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"..." Modern Silence

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MODERN SILENCE

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Thesis Statement

Silence is remarkable, both in concept and in reality. The human ear is outstanding at doing what it was made for. Not only can it withstand loud sound, but can also recognize the softest and most intricate whisperings, as well as everything in between. The ear can recognize all of these sounds and passes them on to our brains for interpretation. Our ears collect all sound but our brains determine what to focus on and what to ignore. But what if there are no "important" sounds? What if you are sitting alone in an empty room, making no unnecessary sounds? Is this silence?

When someone says silence I tend to immediately hear a complete absence of sound. Although I have never heard this, it would be as the dictionary defines the term. However this is often not what we mean. Instead we are generally referring to a lack of voice or other man-made sounds. The silences that people hear on a daily basis are special to them. It will change based on where they are as well as who they are. What changes have happened to our sonic environment to get us to where we are today?

Everyday silence is not *true* silence. What is silence in the 'modern' world?

Summary and Analysis of Creative Work

This written work is a supplement to an audio piece that I have created to analyze a day of modern silence, specifically the silences that I experience every day. These silences are not total silence; they are the sounds of quiet that I experience on a regular basis. My average day is oddly quiet, but everything that I do affects it. In the following text you will find descriptions of the historical events that I feel created the modern silence that we experience as well an analysis and explanation of the creative work that this document accompanies.

Our sonic environment can always be changed by what we are doing. Right now I am changing my environment with the sound of music and the sound of my fingers as they type, and then re-type, the words from my head.

The piece that I created takes a journaling of my every day silences and combines it with an emphasis of sounds that are very common in my life. My relationship with silence is not like that of most others. Despite my involvement in radio, music, and sound in general, I spend a good majority of my day in silence.

I deeply love silence; in both its most basic form as well as the many creative ways to analyze it. Conversely I also have a great interest in what most people determine as noise, and how to redefine those sounds. These two passions came together into the idea behind this piece. I wanted to look further into the distinction between silence and noise through sounds in my everyday life.

The piece begins where my day starts, in my room, and follows me from there. In the opening portion, you can hear the birds outside my window and my cat as she moves about her day. The sounds begin to layer with the subsequent spaces that I visit on a daily basis. This includes SIU's student-run radio station, WIDB.net, as well as the Southern Illinois Radio Information Service, SIRIS.

These two locations have their own relevance to the work. One station, WIDB.net, follows the format of college radio playing alternative rock and hip hop. This is why there is a really low layer of 'new' music heard later on in the piece. The other station is a broadcast service that provides readings of local newspapers to blind and visually impaired in the community. The content of this work is another example of the specific relationship that I have with silence. Our volunteers take silent words written on a page and share them with those who could otherwise not be exposed to the ideas presented in the text. My work at this station was why I decided to include portions of voice over broadcasting. When putting the piece together I realized that not everyone would understand these connections, so in order for the content to be easily recognizable I added a layer of static, which would be picked up by any radio when there is no signal to receive. Lastly, the main layer of radio is a constantly changing radio dial. I included this because even in a small radio market such as Carbondale there are a lot of options that a listener can choose from.

From there I layered in more and more sounds that anyone would recognize from their every day. The sounds of a keyboard and mouse, a printer, the opening and closing of a drawer, and the jingle of keys, to name a few. They start softly in an attempt for them to maintain the feeling of listening to silence. As the piece progresses more of the sounds are layered in and the volume increases. This brings about the transition from sound to noise.

When we focus on listening to our environment, we can realize how our actions affect its aurality and how those sounds, in turn, affect us.

Introduction

The idea of what our environment will sound like is often dismissed. Despite this, our sonic environment is very important. Often we think of things that will affect how we dress. But despite its lack of effect on our attire, our sonic environment cannot be fixed with a wardrobe change.

We may not realize it as such, but our sonic environment affects things more important than how we dress. Often the sound of our environment will affect our mood and how productive we are. There are numerous studies on the right kind of music or silence for the most productivity, but I wanted to focus on what we term as silence, and what we hear when we listen to "nothing".

Everyday silence hasn't always been like it is now, what we term as silence today has been influenced by many things, such as the shape of the room your in, the materials used to put it together, and what you have used to decorate the space. Since the dawn of innovation new sounds have become standard in our everyday lives. These new sounds have added themselves to those that we had previously been accustomed to. And this process has been continuing since before anyone thought to pay attention.

What will follow below is my own review of the historical aspects of silence. It may seem long, but it is quite important. Not only to my work but also to the sonic environment we hear everyday. The intention of what I've included here is to give context to the decisions that I made in deciding to work within the framework of silence as well as the choices I made within the creative work.

The Beginning of American Architectural Acoustics

The history of room acoustics is something that is often overlooked; yet it is something that we take advantage of every day. The architecture of a space is a design that has determined how a room will sound, whether you're talking or you sit in complete silence.

In this piece, I wanted to take a deeper look into the sounds of the rooms that I inhabit every day. This silence is directly affected by the measures that were taken in building these spaces. Whether at home or at work, the amount of noise that I hear is determined by how much, or how little, sound dampening was included in the room. While some spaces take great effort to control the sound created, others are not as concerned. These sounds would include the hum of an air conditioner or the rumble of traffic outside. Successful treatment of spaces would allow for a hushing of unwanted sounds that allows you to listen to only what you insert into the space.

In the work that I created, the unwanted hums were accentuated. Listening you can hear the hum of the air conditioning at our student-run station as well as the occasional shuffling of window blinds. At the Southern Illinois Radio Information Service, you can hear each and every car as it passes by. That building is a very old home, and has next to no sound treatment. Any outdoor sound comes through the windows and rumbles through the building itself. Though not audible in the recording I used, if you listen closely you can also hear the air conditioning as it turns on and off as well as the sounds of our Internet connections humming through the closet that they are housed in.

What will follow is an explanation of historical events that have played an important role in the sonic environment that we find ourselves in today. This includes the origins of how architectural acoustics started and how it changed.

For a period of time, control of acoustical space was measured in the reduction of an existence of space, often done by minimizing reverberation times and removing the interior of a space from the soundscape surrounding it. But even this was not commonplace until we had entered the 1900s. There were a number of people and steps that led to our contemporary architectural focus on the sonic qualities of the spaces we inhabit. Although I cannot cover them all here, I have selected a handful of what I find to be highly influential to discuss.

The Smithsonian Institute

The first work done in the field that I will mention was done in preparation of a renovation of the Smithsonian Institute Building's Lecture Hall. In around 1849, Joseph Henry, who was the first Secretary of the Smithsonian, was working to learn more about how different materials effected sound. Henry had hopes of improving the room's arrangement, acoustics, and ventilation (Renwick, 1993). To further the knowledge on the subject, Henry worked with a tuning fork and a number of different materials to determine the amount of time it took for the object to cease vibrating. "He sounded a tuning fork, placed the stem of the fork against the material to be tested, then measured how long the fork continued to vibrate. Believing his eyes to be more sensitive than his ears, Henry marked the cessation of vibration at the moment when he could no longer visually perceive the movement of the fork…Henry proved that the energy was converted to heat rather than sound, by measuring an increase in the temperature of the rubber as it absorbed the vibrations of the tuning fork" (Thompson, 2002, p. 27). By measuring the amount of time it took for the material to cease vibration, he was determining the sound absorption of the material.

When the lecture hall opened in 1855, it was considered to have the best acoustics of any lecture hall in the City of Washington (Renwick, 1993).

Wallace Sabine

The idea of American Architectural Acoustics was transformed 10 years later, in 1868, when Wallace Sabine was born. He is considered by many to be the father of architectural acoustics. Though Henry had already completed his experiments in examining the conductivity of sound through a number of substances, it was Sabine who took the acoustics of space and made them a science. When describing the work the Sabine did Thompson said, "For architects, he provided the "fixed rule" and the scientific expertise that they had long sought to guide and inform their acoustical designs. For audiences, his work endowed the spaces in which they gathered to listen with what most listeners considered to be a satisfying sense of control. And, for scientists like himself, Sabine opened up a wide new field of opportunity" (Thompson, 2002, p. 57).

Sabine was a physicist who was gently pushed into this new and unexplored career in room acoustics. When he started his instruments were "organ pipes, common fabrics and materials, and the unaided human ear" (Hall, 1919, p. 349). At the time of his death he was a leader in a new field where there were rapid inventions made to improve the craft that he had started.

Fogg Lecture Hall

The beginning of Sabine's career as an architectural consultant began while he was working as a physics professor at Harvard. At that time the Fogg Lecture Hall was recently constructed and had a very long reverb time, which made it a terrible location for lectures. At the request of the dean of the department, Sabine and a group of assistants began to test the space in an attempt to resolve the problem. "Sabine's technique consisted of sounding a source, an organ pipe…until a steady volume of sound was achieved in the room. He then shut off the source of sound and listened to the residual sound, or reverberation, until it was no longer audible. A torsion pendulum silently recorded the duration of audibility to hundredths of a second" (Thompson, 2002, p. 35-36).

Coming from his science background in physics, Sabine was very concerned with accuracy. He was determined for his experiments to be as accurate as possible. In order for this to be true, there were a number of restrictions put onto when he could conduct his experiments, due to the nature of his work. Hall described it best saying, "He must work in the small hours of the night, when other men had ceased from their noisy labors and when street-cars were infrequent; he must, for certain ends, work only in the summer, when windows could be kept open; in the early summer, before crickets began their nightly din. He must work with the most scrupulous regard for conditions that to another might seem trivial" (Hall, 1919, p. 349).

One example of his dedication to the specifics were shown when he "once threw out over three thousand measurements, representing several months' work, after determining that the clothing worn by the observer (himself) had a small but measureable effect upon the outcome of his experiments. Subsequently, he always wore the same outfit ("blue winter coat and vest, winter trousers, thin underwear, high shoes") when experimenting" (Thompson, 2002, p. 36).

In order to resolve the issues found in the Fogg Lecture Hall, Sabine "needed to be able to measure the rate of decay of sound in the room as he introduced various kinds and amounts of materials…[he] concluded that the two known optical methods for measuring the intensity of

sound…were unsatisfactory" (Beranek, p. 46). The means of measuring sound were not the only unsatisfactory aspect of the work that Sabine was tasked with. "At the time of Sabine's investigation, the literature of architectural acoustics showed no consensus on the dimensions for an acoustically acceptable room, or the materials of which to build it, or the means to correct existing defects. Sabine recognized that, broadly speaking, only the size and shape of the interior materials, including both the furnishings and the audience, constituted the prime variables in the acoustics of the rooms. In most repair work, only the materials could be varied" (Beranek, p. 46).

Sabine's work in room acoustics was sought only to resolve the problem with the singular auditorium, however Sabine was thorough and determined to discover as much as he could about architectural acoustics. When he started work on the Fogg lecture hall "his colleagues warned him that the problem was so complex as to preclude satisfactory solution. They even referred to his new assignment as "a grim joke"" (Beranek, p. 45). Not only did Sabine end up completing the task he far surpassed it, finding an unexplored field that he could excel in.

The work that Sabine did in updating the Fogg Lecture hall not only started him in his research of the subject of architectural acoustics, but it unknowingly gave him the push he needed to be the most recognizable name in the subject and make it a respected science.

Symphony Hall

Major Henry Lee Higginson, the founder of Music Hall in Boston, knew the dean who had assigned Sabine to work on the Fogg Lecture Hall. As the city of Boston was preparing to destroy the old Music Hall, the founder and benefactor of the Boston Symphony Orchestra decided to revise plans to build a new hall for his orchestra. Being convinced of the success that Sabine had with his recommendations for the Fogg Lecture hall, Higginson persuaded the architects of the project that they could benefit from Sabine's experience. When offered the job, Sabine hesitated before responding, he had not yet applied the information he now knew to the plans of an un-built structure. Sabine spent the next two weeks devoted to determining a formula, and was successful. The formula, now known as the Sabine formula, was used to predict the character of the reverberation in any room (Beranek, p. 47). This formula is still commonly used today. With the discovery of this formula he truly began the work to craft and design silence.

This hall was the first that employed Wallace Sabine, who was still a young assistant physics professor at Harvard, to consult on the acoustics of the building before it was built. Symphony Hall was opened on October 15, 1900. It was "the first auditorium in the world to be built in known conformity with acoustical laws" (Thompson, 2002, p. 13).

The initial responses to the hall were not as positive as one would have hoped. Many musicians and other critics stated that the hall was not good for music. Following critiques of the building Sabine decided to study "The Accuracy of Musical Taste in Regard to Architectural Acoustics". Following the responses that he got for the Symphony Hall, he realized that the opinions of those listening would be essential to his future work. "Sabine divided the subject of architectural acoustics into two distinct lines of investigation. The first was based on the physical phenomena, and the second on their musical effect" (Thompson, 2002, p. 55).

Though Sabine found errors in his initial calculations for the hall, and even avoided mentioning it in papers that he wrote after 1900, I find it significant to add that "Boston Symphony Hall, unchanged today, is rated the greatest hall in the western hemisphere and, for

its size, one of the greatest in the world. One explanation for its poor initial reception may have been its size; it seats 2625 persons, almost twice the 1400 seats typical of European halls. Thus, with an orchestra of 90 or so –the usual number of musician in 1900- the music sounded thin in Symphony Hall. With today's complement of 104 musicians, the sound is fuller and louder" (Beranek, p. 49).

From there, acoustics as a science began to take off. "In 1904, Sabine began to accept commissions from architects to advise on the acoustics of churches, cathedrals, auditoriums and theaters by the dozens" (Beranek, p. 50). By 1920 there was a society of professionals involved in acoustical sciences.

Sabine died in January of 1919. Before his death he also worked with the allied war effort in World War I. He worked on a planning report for the International Tuberculosis Commission, visited the battlefield twice on scientific missions, and spent many days in Washington advising on aircraft design and production; all of this done while teaching classes in Cambridge (Beranek, p. 51).

Into the 1920s and the advancement of everyday spaces

The work of Wallace Sabine may have ended before the 1920s, but his ideas and work were carried on through the new frontier that was the 'Roaring 20s'. The 1920s were a loud time; they weren't called the 'Roaring 20s' for nothing. Radio was taking off and was played in every storefront. Cars were becoming more affordable and the age of industry was taking off. New buildings were erected at every corner. All this added up to a loud environment, considered to be the loudest time in history, and people weren't thrilled about it.

This loudness wasn't necessarily new. Noise has always been a companion to human activity and city life. The problems of noise weren't just that they were a bother, but at this time "medical experts warned of the danger that noise posed to physical and mental health, while efficiency experts proclaimed the deleterious effect of noise upon the nation's productivity" (Thompson, 2002, p. 7).

Following Wallace Sabine and his successes, the 1920s carried architectural acoustics into its new soundscape. The knowledge that he had found was expanded to a society of acoustical engineers and became a potential solution, not only for the sonic qualities of buildings created especially for sound, but also in an attempt to give citizens an escape from the ever increasing loudness of city life. It was in this era that the construction of buildings began to be done with the help of scientists and sound engineers. These intellectuals didn't just spring up and impose their knowledge onto the masses; it was a need that built up quickly amongst the public.

Writer Emily Thompson compiled all of the noise complaints she could find from New York in the 20s, as well as sounds from the era, and put them into an interactive webpage. Here you can see that she divided the noises into specific sections- traffic, transportation, building operation, homes, streets, the harbor and river, collection and deliveries, and miscellaneous- that describe the sounds that were bothering the residents of New York City's soundscape in the 1920s.

Even before the 20s many were beginning to complain about the noise of industry. However, despite the complaints, many were unwilling to slow the progress of the machines to appease the people with the complaints. It was into the 20s that this argument began to be

argued against. Many began to say that these excessive sounds were not the sign of prosperity, but instead a sign of industrial waste and poorly designed process.

In 1927 "Laird studied the effect of noise on the physiology and working efficiency of typists by scientifically analyzing their performance under both quiet and noisy conditions. Typing and error rates were compared, and the exhalations of the typists were chemically analyzed to determine their rates of caloric consumption. Laird concluded that energy consumption increased by 19 percent when typists worked under noisy conditions, and he also demonstrated that the best typists worked about 7 percent faster in a quieter environment" (Thompson, 2002, p. 155-156).

This information was all that was needed for office buildings and banks to be built with their acoustics in mind. These ideas were the beginning of designing silence. Changing the materials used in a building to ensure that there wouldn't be a long decay was only the beginning. There were soon any number of materials created specifically to be used in the building of acoustically-treated buildings. Today, these buildings are the norm. The majority of the spaces that we inhabit were designed with silence in mind.

Even if you were to stand on the street in New York today it would not be as loud as it was in the 20s. For a brief period, acoustical engineers tried to take the expertise to the streets, trying to solve the problem of noise at its source; with the end goal always being as close to silence as possible.

The Anechoic Chamber

When many think of complete silence the structure that comes to mind is the anechoic chamber, a room that is literally 'without echo'. Although these rooms allow no sound from the outside world to enter your ears, they still are not completely silent. Within the room one "might hear the blood gently pumping through your head, or a high-pitched hiss caused by spontaneous firings of the auditory nerve…If you have tinnitus (ringing in the ears), then it becomes very obvious in an anechoic chamber" (Cox, 2013).

I did not use this space in recordings that I made for this piece, but I have had the opportunity to use it for a number of other projects. Its importance and specific qualities are directly related to the subject of silence. Since it is not an everyday space, I couldn't convince myself to include it in the work, but wanted to be sure to include it here.

The main use of these rooms is for testing products, in fact that was the reason that they were first invented. There are differing stories on the origins of the anechoic chamber. The title of the "first" to build an anechoic chamber has been claimed by two people. Bell Laboratories as well as Leo Beranek both argue that they were the first to build an anechoic chamber.

The chamber built by Bell Labs was built in 1940 in Murray Hill, New Jersey. Beranek claims that while Bell Labs had built a structure to house their chamber, it wasn't lined with any materials until after the war, when his wedge fiberglass designs were used in its construction.

Beranek first built his anechoic chamber, originally just called "Beranek's Box", in the summer of 1943 at Harvard. At the time he was the Director of Harvard's Electro-Acoustic Laboratory during WWII. The initial reasoning behind the creation of the structure was to investigate sound in combat vehicles for the American National Defense Research Committee.

Beranek's box is the anechoic chamber that is said to have inspired John Cage to compose his most famous work, 4'33". That piece in particular was one that forced its listeners

to focus on the sounds around them, such as the traffic or shuffling of the audience. It was one of the works that influenced my piece. Cage and his works with silence will be discussed later within this text.

The Electronic Age and the 1881 Paris Exposition

Though Cage's piece was released in the 50s, the silences his audience's heard are similar to those one would hear during a contemporary performance of the work. A good portion of the sounds that make up the silence and noise that we hear around us is all thanks to the electronic age. There were many things that led up to this age of invention, but none were quite so important as the rapid invention and improvement of electronics. It was at the Paris Exposition in 1881 that many of the most recognizable inventions at the beginning of this age were first shown.

This was the first international electrical exposition. This exposition was a monumental moment in history where a large number of inventors met to exhibit the work that they had done to advance electrical technology. The meeting was not only important because of the number of important people that were there, but what they were doing. The first International Congress of Electricians met to deal with the organization of electrical units and standards for practical use.

Edison's incandescent light was shown at this exposition, as well as Alexander Graham Bell's telephone, and a number of plans for the production and transmission of electricity - including sound, heat, and light. These inventions were the beginning of a new era. As I sit and look around me I see many things that would not be possible without some of the inventions and discoveries shown at this exposition and, furthermore, they changed the sound of our environment forever. Even though many of these inventions had nothing to do with sound, they did have their own distinct sound that went along with them.

Inventions that changed the Sound of Silence

In terms of technology, the early 1900s advanced at a rapid pace. The airplane, the automobile, the telephone, the phonograph, the radio, and the talking motion picture. All of these inventions, and more, happened within a span of under 50 years. Though these inventions were not all intended as sonic devices, many of them had a huge impact on the aural environment we find ourselves in today. It especially changed the soundscape of large cities.

These changes had a pronounced impact on the sound of every day life, but the idea of a loud city is not a new thought. There has always been complaints of noise. "Buddhist scriptures dating from 500 BCE list "the ten noises in a great city," which included elephants, horses, chariots, drums, tabors, lutes, song, cymbals, gongs, and people crying…" This wasn't the only example. "…The ruins of ancient Pompeii include a wall marked by graffiti that pleads for quiet, and an anonymous fourteenth-century European poet complained that "Swart smutted smiths, smattered with smoke, drive me to death with the din of their dints" (Thompson, 2002, p. 2).

The problem that arose in this time of great change was not that there was noise, but the source of the noise. These bothersome sounds from across the centuries have been tied together by how they could be identified, "organic sounds created by humans and animals at work and at play" (Thompson, 2002, p. 4).

Heading into the 20th century there were so many new sounds created by industry and electricity. The problem with these new sounds was that they were not something that people had the chance to grow accustomed to. The transition from organic to mechanical sound was one that was very difficult for many, and it happened quickly. These new inventions became commonplace so rapidly that it didn't allow for familiarity. Those filing complaints would express their suffering in terms that they knew. One complaint filed against the whistle of a train compared it to "the screech of ten thousand cats, each as big as a cathedral" (Thompson, 2002, p. 5).

At the end of the 1920s, New Yorkers were polled about the noises that bothered them. "Only 7% of their complaints corresponded to traditional sounds…The ten most troubling noises were all identified as the products of "machine-age inventions," and only with number eleven, noisy parties, did "the sounds of human activity" enter the picture" (Thompson, 2002, p. 6).

The 1920s were the time between the acoustic era and the electric era. Each of the inventions from this time period made large and impactful changes, but in the terms of 'noise' there were a few that stuck out. The following inventions are ones that I feel changed the history of sound. These inventions were the start of many of the sounds that changed the sonic environment of my life. My personal work revolves around many of the progressions of these inventions.

Radio

It seems appropriate that I start this discussion with radio. Not only because of its importance on both the historical and current soundscape but for its importance in my life and its place in the audio work accompanying this written piece. I included radio in the piece because two of the three physical locations that I recorded at are both broadcast facilities.

Similar to any great invention, there is no one story to how it came about. There were 'scientists', Heinrich Hertz, Nikola Tesla, and Ernst Alexanderson, who did the heavy lifting discovering and creating the technology that made radio possible, and then there were the 'businessmen', Gugliemo Marconi and Lee DeForest, who made it a success.

From that first moment when Marconi was said to have heard the letter "S" until now, radio has had a great effect on the aurality of our environment. Whether it happened or not, it led to a lot of success. Not only is it considered to be one of the first devices to allow for mass communication it was a device that forced people to focus on sound and its quality.

This technology is used in many ways. Though we currently tie the name to its use in entertainment purposes, it was initially used for safety purposes, replacing carrier pigeons on ships and boats to contact help. Into the 1920s the technology was used mostly in point-to-point services for military, commercial, and amateur use (Sterne, 2003, p. 195).

Initially the idea of radio seemed like it would bring people together. Every night thousands, soon to be millions, would tune into their favorite shows on the radio. These people "shared live musical or theatrical performances over the radio" and since each person listening knew that there were others hearing the same programs at the same times "radio imparted a feeling of connectedness…" (Taylor, 2012, p. 3)

This technology has grown and expanded so far that it offers options to even the most specific of niches. The country of Norway has progressed so far that in the next two years they will be shutting down FM radio in order to switch to Digital Audio Broadcasting (Plaugic, 2015).

Not only has radio effected the literal sound that we hear, it has changed how we see silence. Commercial radio has made silence the enemy. Stations do all they can to avoid 'dead air'. Even the term they use to describe on-air silence gives a bad name to the idea of silence. The monetization of radio has made this necessary for success, but the idea seems to have seeped over into our every day lives. It's almost as though we're scared of silence, and that's why we fill all empty sound with recorded music.

Phonograph

Since the dawn of recorded music, silence has quickly been invaded by listening to our favorite recorded songs. From the dawn of the LP to the MP3 it's become more and more common to hear music everywhere you go. Whether it's the new Ke$ha album or Beethoven's fifth symphony it can accompany you to work or the gym or on a walk to the grocery store. This whole process began with the phonograph in 1877.

Before its invention, musicians were already worried about being replaced. "By the end of the century, countless parlor pianos had been replaced by automatic "reproducing" pianos or other mechanical devices that recreated the performances of great concert pianists" (Thompson, 2002, p. 50).

The reproduction of sound was a common goal. There were inventions before the phonograph that started the process, such as the phonautograph, and there were far better inventions that followed it. But this invention was the first to both record and playback the recordings it made. Invented by Thomas Edison, the phonograph is now so recognizable its name is often used to mislabel its improved successor, the gramophone.

The initial goals of recordings were not for the reproduction of music. The main goal behind the phonograph specifically was use as a dictation machine, to replace secretaries. On Edison's list of possible uses for the machine, music placed fourth on his list (Taylor, 2012, p. 13).

The phonograph recorded on foil cylinders and was incredibly difficult to use. Not only was it difficult to use because of how fragile it was, but also because there were many settings that had to be just right. The technology was also inconvenient because of the short amount of time that could be recorded on each cylinder. Though the technology did not take off, it was the beginning of recorded sound.

"Recordings were made by (necessarily) shouting into a mouthpiece (or "speaking diaphragm") while turning a crank attached to a metal cylinder. A needle, conveying the sound vibrations of the voice, inscribed a thin sheet of tinfoil wrapped around the cylinder. The tinfoil "record" could then be played back by turning the crank as the needle tracked the grooves indented in the foil; this action reversed the conveyance of sound from the foil to the needle to the "reproducing diaphragm," essentially a small speaker" (Taylor, 2012, p. 12). These first phonographs captured and reproduced sound mechanically, without any electricity involved.

This technology was great for many reasons. One less obvious benefit that came with the invention of the phonograph was the ability to hear oneself. Prior to this, all listening was done at the moment it was spoken. In listening back to a recording of themselves, people were able to hear his or her own voice for the first time outside of their own head, "without the bones" (Kahn, 1999, p. 8).

It also had some down sides. "As [John Philip] Sousa had feared, [the phonograph] was now replacing self-made music with recordings by professional executants. The result of these trends was a new dissatisfaction with amateur music and, perhaps more significantly, a heightened engagement by amateurs with the experience of listening to professionals" (Thompson, 2002, p. 50).

The gramophone, invented 10 years after the phonograph by Emile Berliner, was the invention that took off and made recorded music an industry. Though there were attempts between the phonograph and the gramophone, this recording device was the most successful. It would record to a flat disc, instead of the cylinder, and allowed for a longer recording time and, thanks to other improvements made by Berliner, had better quality sound.

When recorded music did begin to take off, it required a drastic change for the listener. There were many listeners who found it unsettling to hear "a remarkably life-like human voice issuing from a box." There were even assumptions of those people who would listen to music alone. Since music had always been a part of social and communal events, solitary listening was, to some, considered evidence of "an unwell mind, whether caused by mental instability or substance abuse" (Taylor, 2012, p. 16) Through the 20s these feelings diminished, as people began to hold listening parties and took their listening into the home.

This invention changed not only the industry of music, but had an effect on the 'battle of the sexes' that was going on in the early 1900s. They made high-class entertainment more affordable and, at the time, highly portable.

These changes have only improved since then, and now recorded music has permeated our everyday society. I included music into the piece that I recorded for this fact. Even though I do enjoy many aspects of silence, I often find myself putting on music while I work. The sound, even when very low in the background, allows my mind to not focus on any sounds in particular.

There is also the aspect of recorded silence that can be discussed here. When you listen to a vinyl record or a cassette, or any other form of analog recording, you can hear a hiss or a crackle filling the silences between the music. These sounds can come from a number of different places, including dust or just the hiss of the motor, but all have a similar effect. They fill what we would often consider silence with another sound. This sound is often called surface noise. Using this term to describe silence in a recording is interesting, as it terms recorded silence as being filled with noise. Although no one would immediately hear this sound when someone said 'silence' this is another example, similar to radio, in which technology has made an unintended change on how we define silence.

Industry

Not everything is invented with the idea of its sonic effect taken into consideration. There were many inventions that changed the soundscape of our everyday lives but have nothing specific to do with sound. Just looking at two of the inventions that I mentioned previously, the airplane and the automobile, you can see exactly what I mean. No matter how large or small your town is, you can always hear the hum of cars as they drive by. Some areas may only hear one or two cars pass an hour, but the bigger the city the louder the hum. The airplane is the same. Its sonic qualities won't often affect you unless you live near an airport, but its effect is similarly easily recognizable.

These two examples were the easiest to bring up, but there are many, many more. Many of the sonic changes brought about by industry have now folded themselves into the

background hum of our lives. In the early 20s they had the sound of large factories as they created the product of industry. Today, though we still associate the word 'industry' with large factories, we don't hear as much the process of industry but instead the output that it creates. The hum of a working air conditioning unit, cars as they drive past, the sound of your computer as it turns on, the office vending machine as it dispenses your midday snack; all of these are examples of the sounds of industry that we hear on a regular basis.

I included a number of these aspects into my piece, including the cars as they drive past my work and the many aspects of my computer that I use on a daily basis. As with many of the sounds I've mentioned here, these sounds blend into the silence until the moment that they are isolated. The hum of the air conditioner at the student-run station is a great example. Even though the unit creates a louder noise floor than many other rooms, it still falls into the background.

The difference between silence and noise

These inventions and their descriptions of making 'noise' bring up the question of what distinguishes a sound as noise. There seems to be an acceptable collection of sounds that can still be described as silence, but when do these sounds become noise? This question has been asked time and time again and was also one of the reasons that motivated me to work on the sound piece. The question has been brought up many times before, and there is no specific answer-nor will there ever be. Each person will have their own opinion on the definition of noise. Though silence and noise are not polar opposites, they are related.

The Roaring 20s

In the 20s, the content of the sound was taken into question. Although much of the noise was due to industry, there were still residential areas that were filled with the sounds of loud parties. Thompson discussed one example where a woman was not held accountable for the loudness of her parties because a number of witnesses came to declare that the music she played was of the best "artistic character" and therefore not noise (Thompson, 2002, p. 32).

At this time, the difference was often between natural and mechanical. In the terms of music, classical was not considered noise because one must be well educated to be able to play it, and the most educated and well-to-do members of society enjoyed it.

There were many sound artists who were working outside of classical composition. "By the latter half of the 1920s, the arts were suddenly better equipped, due to an audiophonic-led revolution in communications technologies involving radio, sound film, microphony, amplification, and phonography" (Kahn, 1999, p. 10). Some artists were working to include noise into their art; the whole genre of jazz had a lot of influence from the 'noises' of life in the city. As time progressed the question of what defined silence and what defined noise became more and more commonplace.

John Cage & Other Artists on Silence and Noise

Since there is no specific answer, this has been something that has been looked at by many sound artists, John Cage being one of the most well-known. As our environment changes so does the perceived silence. Unlike most people, Cage described silence as its own music. "Wherever we are, what we hear is mostly noise. When we ignore it, it disturbs us. When we listen to it, we find it fascinating" (Cage, 1961, *Silence*, p. 3).

Salomé Voegelin took a different view on how to listen to silence. She argued that silence isn't about opening up or locking all sound into a musical time frame. Her opinion was that, "silence is about listening, listening to small sounds, tiny sounds, quiet and loud sounds out of any context, music, visual or otherwise" (Voegelin, 2010, p. 81). However Voegelin did agree with Cage in the fact that silent sounds can be loud, as much as noisy sounds can be quiet.

But what is this 'noise' that they speak of? Douglas Kahn described the development of the term noise saying that it "developed because of the unwillingness, inability, and awkwardness within the arts to adequately incorporate these sounds and tactics" (Kahn, 1999, p. 10). This is not the only definition of the term. There are those who argue that noise and, more specifically, noise-art are extreme sounds "that take possession of one's ears by one's own free will and against it, isolating the listener in the heard. (Voegelin, 2010, p. 44). For this reason, listening to noise could be considered 'extreme listening'.

I personally preferred Kahn's description of noise by way of handwriting. The written alphabet is made up of a basic set of letters that, when written, can be read without problem. Kahn explained the inconsistency that can be seen in handwriting, from pure legibility to illegible scrawl. "What in some cases might be considered either undesirable or extraneous –that is, noise –might also be read as a person's style, the result of physiological (sickness) or environmental forces (writing on a bus), and the like. What one considers to be a scrawl depends on who is doing the considering, when, where, and in what capacity. Where a teacher would be intolerant of scrawl, a graphologist would be excited by its wealth of information" (Kahn, 1999, p. 26).

John Cage sought to distinguish between what he called *all sound* and *always sound*. To him "sound was no longer tied to events but existed as a continuous state as it resonated from each and every atom…where one might expect night to remove light and give vision a rest, aurality would still exist. Everything always made a sound, and everything could be heard; *all sound* and *always sound* paralleled *panaurality*" (Kahn, 1999, p. 159). Going even further than this he explained that, "…there could be no such thing as *a sound.* Any sound, once it has time to be heard, is plural (Kahn, 1999, p. 232).

These ideas were some of the thoughts that influenced my work into the silences of my every day. The way that these artists described silence and how we listen to it led me to pay more attention to the silences of my every day. When I did that I became very aware of how much of my day is spent in relative silence. I also realized how much I do to change my environment. Through playing music or making small talk I am avoiding my own silences. The sound piece that I created looks into how we change our silence, and focuses on how silence changes not only by what we do but also by the way we listen to it.

Listening Today

"One can look at seeing; one can't hear hearing" (Kahn, 1999, p. 9). I can tell what a person is looking at by following their gaze, but I can never tell what a person is listening to. There are always assumptions that can be made, and even visual cues that can inform me to what you're paying attention to, but I will never really know. This is due to the fact that we never stop hearing. When your eyes are tired, you can shut them. However you can never turn off your ears. It was mentioned briefly earlier with John Cage and *all sound* that there is always sound. No matter how quiet the space you're in there are always vibrations being gathered by your

ears. The sense is different from others in the fact that it never stops and someone who is not doing the hearing cannot recognize it. This makes it impossible to "hear hearing".

It's often considered easier to see something than it is to hear something. There is rarely confusion when you see something as to what that object is, and if there is confusion you can generally look again. Hearing is very different. Without visuals there are many sounds that we don't recognize what causes the sound. There is also the fleeting nature of sound. Once it passes we cannot hear that sound again, unless it was recorded. The literal differences and difficulties of hearing have changed how we listen, but there are also the cultural aspects of listening.

Everyone always says, "seeing is believing" but what about hearing?

The Science of What We Listen To

There have been many studies in the context of radio that have looked at what people want to hear. While many of us will outwardly say that we don't want to listen to the same 40 songs over and over again, there are many studies that have determined that we are lying. What we really want is familiarity. "There is evidence that a preference for things that sound "familiar" is a product of our neurology. Scientists have examined people's brains as they listen to music, and have tracked which neural regions are involved in comprehending aural stimuli. Listening to music activates numerous areas of the brain, including the auditory cortex, the thalamus, and the superior parietal cortex. These same areas are also associated with pattern recognition and helping the brain decide which inputs to pay attention to and which to ignore. The areas that process music, in other words, are designed to seek out patterns and look for familiarity. This makes sense. Music after all, is complicated. The numerous tones, pitches, overlapping melodies, and competing sounds inside almost any song – or anyone speaking on a busy street, for that matter – are so overwhelming that, without our brain's ability to focus on some sounds and ignore others, everything would seem like a cacophony of noise. Our brains crave familiarity in music because familiarity is how we manage to hear without becoming distracted by all the sound…habits allow us to unconsciously separate important noises from those that can be ignored" (Duhigg, 2012, p. 202).

Although this description refers to music listening, it applies to silence as well. Those sounds that our brains decide are unimportant noises fall into the background that we often classify as silence. If this isn't the case, the sounds will likely stick out as a nuisance. This was the central idea of my creative work. These sounds that fall into our 'silent' backgrounds can easily also be considered noise. Some of the sounds I decided to use required amplification and repetition in order to be moved out of the area of background into the focus of foreground. This was because many of the sounds are so often part of our background environment, sounds that we don't care to focus on, that it's hard for them to stand out otherwise. Today these sounds are often related to, if not created by, technology.

Technological listening of Today

There are so many places today that music, and sound in general, is found; not only at home or at a live event, but also in the grocery store, and even while you walk down the street. These many venues, and the freedom of choice offered by mobile devices have changed the face of listening today. "With the advent of the Walkman, the Discman, the DATman, the car radio, tape, and CD player, we have all become monarchs, at least in the sense that we can cut ourselves off from our surroundings" (Toop, 1995, p. 271).

Being a student in college, I walk each day to campus and see a large portion of my fellow students walking with earbuds or, more recently, a pair of large over-the-ear headphones. Some are using their devices to listen to music or podcasts and others are using them to carry conversation with a friend or family member on the phone. This creates their own micro environment. One which is easily set within our ears and silences the outside world, replacing it with music or voices that are familiar. This is one of the most common examples of how our everyday environment has changed sonically over the past fifty years. We have become mobile and have nearly unending control of what we hear around us at any moment.

In his book, David Toop said, "the general lack of deep engagement with all this stimulus is disarming, alarming or enthralling. It depends on your mood, your point of view, your vested interest in products and solid values, or invisible, intangible, emergent, shifting communications" (Toop, 1995, p. 10).

Though my opinion on the matter differs from Toop's, I do agree that there can be a lack of engagement in our present-day listening. Whether we are listening to an album for the first time or our favorite album in the background while at work, there are many instances where we hear but we just don't listen. I found this was true for me when I finally began to pay attention to the every day sounds of my life. I determined that I was trying to drown out the sounds of the birds outside the window by playing music. Sometimes this was with the purpose of a greater focus or productivity, but often it was just to have something to fill the silence.

My personal analysis/opinions on silence and noise

In my opinion, the difference between silence and noise depends entirely on perspective. Our brains will categorize them as they see fit, and do a very good job of it.

The term noise has a very negative connotation. It is something unwanted. There is noise art, such as Merzbow, but even this use of noise is not enjoyed by the majority.

In my experiences, location is one aspect of a sound that could easily change its definition. When listening to an orchestra, the sound of a bird would be an unnecessary noise. But that same bird would be able to blend into the silence when in nature. This example may be extreme but does demonstrate the situational aspect of defining sound.

Repetition can also be important to our definition of a sound as silence or as a noise. For instance, that same bird when chirping occasionally would, once again, be part of the 'silence' of nature. But if that same bird, even when still in nature, chirped louder and more often than the other birds, after a while it's chirp begins to be a noise instead of just a part of the background.

On a similar note, what if there is no context. What if I were to put on headphones and just listen to sounds. How would I classify them? Our society places a lot of importance on the visualization of our surroundings. Sound is generally considered little more than a great addition to what we see.

Conclusion

Today, if you were to look above your head in an office you would see sound-absorbing tiles. If you were to listen as you walked down the aisles of your grocery store, humming behind the sounds of families and rolling carts, you would hear music piped in. These are the most common examples of the sound design that is included in our everyday environments. This may

not be the most common use of the term 'sound design', but it is nonetheless a design of the sound we hear every day.

Over the past 100 years the science of architectural acoustics has been improved and our environments, from special facilities to every day locations, have become designed for productivity and silence. Since the incorporation of this design process into buildings we have started to fill our well-crafted silence with recorded music and other 'background noise' to fill the void of sound.

There is no way to definitively define what noise is and what silence is. The terms are fluctuating and can be influenced by any number of things. However, there are many things that allow us to manipulate the noises and silences that we hear.

This flexibility is possible thanks to the advancement of technology. The technological improvements that humanity has gone through since the 1920s has changed our soundscape permanently. It has given us new and unknown sounds and reshaped how we see old sounds. Although technology has brought with it a number of different sounds that many classify as noise it has also allowed for the sounds we do want to hear to be improved. Technology has changed our everyday soundscape and allowed even greater control over what we hear each day.

All of these are small things that have added up over a history of innovation to create our modern version of silence.

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