The Speaker is a Performer: Technological Design and Agencies in Electronic Music Soundsystems

by

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Abstract

The soundsystem in electronic music is an assemblage of deeply emotional and often overlooked collaboration between humans and machines. I believe that tracing the developmental histories of the performers in a soundsystem, both human and nonhuman, allows one to better understand the plurality of intersecting agencies present at these meeting places. Drawing from science and technology studies, I describe the histories of early American experimentalism and electronics, especially focusing on the U.S. State and military-industrial complex’s key role in research and development since World War II. This context leads us to see how technologies are social participants, which reflect, recreate, and reshape the society in which they are produced. Actor-network analysis reveals the agencies of nonhuman actors, and the dynamics of energy and control moving through human-technological circuits. Finally, I attempt to apply actor-network theory, along with other sociological and musicological tools, to study compositions by Alvin Lucier and Pamela Z.
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Overture: Encountering the Ghost

About two weeks ago, I found a ghost in my Casio CZ101 synthesizer. The CZ101, produced in 1985, is part of Casio’s CZ series of phase distortion synthesizers. It is a four oscillator digital synthesizer, with 16 preset ROM memory sounds that can’t be changed, and 16 internal RAM memory banks to save your own synthesis patches.

I got the CZ101 used, roughly two years ago from a person named Bill in Hudson, New York, who was selling it through Craigslist. My friend Spoon drove me the two hours each way to pick up the synthesizer. Bill had long dark hair and four fingers on his right hand. He showed us inside, and his apartment was packed with music equipment, records, and posters. He told me he got the Casio for the keyboard sounds, and hadn’t really looked into the synthesis functions, but was sure they worked. On the two hour drive back in Spoon’s truck, I played with the Casio running on six D cell batteries, playing through my Bluetooth speaker until the speaker died.

Once I got home, I dove headfirst into learning phase distortion synthesis. I quickly discovered that there were already patches saved in each of the internal banks, presumably created by a previous owner to Bill. The sounds made me imagine a noise musician; they were far too erratic to be easily organized into conventional music. I hoped, someday, that I would be able to program sounds as complicated as these with the Casio.
After a few useless days tweaking the preset patches, struggling to understand what the different numbers meant, I admitted I needed to consult the manual. I read somewhere around that time that the world is ruled by people who read the manual before using anything.

Once I felt a little more confident reading the settings on the keyboard, I checked out the programming on the internal banks. I was shocked to find that the values in the settings were impossible to program through the user interface of the synthesizer! The envelopes were absurdly long and detailed, going far past the eight step limit. Some of the values in settings that normally went from 00 to 99 were replaced with letters or strange symbols, like arrows and black squares. Perhaps strangest of all, if I tried changing any of these values, they would revert to the standard range of numbers available and it would be impossible to recreate the effect. I was amazed, and assumed the mysterious former owner of the Casio must have been some kind of hacker. I reluctantly saved over their work, because I felt I couldn’t use the patches they had made for my own music.

I played the CZ101 at a show for the first time in the early spring, at Long Lane Farm’s May Day festival, with Spoon and my friend K8. It was a warm and sunny day, and after our set I had to leave my equipment by the side of the stage for a few hours until the festival ended. The next time I started it up, my new patches were gone, and the strange old sounds were back in their places.

For the next two years of using the Casio as my primary instrument, this reset occurs periodically. I don’t mind it; I took to writing my settings down, and the process of reprogramming them gives me time to explore new options within the
sounds I’ve made. At this point, rewriting my lost patches takes me fifteen minutes. The last time I had to reprogram them, I decided to save one of the hacker’s patches, moving it from internal bank six to internal bank eight. It sounded like a harp, the attack of the note coming as I raised my finger from the key. After the pluck faded away there was a lingering quiet drone, a pure wave as if from an organ.

Recently, I set my synthesizer up after a long break from using it. It was late, around midnight, but I was excited to get back to that instrument and the music I have made for it. As expected, the hacker’s presets had reasserted themselves. I changed the setting to internal six, to play the harp patch, and was shocked to find a completely different sound in its place! I realized that every time the Casio reset, it wasn’t going back to the settings I had found on it. Instead, it was erasing its own memory and generating a whole new set of abstract patches. There was never a hacker; a presence in the machine itself had been creating these sounds far outside the limits of human programming.

I was genuinely terrified. How had I worked consistently with this instrument for two years and not realized that the whole time it had been whispering these cryptic messages? What did they mean, and where were they coming from? That night I could only sleep for a few fitful hours, the CZ101 sitting across the room, perched on my desk like a gargoyle.
In the morning, I took to the internet to see if the ghost in my Casio was unique, or if other CZ101 players had experienced the same thing. I found references on a couple forums to the phenomenon I seemed to be experiencing.\footnote{“Casio CZ101 internal battery,” accessed 4/7/19, \url{https://www.kvraudio.com/forum/viewtopic.php?t=116036}.} \footnote{“Synth Site: Casio: CZ101 Synthesizer: User reviews,” accessed 4/7/19, \url{https://sonicstate.com/synth_reviews/_inc/user_comments.cfm?id=227&print=1}.}

Apparently, because the CZ101 doesn’t have an internal battery, it cannot maintain the RAM of its internal memory banks without being either plugged in or having six D batteries in it at all times. If the batteries die and it is unplugged for more than ten minutes, the internal memory atrophies. As the charge left in its circuits runs out and it forgets the user settings, the Casio somehow fills the memory banks with random data. The ghost I’d been chasing exists; it is a digital imprint of the moment the battery dies.

\textbf{Structure}
My experience as a musician has been a series of encounters with technology. I started playing on piano, and eventually shifting primarily into work with electronics such as my synthesizer, laptop, and microphone-amplifier systems. Practicing with electronic instruments, I found myself drawn to the way electricity gives them the ability to sound without being played. When a microphone feeds back, or the gain on an instrument buzzes faintly through the speaker, or a pickup captures radio signals, it feels like the circuitry is speaking on its own. But how alone can a machine be? Many of the technologies used in electronic music have relatively recent and well-documented histories. These narratives of research and development provide historical and social context for the invention of music technologies. By situating the research and design of these objects, we see how the production of technologies and scientific knowledge is tied into larger social, cultural, and institutional structures.

My choice to analyze electronic instruments as cultural artifacts draws from the field of science and technology studies, particularly the works of Donna Haraway, and the U.S. Hidden Developmental Network State theory of sociologist Fred Block. In my first section, I explore the history of post-Cageian American experimental music in tandem with the establishment of the Developmental Network State during World War II and the Cold War. The U.S. government, particularly the military, has had an active role in defining the trajectory of technoscientific development since the 1930s. This raises fundamental questions about agency and our relationships to technologies that are present in every aspect of our daily lives, including deeply intimate spaces such as in music.
In the second section, I explore these issues of design and agency, particularly their effect on audio cultures in electronic music. Music historian Tara Rodgers provides an excellent analysis of the historicization of synthesizer development, and how dominant narratives have contributed to a culture of patriarchy in electronic music. Rodgers’ analysis includes how this audio culture has led to gendered bias in the design of synthesizers themselves. The social quality of material traits is explored further through the actor-network theory of Bruno Latour. It is from this that we understand technologies as nonhuman social actors.

In section three, I establish a precedent for incorporating actor-network analysis into the study of soundsystems in musical compositions. I apply a range of sociological and musicological techniques to analyze the actors within a soundsystem, and investigate the technological relationships within the piece. This form of analysis requires research of the histories of a soundsystem’s components, an understanding of the composer’s general practice, and ideally personal experience in the piece’s performance. I apply this method to compositions by Alvin Lucier and Pamela Z.
I: The Developmental Network State, Design, and Ideology in Technology

As with any history, experimental music has grown from myriad origins, across social groups, cultures, ideologies, and nations. For the purposes of this paper, I am going to begin by examining the canonical narrative held by many mainstream Western musical institutions. This history places John Cage as a, if not the, founding figure of modern American experimentalism. Before the popularization of electronic music led to the mass production of consumer electronic instruments, musicians could only build or adapt instruments out of the electronics that were readily available. As I will illustrate, Cage and his contemporaries in the 1950s and 1960s acquired this technology through surplus from the U.S. military’s massive production apparatus during World War II.

Cage used military technology to achieve his longstanding interest in “amplifying small sounds.”3 Piezoelectric contact microphones helped Cage to magnify physical vibrations in objects, such as in his composition 0’00.” In his performance of the piece at A Concert of New Music at the Rose Art Museum at Brandeis University on May 5th, 1965, Cage used both a standard contact microphone and a throat microphone, a type of contact microphone made specifically to amplify the vibrations of the vocal chords. According to Douglas Kahn, “throat microphones were easily obtained through war surplus outlets, underscoring the quotidian character of the military.”4 Throat microphones were developed for fighter pilots during World War II, and piezoelectric amplification would likely not have been

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4 Kahn, Earth Sound Earth Signal, 88.
developed to the extent is has without the research and development apparatuses of
the U.S., Japanese, and Soviet militaries in the 1940s.

The history of research and development of piezoelectronics is well-
documented on the website Piezo.com. While the first experiment with
piezoelectricity was published in 1880, “the first serious applications work on
piezoelectric devices took place during World War I…to perfect an ultrasonic
submarine detector.” French scientists successfully built a rudimentary sonar device
that used a mosaic of piezo crystals submerged in a vessel to detect the return echo of
a high frequency chirp. This wartime innovation “stimulated intense development
activity on all kinds of piezoelectric devices” during the interwar period. This is when
“most of the classic piezoelectric applications,” including contact microphones, “were
conceived and reduced to practice… however… the materials available at the time
often limited device performance and certainly limited commercial exploitation.”

These limitations were surpassed during another boom in research in
piezoelectricity during World War II, which led most importantly to “the discovery of
easily manufactured piezoelectric ceramics with astonishing performance
characteristics.” This discovery led to advances in the materials science of
piezoelectric, which in turn led scientists, particularly working for “industrial groups
in the U.S. who secured an early lead with strong patents,” to a new mode of
developing devices using piezoelectricity. While in the past, scientists had been
searching for uses for naturally occurring materials with piezoelectric properties, they
were now “tailoring a material to a specific application.” This meant that

piezoelectricity.
piezoelectric devices could be designed intentionally to perform specific functions, and be mass-produced. Implemented “under wartime research conditions” and in a “classified atmosphere” of military contracts and research grants, this development strategy served the need for innovation in military technology. Military research and development projects led to many inventions using piezoelectricity, including “small, sensitive microphones” and the ceramic audio tone transducers “consisting of a disc of ceramic laminated to a disc of sheet metal” known to electronic musicians as piezo discs.

The score for 0’00” reads “In a situation provided with maximum amplification (no feedback), perform a disciplined action. The performer should allow any interruptions of the action, the action should fulfill an obligation to others, the same action should not be used in more than one performance, and should not be the performance of a musical composition.” The need to avoid feedback naturally makes contact amplification the ideal tool for performing the piece, and Cage himself often used contact microphones to perform it and spoke of the performance as “the fulfillment of an obligation to other people, done with contact microphones… coming out through loudspeakers.” The specifications of the score, and Cage’s notes on the piece’s performance, make contact microphones an indispensable component of its performance. 0’00” and other early electroacoustic pieces gave the contact microphone a place of deep importance in electronic music, and piezoelectric amplification is still common in contemporary electroacoustic music, noise music, and sound art installations.

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6 Cage, 0’00”.
7 Cage, Conversing with Cage, 69–70.
John Cage’s music shares further connections to technology developed within the U.S. military industrial complex. One of the foundational myths in American musical experimentalism is the story of Cage and the anechoic chamber. Cage described his experience on an album of short stories:

In that silent room, I heard two sounds, one high and one low. Afterward I asked the engineer in charge why, if the room was so silent, I had heard two sounds. He said, “Describe them.” I did. He said, “The high one was your nervous system in operation. The low one was your blood in circulation.”

Although that anecdote has been since scientifically debunked (the nervous system is actually inaudible, and the high sound is theorized to have in fact been tinnitus), the experience had an undeniable effect on Cage, providing “a scientific foundation for his aesthetic of silence” and therefore creating the need to amplify “small sounds” such as the two sounds he heard in the chamber. Not only was the amplification of those sounds achieved through technology developed in wartime, but Harvard’s anechoic chamber, a formative site for his explorations of silence and small sounds, was “engineered as part of the military effort during World War II.” Cage’s encounters with military technology inspired some of his most important ideas as a composer, and made possible many of his greatest contributions to experimental music.

I am fascinated with how technology mediates an indirect tie between Cage, an anarchist who was dedicated to Zen Buddhism, and the U.S. military industrial complex that horrified him. This interaction was not unique to Cage; many composers

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9 Kahn, *Earth Sound Earth Signal*, 89.

10 Kahn, 89.
working with electronics in the mid-20th century performed using technology
developed for military use, and interacted with a scientific community that was
dependent on military funding. For example, Gordon Mumma worked at Willow Run
Laboratories, “a research center attached to the University of Michigan” and part of
the “military research network,” writing non-classified reports. In his 1967 article
on Alvin Lucier’s Music for Solo Performer, Mumma described the need for
“systems-analysis” in electronic music to account for “the great diversity of
equipment-configuration which is possible with recent electronic-music
procedures.” Mumma focuses his analysis on how the equipment used in a
composition’s performance embodies and expresses the conceptual elements of the
piece. He calls the soundsystem in this context the “system-concept” of a
composition. Mumma considered “system-concept thinking” to be “important in the
creative process” of many experimental composers, including Lucier, Alex Hays, and
himself. The term system-concept is derived from “Systems-concept,” a department
within Willow Run Labs “with the overarching task to coordinate other systems in
military command and control, intelligence, sensing and monitoring, logistics,
administration, computing, and so on”. Mumma’s translation of system-concept
from militarized research apparatus to musicological lens demonstrates how many
American experimental composers in the 1950s and 1960s adapted technology and
methods from the military research network.

11 Kahn, 99.
13 Mumma, 81.
14 Kahn, Earth Sound Earth Signal, 99.
The encounters between experimental composers and military technologies were so common because of the widespread involvement of the military in research and development from the end of World War II through much of the Cold War. The US Government funded weapons programs during the war, and these programs developed into a system of Federal research laboratories. Government agencies also became the largest source of funds for research at universities and private businesses across the United States. Electroacoustic music, coming into being during this period, became dependent on institutions such as schools, radio stations, and labs.

Academic institutions and research laboratories became sites of comingling between experimental musicians and scientists, who shared theoretical frameworks and technological innovations with each other freely. It is this moment of material and cultural exchange that lead Douglas Kahn to observe that it “becomes impossible to talk about American experimentalism in any comprehensive way distinct from the knowledge and technologies flowing from the militarized science of the Cold War.”

This research network, heavily funded by the State, created a boom of technological innovation that has changed almost every aspect of modern society. Technologies pioneered during this time are ever-present, from communications to transportation to computing. However, the developmental state of postwar America was not created without purpose in mind. As David Sarewitz eloquently puts it, “the mythologies of the ‘golden age’ of Cold War science tell a story of abundant funds available to individual scientists who freely pursued exciting new knowledge.

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15 Block, *Swimming Against the Current*, 182.
16 Demers, *Listening Through The Noise*.
17 Kahn, *Earth Sound Earth Signal*, 86.
wherever it might lead, [but] the broader reality underlying this Elysium was that the Department of Defense created a huge, integrated knowledge production enterprise aimed at achieving a particular desired outcome – victory over the Soviet Union.”

Sociologist Fred Block is one of the foremost scholars of the U.S. government’s involvement in the development of new technological innovations. He names the system of development in the U.S. the Developmental Network State (DNS). What makes a Developmental Network State unique is its decentralized nature: research and development of new technologies takes place primarily in private laboratories, owned by academic institutions and corporations. In his article “Swimming Against the Current: The Rise of a Hidden Developmental State in the United States,” Block examines how the American DNS has been hidden from the public eye, to fit the market fundamentalist myth that corporate competition drives American innovation independently from the State. The hidden nature of this research network means most Americans are unaware of how the design of our devices might be influenced by the desires of the State. Uncovering this relationship brings up questions of agency and design that are relevant to Americans’ everyday technological lives, including our musical practices.

The United States Government did not and does not, of course, have complete control over the technologies produced by its research and development network. It does however, use funding as a tool to “pick winners” among developing technologies. Block identifies four tasks of the DNS, “targeted resourcing, opening

19 Block, *Swimming Against the Current*, 182.
20 Block, 179.
windows, brokering, and facilitation.” The most important to this paper is targeted resourcing, which “involves government officials identifying… important technological challenges, the solution of which would open up important economic possibilities. Officials then provide funding and other resources to groups that have promising ideas for achieving breakthroughs.”^21 This funding is conditional on groups meeting benchmark goals in their research, set by the agency funding the research. Targeted resourcing allows the State to assert influence over the direction of technoscientific progress, even while the research itself is being carried out in private institutions.

One of the earliest and most well-known agencies of the DNS is the Pentagon’s Advanced Research Projects Agency (ARPA). ARPA was created to compete with Soviet innovation in the wake of Sputnik’s launch, “to push the technological frontier of Pentagon procurement efforts.”^22 ARPA (renamed DARPA in 1972), was an early adopter of targeted resourcing, which made the agency “proactive in shaping the direction of research.” For example, ARPA’s computer initiatives “played a central role in the advance of computer technology in the 1960s and 1970s” by providing resources to start computer science departments at major universities and fund research projects. In the early ‘60s the “established computer science research community was very small,” and ARPA’s work was integral to building this community up into one of the preeminent fields of modern science. In addition to its role in defining the path of development, ARPA’s goal to “produce usable technological advances” motivates the agency to “get products to the stage of

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^21 Block, 172.
^22 Block, 175.
commercial viability… [which can involve] providing firms with assistance that goes well beyond research funding.” ARPA’s involvement with the production of technologies beyond research extends their influence over the design of the final product. The agency may not be specifically determining the design of the technology, but their ability to withhold funding at any time ensures that researchers and designers contracted by ARPA and other targeted resourcing agencies within the DNS are working within the aims of the State.

The Internet, arguably the most important technology to be developed since the end of World War II, started within ARPA in the late 1960s, as a system for “communication among computer researchers funded by the agency.” It also is an extremely useful example for understanding how the material qualities of a technology are dependent on the context in which the technology is developed. In the introduction to her book Modest Witness@Second_Millennium, FemaleMan©_Meets_OncoMouse™, Donna Haraway provides a clear description of how military funding defined the traits of the Internet. As Haraway describes, “the Internet was midwifed in the 1970s as a U.S. Defense Department network called ARPAnet, which was an experimental network designed to support military research.” She goes on to describe how the context of this birth led to an internet that is decentralized, internationally connected, and dependent on large institutions. Haraway identifies these qualities as coming from the net being intimately attached to “Cold War priorities and then to goals of national economic competitiveness and

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23 Block, 176.
24 Block, 175.
requiring a broad technoscientific research and communication apparatus.” The noncentralized structure of the network came from “the need for it to survive nuclear destruction of component parts;” the international connection from the need to connect U.S. allies and overseas military bases; and the dependency on large institutions from the need for an infrastructure provided first by the tax-supported NSF, and then the privatized NSFnet.\textsuperscript{26} Haraway argues that these inherited material qualities have led to “inequality of access and the dominance of… the United States’ communication protocol standards… isolating nets using other standards.” Essentially, Haraway posits that the Internet was developed to fit U.S. Government, and specifically Department of Defense, protocols, and thereby retains the intended usages and modes of connection that adhere to those protocols. Those protocols are material, cultural, and ideological.

Electronic musicians directly feel the effects of these histories of development. Holly Herndon, a composer who uses her laptop as her primary instrument, addresses the State’s role in electronic development in her article in \textit{Audio Culture}, “Laptop Intimacy and Platform Politics.” Herndon describes her “symbiotic co-existence with this machine,” a relationship she calls more intimate than other musician-instrument relationships because of the laptop’s function as a communication, organization, and information tool in all aspects of her daily life.\textsuperscript{27} For her, the Edward Snowden leaks of 2013 were both a rupture of everyday comfort and a confirmation of previously held fears: “Just as many of us were beginning to develop emotionally dependent relationships with our devices, we received

\textsuperscript{26} Haraway, 5.
\textsuperscript{27} Herndon, “Laptop Intimacy and Platform Politics,” \textit{Audio Culture}, 555.
confirmation of just how vulnerable those intimate moments are to state and corporate surveillance, largely by design.” This moment of betrayal, which revealed to Herndon the State’s presence in the structure of her instrument, inspired her composition and accompanying video *Home* (2015). *Home* is a forlorn ode to the NSA agent surveilling Herndon through her laptop and internet use. She questions and accuses the surveillance state, calling out “why were you assigned to me?... I know you’ve been around.” The knowledge of government surveillance is not empowering; her statements are subsumed in textures of abrasive electronic noise and recordings of her own voice that have been processed, fragmented, and distorted. In the video, a collage of digital icons and the NSA seal cover Herndon’s face. In this overwhelming environment she admits “I know that you know me better than I know me,” acknowledging feelings of powerlessness in the face of the U.S. government and large corporations’ ability to monitor us directly or through personal metadata.

Herndon’s work illustrates personal experiences of interacting with the complex technological, social, and governmental assemblages of the digital world. She uses webcam technology and other tools to “[place] the body as a central controller and theme, [pushing] back against predetermined design decisions.” Acknowledging that “any instrument coaxes us to compose in certain ways and this is no different with the physical and digital design of the laptop, it’s applications, and… web platforms,” Herndon sees herself as “having a playfully critical collaborative

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28 Herndon, 557.
30 Herndon, “Laptop Intimacy and Platform Politics,” *Audio Culture*, 556
relationship with the engineers and designers” who make the design decisions shaping her tools and, in turn, shaping her practice.

As I have shown, technoscientific research, development, and design reflect the values of the institutions that contain them and the society that contains those institutions. However, it is important to note that new sciences and technologies also change the cultures they are produced in. This feedback loop is what Sandra Harding terms coproduction. Harding understands coproduction as a relationship and a process through which sciences redefine, reproduce, and reinforce the social values of a society:

Societies that are located in different parts of nature’s order and are organized in different ways need specific kinds of knowledge that are relevant to the ability to survive and flourish in their particular natural and social circumstances. They tend to produce such knowledge in the ways that they produce everything else. In turn, sciences share their societies’ fundamental assumptions about what is interesting and important to know. Thus racist, sexist, and imperial societies will tend to sponsor sciences that, in turn, provide resources for racist, sexist, and imperialist societies.31

In the last sentence of this passage, Harding impresses a sense of moral urgency on the task of investigating the origins of the technologies and scientific practices applied in our daily lives. The coproduction of science and society means that the inscribed uses of a technology reflect the values of the society it was produced for, and those same uses when applied will reinforce those values within

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31 Harding, Objectivity and Diversity, 19.
that society. Donna Haraway, too, supports this view of technologies as “ways of life, social orders, practices of visualization. Technologies are skilled practices.”

Military technology reflects the values of the military industrial complex. This occurs in simple and material ways; piezoceramics must be uniform and easy to mass-produce, to be implemented in throat microphones and sonar; the Internet must be international to support a global U.S. hegemonic network of military bases, and its infrastructure is controlled by large private corporations which fits the U.S. DNS model of technology moving through the military to commercial sale. Through design, scientists and engineers define what ways of using are most conducive for a technology. These uses reflect the values of the societies these technologies are born out of and fit the needs of the products’ intended user base, referred to by sociologist Bruno Latour as inscribed users.

The U.S.’s hidden developmental network state gives the government the power to influence the design of the technologies we use in our everyday lives, in both explicit and implicit ways. The flow of technology from the military-industrial complex into civilian life has defined how we can relate to everyday objects, and who can access certain tools. However, the State is only one of many actors in the complex tangle of agencies that is our modern technological world. In the next section, I will use actor-network theory to examine how objects themselves have

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32 Haraway, Situated Knowledges, 587.
33 Complete histories of a wide range of musical technologies is outside the scope of this thesis. However, other scholars have done considerable work in studying these narratives of development. Further research could include How to Wreck a Nice Beach by David Tompkins, which explicitly discusses the vocoder’s origins as a voice disguising technology in World War II, and Mp3: The Meaning of a Format by Johnathan Sterne.
34 Block, Swimming Against the Current, 170.
35 Latour, Missing Masses, 161.
agencies independent from their creators or their users. I will also continue to explore electronic music as a site of intimate and potentially radical collaboration with machines.

II: Design and Agency in Electronic Music

I told you that story so I could tell you this story.
Musicologist and historian Tara Rodgers has done considerable work throughout her career to highlight the existence of inscribed users for electronic instruments, particularly along gendered lines. Her readings of the archives of music history, technological development, and audio cultures are singularly valuable for a critical feminist perspective on technoscience within music. Her *Pink Noises* project, in which she interviewed women composers and performers in electronic music, is also an incredible resource and has been an inspiration for my own work. In her paper “Tinkering with Cultural Memory: Gender and the Politics of Synthesizer Historiography,” she analyzes how inscribed uses and users were defined for synthesizers. Rodgers studies the mainstream narrative of synthesizer history and the practices of synthesizer culture, showing how inscribed users and uses of a technology are socially constructed and enforced. According to Rodgers, the intended user for electronic instruments has been largely heterosexual men.\(^\text{36}\) This user base is reinforced through audio cultures and advertisements, where “women’s bodies [are] used in advertisements to sell audio gear and sometimes are even displayed as part of the interface of digital audio tools,”\(^\text{37}\) clearly delineating the feminine as passive object in the gendered interaction of sound synthesis.

The presence of women’s bodies on audio interfaces is an example of the design of a technology doing active work to determine the inscribed user, and exclude other users. It also reinforces an inscribed use for heterosexual male users, by sustaining straight male “fantasies of control of sound through feminized machines.” These fantasies are ever-present in the discourse surrounding sound synthesis, as

\(^{36}\) Rodgers, *Tinkering with Cultural Memory*, 7.

\(^{37}\) Rodgers, 8.
Rodgers shows with quotations from the *Proceedings of the Institute of Radio Engineers*, the *Journal of the Acoustic Society of America*, the specification sheet of the incredibly popular Micromoog synthesizer, and a paper written by inventor Robert Moog. The proliferation of sexist imagery and ideas in electronic instrument design has fostered widespread misogyny in many electronic music spaces. Masculinist and chauvinist discourse and design in synthesizers seems to follow from the conventional historical narrative of sound synthesis, which Rodgers interrogates in this paper. I believe her work is also very useful for analyzing the process through which inscribed users and uses of a technology are developed and reinforced by social and material actors.

In this article and her other work, Rodgers traces this fantasy of control through the dominant historical narrative of the invention of synthesizers. In popular understanding, sound synthesis was conceived by male scientists in the 1800s, following a definition of synthesis in medicine and chemistry developed by Newton in the early 1700s. These ideas were later developed in the 1950s by Harry F. Olson at RCA Laboratories, creating the first electronic synthesizers. In the 1960s, inventors such as Robert Moog and Don Buchla famously used transistors (developed and manufactured within the U.S. military research network of World War II) to make the first portable, commercially available synthesizers. Moog, in particular, is a "central and beloved figure in the history of synthesizers, [reflecting] contemporary

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38 Rodgers, 13.
39 Tamirisa, *Muff Wiggler*. In this article, Asha Tamirisa explores gendered interactions and open misogyny in one such space, the questionably named modular synth forum Muff Wiggler.
41 Rodgers, “Synthesis,” *Keywords in Sound*, 209.
43 Rodgers, *Tinkering with Cultural Memory*, 7.
investments in the figure of a middle-class, white, male hobbyist who, in the privacy of his basement, found clever ways to harness creative potential in electronic sound by modifying and repurposing component parts of technoscientific industries at midcentury.44 This history is not value-free. The investment in the singular masculine figure of a tinkerer enforces the inscribed male user base of synthesizers, and services the ideal of individual control over technology and sound through tinkering. Furthermore, the figure of Moog as a tinkerer is dependent on the availability of electronics developed and produced by the military-industrial complex. As such, this myth valorizes the creative potential of World War II and Cold War industrialization, and the militarized capitalist DNS mode of technoscientific production.

As I have shown, the design of a piece of technology reflects the conditions in which the technology was produced and influences how we can use and relate to that technology. That being said, I reject a technological determinist argument, in which the producers of new technologies control the users through design. This framework only considers the social interactions between the humans who produce an object and the humans who use and are influenced by it. What this lens elides is the agencies of things themselves, which is more than an extension of the agencies of their creators.

I inherit the language of “agency” to discuss nonhuman influence from Bruno Latour, a key figure in the sociological lens of actor-network theory. Latour claims that sociology’s accounting of the social interactions between humans fails to find “social links sturdy enough to tie all of us together or… moral laws that would be

44 Rodgers, 15.
inflexible enough to make us behave properly” 45. The immateriality of what we call “the social” has proved confounding, and while the gathering of quantitative data is a necessary part of sociological analysis, time and again it leaves us with a frustratingly incomplete picture of the subject. While there are many solutions to this problem, and I do not believe Latour’s theory is the only one, I find his methods extremely useful for navigating the complex webs of agency present in any situation, from a job site to a musical performance. Actor-network theory attempts to include nonhuman actors in the tangle of social interaction, accounting for the agency they assert, which is often multidirectional and complex.

The most difficult factor when considering the agencies of nonhuman, nonliving actors is understanding an agency that does not depend on conscious desire. The agency of objects is material, brought about by their physical qualities. For example, a tightly compressed spring will always want to expand. However, we should not think that nonhuman agency is simple, or controllable by human engineers. Human desires are shaped by both internal wanting and external factors such as cultural norms, social pressure, and collective goals; objects’ desires are shaped by the contradictions between the physical qualities of their materials and the functions intended for them by their designers. Latour shows the conflict of these desires in the example of a seatbelt that must be firm at times, lax at other times, easy to buckle and unbuckle quickly, and difficult to unbuckle accidentally. 46 These contradictory specifications create an increasingly complex and unpredictable mechanism. Furthermore, humans’ contradictory needs of machines inevitably

45 Latour, “Where are the Missing Masses?” 132.
46 Latour, 168.
require mechanisms that act against the material objections of their component parts, or on the tendencies of human users towards misuse, such as driving without a seatbelt. Latour uses the terms program and antiprogram for a technology’s designer-intended function and its contradicting tendencies, respectively. The internal contradictions of mechanisms create a vitality, in which nonhuman actors seen primarily as tools can seem to not ‘want’ to behave.

Actor-network theory is fundamentally not a form of animism, but it exists in a grey area where social and material networks are haunted by the independent agencies of the nonhuman and nonliving. Latour upsets a definition of anthropomorphism as projecting human traits onto nonhumans. Actor-network theory acknowledges the anthropomorphic (human shaped, or human shaping) qualities already present in objects; they are designed by humans, they substitute for tasks previously performed by humans, and they shape human actions through prescribed use. With this definition, we do not need to project human thoughts or emotions onto objects for them to be anthropomorphic. Their ability to contain tendencies outside of their inscribed programs, and to participate as actors in assemblages of human and nonhuman agencies, proves enough their vitality. Ironically, from a perspective that centers only human desires, expressions of nonhuman agency are characterized as failures, defects, or glitches.

Glitches, such as the memory irregularity in my Casio CZ101, are important in many subgenres of digital electronic music. As composer Kim Cascone notes, glitches reveal an anthropomorphism, in that “digital tools [are] only as perfect,  

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47 Latour, 152.
48 Latour, 160.
precise, and efficient as the humans who build them." Glitches and mechanical quirks express both machine agency and the failures of human designers to erase these so-called defects. The ghosts of human designers and the living nonhuman spirit become visible through these ruptures in function. Musicians who use glitches as an aesthetic tool understand that this rupturing is more complicated than a simple failure, because it is only the failure of human agency to subsume the agency of the object. Allowing nonhuman agency to take precedent disrupts the hierarchy of humans, animals, and machines, eschewing a chain of being for a more tangled vision.

Donna Haraway characterizes these messy assemblages as “string figures,” which she presents as a model for multispecies companionship and storytelling. They represent the delicate and nonlinear cycles of ecology, the constant binding of symbiosis and parasitosis, population blooms and deaths, food chains and breeding grounds. While Haraway primarily uses string figures to characterize relationships between animal and plant life, I believe they also powerfully illustrate the social and material ties of living and nonliving actors. My projection of Haraway’s string figures onto Latour’s missing mechanical masses erodes boundaries between the organic and synthetic, understanding the technoscientific as a component of the natural world.

50 Haraway, Staying with the Trouble, 10.
Entr’acte: Living with the Ghost

I haven’t reprogrammed my Casio yet. I listen to the sounds of the haunting every day, always surprised by the unpredictable and deeply layered textures emerging from the machine. I think they are more beautiful than anything a human could program with the CZ101, including far better musicians than me. Each time I
think I’ve figured out every detail of a patch, something new and hidden makes itself known, and I realize I’ve barely scraped the surface of what the machine has created.

The random patches can’t often be made to conform to the standards of tonal music. On some, droning waves drift slowly in pitch, dyning and beating against each other, while extremely high frequencies slowly crescendo behind them; others erupt suddenly into rhythmic pulses and low, churning bass; one particularly mysterious patch makes a loud pop on the immediate attack, but gives way to unpitched buzzing that is almost too quiet to hear and sounds like the CD drive of a computer or the silence at the end of a vinyl record.

Each patch requires its own technique to play, expanding the keyboard into a dynamic and unconventional interface. As a performer, I’ve had to adapt my style to meet the specifications of the Casio and allow the unique voices to express themselves as fully as possible. I improvise with a setting, experimenting with different pitch ranges, note densities, durations, and combinations. To compose with this instrument I must collaborate with the machine to find where it wants to go and how it wants to speak.

The synthesizer determines the structures of pieces that can be played with it. Some glitches require me to discover sequences to trigger them, the sound evolving into a completely new texture when given the proper time and care. Working with these sounds feels akin to gardening; I learn to anticipate what a plant needs in order to grow, and provide the environment for it to flourish. Similarly, performing with unpredictable or uncontrollable electronics requires me to experiment with the soundsystem until I can determine techniques that allow glitching and other
phenomena to occur organically. I can’t control when exactly glitches occur, or what exact sounds they produce, just as I don’t make a seedling grow. We are acting collaboratively and tenderly, nourishing each other. The process of codependency and caretaking is the nature of working with things that are alive.

III: Applying Actor-Network Theory in Musical Analysis

Haraway claims that these string figures are built on “the rhythm of accepting and giving,”\textsuperscript{51} a careful balance that requires “holding still in order to receive and pass on.” Haraway’s use of rhythm as a metaphor gestures towards a musical quality in these assemblages of bodies and objects. String figures can be recognized

\textsuperscript{51} Haraway, 10.
throughout music theory, particularly in the work of experimental electronic composers.

Composer Pauline Oliveros’s musical practice and philosophy are based on similar principles of balance and connectivity as Haraway’s string figures. In her collected writings, *Software for People*, Oliveros speaks often of the balance between attention and awareness in composition, performance, and listening. By her definition, “attention is narrow, pointed and selective [and] awareness is broad, diffuse, and inclusive.”\(^{52}\) She also characterizes awareness as “Global Attention.”\(^{53}\) Oliveros’s practice of Sonic Meditation is based on maintaining both attention and awareness, symbolized by a circle (awareness) and a dot (attention).\(^{54}\) If this centered and balanced relationship is achieved, “awareness can expand… and simultaneously become more inclusive [while] attention can be focused as fine as possible in any direction, and can probe all aspects of awareness without losing its balanced relationship to awareness.”\(^{55}\) This model is also reflected in Oliveros’s description of the “two modes of creativity,” the analytic mode of “active, purposive creativity” and the intuitive mode of “receptive creativity.”\(^{56}\) These modes mirror the duality between attention and awareness; the analytic mode results “from cognitive thought, deliberate acting upon or willful shaping of materials,” and the intuitive or receptive mode is a

\(^{52}\) Oliveros, *Software for People*, 139.

\(^{53}\) Oliveros, 185.

\(^{54}\) Oliveros, 140, Figure 1.

\(^{55}\) Oliveros, 141.

\(^{56}\) Oliveros, 132.
state in which “the artist is like a channel through which material flows and seems to shape itself.” Oliveros rejects works based only in one mode as “one-sided,”

instead encouraging a similar synchronization to her balance between awareness and attention. Through this synthesis of the analytical and intuitive, she seeks to “bring about [the] necessary conditions for encouraging intuition voluntarily.”

This creative technique is based upon recognizing the agency held by a composer or performer as being affected by the forces of their environment, collaborators, and materials. A musician must maintain a balance between attention to her own performance and an awareness of other elements of the performance and space, which can range from other performers to equipment, set design, and environmental sound sources. This is a creative state where the artist is listening and responding, being actively receptive, and receptively active. To follow Oliveros’s balancing technique is to recognize your place within the soundsystem and to hold that place, as in the playing of string figures.

Steve Reich’s essay *Music as a Gradual Process* provides another view of the human musician’s role within a soundsystem. Reich describes a common compositional style in electroacoustic music, in which a musical or technological process determines the form and all sound-to-sound details of the performance.

Reich’s essay addresses how a shift in control takes place through the composition and performance of these pieces. According to Reich, the composer of gradual process music has “a direct contact with the impersonal and complete control… by

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57 Oliveros, 134.
58 Oliveros, 133.
running this material through the process I completely control all that results, but also… I accept all that results without changes.” Reich acknowledges that while a composer of process-driven music has agency in determining the soundsystem and musical, electronic, or acoustic process to be realized, they give up the ability to determine on their own the form or sonic content of their work. Unlike Cage’s music of indeterminacy, which used chance processes to direct the composition of music that is then played by human performers, gradual process music “is a compositional process and a sounding music that are one and the same thing.” This flattening of writing and sounding music blurs distinctions between composer and performer, as performance of the process is a key part of composing process music. This further alters the agency of the composer, as in performing gradual processes, the human musician participates “in a particular liberating and impersonal kind of ritual,” in which their individual desire is redirected into the larger gesture of the soundsystem completing the process. This subsuming of individual agency is what separates a process, in which human and nonhuman performers may be working without a prewritten script, from most frameworks for musical improvisation. Process music is not concerned with a human performer’s individual expression, but the collective expression of all the actors in the system-concept network.

The writings of composers and musicologists such as Kahn, Herndon, Reich, Rodgers, Oliveros, and more set a precedent for the application of actor-network theory to music and sound studies, particularly in the analysis of electronic music. Sociological theories and methods are commonly used in ethnomusicology and other fields of cultural studies that analyze music, but they are less commonly applied when
understanding the mechanics of compositions themselves. I believe that the soundsystems of electroacoustic compositions can be examined as networks of human and nonhuman actors. By studying the system-concept of a piece, we witness the relationship between the composer and their equipment. Understanding this relationship is critical if we are to reckon with the cultural effects of the Developmental Network State, particularly the military’s role in research and development. Electronic music performance, as a site of highly intimate and emotional connection between human and nonhuman, is a crucial subject for science and technology studies and actor-network sociology.

To understand the assemblages of agency and vitality in a soundsystem, I employ a diverse set of tools borrowed from sociological and musicological methodology. These techniques include score analysis, interview, secondary research, thick description of soundsystems, and first-hand performance notes. This plurality of methods is needed to witness the many agencies of a system-concept, and understand how they relate to each other in the larger assemblage. Through the project of naming the actors in a composition’s soundsystem, I seek to unpack the social dynamics between human and nonhuman participants in the performance. To explore this method in action, I will analyze soundsystems constructed by composers Alvin Lucier and Pamela Z.
Alvin Lucier – The Queen of the South

My analysis of Alvin Lucier’s *The Queen of the South* (1972) builds on Douglas Kahn’s analysis of Lucier’s *Music for Solo Performer* (1969). In *Music for Solo Performer*, a human performer is attached via electrodes on the head to a brainwave amplifier, which amplifies Alpha brainwaves (a frequency of 8-12 Hz). The amplified waves are sub-audible to human ears, but through speakers can vibrate an array of percussion instruments set up across the stage. The score for *Music for*
Solo Performer is a drawn diagram of the soundsystem and text instructions, but the text leaves some options for realization open-ended. Along with this score, the performance practice for Music for Solo Performer has been preserved primarily through what Gordon Mumma, one of its early players, described as an “oral tradition” passed down from Lucier. Kahn, a former student of Lucier’s, can be placed within this tradition. This method of preservation makes realizing Music for Solo Performer by necessity a highly social activity, dependent on the documentation work and pedagogy of either Lucier or someone in the long line of musicians who have been taught how to play it.

The unconventional score and oral tradition of Music for Solo Performer places the soundsystem of this piece within a larger network of connections between individuals, technologies, and institutions. Kahn particularly focuses on the history of the brainwave amplifier Lucier used in originally performing the composition. Lucier was given the amplifier by his colleague at Brandeis University, Edmond Dewan, who was credited as the “Technical Assistant” at the first performance of Music for Solo Performer. Lucier met Dewan in 1964. At the time, Dewan was a physicist at Brandeis, as well as an officer with the Air Force Cambridge Research Laboratories and a passionate researcher of cybernetics, known for the development of mechanisms that could be controlled through brainwaves. He was also an
organist and music lover, who actively sought composers who would be interested in creating works utilizing his brainwave research and equipment. Kahn’s description of Dewan shows him to be brilliant, creative, and passionate, motivated in his research by a “larger mission to gain philosophical insight into consciousness, and by… the beauty of science.” It is important, however, that we also consider Dewan’s work as existing within the military research network; his brainwave research was funded by the U.S. Air Force as part of a project on the neurological effect of the flicker of light through helicopter blades, which would disorient and temporarily blind helicopter pilots.

This context of military research and cybernetics is important to bear in mind when considering the dynamics of control and energy at play within the soundsystem of Music for Solo Performer. Kahn describes Lucier’s setup as subverting the “linear circuit” of electronic music, in which the human performer controls equipment in to generate a signal, which may or may not be sent through further electronic processing before being sent through the speaker as sound to the audience. This model evokes a military chain of command: the human controls their instrument which controls the speakers, and while the equipment has the agency to determine what sounds can be produced, nonhumans are not allowed to create or alter sound outside of the specifications being set by the performer. As such, the linear circuit is a tool for

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Kahn, 93.
Kahn, 89.
Kahn, 94.
Kahn, 95.
Kahn, 95.
Kahn, 101.
individual human expression, redirecting the agencies of the nonhuman performers to fit the controller’s goals.

Kahn quotes Lucier as saying that in *Music for Solo Performer* “the speaker is a performer.”\(^{71}\) The fact that loudspeakers exciting acoustic instruments produce the only sound in *Music for Solo Performer* gives the speakers an importance and an agency normally not afforded to them in electronic music. Furthermore, because the human performer and the amplified brainwaves are silent, the human performer must listen for the soft sound of the drums being vibrated by the loudspeakers to know that they are successfully generating alpha waves.\(^{72}\) This creates a feedback loop between human and nonhuman performers, closing the circuit of energy and including a human as a component as opposed to a controller. The control of the human performer is also mediated by the fact that alpha brainwaves require “an absence of visual thinking,”\(^{73}\) and are difficult to generate at-will.\(^{74}\) In order to generate alpha waves the human performer must close their eyes and clear their mind, and only when the rolling drums begin to sound will they know they have succeeded. Kahn describes this as “[breaking] open” the circuit and “equalizing all elements” in the soundsystem.

*Music for Solo Performer* forms a cyborg assemblage by treating the speakers and human performer as equally important and deeply connected components of the soundsystem. Dewan “imagined that his [brainwave control mechanisms] could eventually enable communication for people who suffered from complete

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\(^{71}\) Alvin Lucier quoted in Kahn, *Earth Sound Earth Signal*, 99.

\(^{72}\) Kahn, 102.

\(^{73}\) Kahn, 100.

\(^{74}\) Kahn, 101.
paralysis.” Similarly, Lucier saw this soundsystem as allowing a musician “to go directly from the brain to the instruments, bypassing the body entirely.” By reading *Music for Solo Performer* as part of the project of cybernetics, we can understand the titular “solo performer” as including the soundsystem as not only a bypassing but an extension of the body, extending what is human to include the anthropomorphic (human shaped, human shaping) objects of the soundsystem. Through its nonlinear system-concept and the somewhat indirect nature of the human performer’s control of the system, *Music for Solo Performer* questions the dominance of human agency in mixed networks of human and nonhuman actors.

Alvin Lucier’s music lends itself to analyses of nonhuman agency because of the composer’s concern for material phenomena. Much of Lucier’s work is rooted in the observation of the physical traits of materials in a non-representational manner. Pauline Oliveros called Lucier “the poet of experimental music,” and I believe a fitting point of comparison to his work in poetry would be the imagism of writers such as William Carlos Williams. Lucier himself is fond of the William Carlos Williams quotation “no ideas but in things,” which he cites as a philosophy for composition.

It is with these ideas of materiality and agency in mind that I turn towards Lucier’s composition *The Queen of the South*, written three years after *Music for Solo Performer*.  

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75 Kahn, 95.  
77 Oliveros, *Software for People*, 192.  
78 Lucier, personal communication, March 2019 (used with permission).
Performer. The text score describes the setup and practice for the piece: any number of human performers “sing, speak, or play electronic or acoustic musical instruments in such a way as to activate… responsive surfaces upon which are strewn… [granular] materials suitable for making visible the effects of sound.” The vibration of the flat resonant surfaces (such as metal plates or paper screens) creates patterns in the strewn material. These patterns of movement are best shown through sustained tones at consistent frequencies. The performer uses “closed-circuit television monitor systems in fixed closeup positions to verticalize and enlarge for the players and audience the visual images made by the players’ sounds on the material-strewn surfaces.”

The piece is dedicated to Ernst Chladni and Hans Jenny, two scientists who studied how granular materials on vibrating surfaces form patterns based on the frequency of vibration. While the piece does illustrate the physical phenomenon explored by Chladni and Jenny, to characterize it as a scientific demonstration is reductive. The projection of the grains onto a screen translates the patterns “into another medium,” recasting the interaction between musician, vibrating surface, and strewn material as the production of a piece of visual art. The darkening of the stage required for the screen to be visible to the audience also draws visual attention away

79 The Queen of the South is published in Alvin Lucier’s Chambers, along with commentary from the composer. A close reading of the score significantly informs my understanding of the piece.
80 Lucier, Chambers, 94.
83 Lucier, Chambers, 101.
from the human performer(s) and vibrating media, prioritizing an abstracted image of
the total interaction over a clear view of each component of the system. Furthermore,
“All musical considerations including pitch, timbre, lengths of sounds, texture,
density, attack, decay, and continuity are determined only by the real-time decisions
necessary to the image-making processes.”84 In both Music for Solo Performer and
The Queen of the South, Lucier’s “sounds do some kind of work,”85 but while in
Music for Solo Performer the work being done by the subaudible brainwave sounds is
to produce more sound from percussion instruments, in The Queen of the South the
sonic content works to generate images. While a human musician playing The Queen
of the South makes decisions during the piece, she is not improvising, because her
musical decision making is determined by the behavior of the granular material. The
sonic identity of The Queen of the South changes completely each time it is
performed, but the relationship between sound and the image it produces is consistent
across realizations.

In this way, The Queen of the South treats nonhuman performers very
differently from Music for Solo Performer. Instead of building the collective agency
of a single superorganism, the nonhuman and human performers in The Queen of the
South act with, on, and against each other, “producing cooperative pictures.”86 The
image of human and nonhuman collaboration opens the piece up to become an
encounter between the creative vitality of humans, instruments, loudspeakers, paper
screens, and grains of sand.

84 Lucier, 95.
85 Alvin Lucier, quoted in Joel Chadabe, Electric Sound: The Past and Promise of Electronic Music
86 Lucier, Chambers, 101.
I performed *The Queen of the South* in March as a part of my thesis recital, experiencing first-hand the entwining and clashing of agencies inherent to the soundsystem. I found that the poetry of the score lends it its own agency in instructing the performers. The extremely long list of natural, mythical, and supernatural visions trained my eye to recognize patterns being formed by the grains, and encouraged me to keep an open mind to whatever images were being conjured. I had no illusions of myself as controlling these images, only following and facilitating their creation and continuation. The paper screens and loudspeakers I used also played a significant role in determining the structure of the piece. The screens were much larger than the speakers, and as the piece continued the strewn material would eventually be pushed off of the vibrating region of the screen over the speaker. In my final performance, this process took significantly shorter than its usual time, and I simply had to accept that the materials had chosen to stop painting and end the piece. These negotiations show how the equalization of agencies within a soundsystem often requires the human musician to abandon a certain amount of control they may be used to in performance.

The score also contains long and open-ended lists of different materials one could use to realize the piece, and different additional processes such as heating and cooling that could be added into a realization. By giving the performer a plurality of options for vibrating surfaces, granular material, sound equipment, and instrumentation, Lucier gives up some of his own agency as the composer to dictate realizations of his work. Each performance of *The Queen of the South* becomes its own largely independent network, defined by the material decisions made in
constructing the soundsystem. These self-determined networks showcase the relationships between their actors, without the interference of the composer’s authority dictating specific physical interactions or gestures in performance.

For me, close reading of the score and consultation of other performers and records of past performances informed my realization of *The Queen of the South*. Building the soundsystem became a communal experience; I borrowed my vibrating surfaces and speakers from experienced performers of the piece, Wesleyan Music Professors Paula Matthusen and Sumarsam, and sought their guidance on how best to go about performing it. I had the honor and luck to work directly with Lucier, and borrowed a compressor unit from him as well. I used a feedback-based instrument, called the feedback eyeball, that I built over a year ago and have been studying and developing a practice with. The feedback eyeball produces droning feedback that can be changed in pitch indirectly, through slow and precise movement in the space around the resonator, a large plastic orb. The carefulness required by the eyeball, and my own lack of formal movement training and general physical coordination, make playing with this instrument a task requiring extreme focus and effort. For *The Queen of the South*, I had to perform on the ground, directly in front of the speaker producing sometimes ear-splitting feedback. Prostrate in the dark before the feedback eyeball, I was acutely aware of my own lack of centrality in the soundsystem, serving only as a component of the interaction between sound waves and grains of dirt.

I collected soil from the farm I work at and salt from my kitchen for the granular materials. Selecting the granular materials was a particularly interesting and challenging part of the process. I tested many different materials to see how they
moved over the surface of the paper screens I was using, and how they responded to
the frequency range of the instrument I was using. It felt like choosing a new member
for a human musical ensemble: I had to judge the strewn materials by their
interactions with the other nonhuman performers, and what new patterns they brought
into the final image. My selection process was also affected by my own sentimental
desire to work with materials from my daily life. It is highly unlikely that Lucier
would use this emotion in his own selection process for this piece, but the score gave
me the freedom to exercise my own agency within its parameters.

In my realization of *The Queen of the South*, the assemblage of actors present
in the piece came out of my community and living space within Wesleyan and, more
specifically, the music department. Each object in the piece brought not only its own
material agency but the influence of the humans and institutions from its own
development and history of existence and use. These assembled knowledges and
desires affect how I interacted with the materials of the piece. For example, my
relationship to the soil informed how I treated it in preparation and performance. I
was acutely aware of the nutrients present in the soil that feed our crops on the farm,
and the soil also is a piece of a space and community that is very important to me. In
order to prepare the soil for the piece I needed to dry it out by baking it, and sift it so
that I had a uniform grain size. My emotional attachment to the soil, and the labor I
put into its preparation, led me to see it as a valuable and irreplaceable component of
the ensemble. In performance, this led me to distribute the grains slowly and
carefully, which the audience could see projected on the screen before the beginning
of the piece. This ritual became a part of my realization of *The Queen of the South,*
along with other interactions born out of social ties between the nonhuman
performers in the ensemble.

Approaching technologies and nonhuman objects in this socially situated and
personal manner has the potential to dramatically alter a person’s interactions with the
world of things. Most modern technological interactions are based around limiting
nonhuman agency and achieving the human user’s desire as quickly and efficiently as
possible. This is true not only in music, but in almost every aspect of life in an
increasingly industrialized society. Alvin Lucier’s work subverts this relationship
between user and tool, giving room for nonhuman performers to express themselves
fully and at their own pace. The sparseness and slowness of many of his compositions
result from cultivating acoustic and electronic processes and allowing them to unfold,
rather than struggling to bend them into musical structures that are more familiar to
human ears. This balancing of human and nonhuman agency creates music that is
beautiful and deeply moving in its simplicity and sense of purpose. Lucier uses sound
to make apparent the invisible histories, desires, and intimacies of the material world.

Witnessing the hidden social lives of technologies, spaces, and materials gives
us a greater awareness of the world around us, and allows us to better perceive our
own existence within complex and diverse networks of agency and power. The
hidden Developmental Network State, global surveillance apparatus, and militarized
design are present in tools we use every day, from the laptop I’m writing on right now
to the contact microphones I used to perform The Queen of the South. Along with
these influences are the antiprograms of material agency, that can never be fully
erased by human design. Living in cohabitation with technoscientific objects gives us
the opportunity to recognize their vitality and transformative potential, and discover methods of technological interaction that reach beyond inscribed uses and users of the DNS.

**Pamela Z – Correspondence, a work in progress**

Pamela Z is an incredibly accomplished composer and virtuosic performer whose work embodies an alternative practice of relationship-building with electronics. Z performs primarily with her voice run through digital processing, using the music software Max/MSP on her laptop. She also uses a variety of gestural controllers to manipulate samples and processing through movement. Z’s work also frequently incorporates video elements, ensemble playing, communication technology, and some audience participation. The combination of voice, movement, and electronics forms Z’s primary instrument.
I met Pamela Z during her residency at Wesleyan in the winter of 2017, when I participated in the ensemble for her performance Correspondence: a work in progress (2017) as a typewriter player. In December of 2018 I got the chance to interview her over Skype about the equipment she uses in her music, transitioning from hardware to software, the proliferation of communications technology in daily life, and inscribed uses and users through design. The full interview is printed in the appendix of this paper, edited for clarity but otherwise preserved as a complete document out of a desire to not speak on behalf of Z or abridge her answers. The interview covers a wide variety of subjects that I do not fully cover in my analysis of her work, and I consider it a vital companion piece to my writing.\footnote{Unless cited otherwise, all quotations from Pamela Z and information about her soundsystem and practice are from our Skype interview, recorded on 12/18/18.}

Z has been developing her voice and electronic system for live performance since the early 1980s, when she got her first delay unit.\footnote{Z, “A Tool is a Tool,” Women, Art, and Technology, accessed 4/12/19, http://www.pamelaz.com/tool.htm.} It is necessary to study the history of this development to understand Z’s performance practice and relationship to the equipment that remains central through most of her compositions. Through the ‘80s, Z was working with a set of rack-mounted delays and a multi-effects processor controlled through foot pedals, and a sampler. She used this setup to loop, pitch-shift, stretch, and layer her voice and samples, particularly samples from interviews she has conducted. This plurality of voices builds into huge textures of sound that she can manipulate and add to with her voice. She started working electronics in the early 1980s, and by the mid-‘80s she was also incorporating found objects and visual
performance elements, and her Macintosh laptop. In the 1990s she began using the BodySynth, created by Ed Severinghaus and Chris Van Raalte. This device allowed her to control electronics with physical gestures, using electrode sensors that measured the electrical impulses of her muscles. She has since moved on to other gestural controllers such as the Nº UTM Ultrasonic controller, and SensorPlay wireless controllers. Around the turn of the millennium Z undertook the conversion of her delays, processor, and sampler setup into a patch in music programming language Max/MSP.

This conversion process, which took roughly four years, was an attempt to exactly recreate the hardware delays, effects, and sampler Z had been using into a single patch in Max/MSP. The decision to transfer this hardware into the computer, instead of building a new setup from scratch, has several ramifications for the soundsystem’s design. Firstly, the design decisions made by the original engineers of the devices are maintained, if altered, in the software translations. This connects Z’s Max programming with the production of her original hardware, creating a blend of her code and the designs of the engineers. Furthermore, the shifting in platform from hardware to software transforms the agencies of the devices themselves. Z often composes by exploring the glitches and idiosyncrasies of her equipment. Some of the unique traits of her hardware, like the stretching of samples on one of her delays, could not be translated to Max/MSP. However, the architecture of Max as a programming language also brought its own unique traits that further informed Z’s

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89 Ibid.
90 Ibid.
practice. These traits include the ability to switch between arrangements of different settings instantly, which makes it easy for her to explore new possibilities by applying new presets to preexisting material.

Pamela Z’s soundsystem has retained its core identity through these processes of translation and growth. In our interview, Z described the incorporation of new devices, and new mediums such as video, into her soundsystem as an additive process. While new elements being added did not dramatically change the function of the already-present devices, they did bring the potential for new interactions and discoveries. Because of this, her equipment becomes a “fluid set of tools” that she can draw from composition and improvisation. By maintaining a particular set of tools in her soundsystem over her life, Z has developed a deep connection with her equipment. Her live processing of her own voice and use of gestural controllers furthers that intimacy by incorporating her body directly into the soundsystem, without the usual interfaces like a keyboard or mixer to mediate the interaction.

The presence of improvisation in Z’s practice highlights an important distinction of her Max/MSP programming from many other Max composers. According to Z, many of her contemporaries using Max in the 2000s “were reticent to improvise, because… each piece was a very carefully sculpted Max patch that was intended to be used a very particular way. And so they felt like they couldn’t improvise, because they were set up for one thing so they couldn’t just start doing something else… Whereas I built my Max patches to be an instrument.” By working primarily with one Max patch, itself a continuation of an earlier soundsystem, Z can
develop a set of techniques for performing with that instrument, achieving “virtuosity with the tool through years of diligent practice.”92

Alongside her work in electronics, Z received extensive training in bel canto singing, a vocal style used in Italian opera. According to Z, “the voice itself is this technology that we use to communicate with,”93 and therefore formal vocal training can be viewed as the design of a singer’s instrument. Like with the design of a device, bel canto training prioritizes certain vocal timbres and styles, and provides techniques to achieve the desired sound. In bel canto, these techniques include using the resonant chambers of the face to produce different tones of voice. While Z’s work includes speech and extended vocal techniques, these practices were largely self-taught until after she composed Voci before 2003, with bel canto being her only formal training before that point.94 These techniques influence the ways in which she is able to interact with the nonhuman devices that mediate her voice in performance; her mastery of tone allows her to precisely alter the timbral “color” of her voice, and other delicate parameters such as “shape of attack.” Her use of the term ‘shape of attack’, which would commonly be used by electronic musicians to describe the envelopes of synthesized sounds, shows how her practice in electronics also informs her vocal technique. She experiences the relationship of coproduction between her electronic and vocal practices in real-time during performance, where she finds that “when I process my voice, and the fact that I can process my voice, definitely influences the way I use my voice because I hear things coming back from the

93 Rodgers, Pink Noises, 220. 
94 Rodgers, 218.
processing.” Simultaneously listening and sounding, Pamela Z participates in a string figure that includes her bel canto training, the designers of her original hardware equipment, the design of Max/MSP, the code of her patch, and her gestural controllers. Within this web of interdependencies, “one action feeds the other and… if you manipulate one thing it automatically changes what’s happening with the other thing and vice versa.”

A video of Z’s performance of Quatre Couches (2015) and Badagada (1988) on 11/19/17 displays how the composer/performer creates a practice with her instrument by shifting fluidly between methods of control.95 Quatre Couches showcases how quickly she can switch between techniques, moving through a sequence of different relationships of control between laptop and human performer and blending them into each other. She describes the piece as “a sonic trifle, tiramisu, or mille-feuille – juxtaposing four contrasting layers and manually toying with them – mixing them and moving them around on the plate until they all melt away.”96

The piece begins with Z controlling non-vocal samples gesturally while singing with delay. She then shifts to layering multiple looping vocal lines, each one a character distinguished by timbre, affect, language, and physicality. She resumes her gestural manipulation of samples without singing, but now the samples being manipulated are now the vocal lines she just performed. The sound of her voice is transferred into the electronic circuit, transforming Z’s control of her own voice into a

negotiation with the laptop through movement. By incorporating herself into this network Z gains the superhuman ability to manipulate multiple versions of her own voice simultaneously, but also entwines her agency with that of the processors and controllers.

Badagada continues to elaborate upon this set of techniques, including gestures that are not controlling any electronics, but correspond with her singing. Z uses elaborate and repeating hand gestures to address her body and voice in the same manner as she interfaced with the gesture-activated controller. This action creates a visual parallel between her manipulation of her recorded voice and her manipulation of her live singing. The two processes become blended together through the few gestures in the performance that use her gestural controller to trigger samples. She also uses her ability to project her voice without a microphone to combine the direct sound of her voice with its processed double that is mediated by the soundsystem. The plurality of techniques used in the performance of these two pieces serves to dissolve the boundaries between methods of control, and between electric and acoustic sound production, forming a practice that deals with her core soundsystem in a holistic manner. George Lewis writes that the foundation of this fusion is Z’s background in “the interpretation of art song, in which gestural communication constitutes avital aspect of the communication of meaning, becomes extended to the realm of the cyborg.”

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97 Lewis, The Virtual Discourses of Pamela Z, 59. Composer George Lewis’s essay on Pamela Z, while not referred to extensively in my analysis, is an incredible discussion of Z’s work in the context of critical race theory and Afrofuturism.
The rich development of her soundsystem as an instrument with its own set of techniques and performance practices enables Pamela Z to explore further transformations and expansions of that system. I had the privilege of experiencing that process as a member of her ensemble for *Correspondence, a work in progress* at Wesleyan in 2017. *Correspondence, a work in progress* fits into a long line of Z’s compositions that deal with the evolution and proliferation of communications technology. These compositions include *Voci* and *Correspondence* (1988), which was a collaboration with 77hz. Z describes herself as having been “always an early adopter” of communications technology, being “the first person [she knows] who had an answering machine.” By incorporating pieces of this technology into her soundsystems, Z connects figuratively and literally to the larger networks of cell phone data, wifi, the postal service, and email. Z plays with the social norms of these technologies, such as when audience members are asked to speak on the phone in concert, in their “loudest cellphone voice” in *Voci*.

*Correspondence, a work in progress* offers an example of Z addressing the larger social and technological networks she and her soundsystem inhabit. During her residency at Wesleyan, Z approached *Correspondence, a work in progress* in a fluid manner that allowed for the piece to be entangled in the social ties of the space it was produced in. Z was very open in rehearsal to the contributions of the ensemble, and the structure and setup of the composition evolved naturally throughout the rehearsal.


process. It felt like she acknowledged and appreciated the agency of each performer, human and nonhuman, that joined the ensemble. Furthermore, she approached the ensemble and the audience as socially situated within a particular institution that brings with it a set of social, musical, and technological understandings.

The night of the show, CFA Hall felt filled with an energy that bubbled up out of the piece itself, through the preexisting connections of its participants. While waiting for the show to start, Professor Ron Kuivila ran through the aisles of the concert hall in an elaborate game of distributing and passing around the paper programs. This spontaneous display indirectly mirrored the content of the performance to come; in one movement couriers moved through the space delivering letters between the typists and singers, connecting the soundsystem in the same way Ron had connected audience members. While one could dismiss this occurrence as a coincidence, I rather see it as evidence of the affective power of Z’s process of sonifying the social network of the space she was composing in. Another powerful example of this effect was when Z included a recording of Professor Paula Matthusen confessing to an extremely high number of unread emails, played back to an audience of her students and colleagues. (Professor Matthusen notes that she was referring to her personal email account, not the Wesleyan email she uses for work). I easily recognized the professor’s voice, as I’m sure much of the audience did. This moment of recognition called the audience and performers into the circuit through our personal and institutional ties. In this way, Z instrumentalizes the institution, expressively playing with her social surroundings through sound. This practice depends on Z’s long history shared with the primary instrument (voice and
electronics) of her soundsystem and virtuosic ability to make that system function fluidly and expressively. Her core soundsystem becomes a voyager, plugging into larger social and technological systems to tease them out, show their threads, and potentially rewire them.

Exit Music: The Ghost Onstage

Last weekend I played a set with the Casio glitches for the first time. I had selected random patches from several internal memory banks to showcase, and was planning to perform a set of instrumental improvisations that allowed the glitches to fully express themselves. The show was billed under my solo voice and electronics project, “dreamboat,” which has in the past been an outlet for my songwriting. In the past, the soundsystem for “dreamboat” has been my synthesizer (playing more conventional keyboard sounds), a microphone and vocal processor that I used to autotune my voice, and sometimes a laptop that would automatically generate ambient background sounds during the set. I’d never included instrumental music in this project before, and when I was practicing I missed having my voice in the mix.
The day before the show, I decided to experiment with playing one of the “dreamboat” songs with one of the Casio’s ghost patches. The patch sounded like a distorted electric lead guitar, like you might hear in a hair metal band from the ‘80s. If held down, the notes would bend upward, which led me to playing mostly staccato notes with some bends smoothly shaping melodies into arcs and dips. After a key is released, a soft and organlike drone keeps playing the pitch, so the melodic lines played on the guitarlike sound hang in the air indefinitely. The dynamic contrast between the melodies and the chords they leave behind gives the effect of the sound reverberating through the space.

The song I decided to adapt to the new Casio sound is one of my favorite songs I’ve written, but it’s never been as well-received as other songs in my “dreamboat” set. It has a simple verse, sung and played in unison melody, with only one lyric. The original patch I performed with was a simple saw wave, which sounded like the reed stops on an organ. Most of the piece has a very loose sense of rhythm, speeding up, slowing down and pausing frequently. The structure is disjointed, going from an alternating verse and chorus in the Lydian mode centered around the IV chord to an extended outro that shifts the tonal center to the I and picks up a rhythm, like a fragment of another, poppier tune. The lyrics are personal and vulnerable, about seeking shelter from the fear of transmisogynistic violence in public spaces. I found that playing the song with the ghost’s patch felt much more natural than the original composition. The powerful guitar sound added a sense of confidence behind the lyrics, and the lingering drones gave space for vulnerability during the quiet pauses. The fact that I could leave these drones sounding without touching the keyboard also
freed up my movements, and I developed a choreography of swaying back and forth, shifting my posture through a series of slightly distorted shapes. I hadn’t been able to add much gesture into my “dreamboat” performances before, even though dance had previously been an important part of my work in punk bands.

The Casio did more than just replace the keyboard sound I had been using, it improved the song by allowing me to bring out aspects of my stage practice that I had previously left out of my solo playing. Twenty minutes before the set, I decided to write simple lyrics for each of the patches I was planning to feature that night. Thinking of how to fit my songwriting with the improvisatory techniques I had developed for the different patches gave me material for experimenting with song structure, my favorite part of writing lyrics. Many of the random patches could be left playing on their own, allowing me to dance around the stage and focus on singing over the drones. The atonal nature of the glitches, and the strange timbres of the synthesizer, also freed me to use extended vocal techniques and weird affectations that had been an important part of my punk singing. It also freed my vocal processor; to accompany the Casio, I used unusual pitch shifting and sang out-of-tune with the autotune setting. These functions of the processor had gone unexplored in my solo work because I couldn’t find ways to incorporate them into my songs.

The influence of the Casio ghost on my performance was remarkable. Even though I was under-prepared, the show felt more energetic and natural than any of my previous solo sets. In most of my solo work I have included machines that act unpredictably, so that I have an unknown element to listen and respond to. But the Casio had such a unique spirit that it really felt like writing and performing with an
active collaborator. The technique of my keyboard playing was defined by the desire of the ghost, and my attitude of accepting that desire and allowing the machine to express itself. In turn, the autonomy of the instrument allowed me and the vocal processor to explore our own idiosyncrasies as performers. We fed off of each other throughout the set, and although I was the only human onstage I felt like I had the support of a band behind me. The introduction of the Casio ghost has transformed my “dreamboat” project by opening my performance to nonhuman agencies, and giving me the chance to collaborate with my equipment.

The agencies of machines and devices are complex, materially and socially situated. Collaborating with nonhuman performers in electronic music has allowed me to witness their vitality and better understand my place in cybernetic networks, both in music and the everyday. When we act without considering the webs of design, production, and cultural influence that entangle us we often perpetuate the agencies that have shaped our surroundings. Electronic music provides us with a space to intertwine our desires with the unusual animacies of machines, and collectively move towards new modes of technological relationship and development.
May Klug: You’ve described in interviews the progression you’ve made from using mass-produced and commercially available delay pedals and effects processors, to designing your own gear in Max/MSP and working with more custom build hardware. I was really interested in how that’s effected your compositional and performance practices, working with things you made yourself and the process of composing and creating technology?

Pamela Z: Well, just to be clear, the first delays that I had before I was using Max/MSP were hardware delays but they were not pedals. I never used pedals; I have foot switches, but the foot switches were triggers to control the devices. When people talk about delay pedals they’re usually talking about the sort of stomp boxes, like the guitar stomp boxes, and when I first started doing this stuff the guitar stomp boxes had really, really low sampling rate. So, the quality of the recording wouldn’t stand up to being heard simultaneously with my live, amplified voice. It would sound like a
much different quality. So I bought delays that were rack mountable digital delays, and then they have inputs that you can plug foot switches into. So you can control them with your feet, but the actual delay itself is another piece of hardware.

MK: I’m so sorry about my confusion there.

PZ: No worries, that’s what most people think because most people aren’t aware of those things. But anyway, I made that transition from using the hardware to doing it all in the computer in Max/MSP in the late ’90s, early “Aughties,” and I would say that it took a lot of time because it was a lot of programming involved and I had a lot of help from various friends and colleagues that were also much more knowledgeable about Max/MSP programming and stuff than I was.

The effect that it had on my work, though, was more subtle because I tried to recreate in software everything I had been using in hardware, and I even went so far as to have a friend of mine build me these little devices that I could plug the same foot switches that I was plugging into my hardware into Max/MSP, so that I could control them in the same way I was controlling them when they were hardware. So in a way it was a fairly smooth transition even though it took a long time. I would say that it took about four years to really complete the transition from the hardware to using software. In doing that I was basically trying to recreate everything that I had in the hardware that I was using. This included a rack of digital delays, so I created a bunch of digital delay lines in Max/MSP, and a multi-effects processor that had all kinds of pitch shift and multi-tap delays and different things like that in it, and I was using that. So my friend helped me rewrite just the presets I was using in that device in Max. [I also had] a sampler, which was a hardware sampler that I then used samplers in Max/MSP to replace.

So, what I ended up with was almost the exact same setup that I had before digitization, but I would say the big difference was, well, there were two differences. One was that each piece of hardware has its own weird idiosyncrasies, and I had built pieces around weird things that happened in the hardware. So, for example, one of the delays I had if you changed the duration of the delay while you already had things looped, it would actually stretch or squish the sound file and change the pitch. So you would get this “aaeeooo,” so that was an artifact from how that particular delay worked that was much more difficult to recreate in Max. So I ended up losing some pieces that I had that were based on these weird idiosyncrasies of the hardware.

But probably more profound was that, for one thing, the computer was much more precise. The digital delays that were hardware were partially analogue devices, and particularly the timing in them was analog. So I could say “2000 milliseconds,” and that would be kind of two seconds, give or take some milliseconds, so the tempo would change a little bit each time I played a piece. Whereas if I did the same thing on the computer, you say “2000 milliseconds,” “4000 milliseconds,” “3800 milliseconds,” whatever you say, it’s gonna be exactly that and it will continue to be...
that. It’s not gonna drift, the time won’t change. As a result of that, if I wanted things to be slightly out of synch, which I sometimes do, I would have to deliberately design it that way and say “okay, this delay is going to be slightly out of phase with this delay, so this delay will be 4000 milliseconds and this delay will be 3700 milliseconds,” so that they would slowly drift. Otherwise it wouldn’t happen, they would just stay together perfectly. It also meant I could be totally accurate if I wanted to.

Also, when I was using hardware, anytime I wanted a new effect I would have to go out and buy another piece of hardware, whereas in the computer if I wanted a new effect I could mess around in Max and try to build that effect myself or I could just buy a plugin to do that effect. It meant that I had a lot more effects at my fingertips than needing to run out and buy new little black boxes everytime I wanted something new. So that helped a lot. There’s also the introduction of the fact that computers tend to occasionally crash or need software upgrades or things like that, and hardware is pretty stable and doesn’t tend to crash, even though it has computer components in it. So although I would say that for most of my career Max has been pretty stable for me, I have not suffered a lot of having Max crash at performances. It’s a little bit like, I always tell people, you can compare it to air travel: Most plane accidents happen on takeoff or landing, usually once the plane is in the air you’re good, it needs a little time to land at least. The same thing is true I find with using computers in performance. As a rule, once the patch is up and running it’s not going to have something happen, if something goes wrong it’s usually during setup or trying to start the piece.

MK: I’m really interested in what you said about exploring around in Max for making new effects. Has that led to discovering any similar idiosyncrasies like in the hardware, like if you’ve played with finding the weird little specifics about how Max works?

PZ: Well you know, I always tell people, and I think this is true for a lot of artists, that some of the most interesting ideas I’ve had have come from happy accidents. For example, I create a pretty complex set of presets for each piece that I do. I’ll have a preset to begin the piece, which would be a setting that tells me like what’s the duration of all the delays -- I have like four different delay lines that I have in my Max patch -- and I have places I can bring in different plugins with different effects, I have sampler patches where I have sets of samples, so a preset for a bank of samples would involve not only which sample bank but what portion of that bank of samples, whether or not those are being played at pitch or if they’re being transposed as they’re played, and which controller is controlling them. Sometimes I will do something where I start to play one piece and I accidentally have the preset for a different piece, and end up getting, let’s say I had a certain bank of samples loaded but I’m actually addressing them in a way that I meant to address a different bank of samples. Something strange, a strange chirping sound that is that tuned three octaves higher
than they’re supposed to be, or a strange booming sound because they’re detuned, or just a stuttering sound because the type of sample wasn’t designed for the way I’m manipulating it. And I’ll hear that and say “oh! That’s an interesting sound,” and I never would have thought of that sound, but it just happened by accident. I’ll have to figure out what I did so that I can use that. So things like that will happen from time to time.

A lot of people who were using Max in their performances when I first started using it were reticent to improvise, because they really had worked hard to design each patch; each piece was a very carefully sculpted Max patch that was intended to be used a very particular way. And so they felt like they couldn’t improvise, because they were set up for one thing so they couldn’t just start doing something else. Whereas I built my Max patches to be an instrument, where instead of building a new patch for each piece I built a sort of a basic, standard patch, that’s very very gangly and has lots of things attached to it, that is my instrument. And I use that same patch on every piece; it’s changing the presets, changing the settings within the patch, that makes it different for each piece. That gives me the ability to completely improvise, which means I can just open up the patch and I can choose the presets from a kind of a piece but then I can actually improvise and do something else, and switch to different presets, or switch the settings within that preset. When I do that I often come up with sounds and textures that are surprising and unexpected.

MK: That’s something that I love so much about your music, that I can see coming from having one patch, is that it seems like you’ve developed a really strong relationship with that patch and the way of moving through it that I think is really really cool.

PZ: Thank you. Well, I definitely consider the combination of the electronics and my voice to be my instrument. And so I really take that seriously and treat it as an instrument, that’s something that you can become virtuosic on, you know, something that requires practice in using and getting comfortable with the ins and outs of it.

MK: I actually have a question tying to virtuosity in electronics. I read your A Tool is a Tool is a Tool article, which is from a long time ago so maybe isn’t fresh in the mind, but in that article you were talking about the act of exploring a new piece of technology and coming at it from a perspective of not knowing much about it and then learning new things with it and incorporating it into what you already know. Does that act of exploration change also your relationship with the things you’ve already mastered and maybe your understanding of that virtuosity, as well as the new thing?

PZ: I suppose it does, I think it’s usually more of an additive kind of a thing. For example, a big milestone of that exact thing is when I started using video in my work. Whenever I had used video in the past I had worked with collaborators who were video artists, and I would sort of tell them what I was looking for image-wise and I
would choose people whose aesthetic I really trust, and then they would make things that worked with my work. But at a certain point, this was like maybe 17 or 18 years ago, I borrowed a camera for the purpose of documenting my work, and playing with it I ended up making mistakes because I didn’t know what I was doing. Those mistakes ended up being really interesting, and I ended up making a new piece out of what was supposed to just be documentation.

From there, I started incorporating video components into my work and started making more work where there was live performance with video that was intended to happen together, and was created as a piece in a holistic way. Unlike just writing some music and then saying “oh, now I’m gonna throw some video up with it,” then it was like this was the piece and the piece was conceived to have both video and sound and that those things are coordinated or somehow complementing each other or somehow rubbing against each other in an interesting way.

I took a workshop at one point of Jitter, a live video manipulation kind of program that you can do in Max, so that you can run video. When I first started working with video in performance I decided I wanted to create some things where I was manipulating video, so I used Jitter. I am not an ace Max programmer by a long shot; I always go to my friends who are much better at programming than I am when I need help in figuring out how to make something happen that I can’t figure out. So when I was doing video I was constantly having to go to R. Luke DuBois, who is one of the authors of Jitter, to get help with how to use it because for me it wasn’t that user-friendly to figure out. Then at some point I took a workshop with this guy named Mark Coniglio who created a software called Isadora, and Isadora is also a sort of performance, live video manipulation kind of software that allows you to basically control video, from playing video to mixing video to controlling what happens in the video, in a live way. When I took that workshop I was like “oh my god,” for me (everybody’s different, but for me) this was so much more user friendly and intuitive to use than Jitter was. I think it’s like when people who do notated music and they use Finale and then they switch to Sibelius and they’re like oh it’s just obvious how to do things. It felt a little more that way to me when I switched to Isadora.

Once I started using Isadora I started having the same thing happen like what happens with new devices, that I just discovered funny little weird things I could do in it and then I would build whole pieces based on those things. It changed the work and expanded the work because it just brought the visual art part of the work. Because my work has always been very interdisciplinary, but it made it much more interdisciplinary because I was thinking about, now I find that when I make a new piece I often am thinking about visual at least as early on in the process as I’m thinking about sound. Occasionally, some pieces I think of something visual before I think of anything sonic, and then I’m like “ok what would go with that?,” because I get a visual idea.
MK: This one’s kind of a pivot, but I think it’s connected. I was in *Correspondence*, the piece you did at Wesleyan, and in that one, one thing I thought was really cool was how we worked with such a wide array of communications technologies that were built into the piece, from the typewriters and the phones and the emails, I thought it was a really cool integration. And I was reading your *Pink Noises* interview the other day and in it you talk about, in the context of *Voci*, you were talking about ways that the voice is a technology and then is also mediated through other technologies. I was wondering, and it’s funny that we’re doing this through Skype; how do you think different communications technologies modulate the voice as a communication technology and an artistic expression technology?

PZ: That’s kind of a broad question and I’m not sure how to approach it, but what comes to mind off the top of my head is a lot of things. One thing is that the frequency range of telephones was so small when they were early, so voices sounded very trebly and tinny and sort of like you’re talking from out of a little box or something. And so there’s interesting things timbrally that happen to the voice just because it’s going through communication technology. The stuff we have now today, we have all this digital stuff, and the quality varies a lot because it depends on connection speed and all of that kind of stuff. This sound quality, Skype sound quality is kind of terrible, but sometimes people are giving phone interviews on the radio and it’s not as obvious as it once was that one of the people is on the phone, whereas it used to be that there was no mistaking it. So that’s an interesting thing about it, but I also think there’s something about the disembodiment of the voice, where you’re hearing somebody but can no longer see their facial expressions, or the delay, where you’re seeing them but the mouth doesn’t match up with the speech. There’s a lot of interesting things that happen when things are mediated through devices.

But also I think something that has maybe had a really marked effect on the way that we function in the world in general is the level of distraction from all of these technologies that we now all have in our pocket all the time, like nobody gets very far away from their phone. It used to be that you’re at home and your phone is on the desk or the table, or you’re not home and the phone is really far away. Now the phone is never more than a heartbeat away, because people usually have it on their person, or when they’re home it’s maybe sitting very close to them on a table or a desk, and they take it with them wherever they go. So there’s this strange remove from your immediate reality to this being distracted by realities elsewhere, which is interesting. You can see it as a negative or as a positive or as just something different from what our lives used to be like, but I am not sure if I’m answering your question [laughs].

MK: No you are, I really wanted to hear your perspective on this. And that ties to, in *Voci*, in the section you have where everybody uses their phones to call – I’ve never seen *Voci* live but I’ve watched the video excerpts. But in *Voci*, in the part where people call in, I was interested in the choice in bringing the audience into the
soundsystem I think is really cool. And I feel like that was also there in *Correspondence* in a way that I thought was really cool, because it was within Wesleyan and a lot of the performers were students, and I just remember recognizing Paula’s voice on the speaker saying “I have 40,000 unread emails” or something crazy like that, and for one thing I remember thinking “oh that’s where my emails went” but I also thought it was a really cool piece of bringing the audience into the soundsystem by just, Paula was sitting there in the audience and she wasn’t performing but her voice was. And similarly with the section in *Voci*, how it just brings everyone into the soundsystem. How do you make the decision in a piece to open it up to the audience like that, to bring people into the circuit?

PZ: I think I tend to do that more in these larger works that have lots of sections to them, and I feel like it’s something I got into that habit of doing pretty early on when I first started making larger performance works. I kind of found it interesting to break that fourth wall as they say, but I don’t always like audience participation just for audience participation’s sake. But if it somehow speaks to the meaning of the piece or the aesthetic of the piece then I find it to be really interesting to connect and include.

I also really like the texture of hearing a lot of different people’s voices, especially a lot of people’s speaking voices. You may have noticed that in a lot of the works I’ve made that I do these interviews with people, and then use fragments of their voice so even if nothing happens real-time in terms of the people being invited to speak within the piece, their voices end up in the piece and I think that I just like the texture of that, I like the color and texture of speech and speech sounds that are layered and used as a component of the music. So that makes it interesting to me, but I also, even though I always tell people I’m interesting in making things that are abstract and open-ended, I’m not trying to deliver concrete messages in my work, I still enjoy the topicalness of inserting things that are current or pervasive into the piece. I think it draws a bit of the world into the piece.

So at the time that I made *Voci* – you’re way too young to remember this, but cell phones were not a thing. People didn’t have them, and they were new. In the early days the only people who had cell phones in the United States were like a handful of sort of entitled yuppies that everybody else hated. And they were huge, they were like the size of this mic case, they were like these great big things, you know? And then I went to Japan in ’99, and when I left for Japan I left a world where there were very few people with mobile phones and people who had them were despised for having them. And also, because they were new, people hadn’t really learned any kind of an etiquette with them, so it tended to be a rude thing. Whoever had the mobile phone would talk extremely loud when they were talking on it; so they’d be in a public place, like on the train or in a restaurant or something, and everybody else is speaking to each other quietly to not disturb everyone around them, and THEN THIS PERSON PICKS UP THEIR PHONE AND THEY’RE GOING “WE REALLY HAVE TO GET THAT DEAL TO GO THROUGH,” and the
reception was really bad on the phones in those days, but also because people just psychologically thought they couldn’t be heard, so they would yell. So it was really weird, it was like cellphone voices were, like, loud.

Then I went to Japan, and when I got to Japan they were miles ahead of us. Everybody had mobile phones, and they were tiny. They were like those little flip phones, they were this size or even smaller. And everybody under 40, probably 80% of Japanese people who were teenagers and young adults, had a phone. And probably 50% older had phones. So it was like more people had them than not. And because in Tokyo it was very expensive to have a landline, it was kind of the opposite of like, here it was relatively cheap to have a landline but it was extremely expensive to have a cell phone. Over there, it was pretty inexpensive to have a mobile phone, but it was tremendously expensive to have a landline, so a lot of people didn’t have phones. So when these came out, they all bought them, and the world was just filled with people with phones. And so I noticed a lot of funny things. One of them was businessmen, they call them salarymen in Tokyo, were always with an earphone in their ear, walking down the street, and they looked like crazy people. They were just walking down the street talking really adamantly to apparently no one. And so that was really interesting, and then teenagers and young people all had phones, and they all had ringtones. Now ringtones are digital soundfiles, and they all sound very accurate as whatever it is they are. But in those days they were all little synthesized tones that were in this kind of bright, tinny timbre, and so the phones would come with a few set ringtones but then people can buy ringtones. In Japan they would typically buy, favorite things would be like Beethoven’s 9th Symphony, so it would be like [sings very high pitched rendition of Ode to Joy], you know, or It’s A Small World After All, they all chose those kinds of songs. So you would just hear all these little songs all the time. You’d get on the elevator and two or three people’s phones would ring and they would all be playing these little sounds. So that’s when I got the idea that it would be really interesting to hear them all at once.

That’s what made me decide to make that piece, so that section of Voci I made before I actually made Voci, and I later inserted it in. I created it in Tokyo, I was playing in a university, and there were 200 students in the audience so I made this piece and I passed out at the beginning of the concert little slips of paper that were on the seats. On one side of the room they were pink and on the other side of the room they were green, and you were supposed to write your mobile on it and switch for the opposite color. And so then, the idea was that everybody on the green side would call everybody on the pink side at one time, and when the phones rang they were supposed to let them ring until they thought it would go to voicemail. When they answered, the instructions were “In your loudest cellphone voice, say ‘Hello, I can’t talk right now, I’m in a concert’.” What was really cute was in Japan they would be so polite that they wouldn’t yell, so they would answer really politely, and they were really quietly talking. But what was funny is that I literally was hearing, because there were 200 kids and they all had phones, so I was hearing 100 phones ringing all at
once, like an orchestra of phones. And I loved it, and then heard all the voices whispering back. When I got back to the United States I wanted to do the piece here. When I got back it was still 1999, and I tried to do it, and there were like 7 phones in the audience. So it was not very successful the first several times I did it. But a few years later, everybody started to have phones, and then I was able to make it work here.

MK: And that’s funny too how the American cultural phenomenon of, like, full-on screaming into your cellphone intersected then with the proliferation. Because I’ve seen some of the later Voci excerpts where it’s like 100 people yelling into their phones at once.

PZ: Yeah, because they were Americans, and it was now a time that everybody had one. And that was just a few years; the first time I tried to do it, late 90’s, early 2000s, it worked great in Japan but the yelling was much quieter, but in the states there just weren’t enough people to make it interesting. But it was only a few years later, I would say maybe 2004 or so, that’s probably when that excerpt you saw was from, and you have that many people. In just a few years it went from almost nobody to kind of everywhere.

MK: That was some of my earliest memories, but I remember when nobody had phones and then everybody had phones being a very sudden switchover.

PZ: I remember that same thing with answering machines, which are now a relic because everybody has it built in as voicemail on their phones, but in the old days there was no voicemail on your phone. You actually had to have a physical tape recorder that sits on your desk and had tape in it, and it had two cassettes; one was your outgoing message and one was the messages that were recorded. So you would have to record your outgoing message, “hello, I’m not home right now,” everybody would always say “please leave a message after the beep.” Those answering machines were, when they first came out, they were something that only companies had. Like, you would call a store or a law firm or something and you would get an answering machine, you would not call an individual person at their home and get an answering machine. Usually the phone would just keep ringing because nobody was home, or somebody would answer, or you would get a busy signal because there also wasn’t call waiting. I don’t even know if busy signals exist now.

Anyway, I don’t know what put me on this line of thought, but I found all those things when they were introduced to be interesting, and I was always an early adopter. I’m the first person I know who had an answering machine, and my friends used to call and they’d be mad, because they’d be like “I’m not calling some store or business, you’re my friend, I don’t want to talk to a machine!” And I was like, “what’s your alternative? You’d just hear the phone ring and you wouldn’t talk to anything!” And it took people a while to go “oh, yeah, right, I guess leaving a message is better than you not knowing that I tried to call.” So then again, it was the
same thing as with the phones, a sudden proliferation of answering machines. Everybody had it, and it was a machine, so it was kind of like, you know, something that people had to figure out how to program. You had to turn it on when you weren’t at the house, and decide how many rings before it picks up and takes the message, how long of a message you want to allow them to leave, all that stuff had to be decided.

MK: The idea of only businesses only having answering machines, it would be kind of like calling a friend now and getting a fully automated “dial 1 if you want…”

PZ: Yes, “dial 3 for, or say this for”

MK: Oh yeah, there’s the ones you can talk to now! And you talk about this a little bit in your Pink Noises interview, I remember there’s a part where you talk about automated voices, and how you interact with technologies that have their own voice.

PZ: Yeah, it’s funny. And again, I first heard that stuff in Japan, because they were just miles ahead of us. One thing that was crazy in Japan when I was there, and now it’s starting to be that way here but it hasn’t fully become that way, is that everything talks. So they have little electronic voices if your smoke alarm went off, instead of a beep it would be a little voice in Japanese going “warning, warning, smoke is detected!” It would talk. And there’s this thing, and we do have this, but in the airport if you’re coming to the end of the moving walkway and the it’ll tell you in a voice, and things like that. So everything in Japan had little voices; on the bus, announcing which stop was next; at intersections, you know how sometimes you have when there’s construction people who stand there with a flag going like this, to let you know you need to go slow coming through a construction area? In Japan they have robots, dressed as construction workers, holding a flag and their arm would move like this, and if you got close enough to it you’d hear a little voice saying “warning, blah blah blah,” something in Japanese. Also, I experienced my first navigation systems in cars, we didn’t have them in those days in the United States. I was in Japan, in a car, and their car was talking to them. And it was not a little thing, like a phone or an external navigator; our new cars are coming with little built-in screens. But in ’99 I saw cars with those little screens, and they’re giving instructions, turn left, turn right, all in Japanese, and I was so fascinated. I asked “what is it saying?,” it’s yelling at you; if it said turn left and the person turned right it would get really emphatic, telling them they needed to turn left. That was really interesting.

There was this whole little section of town called Akihabara, and Akihabara was an entire neighborhood that was like an electronics mall. So there was just store after store after store that’s selling nothing but all kinds of crazy electronics at every one of them. When you walk into an establishment in Japan, like a restaurant or someplace, when you walk in the door all the workers yell “Irasshaimase, irasshaimase!” and that just means “welcome.” You’d hear this chorus of all the, you know, the bartender and all the servers, they all yell “Irasshaimase!.” And when you
went to this electronics section of town, all the doors had an electronic voice and when you opened them they’d go “Irasshaimase.” I found all that stuff really interesting, and I was always trying to record things, or remember what they were so I could use them in my pieces.

MK: I love that outsourcing of an emotional greeting to a machine, that’s amazing!

PZ: Exactly!

MK: I think what you’re saying brings up a lot of interesting things about, like, the assertion of agency of machines in these situations, how a mechanical voice in these situations telling you to do something really does have authority, and I have a question that does pertain to agency. I was watching one of your videos of a bunch of different voice and electronics pieces, so I don’t know the names of each one, but I was looking at the different techniques you were using. I think it was one from 2017, and you had the little sensor box that you can do gestures around. I thought it was really cool how the sort of gesture you would make of moving from singing into manipulating those same vocal parts with gesture, into a combination of those methods of control. It created, I mean I guess it follows already what you were saying about the voice and electronics as one instrument, that extended technique moving into technological control. I’m interested in considering your Bel Canto training as a technology as well, the techniques of that style, and how the agency of that technology interacts with the agencies of your processors and the other technologies you use.

PZ: I guess I just think of it all as being a fluid set of tools that I work with. I do think that when I process my voice, and the fact that I can process my voice, definitely influences the way that I use my voice because I hear things coming back at me from the processing, and as you do that you learn you can manipulate what that final thing is gonna sound like by changing the color, or shape of attack, or whatever you’re doing vocally. So these things kind of work together, and it becomes – this is all just off the top of my head, but if you think about driving a car, and you’ve got access to the steering wheel and the brake pedal and all these other things. When you’re young, and you’re just learning how to drive, you’re like “oh, I’m turning, I’m stopping, I’m going.” You eventually learn how to combine those things to make something interesting happen, like you learn how to slow down into a turn, because you’re manipulating the steering wheel at the same time as you’re manipulating the brake. Or if you’re in a manual transmission you learn how to slow down using the gears instead of the brake. And you find out that one thing has an impact on another, and something interesting happens. I think the same thing happens when you’re working with an acoustically generated sound like voice, and also at the same time you’re processing it or grabbing samples of it, you eventually learn how one action feeds the other and how if you manipulate one thing it automatically changes what’s happening with the other thing and vice versa. It just becomes a part of basically learning the instrument I guess.
MK: It sounds like it creates a very holistic process of listening and making sound at the same time, which reminds me of Pauline Oliveros’s writing about being receptively active and actively receptive.

PZ: Yeah.

MK: I love the dynamic that creates, that you’re listening to what the technology is doing while you’re generating that from the start. It’s like a feedback loop in a way. Wow, I love that.

MK: I think I have one more question, that’s a little bit out there but it’s something that I’d be interested in, it’s also from the interviews with you I’ve read. You talk about how gendered and cultural background differences can lead to different relationships with technologies, like in A Tool is a Tool, you talk about how because of different gendered norms, different people would have more comfort, say, integrating their body and voice with technology, and different techniques when interacting with machines are more available based on different backgrounds. And I guess I was sort of thinking about flipping that to the perspective of someone designing a piece of technology, or like when you program in Max, and wondering if you also feel that sort of influence in the production of technology?

PZ: I don’t know if I’ve ever thought about it that way, I think my point – It’s been a long time since I wrote that article – but I think the point I was making was that people have been socialized a very particular way. So, I feel like there’s certain things that are expected of women, and certain things that were expected of men, and that some people really felt the pressure of those expectations or just the influence of them. But I feel in a way like I always bucked that a little bit, so I wasn’t really approaching things, at least not consciously in my mind, I wasn’t really approaching anything from a different way of approaching it. So, I think for me I haven’t noticed that. Although, I think in a more broad, abstract way I can imagine that when somebody designs something themselves that they’re aware of more of the ramifications. For example, this isn’t really about music, but you think about that so many things were designed by men, and for that reason seatbelts do not work well for women, especially women who are not tall, or women who have ample breasts, so seatbelts are just wrong. And I think when more women get jobs in that area of design that is likely to change. Or another example that again isn’t music is you know these automatic faucets that come on in bathrooms in the airport when you go to wash your hands? There’s no knob, it just senses the presence of your hand? When those first came around, they didn’t work for dark skinned people.

MK: Oh I’ve heard about that!

PZ: And people were like, “that’s racist!” And I was like, it’s not really racist, it’s just that whoever designed it checked to make sure it worked on their hand. And they didn’t think about the fact that it was looking for a level of, I guess, looking for lightness. I think they redesigned those sensors, because they all seem to work now.
But I do remember going into bathrooms and putting my hand there going “it just doesn’t come on, it’s not working!” and seeing somebody else walk in and go [imitating faucet sound] “ssshhhh,” and I’d say “What?!”

And I have to tell you, I had a sound installation that – it’s a video and sound installation, and it uses a sound dome that you stand underneath of it. You stand in that spot, the image comes into focus, and the sound comes on. And I did that using a camera, and the way that I did is by using in Isadora something that is looking for darkness or lightness. So what I did was I made that area of the floor white, and then because most people’s shoes are dark, and usually people were wearing long pants and it’s very infrequent that somebody’s wearing all white and white shoes. But I didn’t even think about that; I wear black, all the time, so when I designed it I just tested it on myself. And I had this thing happen where one person came up and they stood there and it wasn’t working, and I came out and I saw all these people standing around it and one person was teasing her and saying “I think you’re a ghost! You must be a vampire or something, it worked for everyone else but you!” And I looked down at her feet and she was wearing white pants and white shoes. I was like, “oh!” and I laughed and I said “take your sweater off and drop it at your feet.” And so she did, and it immediately came on, because she was wearing a dark sweater. I realized that, when everybody was calling racism about the faucets, it’s not really conscious racism. It was not thinking about anybody else and just testing something on yourself, and having it not occur to you that you have characteristics that not everybody has.

MK: It becomes like a mechanical implicit bias.

PZ: Yeah, exactly. That was kind of funny to me, because I caught myself in the same act as these things we’re criticizing! I created this piece, and I know how to program it to sense that somebody’s there with light, I don’t have any sensors to know that somebody’s there by, like, body heat or something else. It’s like that expression, “darkening a doorstep,” meaning basically you come and you block the light by standing there. So I was thinking about the presence of a person blocks the light, and so changes the light level at that specific point that I was pointing the camera at. [Laughs] But that doesn’t happen if the person’s wearing all white! It is true that it’s very infrequent that somebody’s wearing all white, like who wears white pants?

MK: A very fancy vibe!

PZ: But it’s not impossible, as we found out!

MK: Well thank you so much! I think that just about does it.

PZ: I’m glad I was able to help you!

MK: You helped me so much, that was great. Thank you so much, and I hope our paths cross again in the real world sometime!
PZ: I’m sure they must, I mean, it’s a small world and people reconnect. And I have very fond memories of working with you in that piece at Wesleyan. You were one of my faithful typers!

MK: I was, yeah! I really loved that rehearsal process too. I felt like it really let everybody bring in what they were gonna bring in, and I feel like you used what people were bringing in in a very cool way. Because I’ve definitely worked in things where it was just like, “do this, this way, now” and I feel like yours was a much more open-ended process of creating.

PZ: I’m glad you liked it, I’m glad you have fond memories of it. Well thanks so much, and say hello to everyone!

MK: Oh I will! Thank you, and good luck with your composing, I hope I can see it sometime!

PZ: Ciao!

Bibliography


https://www.youtube.com/watch?v=9_d6UFZZ8ck.


