.

The only thing that I think is inherently harder with sound in terms of commodification is that sound and sound work is always closely linked to site, physically, even if not always conceptually. Site-specific sound works are hard, if not impossible, to relocate. Even if site-specificity is not an issue, a set of sounds will often have very different characteristics emerge when heard in various spaces. This is not a helpful feature when trying to make a sale.

Was there an established context for sound art in galleries when you first started exhibiting your work?

ed: Not really an established context, but I knew that there were contexts neverthe-

less. Sometimes sound art was presented in music festivals, sometimes in museums, sometimes in project spaces, sometimes outside in site-specific settings. For me, it was a question of what seemed to be available as a context. Also, the kind of work I do requires a relative amount of quiet; I need to know that there's someone watching the piece and that the space is controllable on a number of levels. Those requirements are most likely to be found in visual arts settings. It was simply the best context for me. It's different for someone like Matt Heckert[5] who makes big, sound-producing machines. Because they're so large and loud and strong, his pieces can be presented in a number of contexts, including clubs. I don't make work like that, so the options for presentation are a bit more limited. I don't see it as an impediment at all, it's just a question of finding the right context.

Could you tell us more about your relationships with specific galleries?

ed: I've been working for a about a dozen years with a contemporary visual arts gallery in San Francisco, the Catherine Clark Gallery. They have been consistently supportive of my practice for a long time now, but I don't count on paying the rent with my sales there. There is also Galerie Haferkamp in Cologne, who set out to be specifically a sound art gallery, though they have since expanded into showing other kinds of work. The owner was interested in sound art, got together with a few other people and decided to make a go of it. They've created a situation in which a lot of interesting things happen, both through live performances and in the exhibitions; it's become a very vital space. From the programming it looks similar to a non-profit space, but they function as a commercial gallery in other respects.[6]

Working in an art-world context, do you have collectors? Do you work in ways analogous to visual artists? Do you put out limited editions?

ed: Usually they are unique pieces, sometimes limited editions. Multiple copies might be built if the exhibition schedule requires it, but usually I never have to worry about building more than one for the purpose of sales even if it is designated as a limited edition.

Could you describe an example of one of your early installations?

annea lockwood: When I came here to New York, in 1973, the first installation was at The Kitchen, the old one over on Broome Street. I assembled a group of rivers, and it included recordings made in the Himalayas, and recordings made by Pauline Oliveros,[7] and Lynn Baron, and a lot of people. As I recall, it went from white water to calm over the course of a couple of hours or so. I covered the floor

5 Matt Heckert, American, b.???. In the 1980s, Matt Heckert built and designed robots for performance as part of Survival Research Laboratories. In 1988, he began work on the Mechanical Sound Orchestra, remote controlled robots designed with a variety of timbres and rhythms that could perform musically without the accompaniment of synthesizers or samplers.

6 www.rachelhaferkamp.de

7 Pauline Oliveros, American, b. 1932. Composer, performer, founder of Deep Listening. • Oliveros is a central figure in 20th- and 21st-century electronic music. She was an original member of the San Francisco Tape Music Center, founded by Morton Subotnick and Ramon Sender in 1962, and was its first director when it moved to Mills College (Oakland, CA) in 1967. She currently is a research professor at Rensselaer Polytechnic Institute in Troy, New York and as Composer in Residence at Mills College, as well as Artistic Director of the Deep Listening Institute. www.deeplistening.org

with foam rubber, and I put an ozone generator in the space—to give everyone a slight high – and projected slides made from beautiful old postcards of the rivers which had been recorded.

I just let it run continuously for a while. That was the first one, I called it *Play the Ganges Backwards One More Time, Sam*. That became a sort of a heading for other water installations, which I did variations on in various spots. I worked out of the River Archive for about five or six installation works, including one in Charlotte Moorman's New York Avant-Garde Festival. That was an interesting experience. That was the Festival that ran in Grand Central Station in 1973. I put headphones on people. And, as they were walking around the station, people swore that rivers were passing stereophonically, panning from ear to ear. Which they weren't, of course, but it's a really nice illusion to come across. Then, in 1981, I did the *Hudson River Sound Map*. I went into the Hudson River Museum in Yonkers looking for an arts administration job and instead they said, "Make a proposal." I was looking out onto the River, across to the Palisades, and the topic was totally obvious.[8]

It seems like your work would be inhibited by trying to install it in a gallery space.

mark bain: Yes. For example, there is a show I did in de Appel[9] where I had four of these oscillators mounted to the non-loadbearing wall on the second floor. This wall was about a meter thick, made out of wood and plasterboard, and when you operated the system it really pushed the wall a couple of millimeters back and forth just through the vibration. So it acted like a giant diaphragm, pumping the space with heavy infrasound. It worked really nicely, and people were into it at the opening, really into it. I had put a timing button on it so that it wasn't on all the time, but the audience had to activate it for this implied auto-destruction of the building. I don't think it ever stopped running. Anyway, it was shut off after the opening, supposedly because the environmental police showed up. In Amsterdam they build the buildings right next to each other, and the neighbors were complaining that the objects in their living room were moving around and things like that. So that lasted one day, essentially. That's an example of the difficulty of working with a gallery space. I really prefer some sort of public interface outside of the norms of the gallery museum context, making work that has this kind of openness for whoever's there.

What was it like to work with the City of Seattle?

mark: Because it's a City Hall, I think it's quite beautiful and poetic that it's a sonic democracy to hear all the actions and elements of the building like this. Of course, the authorities are very paranoid about the fact that we're tapping into or bugging

8 *Play the Ganges Backwards*. Installation at The Kitchen. Performance at Franklin Furnace, NYC, January 8, 1980. Installation at Modern Art Galerie, Vienna. • *A Sound Map of the Hudson River*, Hudson River Museum, Yonkers, opened 1982. A stereo version was published in 1993 by Lovely Music (Lovely CD 2081).

9 Anarchitecture, de Appel, Amsterdam, NL 1999

11 House Rockin: X-SITE (1999)
Het Paard, Den Haag, NL

their building. The thing is we're not interested in conversations; our microphones are not even picking up the range of voices. We're really interested just in the tonalities of the building and the idea of impact: What's impacting the building? Outside weather conditions, footsteps, machines attached to it.

Earthquakes and tsunamis, too. Impact generally has such destructive connotations.

mark: Yes, I'm interested in that too. Ideally I would like to get a building that I would be allowed to destroy with sound, because it's not really been done before. This is something I've been developing for a while as a new form of demolition technique, for example in the project I did in den Haag.[11] It was a large music venue that was being shut down to be renovated, so they allowed parts of the building to be destroyed. With these systems it's all about the tuning: you can tune it for destruction or you can tune it more for the sound element, so it's a decision I can make through the composition. But they actually gave me permission to destroy parts of this building! So this picture with the crack was a solid brick wall that was about a meter thick. There was also another part of the building complex where I took out a whole floor from the oscillators underneath.

Sounds intense!

mark: I'm very interested in intensity. We live in such a complex world now, and it's hard to have this experience of intensity outside the normal chatter. Everything is so modulated. I'm interested in being able to rip the carpet from under people's feet in a sense. I'm not interested in hurting people or destruction per se, but I'm certainly into the idea of dissolution. These projects are moving buildings in very micro amounts. Complexity and indeterminacy, unlike the older scientific view of harmony and order, stresses that if you look closer and closer, things are completely in disorder. This work of tuning and harmonizing also creates this disorder; it straddles the edge between resonance and chaos.

If audio experimentation can toss something so solid as architecture onto the edge of chaos, what does it mean for a medium like the radio?

gregory: Taking experimental audio and then passively broadcasting it does not qualify for me as radio art. Radio art has to be some kind of event or performance or presentation—a "play" in the broadest sense—that deals with the fundamental materials of radio, and the material of radio is not just amorphous sound. Radio is above all a set of relationships, an intricate triangulation of listener, "player," and

system. It's also a huge corporate beast, and the awareness that you're working within a highly capitalized network. Finally, there is the way in which radio is listened to, frequently in an extremely lo-fi environment, with people listening on a car radio, or in the kitchen, cooking, and listening with only half an ear. To me, radio art comes to grips with all of that, it comes to grips with both the context of production and the context of listening. There must be a play of relationships. The call and response, the give and take, the friction, the rub, the tangle. Sometimes literally, through feedback loops like telephone call-ins, but sometimes more deeply buried within the structure of the broadcast, some way of acknowledging the fragile, weird complicity with a listener, who is always just one twitch away from tuning you out.

While you're on the air, you feel as though nobody could be listening.

gregory: And I love that, the not-knowing. There's something so wonderful about it, if you embrace it. To some people it's very discouraging, they think "why bother?" You know it's that slippery question of "Who's there?" Is there anybody there? Are you out there? Are you listening? And then of course, as the trickster knows, once you open the question, the space for a question, then the seduction begins. In my longer pieces I always try to design them in a very circular way so that you can enter in many different spots and still get the basic idea. Or you can listen to the whole loopy adventure.

A play but not a story?

gregory: Not a story that has a conventional beginning, middle, and end. I mean conceptually it has a beginning, middle and end, but one that can repeat, that the listener can ride like a wave form, a structure that's just waving waving waving. So if you listen to it, if it's a one-hour program or play or broadcast or whatever, any five minutes, no matter where in the program, if you listen to those five minutes you will get that sense of waves of thought, through a structure that's true to the random access nature of the medium. Now if you put that same structure on a CD where somebody's going to sit down and listen, then it doesn't work, but the equivalent might be shuffle mode. On some of my works that have been released as CDs, I put ID points at different sections of the piece and then encourage people to play it in shuffle mode, allowing the chance of new associations to emerge when you listen differently, in a mutating sequence.[12]

How does your work relate to the dominant formats of commercial or public radio?

gregory: For me, to listen to those formats and those hideous delusional aspirations and those grubby commercial models and think of ways to get inside them and take them somewhere else is very intriguing, maybe it is just the imp of the perverse. To begin with the arrogance of absolute certainty—the world in your ears—and then gradually bleed, minute by minute, into a nebulous zone where all boundaries, bodies, voices, themes and ideas blur into each other, or into a fog of thought and feeling that is closer to some kind of lived truth. The voice of authority is part of what I call "radio Thanatos," the side of radio that vibrates with death, as weapons or as control over communities. Then there is "radio Eros," the radio of play, and attraction, a radio of productive illusion, a radio that brings ears together into some kind of fresh network. The best radio art hangs in the turbulence between the two. I want the whole body of my work, taken as a whole, to be a kind of navigational system for the turbulence, between the scream and the laugh, perhaps, or between the horrific shudders of a sort of cultural Grand Mal seizure – for what else should we call the Age of Bush? —- and the stubborn insistence of some other vibe: Eros, affirmation, call it what you will. Life!

SITES OF PERFORMANCE

Throughout the 20th century, artists in a range of disciplines developed a concern for the site where an artwork was to be presented, producing an ethics of site-specificity. To bring the ethics of site-specificity to a performance situation, two sets of information are immediately reflected—the venue as a social site with a set of audience expectations, and the venue as a physical site, as a building with physical properties that may influence the sounds themselves.

In this chapter, we examine artists' responses to the concert music setting, and how they gravitate towards one of two contrary tropes—appearance or immersion.

Could you describe your evolution as a performer?

brenda hutchinson: In my early pieces, I really struggled with how to put them out, other than just directly as tapes. Once I started to perform it became a lot easier for me to figure out how to perform with my recordings. Mostly, I'm a witness. I feel like a witness when I do these pieces, and I decided to just do something on stage while these tapes are playing. It took a long time, between making these recordings at the psychiatric hospital and when I actually had enough money to finish the piece. Maybe seven or eight years. In that amount of time, I had built this really large music box. The Giant Music Box.[1]

Let's back up a moment. The psychiatric hospital?

brenda: Where I grew up, you either worked in a factory or you had a civil service job. When I was in high school, I got one of these civil service jobs, a "good job," in this place that used to bill all the families of indigent patients for the four psychiatric hospitals in New Jersey. They had this huge room of files, all case studies, and told

1 The Giant Music Box is an instrument/interactive exhibit, consisting of a large rotating cylinder—38" l X 32" d—and an octave and a half of 40 brass bars tuned to a quarter-tone scale. It is played by inserting push pins into the cylinder corresponding to the desired notes, gently tapping the pins with a rubber mallet before pushing the cylinder forward.

me, "Fix 'em! Put them in order." Well, I spent that whole summer reading... Holy God! You should see these huge files and read these records! I'd think, "Jeez, what if this happened to me? All you really have is your ability to think. You survive by your wits: if you don't have them, what's going to happen?" That's how I got the idea to go into a mental hospital to record. I decided that I didn't want to commit myself into a psychiatric hospital just to record. I wanted to have control over the situation. I wanted a quiet room to record in.

It took me a while. I had no expectations. I just wanted to get in there. See what's going on. I volunteered for about a year at an outpatient clinic. They had all this video equipment and no one who knew how to use it. They had sessions where the patients would do play-acting and they needed someone to videotape them. I did that and met a lot of people there. I recorded a few people from there, who would invite me to their homes. Doing that, I met someone who worked in an administrative office at Bronx State Psychiatric Hospital.

I went there two days a week for two years. I went up in the mornings, and played this little organ and we'd sing. We sang Protestant hymns, show tunes and patriotic songs, because those were the things that everybody knew words to. I wouldn't say *the* words, but words nevertheless. We'd play and sing, then I'd take my lunch ticket and go eat lunch in the cafeteria, and go back up after lunch and just record. See, people would come to sing with me in the morning because after they were done, they could get a cigarette. They'd come, sing, and then line up to get their cigarettes. But, in the afternoon, people would come back into the room. They'd come just because they had nothing else to do.

So how did these recordings work into your early performances?

brenda: At the hospital, everybody always wanted to sing *Silent Night*. That was their favorite, so I decided to construct *Silent Night* on the music box, putting all the keys on. There's about forty keys, so just to put the music box together takes a long time. The tape was about 40 minutes, and I had a sampler. I sampled laughter. I sampled certain phrases that the patients would say. And I would play along; there were sections where there'd be a waltz or different things. And, in between, I'd go over to the music box and the voices on the recording would sing or talk some more. I was just with them. That's how I would perform with them.

The goal of these pieces was not always entertainment. They're... I wouldn't say rituals, but they're these difficult tasks to do. That's the way I set up performances for myself. I was always terrified to perform. That's part of why I didn't perform for so long.

Soon after, I had these friends who came back from Thailand. They gave me a

recording of a woman in Thailand calling her pigs: "Eeeyah." I sampled the woman so I could have it just play over and over and over again. Then I would go and try to get the inflection right. It rips up your throat like crazy. It would make my eyes tear. I was just coughing coughing coughing, because I had just quit smoking. Then, while it would make my eyes tear, it would make me think of really sad things; this string of people who had died. That's how *EEEYAH!* came about.[2] Then I realized that I have my own voice: that's what I can use to perform. A year later I found the tube and started singing into the tube.

You are known for your practice of blindfolding your audiences during your performances. In your performances, do you think any visual input detracts from the immersion?

francisco lopez: Yes I think so. And not from a theoretical point of view, but from my direct experiences. I've done many shows, and of course I've seen many shows, and, to me, this is a serious problem. And a lot of people tell me they have the same feeling. In my live performances, when visitors go through the performance blindfolded, most people say it really makes an incredible difference. Just because of this simple idea; it's not a big trick, it's just a simple thing to do. When you use a blindfold, the difference is just amazing. And for me... it's my favorite kind of listening anyway. This is voluntary for anybody in the audience, and I think that it changes things dramatically. For example, just think about having someone with a laptop on stage, or a DJ on stage. What is the reason for someone with a laptop to be on stage?

What is there to see really?

annea lockwood: One of the things I love about concert music is that you are seeing the being of the performer manifested. I find that moving, when a performer really dives into a piece and becomes one with it, then there's this beautiful unfolding of the person in front of your eyes and your ears. I love that.

francisco: Up until now everybody was on stage, all the bands, all the musicians; and now it is the electronic artist on stage. Originally, the reason for the musicians to be on stage was so that people could hear the music and see the performer. I just don't see the point of that with electronic music.

janek schaefer: I just played in Oslo at the Ultima Festival. There was a stage and an arrangement of speakers, but the arrangement had nothing to do with the stage. The stage was where the audience would have stood or sat and I decided to

2 *Voices of Reason*, performance for Giant Music Box, electronics and tape. Premiered at Roulette, NYC in 1991. • *EEEYAH!*, performance for voice, drum, bell, and tape. Collaboration with choreographer Nancy Zendora. Premiered at St. Mark's Church, NYC, in May 1989. • Excerpts of both works were published on the Deep Listening cassette, *Seldom Still*. (Catalog # HB-C-1)

play in that space with the audience around me, which I always like to do. If people get a visual and conceptual understanding of me standing up there twiddling knobs, it actually isn't very interesting, messing with records and so forth. People do get excited about that, but if they can see what I'm up to it has an impact on the musical experience.

francisco: If someone is looking at me during a live show, they will be looking at the equipment, trying to figure out how I am doing this or that. I don't want people to look at me during a live show, trying to figure out what I am doing. I want people to focus on what is going on in the space. When you give your attention to space, I think you're freer to go through that trip, you know, to go with the sound. I always cover the equipment, and I don't want the audience to see what I'm using. And I've used laptops and all kinds of things for the live shows, but to me that is irrelevant. It's better for the work to have some kind of mystery about it. You don't know what it is, but you're there to enjoy the experience, or whatever you want to call it, to go through the experience.

1 For more on this, see Kim Cascone's concept of "Gestural Theater" in the article The Microsound Scene: An Interview with Kim Cascone (http://www.ctheory.net/articles.aspx?id=322 CTheory 2002.)

BRIDGES AS BELLS

While all architectural forms have properties that influence sounds occuring within and around them, bridges in particular, with their stranded cables and floating iron beams, have driven artists to use them in their pieces, like giant instruments. At issue are different methods of recording and amplification, whether and how to increase the levels or patterns of sounds by direct intervention, and how to get around the rules governing public space, either through established channels or by guerilla action.

jodi rose: I really love the Futurist manifesto, *The Art of Noise*. It talks about walking through the city and composing a symphony in your head from all the clanging doors and the automobiles and airplanes and all the industrial noises. 1 Russolo (x)

> *Let us cross a great modern capital with our ears more alert than our eyes, and we will get enjoyment from distinguishing the eddying of water, air and gas in metal pipes, the grumbling of noises that breathe and pulse with indisputable animality, the palpitation of valves, the coming and going of pistons, the howl of mechanical saws, the jolting of a tram on its rails, the cracking of whips, the flapping of curtains and flags. We enjoy creating mental orchestrations of the crashing down of metal shop blinds, slamming doors, the hubbub and shuffling of crowds, the variety of din, from stations, railways, iron foundries, spinning wheels, printing works, electric power stations and underground railways.*[1]

jodi: I was going back and forth to art school every day on the bus, looking up at the ANZAC Bridge in Sydney during its construction. It looked really weird and

over-engineered for its surroundings. The old bridge, a low four-lane steel bridge with truss spans, is built on sandstone piers close to the water. The new bridge has concrete towers 40 stories high, is 345 meters long, and has these striking black cables! The ordering of the cables is called a "harp arrangement." I looked at the cables and thought, "They look like a musical instrument. I'd like to play that someday. I wonder what it sounds like?"

So, I wrote a letter to the head engineer at the Roads and Traffic Authority, Peter Wellings, who was in charge of building the bridge. I have these little poetic reveries now and then. I wrote: "The city is our temple. The electronic networks are our religion and the voice of the Glebe Island Bridge cables is the voice of the divine." I think he responded to that because it was a little kooky and out there. When I was there to make the recording, he got out a model of the bridge and said, "Here's God on the telephone for you!" Obviously it tapped into something for him, an engineer, to be interested. The R&T Authority had received other requests to have concerts on the bridge, film clips, but they'd actually turned most of them down.

Then, I wrote a letter to *The Listening Room*, which is the audio arts program at ABC (Australian Broadcasting Corp), and said, "I've got this opportunity to record this bridge and I'd really love it if you'd help me because I don't have any equipment that will do it justice." And they were excited and said, "Sure we'd love to help because we'd like to know what it sounds like too!" So they set me up with two sound engineers and a whole lot of equipment. We drove up onto the building site. I always regret that I didn't walk out to the end of the road. But, I was kind of obsessed by the cables even then. Bridge engineers want to minimize the vibrations in the cables; my project is about tuning into those vibrations and listening to them, really hearing them. The ABC brought these C-Ducer contact microphones: these long, thin strips that are used to mic up things like grand pianos. The cables weren't finished, so the 25-78 strands inside them were exposed. (When they are completed they are covered in a thick polyethylene plastic.) We placed the microphones inside the multiple strands of cables.

That bridge is one of my favorites, because of the sound. Because it was unfinished there are really beautiful moments with the sound, where it goes into these rhythms with the wind, and popping and "pow"-ing from the cables. It's really quite special. Old steel-cabled suspension bridges like the Brooklyn Bridge and the Golden Gate are absolutely fantastic! The cables are just naked. They're just there! And, it's beautiful. I love it. The sound from those two bridges is just wonderful. They're gorgeous.

Other bridges call for intervention, for "playing." I had gone to Vietnam to record this bridge, the My Thuan Bridge over the Mekong Delta, south of Ho Chi Minh City. Beautiful blue cables. I had to go on this three-day tour to get down to it. I

told the guide that I really wanted to walk across that bridge. "Crazy Australian," he said.

So, I walked onto this bridge. It was really really hot. It was the first one I'd done after a long break. The first one I'd done on my own. The first one overseas. I put the microphones on the cables and went... "There's NOTHING! No signal at all! There's absolutely no sound coming out of this! What am I going to do? I've come all this way to this bridge in Vietnam, and there's no sound from it."

Then I decided, ok, I'm just going to start banging on bits of the structure and see what sound it would make. I guess necessity is the mother of intervention!

When I was at the bridge in Rotterdam, the Erasmus Bridge, the cables themselves weren't the most sonically alive. The railings and parts of the pylons and some of the mechanisms had much more going on. So, I had to relax my idea that it was just the cables that I would record, because they were like the guitar strings. Anyway, with a guitar, you don't record the strings, you record the resonance. The rest of the bridge is resonant.

I like the purist idea of an Aeolian bridge, but I'm not convinced by it. It's fun to play on a bridge, too. There, it is a matter of finding what kind of sound there is on the structure, so when I'm actually on the bridge recording I feel like I am playing the bridge as an instrument. I like getting the sort of bell tones. The bell sounds are intriguing because they're all really different. There seems to be a site and cultural specificity within the sound of the bridges. Like the bridge in Vietnam, I've had a number of people comment to me that it sounds like an Asian gong. Whereas the Heureka Silta, outside of Helsinki, sounds really Nordic.

Is there some tone that would come out if you could somehow "strike" the whole bridge?

jodi: Yes, each one has its own resonant frequency, as we know from the Tacoma Narrows Bridge, which collapsed![2]

mark bain: Yeah, certainly every material has its own kind of effect or resonance. It's just like when you have different kinds of bells. Essentially I'm using the architecture as a kind of bell and then striking it. I was interested in using massive steel structures, and this one in Boston Harbor must be 200 meters long or something. It's closed; I think only pedestrians can walk on it. I went down there with two small engines and hooked into two of the girders in the middle. I found a power supply on the bridge that was working. I was down there with my brother doing this, and it was sort of a guerilla action around 3 in the morning. It was amazing how powerful these things were because it really did start cycling the whole bridge, as this kind of low-tone bell sound. And then you could tune it different ways to the point where the

2 The first Tacoma Narrows Bridge, or Galloping Gertie, opened in 1940. Galloping Gertie was the first bridge of its type to employ "plate girders" to support the roadbed. Earlier (and subsequent) designs were supported by steel trusses. The bridge was nicknamed after it was discovered that the bridge would sway and buckle dangerously in relatively mild windy conditions for the area. This resonance was longitudinal, meaning the bridge buckled along its length—one half of the central span would rise while the other lowered. Drivers would see cars approaching from the other direction disappear into valleys which were dynamically appearing and disappearing; however, the mass of the bridge was considered sufficient to keep it structurally sound.

The failure of the bridge occurred from a twisting, or torsional mode, whereby when the left side of the roadway went down, the right side would rise, and vice-versa, with the centerline of the road remaining still. This vibration was due to aeroelastic flutter.

The bridge's spectacular self-destruction is often used as an object lesson in the necessity to consider both aerodynamics and resonance effects in civil and structural engineering. However the effect that caused the destruction of the bridge should not be confused with forced resonance (as from the periodic motion induced by a group of soldiers marching in step across a bridge). In the case of the Tacoma Narrows Bridge, there was no periodic disturbance. Source: http://en.wikipedia.org/wiki/Tacoma_Narrows_Bridge

3 *Geo-Site: Portable Earthquake*, Silhouettes 'n' Shadows, Tilburg, Netherlands, 2001

frequencies would flake the rust off. You could get the tuning of rust falling.

How do you vary the rate at which you vibrate something to affect the sound?

mark: One thing with the projects using buildings, because the buildings are huge and the frequencies are quite low, it is good to play them like an instrument and tune to these resonant frequencies making slight adjustments to the specific structure. I use multiple oscillators to be able to generate more complex harmonic content. These harmonics are the sounds I'm most interested in and which produce the infrasound. Because I use upwards of sixteen or more of these oscillators all together, you can get some really complex patterns and energies happening.

Could you describe some more of your work where you oscillate something to create a sonic event?

mark: I had a piece in Tilburg, which is in the south of Holland, called the *Geo-Site Portable Earthquake*.[3] This was a six-meter long steel plate, one of these huge steel plates you see when they do roadwork. So I had this large plate, and I had three very big oscillators that they normally use for industrial applications mounted to this. Everything was then sunk into the ground and covered up so you didn't see anything. It was in this empty lot and I had an infrared beam that would trigger whenever somebody went into the space, creating a sudden action underneath the feet. All these vibrations would make this Hans Jenny effect in the earth, or what Jenny calls Cymatic action. So you get a kind of rhizome formation with different vibration patterns in the ground. This energy also travels through the earth just like a real earthquake, so it starts reacting with the other architecture around the location. It actually had an impact of about a half a kilometer in radius. Of course some of the buildings are older than others so I had people coming up to me like "Hey, man what are you doing here, all my glasses are rattling in my kitchen." It's interesting the way these waveforms can travel through the ground. I try tuning directly for this earth resonance that causes it to percolate into certain areas, a sympathetic vibration action which travels. I like that idea, this communication between things and location. You create a small energy source here and it can seem dead, but then somehow this energy reappears somewhere else far more powerfully. So it's interesting how these frequencies relate to each other, these mutual resonances.


Noise Workshop

Powerful as the vibrations in the earth may be, it is the sounds traveling through the perfect medium of the atmosphere which make up our acoustic environment.

"Ecology is the study of the relationship between living organisms and their environment. Acoustic ecology is thus the study of the effects of the acoustic environment or soundscape on the physical responses or behavioral characteristic of creatures living within it. Its particular aim is to draw attention to imbalances which may have unhealthy or inimical effects."[1]

THE SOUNDSCAPE

How did you become interested in acoustic ecology?

hildegard westerkamp: When I was a student[2], Murray Schafer came to give a lecture here at UBC, and that lecture "did it" for me. He had three or four music stands on the stage. One stand was connected to him talking about his trip to Persia. Another was connected to general soundscape matters here in Vancouver. Another was connected to music composition and his own work. Some of it was connected to contemporary composition.

Murray Schafer had placed members of the World Soundscape Project[3] into the audience. Every so often, one of them would get up and ask something like, "How many birds have you heard today?"

I don't know how much of this was pre-arranged or how randomly these questions were placed within the time frame of the lecture. "How many airplanes have you heard today?" All these questions totally blew my mind. I came out of this lecture, suddenly hearing absolutely everything. I think at that point, I became aware that

1 Schafer (7)

2 Sometime between 1969 and 1972.

3 The World Soundscape Project: A project headquartered at the Sonic Research Studio of the Communications Department, Simon Fraser University, British Columbia, Canada, devoted to the comparative study of the world soundscape. The Project came into existence in 1971, and since that time a number of national and international research studies have been conducted, dealing with aural perception, sound symbolism, noise pollution, etc., all of which have attempted to unite the

arts and sciences of sound studies in preparation for the development of the interdiscipline of Acoustic Design.

4 Schafer (275)

I was always connected through the ears to the world. I hadn't been aware of it. I continued with my studies, and some years later, when I was finished and I was teaching music, I remembered that lecture. Someone told me that Murray Schafer had written *The Book of Noise*, which I ordered for my students. I had also heard that they were working on The Vancouver Soundscape. "I really want to know more about this," I thought. So I found Murray Schafer. At that time, he was working on *The Tuning of the World* at Simon Fraser University. The book offers an overview, like an anthology almost, of the soundscape in general.

> *The soundscape is any acoustic field of study. We may speak of a musical composition as a soundscape, or a radio program as a soundscape or an acoustic environment as a soundscape.*[4]

The book covers the natural soundscape, rural soundscapes, city soundscapes, post-industrial soundscapes. Then, it speaks on music and soundscape, followed by the analytical part. In other parts he talks about listening, the acoustic community, the soniferous garden, silence. He was trying to cover the whole spectrum.

I eventually gave up teaching and became a member of the World Soundscape Project. I was hired to do research for the book, and never turned back. It was so fascinating for me to get to know the world through the ear, particularly as an emigrant from Germany. It opened up this Vancouver world and the Canadian, North American world in a different way. I just loved it: to listen with a musician's ear to the world.

Murray suggested at the time to listen to the world as if it were a composition, and to analyze it with a musician's ear—analyze the instruments with which this world makes its sounds. He took it very much from that aesthetic point of view, and that's sometimes where he gets criticized these days.

Do you ever find that aesthetic approach limiting?

hildegard: I found at a certain point that I had to expand my language. That was when I went into communications. I was also involved with a local group here organized to fight noise, so I was a bit of an activist. That was interesting, because the listening sensitivity didn't seem to fit into the activist mode at all. It was difficult. When you come from the cultural perspective of listening to music, from the classical side, there is this attitude that you are not concerned with matters of the world. When you listen to music, you are in a quiet environment to enjoy the particular experience: that's the attitude I grew up with, and it's still around in the classical music audience. And the environmental activist is not necessarily a listener. There is a political agenda to get rid of noise. To ask noise activists to stop and listen and

to include the information that comes from listening into their activist mode—that often is too much of a jump for them to make. To me, it's not a jump. There's continuity there.

We had this noise workshop here in Vancouver. We invited the City Council to come on a soundwalk. The Mayor and quite a few council members came, and before the soundwalk, we had them listen blindfolded to a environmental sound mix of recordings from Vancouver and basic messages about noise.

I'm trying to imagine your blindfolded city council members.

hildegard: It was great! The press of course liked it. The point is, when you get everyone to listen to the actuality of what's happening, it adds a whole new dimension to the political work. That's what I found interesting at the time. We were fighting the expansion of the airport, and were moving to improve the city noise bylaw. To ask people to go on a soundwalk, and listen to the environment while they're frantically trying to put out petitions and do all this activist stuff is difficult, because it asks people to stop. Just for an hour, put your mind out of this and just listen. Just take in what is. It's another level of information! It reaches your heart, your emotion, and puts you in touch with your own listening experience. How do I interact as a listener? How does it affect me personally, and as part of a community? And how do we affect the community with our sounds?

> *We want to attune and regulate this tremendous variety of noises harmonically and rhythmically.*
>
> *To attune noises does not mean to detract from all their irregular movements and vibrations in time and intensity, but rather to give gradation and tone to the most strongly predominant of these vibrations.*
>
> *Every noise has a tone, and sometimes also a harmony that predominates over the body of its irregular vibrations.*[5]

bruce odland: Our culture is extremely visual. Everything we observe around us is justified by visual logic and visual perspective. Our modern soundscape is an accidental side-effect of visual thinking.

> *There is no need to subject modern towns, their outskirts and new buildings, to careful scrutiny in order to reach the conclusion that everything here resembles everything else. It is obvious, sad to say, that repetition has everywhere defeated uniqueness. At all events, repetition reigns supreme. [An] important aspect of spaces of this kind is their increasingly pronounced visual character. They are made with the visible in mind: the visibility of*

people and things, of spaces and of whatever is contained by them. The predominance of visualization serves to conceal repetitiveness. People look, and take sight, take seeing, for life itself. We build on the basis of paper and plans. We buy on the basis of images.[6]

bruce: Sam and I are aural thinkers: we think with our ears. *Blue Moon*[7] is part of a series of pieces about hearing perspective, that have happened in different sites and cities. Starting with *Traffic Mantra* in Rome, 1991, we have been altering the harmonics of public space as a means of altering the emotional landscape. That piece used the resonance within a roman amphora responding to traffic noise, and via microphones and solar-powered speakers exported this resonance in real-time to the broader site. Later pieces substituted the tuning tube for the amphora, and since then we have explored and learned from this phenomenon in many pieces and cities.

Blue Moon is specific to this site, where they've made a nice-looking 1970s plaza with old weird gaslights that are supposed to let people know that they should feel comfortable, like Disneyland. Those are the Disneyland lights that they've installed, visual things to make people comfortable in the middle of a scary glass-and-steel building full of futures traders. And it works! The consumers know how to follow the cues—but, if they sat and closed their eyes, they would realize that they're just in the middle of a maelstrom of fossil fuel usage that truly sounds more frightening than the soundtrack to *Blade Runner* or *Mad Max Beyond Thunderdome*! We're listening to all the wasted horsepower of our culture go past this site.

With a public intervention like this, are you attempting to actually transform the soundscape or simply direct attention to it?

bruce: We're trying to add one purposeful element to this messed-up soundscape. Though all the visual elements are purposeful, for some reason all the auditory ones are purposeless, merely accidents. If they had an acoustician working on this building, he didn't work on the outside. He worked on the inside and his job title disappears when he walks out the door. So, no job-title created the soundscape that we're listening to. None of these sounds that we are hearing were designed to be sounds.

The fact is that all the aural information here is completely messed up, giving you false signals because of things reflecting from the wrong direction. So, whatever your hunter-gatherer hearing system is picking up is almost useless. That system is still intact and functioning inside your head, despite the fact that you're using half your brain to cancel out all the noise in order to think, to hear people, to walk down the street, to use your credit card.

Our intention with this piece is to reduce all the chaos to an overtone series, which is order. We're taking the chaos of this random soundscape and creating an order of

6 Lefebvre (75-76)

7 O+A, *Blue Moon*, World Financial Center Plaza, New York City, May 4 – August 20, 2004. "Three u-shaped tuning tubes, ranging from 8 to 18 feet in overall length, are wired with microphones and suspended over the North Cove of the harbor with switches at different levels that are activated by rising tides. As the tubes collect and filter ambient noise—from docking commuter ferries, helicopter and jet traffic, and car horns to waves, birds, and breezes off the Hudson—they convert it simultaneously into music by generating an 'overtone series of perfect harmonic proportions.' Five custom-designed cube loudspeakers mix the overtones in real-time and radiate the sound in all directions."

http://www.creativetime.org/programs/archive/2004/OA/oanda.html

an overtone series and installing that order in a geometric form on the plaza as part of our purposeful intervention. And we're reducing that noisescape to a single overtone series so that people can shift the part of their brain that they're listening with over to the musical part of their brain. When people shift over to the musical part of the brain, then they can relax a little bit. It restores certain information that was lost. Now the information is a musical overtone series going up and down which is easy to decode. It's almost automatic for human beings to decode harmonic intervals. That's the humane gesture which we're putting onto the plaza for the acoustical purpose of de-stressing people and being a little considerate to their perceptions.

You are drawn to spaces where the architects have ignored acoustics. Have you worked anywhere where the architects have been influenced by acoustic ecology?

bruce: No. But we worked in Rome. The acoustical zones there were beautiful.

sam auinger: During the Renaissance everything was shaped according to golden proportions, which is very very close to the proportion of the overtone series. If you walk in a little town, let's say Ravenna, in the inner circle, an old monk walking late at night with a bundle of keys is a musical event! Because everything is so in proportion that the spaces start to talk, and not to fight with each other. Our problem nowadays is that the spaces start to fight with each other.

The thing is, I've had so many experiences in Europe that led me to a spatial understanding of acoustics. For example there is the point in the Hagia Sophia where King Constantine was crowned. This whole coronation procedure took six hours. But if you stand on this exact focal point, the whole space becomes acoustically clear. Think about how Gothic churches are made to really fill up with reverberations for the purpose of filling the whole space with the sound. Of course, all of this knowledge came out of a time when it was very important to be able to remember aural information. Very few people were capable of writing, so aural information had to be shaped in a way that was accessible. And this, definitely, we have lost. Now we have the feeling that we can have everything, save everything. It's just put away somewhere. It's somewhere, so we don't have to devote real attention in the moment.

I'm curious about the harmonic structures that you're amplifying. On the one hand, these harmonic structures are present in the sounds of these engines.

sam: Yes. Definitely.

So they're not just pollution. This noise that we're hearing that we filter out actually has these harmonic structures.

sam: Don't get us wrong: there are certain aesthetics in noise. We don't want to put this away. But when we talk about social spaces, public spaces, let's say all these machines are the players, but the real soundbox is the architecture. You know? It's this kind of marriage of architecture and sound-producing engines.

There's one place we walked by...

bruce: The postal place! Oh my God! It's the combination of the dimensions of the streetscape, the materials of the architecture, and the usage to which it's been put, which is sorting mail and opening and closing giant metal doors which don't work properly, that has created the most nightmare sound zone, worse than whatever is the most blown-out Dolby action movie soundtrack that is supposed to drive your ears down inside your cochlea just to survive. This is worse than that. But it's accepted because it makes a certain amount of money. At this moment in time, that shows us something. Our disdain for the planet is evident in our soundscape.

sam: And this is not confined to the city. Bruce and his family like to go to this wonderful little lake in Michigan. Then comes a man on a jet ski—a motor scooter for the water!—and he messes up the whole lake! So, this also begs the question of something like acoustical politeness.

How has the soundscape changed since the early days of the WSP?

hildegard: Certainly, one of the things that has increased enormously is the sound of media, the sound of music in the environment. The schizophonic soundscape—this is a term that Schafer coined—has changed.

> *The Greek prefix* schizo *means split, separated; and* phon *is Greek for voice. Schizophonia refers to the split between an original sound and its electroacoustical transmission or reproduction. It is another twentieth-century development....*
>
> *Since the invention of electroacoustical equipment for the transmission and storage of sound, any sound, no matter how tiny, can be blown up and shot around the world, or packaged on tape or record for the generations of the future. We have split the sound from the maker of the sound. Sounds have been torn from their natural sockets and given an amplified and independent existence.*[8]

hildegard: A schizophonic sound is any sound that comes out of a loudspeaker,

8 Schafer (90) • Art-historical parallels between Shafer's concept of schizophonia (or Wishart's concept of "virtual acoustic space") and Krauss's concept of "the movable base" of modern sculpture beg to be investigated.

where the source of the sound does not occur in the same place as the reproduced sound. If you hear an orchestra playing through a loudspeaker, the source was somewhere totally different in time and place. That's where the schizo-, the split, comes from. Whatever we hear through a loudspeaker is not of this place, ever. To us, now, and to young people in general, it is quite natural to perceive the loudspeaker as the place of the sound source. But, when you think about it, of course it isn't. A loudspeaker introduces something quite foreign into an environment, something that doesn't naturally belong there. In the seventies when the word was first used, the split between sound source and reproduced sound was still pretty obvious. When you think about the Muzak Corporation[9] and how they were trying to manipulate customers into staying in stores for longer or shorter time spans, into buying more, or having staff work harder, there you find one of the most sinister representatives of schizophonic media. Designed explicitly so that it is not listened to, a musically designed soundscape is used to somehow manipulate people into changing the pace of their activity, whether it is consuming or working, preferably without noticing it.

At the same time, I was working at Co-op Radio, a radio station that was trying to connect with its listening community—also a schizophonic medium, but totally at the opposite pole from the Muzak Corporation. Co-op Radio is a medium of connection and conversation with community, to animate conversation, to disperse knowledge, to analyze and understand social processes. For me, those are the two poles of the spectrum of the schizophonic environment.[10]

Schizophonic or live, sound travels and carries information with it, information that can reconnect a person to their world in a profound way. The connection engendered by Co-op Radio illustrates a positive function of schizophonia.

How does this connect to installation work?

sam: What became so interesting to us, learning about sound art or whatever, is what we found in public space. It was never our interest to import a sound from A to B and install it there.

bruce: The first stage of not listening is to replace the soundtrack with something else. This is often done without really any idea. Often, inside a restaurant, there will be two Muzak systems going on at the same time. It's not unusual. Combined with a detuned fluorescent light, and maybe a microwave that's on the blink. So, you get these nightmare soundscapes that are just there, formed by accrual—one thing is added to another. We're not interested in the whole idea of soundtrack replacement.

sam: We e want to make compositional choices with what we find at a site, in real-time.

9 For an eerie, intimate look at Muzak, see *Thank You for the Music* (1997), directed by Mika Taanila. "To the accompaniment of 26 Muzak recordings, established professionals talk about making, programming and distributing [background] music. The program features American author Joseph Lanza and the Dutch music programmer Theo van Leeuwen."

www.phinnweb.org/links/cinema/thankU4themusic/

10 For a critique of Schafer's concept of schizophonia, see Francisco Lopez, "Schizophonia vs. l'objet sonore" (1997), an extract of "The Dissipation of Music."

www.franciscolopez.net/schizo.html

Any musical innovation is full of danger to the whole state, and ought to be prohibited.[1]

—Plato

Where the danger is, grows the saving power also.

— Heidegger

So far, in all this discussion of traditions, of microphones, of harmonics and scales, of whether or not to represent, of appearance, of the environment, we've completely ignored rhythm. We must now correct this oversight. This chapter considers rhythm as a social force which we examine in three distinct sites: on the airwaves, on the street, and most importantly, in a dancing body.

RHYTHM/POWER

tobias c. van veen: Sounds can instigate "political" activity, or a pre-political space or figure, without having any vocal or manifest "symbolic" component at all. That space and time can be created through a semiotic of interaction. As techno is often completely devoid of voice, we must understand its politics, its communicability, its force affecting in ways that exceed the symbolic.

Detroit techno is based on rhythm, a movement of rhythm. It requires a space to hear the music and participate in it. Field recordings, and audio art derived from field recordings, usually have a politics based on recording a situation and re-presenting it back to you, altered or not.[2] Detroit techno is concerned with creating new sound, and when you play that new sound, this alien novelty or foreign element, it creates an uncertain social space, possibly a new conception of the "social." It's not so concerned with playing back something that has happened as it is concerned with creating the happening. Hence, it's futuristic—"Afro-Futurism."

Yet this is also in part the mythography of Detroit, that it can forever suspend his-

1 It is doubtless that new sounds are revolutionary, but it is questionable whether in their overturning of existing orders, they serve the ends of liberation or new regimes of control. This question will have to be answered another time, but the history of the Theremin offers one anecdote to highlight this ambiguity. "[Lenin] stood up, moved to the instrument, stretched his hands out... It is not so often that a head of state tries out the latest electronic musical instrument, and, yet more exceptionally, plays it well." Chadabe (11)

2 See Ultra-Red, in this volume.

tory in the movement of novelty.

For a long time, it is true that Detroit was at the cusp of creating new forms of electronic music, and the sounds that came out of Detroit, and Chicago, were really quite radical. If, mind you, one could accept the framework which they were operating within—rhythmic music. A lot of cultural critics of Detroit techno, and the established "avant-garde" of New Music and so on have dismissed it too easily. "Oh it's just dance music." I think that such critique is based on a crude distinction of the "experimental" as being essentially attached to arrhythmia, of the derivativeness of "music" and of "rhythm," that is, of bodily engagement, and of a secondariness of percussion to the concept or idea. All of which serves to re-enact a classical "avant-garde" position of reappropriating "black culture" to render it proper—the Bruitists come to mind.

There's always a sense of rhythm.: Why is there a sense of rhythm? Because dancing is an acutely borderline semiotic activity. It dances on the borders. The whole movement of the body, of not-speaking, of getting down to the DJ's rhythm, is vastly liberating. And it can also be foreign and sado-masochistic, driving yourself for hours to dance. A series of complex relationships between you and sound, the DJ and the dancer, the event and "continuous life," especially in techno. Liberation is perhaps a dangerous and misleading term here, but its effects cannot be denied.

Hard and aggressive techno retains this sado-masochistic relation, this fascistic relationship between you and the DJ. I think Ritchie Hawtin, a.k.a. Plastikman from Windsor, Ontario played with that for a long time, this driving toward breakdown, this pushing people to the mental, to the body on the verge of collapse. That's where minimal techno makes its mark: stripping these funk and percussion elements down to very isolated, separate components to really fuck with your mind. Four A.M. and that's all that is hitting you, this absence of signifying sound, this hollowness and alien expansiveness in the space between beats. It's desperate, it's mental, performed through the body, through the ears, out to the limbs, and back. If done right, it's an event.

It signals a movement of power. If used in a situation—set into motion, for once it starts spinning, it verges on the uncontrollable—a context of particular forays and experiments, a space apt for the sonic, there marks the emergence of pre-political space. It's always a delicate question of this context, of what is necessary to suspend the political as such.

By pre-political, I mean it's at the advent of polis, if we take polis as that which defines and delineates "politics" and all it encircles. This goes back to Paul Virilio and Heidegger and Derrida, all thoughts on *polis* [the City, the encircling] and *oikos* [the household, hearth, altar], Deleuze and Guattari on the entrapment of the City. "Politics" comes into being as a City, arising as a fortification which delineates a

territory and becomes static in one sense, yet sustains a continual circulation or economy on the other, through its perpetual recircling, its centripetalism. Deleuze and Guattari write that the polis blocks nomad flows. But it's an event, the founding of the polis, a technology of the encircling, of the altar, the hearth, the home, the economics of gathering, including sacrifice.

I find that dancing space and rhythmic time shakes down to the foundations.

grey filastine: There was a legacy from the group tchkung![3] of a few people knowing some common rhythms. With that group, we would go down with the crowd and march around. Sometimes we even took over streets near the club. We would leave the club and take over a street, start a bonfire. The Infernal Noise Brigade is a way of expanding, amplifying and professionalizing what we had done with tchkung!, where groups of us would kind of come up with a rhythm about an hour before the show: What rhythm are we going to do in the street after the show? Ok, you do this. Ok, you try that part. Ok, let's do that.

tobias: It's anarchic in the sense of an-arche. I don't mean anarchic like the politics of anarchy—that's a politics. What we're talking about promotes an-arche, sonically. At the same time, rave culture has always contained this immensely dangerous element, this fascist and sado-masochistic element. The <ST> Collective[4] attempted to play with this. Why is it that industrial music, avant-garde elements and so on deploy proto-fascist aesthetics?

There's something going on when you dance that hard. It borders, on the one hand, a brutal sado-masochism and what on the other hand Deleuze calls masochism—this latter, according to Deleuze, opening the potential of desire. However, when rave culture is in all respects becoming this sado-masochistic relationship between you and the music, between you and an economic system, the whole thing closes in on the distinction. It questions Deleuze's theoretical division. A few of us, with the work of <ST> especially, were trying to resonate and echo this space, bring it to question. The work of Hakim Bey and his idea of the Temporary Autonomous Zone was indispensible in this regard.

At the time, I started reading a lot of Bakhtin on the Carnival. For a very quick paraphrase of Bakhtin, Carnival operated in the Middle Ages as a chance for the social order to be reversed, for the symbolic hierarchy to throw itself over in a temporary celebration. Throwing of flesh on the streets and all that fun jazz.

We can pick up that paradigm and apply it to rave culture, but it doesn't really work to the same extent, to the extent that rave operates purely as catharsis or pressure valve. At its limit it changes the operations of the social, of the polis, in ways which cannot be merely condensed to the release of steam. Looking at the event as a

3 tchkung! Discography: *Incite* (1997); *Postworld Handbook* (1995); *Dogs and Gears* (1993). All published by Postworld Industries.

4 <ST> was a Vancouver-based collective, directed by tobias van Veen, producing audio art, techno, and experimental music events. http://www.shrumtribe.com/html/events.htm

whole, and at the intricate micro-relations between people at the event, there's more than just a reversal of social order: there's excess that amounts to a stripping of the structure to something other than revelry. There's danger. And there's also a massive paradox that rave never escaped, and this is its capitalism. Its economy, commodity, the "spectacle" of its disappearance, even of spectacle itself. For all the liberatory aspects of "rave" culture, it was by no means a romanticized event: it contained the seeds of its own destruction, not internally, essentially, but through the monumentality of what it challenged.

In the event of the rave, there is an undeniable affect of the power of tekhne, just the way it happens with the dissemination of voice or music or any sort of sound, over a significant technological apparatus. It can take on a distance, and it can take on an incredible power. As you mentioned, Hitler wouldn't have come to power without loudspeakers. What you can do with amplification, ordering and commands, is amazing—I use this in the sense of "perplexing" as well as astonishing. It makes the human bigger than human. It's superhuman, or cyborg.

What do you mean by the power of tekhne?

tobias: Heidegger writes of technology as *tekhne*, as one way of being, of revealing, that is inherently dangerous yet also potentially liberating. I'll summarize here, with some departures from Heidegger. It is evident that what tekhne, as technology, allows us to do is to automate various processes. In Heidegger's examples, taking minerals out of the Earth or damming the river. Such operations are invasive; they penetrate the Earth and block the river. Technology stops the "natural" flow of things. Yet, it benefits us, almost unavoidably so. It is this unavoidability that risks becoming the horizon of not only our relationship to the world, but of ontological experience or being. Technology takes our relationship with the earth and with the soil, and puts it into standing reserve, kind of at a distance, at arms-length, where we can wash our hands of the affair, out of mind and out of sight. One could say into exchange-value—when you have the world quartered into standing reserve, it's there for profit and speculation, but above all, control and mastery.

Thus our "ontological" relation to things becomes catastrophic, says Heidegger. The way we think of the world under tekhne is in its command and order. We command and order earth, we command and order the world, we command and order others.

Can we command and order a sonic an-arche?

The Unofficial Infernal Manifesto: The Infernal Noise Brigade[5] *is a marching drum battery and street performance group activated by massive politi-*

5 The Infernal Noise Brigade was a musical group, originally formed to participate in the protests at the WTO Meeting of 1999 (also known as the Battle of Seattle or N30.) Over its seven-year history, the group performed as part of several large-scale protest actions, such as those at the 2000 IMF/World Bank Meeting in Prague, the 2003 WTO Ministerial in Cancun, Mexico, the 2004 United States Republican National Convention in New York City, the 2005 G8 Summit in Scotland, as well as at numerous events in their homebase of Seattle. • The group officially disbanded on July 29th, 2006.

cal and cultural uprisings. We are a tactical mobile rhythmic unit consisting of a majorette, medic, tactical advisers, rifle twirling contingent, flag corps, sound-generating kart, vocalists, horns, and between 8 and 12 percussionists. It is our intention to be a soundtrack for insurrection. Rendering ideology obsolete, we practice the politics of pleasure and subversion on the streets. We are not interested in chanting dogmatic slogans, nor is there a banner behind which we all wish to march. We attempt, through our aesthetic sense and our fierce commitment to the politics of joy and desire, to create a space of carnival. A space where rules are broken and anything is possible. Whether in the larger context of an action, or in random appearances on the streets, the INB interrupts the status quo, enlivening the everyday and fueling it with infernal noise.

grey: When doing an action in the street, the State expects you to be disorganized; they expect that nobody is going to have a structure in place that could really challenge them. Now INB have practiced rhythms and songs, we've learned to march in step, we have uniforms, we have a majorette who moves us around via commands, scouts with radios, and a whole infrastructure. If you put in even a minimal amount of work, into communications, into technique, and you practice, it isn't that difficult to challenge the State on the territory of the street. And of course, that's what November 30th proved here in Seattle.

You feel you are raising a counter-power by creating this organized direction?

grey: Yes. And, there's almost this situation of mutual intimidation, where the police have never actually attacked the INB, or grabbed anybody in it. They know who we are; we're always antagonizing them. They'll grab people who are with us, people on the periphery, other people around, but they never touch us. I think they're afraid to touch us, because we're in a uniform and we're marching in step, and we're a unit. How can you grab one of us without enraging all of us? It's like a hornets' nest. You don't want to get them mad. Better to get the stragglers or the loose people. So we create this really powerful bloc, since people know that if they stay close, they're also safe.

How do you feel about carrying on this tradition of the marching band, something so bound up with war and militarism?

grey: There's a difference between militarism and conflict. You can be involved in a conflict, which you feel is a good struggle, without being a "warrior." Being involved in a conflict, you have the right to use the tools of conflict. That's what

direct action is about. I feel that using this music in this way, as a force, is just using the tools in the toolbox.

A lot of people think that the marching band is a joke, an elaborate joke, and there is a bit of that. When it comes to the marching it's kind of tongue-in-cheek. But, I think we have a genuine appreciation of that kind of discipline.

The first known marching band is a group called Mehter from Turkey. After they made the example of using music in this kind of terrifying force in conflict, Europe began doing the same and that's where all the European military marching bands came from, down to your high-school marching bands.

Mehter were the musical ensemble of the Janissaries during the time of the Ottomans. This group was a special, elite, musical military corps, and this was the first known marching band. They were banned for hundreds of years then banned again by Atatürk, who wanted to modernize Turkey. He switched from the Arabic alphabet to the Roman alphabet, and he banned the fez and beards. And he banned Mehter, because this group was a militant Islamic musical body. They're still around, but now they're nothing: they're just an historical group. They have their uniforms and they play old songs in the military museum once a day. They had these enormous kettledrums and they would transport their drums on animals. They had a bunch of shehnai, or raitas or zurnas. The group's entire instrumentation is actually very similar to the INB: trumpets, voice, zurna, lots of drums. There must be some kind of collective unconscious thing going on there.

What do you think of the relationship between the direction you provide and authority? Are you directing the energies that people have within them, or are you putting ideas and words into people's hearts and mouths through your rhythms and through your direction?

grey: I always thought of our rhythmic direction, to use New Age-speak, as facilitating the self-actualization of the Mob. If the Mob wants to tear down a McDonald's, or wants to sit peacefully in the street and block access, or wants to chant and sing, or wants to invade a bank lobby—it's about providing that extra kick of energy to whatever people want to do to make it the possible, and not the dream.

And how do you find out what the Mob wants to do?

grey: I think you just try to read the crowd energy and you try to play the right rhythm at the right time.

That's reminiscent of traditional African music where virtuosity is secondary to the success of a social event.

grey: Yes, it's not about virtuosity at all. It doesn't matter how simple our rhythms are. The idea is to actualize, to be a social accelerant, a cultural accelerant, a street accelerant. To be that substance.

What about that substance that accelerates lynchings, or actualizes genocide?

gregory whitehead: Think of the master radio delusionist, Hitler, who had a monomaniac's instinctive grasp of the tremendous power of the microphone, and the amplified voice, and who mesmerized an entire generation to obey the juiced-up projections of his own apocalyptic myth.

> *Radio has been one of the great forces for social and political mobilization in the twentieth century. The Bolsheviks were among the first to exploit its potential for overt indoctrination of the masses, but it was Joseph Goebbels who brought its use to perfection. Goebbels subsidized the production and distribution by German manufacturers of millions of cheap radios for German homes and ordered the installation of loudspeakers to broadcast Nazi radio news bulletins and speeches in factories and public places, where listeners were observed by so-called radio wardens.*[6]

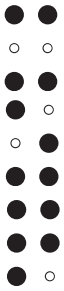
And we mustn't ignore Rwanda, where the radio was used to incite genocide and to coordinate the movements of complicit army and police forces.

gregory: I'm endlessly astonished at what people will believe, just because it comes down the tubes. The disembodied voice, it's like this vibrating skeleton or some sort of phantom that's suddenly speaking that has a tremendous power over the human imagination, since we all desperately want to hear the voice of god, right, we long to hear that inner voice that is the voice of god. So the magical voice that's coming out of a tiny little radio taps into that desire, which is very powerful, which is why radio remains such a red hot medium, still capable of unleashing corrosive waves of fear, bigotry and vengeance, as in the radiocasts so chillingly portrayed in the movie Hotel Rwanda, with the disembodied DJ of death urging his listeners to "cut down the tall tree kill the cockroaches, kill the cockroaches exterminate them, every one."[7]

Though camouflaged by more elegant designer threads, I hear a similar message on a thousand frequencies, in a thousand markets across America —- the radio of deception, hysteria and catastrophe. It seems to me that creative radiomakers have no choice but to enter straight into the thick of it, not to be carried away, towards rapture or apocalypse, but to invent some new language, full of laughter, compassion, resistance, friction, and from there, who knows, some fresh place for a different

6 Frank Chalk, "Radio Propaganda and Genocide," an excellent paper on radio in the Rwandan genocide and also the history of radio in general. • migs.concordia.ca/occpapers/radio_pr.html

7 *Hotel Rwanda*: Written by Keir Pearson and Terry George. Directed by Terry George. Released 2004.



LISTENING

instantaneous and unpredictable
our ears are now in excellent condition
— John Cage

hildegard westerkamp: As you've noticed yourself, you're also engaged in a schizophonic activity right now. You are in the same place as I am, but you are hearing it through the headphones as you record. That can be very positive, in that it switches your perception: it makes you aware of the environment in a different way because you are hearing it differently. The microphone is your new ear. So, it presents the environment to you quite differently. There again, that is a very positive aspect of sound technology and the recording medium, connecting you to the environment in an awareness-raising way.

bruce odland: It's very transformative. Just that first time you hear your own voice, the way others hear it, you hear it electronically.

Similar to the impact of the camera on the eye, the impact of the recorder and headphones has been to teach us to listen in a different way, to listen with intention, to use our ears as a tool. After you've used the prosthetic of the microphone and the earphone, you don't need them anymore: they've brought you to attention.

jeph jerman: And that's what happens when you truly listen! You can shut out everything else. That is the ultimate aim. I'm trying to lose myself; I'm trying to forget myself. That's the reason for doing this. Like Cage said: "Music is the paying attention to sound."

francisco lopez: I tend to get myself immersed into a very profound, deeply touching, deeply transforming experience of listening. This is the way I listen, so that's what I basically try to offer in different ways in the recordings and in the live shows. I think there is something about going through unusual situations, very loud, very quiet and other extreme acoustic situations. It certainly awakens something in your listening capabilities.

What exactly does it awaken? Or is there nothing in particular? Is wakefulness inherently nothing in particular?

francisco: Absolutely, the only thing is that there is no specific definition of this profound listening experience. Of course, I also aim to give the listener, and give myself, an intense physical experience that is not only listening to the sound but rather something that really makes your entire body vibrate and your spirit resonate, that makes you feel like you are inside the sound.

ken montgomery: I was at the Spritzenhaus in Hamburg, Germany in 1998 when I received a copy of *Belle Confusion 696* by Francisco Lopez. I wanted to give this CD a proper listening, so I waited until I had the necessary time and space before I opened the CD. I laid out a pillow in front of 2 perfectly placed speakers and positioned myself between them before starting the CD player. I turned on the player, closed my eyes and laid comfortably on my back. As I expected from Francisco's work at this time, there was no abrupt beginning to the piece. I had to listen very carefully to perceive it. So subtle was his introduction that I had trouble discerning it from the quiet sounds of the courtyard below. Though I was in the heart of the city I became very aware of bird calls, wind moving leaves on trees and the distant sounds of cars and workers. I tried distinguishing these familiar sounds from the sounds on the CD which were only slowly fading into my attention. I was amazed at how seamless the integration of the composed sounds were with the environmental sounds I was experiencing, and I complimented Francisco on his sensitivity. I was so immersed in this listening experience I completely lost track of time.

After what seemed like a very long time I wondered how the CD would end, and when it would end. It had been going on for an abnormally long time. I was patient but eventually I got up and walked over to the CD player… to find that it had been on pause.

jeph: When you get involved in just listening, your mind will stop interfering. Look up the definitions of hearing and listening: the difference between the two is attention. When you are hearing you are not necessarily listening, which is the case in general, because we are constantly trying to block out so much sound. If you live in

a city for instance, you're blocking out all the things you don't need to pay attention to, things that aren't life-threatening.

sam: So, we make an offer: to perceive an environment that you think you know well, to perceive it fresh without your normal filters. It makes people much more vulnerable to drop their normal filters, but this is essential. People need to lose their filters in order to formulate questions. Learning and understanding only comes from perceiving.

Because when you are filtering, you're not just filtering sound, you're filtering information. You're filtering —

bruce: EVERYTHING!

Just between us: On an electronic music of resistance and the resistance of politics

Ultra-red

Electronic music, in an age of electronically mediated sound, defies memory. Limiting the definition of electronic music to music self-conscious of its mediation, one is confronted with a range of prejudices against the materiality of that mediation. Acknowledging electronic music's inextricability from the electro-technical apparatus only goes so far in questioning the givenness of the apparatus. Making reference to electronic music as an art form always already plugged in—both in terms of technical mediation and memory—is insufficient to examine its politics. Neither politics as the condition of cultural practice, nor politics as social action, can be satisfied with a simple nod to the machine. The machine must be broken open. Technology, the life-support system for electronic music, assumes the status of cool disinterest. The machine participates in the creative process with neither a history, nor memory of a pre-existing social life. Likewise, most electronic music may remember a historical indebtedness, but assigns that debt to a thing called the machine. In the faulty storage banks of electronic music, history ends there. The history of the machine itself and of the networks of labor integral to its being are all but forgotten. The politics of electronic music begins in the forgetting.

The great irony is that at the center of electronic music is the record. Sound as memory, memory as sound, appears as the residue of one thing (the remembering-machine) rubbing against another (the amplifying-machine) even as the sound resonates our bodies and the air between us.

Bodies and the air between us

The question was first put to us in 2003 during a round-table on the politics of electronic music held during Berlin's Club Transmediale.[1] As the only electronic musicians to participate in the panel, Ultra-red's was the authentic voice. We spoke in English through a poorly prepared translator. Our position was articulated in terms of analysis and practice.

"Any consideration of the politics of electronic music must begin with the fetishization of technology. As long as technology is denied its own history within social space, the music of that technology will function like a spiriting away. Does the music resist techno-fetishism, or does it collaborate in the forgetting? Electronic music consistently re-establishes itself as an art form predicated on mediation and memory. But insofar as musical memory recalls

anything of sound's history, it is scrubbed free of social relations. Filtered from the social, the emergent sound gives memory a proper listening. We define that properness as a spiriting away of technology: the sound machines make. Subsequent to the spiriting away of the machine, music struggles with what is remembered: either materially recollected as between human actors or spiritually recollected as between things. This antagonism, one could argue, composes the politics of electronic music."

Here the microphone was passed to another member of Ultra-red. This electronic musician-cum-organizer had previously resisted the notion that electronic music can somehow perform a politics in and of itself. Confronting the question "Can electronic music exact a politics apart from intention and use," this artist was quick to respond:

"No. Speaking as a political organizer in communities organized by and in struggle, I find that matters of negation and transformation occupy the ways in which I hear sound and music. Specific to electronic music, where sound is all mediation and memory, the recorded/duplicated sound takes any music created, even if the music is created inside a political process, away from politics and transforms it into a product or document (for sale or use as a tool).

"The challenge arrives at taking up a position that restores the social to electronically-mediated sound. Taking such a position will inevitably assume an antagonism to the spiriting away of technology: music's disembodied phantasms. Electronic music, whose inherent politics consist of amnesia, becomes active only when we situate electronic music within socially articulated processes. Even then, electronically mediated sound still cannot be called 'political' in and of itself (that Kantian pre-condition John Cage so greatly esteemed). Recorded sound is still a document. Copies of this document are always and already fetishized within the reified object (whether analog or digital). Only that process—the work done between and with other people—and the social changes it produces, only this acquires the status of the political within matters of negation and transformation."

The negation of forgetting together with the false freedoms forgetting produces motivate our antagonism toward the document in and of itself. Stated as a problem, the conditions of electronic music echo inside its amnesia. Opening up that forgetfulness and chasing its disseminating pathways we encounter how electronic musical practice might be political in an active sense. Thus, what began as an assault on the spiriting away of the machine delivers us into the midst of struggle.[2]

In the dis/comfort of a public place

Several months had passed before Ultra-red were asked again to consider the politics of electronic music. This time we welcomed our interlocutor into our home-away-from-home. With the sounds of jackhammers and cement mixers churning out public housing regeneration outside, the interviewer asked about how political action might influence the actual composition of electronic music. In his distinctly North Dublin accent, the interviewer raised the ques-

tion of instrumentality:[3] "Beyond the sort of community-based processes Ultra-red engages in, what about other sites where an audience encounters your work without the benefit of going through that process? What about the record buyer or the average audience member who knows nothing of the group's political activism? How will these people ascertain that activism?"

"I don't think we're resolved on the matter," replied one member, recalling the comments from Berlin about "documents" of recorded sound. "The four members of Ultra-red take different positions. On some level we have no expectation that social change will occur at that place where you buy a record or attend a performance. What we've learned over the years is that—and here there is consensus—change occurs when we engage in dialogue.

"The social act of dialogue makes meaningful the context of documenting acoustic spaces and reflecting on those documents in a way that interrogates and problematizes them. As electronic musicians, we locate the various aspects of musical composition within that context. We record a sound, documenting a place where Ultra-red members conduct our politics. That recording is then subjected to a range of processes from granular synthesis, parametric equalization, frequency dampening, editing, montage, and rhythmic formalization. These are all means by which we as artists and organizers reflect on sounds and the memory of a social space. Eventually, the composition is reintroduced into a social setting so that a larger network of relations can reflect on the now-defamiliarized acoustic images. Those situations can be organized specifically for purposes of reflection and/or can be part of a public action designed to intervene upon an antagonism. With microphone on-site to record the event, the process is repeated.

"Alternatively, speaking as an organizer, I would argue that change, or that certain instances of power, need to be confronted in an organized way. Returning to the site of purchasing an album or attending a performance, the solitary nature of those acts reinforces amnesia of electronic music's history within social space. This is precisely the effect that exchange value has, both on the individual and on the art which is consumed. As long as we reduce one's relationship to music to the terms and conditions of exchange value, the capacity for political action loses. To negate the spiriting away of social relationships as the relationship between objects requires a social response. Change requires people to come together as a unit, as a collective, to focus on problems and to engage in those problems. Social change doesn't just happen. It doesn't happen just because someone had a good idea. It happens when people understand it and act on it. For one person to locate social change in a record, to seek out the history behind a recorded sound—all that is merely the beginning of something that needs to be organized within social space."

Our Irish interviewer pressed further, refining his question to: "Can electronic music produce social change?" Secreted within the assumptions of this question were fervent problems of value: the value of political transformation and the value of a transformation unfettered by authoritarianism.

Electronic music either contributes to the fetishization of technological mediation (mediation by the thingified machine) or to the negation of that fetishization. Conversely, the drive for social change can participate in the very fetishization of social relationships that it seeks to negate. In which case, strategy and analysis become subordinated to idealized social relations, fraught with prejudices around the proper arrangement of individuals and groups. The program takes precedence over the process. The quest for a terminus draws the very air out of social movements as predetermined ends stamp out any and all tangents and contradictions. More and more of everyday life is put outside of the movement, reflection is gagged and the unconscious becomes a growing trough of liberation's silent other. A resistance to the instrumentalization of human imagination is no counter-revolutionary concern. It is inextricable from the social transformative process.

"It is like an echo or a shadow," ventured an Ultra-red member, perilously navigating between the two poles of social change and suffocation. "The shadow is a projection of something already there. The echo is a reflection of a prior sound event. You can't have either without an original source. Listening to the work, we may not be able to grasp the original source fully, but the shadow or the echo offers a clue.

"Political music and political art cannot exist outside a political context. When it does, it's like a shock. That shock may have an effect, but without a social context it can just as easily serve the interest of entrenchment and reaction."

Negative technologies negating technology

The cacophony of regeneration outside was momentarily displaced by the music of Latin America. Recalling Nicaragua and the Sandinistas, in the 1980s, the music came from Grupo Mancotal with singer-songwriter Luis Enrique Mejía Godoy. Grupo Mancotal was one of several bands at that time playing music designed to teach people and remind them of the struggle against neo-colonialism. Drawing on the language of the community, and the richness of popular storytelling, Grupo Mancotal used the popular discourse to demonstrate how to put together a grenade. How to use rifles. How to organize a brigade of defense, etc. In moments of political confrontation with the contras, the people consulted the music of Grupo Mancotal with its familiar discourse and traditional rhythms. So, while there was singing and dancing, the audience learned how to make a grenade.

Over the course of the afternoon, we listened to a variety of music from Latin America. After Nicaragua, we listened to the music of Chilean bands Quilapayun or Inti-Illimani. At the core of this music was the memory of the struggle for democracy in Chile. During the 1970s and 1980s, these bands survived in exile, traveling throughout the world performing for the Chilean diaspora. Performances drew upon the collective experiences and memories of musicians and audience, reminding both: "We're still here! We still fight and we still remember the struggle."

For Grupo Mancotal and the Chilean bands in exile, music and performance accompanied

social movements. Accessible to a larger audience, the full impact of the music and its political activity bloomed from the relationship between art and the movement. The music occupied the center of that movement precisely in its capacity to create a collective space for remembering. The music reminded the audience of their own experiences in exile and even prepared them for future actions. In a literal sense, the music accompanied—to occur in association with and to conduct an activity—the struggles. The ambiguous spatiality of the music, both alongside and within the social movement, problematized any mere instrumentality.

At the beginning of this essay we defined electronic music as that which is self-conscious of its electro-technical mediation. We defined political electronic music in terms of resistance to the forgetting of social space. Our compact discs of Grupo Mancotal and other practitioners of guitara armada represented an accidental electronic music. The spectrum from accidental to intentional did nothing to efface the potential of musical sound to act as a shadow or an echo of political struggle. What is performed, what the music plays may not be the struggle itself: it is the shadow accompanying struggle.

Are we reducing electronic music to an instrument of something else? How can self-emancipation be possible when the very processes of intervention are instrumental to a fixed ending: the political? Politically engaged art practice will remain instrumentalist as long as political struggle itself is positivist. If struggle is limited to taking power, or to the establishment of a fixed thing called democracy (or communism, for that matter) then our tactics and strategies are clipped of their evocative potential and bound to a positive teleology. The process tests not our capacity as artists, but the potential of our social relationships.

To advocate for a destruction of power, for a negation of "fetishized appearances"[4] and for the play of self-emancipation is not, however, to dispense with the capacity for evocation, negation, and transformation. The rejection of instrumentality necessitates the rejection of efficacy only wherein efficacy itself is bound to the forces that foreclose negativity's radical potential.[5]

It is possible to negate the idealism of political and aesthetic action while still evaluating the political efficacy of that action. That possibility requires that evaluation itself be conceived of as a negative process. What is transformed by such a negation is the goal itself. The objective of political action shifts from an ideal terminus to an open process. This clarification is not merely a point of rescuing some notion of science or privileging political art over those semiotic acts unintended for political struggle (although one effect of this argument is to elevate the importance of artistic and semiotic acts within political struggle). Rather, our hope is to recover struggle from the graveyard of Party politics and restore aesthetic experience to the whole of life, including life's rage for self-emancipation.

Efficacy itself remains crucial for the basic articulation of aesthetic and social critique as a negative—versus positivist—enterprise. Evaluation is not merely an afterthought but, upon reflection, a transformation of the goal itself.

Impatient with the disavowal of the social within self-consciously electronically mediated music, a small number of musicians (and a greater number of curators and writers) have asked themselves, "What would a political practice of electronic music sound like? If a political electronic music were to grace our ears, would its politics be apparent? Would we know it by its sound?"

Over the course of our conversation, the interviewer attempted to put this question to us on four separate occasions. With each insistence, he attempted to draw closer and closer to the sound. First, he asked us to describe the politics of sound apart from the social practices of organizing and activism. Second, he wanted to hear about sound and its politics apart from all social space, including that governed by exchange value. Then, he excluded discourse itself. Finally, he asked us to consider pure sound: within the phenomenon of vibrations upon the hearing apparatus, what were the politics of sound? The question itself traced its own answer.

Aware of this, a third member of Ultra-red asked that we back-track our thinking about politics. Turning off the CD player, he said, "At the center of your question are the terms and meaning of politics. How can we conceptualize the politics of electronic music purely within sound when it is within that purity that electronic music effaces its politics? When that effacement is itself a political act? If the material conditions of electronic sound are the accumulation of labor, the privatization of experience, and the idealization of the cultural sphere, then an engagement with social space launches a direct confrontation against a fetishizing electronic music that spirits away technology.

"It is not in the sound itself, but in the socially-situated meaning of that sound that struggle and antagonism becomes tangible. The question is whether an engagement with that situated meaning can have a political effect. Can electronic music enunciate anything described as a progressive politics in its technique (let alone its expression and style)? In the struggle of investments, can electronic music serve the means of capital disinvestment?"

"Such an enunciation," added the second Ultra-red member, "is impossible without a direct relationship with a community in struggle. Art practice, socially engaged and opposed to the instrumental fetishizing of a terminus, is not unlike organizing, where the latter requires decisions based on a political (power) analysis constituted within a community in struggle. Again, reflecting on my experience in Latin America, the music practices of artists like Grupo Mancotal were articulated within a direct relationship to a struggle. That articulation entailed a certain degree of risk, both for the performers and for their audiences. If we were to review those musical practices that reached a level of political efficacy, there is invariably a relationship to communities in struggle. A politically effective electronic music would be no different. Certainly one can make an observation about a political conflict of which one has no direct experience. One can communicate intellectually or rationally. One can research for an essay

and produce a piece of music along those lines. But the actively engaged artist occupies the position of an echo: connected to a subjectivity articulated through struggle. The value of that relationship rests not in the production of representations. The dynamism of the relationship spins from the mutual participation in a process."

The interviewer turned off his tape-recorder. As if on cue, he and the three Ultra-red artists fell out into a fit of sighs riddled with giggles. What did words matter now? All that remained was the teeth-rattling din of concrete drilling out on the street. Permeating the laughter, that sound seemed to ask, "What political effect could this noise portend?" In the months that followed the interview, we would increasingly realize that sound, in and of itself, carries as much a history of affect as it conducts anything resembling a politics. The daily blasts of high-compression drills and monstrous bulldozers created a symphony of siege and community-wide powerlessness. There was no language to make sense of the politics of these sounds. No such language existed in the discourse of either urban planning or community resistance. The articulation began with the microphone. To electronically replay those recorded sounds in another otherwise neutral space would set off a wave of responses more passionate than anything triggered by word or image.

Here is where exigencies of affect over content suggest a political sound practice infinitely more expansive and far more available to process than strategies of political content "put to" music, or of seizing the modes of distribution. How seriously we take sound's capacity to produce and transform social space is in almost direct proportion to how much we privilege affect over content. A proportion gauged by, in the language of yesteryear, the semiotic over signification. The real task seems not to articulate a politics of electronic music. Rather, it is to understand and appreciate the affect of sound upon the spaces between us.

notes

1 The round-table discussion, titled "Strategies," was held February 2, 2003 at Maria am Ufer Hall. Organized in cooperation with Die Tageszeitung, the panel included Sebastian Handke (taz, DE), Diedrich Diedrichsen (critic, DE), Peter Kraut (Taktlos, CH), Ted Gaier (musician, 'Die Goldenen Zitronen', DE) and Mercedes Bunz (de:bug, DE).

2 On music as a socially constructed technology of memory, see John Mowitt, "Music in the Era of Electronic Reproducibility," in Music and Society, ed. by Richard Leppert and Susan McClary (London: Cambridge University Press, 1987).

3 Interview, liberally altered for this essay, conducted by Kevin O'Donovan on July 25, 2003 at 6 Coultry Gardens, Ballymun, Dublin Ireland. The purpose of the interview was for the catalog of the 2003 Dublin Electronic Arts Festival. For a full transcript of the original interview contact O'Donovan at kod@dublin.com.

4 John Holloway, Change the World Without Taking Power: The Meaning of Revolution Today (Sterling, VA: Pluto Press, 2002): 130. Holloway's negative reading of the revolutionary project forms the core of our argument. For Holloway, the older autonomist reading of capital reacting to labor's advances in class-composition relies on the basic assumption that the two are mutually exclusive poles. Labor opposes an abstract other, called capital, in an ever-escalating dance of power. In contrast, Holloway argues that the scream of labor is against its very constitution as a class, the reduction of subjectivity to a fetishized object for accumulation. Thus, the revolutionary project is organized around the negation of any fetishization whether it be identity, class, capital, the state, nation or money.

5 This is, after all, the lesson learned long ago by that disastrous alliance between the surrealists and the Party. Recall Breton's

comments upon hearing of the compromise between Aragon and Moscow: “That was the first time in my life that I saw a chasm opening up before my very eyes, a chasm that has since widened dizzyingly, in proportion to the relentless headway made by the outrageous idea that truth should bow down before efficacity, that neither conscience nor individual personality are worth heeding – in short, that the end justifies the means.” Quoted in J.-F. Dupuis (Raoul Vaneigem), A Cavalier History of Surrealism, trans. Donald Nicholson-Smith (San Francisco, CA: AK Press, 1999 [1977]): 25.

6 “Nihilism in art is a precondition for a politics that can allow the working class to speak.” Ben Watson, Art, Class & Cleavage: Quantulumcunque Concerning Materialist Esthetix (London: Quartet Books, 1998): 138.

Energetics of Sound: The Science and Perception of Audible and Sub-Audible Waves

Gregory Gangemi

Send through thy body a wave of vibration,
Irregular first and regular second,
Repeating time after time until free.
Start the Wave Force in thy Brain Center.
Direct it in waves from thine head to thy foot.
–Te Emerald Tablets of Thoth-The-Atlantean[1]

In 1787, the German physicist Ernst Florens Friedrich Chladni made a discovery: when he put a metal plate in a clamp, sprinkled sand evenly over the surface of it, and then bowed the edge of the plate with a violin bow, the sand scattered in different directions revealing a symmetrical pattern of amazing clarity. The lines curved and bent around the plate in different patterns, he discovered, depending on where the plate was clamped. When he damped an edge of the plate with his finger, the shapes changed again, revealing a different figure of lines in symmetry.[2]

Experiments resembling these have been repeated by many other scientists and in different formations, with different materials and with different intentions. Among others, Hans Jenny made a thorough study of the effects of vibrations on matter, and collected the photographic images of these in his book, *Cymatics*. But Chladni, as the first to study the visible, physical

impact of sound vibrations on matter, is known as the founder of the science of acoustics. His discoveries, although perhaps subconsciously, continue to shape peoples' thoughts about sound and the peculiarities of sound waves, and have also influenced other fields. Smoke detectors are triggered by sensitive detector plates[3] with Chladni figures adhered onto their surfaces. Scientists in search of traces of the Big Bang have found fluctuations in "primordial plasma" that "look like Chladni patterns resulting from a complicated three-dimensional drumhead that vibrated for 300,000 years." These patterns "yield a wealth of information about the physical conditions that prevailed in the early universe" as well as expressing "the vibrational modes of space."[4]

Nature is full of hidden patterns. As John Cage said, "The emotions of humans are continually aroused by encounters with nature."[5] These encounters are most often made not in the passive experience of nature but when experimentation pushes certain boundaries, and when the boundaries fall away there are witnessed yet finer layers of detail and pattern where one first witnessed only the tough outer skin of appearance. Digging into the materials of nature, one finds hidden mysteries.

Cage was highly attuned to the perception of nature, and also keen to experiment whenever possible. He describes one discovery made by way of an experiment: "He who has entered an anechoic chamber, a room made as silent as technologically possible, has heard there two sounds, one high, one low—the high the listener's nervous system in operation, the low his blood in circulation."[6] Even when all external stimuli is cut off, Cage still hears music, the generally imperceptible music of his own body working. Cage was an experimenter, and when he listened closely, the world of his own nature opened up and played him a simple tune. This method of listening occurs only when the "mind is free to enter into the act of listening, hearing each sound just as it is, not as a phenomenon more or less approximating a preconception."[7]

Experiments in neurofeedback reveal just how the frequencies of the human brain behave. Invented in 1929 by the physician Hans Berger, the "electroencephalogram" was an experiment conducted using probes to detect electrical signals emanating from the human skull. The first experiments revealed that the human brain at rest, with eyes closed, produced frequencies around 10 Hz, just below the range of our hearing, which reaches down to about 20 Hz. At attention with the eyes open, the human brain cycles at about 15 Hz.[8] Since that time there has been a general acceptance of the following levels of brainwave activity: delta (below 4 Hz, deep sleep), theta (4-8 Hz, light sleep or dreaming), alpha (known as Berger's wave, 8-12 Hz, relaxed consciousness, eyes closed), beta (above 12 Hz, walking around consciousness), and gamma (26-50 Hz, higher brain activity).

There is more going on in our heads and on our planet than we can see or hear. Our own natural world is full of mysteries open only to those who experiment. Johannes Kepler was an experimenter with his imagination as well as with the scientific instruments of his time. His imaginative experiments may have been his most fruitful ones: what he imagined to

discover was a perfect celestial harmony, with each planet (i.e., the six known to him) of our solar system ringing in perfect consonant unity. This of course was attributable to the perfect design scheme of God; the consonance of the planetary spheres was to him proof of that indisputable planner and His perfection.

Accordingly, perfect consonances are found: between the converging movements of Saturn and Jupiter, the octave; between the converging movements of Jupiter and Mars, the octave and minor third approximately; between the converging movements of Mars and Earth, the fifth; between their perihelia, the minor sixth; between the extreme converging movements of Venus and Mercury, the major sixth….[9]

These observations, Kepler admitted, followed from the experiments of Tycho Brahe and belong to a peculiar mystical tradition of science known as alchemy. There is no doubt that Kepler was an alchemist, and that the knowledge of sacred geometry and divine proportions informed his discoveries.

Although Kepler's Music of the Spheres doesn't hold up under modern scientific scrutiny, Kepler's alchemical awareness of the physical universe has been substantiated in many ways by science. It is correct that planets all have some level of resonant frequency, including the earth, where resonance is a manifestation of seismic activity in conjunction with the atmosphere. The upper level of atmosphere, the ionosphere, is an electromagnetically charged layer of air that creates a cavity between itself and the earth that resonates in sympathy with earthquakes, massive weather events, and lightning charges.

The artist David First has explored this interesting connection between lightning and the ionosphere, piecing it together with some other data to reveal that the actual frequencies detected in the cavity between the earth's surface and the ionosphere (called Schumann resonances) are actually remarkably similar to the different levels of the brainwave states detected in the EEG. "This is the apparent fact that much of the human brain's electrical activity is in the same range of frequencies as the Schumann Resonances and that the alpha state, in particular, lines up quite nicely with the lowest—or fundamental—Schumann frequency."[10] As First experimented with the Schumann resonance data he was receiving from Alaska, he "started finding hidden relationships–the 8th harmonic was exactly six times the frequency of the fundamental rather than the usual 8-to-1 relationship. This would be called a 3/2—arguably the most important interval in traditional music…."[11] So there is some basis to Kepler's belief that the universe rings in harmony, in consonant unity.

But these experiments to detect the resonance of the Earth's ionosphere (the cavity between the ground and the ionosphere) are still ongoing, and they are more complex than they first appear. It is known that the Schumann frequencies are activated by lightning. Recent experiments have revealed that:

> *Particularly intense lightning discharges in the troposphere transmit radio waves at extremely-low frequencies, which propagate with little attenuation within the*

Earth's atmosphere and exhibit constructive interference, denoted Earth-ionosphere cavity (or Schumann) resonance. This electro-magnetic resonance phenomenon in a thin spherical shell geometry was predicted theoretically prior to experimental confirmation. These first observations reported five resonance frequencies from 7.8 to 32.5 Hz based on the spectral analysis of 2 hour long recordings of naturally occurring radio noise.[12]

More recent experimentation "unambiguously reveals the full sequence of thirteen resonance frequencies from 5–90 Hz."[13] So our Earth is resonating at thirteen frequencies. We dwell in this bath of resonances, and yet are completely unaware of it. Most of these tones vibrate in the fuzzy range of near-infrasound[14] just below the lower threshold of human hearing (20Hz), but are they outside the realm of human perceptibility? It seems not, as Kepler intuited.

There are other things besides lightning that resonate the atmosphere and contribute to the Earth's infrasonic harmonies. Recordings made by infrasonic observatories (mostly used for weather monitoring) have detected infrasonic events emanating from tornado vortices.[15] These are in addition to the audible emanations of the tornadoes, which are comprised mostly of wind noise. Additionally, meteors striking the earth create infrasound resonance. "Bolides have been shown to be a natural source of infrasound; detections by arrays of microbarometers have been well documented."[16] The Flers infrasound array in Normandy, France recorded infrasound activity in the range of 0.2–0.5 Hz following fall of the Villalbeto de la Peña meteorite in northern Spain (January 4, 2004). The infrasound array was more than 750 kilometers from the site of the fall. The infrasonic event is clearly distinct from the audible noise event, and was described as "thundering detonations heard over a wide region. [S]everal localities in León and Palencia Provinces felt a strong pressure wave that made buildings shake and windows rattle."[17]

That experiments are conducted with rational goals and become couched in scientific rhetoric does not change the fact that these scientists are recording the infrasonic frequencies emanating from tornado vortices and from meteorite falls: Scientists listen with a musician's ear to the world, a practice to be admired and emulated as much as possible by "sound artists." The Earth itself is constantly producing tones, vibrations, and resonances, and these resonate in sympathy with our own brainwaves. The atmosphere is like an instrument: lightning strikes are in effect playing the instrument, and our bodies/ears/minds are resonating sympathetically.

Say a non-scientist wanted to listen to this music of the Earth. How would they listen? These frequencies are out of audible range, impossible to hear, right?

As was stated before, infrasound accompanies massive geophysical events: storms, earthquakes, meteor falls. The large earthquakes that triggered the December 26, 2004 tsunami in Southeast Asia produced pressure waves from the seismic jolt, major ground-to-air-wave sound, and an infrasound emission that was enhanced when the seismic waves traveled

through mountain ranges. These infrasound emissions were recorded by the Diego Garcia infrasound array, located in the British Indian Ocean Territory, about 1500 km from the southern tip of India, and about 3000 km from the earthquake center.[18] The array in composed of seven microbarometers, and they detected deeply subsonic infrasound in the range of 0.02 to 0.15 Hz, emanating mainly from the mountainous northern region of Sumatra.[19] These infrasonic waves were created by the earthquake that caused the tsunami, not from the tsunami itself. There was, in addition, infrasound detected from the tsunami itself. To continue with our metaphor, a massive submarine earthquake played an infrasonic song on the earth's crust, and the speakers from which the song emerged were the mountains of North Sumatra. (This fact, amazing though it may be, does not detract from the human tragedy associated with this event.)

While humans in the region may not have noticed the infrasound produced from the earthquake causing the tsunami, these preliminary signs of the tsunami were not imperceptible. In fact, after reports of the tsunami and its carnage hit western newspapers, reports appeared that the animals of the region had headed for high ground well before the waters from the tsunami actually appeared. Don Oldenburg from the Washington Post wrote that "In Khao Lak, 50 miles north of Phuket along Thailand's western coast, a dozen elephants giving tourists rides began trumpeting hours before the Dec. 26 tsunami—about the time the 9.0 magnitude quake fractured the ocean floor. An hour before the wall of waves slammed the resort area, the elephants grew agitated and began wailing. Just before disaster struck, they headed for higher ground – some breaking their chains to flee."[20] As the author later points out, the fact that many animals can detect frequencies in the 1-3 Hz range makes them sensitive to these kinds of events. Christine Kenneally, a correspondent for the *Boston Globe*, reported the same story and raised a good question: "Could humans be trained to tune in to these signals more?"[21]

Elephants use infrasonic signaling to communicate over long distances. Most of the energy in the calls of Asian and African elephants occurs in the 14–35 Hz range, right around the lowest limit of human audibility. These calls are of extreme volume, however, in the range of about 117 decibels (louder than construction noise and just lower than a rock concert). When played back at a speed about ten times the recording speed, recordings of elephants that were inaudible suddenly sounded "like a bunch of cows in a barn," researchers relate.[22] The signals allow elephants to communicate over distances of more than 2 kilometers as they travel, a behavior long found mystifying to observers.[23]

Fish also respond to low-frequency waves in water. Among those that have been studied is *Rutilis rutilis*, or the Juvenile Roach, a fish that lives in freshwater lakes all around the world. When studied experimentally, the Roach was revealed to possess mechanisms that allow it to flee not only from the presence of danger as a visual stimuli, but from low-level sound: it is believed that this capability comes from their swim bladder which is sensitive to both the pressure changes and kinetic forces of sound.[24] When subjected to sound at 6.7 Hz from an

invisible source, the fish overwhelmingly fled the source of the sound.[25] Cassowaries, the largest species of rainforest bird in the world, which live in the dense rainforests of New Guinea, communicate with each other using booming calls in the lower threshold of human hearing (around 23Hz). Observers report an "unsettling sensation" when they observed these vocalizations, an experience also reported by observers of elephant infrasound vocalizations.[26] Experiments can prove that these species either send or receive signals in the barely audible and sub-audible range, but the meanings and mechanisms of these signals remain obscure. For all that we humans laud our technology, we still can't get much below the surface of the complex, highly significant in-born behaviors of the rest of the planet's species.

But if we can't understand all the aspects of animals' uses of infrasound, we can sure produce plenty of it ourselves. The infrasound associated with the vortices of wind produced by aircraft landing at JFK Airport in Queens, NY is 40 dB stronger than the audible noise.[27] Aircraft are loud, but what we can't even hear is louder. In experiments conducted in schools in the UK, Netherlands, and Spain, it was shown that "exposure to chronic aircraft noise was associated with a significant impairment in reading comprehension."[28]

On another level, the emissions of stations like HAARP in Alaska are startling. This installation is controlled by the United States Navy and Air Force and is publicized as a strictly research oriented station. This "High-frequency Active Auroral Research Project," built in the mid-90s, has attracted conspiracy theorists since its inception, perhaps due to the startling similarity between the project and Nicola Tesla's "Death Ray," or due to the similarities between the project and Bernard Eastlund's massive radio transmitter planned to run on Alaskan natural gas and designed to "zap incoming missiles, alter weather and search the ground in enemy territory for buried missiles."[29] This latter scary resemblance is not unsubstantiated, as the company (ARCO) contracted by the government to build HAARP is in possession of all of Eastlund's related patents. Despite the assertions of the government and scientists working at HAARP that the array has nothing to do with Eastlund's plans, suspicion has not disappeared about the creation of a so-called "nonlethal weapon" which could affect peoples' brainwaves, knock out communications networks for large parts of the globe, and affect the upper atmosphere where global weather trends develop. In fact, despite all the protestations to the contrary, as recently as 2002, a Russian MP told BBC reporters that "the problem is that the HAARP program is presented to the world community as just a scientific research, as if it is directed at searching for ways of improving radio communication. But the program has a military component, and that is the main component. The USA have secured the aim of creating a geophysical weapon during the research."[30]

Exactly what kind of weapon, the Russian MP does not say, but plenty of options have been suggested. Substantive writing on the subject has been done, e.g., *Angels Don't Play This HAARP* by Jeanne Manning and Dr. Nick Begich. By beaming around 2 billion watts of energy into the ionosphere, HAARP is built around a transmission array that functions as "a reversal of a radio telescope—just transmitting instead of receiving. It will 'boil the

upper atmosphere.' After disturbing the ionosphere, the radiations will bounce back onto the earth in the form of long waves which penetrate our bodies, the ground and the oceans."[31] It's odd that the object of this "research," and the targets of these super-powerful heaters is the ionosphere, which forms that resonating cavity that harmonizes with human brainwaves. The potential hazards for altering brainwave states becomes immediately clear when examining this technology. The Russians do know about technology like HAARP because of their Woodpecker project, which pulsed 10Hz frequencies that were picked up by Ham radio operators in America. Such research was the bi-product of the Cold War. "When Dr. Gottlieb, the MKULTRA program director for the CIA, testified to the United States Congress, he said that when President Nixon went to the USSR in 1971, members of his party showed abnormal behavior including crying and depression. The spy community already knew that the Soviets had developed microwave beaming technologies which can affect mind, memory and health."[32]

What is startling is the fact that while US standards allow far higher electromagnetic levels than, say, Russia, it has been shown experimentally that even low-level electromagnetic signals can dramatically affect the brain. And it need not affect it by making it more depressed, it can lessen depression by stimulating certain chemicals that are naturally produced in the brain. "They [the U.S. Naval Medical Research Center] were able to apply external fields in such a way as to affect the brain chemistry of rats. The same effect can be created in humans. The Navy research showed that they were able to affect the lithium ion, occurring naturally in the brain, so as to create the same effect as if they had treated the animal with the chemical introduction of lithium (lithium is used as a strong anti-depressant)."[33] The point to note is simply that levels of electromagnetic radiation created by HAARP, which are well within the legal bounds in the US, have been shown to alter the development of organisms at the cellular level. This confirms the strong relation that organisms have with the electromagnetic patterns of the Earth, and shows the danger in adversely affecting this relationship.

It remains impossible to confirm or deny whether HAARP is an insidious contraption for world domination developed by the US military. Plenty of people are willing to assert that this is true, while just as many others deny it. One fact is certain: HAARP points to the extraordinary ways in which the earth is engulfed in energy fields that effect all living creatures at the most basic level, a level beyond our conscious awareness. The levels of the transmissions of HAARP, like the infrasonic events associated with earthquakes and severe weather, are beyond our conscious awareness, and yet they are vital.

It may be wondered why these phenomena are associated with other "sound" phenomena, events which we hear, while these events cannot be "heard" as such. To this, I offer three assertions which can be broadly subsumed under the idea that, rather than simply the province of art or music or speech, we look at sound as a phenomenon of energy that is unified with all other energy fields. While the study of "Energetics" is the "study of energy flows under transformation," the principle of "The Energetics of Sound," is composed of three

interrelated parts:

"Energetics of Sound" sees a spectrum with no boundaries from music to speech to noise to non-auditory vibration and resonance in general, and emphasizes musical or artistic exploration outside the area over-trodden by music.

"Energetics of Sound" creates as an economy a continuous field of possibilities in the world's soundscape, including the use of telepresence and transmission of sound from any possible apparatus, creature, location or material, to any other site, public or private.

"Energetics of Sound" employs recording as the functional first step into composition, and emphasizes forays into recording environments, including the deep sea and outer space and underground, with an emphasis on the act of listening and the development of increased listening capabilities of humans.

This field of the Energetics of Sound thus encompasses all vibrations, whether we hear them or not. It creates in the world's soundscape one "continuous field of possibilities"[34] to be explored for the benefit of humanity. The point of emphasis is to encourage a "waking up to the very life we're living,"[35] the life of our planet and of the subconscious, and to the fields of energy which surround us all.

Notes

1 Dr. M. Doreal, trans., *The Emerald Tablets of Thoth-the-Atlantean* (Nashville, TN: Source Books, Inc., 1996), 34.

2 Nicholas J. Wade, "Sound and sight: Acoustic figures and visual phenomena," *Perception* vol. 34 (2005): 1280-1282.

3 C.L. Worrell, R.J. Roby, L. Streit, J.L. Torero, "Enhanced Soot Deposition, Acoustic Agglomeration, and Chladni Figures in Smoke Detectors," *Fire Technology* vol. 37, no. 4 (Oct 2001): 343.

4 Jean-Pierre Luminet, "Astrophysics: Universe's vibrations help scientists map its topology," *Science Letter* (Jan 27, 2003): 34.

5 John Cage, *Silence* (Hanover, NH: Wesleyan University Press, 1973), 10.

6 Ibid., 23.

7 Ibid.

8 Frank Masterpasqua and Katherine N. Healey, "Neurofeedback in Psychological Practice," *Professional Psychology: Research and Practice* vol. 34, no.6 (2003): 652.

9 Johannes Kepler, *Harmonies of the World*, Book Five (Philadelphia: Running Press, 2002), 29.

10 David First, "The Music of the Sphere: An Investigation into Asymptotic Harmonics, Brainwave Entrainment and the Earth as a Giant Bell," *Leonardo Music Journal* vol. 13 (2003): 33.

11 Ibid., 35.

12 Martin Füllekrug, "Detection of thirteen resonances of radio waves from particularly intense lightning discharges," *Geophysical Research Letters* vol. 32, no. 13 (2005), 1.

13 Ibid., 3.

14 A.J. Bedard, "Low-Frequency Atmospheric Acoustic Energy Associated with Vortices Produced by Thunderstorms," *Monthly*

Weather Review vol. 133, Issue 1 (Jan 2005), 241-263.

15 Ibid.

16 J. Llorca, J.M. Trigo-Rodríguez, J.L. Ortiz, J.A. Docobo, J. García-Guinea, A.J. Castro-Tirado, A.E. Rubin, O. Eugster, W. Edwards, M. Laubenstein, I. Casanova, "The Villalbeto de la Peña meteorite fall: I. Fireball Energy, meteorite recovery, strewn field, and petrography," *Meteoritics & Planetary Science* vol. 40, no. 6 (2005), 798.

17 Ibid., 796.

18 A. LePichon, P. Herry, P. Mialle, J. Vergoz, N. Brachet, M. Garcés, D. Drob, L. Cerrana, "Infrasound associated with 2004-2005 large Sumatra earthquakes and tsunami," *Geophysical Research Letters* vol. 32, no. 19 (2005), 1.

19 Ibid., 3.

20 Don Oldenburg, "Animals show tsunami instinct Scientists probe sensory capacity for early warning," *Journal-Gazette*, Ft. Wayne, Ind. (Jan 9, 2005), 2A.

21 Christine Kenneally, "Do They Know Something We Don't? Animals' Senses May Have Helped Them Survive the Tsunami," *Boston Globe* (Jan 11, 2005), C1.

22 Elia T Ben-Ari, "A throbbing in the air – The discovery of infrasonic communication among elephants has given researchers a whole new way of hearing things," *BioScience* vol. 49, issue 5 (May 1999), 353-358.

23 Ibid.

24 H.E. Karlsen, R.W. Piddington, P.S. Enger, O. Sand, "Infrasound initiates directional fast-start escape responses in juvenile roach *Rutilus rutilus*," *The Journal of Experimental Biology* no. 207 (2004), 4185.

25 Ibid., 4187-4188.

26 A.L. Mack, J. Jones, "Low-Frequency Vocalizations by Cassowaries (Casuarius SPP.)," *The Auk* vol. 120, no. 4 (Oct. 2003), 1065.

27 William L. Rubin, "The Generation and Detection of Sound Emitted by Aircraft Wake Vortices in Ground Effect," *Journal of Atmospheric and Oceanic Technology* vol. 22, no. 5 (2005), 543.

28 S.A. Stansfeld, B. Berglund, C. Clark, I. Lopez-Barrio, et al., "Aircraft and road traffic noise and children's cognition and health: a cross-national study," *The Lancet*, London vol. 365, no. 9475 (Jun 4-Jun 10, 2005), 1942-1950.

29 Doug O'Harra, "The Buzz Over HAARP Scientists and Critics Say the Other Side Tunes Out the Truth," *Anchorage Daily News* (Apr 7, 1996), F4.

30 BBC Monitoring Central Asia, "US radio research is threat to humanity, Russian MP tells Kazakh paper," *BBC Monitoring Central Asia* Wire Feed, London (Oct 6, 2002), 1.

31 Jeanne Manning and Dr. Nick Begich, *Angels Don't Play This HAARP* (Anchorage Alaska: Earthpulse Press, 1995), 8.

32 Ibid., 151.

33 Ibid., 146.

34 R. Murray Schafer, *The Soundscape: Our Sonic Environment and the Tuning of the World* (Rochester, Vermont: Destiny Books, 1977), 5.

35 John Cage, ibid., 12.

1) Dr. M. Doreal, trans., The Emerald Tablets of Thoth-the-Atlantean (Nashville, TN: Source Books, Inc., 1996), 34.
2) Nicholas J. Wade, "Sound and sight: Acoustic figures and visual phenomena," Perception vol. 34 (2005): 1280-1282.
3) CL Worrell, RJ Roby, L Streit, JL Torero, "Enhanced Deposition, Acoustic Agglomeration, and Chladni Figures in Smoke Detectors," Fire Technology vol. 37, no. 4 (Oct 2001): 343.
4) Jean-Pierre Luminet, "Astrophysics; Universe's vibrations help scientists map its topology," Science Letter (Jan 27, 2003): 34.
5) John Cage, Silence (Hanover, NH: Wesleyan University Press, 1973), 10.
6) Ibid., 23.
7) Ibid.
8) Frank Masterpasqua and Katherine N. Healey, "Neurofeedback in Psychological Practice," Professional Psychology: Research and Practice vol. 34, no.6 (2003): 652.
9) Johannes Kepler, Harmonies of the World, Book Five (Philadelphia: Running Press, 2002), 29.
10) David First, "The Music of the Sphere: An Investigation into Asymptotic Harmonics, Brainwave Entrainment and the Earth as a Giant Bell," Leonardo Music Journal vol. 13 (2003): 33.
11) Ibid., 35.
1) Dr. M. Doreal, trans., The Emerald Tablets of Thoth-the-Atlantean (Nashville, TN: Source Books, Inc., 1996), 34.
2) Nicholas J. Wade, "Sound and sight: Acoustic figures and visual phenomena," Perception vol. 34 (2005): 1280-1282.
3) CL Worrell, RJ Roby, L Streit, JL Torero, "Enhanced Deposition, Acoustic Agglomeration, and Chladni Figures in Smoke Detectors," Fire Technology vol. 37, no. 4 (Oct 2001): 343.
4) Jean-Pierre Luminet, "Astrophysics; Universe's vibrations help scientists map its topology," Science Letter (Jan 27, 2003): 34.
5) John Cage, Silence (Hanover, NH: Wesleyan University Press, 1973), 10.
6) Ibid., 23.
7) Ibid.
8) Frank Masterpasqua and Katherine N. Healey, "Neurofeedback in Psychological Practice," Professional Psychology: Research and Practice vol. 34, no.6 (2003): 652.
9) Johannes Kepler, Harmonies of the World, Book Five (Philadelphia: Running Press, 2002), 29.
10) David First, "The Music of the Sphere: An Investigation into Asymptotic Harmonics,

Brainwave Entrainment and the Earth as a Giant Bell," Leonardo Music Journal vol. 13 (2003): 33.
11) Ibid., 35.
1) Dr. M. Doreal, trans., The Emerald Tablets of Thoth-the-Atlantean (Nashville, TN: Source Books, Inc., 1996), 34.
2) Nicholas J. Wade, "Sound and sight: Acoustic figures and visual phenomena," Perception vol. 34 (2005): 1280-1282.
3) CL Worrell, RJ Roby, L Streit, JL Torero, "Enhanced Deposition, Acoustic Agglomeration, and Chladni Figures in Smoke Detectors," Fire Technology vol. 37, no. 4 (Oct 2001): 343.
4) Jean-Pierre Luminet, "Astrophysics; Universe's vibrations help scientists map its topology," Science Letter (Jan 27, 2003): 34.
5) John Cage, Silence (Hanover, NH: Wesleyan University Press, 1973), 10.
6) Ibid., 23.
7) Ibid.
8) Frank Masterpasqua and Katherine N. Healey, "Neurofeedback in Psychological Practice," Professional Psychology: Research and Practice vol. 34, no.6 (2003): 652.
9) Johannes Kepler, Harmonies of the World, Book Five (Philadelphia: Running Press, 2002), 29.
10) David First, "The Music of the Sphere: An Investigation into Asymptotic Harmonics, Brainwave Entrainment and the Earth as a Giant Bell," Leonardo Music Journal vol. 13 (2003): 33.
11) Ibid., 35.
1) Dr. M. Doreal, trans., The Emerald Tablets of Thoth-the-Atlantean (Nashville, TN: Source Books, Inc., 1996), 34.
2) Nicholas J. Wade, "Sound and sight: Acoustic figures and visual phenomena," Perception vol. 34 (2005): 1280-1282.
3) CL Worrell, RJ Roby, L Streit, JL Torero, "Enhanced Deposition, Acoustic Agglomeration, and Chladni Figures in Smoke Detectors," Fire Technology vol. 37, no. 4 (Oct 2001): 343.
4) Jean-Pierre Luminet, "Astrophysics; Universe's vibrations help scientists map its topology," Science Letter (Jan 27, 2003): 34.
5) John Cage, Silence (Hanover, NH: Wesleyan University Press, 1973), 10.
6) Ibid., 23.
7) Ibid.
8) Frank Masterpasqua and Katherine N. Healey, "Neurofeedback in Psychological Practice," Professional Psychology: Research and Practice vol. 34, no.6 (2003): 652.
9) Johannes Kepler, Harmonies of the World, Book Five (Philadelphia: Running Press, 2002), 29.
10) David First, "The Music of the Sphere: An Investigation into Asymptotic Harmonics, Brainwave Entrainment and the Earth as a Giant Bell," Leonardo Music Journal vol. 13

(2003): 33.
11) Ibid., 35.
1) Dr. M. Doreal, trans., The Emerald Tablets of Thoth-the-Atlantean (Nashville, TN: Source Books, Inc., 1996), 34.
2) Nicholas J. Wade, "Sound and sight: Acoustic figures and visual phenomena," Perception vol. 34 (2005): 1280-1282.
3) CL Worrell, RJ Roby, L Streit, JL Torero, "Enhanced Deposition, Acoustic Agglomeration, and Chladni Figures in Smoke Detectors," Fire Technology vol. 37, no. 4 (Oct 2001): 343.
4) Jean-Pierre Luminet, "Astrophysics; Universe's vibrations help scientists map its topology," Science Letter (Jan 27, 2003): 34.
5) John Cage, Silence (Hanover, NH: Wesleyan University Press, 1973), 10.
6) Ibid., 23.
7) Ibid.
8) Frank Masterpasqua and Katherine N. Healey, "Neurofeedback in Psychological Practice," Professional Psychology: Research and Practice vol. 34, no.6 (2003): 652.
9) Johannes Kepler, Harmonies of the World, Book Five (Philadelphia: Running Press, 2002), 29.
10) David First, "The Music of the Sphere: An Investigation into Asymptotic Harmonics, Brainwave Entrainment and the Earth as a Giant Bell," Leonardo Music Journal vol. 13 (2003): 33.
11) Ibid., 35.
1) Dr. M. Doreal, trans., The Emerald Tablets of Thoth-the-Atlantean (Nashville, TN: Source Books, Inc., 1996), 34.
2) Nicholas J. Wade, "Sound and sight: Acoustic figures and visual phenomena," Perception vol. 34 (2005): 1280-1282.
3) CL Worrell, RJ Roby, L Streit, JL Torero, "Enhanced Deposition, Acoustic Agglomeration, and Chladni Figures in Smoke Detectors," Fire Technology vol. 37, no. 4 (Oct 2001): 343.
4) Jean-Pierre Luminet, "Astrophysics; Universe's vibrations help scientists map its topology," Science Letter (Jan 27, 2003): 34.
5) John Cage, Silence (Hanover, NH: Wesleyan University Press, 1973), 10.
6) Ibid., 23.
7) Ibid.
8) Frank Masterpasqua and Katherine N. Healey, "Neurofeedback in Psychological Practice," Professional Psychology: Research and Practice vol. 34, no.6 (2003): 652.
9) Johannes Kepler, Harmonies of the World, Book Five (Philadelphia: Running Press, 2002), 29.
10) David First, "The Music of the Sphere: An Investigation into Asymptotic Harmonics, Brainwave Entrainment and the Earth as a Giant Bell," Leonardo Music Journal vol. 13 (2003): 33.

11) Ibid., 35.
1) Dr. M. Doreal, trans., The Emerald Tablets of Thoth-the-Atlantean (Nashville, TN: Source Books, Inc., 1996), 34.
2) Nicholas J. Wade, "Sound and sight: Acoustic figures and visual phenomena," Perception vol. 34 (2005): 1280-1282.
3) CL Worrell, RJ Roby, L Streit, JL Torero, "Enhanced Deposition, Acoustic Agglomeration, and Chladni Figures in Smoke Detectors," Fire Technology vol. 37, no. 4 (Oct 2001): 343.
4) Jean-Pierre Luminet, "Astrophysics; Universe's vibrations help scientists map its topology," Science Letter (Jan 27, 2003): 34.
5) John Cage, Silence (Hanover, NH: Wesleyan University Press, 1973), 10.
6) Ibid., 23.
7) Ibid.