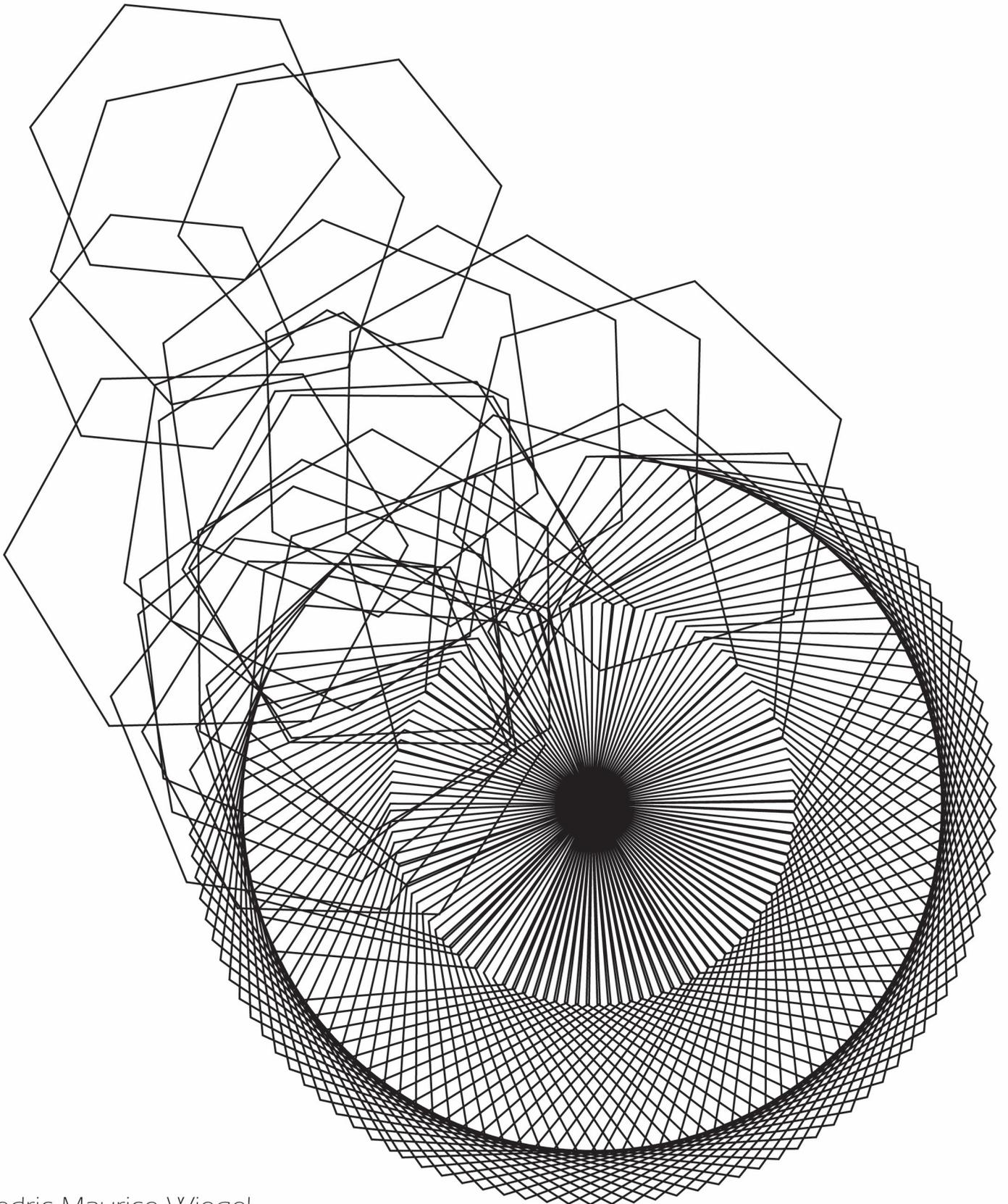




KLANKÖRPERKULTUR

We are all resonant bodies creating the composition of the world



Cedric Maurice Wiegel

Klangkörperkultur

*We are all resonant bodies creating
the composition of the world.*

Graduation Project, Position Paper iArts Maastricht,
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KLANGKÖRPERKULTUR

We are all resonant bodies creating the composition of the world.

*A research into how sound shapes our daily
perception of dissonance and harmony.*

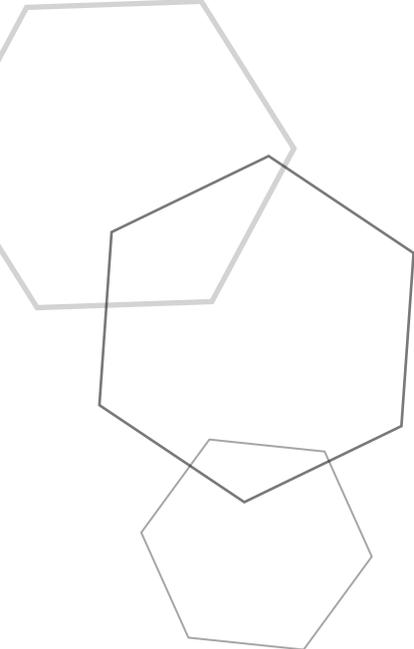


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ABSTRACT

"This book is not an attempt at a multidisciplinary study, but rather a call to theoretical indiscipline with an ear to sound matter as the herald of society. The risk of wandering off into poetics may appear great, since music has an essential metaphorical dimension: "for a genuine poet, metaphor is not a theoretical figure but a vicarious image that he actually beholds in place of a concept"

(Jacques Attali, 1977)

Since the Industrialization of the 1700ths and 1800ths, strong environmental sounds are dominating our day to day lives. This makes it difficult to achieve a state of clear and focused hearing. A so called state of "clairaudience" (R. Murray Schafer, 1977). Machines and non- biological inventions, modern media such as TV, Radio, portable music and smartphones, to name a few, mix with the environmental sounds of nature.

Considering this statement, we can recognize a pattern of behavior within our environment and ourselves: the constant struggle to balance chaos and order, conflict and peace, dissonance and harmony. This balance is the fundamental issue that inspires this research: how do we perceive dissonance and harmony through sound and how does this perception relate to the "human condition"?

This question will be dissected and explained throughout CHAPTER I.

This spectrum of extremities will be artistically analyzed by the means of sound; it being the technique and also the central theme of the research. The aim of this research, and therefore this document, is not to give an answer to a question, but rather to offer an alternate perspective by taking a position within the theme. This position is established through in depth research and artistic experimentation and is therefore not to be generalized, but to be read and used as source of inspiration and innovation. This document is complementary to the final work, whereas it can also be viewed as an artistic output in itself.

This is a story of discovery where facts create a storyline. It is an academic essay, wherein scientific concepts are applied, combined and described in an artistic manner.

PROLOGUE

The beginning of a journey

Since I was a child, I was always intrigued by balance. Maybe because my star sign is a Libra. I wondered what this sensitivity was, but as a child, one does not necessarily have the vocabulary nor the experience to describe what one is feeling. As I matured and grew older I was able to recognize that my perception of the world had the tendency to swing between two fronts: dissonance and harmony. I began to question what this meant, what this state of being was.

5 Being a mellow guy in his teenage years, I constantly wanted to have a harmonious environment around me. Recognizing the conflicts that happened elsewhere, the desire was grand to keep everything at peace, at least in my little world and in the worlds of the people around me. I did not have selfish ambitions, I just despised conflict: it made me confused and uneasy. Now, in retrospect, I realize it was not the conflict in itself that I tried to avoid, but the dissonance of the situation. I despised the moment of getting pushed out of my comfortable, known terrain and being forced to walk upon uncharted territory, unknown to myself. I did not know what I would find, what parts of me I would unravel. As I cursed and wished every evil upon this moment, I couldn't comprehend the value of this process of discovery at the time.

It is as if you are a child.

Growth is a painful process of balance that is weighed with "dissonance" and "harmony".

I began to channel this balance into music. Not only with the instruments that I played, such as drums or guitar, but with what type of music I would listen to. Tunes that conveyed a dissonant, darkened atmosphere were in juxtaposition to heavenly, calming melodies, creating a blissful moment in time. Did this perception ultimately define my personality? No. But it became an intricate part of my personal development and mindset, how I see the world and how I undertake this process of growth. These experiences and perspectives progressed with me and became a focal point of interest and analysis, especially throughout my studies.

In this context, sound was, at all times, an essential element of my artistic research and practice, independent of the theme. Whilst contemplating about new projects, I would always return to sound, not solely due to personal preference, but because of the realization that sound is an immersive topic: it can be used in a multitude of ways. I followed this notion and categorized sound into three factors, as illustrated in the diagram on the next page:

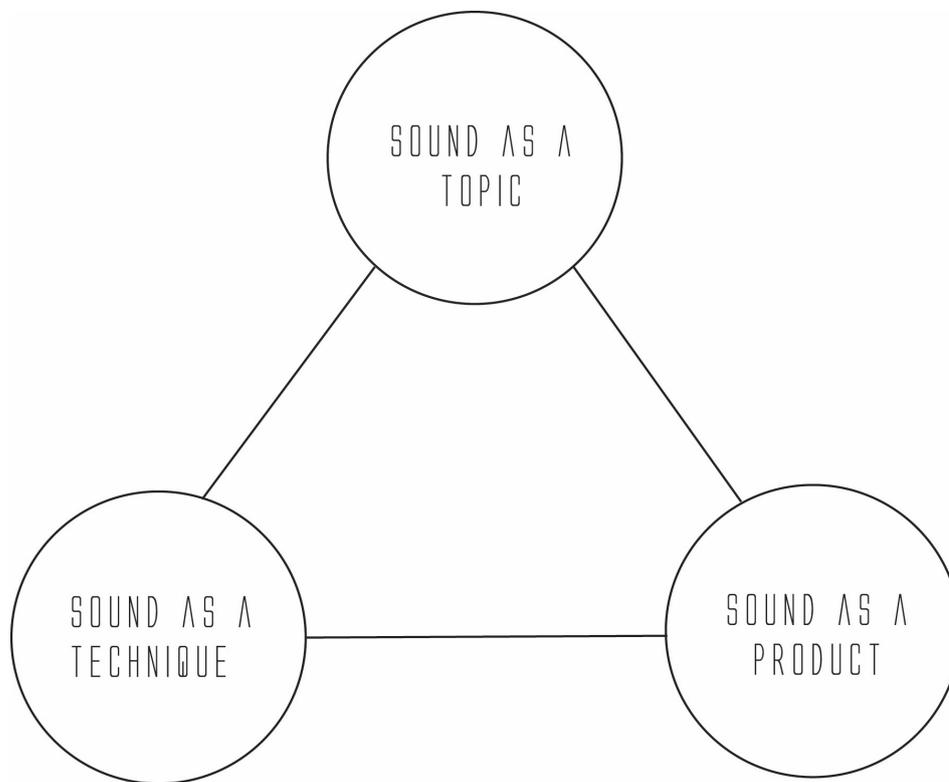


Figure 1, Cedric Wiegel, 2016

The research and production of my final work revolves around these three factors. This mentality enables mobility within the research topic but with a stable, overarching framework. This illustration is to be read in the following way: sound can be used as a 'technique' for artistic research, whereas sound can also be the 'product' of artistic research. Sound can also be used as a 'topic' of research, which completes the triad. Both artistic and theoretical research processes constantly shifted between these key factors, depending on what section of the topic I focused.

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Considering this research method, the storyline of this academic essay was constructed:

CHAPTER I:

The dissection of the question: How do we perceive dissonance and harmony through sound and how does this perception relate to the 'human condition'?

CHAPTER II:

The different dimensions of sound perception: our sonic environment and music.

CHAPTER III:

The relation between Cognitive Dissonance, sound and the individual.

EPILOGUE:

The artistic translation using following techniques:

- Interactivity Design
- Visualization of sound
- Composition and Neuro-Acoustics

CHAPTER I

To find a balance...

Dissonance, harmony, daily perception, sound and the 'human condition'. What type of conversation do these 5 terms have? What is their relationship to one another? I believe they all create the framework for the composition of the world and we are the resonant bodies that create this composition.

7 To understand this metaphor, we have to comprehend what a 'composition' is and where it can be applied. The term 'composition' can be used to describe a variety of circumstances and occurrences and is not limited to solely artistic purposes. It is not only a metaphorical term, but is in fact a universal noun under which any forms of constellations and relationships can be described. According to the Merriam Webster dictionary, a 'composition' is the way in which something is put together or arranged; the combination of parts or elements that make up something (www.merriam-webster.com). Considering this definition, the notion of a composition not only being a musical or artistic entity, but also a concept that can be applied to, for example, social or political contexts becomes not only plausible, but significant. If we look at the world through this perspective, it is not one of stale stigmatization, but a world defined by a dynamic of poetics. The importance of sound and music becomes apparent as they are immersive translators of these poetics.

Jacques Attali, a renowned French economist, advocates this relevance of sound in connection to politics and economy in his 1977 publication *Noise: The Political Economy of Music*. His words speak for themselves:

"Music is more than an object of study: it is a way of perceiving the world. A tool of understanding. Today, no theorizing accomplished through language or mathematics can suffice any longer; it is incapable of accounting for what is essential in time- the qualitative and the fluid, threats and violence. In the face of the growing ambiguity of the signs being used and exchanged, the most well-established concepts are crumbling and every theory is wavering. The available representations of the economy, trapped within frameworks erected in the seventeenth century or, at latest, toward 1850, can neither predict, describe, nor even express what awaits us." (Jacques Attali, 1977)

This statement, already posed in 1977, 40 years ago, describes a deep necessity to break free from the established, stigmatized frameworks of understanding. Now in the 21st Century, the world has developed an accelerated mindset where transformations within society occur rapidly. There is no more singularity but a sense of duality, as late Pop-musician David Bowie stated in an interview with BBC in 1999: ...there was no kind of duplicity or pluralism about the things that we believed in. That started to break-down rapidly in the 70s. And with the idea of duality in the way that we live, there are always 2, 3, 4 or 5 different sides to every question; the singularity has disappeared. (BBC

Newsnight Interview, 1999) There is an apparent need to cope with these new ways of comprehension, to discover new linguistics to translate the changes that are happening and to interpret their meaning. The use of poetics and artistic interpretations of the present have thus never been as relevant as they are now.

Thus, the elements of composition expressed within this research consist of precisely the 5 terms of the above: dissonance, harmony, daily perception, sound and the 'human condition'.

In order to gain further insight into this composition, it is of essence to put the 'human condition' under the microscope. What does it mean and how is it relevant to this research? The epistemology of the term ranges beyond the era of great philosophers. In his book *Freedom: The End of the Human Condition*, biologist Jeremy Griffith describes its origins in the 'existence of "good and evil" within our make-up':

"We humans are capable of shocking acts of inhumanity like rape, murder and torture and our agonizing predicament or 'condition' has been that we have never been able to explain and thus understand why. Even in our everyday behavior, why are we competitive, aggressive and selfish when clearly the ideals of life are to be the complete opposite, namely cooperative, loving and selfless?" (Jeremy Griffith, 2016)

Whereas Griffith's description might be accurate, it is unsuitable in its hyperbole for the purpose of this research. Here, the 'human condition' is being divided into good and evil, which, in their core, are abstract concepts. Therefore, Griffith's definition of the 'human condition' will be scaled and downsized into the following forms: "a dissonant state of mind and a harmonious state of mind". These two opposite terms have been used in a variety of contexts as they describe a universal struggle between comfort and conflict. Considering this, the 'human condition' can be re-framed into a multitude of fields: one of which Psychology is utterly relevant to dive into with this work.

The psychological theory of Cognitive Dissonance refers to a situation involving conflicting attitudes beliefs or behaviors: the discomfort that is created, then leads one to alter his beliefs to restore the balance (simplepsychology.org). This theory bundles the notion of harmony and dissonance and applies the 'human condition' on a focused scale. Based on these terms, we can summarize the theoretical composition into the following: The 'human condition' is the constant balance between dissonance and harmony; it is the epitome of growth and understanding, the search for wisdom, whose translators are sound and music.

CHAPTER II

The sonic landscapes of our world

Sound is an ever present entity. It is a signifier of life, of cause and effect. The perception of it is more than only auditory; it is a physical power that creates of a fluctuation within air, a vibration. It does not only interact with our environment, it shapes it. "It's a sphere without fixed boundaries, space made by the thing itself not space containing a thing" (LaBelle, 2010, Pg. 14). Throughout the past decades, our sonic environment underwent enormous changes that indicated a new era of development. One of the apparent examples is the Industrial Revolution of the 1700s. Mass production within factories created a Lo-Fi (low defined sounds) of auditive information through the invention of various machines, as R. Murray Schafer, a Canadian composer, showcases with a list of inventions in his book *The Soundscape: Our Sonic Environment And The Tuning Of The World* (shortened here for illustration purposes):

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1774	<i>Boring machine</i>
1775	<i>Reciprocative engine with wheel</i>
1776	<i>Reverberatory furnace</i>
1781-1786	<i>Steam engine as prime mover</i>
1781	<i>Steamboat</i>
1785	<i>First steam spinning mill (at Papplewick)</i>
1785	<i>Power loom</i>
1785	<i>Screw propeller</i>
1787	<i>Iron steamship</i>
1788	<i>Threshing machine</i>
1790	<i>Sewing machine first patented</i>
1791	<i>Gas engine</i>
1793	<i>Signal telegraph</i>
1795-1809	<i>Food canning</i>
1796	<i>Hydraulic press</i>
1797	<i>Screw cutting lath</i>

(R. Murray Schafer,
The Soundscape, 1977
PG.72)

These inventions struck a dissonant chord. Up until today, we can witness the auditive repercussions of the Industrial Revolution. Cars, mobile music, electrical circuits, air-conditioners and TVs, only to name a few, dominate our daily hearing experience and mix with the natural soundscape of the world. These two sonic landscapes are two different compositions which lie in contrast to one another: the industrial being dominated by the Lo-Fi and unclear sounds, while the other is the natural Hi-Fi composition that is based on cliraudience. The accelerated mindset of the 21st Century supports a Lo-Fi environment, where duality and a diversity of layers make it difficult to reach a state of cliraudience, a state of clear and focused communication. We have reached a tipping point of awareness, where it is dawning that we have to weigh the scales again. As Murray Schafer puts it: The emergence of noise pollution as a topic of public concern testifies to the fact that modern man is at last becoming concerned to clean the sludge out of his ears and regain the talent for cliraudience- clean hearing. (R. Murray Schafer, 1977, PG. 11)

We are attempting to re-shape our acoustic environment, realizing that it has great impact on our state of being. With agreements on noise regulation, showcased in Brandon LaBelles 2010 *Acoustic Territories: Sound Culture and Everyday Life* (Chapter "Acoustic Space", Pg. 15), we began to eradicate unwanted and irritating sounds from our imminent surroundings that disturbed the balance of dissonance and harmony. With these agreements, centralizing sounds into their respective fields became a political endeavor: the factory is where the production and machinery resounds, the restaurant is where conversation, cutlery and food resounds, for example. As we swing between extremes of high volumes of production in the 19th Century and now, in the 21st Century, the attempt to isolate these sounds, one can recognize a red thread: the need to balance between these extremes in order to understand and constantly re-adjust our environment according to the experiences we've made. Our soundscape is the direct result and representative of how we interact with our environment and what we do. We are the resonant bodies that create the composition of the world.

10

Music is one of the best examples of how we channel our acoustic environment and try to make sense of all the sounds we create. Music is, in its essence, the systematic organization of sounds. A composition of different physical characteristics of sound that create an auditive experience. Whereas the music of today has mostly degraded into being used solely for entertainment purposes, it had an entirely different meaning and position, when we take a peek into history.

Throughout decades, centuries, even in pre-historic times, music was a source of communication. Not only the tunes, which contained a message, but the form it was played in, the setting and its audience. It revealed the state of society and its hierarchies. Let's take the 18th Century as a showcase, specifically Europe. The monarchical powers were still on the go; it would be another 100 years until the first European Revolutions began. The nobility was at the top of the food-chain and there were clear social hierarchies with a clear distribution of wealth and power. Music played a large role in this theater. It was classical music especially that was used as a form of political power. It was a secluded entity, highly regarded, only affordable by the bourgeoisie because of its expenses. "*Haydn and Mozart was background noise used by aristocrats as sign of power*" (Jacques Attali, 1977). The aristocrats used composers and musicians to display their status. It was primarily about demonstrating that they had the financial capabilities to hire a composer, the listening was secondary. Music was in the hand of those in power and experienced little liberty when it came to how it should be shaped or composed. This lack of freedom, of expression of oneself, is translated within the structures of classical music in that century. A piece would be created using a formula, where the communica-

tive capabilities of music were restrained into solely what sounded pleasant to the ear, or more accurately, what the nobility believed sounded pleasant to their ear. It was a creation of a façade of harmony, representative of their luxury and power, because it was limited to them. The dissonance came after the 1848 revolutions.

As music was always a representative of the fight of hierarchies between the lower classes and the bourgeoisie in the 18th Century, it was used likewise for that purpose in the time of Communism after World War II. There was a significant difference though: the recognition of music as a powerful political entity that did not only display social status but maintained the status quo. The façade of harmony started to crumble, as the boundaries between social classes became corroded. This fight is very accurately phrased by Zhdanov in 1947 (read in Attali, 1977, PG. 7)

"And, indeed, we are faced with a very acute, although outwardly concealed struggle between two trends in Soviet music. One trend represents the healthy, progressive principle in Soviet music, based upon recognition of the tremendous role of the classical heritage, and, in particular, the traditions of the Russian musical school, upon the combination of lofty idea content in music, its truthfulness and realism, with profound, organic ties with the people and their music and songs- all this combined with a high degree of professional mastery. The other trend is that of a formalism alien to Soviet art; it is marked by rejection of the classical heritage under the cover of apparent novelty, by rejection of popular music, by rejection of service to the people, all for the sake of catering to the highly individualistic emotions of a small group of aesthetes..."

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The controlled composition of music here was used once more to maintain a hierarchy of power, this time turned around. After the reign of the bourgeoisie, the people, supposedly, had the power. Whereas it was the exact opposite. Music was centralized under the façade that it was from the people for the people, but it was truthfully maintaining the position of a few individuals in power by keeping the formula of composition intact only framing it with a different context. The status quo was the resonant body that determined the composition of its time. As we can observe, there is a direct correlation between the state of a society and the formula of creating music and organizing our acoustic environment.

How was it possible that the status quo and political hierarchy was able to uphold a sonic reign over the people? Isn't music a universal language that everyone was able to enjoy? Yes, everyone could enjoy music, but not everyone had the power to officially determine what should be considered music or not. That right was reserved to the bourgeoisie. Major and minor scales were only fully developed by 1650 (klassikazente.de). This indicates the development of music as a process of growth and understanding, not as a given. Before 1650, one can trace the modern knowledge of sound back until Pythagoras, 570-510 BC. His metaphysical theory, that the entire Universe consisted of mathematical patterns and relationships, therefore harmony, established our modern view of Physics in relation to sound. According to Pythagoras, the relationship between harmonious frequencies is established by mathematical calculations. An old story tells of him passing a Smith once, hearing the sounds of the hammer hitting the anvil. He entered the workshop and discovered that the harmonious frequencies he heard were based on the weight of the hammers: one that weighed half as much as another, created a sound exactly an octave higher (an octave is a ratio of 2:1) than the heavier one (Anthony Ashton, 2003, PG. 188).

The usage of Pythagoras' discoveries had a fixed form in composing music until the 1920s. I believe that the formula of composition, being a political entity with the façade-

de of musical harmony, became disrupted by one musician in the 1920s: Arnold Schoenberg. It was time for a revolution, time to re-invent the frameworks that were used since the Renaissance of the 15th Century, based on the mathematical discoveries of Pythagoras. The harmony that upheld music, and therefore also the status quo, now clashed with dissonance. Schoenberg opposed the traditional method of composition. The traditional method included some of the following rules:

- *A root note would be very important in order to determine the key of the piece.*
- *A tonal key would be chosen, either major or minor.*
- *There would be a strong tonal hierarchy, where all the notes have a different importance, either more or less. There would be definitions of what notes would sound good or bad.*
- *A motive would be created; a repetition of a certain arrangements of notes.*

In response to this hierarchical method of composition, Schoenberg proposed an entirely different approach that marked a liberation of sonic perception: the 12 tone technique.

The 12 tone technique created a new form of expression in which dissonance and harmony were fused into one entity. The difference between the two, which was usually created by the hierarchy of notes in the traditional method, was undermined by creating a fluid continuum of notes where the root note of the piece vanished. The idea of a motive became irrelevant because the continuum would create a constellation of notes that would not repeat themselves. This was known as 'free atonality' (wissen.de, own translation into English). The 12 tone technique created a framework under which this perception of dissonance and harmony became applicable to use as a form of expression. The composer would create a piece that consisted of a continuum of notes; each of the notes had the same importance, meaning that each note could be the potential starting point of the next continuum. It created the idea of a fluid storyline, instead of a repeating chapter. The music world faced an intense moment of cognitive dissonance at that point. The old methods became invalid, outdated and new ones took their place. This development was opposed very heavily and was a hard birth for a new form of auditive aesthetic. In the 1920s, free atonality was not common and therefore considered as an abomination of music.

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What I find striking and utterly important to consider, is the impact this new aesthetic had on not only the music world, but on our general perception of sound. Free atonality was the first step into any type of sound study of the 21st Century. It was not the musical framework of the 12 tone technique that had the greatest impact, but the mentality of how Schoenberg approached the creation of such a technique: by opposing the status quo, by advocating a perspective that seemed preposterous and outraging. It created the ideological space to think free of tonal hierarchies and to start composing with a self-determined form of expression. I dare say that self-expression through music for the first time became personal, cut to the individual. Suddenly there were no fixed boundaries anymore, no aristocracy that determined what was appropriate or not; the lower classes were able to voice themselves.

Our sonic environment started to be of interest to music because suddenly musicians, who built on Schoenberg's approach, heard the musical qualities of an acoustic environment; its rhythms, melodies and intervals. John Cage is one primary example of how the environment became an instrument with his infamous piece 4:33. In this piece, the sounds that the audience would exert was considered the composition, the musicians on stage were only the props. Every individual became the resonant body, creating the composition by moving, chatting or sniffing; any type of interaction that created a sound.

The power of sound was now truthfully given to the people, in opposition to Zhdanov's argument.

Every new experience requires time to process. So did the idea of free atonality, the liberation of composition. Since the 1920s, music developed enormously. New genres and instruments were created in the span of, by now, 96 years, at an incredibly accelerated speed. Especially since the 1950s and 60s, the electronic age began to flourish with the invention of several synthesizers like the infamous Moog in 1953 or the RCA Mark II synthesizer in 1960 (emstudiosaos.com). The conventional idea of composition became almost like an abstract concept in comparison to the new worlds of sound perception that electronic circuits presented. This evolution entailed several implications: analogue electrical circuits contained an amount of chaos; one could only change the sound but would not receive exactly the same sound again, very similar to Schoenberg's 12 tone technique. Repetition was not the dominant compositional aspect any longer; a continuum was created. The aristocracy that was reigning in the 18th Century and before, began to lose control over the formula of composition. Dissonance started to encounter the harmony, always opposing the established status quo with a new perspective, undermining the current state of cognition. Where, at first, this growth process would only occur sporadically in the beginning, it accelerated very rapidly through globalization and, most importantly, through digitalization.

13

Now, in 2016, our auditive environment has become shapeable and musical. Digitalization made it possible to convert analogue signals into digital information, where the matter of sound became fluid. It is no longer restricted by any type of force or entity, only by electrical signals. The introduction of Digital Audio Workstations, an evolution of programmable synthesizers and now the definite cornerstone of modern music, enabled complete manipulation of sound. Our auditive environment, the dissonance and chaos of sounds, became intertwined with music, the harmony and organization of sounds; a direct reflection of society's state of development. The overwhelming amount of environmental sounds that are present today have outweighed the balance of dissonance and harmony. Modern man now attempts to balance inconsistency, according to Festinger's theory of cognitive dissonance, by organizing our overly dissonant acoustic environment into a musical form and thus re-establishing consistency.

Considering the above, one can draw the following conclusion: *Since the 1920s, the development of music and sound into its current form is a direct reaction to the progression of a highly dissonant acoustic and social environment. It is an attempt to re-establish harmony, where the sound of music is not harmonious in itself, but the process of organizing new auditive information is.*

CHAPTER III

III, the resonant body of the world

Even though the struggle to find harmony in a dissonant environment is present on a macro level of society, it is equally, if not dominantly, present on a micro level: cut to the individual. How does this development of acoustic design affect us as individuals? How does it affect our emotions, understanding of the world and our interaction with one another? And, more importantly, how does it impact our balance of dissonance and harmony?

Modern technology and scientific experimentation has shown the extraordinary impact of sound on the brain. The brain's emission of electrical frequencies that are measured via an EEG scanner (Electroencephalography) were explored in more detail. These frequencies are measured in cycles per second a wave re-occurs, commonly known as Hertz (Hz). There are 5 different frequencies that construct your state of mind (read on mentalthoughtdaily.com, in reference to John N. Demos' 2005 book 'Getting Started with Neuro-feedback'):

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Delta Waves (0.0 - 4Hz): Delta waves are very low frequencies that can be compared to a steady impulse like a drum beat. They are generated when one is in deep meditation or deep sleep and are related to empathy and a sense of awareness. Healing of the body, regulating heartbeat and digestion is also stimulated by Delta waves. The main functions of Delta waves, when emitted in the right amount, are healing, restoration and support of the immune system. If they are out of balance, either too much or too little, the symptoms are reduced learning, thinking and restoration ability.

Theta Waves (4 - 8Hz): These waves are mainly related to daydreaming and sleeping, creating intense emotional states. The senses of creativity, intuition and relaxation are commonly associated with this wavelength when emitted in the right amount. The symptoms of over production are ADHD, depression and inattentiveness, whereas too little production is indicated by anxiety and stress.

Alpha Waves (8 - 12Hz): This wavelength creates the transition between conscious and subconscious emotions and thinking. It creates a state of relaxation when optimally emitted whereas the inability to focus is a symptom of overproduction and insomnia is one of underproduction.

Beta Waves (12 - 40 Hz): Beta waves are the most common waves, associated with critical thinking, task solution and conscious focus. These mainly occur in a state of being awake. The right amount of Beta waves creates the best circumstances to conduct, for example, school work or solve a problem. An overproduction indicates adrenaline, anxiety and

stress situations. Too little on the other hand creates poor cognition and daydreaming, amongst others.

Gamma Waves (40 - 100 Hz): Gamma waves are associated with learning and memorization. The general processing of information and combining our senses of perception are related to the production of Gamma waves. In the best-case scenario, learning, cognition and combining our senses occurs. Anxiety and learning disabilities are amongst the effects of a too low or too high production of Gamma waves.

In 1981 Dr. Jeffrey Thompson's research on brainwaves (www.soundstrue.com), in relation to sound, created the field of Neuro-Acoustics. He established the Center for Neuro-Acoustic Research, based in Encinitas, California, where he experimented with the exposure of the brain to a state of clairaudience. Focused sounds that included very specific wavelengths, for example, a Delta wave, supported the healing process of the body and were fused into music or a soundscape. This research in the neurological field not only demonstrates the impact of sound on the brain, but creates an intimate relation between our acoustic environment, music and our individual state of mind. Everything that we hear is a frequency and gets processed by electrical currents within our brain. These scientific discoveries, that sound has an impact on our emotions and cognition, is supportive of the notion that individuals, especially musicians, have to train an awareness of what affect sound has on the brain.

15

Psycho-Acoustics, the way we perceive sound, is very important to analyze: likewise is the creation of sound and music. I believe that the connectivity that the internet established was the turning point of enabling the individual to voice him/herself. The internet made the formula of composition fluid, musically and also socially. Through the ability of downloading software, especially Digital Audio Workstations, any person with internet connection and computer power can shape auditive information (any type of information that involves sound); he/she can influence his/her acoustic environment, if it is desired. This reflects directly onto the ability of the individual to communicate and expose their mindset to the world by the interconnectivity of the internet; every singular body is able to resonate in not only a musical but social way. They are able to send a frequency of communication into the vast space of the digital and thus add to the composition of the world. Taking the discoveries of Dr. Thompson into account, this statement becomes more than a sole metaphor. In an interview with Atlantic City Weekly (atlanticcityweekly.com, 2015), Dr. Thompson explains how specifically tuned sounds can alter your state of being:

"...we hook up patients to medical monitoring systems, like EEG and brainwave systems to analyze your nervous systems. We can pretty much see the control centers on a computer screen. We can see what's imbalanced in there. We can use precisely tuned sound frequencies to normalize those imbalanced systems. Mostly its stress in the nervous system. We can see the stress levels of your fight-or flight response locked in place and then we can use these precisely tuned sound frequencies. It's like a wineglass vibrates when you sing the right note, except that you are the wineglass and we sing the right note and makes your stress handling ability go to its zero stress-point..."

He continues to state that the left and right hemisphere of the brain and the body communicate differently with the central nervous system and that through sound, the synchronization of both sides becomes possible:

"...the moment of synchronization of the hemispheres is usually associated with an epiphany, a moment a problem gets solved or personal realization of some kind. Being able to orches-

trate that, helps me to solve problems in my life that I usually do not have access to. You can boost creativity, performance, learning and memory. All of those brain states are associated with activity in brainwaves and we can orchestrate brainwaves to go from a certain state to a target state using different types of sounds. We can orchestrate your brain state. That means that we can alter your brain state to states to be nice to go to. In medical clinical set ups, for example, pain reduction and stress control..."

These assessments can be applied to Festinger's theory of cognitive dissonance. The state of cognitive dissonance occurs when you face something unfamiliar that clashes with the familiar things that make up your world-view. The dissonance, an inconsistency within your perception, that is created, is to be reduced as rapidly as possible in order to restore the balance between harmony and dissonance, harmony being consistency within your cognition. Thompson's discoveries within Neuro-Acoustics created a technique that makes the reduction of cognitive dissonance by sound significant. The repercussions of the stress that is created by a constant state of cognitive dissonance are identical to the symptoms of an over- or underproduction of certain brainwaves, as stated above. If the balance between dissonance and harmony is not achieved, according to A.M. Hull in his 2002 publication *Neuroimaging findings in post-traumatic stress disorder*, it leads to 'mood regulation disorders such as depression, anxiety or post-traumatic stress disorder' (read on <http://cogsci.stackexchange.com>).

With noise pollution, an overabundance of environmental sounds and a world that is becoming more and more interconnected, many voices are heard at the same time. Once more referring to David Bowie: "...with the idea of duality in the way that we live, there are always 2, 3, 4 or 5 different sides to every question; the singularity has disappeared." (BBC Newsnight Interview, 1999) The state of clairaudience, a relaxed and focused state of hearing is scarcely to be found in the ocean of digital information. Our hearing and cognition is constantly under a high stress level. Thompson's, Festinger's and Hull's findings all support this notion. They also support the notion that the individual is now the resonant body. A stressed body, with an imbalance of frequency and brainwaves will reflect this imbalance unto the world, creating a cycle of receiving and sending stressful sounds.

In context of the above, the responsibility of those who shape an acoustic environment, such as musicians or architects, has become more complex. Even though the freedom of expression through sound shifted from the aristocracy to the individual, so did the cognitive dissonance that occurred mainly within the hierarchy of the aristocracy. Now every sound that is constructed, composed and heard has become a potential carrier of a message. A message that does not resemble the preferences of the aristocracy any longer, but the needs, desires and thoughts of every individual that decides to resonate. This framework requires new forms of sound organization; new ways of communication to reach a state of mutual understanding, a synching of both cerebral hemispheres, like Thompson describes in the interview in the above.

All these scientific discoveries lead one to the following conclusion: ***Sound has a direct impact on your state of being. The frequency that your body resonates to, creates a balance or imbalance of dissonance and harmony. The cycle of sending and receiving stressful frequencies is an accelerating process, hindering a global state of clairaudience, whereas the receiving and sending of balanced frequencies would lead to mutual epiphany and problem-solving.***

EPILOGUE

The Experience

To conduct theoretical research in various disciplines expanded my horizon of knowledge. New perspectives and insights lead me to formulate conclusions that I drew by combining the theory of disciplines, such as Neuro Science, Sociology, Politics and Music. All of the conclusions can be summarized in the following statement:

In an accelerating digital age, where the individual became the focal point of interest, it is essential to re-interpret and re-discover our frameworks and methods of communication. It is of utter importance to become aware of the balance between dissonance and harmony; to adapt and act towards a state of clairaudience.

The following step is the translation of theory into artistic practice. As an interdisciplinary creator, it is important to contemplate and make decisions on what elements your work should consist of, having a generous tool and inspiration pallet at your disposal. By researching, observing and witnessing modern artistic creations, I reckoned that interactivity design within an artwork has incredible potential. Being immersed into an experience by becoming part of the creation in some way or another was very striking to me. Modern technology enables you to hack into reality and make it your playground.

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In connection to the above, the second technique that will be researched is composition in combination with neuro-acoustics. The relation between sound frequencies and our brainwaves becomes an interesting field of experimentation. Creating a composition based on brainwave data putting it in contrast to our daily acoustic environment is part of the translation. I will be attempting to conduct a semi-scientific experiment with students from the Science Faculty in Maastricht and Amsterdam, in order to research an artistic translation of brainwaves in reaction to a variety of soundscapes and musical compositions.

The visualization of sound becomes interesting to observe in this context, in order to see what the brainwave reaction looks like. Because of the distinct aesthetics of the physics of a frequency, I will be experimenting with a 'Chladni Plate', an old method of visualizing sound waves, and connect it to an EEG scanner as a translator. Thanks to recent technological developments in the field of neuro science, multiple companies, such as *EMOTIV* (emotive.com) or *NeuroSky* (neurosky.com), launched wearable EEG scanners that enable you to manipulate and control your electrical and digital environment. Actions, such as switching on your surround sound system, become a matter of brain activity. The interactivity between the audience and the work is created on a very intimate level: sound and music created and manipulated by your own brainwaves and cognitive activities. This is also related to research that Dr. Thompson, mentioned in Chapter III, conducted in the field of neuro-acoustics and composition. Using this technique creates an entirely new world of possibilities when it comes to researching acoustic design and the impact of sound on the human brain. You become the resonant body. Festinger's

theory of cognitive dissonance and Schoenberg's 12 tone technique become variables and practical tools to be used in experimentation. How does the human brain react to the 12 tone technique? Will there be a factor of cognitive dissonance when exposed to the 12 tone technique or other forms of sounds?

During this journey of discovery, my intention is to stay in close contact and possibly collaborate with other artists and creators. One of these is Ricky van Broekhoven (studiovanbroekhoven.com), a sound artist based in Eindhoven, who is involved in experimentation of visualizing sound. His approach is a very physical one, involving mechanics and analogue signals to visualize the aesthetics of sound. One example of his work are the Sound Shape speakers, where sound shaped the casing of the membranes; a prime example of how sound can influence matter and create new methods for aesthetics. His techniques and approaches are very inspiring and triggered me to gain deeper insight into other applications of sound.

Marie van Vollenhoven (www.ininfinity productions) is another inspiring artist that specialized in interdisciplinary creations involving the visualization of sound, digitalization and technology. Her organic approach to an artistic work and focusing it into a specific concept are very valuable to my own artistic process. She is currently researching the fusion of Science and Art as well.

The concept of the artistic product is an interactive installation that involves the digital and physical translation of sound into visuals, by creating a new form of instrument based on the technology of EEG scanners. Your brain activity becomes a composition.

There is a variety of technical factors that influence the direction of this project. Is it possible to create new sounds by translating electrical currents? Or do you have to assign parameters to a certain brain activity in order to let a pre-recorded sound respond? How do you combine seeing (visualization of sound) and listening (auditive perception of sound) in an effective, interesting manner? These and more research questions are bound to be explored and fused into a compelling, interdisciplinary output aiming to blur the boundaries between audience and artist, between Science and Art. Let yourself be immersed and step into uncharted territory of your own mind.

We are all resonant bodies creating the composition of the world.

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Figures

Cedric Wiegel, 2016, Figure 1, self-developed Illustration via Adobe Illustrator

