20-20 listening: a sound documentary dedicated to the study of listening experiences in acoustic environments

Julian Andres Osorio
Iowa State University

Follow this and additional works at: https://lib.dr.iastate.edu/etd

Part of the Acoustics, Dynamics, and Controls Commons, Art Education Commons, and the Graphic Design Commons

Recommended Citation
Osorio, Julian Andres, "20-20 listening: a sound documentary dedicated to the study of listening experiences in acoustic environments" (2016). Graduate Theses and Dissertations. 15050.
https://lib.dr.iastate.edu/etd/15050

This Thesis is brought to you for free and open access by the Iowa State University Capstones, Theses and Dissertations at Iowa State University Digital Repository. It has been accepted for inclusion in Graduate Theses and Dissertations by an authorized administrator of Iowa State University Digital Repository. For more information, please contact digirep@iastate.edu.
20-20 Listening: A sound documentary dedicated to the study of listening experiences in acoustic environments

by

Julian Andres Osorio

A thesis submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

MASTER OF FINE ARTS

Major: Graphic Design

Program of Study Committee:
Alex Braidwood, Major Professor
Paul Bruski
Christopher Hopkins

Iowa State University
Ames, Iowa

2016

Copyright © Julian A. Osorio, 2016. All rights reserved.
DEDICATION

The following work is dedicated to my family, Martha, Jairo and John. My closest friends: Calee, Sam, Heather, Ryan, Anna, Emily. Thank you to my second family Jaime, Daphne, Heidi and Adriana. As well as everyone that accompanied me in this journey, and offered support, advice, encouragement and motivation. Thank you all.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIST OF FIGURES</td>
<td>v</td>
</tr>
<tr>
<td>ACKNOWLEDGMENTS</td>
<td>vi</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>vii</td>
</tr>
<tr>
<td>FOREWORD</td>
<td>viii</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>ix</td>
</tr>
<tr>
<td>CHAPTER 1 THEORETICAL FRAMEWORK</td>
<td>1</td>
</tr>
<tr>
<td>1.1 On Hearing</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Listening to the Environment</td>
<td>2</td>
</tr>
<tr>
<td>1.3 Auditory Scene Analysis</td>
<td>4</td>
</tr>
<tr>
<td>1.4 Listening to Sound in Film</td>
<td>5</td>
</tr>
<tr>
<td>1.5 Listening to Video Game Sound</td>
<td>8</td>
</tr>
<tr>
<td>1.6 Dynamic Audio</td>
<td>10</td>
</tr>
<tr>
<td>1.7 Semantics of Film and Video Game Sound</td>
<td>11</td>
</tr>
<tr>
<td>CHAPTER 2 NOTES ON HEARING AND LISTENING</td>
<td>13</td>
</tr>
<tr>
<td>(Podcast Episode 1)</td>
<td></td>
</tr>
<tr>
<td>CHAPTER 3 NOTES ON LISTENING TO THE SOUNDSCAPE</td>
<td>15</td>
</tr>
<tr>
<td>(Podcast Episode 2)</td>
<td></td>
</tr>
<tr>
<td>CHAPTER 4 NOTES ON SOUND IN VIDEO GAMES</td>
<td>17</td>
</tr>
<tr>
<td>(Podcast Episode 3)</td>
<td></td>
</tr>
<tr>
<td>CHAPTER 5 NOTES ON SOUND IN FILMS</td>
<td>20</td>
</tr>
<tr>
<td>(Podcast Episode 4)</td>
<td></td>
</tr>
<tr>
<td>CHAPTER 6 NOTES ON SOUND AND PLAY</td>
<td>21</td>
</tr>
<tr>
<td>(Podcast Episode 5)</td>
<td></td>
</tr>
<tr>
<td>6.1 Project Process: Play Stop</td>
<td>21</td>
</tr>
<tr>
<td>6.2 Project Process: Silly Urbanity</td>
<td>24</td>
</tr>
</tbody>
</table>
**LIST OF FIGURES**

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1</td>
<td>The Hearing System</td>
<td>2</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Chion’s Listening Modes</td>
<td>8</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Tuuri, Mustonen, and Pirhonen Listening Model</td>
<td>12</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Play Stop video still #1</td>
<td>21</td>
</tr>
<tr>
<td>Figure 5</td>
<td>Play Stop Schematic #1</td>
<td>22</td>
</tr>
<tr>
<td>Figure 6</td>
<td>Play Stop Schematic #2</td>
<td>23</td>
</tr>
<tr>
<td>Figure 7</td>
<td>Silly Urbanity still #1</td>
<td>24</td>
</tr>
<tr>
<td>Figure 8</td>
<td>Silly Urbanity still #2</td>
<td>25</td>
</tr>
</tbody>
</table>
ACKNOWLEDGMENTS

I would like to thank my department chair, Bernard Canniffe, for his support and advice, and my committee members, Alex Braidwood, Paul Bruski, and Christopher Hopkins, for their continued guidance and support throughout the course of this research.

In addition, I would also like to thank Calee Himes, Ryan Hubbard, Samantha Barbour, Heather Purdy, Brennan Scott, Ryan Williams, Ryan Hubbard, Audrey Kennis, Meredith Foley, Paula Curran, Brenda Jones, my friends, colleagues, the department faculty and staff for making my time at Iowa State University a unique and wonderful experience. I want to also offer my appreciation to those who participated in my work, research, recordings, installations and observations, without whom, this creative endeavor would not have been made possible.
ABSTRACT

The intersection of sound and design is an exciting and complex space for artistic experimentation and research. My approach for this work was to design, write, record and mix seven podcast episodes that narrate my analysis and interpretation of how we listen to sounds and interpret their meaning. Each episode is dedicated to one topic, and presents multiple sound samples that illustrate my take on the subject. The episodes cover the basics of listening, how sound conveys information about objects in environments and how soundscapes are ubiquitous. They include how the music, sounds and noises in film convey meaning, represent physical qualities and produce an emotional connection with viewers. I also introduce an episode on dynamic audio in video games, and the process of design conceptualization and artistic interventions to make simple sound-based prototypes for people to make sounds, play and enjoy. Furthermore, I introduce the story of a whistling language in the Canary Islands to illustrate the concept of “acoustic community,” and how soundmarks create meaning and a sense of belonging in a social group. I also present a sonic composition that uses speech, sounds, noises and music to create an artistic narrative. This project is the sum of experiments in my sonic journey; it is an audio documentary that uses the listener’s focal attention to create stories about listening.
FOREWORD

The following creative scholarship is a compilation of works from making and experimentation with design and sound. In this work I present analysis, deconstruction and explanation of projects, methodologies and the learning outcomes from working in the intersection of sound and design. Alongside this creative making endeavor uses research as a theoretical framework to provide a methodical design approach to the podcast episodes. This work extends from projects, to a written document, to a podcast series, and a website. It is designed to be a multimedia deliverable that is accessible to an academic and non–academic audience. The complete content of this work is available at

www.osorioworks.com/2020listening/

For the listening experience please refer to the Soundcloud account, found in this link:

https://soundcloud.com/user-610620414

The conversation transcripts of the Podcast episodes can be found in the Appendix section. In addition, as of April 20 2016 this creative work is also fully available at

I work in the intersection of sound and design. It is a place where symbols are visual and sonic; it is an intersection where written words are also the sounds of language. This cross-disciplinary place does not offer straight answers, instead offers questions that can only be investigated through a blend, a combination, a collage of thinking and making. This type of remix philosophy has guided my creative work. It’s characterized by experimentation in the use of design with sound, and sound used for the purposes of design. These juxtaposed disciplines can find different forms of expression. Some of which are films, video games, vlogs (and blogs), interactive installations, podcasts, websites, Apps for mobile devices, theater sets, performance art, concerts, branding campaigns, VR experiences, the list of forms of media is endless. It’s through the mix and match of different media that design and sound not only co-exist but thrive to make something greater. Together they are impactful films, addicting video games, charming vlogs, engaging installations, one always intertwined with the other, seeing and listening as one, both part of a single experience. This ideal is what has guided my creative endeavor, and it is based on two questions:

1. How can I make design that incorporates sound?

2. How can I design with sound?
These questions offer an approach to working with sound and design as a cooperative set of disciplines. Both are indispensible, and often one is more apparent then the other. Yet, both at work in the process of learning outcomes, designing and the making an object.

The title of this creative work is “20-20 Listening: A sound documentary dedicated to the study of listening experiences in acoustic environments.” The name is inspired by the human range of hearing which starts at the baseline of 20 Hertz, and expands to 20,000 Herzt or 20 Kilohertz (kHz.) for short (Wiener 5). It is also a “documentary,” a collection of episodes that narrate my analysis, interpretation and representation of how we listen to sounds in acoustic environments.

The scope of this work is a podcast series that presents my interpretation of the listening experience using sound as the main object of study. In the series I take a wide variety of listening experiences and deconstructs the how sound conveys information and what possible meanings we deduce from what we are hearing. The road that lead to this podcast is based on my learning outcomes from projecting unfamiliar sounds into space, prototyping simple sound–based interactions, theorizing about how sound can be used in design situations, recording, mixing, designing, and narrating my learning journey.

To explain how listening works I use three Listening Modes, the first one corresponding to the works of the theorist Michel Chion in particular, referring to his work in “Audio–Vision” (25), the second model is proposed by Barbara Flueckiger in her work “Sound Effects: Strategies for Sound Effects in Film” (151). I refer to the six point listening model proposed by Tuuri, Mustonen and Pirhonen in “Same sound – Different meanings: A Novel Scheme for Modes of Listening” (16). The three listening models are the theoretical
framework used for the design of each episode, for explaining the content of each episode and the overall structure of the audio documentary podcast.

For my making approach I considered sound editing as a form of collaging with sound. To craft each episode into a narrative. By dedicating one section to the sound in film, I describe how sound works as symbols and representations of concepts and ideas about the unseen. Another episode is about the interactive use of sounds in video games, and how they function to entertain and relay important game information. This concept of sound as a rewarding experience and as an information cue inspired the prototyping and construction of two sound-based interactive installations. At their core, these installations begin to engage with my original question: “How can I make design that incorporates sound?” While the entirety of this investigates: “How can I design with sound?”
CHAPTER 1
THEORETICAL FRAMEWORK

1.1. On Hearing

The human hearing system is anatomically composed of three major sections: the outer ear, the middle ear and the inner ear (Weiner 9). Each of these different sensing sections performs elaborate tasks that can be summarized into: converting acoustical energy waves into neurological signals (Schnupp, “Lesson 5: Hearing Things”). The outer ear is the first part of the sound transducing system and its primary function is to transmit sound energy to the tympanic membrane (Alberti 2), from there it is transmitted to the middle ear which is composed of three principal bones: the malleus, incus and stapes (Alberti 2). From there it is directed to the cochlea, which is a bony cavity in the shape of a snail. Inside there are four rows of tiny hair cells that are sensitive to different frequency ranges (Wiener 4). When the human ear is actively hearing it perceives sound with three major qualities, which can be summarized as: Timber, Pitch, and Loudness. Timber is understood as the tone qualities of a sound, it is linked to the behavior of the harmonics that accompany a sound, thus providing a unique “color,” that can be associated to the material qualities of the sound source. Pitch corresponds to the frequency of the sound wave vibrations; the ear associates higher frequencies with higher pitches, while wider waves are perceived as low sounding sounds (Wiener 5). Loudness is the intensity in which the sound is perceived. What commonly is associated with the term: volume. The perception of this phenomenon can be influenced by the proximity to the sound source or by the potency of the sound wave.
The ear is selective in what it listens to, an example of this is how it mostly filters out many of the body’s own biological sounds, which are of low potency, yet are produced from blood flow, brainwaves, heart beat, the airflow of the lungs, among other sounds of equal subtlety (Schafer 207).

Figure 1. The Hearing System (Schnupp, “Lesson 5: Hearing Things”)

1.2. Listening to the environment

Hearing is one of the major senses of perception, it is used for functions that range from perceiving the qualities of the surrounding environment, including: possible dangers, pleasurable experiences such as music, calibrating our voice projection and communicating with others (Hanson 2016). When actively listening to the acoustic environment, I refer to listening to the soundscape, which is defined by R. Murray Schafer as:
“The soundscape is any acoustic field of study. We may speak of musical composition as a soundscape, or a radio program as a soundscape or an acoustic environment as a soundscape. We can isolate an acoustic environment as a field of study just as we can study the characteristics of a given landscape.” (Schafer 7)

For my study of the soundscape, I start with Schafer’s categories for understanding sounds, which are identifying individual and collective sound as either: Keynote sounds, signals, soundmarks and archetypal (Schafer 9). **Keynote sounds** give a place a distinct acoustic identity, be it through the sound of crickets, birds, waterfalls, wind, forests, etc. These sounds can be of any form, yet they are always present in that particular acoustic space.

“Even though keynote sounds may not always be heard consciously, the fact that they are ubiquitously there suggests the possibility of a deep and pervasive influence on our behavior and moods.” (Schafer 9)

**Signals** are sounds that call to our attention; they contrast with the background sound or the continuum (Oliveros 13) and are listened to on a very conscious level, for example the sound of a siren. These sounds are also codified and interpreted by several listeners. **Soundmark:** “refers to a community sound which is unique or possesses qualities which make it specially regarded or noticed by the people in that community” (Schafer 10). These types of sounds are instrumental in the building blocks of acoustic communities.
1.3 Auditory Scene Analysis

The process of listening to the environment involves what Bergman refers to as “Auditory Scene Analysis” (Bergman 15). This process consists of a set of listening regularities in which the mind will process sound events, and will determine the distance of a sound, potency or estimated loudness, loudness of a sound event in comparison to another, the blend of two identical sounds from different sources (Bergman 17). The first one of these regularities is: “Unrelated sounds seldom start or stop at exactly the same time” (Bergman 17). This refers to the ear’s ability to perceive micro-differences in the timing of different sound events; this ability is used to construct the steady flow of sound information or the continuum (Oliveros 13). An example of this is that a steady tone with short bursts of a different sound will seem to have continued sounding in the background, even if in reality the sound was interrupted (Bergman 18). The Second regularity consists of two parts:

“A. A single sound tends to change its properties smoothly and slowly. B. A sequence of sounds form the same source tends to change its properties slowly.” (Bergman 18)

An example of the first regularity is the sustained note of a musical instrument, which will contain minor difference throughout a set period of time, yet it will still be perceived as steady unified tone. Also the repetitive sounds of an engine, which is a cacophony of multiple sound events, yet united make a singular engine sound perception. And an example of the second regularity is the sound of footsteps; each step will have micro-differences in loudness, timber and pitch, yet they will still be identified as footsteps belonging to the same person or the same sounding source (Bergman 16). The ear uses these auditory scene analysis
methods to quickly scan and identify objects in space and make estimates of their acoustic qualities. Our listening is also conditioned by harmonic sounds: much of the human hearing range is harmonic (Bergman 14). This means that the components of a single sound are the sum of multiples of a fundamental frequency (Bergman 16). With this assessment, the mind actively deduces the range of sounds possible from a single sound source. The resulting sound that is perceived is a totality or mixture of memory and timber analysis. This is the reason why we can identify a violin, when it plays in higher registers or all the way to its lowest sound range in the low G String (Bergman 18). These sound regularities of objects can also be described as Micro-temporal properties, and they are the sonic affordances that are directly correlated to the materiality of the object (McAdams 152). An example of these micro-temporal properties is the way we expect things to sound. One way of predicting or defining the sounding affordances of the object is by referring to the memory of previously experienced sounds. We thus anticipate what sounds an object could make. E.g.: Taking a metallic object, we expect that if it were to fall, struck or moved, it would and should produce a sound that meets our expectation of “metallic sounds” (McAdams 153).

1.4 Listening to Sound in Film

Sounds in film narrate, the unseen and crucial parts of the film’s reality (Chion, Film – A Sound art, 143). My approach is to focus on the dimensions of sound proposed by film theorist Michel Chion (Audio-Vision 25). His theoretical framework was used to understand the podcast format as a non-diegetic from of narrative, and as a form of media that can properly present sound as the medium and method to convey and narrate the study of sound.
One element that is not included in the present work is engaging with the semantics or the psychoacoustic qualities of speech. This is a valuable component in our study of sound, yet it extends beyond the scope of the present creative work. The two main categories of: diegetic sound and non-diegetic sound are the basis for understanding sound sources, and their placement and function in the film scene (Audio-Vision 25). Diegetic sounds are auditory events that the viewer/listener can see and identify; it originates from the action that is taking place. In this category there are visible dialogues, music from on-screen instruments and sound effects of the objects that are present in the film-world (Chion, Film, A Sound Art 139). Technically, every sound on film is manufactured and is not being emitted by an object, yet the implication of identifying the sound-making object, is one of the cornerstones for immersion in film (Hug 119). Non-Diegetic sound is when the perceived sound is not part of the action that is being depicted; this includes ambient soundtrack, not-on-screen narration and/or commentary and sound effects (Chion, Film-A Sound Art 142).

My interest with these categories is in how they are interchangeably used in film to create the world-reality of the motion picture. The motion picture presents a soundscape that conceptually imitates the soundscape of everyday experience: objects sound. For using sound effects and sound samples I refer to Barbara Flueckiger’s categories for understanding the roles of sound in film and audiovisual media (Sound Effects 152). Firstly, the combination of diegetic and non-diegetic sound can provide “orientation, setting and scenography.” (Hug 212) Thus, offering a fast auditory scene analysis and allowing the viewer/listener to quickly make assessments of the geographical space, time period, and the suggested emotional state of the on-screen action. This relates directly to the previously defined: Auditory Scene Analysis (Bergman 18). The second category is how sound can give on-screen objects
materiality, dimension, volume and density (Flueckiger 153). This “physicality” of objects is achieved through the artful combination of sound design, also called Foley sound, and the use of music in film. One condition to remember is that almost all sounds in a film and in a video game are completely manufactured and crafted to fit the overall soundscape of the film. This sound design is useful in replacing the “real world equivalent sound,” since the real life sounds would not suit the sound world of the audiovisual dimension (99percentinvisible, “99% Noise” 2010).

For a more engaged understanding of the meanings of the sounds in a film there are a series of questions provided by Barbara Flueckiger. These questions are: “What emits sound? What moves? What material emits sound? How does it sound? Where is the sound?” (Flueckiger 151 - 154). These questions are a more detailed deconstruction of what Chion has referred to as three modes of listening, which are named: Causal, Semantic and Reduced (Audio-Vision 25). “Causal listening, the most common, consists of listening to a sound in order to gather information about its cause (or source)” (Chion, Audio-Vision 25). Causal listening is a way of probing and investigation in which we make assumptions and draw conclusions from the object or objects that created the sound event. This also relates directly to Berg’s Auditory Scene Analysis (Bergman 18). Chion characterizes Causal listening as our primary form of acoustic scene analysis, yet it is also a form of listening that is susceptible for deception, which is effectively exploited by the sound design and the editing of films (Chion, Film - A Sound Art 138 -140). Semantic Listening: refers to a codified system of sounds that have a meaning to the listeners, in short this means any form of languages, or codes, e.g: Morse code. Pierre Schaeffer refers to “reduced listening” as a way of listening that focuses on the sound qualities of the sound itself excluding the cause or the
meaning of the sound. It is an analytical and contemplative approach that allows for a very deep understanding of the sounding qualities of the sound (Chion, Audio-Vision 31). This also requires that the studied sound, or “objet sonore” be studied first by being recorded, then later played, analyzed and deconstructed, rewind and then played again (Kane 4).

![Figure 2. Chion’s Listening Modes. (qtd. in Tuuri, Mustonen, and Pirhonen 14)](image)

1.5 Listening to Video Game sound

The framework provided by Chion’s categories and Flueckiger’s questions for analyzing sound effects, have been useful for me to transposed and apply the terminology into the presentation and analysis of sounds in video games. By drawing parallels in the theoretical framework between films and in video games, I have a wider set of tools to present sound to the listeners and analyze its meaning. In addition, I will also define the sound world of the video game as a soundscape, which I approach as the combination
proposed by Schafer’s definition and the human-centric definition by Emily Thompson in “Sound, Modernity and History” (Thompson 119). Hug has proposed three conditions that are unique to the functions of sound in video games (Hug 119). The first one is that the soundscape of the video game word should confer a sense of completeness, this means that the virtual world should replicate the in part, the logic of acoustics of our own physical soundscape. In the video game world: footsteps should sound, doors, swords, jumps, and so on. In short, objects have to convey the sense of physicality, as a basic level of interactivity: physical objects make sound.

This is similar to what Flueckiger proposed for film sounds, with the added condition of sound working and reacting logically to the player/listener’s play-through experience (Collins 151). A second condition is that the sound qualities of the game’s soundscape should be consistent, this refers to the technical aspect of keeping consistent timber of objects, consistent loudness of cues, consistent relationships between an object and the sound it makes, and consistency use of the sound mix and/or remix of the video game’s music or soundtrack (Hug 218). This aims to have sounding objects that sound familiar, and new sounding objects should have a different or new sound once they are introduced. Video game sound also has to be adaptive, “In games, the story is fragmented and highly dependent on the user’s input” (Hug 218). This means that a player/listener may stay in a game area fro 10 minutes or 1 hour, and the sound and music should adapt to these flexible time frames (Collins 142). In Karen Collin’s book “Game Sound” she explains the technical process to create “dynamic audio” which is a detailed deconstruction to Hug’s term of adaptive sound.

1.6 Dynamic Audio
In video games there are more complex relationships between perceiving sound sources, identifying sounding objects and the player’s actions that either trigger adaptive audio or interactive audio cues (Collins 125). It is uncommon to combine both cinematographic terminology as diegetic or non-diegetic audio, yet I find it beneficial when analyzing the resulting sounds of actions on the video game screen. Interactive audio is for example, when a player encounters an enemy, the soundtrack changes to battle music. It is an interactive audio cue to a set of conditions determined by proximity.

“Adaptive nondiegetic sounds are sound events occurring in reaction to gameplay, but which are unaffected by the player’s direct movements, and are outside the diegesis” (Collins 126).

An example of this is the different soundtracks of day/night cycles in games, which are triggered through the game’s internal clock (Collins 142). Interactive diegetic is when a player interacts with an object and it makes a corresponding sound, for example the Guitar Hero franchise requires a controller that is in the form of an electric guitar, and in the interface, the buttons correspond to the buttons of the controller. (Guitar Hero, Activision 2005). The player is tasked with pressing the corresponding buttons, in sequence and in sync with the song’s tempo, and thus “play” the song effectively. Non-adaptative non-diegetic can be related to continuous music loops in a game level. These categories are not exclusive and should be understood as fluid forms of sound in the context of video games (Collins 125). A great example of this multimodal use of sound is in found in the Red Dead Redemption soundtrack, when the player is riding his horse to a new segment of the game, the audio plays Jose Gonzales’ “Far Away,” this song is triggered through starting the gallop to the new destination, yet it has a set time frame to connect two distinct game-play sections. It is both
Interactive, adaptive and non-diegetic. Video game audio is one of the key elements in providing environmental information to the player/listener (Collins 140). Sound cues can indicate dangers, completion of tasks, can provide soundscape awareness, can serve as symbols, signs, soundmarks, leitmotifs, which will be discussed in the following section.

1.7 The Semantics of Film and Video Game Sound

Sounds can be thought of as signals, which are sonic objects that have specific meaning built in a society (Hug 214). Sound symbols, have a very specific significance, these can range from ambulance sirens, church bells, police sirens, weather warning alarms, among others. Key sounds, gain meaning through repetition and placement in a specific context or in a media, an example is when Mario jumps and hits the coin cubes until the cube has run out of coins, then it changes to a darker color and there is a specific sound that indicates it has run out of coins (Nintendo, Super Mario Bros 1985). A sound that is categorized as a Stereotype, is a sound that through repetition within a context or media it becomes a well known conventional (Hug 119), for example the “Wilhelm Scream” can be found in numerous films (Greene, “Does My Voice Really Sound Like That?”). The leitmotif, is a figure, a situation, a character or a place that is identified with a unique melody, sound or musical expression. This is not limited to music and leitmotifs can also be created through non-musical sounds (Hug, 214).

A revised and extended system for Chion’s sound analysis and categorization can be found in Tuuri, Mustonen, and Pirhonen moden in “Same sound – Different meanings: A Novel Scheme for Modes of Listening” (Tuuri et al. 16). This system consists of six listening modes that expand on Chion’s three categories, and includes one category for semantic
analysis and one for the listener’s aesthetic evaluation of the sound. This table is also very effective for the analysis of singular sounds in isolated environments, and when the sound is directly correlated to the moving image (Figure 3).

<table>
<thead>
<tr>
<th>Type:</th>
<th>Mode:</th>
<th>Questions:</th>
<th>Example:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-conscious</td>
<td>Reflexive</td>
<td>Did you notice any reflexive responses triggered by sound?</td>
<td>Startle response!! It alarms and grabs an attention.</td>
</tr>
<tr>
<td>modes:</td>
<td>Connotative</td>
<td>Can you describe what kind of freely formed associations listening immediately evoked?</td>
<td>Big...strong...lots of power...close proximity...screeching...air blowing...whistle...scream...old steam trains,...western movies,...</td>
</tr>
<tr>
<td>Source-orientated</td>
<td>Causal</td>
<td>What could have caused the sound?</td>
<td>It’s a train. Critical second thought; the sound comes from the TV.</td>
</tr>
<tr>
<td>modes:</td>
<td>Empathetic</td>
<td>Does it feel that sound signals someone’s state of mind or intentions?</td>
<td>Whistle sounds feels desolate and angry.</td>
</tr>
<tr>
<td>Context-orientated</td>
<td>Functional</td>
<td>What was the purpose of the sound? What function does the context indicate?</td>
<td>The driver signals train’s departure. Critical second thought; sound is used as transitional cue between scenes (just before a visual cut to railway station).</td>
</tr>
<tr>
<td></td>
<td>Semantic</td>
<td>Does the sound seem to represent any symbolic/conventional meanings?</td>
<td>The whistle represents pain... of a suffering man (by replacing his scream)</td>
</tr>
<tr>
<td></td>
<td>Critical</td>
<td>Was the sound suitable for the situation? Did you understand it correctly?</td>
<td>Ah, no panic. That sound belongs to the movie. It was a cliche but quite effective.</td>
</tr>
<tr>
<td></td>
<td>Reduced</td>
<td>Can you describe the properties of the sound itself as objectively as possible?</td>
<td>Sound is high-pitched and loud. A big contrast against quiet earlier scene.</td>
</tr>
</tbody>
</table>

**Figure 3.** Tuuri, Mustonen, and Pirhonen Listening Model (16).
CHAPTER II

NOTES ON HEARING AND LISTENING (PODCAST EPISODE 1)

Sound is a fascinating subject, it’s “touching at a distance” (Schafer 12). When referring to sound, it is the pressure waves that are impacting the eardrum, which vibrates to the frequency of the perceived sound wave, and transmits the information to three bones that stimulate the tympanic membrane.

“Every sound we hear—birds chirping, bees buzzing, people talking, and recordings—is a wave of pressure moving through the air” (Soniak, “Why Do Our Voices Sound Different to Us Than to Other People?”).

On why we hear our voice so different once it is played back to us in a recording.

“When you speak, vibrations from your vocal cords resonate in your throat and mouth, and some get transmitted and conducted by the bones in your neck and head. The inner ear responds to these just like any other vibrations, turning them into electrical signals and sending them to the brain. Whenever you speak, your inner ear is stimulated both by internal vibrations in your bones and by the sound coming out of your mouth and traveling through the air and into the ears.” (Soniak, “Why Do Our Voices Sound Different to Us Than to Other People?”)

Language, listening and making sound are a form of making ourselves noticed, the use of sound and listening are the main channels in which communities communicate and develop a sense of belonging.
“Ludwig van Beethoven described deafness as begin condemned to a life of solitude amidst other people.” (Hug 209)

The human range of listening oscillates between 20hz and 20000hz. We are partial to listening more intently to certain frequencies, yet the ear is perceiving an incredible amount of information at any given moment, with different frequency, timber, loudness and pitch (Hanson, “What's The Loudest Possible Sound?”). The ear process incredible amounts of data, it understands objects and situations through instantaneous deconstructions that occur once the sound wave is perceived.

“The ear transports the spatial information quickly and holistically.” (Hug 207)

Or as Hug would describe it:

“The ear is multidimensional, assembling a stream of many simultaneous acoustic events in virtually milliseconds and extracting information from this stream.”

(Hug 206)

This relates tot Dr. Jan Schnupp’s lecture on “How your brain work,” which is that sounds carry information that we decode, through prior experience and through analysis (Schnupp, “Lesson 5: Hearing Things”). Listening is to understand sounds with contextual information, while performing analysis of the auditory scene.
In the recorded episode I talk about the soundscape being any and all forms of acoustic environment that range from music, to urban, to natural and so on (Schafer 7). In particular, I discuss with Brennan Scott some of the effects of architectural acoustics, which focus on the design of acoustic spaces for human activity, this includes both interior spaces and exterior spaces (Mehta, Johnson and Rocafort 10). The following is a more detailed list of the functions and areas of expertise of architectural acoustics, as described by Christopher Jaffe and Russell A. Cooper:

- Product and materials testing, measurement, and reporting
- Control of noise related to transportation systems
- Control of noise from building systems
- Environmental noise control within and near buildings
- Vibration and seismic control
- Electronic reinforcement and enhancement of sound (electroacoustics)

(Jaffe and Cooper 1)

We can experience the control of sound that is architectural acoustics in lecture halls, music halls, office buildings, libraries, open theaters etc. The materials, the angles of ceilings and walls are carefully planned so as to optimize human speech in particular (Mehta, Jhonson and Rocafort 229). My analysis on what architectural acoustics offers, is a mixture of praise at its wonders and also a critical point of view, in regards to the harsh sound qualities of big spaces, and how the use of materials for certain environments treats noise as an undesirable
byproduct of human activity, while it is in fact essential for auditory scene analysis (Bergman 22). As explained by Bernhard Leitner:

“Take the following solutions which are typical of our civilization: people are buried in rooms built out of concrete, and at the same time we are developing highly sophisticated stereo and quadrophonic hi–fi technologies to allow some sounds to come alive in these spaces.” (Leitner 117)

This duality does not mean that urban noise and urban soundscapes are seen as negatives, rather as part of a unity that is the characteristic: human soundscape (Thompson 118). In this episode I also referred to the work of Pauline Oliveros who is a prominent composer, professor and writer. She was through her work in *Deep Listening* she incorporated a holistic view of sound and music into what became “environmental sounds into musical performance” (Oliveros 14-20). Much of her work is cross-disciplinary, combining listening with meditation, using electronic sounds, music and sounds to lead listening through workshops that result in listening experiences, meditation, and more deeply engaged and mindful listeners.
Super Mario Brothers is one of the most successful and iconic games ever created. Mario first appeared in a different franchise called Donkey Kong (Nintendo, “Supermario” 1985). The musical theme introduced in this episode is known as the “Underground Theme,” and it famously took the longest time and effort for Koji Kondo to compose (Kohler, “Behind the Mario Maestro’s Music”). The technical limitations of the time forced the game development team to load the sound into the computer, test the timing of the theme with the animations and levels, and then remove it to continue programming (Collins 151). This made the process more time consuming for the composer, who would scrap the composition all together and start over (Stuart 2010). Needless to say, Super Mario Bros. is a global phenomenon that is considered a pop culture icon, evident in its popularity, merchandise and media presence (Nintendo, “Supermario” 1985). In this episode I explained Adaptive audio and Interactive Audio. Karen Collins defines these two categories under what she calls Dynamic Audio and provides ten approaches to creating variability in the design of game sound and soundtracks:

1. Variable tempo
2. Variable Pitch
3. Variable rhythm/meter
4. Variable volume/dynamics
5. Variable DSP/timbrres
6. Variable Melodies (algorithmic generation)
7. Variable harmony (chordal arrangements, key or mode)
8. Variable mixing

9. Variable form (open form)

10. Variable form (branching parameter-based music)

(Collins 148)

DSP refers to sound effects that transform or distort the original sound, such as reverb, delays, overdrives, etc. By algorithmic generation, Collins refers to melodic lines that are created by the computer, whom is following a programed set of parameters (Collins 149). This approach was not used in the Super Mario example, yet it currently is a growing trend in current video game soundtracks. Variable harmony refers to changing the key of the piece, for example from a major to a minor, or to a different musical scale system. In the category of variable mix it can be understood as changes in the number and types of instruments that are creating the music or sound effects, these changes can happen according to adaptive conditions of the game or interactive elements (Collins 152). The open form refers to an experimental approach of composition in which music is made by choosing random combinations of music, from a pre-established pool of sound cues, the program would choose and assemble randomly. And finally, the variable form depends on trigger points within the game. This is best summarized in:

“The composer, then composed musical sequences, and them conditionalized those sequences, making decisions involving which segments should play continuously, change, be enabled or disabled, loop, converge, branch, jump and so on”

(Collins 160).

The analysis of video game music and sound is by definition fuid and interactive, it shifts from object to event, to place and to motion of the character, the phenomenon is just as
complex as Schafer’s soundscape. In the video game world, the sound often is in flux, transitioning from adaptive, to non-adaptive or interactive to non-interactive, while also being diegetic and non-diegetic (Collins 142).
The *leitmotif* is a short musical phrase that is used to identify a character, situation or a place (Flueckiger 163), this is similar to what has been described as a *key sound* in the environment (Flueckiger 162), however it is intentionally crafted to convey a set of meanings. The *leitmotif* is commonly associated with the works of Richard Wagner (King, “Variations on a Theme”). In this episode, the minor second interval is the smallest components of the Jaws theme and I analyze the musical piece by using this interval as the principal *leitmotif*. As explained by Wingstedt, Brändström and Berg:

“The motif has played only when the shark is directly referred to”

(Wingstedt, Brändström and Berg 194).

In this episode I described the general soundscape of the scene in which “Jaws” attacks the child on the raft. This scene deconstruction sets the different sound events as narrative devices for the film, allowing us to transition between points of view, the beach and the underwater environment. I described how the sound is place of the visuals of the shark, because the animal is never scene, yet it is described thorough the use of music. In this scene, the sound of the screams serve as the sound symbol for the terror of the beach goers it is a sound of distress that is quickly identified, due to the way it evokes our instinctual response towards danger and alarms (99percentinvisible, “Episode 1: 99% Noise”).
6.1 Project Process: Play Stop

These projects have at its core the question of: “How can we interact with sound?” Through the use of design and sound, I built two prototypes that demonstrated some of the ways that sound can provide enjoyment, interest and entertainment for different groups of people. In the “Play Stop,” the floor is used as the interface for users, whom were able to create sonic compositions when interacting and moving about the designated area.

Figure 4. Play Stop video still #1.

In the above figure we see a detail of the process of composing music with the input of several users. This resulted in a collaborative musical piece based in the A minor pentatonic scale. In the podcast episode I explained the planning process, the design and the
use of the technical components to build this rapid prototype. One of the major benefits of using sound in the design of interactive installations is how Hug explains:

“... Sounds can offer, in the context of interactivity, “clues and information while the user’s attention is directed elsewhere.” (Hug 215)

This is was one of the driving concepts of the “The Play Stop,” since the users were engaged with the installation, they developed a sense of play and exploration within the small floor mat, while also being able to divert their sight to look elsewhere. The design is aimed at easing the wait time by making bus stops enjoyable through the use of sound. One of the most common uses of sound in interactive systems is:

“It has been a common usage of sound to indicate the change of state of a system, machine or a network” (Hug 216).

In this situation, sound indicated an event, which is the different distances form the sensor, resulting in a different musical note for each trigger point. The following figure indicates the schematic of the “Play Stop,” as envisioned in a semi-enclosed bus stop.

Figure 5. Play Stop Schematic #1.
The following figure depicts the trigger points for the different musical notes in regards to the range from the sensor, which is depicted as the grey container to the left.

Figure 6. Play Stop schematic #2.
6.2 Project Process: Silly Urbanity

A sound based installation competes for attention in the urban setting (Connor 129). It requires a deviation from the user’s pathway and a time investment (Maeda 80). In the following figure, a group of children experiment with the installation; they try different forms of actions and movements to test the types of sounds that could be made.

Figure 7. Silly Urbanity still #1
Construction began after experimenting with materiality: the first approach is to find ways in which materials could provide sound without electronic amplification. The second challenge was assembling an object that suggested an interaction. The plastic materials, in this case: plastic cups, offered a resonance chamber that would slightly amplify the sound of the jingle bells. The display of the objects emulated the familiar design of wind chimes. It was designed as a form of visual anomaly.

Figure 8. Silly Urbanity Still #2.
Once I began the assembly, the materials offered ideas about the design decisions that were to follow. Firstly, the materials suggested the weight and strain that were viable for the installation. The colorful plastic materials offered a sharp contrast against the backdrop of cement and brick buildings. The look and design of the object conveyed flexibility and a subtle sturdiness, this allowed for several users to yank, swing and pull on the different chimes to create different forms of interactions that were not previously anticipated, yet afforded by the materials and design of the installation.

The construction process took approximately 12 hours, broken up among three days: It consists of plastic slinky toys, red party cups, different size jingle bells, elastic spaghetti string and a 50 yard rope. In addition, I also used metal clip-on hangers. It was installed on the window of the Downtown Design on Main Studio. The recording equipment for documentation was set behind the window, to not intervene with the flow of pedestrians and to be unobtrusive in their interactions with the installation.

Sound can be the basis for a design. It can determine the direction of a project, the materials, the media in which it is transmitted, and it can offer an alternative to relying on purely visual design. As seen in the two projects, one installation used projected sound through a speaker, while the second one relied on the acoustic qualities of the objects and materials. They were both effective in providing a sense of play and exploration.

The use of cheap, ready–made objects, was personally a novel approach. Re-imagining the use of public space with sound as a primary output for interaction can be a powerful tool for shaping small acoustic environments.

Sound develop a sense of place, it can become a key sound in a community, and provide the basis for the creation of acoustic communities (Schafer 215). An example of a
sound based installation that offers a unique soundscape is “The Sea Organ of Zadar” (Bašić, “Sea Organs”). This architectural sound installation uses the waves of the ocean to push air through pipes. These pipes are hidden under a set of stairs that lead to the ocean. These are used for sitting and for bathing, while the Sea Organ plays (Bašić, “Sea Organs”). Experimenting with materials and making fast working helped me design with sound, noise and music as primary components in experience and interaction design.
CHAPTER VII
NOTES ON WHISTLING AND SOUNDMAKRS (PODCAST EPISODE 6)

In this episode I examine some of the characteristics of acoustic communities, how they are made and why they are important in our society. In each acoustic community there are shared meanings that correspond to certain sound signals. These sounds often acquire importance either by their historic heritage and their role in providing a positive effect on the community.

“Sound signals are the most striking components of the acoustic community, and often such sounds are unique and of historical importance; if so, their special status allows them to be regarded as community soundmarks (by analogy to landmarks)” (Truax 59).

Silbo Gomero is one of many whistling languages, some of which have even more complex sociological functions, such as hunting and even courtship (Lemondesiffle, “The Whistled languages”). What makes Silbo Gomero a social bonding agent is that it is designed as public language, it signifies the presence of the whistler and is used for conversations and the relay of information. These soundmarks are part of the soundscape:

“... Any soundscape in which acoustic information plays positive roles in the lives of the inhabitants (Nagahata 3).”

This positive role also extends to the feeling of belonging and closeness to the other members of the community, and in regards to sound as a communal experience:

“A ‘shared perception’ creates a strong sense of belonging (Hug 207).”
The same can be said about church bells and muezzin calls, they are symbolic sounds that become key sounds to a place and a certain community (Lee 90). Religion is a critical component that shapes how societies is organized and structured (Lee 91), my concern with this topic is primarily how the soundmarks and sound symbols of religion can also foster the sense of belonging and togetherness that is much needed in communities.

“Church bells call villagers to mass. Keynotes may therefore function as shared acoustic elements for those people who hear them, and they bond individuals to an acoustic community.” (Hug 209)
CHAPTER VIII
NOTES ON ARE YOU LISTENING? (PODCAST EPISODE 7)

In Episode 7 I take the opportunity to collect my thoughts and reflect on the auditory journey of Episodes 1 through 6. With this podcast episodes I explored diverse soundscapes, directed the attention of listeners, emulating the structure of a film documentary, dived into the meaning of sound when its presented in film and video games. I have also analyzed and categorized sounds in sonic environments through the different narratives that were built in each individual episode.

To conclude the first part of this series with episode 7, I created a sonic composition that utilizes voice, sounds, and music. I’ve structured this episode with the same conceptual approach that I would use for a film or a video game, focusing on narrating the unseen parts of the story and how sound by itself can produce a unique listening experience. I’ve also used the semantic qualities of sound from the previous episodes, and condensed them to this short form, that is fictional, educational, and crafted as a design piece.

This episode is a departure from previous episode design. It is an artistic interpretation of the modes of listening, the semantics of auditory scene analysis and a literal presentation of Barbara Flueckiger’s questions for sound effect analysis. This recording embraces noise in its execution, it is considered equally important as music and sounds. Noise and noises have not been mentioned as separate entities; instead they have been included as functional parts of the soundscape (Thompson 118). Because only through noise can we detect material characteristics of objects in space, such as: texture, density, porosity, humidity, volume, flexibility even position and place (Connor 133). For this reason is why I
narrate objects, and things in the environment, directing the attention of the listener towards the next sound, exercising his/her focal attention towards the soundscape of the podcast episode. Emily Thompson inspired this approach:

“The physical aspects of a soundscape consist not only of the sounds themselves, the waves of acoustical energy permeating the atmosphere in which people live, but also the material objects that create, and sometimes destroy, these sounds.”

(Thompson 118)
CHAPTER IX
CONCLUSIONS

The topics discussed in Episode 1 cover some of the basic anatomical characteristics of the ear, in particular its focused on the ear’s ability to locate differences of timber, pitch, loudness and location. In this episode it was also explained how sound behaved in air, and how it is a medium dependent phenomenon. This episode serves as an introductory narrative to the series, and illustrates the podcast episode structure, tone and conversation dynamics.

The discussion on soundscapes in Episode 2, began with the definition and naturalistic approach offered by Schafer in his book the Tuning of the World. Quickly I noticed that the term soundscape lacked the flexibility needed to understand and engage sound, noise and music in a modernized society, such as the urban setting, digital spaces and domestic spaces. For this reason, we have used the term “soundscape” somewhat freely, referring to any acoustical space that is either physical or simulated. This free use of the term is aimed at bridging the gap between Schafer’s definition of soundscape with Emily Thompson’s more critical and human-centric definition:

“A soundscape, like a landscape, ultimately has more to do with civilization than with nature, an as such, it is constantly under construction and always undergoing change.”

(Thompson 118)

This allows for a more convenient use of the terminology, especially when referring to the sonic environments that are created through audiovisual communication, such as what is seen and listened to in films and video games. This can also be applied in further research
that focuses on forms and mediums such as: video-blogs, Instagram videos, Snapchat stories, Periscope feeds, among other emerging portable audiovisual formats.

“[...] in the context of media, including radio and TV, sound follows and creates new semantics, meanings and structures.” (Hug 212)

Not only is the term “soundscape” beneficial for analyzing sound in media, it also aids in understanding “noise” with the same level of acceptance of music, speech and natural sounds. In episode 3 I analyzed the soundtrack and sound effects of the video game Super Mario Brothers. Video Games offer a metaphor to how the real world sounds: objects and motion make sounds, when we interact with objects; we expect some form of acoustic feedback (Hug 212).

In episode 4 I presented my analysis of the musical theme form the film “Jaws.” In this discussion, I used Chion’s modes of listening to develop a flexible terminology that can explain the sounds working with the motion picture. These modes of listening can also be used to interpret sound in other forms of audiovisual media. An added benefit of using a film as a source for sound analysis is that it reinforces the concept of sound being unconfined by the screen. Or in the words of Steven Conor:

“Sound in cinema, like sound in the world, has no frame, no ‘auditory-container’.”

(Connor 133)

Therefore, becoming a better listener to the sounds in film, and developing basic semantics for the interpretation of sound, can also offer better analysis of the sounds in acoustic environments.

In episode 5, I presented two interactive installations that used sound as the principal form of reward/output for the users. These projects were a successful manifestation of
experimenting with the concept of “designing with sound.” They provided valuable learning outcomes, especially in regards to the design process, making observations and drawing conclusions from the entirety of the process.

In episode 6, I begin to talk about acoustic communities and how the sounds of human voice can create a sense of identity within a social group. These sounds can characterize a soundscape of the region and become a characteristic key sounds for a community and symbolic sounds that represent a social group.

Episode 7, is an exercise in the use of speech, sounds, noises and music to create an artistic narrative, it reiterates the concepts that have been discussed in the previous six episodes.

In regards to the medium, the presentation of this creative work uses voice acting, sound effects, sound compositions, and scripted narrative. They are transmitted in the form of podcast episodes, and they are a reflection of my artistic interpretation of media, sound, design, writing, academic content and music. The use of a podcast, understood as a mass communication tool is conceptually sound, especially because the act of listening is the focus of this work and reaching as much listeners as possible is the chief objective of this endeavor.

These episodes were designed to inspire curiosity about listening and to provide enjoyment using speech, noise and music. For this reason, the tone of voice and explanations in the featured episodes aimed to keep a consistent balance between academic content, informal conversations and interesting listening experiences.

The creative work presented in the audio format creates several points of discussion in regards to listening, medium and design approaches to sound. First, by using the established listening modes in combination with the semantics of listening there can be an
accessible and intuitive terminology for listeners to learn and use in regards to understanding and analyzing sound. With the auditory examples, the narrative and the repetition of terminology, it is projected that regular listeners of the podcast series will reach episode 7 and have an active relationship with listening to the sounds of their immediate soundscape. It is also expected that listeners begin to understand how sounds are used in film and video game media. These last two forms of audiovisual media facilitate the understanding of sound as a vehicle for storytelling. They also use sound to transmit information about objects, environments and symbolic relationships between situations, things and characters.

Each podcast episode is a soundscape composition. I use music, noise, speech and other sounds to create a listening experience that also provides learning outcomes for the listener. As a result, an audio documentary, formatted into a podcast series makes content accessible to casual listeners, and exercises the listener’s focal attention.

It is noteworthy that conversation transcripts, recordings and the podcast episodes are forms of media that can study and explain sound, beyond the written thesis. This creative component is the sum of my experiments with sound, through the perspective of design. It required presenting analysis and interpretation, engaging with sound as a design device, listening to soundscapes, using media to create content and offer my own insights.

Towards the end of the series, Episode 6 and 7 offered an artistically mature format. These last episodes a confident use of voice narration, curated sound samples, and a complex layering of sound, music and noise. These episodes presented case studies with my own critical stance on sound and its place in our modern listening environment.

While episode 6 offered a format similar to that of a research report, Episode 7 is an artistic approach to the podcast medium. This last episode is pivotal in my experimentation
with the podcast as an informative and artistic space. For the future, the design of Episodes 6 and 7 will serve as models to continue the production of the podcast series and continue the acoustic journey.

The process of this work has provided me with outlets for artistic expression, a deeper interest in using media for the creation of content. It offered a space for the convergence of ideas, abstract thinking and an opportunity to make with only sound. In essence, this work is a remix, a form of collaging. It's a combination of design, sound and research. At its core, it aim is to provide reinterpretations, enjoyment, entice curiosity about the sonic world, and hopefully learning outcomes for listeners.
REFERENCES


Alberti, Peter W. “The Anatomy and Physiology of the Ear and Hearing.” University of Toronto. PDF File.


http://donrathjr.com/basic-characteristics-of-sound/

Rushkoff, Douglas. Program or be Programmed: Ten Commands for a Digital Age. New 


http://howyourbrainworks.net/content/lesson-5-hearing-things

FascoDesign. 06.17.15. Web. 19 March 2016.  


Soniak, Matt. Menal Floss. “Why Do Our Voices Sound Different to Us Than to Other 
http://mentalfloss.com/article/12796/why-do-our-voices-sound-different-us-other-people


https://documentation.apple.com/en/soundtrackpro/usermanual/index.html#chapter=B%
%26section=1%26tasks=true


http://www.soundtrackgeek.com/v2/soundtrack-review-jaws/


APPENDIX A

EPISODE 1: ON HEARING AND LISTENING (TRANSCRIPT)

The following episode is an introduction to the basic elements of how sound travels in the medium, and how the hearing system perceives the phenomenon of sound.

[Podcast Episode Transcript]

Julian Osorio: Hello everyone, this is 20-20 Listening. I’m Julian Osorio. The human ear is fascinating. Imagine an intricate system of bones, membranes and fluids. All combined to transform vibrations in the atmosphere into neurological signals (Schnupp, “Lesson 5: Hearing Things”). From birth we can detect a range form 20 Hertz, up to 20.000 hertz (Ball 36). As we age, our hearing range gets smaller (Lotto & Holt 2), while conversely our vocabulary gets bigger.

(40:00.00)We use our sense of hearing to fine tune and calibrate how our voice sounds to us. However, this perception is slightly deceitful, because when we speak we emit two signals at the same time, the first one is directly from our vocal chords, and this one travels from our tissue and bone, directly into the inner ear. While the second one is the external sound wave that we’ve created in the air (Greene, “Does My Voice Really Sound Like That?”).

This one also reaches the ear, almost simultaneously (Soniak). That’s the reason why we find it so strange when we hear our own voices played back to us in a recording (Greene). It’s because we are only listening to half the story. However this is what the world actually perceives from us. Lets talk briefly about the anatomy of the inner ear. I promise its very interesting.
First let’s talk about the rock-star of the hearing system, the cochlea (Alberti 56). So when we look at the cochlea, it has the exact same shape of a snail. Inside of it we find cochlea liquid and hair cells that go all along its length (Weiner 9). Now, what’s interesting about this organ is that certain fragments or certain sections of the cochlea are sensitive to particular frequencies (Plomp 15). That means that low bass frequencies will be detected in one area, while the higher pitches will be detected in another area. Not only does the cochlea sort out these different frequencies but it also converts acoustic energy into electric signals that go to the brain. Joining us now is one of our favorite collaborators.

Mark Cecconi (MC): You know we can talk about waves and kind of look at them on a computer screen. And we see the small spikes and everything, but... This is our friend Mark Cecconi.

(MC): (2:40.00) Not actually stopping to consider them as pressure waves, right? So you are actually physically moving your ear drum based on compression and expansion of the medium (Soniak). And so what you hear ends up being totally medium dependent (Nieukirk 2015). You can hear much further under water, right, and when you hear people speaking after they’ve inhaled helium, that’s because the pressure waves are at a higher frequency.

(MC): There’s... I don’t remember the chemical, but it’s a gas that’s much higher in density than air is, and so if you inhale it and you speak, you speak at a much, much lower timber, at a comically lower timber. In case you are curious, the name of that gas is sulfur hexafluoride. And so our perception and the way that we hear everything has evolved to function in air, similar to how on earth our eyes have evolved to see in the visible spectrum of sunlight. Its interesting how even that becomes relative, the medium you are in (Nieukirk,
NOAA). So if you look at that old speaker commercial, where the people are sitting in the chair and being blown backwards by their speaker.

(4:00.10) That’s the maxell cassette tape commercial form the 1908s.

(MC): Right? That doesn’t happen. You would never see that, because the air is around you compressing and expanding (Soniak, “Why Do Our Voices Sound Different to Us Than to Other People?”). The air itself isn’t moving.

(4:14.40) According to Dr. Jan Schnupp. “We don’t hear sound waves, we perceive them, what we actually hear are things in the environment (Schnupp, “Lesson 5: Hearing Things”).” Imagine for a second a sonar, a ping that travels across the distance. That is exactly how sound waves behave in the air. Now the ear is particularly talented at distinguishing different sound sources.

(4:44.59) Now the most impressive demonstration of the ear’s analyzing power, is the way in which we distinguish the tones produced by the musical instruments of an orchestra (Weiner 10). All this happens while our ears are functioning non-stop perceiving everything around us in all directions (Schafer 20). Quite similarly, to omnidirectional microphones. We can test that out right now. This one is to the left, this one is to the right, this one is to the center, left–right–left. There is a difference between hearing and listening. So what makes listening than just hearing? The main difference is that when we are listening, we are paying attention to what we are hearing. Listening is making meaning out of what we hear.

(5:56.30) Samuel L. Jackson: “ Maybe they wont, that’s how life is…

When we listen we are especially sensitive to sound sources. That’s why you are able to recognize Samuel L. Jackson’s voice beside mine. When we listen we are also gravitating between focal and global attention. *Global*, being the sort of attention that is diffuse and
unfocused while *focal attention* is when we zero-in, in an interesting sound, piece of music, voice or a noise that we suddenly find interesting (Oliveros 13). One of the things that fascinate me the most about listening is that our perception of hearing exists in the past (Tuuri, Mustonen, Pirhonen 16). Once the word is spoken, once the sound passes, once that musical note has been played, we acknowledge that it existed because we are remembering. It existed once and now its saved in our memory, I would dare say that hearing happens physiologically, while listening happens in the mind (Tuuri, Mustonen, Pirhonen 16).

When we listen we create meaning (Treasure, “5 Ways to Listen Better”), we can become aware of the space around us, and all the little sounds and micro-noises that are happening (Schafer 15). Once we began to organize the sounds that we could create through our vocal chords, we created languages (Masataka 4). When we are listening we are immersed in the space around us. Listening is being here and now (Oliveros 15). And once the sound passes, it lives on in memory.

(7:44.88) The sounds featured in this episode fall under the Creative Commons License form freesound.org. Original music composed by Julian Osorio. This episode is made possible thanks to the College of Design at Iowa State University. A special thanks to Alex Braidwood, Paul Bruski and Christopher Hopkins. A Special thanks to Mark Cecconi and Harvey Neita. This is Julian Osorio signing off, thank you for joining us, and make sure to tune in next time.
The following episode is an introduction to Schafer’s concept of soundscapes, combined with Emily Thompson’s concept of the human soundscape, which includes sound environments that are musical, urban or of natural origin. Along side the depiction of these soundscapes, I will direct the listener through the exercise of focal listening, as seen in the work of Pauline Oliveros in *Deep Listening*.

Julian Osorio: Hello everyone, this is 2020 Listening. I’m Julian Osorio. In this episode I want to talk about a never-ending topic. It’s the infinite possibilities of listening to the soundscape. However, given that I am a mortal human, I’ll talk about it for maybe ten minutes. The soundscape can be understood as the sonic environment (Schafer 16). In R. Murray Schafer’s words, we could consider almost any collection of sounds, in any given space, as a soundscape.

(0:44.02) In Schafer’s holistic view, this includes music as a soundscape as well. But a broader definition would consider also nature, architecture, the materials in the environment, and human action (Thompson 119). For example, we can all relate to this sound: (Recording: Track of the Chilean Ocean by Felix Blume).

This is the sound of the Chilean coastline. This recording was made by Felix Blume. (1:15.24) This would qualify as a soundscape of natural origin.
While this is also a soundscape: (Recording: City top). This is a recording of the city environment, captured from a rooftop.

This is also a soundscape. (Recording: Meridian Soundtrack).

I’ve found that normally we don’t think much about the sound environment. Unless it surprises us with unexpected sounds, sudden loudness or quietness (Schaeffer 76).

(2:27.49) Any given second we are hearing, analyzing and processing incredible amounts of information (Wiener 4). And during this process we ignore a good amount of sounds.

This is a necessity. We need to filter the information, or else risk constant sensory overload (Treasure, “5 Ways to Listen Better”). However, lets return to this sound once more: (Recording: Track of the Chilean Ocean by Felix Blume) It’s refreshing isn't it?

Yes, pun intended.

You see, growing up in an urban environment. I’ve grown accustomed to the cacophony of the city soundscape. So naturally, I’d gravitate to sounds of the earth as my auditory relief.

(3:18.00) Often, I believe we are also seeking some form of sound therapy from nature (Zevitas, Cybulskib & McNeelyc 4). When we talk about soundscape, we have to think about how we as a species have altered the sonic environment (Plomp 10). We’ve introduced machines that make sound; we’ve built structures that amplify our perception of sound, (3:40.41) while other structures dissipate the sound energy. Our soundscape is always about human soundscape (Schafer 17). When we think of human space we are talking about buildings, houses, bridges and highways, cities and towns. We have reshaped our environment with all sorts of materials. And with our living spaces, we have created new
acoustic resonance chambers (Thompson 118). Imagine for a second the sound-space of a library and how it is radically different to a stadium.

(4:31.69) Yeah, it’s an obvious comparison. But hear me out. What interests me is that one space was designed to minimize the dissonance of excessive noise, its made so that we have a relatively quiet environment so we can concentrate. While the stadium, is almost an architectural megaphone. In one space we seek to concentrate on a task. And in the other, we want to connect to our team and the people around us. We do this by wearing our team’s colors and by participating in the sound–space (Mehta, Johnson and Rocafort 222). Whether it be cheers, chants or boos. Pauline Oliveros gives a wonderful example in her book: Deep listening.

(5:36.24) Heather Purdy (HP): “The crowd noise at a baseball game changes when the focal crack of a bat against a ball is heard. If there is a home run, then the voices of the crowd unify from a fuzzy global rumble into a loud focused roar.”

( Oliveros 3)

With this example Pauline Oliveros is referring to the “ways of listening.” She distinguishes two forms of attention in listening. The first one is called Focal Attention. Directed to an object that has captured our interest in the soundscape. The second form is Global Attention. Diffuse and general: taking in the whole of the space–time continuum (Oliveros 13). So lest return to the library, lets take another listen once more.

The idea is not that the library is the opposite of the stadium. But instead, it’s to think about how the materials and the design have shaped the acoustic qualities of each environment (Thompson 119).
Heather Purdy:

“… All spaces and places have acoustic lives of their own, based on their shape, their construction materials, what they are filled with, and mostly, what sources of sound and vibration are near.” (Horowitz 29)

And also we can begin to think that the sound-scape of different spaces, can also shape how we behave (Mehta, Johnson and Rocafort 222). The name of the discipline that specializes in the soundscapes of architectural environments is called architectural acoustics.

Brennan Scott: “Architectural acoustics is a huge field that is seen as increasingly critical for quality of life, particularly in urban settings.” (Horowitz 35)

Architectural acoustics deals with the sound qualities of buildings and spaces, it seeks to either enhance speech and music, while also trying to reduce unwanted sounds. In the quest to achieve more pleasant living spaces (Mehta, Johnson and Rocafort 10). However, next time you have the chance, I’d like to invite you to listen to your surroundings, to move between focusing on singular sounds and on taking in, the entirety of the scenery. To compare the sound-spaces of your home, your neighborhood, your city and workplaces.

We can take a short break form our busy lives and open our ears, and maybe, gradually, we can become better listeners. This is the end of part one, of “Listening to the Soundscape.” We hope you join us in the exploration into the world of sound. For now I’ll leave you with this beautiful soundscape of a summer night in the suburbs. Thank you for listening.

This episode is made possible thanks to the College of Design at Iowa State University. A special thanks to Alex Braidwood, Paul Bruski and Christopher Hopkins.
Original music by Julian Osorio. Special thanks to voice actor Heather Purdy and Brennan Scott. Featured sounds fall under the Creative Commons license from Freesound.org. This is Julian Osorio signing off. Thank you for listening.
APPENDIX C

EPISODE 3: LISTENING TO MUSIC IN VIDEO GAMES (TRANSCRIPT)

This episode describes an analysis of the Super Mario Bros. soundtrack, particularly the iconic main theme. In addition, we will discuss the concepts of diegetic and non-diegetic sound, as well as adaptive and interactive audio, what they do and how they work within the logic of the video game world and soundscape.

[Podcast Episode Transcript]

Julian Osorio: Hello everyone, this is 20 20 Listening. I am Julian Osorio. As a kid, I was fortunate enough to have an Atari game system. Later on, I had a Super Nintendo. And I thought this was the pinnacle of entertainment. I must have been 8 or 9 years old. This machine however, allowed me to have endless hours of fun and play with friends. Years later, when I began practicing guitar is when I started to pay attention to the music of video games. Admittedly, I don’t play video games anymore. But, I do listen to the music of old and new video games. Especially when I work. Video game music has an incredibly rich history. Even when it’s such a young discipline. Many of us have become entranced since the beginning of video game soundtracks.

Brennan Scott (BS): (0:53.25) Yeah, so I’ve found it really interesting. Particularly when you go back to when video games were first coming out. How they only had a very limited range of tones and notes they could use to produce the melodies and the sounds, and if you back and you look at those. Those songs and those different melodies, those are the ones that are the most iconic.

(JO): In the beginning, there was 8bit sound. Back in 1975.
(BS): Because they were forced to be so simple, therefore making them memorable.

(JO): One of the first games to feature this type of sound was “Gunfight” from 1975.

(arcade-history.com 2016)

(BS): (1:34.22) So if you think about the Super Mario Theme, everybody, almost everybody who plays video games knows that same theme song. Its not because its the best, or you know the most creative, and I think that its simple and it has a memorable sequencing, and its just really easy to kind of pick up on. This is the Super Mario Theme, composed by Koji Kondo for the Nintendo Company. Now this theme has a lot going for it. Its based on a major arpeggio and it uses chromatic approximations to move to the next chord, that’s what makes it flow so easily. This theme also has a lot of richness in its rhythms. The natural accents of the melody change from bar to bar, this is what makes it so interesting and at the same time somewhat unpredictable. According to Koji Kondo:

(2:30.60) “Dynamic music, should showcase the participatory nature of a game, which might include changing the tempo, adding instrument layers, changing the position of music with character movements, or adding variability to the playback of phrases” (qtd. in Collins 140).

One of the best examples that we find is that when our hero Mario is running out of time, the music begins to speed up. So in this case the music serves to convey a sense of urgency. Not only is this an indicator that you are running out of time to complete the level, but it also demonstrates how Koji Kondo uses music to provide orientation for the player. The altered tempo, and the frenzy-like melody, provide information about how to play, which basically is: get to the freaking castle ASAP. This is called adaptive sound. Which means, that it
changes based on game conditions, not necessarily paying attention to the player’s actions. So you can basically sit around, or pass the level quickly or extremely slowly, and the “running out of time super fast theme” will still kick in at a set time, and probably give you a sudden rush of adrenaline.

(3:39.32) Much of the information about the world of Mario is relayed through audio cues. For example when Mario jumps up, there is a characteristic sound to his spring. This sound, is somewhat visible or at least we know why this sound occurs, since it’s a sign of Mario jumping. This sound is called a Key Sound, that has been repeated throughout the gameplay and has become an expected sound for the action of jumping. The same can be said about the “coin” sound, when Mario hits a block with his head. Both of these sounds require the player to take an action: jump and also jump and hit with head. Which sounds odd now that I think about it. But it does not stop at that, there are even two different sounds for Mario’s jump! One for tiny Mario jumping, and one for big Mario jumping. Big Mario is when our character consumes a mushroom and grows like three times his size.

(4:38.45) Sounds that respond to player actions are Interactive sounds, and if you see the cause or the object that causes these sound, then they are also called diegetic (Chion, “Audio-Vision” 25). One of my favorite things about sound used in video games, is that they confirm that I’m either in the middle or finishing up an action.

Lets take a leap back to the Super Mario theme, when it is played at regular tempo, we cannot see what is causing the sound, it is built into the game world just as the sound of wind is a natural sound in our real world environment. The fact that we can’t see what is causing the music, makes it a sound called: non-diegetic.
One of my favorite Key sounds in this game is the awesomely titled: “Starman.” This theme plays in any level, and is the same each time around. The repetition of this cue makes it a key sound, but beyond that it is also a leitmotif, because it conveys a specific character and situation which is: *Mario is currently invincible for a certain amount of time.* It’s also a charmingly goofy and funky melody.

I like to draw comparisons to how we hear objects in video games and how we hear in our physical soundscape. Video games often are tasked with making things make sound, even if we don’t expect a sound or we don’t know what the sound should be. While in our surrounding space we do the same, but also we can make predictions on how that wooden chair should sound, or if I drop these dishes what sound they would make and how expensive that would be, or how opening my front door should sound. Video game sound seeks to follow similar logic to our soundscape, even in Mario’s soundscape, the music and sound effects are consistent, continuous and logical, they make sense when you play it the first time or even in your 24th play-through.

Currently, video games have exploded into increasingly detailed worlds, with visually stunning graphics and high definition audio. In future episodes we will explore modern video game soundtracks, and hope that join us then. For now, I’ll leave you with a great quote by Daniel Hug:

“... hearing provides us with contextual information about our environment as well as an instantaneous acoustic image of the things and events around us.” (Hug 218)

Super Mario Bros. is property of the Nintendo Game Company. Original soundtrack for Super Mario Bros was composed by Koji Kondo. The Super Mario music and
sounds featured in this episode belong to the Nintendo Company and Nintendo R&D. This episode is made possible thanks to the College of Design at Iowa State University. A special thanks to Alex Braidwood, Paul Bruski and Christopher Hopkins. Additional podcast music by Julian Osorio. A special thanks to voice actor Brennan Scott. Featured sounds fall under the Creative Commons license from Freesound.org. This is Julian Osorio. Thank you for listening.
In this episode I analyze a scene from the film “Jaws” (Universal, Jaws 1975). I describe parts of the musical construction and how clever editing, and masterful use of sound can create leitmotifs, signals and a memorable sonic experience through film.

[Podcast Episode Transcript]

Julian Osorio: Hello everyone, this is 20 20 Listening. I am Julian Osorio. Its a summer day, sunny and with a gentle breeze. Imagine a pool filled with people bathing and splashing, they are from all ages. They are splashing and enjoying the water. Suddenly, I play this piece of music: “Jaws.” From my part, I will get out of the pool as fast as possible, mainly due to the sudden onslaught of my irrational fears. That sound is so deeply ingrained with fear, water and the image of an awful death by the makings of a giant shark. This is how it plays out in my mind. Obviously there is no great white shark lurking in the pool. But still…

(0:53.41) The Movie Jaws debuted in the summer of 1975. This terrifying film was directed by Steven Spielberg, and distributed by Universal Pictures. During the filming of Jaws, the mechanical shark named “Bruce” would constantly break down and the entire production would halt. This film turned out to be the first Blockbuster to gross over 100 million dollars (filmtracks, “Jaws”).

(1:15.62) Heather Purdy (HP): So there is a composer, John Williams. And, everyone is familiar with his work, even if they are not familiar with his name. Jaws comes to mind.
And just that big little line of the cello playing. Daaa-Dum! Daaa-Dum! Da-Dum! Da-Dum! Da-Dum! (Recording: Jaws Theme by John Williams).

(JO): The success of this film is attributed to the bright direction of Spielberg, the excellent screenplay of Peter Benchley and Carl Gottlieb, and the now iconic Jaws theme. This theme is based on a distinct two note progression, and it was intended to reflect the brutal instinct of the shark as a hunter. The tempo of the theme would pick up as the shark gets excited, this excitement mainly due to his lurking and detecting prey. The brilliant orchestration was developed by Herbert Spencer (filmtracks, “Jaws”).

(2:06.60) “The statement of the motif in the scene described above thus communicates ideational information necessary for this scene: ‘Jaws is present’.

Interestingly, the shark is not visible in this scene, only what might be interpreted as signs of its actions – which the leitmotif helps to make clear.”

(Wingstedt, Brändström and Berg 194).

(2:25.17) The leitmotif of jaws helps tie in the overall narrative. Because to make us uneasy and tense we must still feel that danger is near. The way that this was done was by often showing the shark attack from above water, only receiving hints on the scale, power and ferociousness of the shark, by the screams of the victims, the splashing and the use of the color red in the water. In the famous scene “Get out of the water” little Alex takes his yellow inflatable raft just off the beach, he splashes and rows like any other kid would do. There is an unsettling feel to the scene, there is plenty of action and movement going on in the beach.

(3:07.77) In regards to sound, there is no music, until later on we hear what appears to be a song playing on the radio, the sound source is not seen on screen. Then there are playful high pitch screams, and a dog owner calls to his now missing dog “Pippen.” Suddenly we
switch to an underwater camera, we see the feet of the children splashing and hear their muffled voices. Then the jaws theme plays in the low end of the string section and begins to accelerate. This is the real deal, the shark is there and as the camera moves closer to the victim, the music accelerates, indicating the shark’s attack is imminent (MovieClips 2011). (4:03.65) Once the attack occurs, the camera angle jumps to the beach perspective, there is no jaws theme sounding here, then we jump back to the underwater attack and the theme continues to play through. This time, its grown to a massive tutti, with the string and brass section. This scene is still, to this day, extremely terrifying.

(4:31.16) What gives the shark its massive scale is the music. The use of lower registers for the instruments, and the bulky and stubborn two-note theme are a form of metaphor to what we experience in the soundscape. (4:45.00) Simply put, big objects tend to produce low pitch sounds; this is the nature of their vibrations (Schafer 37). We never really see the shark in the scene:

“Rather than inner attributes, the music emphasizes the outer – letting us feel the size, power, movement, unpredictability and vicious intentions of the shark. These attributes are then what the audience is placed in relation to. This, in combination with Jaws’ invisibility, contributes to installing a fear of the unknown, of the uncontrollable – where the audience has to imagine what is not represented” (Wingstedt, Brändström and Berg 202).

(5:27.55) The theme starts off with a staccato hits accompanied by the timpani. Afterward, we are introduced to a form of basso ostinato. Literally, stubborn bass line. This is the characteristic minor second played in the string section; it is continuous and sonically
wide. It gives the shark a character, not a likable one, but an effectively ominous *leitmotif*. That musical interval of a minor second is the *key sound* that signals the presence of the shark.

(6:02.50) The surprise factor of the sudden attack is insinuated by the brass section hits, cutting through the *basso ostinato* of the stings. John Williams also introduces a couple of breaks through instrumentation, which contrast with the sharp rhythm and tend to complete the sense of terrifying awe. In this theme, the orchestration reflects proximity to the shark. (6:34.00) With the musical device of accelerating the tempo, and also by adding more instruments to the orchestral mass (flimtracks.com, 2009). There is also another theme played by the horns, it is akin to the sound of a hunting horn as if it were played from the depths of the sea.

(6:54.28) Here is an example of a fox hunting horn. Closer to the end, the stings move into a higher register and continue with the two-note theme. (7:07.39) The orchestra in full body, creates a soundscape that grows, aches, shrinks and for this final part it is a shrieking tutti. In addition, the tempo of the piece begins to slow down in a “ritardando.” As the unseen shark swims away. After I saw that film, I could not go into a pool. Heather Purdy: I don’t think anybody did for decades.

(7:41.09) The music for the “Jaws Soundtrack” was composed by John Williams for Universal pictures. This episode is made possible thanks to the College of Design at Iowa State University. Additional sound effects fall under the creative common license from freesound.org. Special thank you to voice actor Heather Purdy. Special thanks to Alex Braidwood, Paul Bruski and Christopher Hopkins. This has been another episode of 20-20 Listening, I’m Julian Osorio. Thank you for listening.
In episode 5 of the podcast I introduce two sound-based interactive projects. With the theoretical background of episodes 1 through 4 I explain how sound and listening can be valuable elements in interaction design.

[Podcast Episode Transcript]

Julian Osorio: Hello everyone, this is 20 20 Listening. I’m Julian Osorio. In this episode I am going to talk about two design projects. The first one is called “The Play Stop.” And this is the main sounds of the installation. (0:34.76) It first started as a question. “How can people interact with sound?” First, let’s try and visualize the installation. Imagine, a floor mat. To one side it has a sensor that can detect the distance between itself and objects. It is located at foot level, and to the side, so that nobody accidentally kicks it. This sensor sends an ultrasonic ping. Once the sound wave hits an object, the sensor estimates the distance where the sound wave was interrupted. Since this is a small sensor, the range was about 1.5 meters. Not a huge range, but perfect for me to work with. Next, the sensor would convert these measurements into data that the computer can read.

(1:22.86) For this to work, I used an Arduino board and for seeing and reading the data from the sensor, I used Arduino and Processing software. After running some lines of code we were able to program a couple of simple trigger points in the sensor’s range. Which meant to the computer, that at a certain range, play a certain sound. If you listen closely, there is a constant tone that the floor mat is playing, even without a participant. This constant tone was intended to draw attention to the floor mat.
I’ll admit that it also helped that the mat was placed in a busy hallway. Anyway, the tones that were programmed to trigger at different ranges belong to the A minor pentatonic scale. The tones from this scale were easily overlaid, and allowed for the layering of sounds.

(2:26.06) This concept came from listening to the soundtrack from “Red Dead Redemption.” I seriously recommend you check it out (Rockstar Games, Read Dead Redemption 2010). What makes this soundtrack interesting to me is that the music is mostly event driven. Meaning that actions trigger different sounds and sound overlays.

(2:57.79) Once the floor mat was in place, soon people began exploring and interacting with the little ugly floor mat. People moved about, trying to discover the trigger points for different sounds. This project proved to be a humble success, and also resulted in some interesting sound compositions that I will play for you right now.

(3:30.00) Months later, I attended a workshop with designer Brett Renfer. Who taught us incredibly valuable lessons in interaction design. One of which stuck with me, and it was to break down the process into three categories.

(3:45.00) First, decide on a catalyst, or a thing that will trigger input. In the previous example, it was people walking in a hallway. The second thing was an input mechanism, which in this case was the Arduino. And third: an output. Which as you can guess, was the sound projected by the hidden speaker. This process in interaction design would be used again in a second project (Renfer, “Prototyping Interaction”).

(4:13.11) A couple of months later I faced this same question again. “How to design an intervention or installation, that would make people interact with sound?” This time, I had the challenge to work in a more public space.
So the chosen spot for the project was a window outside our studio offices. The installation would be facing outward, available to the pedestrians that would pass by. This time around I worked without the technological components and instead worked with dollar store materials. Among them were Colorful Slinky toys, red party cups, string, a rope and as my sounding objects I used different size jingle bells. These different size jingle bells would produce different types of sounds. The idea came from my friend Calee, who sometimes I refer to as Chimes, and as you might have guessed she suggested I build a form of wind chime with the materials that I had purchased.

The premise is simple, the jingle bells go along the length of a string that goes through the middle of the slinky toy and at the bottom they are attached to a red party cup. Meaning that if you grabbed a party cup, you can swing, yank and move the string about. To make the installation more interesting, we added several different slinky-toy chimes, with different jingle bell combinations. As to create a subtle difference in timbre. The name of this project was “Silly Urbanity.”

The installation was successful. Different people of different ages would stop by and hit all the slinky toys and try and make noise, people would wiggle the chimes and put their ear to the party cup to test out the sounds. I was honestly surprised that it actually worked. But then I realized, that the installation continued to function with the three basic principles of: a catalyst, an input, and an output, which in this case was the jingle bells.

A couple of months later I had the opportunity to visit the Venice Biennale. And among the installations, one caught my attention. It was a sound and interaction piece. Imagine, a group of thin metal bars, bent in the shape of arcs. It formed a sort of tunnel. There were several seats and metal plates attached to one of the ends of the metal arcs.
People could sit and hit them, clash them together and swing them form side to side. These were real authentic metal chimes, and the people that sat there really enjoyed playing this public instrument. Unfortunately, I have but one very short recording of the metal sounds that came from that installation. So we’ll have to really focus and listen.

(7:22.13) I hope you enjoyed this episode and that you might take an interest in making sound yourself. For now, I’ll leave you with one of my favorite soundscapes.

(7:58.54) This episode is made possible thanks to the College of Design at Iowa State University. A special thanks to Alex Braidwood, Paul Bruski and Christopher Hopkins. Original music by Julian Osorio. Special thank you to Paula Curran, Brenda Jones, Bernard Caniffe, Erin French, Emily Nizzi, Kayla Brown, Calee Himes and Mark Cecconi. Featured sounds fall under the Creative Commons license from Freesound.org and original recordings by Julian Osorio. This is Julian Osorio. Thank you for listening.
In this episode I examine some of the characteristics of acoustic communities, how they are made and why they are important in our society.

[Podcast Episode Transcript]

Julian Osorio: Hello everyone, this is 20 20 Listening. I am Julian Osorio. Far from the planes of Iowa, there is a small Island. Its a place of many stories and legends. It is located South West of Spain. In the Canary Islands Archipelago, there is a small Island called La Gomera. Its dormant volcanoes have shaped the island into deep ravines and valleys, and sharp mountains ranges. Regardless of the harsh terrain, it has been inhabited by many people through several centuries, and its these people who have developed a an intriguing method of communication called: Silbo Gomero.

(1:10.00)This unique whistling language is almost a transposition and compression of the Spanish language. The technique for this whistling language is to put your index finger in your mouth in the form of a hook, and use part of the tongue and air flow to shape the whistle into a distinct system of consonants and vowels (UNESCO, “Silbo Gomero”). The codification of this language system also relies on variables that we are typically not very sensitive to, such as loudness, abrupt changes and transitions from vowels, tone consistency, and decay of the sound wave.

(1:55.85) Long ago it was a tool used to transmit critical news over the sharp and difficult terrain. An experienced practitioner of this language, can find a ridge in the mountain side, aim his voice projection to the valley and reach listeners that are up to 7
kilometers away (Plitt, “Silbo gomero: A whistling language revived”). The whistle languages of La Gomera, reproduced the intricate details of the Spanish language. It imitates the phonetic behavior of the Spanish language (Plitt, “Silbo gomero: A whistling language revived”). And it is believed that the system used in Silbo Gomero can be applied to other languages as well. It is stated by UNESCO that the linguistic characteristics of Silbo Gomero can potentially reproduce the details of any spoken language.

(2:35.13) Today, it is still used for the transmission of news. “It is a language that was created for the public.” (Suma, “Whistled language of the island of La Gomera”). It’s intended to be heard by all. This is an excerpt from the UNESCO short documentary.

(3:14.95) The government of the Islands has included the whistle language as part of the course curriculum for schools. Seeking to preserve this cultural treasure for future generations (Suma, “Whistled language of the island of La Gomera”).

(3:27.33) The children grow learning both Spanish and the Silbo Gomero. With this effort, it becomes a regular staple in the conversations of children. And as the community continues to grow, it is a keynote sound (Schafer 214) or in other words, the sound staple of the Island’s soundscape. Imagine for a second that you are connected with your community through sound. Imagine that in the afternoon you turn towards the mountains to listen intently and receive news from your neighbors.

(4:01.25) You can hear announcements about a wedding that is coming up, news about the community, a baptism and so on. A key part of the social value of this language is that it relies on being a tool intended to relay positive events. And thus elevates the whistle to a public good, it becomes a tool that strengthens the people’s sense community and togetherness. It is truly amazing that the Silbo Gomero is so sophisticated, that entire
conversations can be held through this language alone (Rialland 2). It is a sign of identity; it is a sign of community that has persevered over generations, a community that posses its own definition of sound and language, a community that is bonded though its acoustic identity.

There are other whistle languages our there I the world. Some of these languages have only been discovered until recently. And in “The World Whistles Research Association” there are five samples of whistled languages: one from the French Pyrenees, The Mazatec of Mexico, The Greek Island of Eubea, and Kuskoy in Turkey (lemondesiffle, “The whistled languages”). (5:22.13) These unique forms of language create what can be defined as a symbol of an acoustic community (Schafer 215). There are several components that make an acoustic community. Firstly, we must see them as flexible groups of people, who experience a common acoustic perception at any given time. And second, that aural perception has a somewhat agreed-upon meaning. Third, this part is a bit tricky, it should have positive connotations for the community (Nagahata 1-4), if the sound is perceived in a negative fashion, then it is labeled as “noise” in the pejorative sense of the word. An example of this is that a neighborhood situated by the airport, does not actually appreciate the constant booming of airplane engines (van Praag and Baarsma 224-225).

(6:13.09) Lets imagine a small town. And in the center there is a temple of worship, of any religion. Lets say for starters that its a church that probably has bells that sound at certain times of the day. The sound that is produced travels across the area and reaches the ears of all the villagers. They become aware of the sound, and immediately invest it with meaning, that is: its time to gather for a worship ceremony (Arnold and Goodson, 102). In previous episodes we mentioned that theses sounds can be symbolic and eventually become key sounds for an acoustic community. Let’s replace the bells and listen to a different type of
key sound, this one is also deeply associated with the spiritual. (Recording: Muezzin - Israel).

You must excuse me if I miss pronounce the word. That is the call to prayer, recited by the Muezzin. This sound can be heard in communities of Islamic faith, and it is a broadcast that radiates from the mosque (Lee 86 -100). There is something deeply moving about this soundscape, in part, its the human sound of people moving and living, yet its also the voice that reaches out to the people, indicating that at this time, and in this place, and with this community, we will come together to celebrate our beliefs.

(7:39.38) I’ve always been fascinated by the sounds of distant places. The soundscapes would be radically different than the ones that I have been surrounded by. When listening to the languages, sounds and music of different communities, we can sense how these societies are sensitive to different tones and rhythms (Schafer 11). As seen in La Gomera, the population is especially talented at shifting vowels with their whistle (Rialland 2133). This requires a different listening sensitivity.

(8:26.37) As a fun fact, in the small city of Ames, which is where this episode is being recorded, there is a small mosque, it sits quietly among a neighborhood of houses, on the west side of the Iowa State Campus. Here, the mosque cannot broadcast the call to prayer, because it must abide with the city’s “Noise ordinances.” In addition to this, the city orders that if there is a sound event that is planned to exceed the 60 Decibel legal limit, then a petition must be sent to the City’s Police Department 24 hours ahead of time (cityofames.org 2016). However, I have found a community sound symbol in the City of Ames. It is played every first Wednesday of each month. And its a weather warning test (9:12.22). If we were to imagine it, a Gomeran whistle that can reach between 108 to130 decibels (Rialland 2132) would be momentarily illegal in the city of Ames. It’s an interesting notion, to consider how
cities disapprove on making noise on a personal scale. And how they implement noise ordinances for trains, cars or heavy traffic on the highways or for the repetitive sound of heavy-duty construction (cityofames.org 2016).

(9:55.87) The acoustic community is a fluid phenomenon. In our modern society, it beings within the physical limits of the house, the walls, wood, concrete and materials enclose the space and dictate how sound will behave. Within the house, we learn to identify how steps sound on the stairs, how they sound in the kitchen or in the living room. At the same time, the people we live with learn to identify where we are and how we sound in that space. After the house, there is a myriad of sound environments that define multiple acoustic communities. From the school bus hubbub, to the sleep-inducing lecture hall, to the Indie rock concert. All of these spaces share unique soundscapes that have meaning to the people that are immersed within. The acoustic community stems from an already established community (Schafer 215), and it can be created at any time through the unifying force of shared listening.

(11:05.41) The sounds featured in this episode fall under the Creative Commons License form freesound.org. Sound samples of whistle languages belong to UNESCO.com and lemondeshiffle.free.fr. Original music composed by Julian Osorio. This episode is made possible thanks to the College of Design at Iowa State University. A special thanks to Alex Braidwood, Paul Bruski and Christopher Hopkins. A special thanks to Calee Himes, Ryan Hubbard and Samantha Barbour. This is Julian Osorio. Thank you for listening.
This episode is a sonic composition. It is designed emulating how sound works in a film and it is an experimental approach to the podcast format.

[Podcast Episode Transcript]

Julian Osorio: Hello everyone, this is 20-20 Listening. I am Julian Osorio. In this episode I’m going to shake things up a bit. So, I’ll ask. Are you listening?

(0:28.53) Are you driving to work? By any chance, are you stuck in traffic? Are there car horns to your left? Maybe to your right? Maybe you are by the sea, and this is what you hear. Maybe you are listening to your car engine. What then, is sounding? (Flueckiger 152).

This is a dog barking, and this is a bird singing. They are both sounding. What is in motion? is there something moving about? Is it cicadas calling out to one another?

(1:26.03) Maybe you truly are stuck in traffic and then a car passes by. You are in tune with your soundscape, you can focus on sounds one by one, name what they are, see motion, and hear motion as well. Like footsteps. You can get an idea of the materials of things with only their movement and their sound.

(1:47.11) You can hear duplicates. You can detect their patterns. Are you listening to signals? Thunder and lightning, its a storm on the horizon. You hear the boom (1:59.11). What is sounding? Where is sound sounding? You can distinguish the instruments in this orchestra. You can also detect that this is a robotic voice, and this one is not. (2:16.40) And that this was recorded at a different point in time. And that this is my electric guitar.
All of this you already knew, you’ve heard it before. Maybe some of these sounds are warnings, keep away they say, be careful they say. Listen to how big they are, or how tiny they can be. What caused that sound? What is the purpose of that other sound (Flueckiger 151 - 155)?

Listening is to explore. To explore is to wander. And may you find yourself immersed, in different acoustic worlds. This is how I build a soundscape. It’s music, and its noise, its also voices and it is also silence.

This episode is made possible thanks to the College of Design at Iowa State University. A special thanks to Alex Braidwood, Paul Bruski and Christopher Hopkins. Original music by Julian Osorio. Featured sounds fall under the Creative Commons license from Freesound.org. I’m Julian Osorio. Thank you for listening.
APPENDIX J

SOUNDCLOUD ACCOUNT

Hello everyone, this is 2020Listening. We are dedicated to the exploration of our interaction with the sonic environment in space and in media, and how the listening experience can offset us as possible and as awesome humans.

Go mobile

Language: English (US)
APPENDIX K

ITUNES ACCOUNT

2020Listening

Description

2020 Listening is a podcast dedicated to the exploration of the interaction with the sonic environment. We dive into the world of sounds in human space and in digital media, and how the listening experience affects us as people and how we can become more mindful listeners. Each Episode introduces new topics and soundscapes, and we hope that you join us in this listening journey.

<table>
<thead>
<tr>
<th>#</th>
<th>NAME</th>
<th>TIME</th>
<th>RELEASED</th>
<th>DESCRIPTION</th>
<th>POPULARITY</th>
<th>PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Episode 2: Listening to the Soundscape Part 1</td>
<td>⌁</td>
<td>Mar 15, 2016</td>
<td>A first exploration into the sounds of our environment...</td>
<td>⭐️⭐️⭐️⭐️⭐️</td>
<td>Get a</td>
</tr>
<tr>
<td>2</td>
<td>Episode 1: On Hearing and Listening</td>
<td>⌁</td>
<td>Mar 4, 2016</td>
<td>In Episode 01 we will get an introduction to the art of listening...</td>
<td>⭐️⭐️⭐️⭐️⭐️</td>
<td>Get a</td>
</tr>
</tbody>
</table>

TOTAL 2 ITEMS
APPENDIX L

PROCESS PHOTO (RECORDING)
APPENDIX M

NARRATOR: JULIAN OSORIO