

**Sonic Spaces:
Technological Access to Dominance and Resistance**

by

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B. Arch, Pontificia Universidad Católica del Perú, 2010

Submitted to the Department of Architecture in partial fulfillment of the requirements for the degree of Master of Science in Art, Culture and Technology at the Massachusetts Institute of Technology

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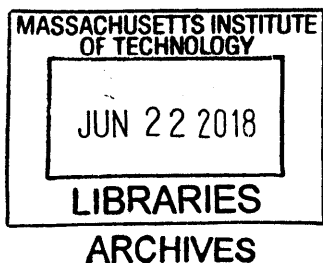
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Abstract

The sonic space can be qualified as a highly relevant layer or dimension to a political notion of public space. The material in use to claim or occupy the sonic space is sound, whose emission or reception by humans largely depends either on biological features or technological resources. Since mostly all humans are provided with equal sonic biological features, it is in the realm of sound technologies where difference appears. Whoever has access to specific sound technologies is able to claim the sonic space in particular ways beyond biological possibilities. If access to sound technologies is restricted, the possibility to claim certain areas of the sonic space will also be restricted. This risks the public and democratic qualities of the sonic space, and leads to its possible partial privatization and control. Artistic production, although far from providing a solution, can play an essential role in addressing this problem. This thesis studies the definitions and connections between public space, sound, technology, anthropology and art. This thesis is produced with the purpose to act as a theoretical framework of the artwork produced by the author in resonance with its claims.

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This all ended up being much better than what I imagined.

Introduction

The ideas and reflections written in this thesis are meant to serve as a theoretical framework to support most of the artwork I have produced in the context of the program in Art, Culture and Technology at MIT. These ideas and reflections are not meant to be understood as finalized, they are meant to be understood as a beginning. As such, this thesis is centered around basic and fundamental concepts that trace my way from an architectural practice into an arts practice. Broadening the notion of public space has been a first step in departing from architecture, with architectural concerns, but trying to open up the possibilities of action. Including the layer of sound to this broad notion of public space has been a step into understanding how public space is actually constructed by multiple interconnected and complex layers and systems, instead of what traditionally I had understood as parks, plazas, streets and the spaces between buildings. The importance of technology has been crucial to understand ideas of access to public space, and how access also ends up mediating the degree of publicness of spaces. If access defines how public space is, access to technology can also define it, especially if centered around the layers of public space that are not accessible by natural means.

Anthropology is a discipline that is concerned with the particular, and is a profession that is also concerned with observing and understanding. Bringing up methods from the field of anthropology such as ethnographic field research and its improvisational spirit has provided with the possibility to explore, discover and research. Additionally, an artistic practice has led to the creation of tools, artifacts and mechanisms that serve as vehicles to conduct these explorations, discoveries and researches. In trying to question, observe and understand the sonic space, a significant layer of public space, artistic artifacts have been created to mediate a technological access to otherwise inaccessible aspects of the sonic space. Through these objects, observations, understandings, research and more artifacts have been created.

Various authors have defined public space from different perspectives, although it can be argued that the term itself carries inherent attributes related to its condition of being 'public', linked to a somewhat defined extension of 'space'. Its publicness, although often ideal, touches upon the possibility of being equally accessible to all, regardless of biological or cultural differences. It is also because of its public nature that this idea of public space has been frequently included in debates and arguments involving politics, some even claiming that public space can be viewed as the ultimate space of democratic citizenship. In this perspective, the discussion of public space regarding politics has defined it as a space of contestation, and of constant agony, situations through which the democratic value of public space

risers and materializes. Access, specifically equal access to public space, enables people's possibility to claim it and, through this action, to be included in the political life of a particular place.

Unequal access to public space, on the other hand, reduces its inherent characteristic of being public. Depending on how and where 'space' is defined, the measure through which it can be accessed equally can be evaluated in different ways. If one is focused on *urban* public space, an index that measures the distance between people's houses and the nearest parks and plazas could provide an idea of accessibility. Another index on the amount of urban public space per citizen could compare access between areas of a city. If one starts considering other layers beyond urban public space, such as virtual space, even specifically the Internet, then it becomes relevant to measure access to the technology that mediates an approach to these particular layers of public space.

Authors have effectively argued that the concept of public space transcends that of parks, plazas, sidewalks and roads in the city. In reality, the complexity of the term supports an equally complex, multi-layered, multi-modal, and interconnected network of physical and virtual spaces that, all together, provide a broader, more complete definition. In this regard, it is important to consider a very specific dimension of this complex system, shaped by the sonic space, the one through which sound waves travel outbound or inbound, audible or inaudible. The importance of the sonic space is linked to many points, one of which relies on the fact that the sonic space is one of the primary spaces of communication, both voluntary and involuntary. Under the umbrella of communications, one can also argue that sound is key to bringing people together, as well as breaking people apart, hence its relevance also in the broadest and fundamental political understanding of 'public space'.

The emission and reception of sound waves require specific equipment that mostly all humans have available biologically, but with limitations. It is known that the human ear is capable of perceiving sound waves in frequencies that range from 20Hz and 20KHz. Similarly, the human voice can emit sound in the range between 100Hz and 17KHz, although this varies largely depending on gender and unique characteristics of each individual. Additionally, vocal loudness, measured in dB (air pressure) can reach up to 90-100dB¹ although a normal conversation is more in the range between 50dB and 70dB. Finally, people are capable of using other body parts to produce sound waves, such as the effects caused by clapping or stomping, but that is where an individual reaches the boundaries of their limitations. In other words, biological means of sound emission are broadly equal to all humans, and if it were the only means of sound production, equal access to the sonic space would be provided.

¹ According to:
<https://www.sltinfo.com/loudness/>

However, it is through technology that one can surpass biological limitations. Sound technologies in particular have introduced the possibility to register, reproduce, amplify and expand the frequency range beyond natural boundaries, providing unique ways of access to the sonic space, consequently introducing also significant inequalities in its participation. The complexity of a particular definition of what technology means, however, calls to reflect upon the 'given' features that humans can count on. Is language all together natural? What is the relationship between language, voice and speech? It is difficult to approach and attempt to answer these questions. However, approaches to anthropological theories in culture and the way it shapes nature and vice-versa, reveal how a feedback loop between both technology and biology is actually more probable than the simple dichotomy between biology and technology. In any case, it is through the technological possibilities, however they are best defined, that the sonic space is re-shaped and the access to it re-configured; creating, at least, a distortion to the basic definition of 'sonic space' already introduced in previous pages.

This is to say that if access to sound technologies is restricted, the possibility to claim certain areas of the sonic space will also be restricted. This, at the same time, risks the public and democratic qualities of the sonic space, and leads to its possible partial privatization and control by producers, commissioners and users of particular sound technologies. In other words, sound technologies can provide unequal access to the sonic space, putting in danger its democratic attributes. And several examples of sonic technologies, starting even with the fundamental invention of telephony in the 19th century, proof this point. Certainly, some technological artifacts or methods are of universal access, or even of inherently democratic features by enabling and allowing massive access to 'the people' where before it was impossible to access given biological limitations. Long distance communication, for example, is now almost universal, at least in a westernized, consumerist, society. But other technologies remain patented, secret, too expensive or simply unreachable to the vast majority, shaping a restricted and somehow 'private' access to the sonic space, rendering it, then, less public, under the domain of just a few, and with the great power that it entails.

A specific, and relevant to this work, way art is capable of addressing such problems is through artistic production. Throughout these pages, there is a deliberate focus on the possibilities art has to produce technological devices and artifacts, linked to the global network of resources available that enable one to make, in Neil Gershenfeld's words "(almost) anything". Effectively, the Fab Lab Network and other hacker spaces or maker spaces are now present in a vast number of cities globally, with an increasing number making of it a growing and relevant network to the ways people produce in what has been labelled the 'third digital revolution'. More importantly, this doesn't merely constitute a network of

spaces, but it rather establishes an extended community of makers and producers that share similar knowledge, and grow together creating rapidly, openly, and freely.

The problem of inequality of access to technologies that provide access to the sonic space is a general problem. It is uncertain if it can be addressed to as a problem per-se, for which it can be also labeled more as a 'problematic' scenario, where specific situations can be looked at in detail, depending on the scope within the 'problematic' panorama. Far from engineering solutions or looking at them, this work will focus on the relevance of artistic production to address the issue: to put it on the table, to highlight it, to imagine alternative scenarios, and to ultimately, catalyze the debate and the conversations on the topic through which a certain awareness and alertness could be achieved.

Artistic production can also be an interesting way of addressing the issue of access to the sonic space through technological devices in being paired with a line of research. Typically, researchers are expected to inform themselves on a subject, discuss about and with the existing knowledge production around it, and eventually contribute to the subject by expanding its knowledge base, or by creating new forms through which it manifests. Usually in that order. First, the research or the knowledge and then, the contribution or production that sustains itself with the discussion provided by the analysis. It can be argued, however, that the production of an object or artifact can also be of value as a first step, as a tool and an equipment through which explorations can be conducted. Naturally, scientific research uses devices to obtain quantitative data to then be processed, analyzed and discussed, like tools to measure specific variables. It isn't such the case argued for in this work. Artistic production has, in the scope of this discussion, the ability to stimulate, motivate, catalyze and detonate a conversation on the specific matters that the objects themselves trigger, even if unexpectedly. Through the study, then, of particular theories, authors and practices, it is possible to begin writing and structuring new ideas that then again push the boundaries of the production itself, thus generating an interesting feedback loop between the artwork and the studies.

Public Space

A concrete idea of public space is necessary. In architecture or urban studies public space is seen, somewhat traditionally, as that which exists “between the buildings” (Gehl, 2011). It is a physical and material definition of public space, and it stimulates complex, ongoing discussions about its nature, capacities and functions. Access to urban public space defined in these terms can be dealt with in relation to location. For example, an index can measure how many square meters of public space there are close to residential areas and determine, just in terms of location, where there is greater or lesser access to public space; mainly considering parks, plazas, and similar recreational spaces. More variables can define where, who, and how this access to urban public space is distributed in the city. However, urban public space only comprehends a region within the complex network of spaces that could be associated with the idea of public space.

Manuel Castells in *The Rise of the Network Society* (1996), specifically in “The Social Theory of Space and the Theory of the Space of Flows” discusses the space of flows. He introduces the section by stating, “space is the expression of society. Since our societies are undergoing structural transformation, it is a reasonable hypothesis to suggest that new spatial forms and processes are currently emerging” (p. 440). This is not to say that new spatial forms are meant to suppress or replace old ones. Rather, it means that these new spatial forms re-shape the overall complexity of the spatial system that we dwell in. Castells adds, “space is a material product, in relationship to other material products –including people –who engage in [historically] determined social relationships, that provide space with a form, a function, and a social meaning” (p. 440). At this point, words such as “material” and “form” need to be taken in its broadest sense to understand Castells’ point in trying to include the ‘space of flows’ as an emergent (back in 1996) space where people engaged in social relationships. As to the specific form or materiality of the ‘space of flows’ one must imagine the flows of information themselves, and the spaces through which they travel. Parts of the electromagnetic spectrum² are an example through which information

² The electromagnetic spectrum is vast, ranging from radio rays to gamma waves, depending on the analyzed wavelengths. Some of these wavelengths, specifically longer than infrared but shorter than ultraviolet are, in fact, visible light. Naturally, the human body is equipped with eyes that are meant to perceive this specific section of the electromagnetic spectrum. For more information on the electromagnetic spectrum, I suggest visiting ‘Electromagnetic Propaganda’, by Bureau d’Etudes at: <http://bureaudetudes.org/2015/04/20/electromagnetic-propaganda-2010/>. At this source it becomes clear too that the other sections of electromagnetic spectrum, although not ‘perceivable’, have been known to affect the human body in different ways. For example, citing text within the infographics provided by Bureau d’Etudes: “The electromagnetic fields (EMFs) emitted by mobile phones have effects on blood-brain barrier permeability, and damage some neurons in the brains of rats”. Another examples reads “electric and magnetic fields in the extremely low frequency (ELF) band below 300Hz can influence biological functions”.

travels globally from one device to the other in enabling social links with specific functions and meanings.

These parts of the electromagnetic spectrum exist³, although they are neither visible nor audible. And it is in this situation where the broadest sense of materiality has to be considered, given the fact that invisible spaces *are* spaces nevertheless. It is interesting to consider these sections of the electromagnetic spectrum, because of their intangibility to the human biological equipment. There aren't instruments built in the human body to perceive these sections of the electromagnetic spectrum and, therefore, one needs to access it through technological devices that are created to mediate our presence in such spaces. Specific technology, indeed, is the gateway, the point of access into this particular kind of space. This means that access to the electromagnetic layer of space is possible only to those who have access to the respective enabling technological devices. A concrete example is mobile phones. One may ask if the degree of access to mobile phones is universal or global enough to understand if the spaces accessed through it should or should not be considered *public*. The situation, however, is more complex, starting from the point that different frequency bands within the electromagnetic spectrum are assigned differently and to various operators to distribute access to end users. Of course, the discussion on whether the 'Net' should be considered public space or not is also a complex one.

Jodi Dean in "Why the Net is not a Public Sphere" (2003) discusses the topic. Although Dean concentrates on discussing the idea of the *public sphere*, it is precisely after concluding and responding to the question of her article's title where she asks, "if the Net is not the public sphere, what is it? Is it just a tool or a medium?" (p. 104). She answers "the Net is a site of conflict over the meaning, practice, and shape of the global The Net is the architecture for the communicative capitalism, both as an order establishing itself and as an order being resisted" (p. 104). About communicative capitalism, the discussion develops further into debating the nature of the content that dwells on the Net and the Web, where the term "Neodemocracy" is introduced. However, Dean's argument does identify the Net as the architecture, the site or space related to the public sphere, not a public sphere *itself*. It makes sense to consider the Net, also in terms of Castells' theories, as a layer or dimension of public space, in danger, in extinction, in contestation, calling for an idea similar to Mouffe's agonistic space, but fundamentally, a piece of public space.

³ For example, radio waves and microwaves. Radio frequencies are carriers of AM & FM radio signals among others; whereas microwave frequencies are carriers of mobile telephone signals, among others. The link suggested in footnote #3 is recommended to learn more.

It is important to map and to generate a somewhat broad idea of what public space is because it is likewise important to understand how access to it works on different levels, layers, dimensions and sections. The examples regarding urban public space could be the closest to many people in understanding access to city spaces (parks, plazas, sidewalks, pedestrian roads, etc.) that enable and supports citizens' interactions. Further examples are important to understand that the complexity of the idea also calls for a complex array of possibilities of access: it isn't only about stepping foot on the public plaza, it can be that a technological artifact is needed to even have a way of access. And it isn't necessarily true that by way of a smartphone one will be equipped with all technology needed to participate. There are many more options, and there are many additional subsequent levels of complexity within each dimension of public space. But the lower the degree of universal access, the lower the degree of *publicness*, to the point where lack of equal and universal access to space can move it past the threshold to the private domain, even if the nature of that space is not private. Therefore, whoever controls access to space also controls its publicness.

Public Space and Politics

Sven-Olov Wallenstein writes in “Public Subjects” (2012) a brief, provocative genealogy of the term, starting with the question “What is the origin of public space, why does it exert such a hold on our political imagination, and why do we so often perceive it as being threatened to the point of extinction?” (p. 17). Wallenstein’s text is useful to understand, even within the specific scope of a political filter, that the idea of public space has been thought, discussed, understood and challenged for centuries by different cultures, systems, contexts and specific authors. It is not the purpose of this text to review the history of the term even *just* linked to politics (as it can also be linked to urban studies, economics, geography, sociology, anthropology etc.), but it is important to briefly note what Wallenstein explains in his article.

An idea of public space⁴ might have originated with the Greeks, around the central *agora*, and has been developed and rediscovered after by, among others, Rousseau and Kant. Decades ago, Jürgen Habermas also entered the debate, developing specific ideas around a space of rational communication and concluding, according to Wallenstein, that “this communicative space [...] is necessarily also conceived as being *under attack*”, adding “the media-centered system once posited as the site for rational debate is now being absorbed by commercial interests that increasingly generate spectacles according to their own logic” (p. 22). Around this debate, others have argued in different directions; Michael Sorkin also in apocalyptic terms and Richard Sennett and Rosalyn Deutsche, instead, focusing on the fall of the *public man* (Sennett, 1977) or of *public life* (Deutsche, 1996).

Hannah Arendt has also developed ideas on the topic thoroughly, centering her thoughts in human coexistence, *naturality* and *plurality* to introduce a specific concept of freedom that is inextricably related to her approach to public space, “created by a human ‘web of relations,’ developed through continuous new beginnings” (Thuma, 2011). Similar to Sennett and Deutsche, Arendt warns of a decline in public life, or public interest in participating in political, public interaction, fundamentally enabled by public space. She recognizes a tendency in modernity to switch priorities of that which enables ultimately freedom, from what used to be public life to an overall more individual reality, probably centered around work, production and its financial correlations. Indirectly, Arendt in this point also refers to an idea of public space suffering from a paradigmatic change in priorities, alerting us to its potential disappearance.

⁴ This certainly is a Westernized idea of public space, for which the origin in the *agora* proves to be relevant, as Wallenstein notes in his article.

Finally, Chantal Mouffe's perspective of politics, democracy, and public space introduces an interesting term related to antagonism and opposition, connected to citizen's *passion* and the action of taking a political stance *versus* the stance of others. Although trying to imagine a better scenario than that of aggression and violence, Mouffe's proposal mutates antagonism into *agonism*. In the words of Wallenstein, Mouffe tries to understand how democracy can "... acknowledge the ubiquity of antagonism and is able to establish a pluralist space in which these opposing forces can meet in a non-violent fashion", adding that the *agonistic* situation is that where "opposing parties recognize the legitimacy of their opponent, although there is no rational consensus to be achieved." (p. 24)

What is interesting and relevant in Chantal Mouffe's regard, particularly for this thesis, is the idea of instability that somehow envelopes and attracts other political definitions of public space. The definition of the term is itself contested, undergoing constant change, unstable. It belongs to a range of concepts that have arisen over time and continue to arise across disciplines. Many of these concepts are meaningful and do not need to exclude the others to be legitimate. Similarly, politics and democracy, and public space themselves can be regarded as spaces that are continuously contested and claimed by numerous stakeholders with different views, agendas, agency, and visions.

However, free and open contestation of public space involves a risk. Sooner or later, some significant players can gain too much weight and leverage in the *battle*, and they can also have agendas of expansion and domination that are ruled by their own DNA. Examples of some of these significant players can be found in the corporate world, where the goal of increasing revenue and profit, embedded in a somewhat de-humanized machinery of production and distribution, serves as a platform and argument to the necessity of boundless control of whichever space serves their purpose. Public space certainly serves this purpose. In other cases, some religious groups also seek to dominate with their doctrines, images, sounds, and projections in public space. Some political groups will too, and the list goes on.

Public space is a political space, a space of power. In democracy the balance of power, to a certain extent, guarantees its existence, as if it were the antidote of totalitarianism. In a similar way, it could be argued that, regarding public space, balance of power could also help keep its publicness. This balance allows equal possibility in its claim, in order to keep equal access to all, regardless of biological or cultural differences. Hannah Arendt might have proposed institutionalizing the balance. For example, some countries' Constitutions institutionalize the balance of power by establishing autonomous legislative, judicial and executive powers. However, and in light of what normally, and constantly happens, it is through the filter of Mouffe's *agon*y that one can think that balance can occur when it is

exercised in public space. In other words, in order to have a claim in the equation, one has to participate in it. One has to go, claim, and participate; otherwise, somebody else will.

The Sonic Space

Brandon LaBelle writes in “Other Acoustics” (2009), “sound is . . . a significant social material. It affords a general sense of sharing, and in doing so it potentialises relationships with emotional and psychological charge Sound charges the environment with a sense of relation” (p. 16). At this point, it is important to combine LaBelle’s remarks with Castells’ already mentioned comment that “space is a material product, in relationship to other material products –including people –who engage in [historically] determined social relationships, that provide space with a form, a function, and a social meaning” (Castells, 1996, p. 440). In combining both, it is clear that sound’s spatial characteristics exist, only with particularities that sound itself has, given its instant vanishing materiality, its invisibility and its wide range of possibilities, including the audible and the inaudible regions of the sonic space.

Furthermore, the sonic *space* differs from the sonic *place*. To attempt an understanding of this difference, a particular phrase LaBelle uses in the same article can be evoked. It describes Pierre Marie Schaeffer’s understanding of sound: “producing elaborate analysis of sonic materiality, the relation of sound and space, and aspects of psychoacoustics, Schaeffer worked through sound as a building material” (p. 18). Both ‘sonic materiality’ and ‘building material’ are key phrases in this quote. As in architecture, building material is key to the understanding of the possibilities of architectural design, and it could be said that building materials somewhat open the vision of architectural space, creating an imaginary of possibilities through the knowledge of the construction material⁵. The production of a specific architectural building, however, is linked to an idea of *place*, created through the use of architectural resources such as materiality, construction techniques, light, structure, *promenade*, distribution, among others. Without material arrangement, a specific idea of architecture isn’t quite possible. It is with material that architectural interventions end up proposing *particular places* enabled by an idea of architectural space. This idea of architectural space, as well as the idea of sonic space could be argued is close to a notion of emptiness.

⁵ One example is the brick, even if not layered and functioning as a piece within a wall, set of walls or architectural construction. Knowledge on how to build with the brick allows for an idea of the possibilities that the brick creates in terms of architectural space. Until a real set of bricks are used in a particular construction site, laid out according to the plan of an architectural design and finished as a building, the brick remains an abstract symbol for what it can create: it partly enables the idea of architectural *space*. When it does become a specific building, then it becomes part of what can be defined as an architectural *place*. Sonic materiality, on the other hand, can be thought of *a* sound, as hard as it is to defined a unit of sound. Through this sonic materiality one can approximate an idea of what sound is capable of, or how sound is capable of occupying space. This capacity, rather than the sound itself, or a composition of sounds, is the sonic space. The possibility of sound is the sonic space. It is not the particular, specific space created by a sound piece, a musical moment, a gathering around a sonic experience. It is the abstract infinite potential that the sonic space has to accommodate all of these events within its boundaries.

Emptiness, like silence, is difficult to define because it might be also impossible to find. It is a theoretical concept that helps, perhaps, the human mind to set baselines and boundaries. Although the discussion on the difference and link between place and space is vast, a particular anthropological essay written by Edward S. Casey titled "How to Get from Space to Place in a Fairly Short Stretch of Time: Phenomenological Prolegomena" (1996) touches upon certain points that are relevant to this argument. It challenges the single Cartesian idea that place is merely a portion of space, as if it were a deductive specification: space being the general, and place being the particular. The essay asks "but what if things are the other way round? What if the very idea of space is posterior to that of place, perhaps even derived from it?" (p. 16). This suggests that the process of understanding space is in reality more *inductive*. First, we experience places, through them we imagine the limits of space. The author develops the idea that it is only through experience that one is bound to either knowledge and that experience itself is already correlated to the definition of place. Experience is what first happens to the body, and through experience, the body creates place. Once experience and place occurs, one can imagine and understand broader categories of space.

It is around these concepts and the previously developed notions of architecture materiality that a particular idea of the *sonic space* can be attempted, at least as it is relevant to this thesis. Under this understanding, it is not the relational social event *during* the emission of sound the one to be called sonic space. It would be more adequate to label such experience, the event, as *sonic place*, a manifestation created by sound, the material in use, and by particular sounds that are been expelled and listened and felt to within a certain range and with a particular pressure, in link with also other dimensions of space that can be more architectural, more urban, more ethereal. However, the *sonic space* is to be considered in the broadest sense, as the dimension that enables an endless number of possibilities, naturally imagined through the experience of the place itself. The sonic space is what *could* happen with sound, and not what happened with sound already. It is in this sense that we can consider it empty or void. Because it presents possibilities. These possibilities naturally are limited, physically and biologically, depending on the perspective of who experiences.

To additionally recognize that this idea of sonic space belongs with the public, Barry Blesser and Linda-Ruth Salter write about it in "Aural Architecture: The Invisible Experience of Space" (2009): "Sound waves have unique properties. Sound flows around obstacles, entering without permission. Because hearing is always active without 'earlids' or a voluntary point of focus, listeners are involuntarily connected to those sonic events that are audible" (p. 55). The fluidity of the sonic space, indeed, already suggests an idea of how difficult it is to seclude oneself from it. There is a whole division in architectural acoustics devoid to producing spaces, like music halls, that are isolated from the 'rest' of the sonic

space, but to confirm the rule: unless one spends a substantial amount of resources in creating a sound-proof facility, one will be, to a certain extent participant of the greater, public, sonic space.

The Sonic Space and Biology

One of the most democratizing, relevant aspects of the sonic space is that our biological features to access it are almost equal, to almost all. Almost, evidently, because there is a minority that is born without the biological resources to participate in the sonic space. For example, the hearing or the speech handicapped have limited *biological* access to the sonic space. Additionally, within the range of the non-handicapped, there are differences that are related to gender, age, ability, among others. Overall, however, the sonic space is equally accessible to *almost* all. In biological terms⁶, the sonic space could be diagrammatically divided into the audible space and the inaudible. Audible sound, is the one that can be heard, listened to, or in other words, detected by our hearing system and decoded through this system by our brains. Inaudible sound, although impossible to detect, can also affect the body in different ways.

Steve Goodman in his book *Sonic Warfare: Sound, Affect and the Ecology of Fear* (2010, p. X) displays an interesting graph reproduced in **Figure 1**. This graph uses the typically employed axis to describe sound: the Y axis for wave pressure, normally measured in decibels (dB)⁷, and the X axis for frequency of sound wave, normally measured in oscillations per second (Hz), or thousands of oscillations per second (kHz). Goodman indicates that the audible frequencies, in a range of 20Hz and 20kHz, can be captured typically by the hearing system, although a minimum amount of wave pressure is needed to be perceived. At 120dB the “threshold of ear pain”, however, is surpassed. Near that threshold of ear pain, according to Goodman, “hearing damage due to prolonged exposure” can occur.

⁶ The word ‘biology’ is used in this thesis in order to refer to the anatomic, the biological components, the natural provisions of the body. According to dictionary entries, one of which can be found at: <http://www.merriam-webster.com/dictionary/biology>, the word ‘biology’ is primarily defined as “a branch of knowledge that deals with living organisms and vital processes”, basically biology *the science*. In this thesis, however the reference is directed to other possible definitions, also found in the provided link “the processes that occur in a living thing”, “the laws and phenomena relating to an organism or group”, perhaps connecting to the possibility of discussing about ‘the biology of the human ear’, ‘the biology of the human voice’, etcetera.

⁷ Wave pressure is associated to the idea that sound waves are mechanical waves. This means that sound waves travel by pushing particles of the medium through which they are travelling, typically air. The higher the pressure, the stronger the sound wave. This is perceived by humans as louder sound, and typically measured in decibels (dB). When your neighbor calls the police because your party is too loud, the police measure the loudness with an instrument that reads air pressure, in decibels. There is an additional discussion regarding the difference between dB around low frequencies and high frequencies. A reading of 100 dB can be perceived as very loud and irritating if it is also a high-frequency sound. But it could be not perceived as irritating if also a low-frequency sound.

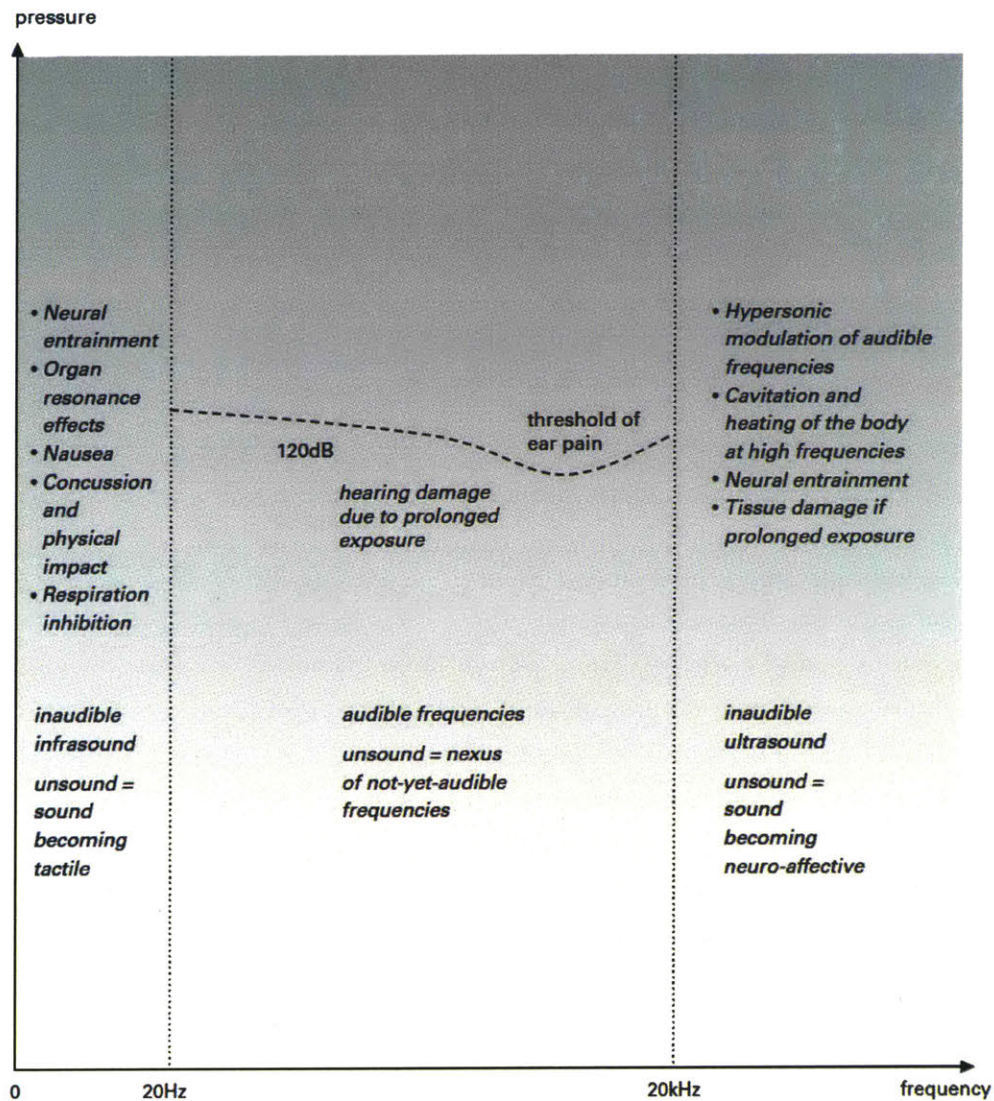


Figure 1. The sonic spectrum as understood by Steve Goodman in *Sonic Warfare*. Adapted from *Sonic Warfare: Sound, Affect and the Ecology of Fear*, by Goodman, S., 2010. Copyright 2010 by Steve Goodman.

Goodman describes the inaudible frequencies too. Below 20Hz “inaudible infrasound” is described as “sound becoming tactile”. Goodman’s focus is, as the title of his book suggests, in the negative effects of sound, centering his descriptions in them. However, this does not mean that infrasound, becoming tactile, will always be negative for the human body. Although he points as possible effects: “neural entrainment, organ resonance effects, nausea, concussion and physical impact, respiration inhibition”. These described negative effects of inaudible sound waves on the body suggest how the biological body

has access to the sonic space, especially in its quality of receptor, even in frequencies that are not audible. Additionally, Goodman describes what is beyond the 20kHz frequency barrier as the “inaudible ultrasound”, adding “sound becoming neuro-affective”. Since Goodman’s focus is in the violent aspect of sound, some of the effects suggested are apocalyptic, pointing out “hypersonic modulation of audible frequencies, cavitation and heating of the body at high frequencies, neural entrainment, tissue damage if prolonged exposure”. However, it is known too, for example, that ultrasound is widely used in medicine with curatorial or diagnostic purposes, or that it can be used to encode communications between devices silently.

The graph in **Figure 1**, used to describe how sound affects the body, does not take into account the possibilities of the body to *produce* sound. In other words, the possibilities one body has to affect other bodies by generating sound waves: the ‘sonic agency’ of the body (LaBelle, 2018). In physical terms, the body’s potential to produce sound is far behind its possibilities to perceive sound. One can listen within the range of 20Hz and 20kHz, but the voice can reach a limited portion of that spectrum. The vocal or oral sonic spectrum ranges depending on the individual, but it can be considered to range from 900Hz up to 17kHz⁸, although these numbers consider singing voices, both male and female and situations outside of normal speech. Normal speech, instead, can range from between 1kHz and 8kHz (Cox & Moore, 1988). Additional to the possibilities of speech, the mouth can produce other sounds, like when whistling⁹, and the body is capable of producing other sounds by way of percussion, for example by clapping one’s hands, snapping one’s fingers or stomping one’s feet.

Human biological possibilities in the sonic space are limited compared to what the sonic space offers to be claimed. In other words, only a small fraction of the sonic space could be claimed by means of our biological sonic possibilities, described in the previous paragraph. However, the range of the possibilities of the body is definitely more complex than what has been described. For example, the idea of speech on the one hand has to do with how loud or through which frequency range it is delivered; but, most importantly, it is the complexity of language that renders speech powerful in terms of its capacity to

⁸ According to:

<http://www.seaindia.in/blog/human-voice-frequency-range/>, a blog entry titled “Human Voice Frequency Range” where a description on the difference between the fundamental frequencies and the harmonics. The ‘fundamental’ frequency of someone’s voice is closer to the description of a single note.

⁹ Whistling is fundamental to the cultural development of particular places. For example, in the Canary Island’s *Gomera* Island (Classe, 1957) a whistling language called “silbo gomero” (“Gomeroan whistle”) is still in use to communicate coded or translated version of Spanish.

communicate messages. Language¹⁰ is, in a way, a specific know-how, sometimes spread through millions of people, but other times spread around a small group. The importance of language, of voice and speech has been deeply covered by Foucault in *Fearless Speech* (2001), making the case for the importance and responsibility of the truth-carrier when delivering the “truth” by ways of *parrhesia*, or free speech. Amanda Weidman in “Voice” (2015) has also written about the power of voice, in terms of having cultural relevance and a clear position within a specific context.

Voice, language and speech are not the same things. However, they are indicative of a notion that goes beyond sonic materiality only. They become an *application* of the sound itself, and not merely a string of random, unrelated noises. Under the scope of this thesis, supported by a basic and fundamental definition of ‘technology’, the application of the sonic possibility of the human body with a more complex know-how than what its biological mere function can provide¹¹ passes the threshold of biology into the realm of technology. This distinction is not sharp and clear, but it has to be done at a certain point, more or less on the line that divides the biological body from the cultural body.

Some cultural-technological developments on top of the individual capacity of the body to produce sound rely on the human capacity to co-ordinate sound. For example, The *People’s Microphone*, as Homa King has written, “is a means for amplifying speech in large crowds. The premise is simple: all those within earshot repeat loudly and in unison what the speaker on the floor has just said” (King, 2012). He adds, to describe its effectiveness: “in assemblies of hundreds or thousands, several rounds may be necessary for the message to reach those on the outskirts.” The *People’s Microphone* is know-

¹⁰ In conversations with my dear friend Pedro Zylbersztajn, who also happens to be an incredibly intelligent person and of a deep understanding of topics surrounding language, I once threw at him the question: *Could language be considered technology?* After which we had a nice exchange. Language can be the capacity of language, perhaps. It can be defined as the natural ability to communicate with what the Merriam-Webster dictionary at: <https://www.merriam-webster.com/dictionary/language>, defines in (b) (1) “audible, articulate, meaningful sound as produced by the action of the vocal organs”, (2) “a systematic means of communicating ideas or feelings by the use of conventionalized signs, sounds, gestures, or marks having understood meanings” and (3) “the suggestion by objects, actions, or conditions of associated ideas or feelings”. These ideas indicate somehow that Spanish, English, Chinese, Italian, etcetera are not “language”, but a specific application of “language”, this capacity unborn capacity to communicate. But Spanish, English, Chinese, Italian, etcetera can be considered *technology*. For the purpose of this thesis, they will also be considered languages, referring to the (1) definition (a) “the words, their pronunciation, and the methods of combining them used and understood by a community”. Pedro is also known to be very rigorous and known to read many of his friends’ thesis so, Pedro, if you are reading this, I apologize for the lack of rigor in paraphrasing our conversation.

¹¹ That is, including a cultural development on top of the *biological* function. Although, as it will be discussed later, the ‘stratigraphic’ approach is rejected by Clifford Geertz, an influential figure in the discipline of anthropology, and suggests instead a perpetual feedback between both culture and biology, both drivers of human evolution throughout thousands of years.

how, delivered as a set of rules that people need to follow by using only their bodies. No machines intermediate, but sound is amplified.

To expand on the sole human biological equipment to access the sonic space, some sort of technological procedure has to appear, whether it renders itself as a machine, such as a “real” microphone, or as a set of rules, like the *People’s Microphone*, it still consists of a technological proposal to use sound beyond its initial biological limitations.

The Sonic Space and Technology

It is through the use of technologies and specific know-hows that the equal access to the sonic space starts becoming different for individuals or groups that develop or dominate the particular knowledges. The case of the citizens of *Gomera* island in the Canary Islands was cited before, and it is a good example of how knowledge acquired from a tradition of a whistling language can be of crucial relevance to the people of a certain geography. It is an expansion on the biological possibility to whistle, in order to have a more complex message than the otherwise simple message any sound carries. However, it is also unique to the people that hold that knowledge, meaning that they have a domain over that method of communication; and therefore, a unique way of accessing the sonic space. In languages and encryption, inequalities in the sonic space start to show. To the relevance of these terms, Brandon LaBelle, also in "Other Acoustics" (2009) accurately points out:

Sound . . . carries messages. It functions as a communicational medium. As a physical and spatial movement, sound carries a collection of information related to the conditions of the original object or body, and the related environment. Importantly, this information also grants animation to things: by stemming from an object or body, sound signals that movement is occurring, and more so, that life is happening. Many spiritual traditions understand sound as the voice of objects, of nature, of animals, etcetera, and the world as an audible chorus whose multiple voices are continually speaking. Sound comes to radically suggest or announce presence (even as recorded material).

(p. 16)

LaBelle's precisions are crucial to understand why the sonic space is important, also in its dimension of message-carrier; from simple messages available to everyone's decoding capabilities (like when a glass breaks, "all" assume safely a glass broke), to more complex messages that are more bound to an idea of know-how (like the whistling of *La Gomera*), related to an idea of technology in this work. In this regard, it is important to somewhat define technology, even in a broader and previous step to the already developed definition of language as a technology (Changizi, 2011). Edwin T. Layton wrote on "Technology as Knowledge" (1974) precisely about bringing the term to a more original idea, or to a broader spectrum of ideas far from its only contender: technology as scientific production. "A common synonym for technology is "know-how." But how can there be "know-how" without knowledge?" (p. 34). He later adds "the laws of science refer to nature and the rules of technology refer to human artifice" (p. 40) meaning, in this case, that science also attempts to understand nature (thinking), whereas technology is centered, perhaps, more in 'doing'.

Although a vast number of texts have been written on the history of technology, always starting from the etymology of the word and later proposing a long historical overview of the term and of the technological achievements in history ("History of Technology," 2018), it is important to make an attempt to define it according to the purpose of this investigation. In this sense, technology is being thought of in opposition to *biology*. In this regard, our necessity of *technological solutions* are methods to achieve what otherwise wouldn't be able to happen by exclusive biological or natural means. There is no need to create a method to see light, because our eyes and vision systems are capable of perceiving light. No specific method to access the sonic space exists to listen what is already audible by *almost* everyone either. As it has been discussed, sound generally in the frequency range between 20Hz and 20kHz is perceived naturally by the human body. Alternatively, if there is a body that was not provided with such access by nature, a method could be created. A *technological solution*, such as hearing aid, then, responds to the opportunity to access what is not possible naturally. Technology, in this sense, is a means of expansion of the natural barriers and limitations provided by biology in order to access what otherwise would be inaccessible.

It would be simplistic to state that things so binary: *biology or technology*. It is far more complex, and perhaps anthropological theory can be useful to understand better the feedback mechanism that exists between the two. Clifford Geertz's famous essay "The Impact of the Concept of Culture on the Concept of Man" (1966) proposes a symbiotic relationship between culture and biology, where cultural baggage tends to influence the body, generation after generation: "culture is not just an ornament of human existence, but a condition for it" (p. 6). In this sense, it is possible to grasp on culture's strong relationship with technology, and possibly a relationship through which technological developments end up being processed into the "human machine" by mediation of cultural relevance. Geertz provides the example of the creation and development of hand tools, and how these introduced changes in the human hand that would optimize the *grabbing* of these hand tools.

Ultimately, these definitions are important to properly discuss technological possibilities in the sonic space. It has been mentioned already that languages can be considered technology, specifically around the broad definition of technology that considers it knowledge, know-how, or method. Within the emission or reception of sound from or to a human body, mediated or not by technology, I propose two main categories. The first one centered around the *content*. It is in the content where the complexity of language becomes a technological developer, and elaborates certain complexity from the basic biological possibility of the body to merely produce random sounds¹². The second one, instead, is

¹² Although, as it has been pointed out, this sounds will be informational of where, who and how it is produced.

centered around the *container*. It is with the containers, or the equipment, through which sound is either *received, transmitted or emitted*. This second approach is what this thesis focuses on, reviewing how sonic technologies in listening, transmitting and emitting provide unequal access to the sonic space, setting aside some areas of the sonic that would have to belong in the public domain, into the private domain.

Sonic Spaces (of Dominance)

A significant area of sonic technologies is covered by sound reproduction. Jonathan Sterne in *The Audible Past: Cultural Origins of Sound Reproduction* (2003) discusses sound reproduction technologies:

Modern technologies of sound reproduction use devices called *transducers*, which turn sound into something else and that something else back into sound. All sound-reproduction technologies work through the use of transducers. Telephones turn your voice into electricity, sending it down a phone line and turning it back into sound at the other end. Radio works on a similar principle but uses waves instead of wires. The diaphragm and stylus of a cylinder phonograph change sound through a process of inscription in tinfoil, wax, or any number of other surfaces. On playback, the stylus and diaphragm transduce the inscriptions back into sounds. Digital sound-reproduction technologies all use transducer; they simply add another level of transformation, converting electric current into a series of zeros and ones (and back again).

(p. 22)

Additionally, Cathy Van Eyck in *Between Air and Electricity: Microphones and Loudspeakers as Musical Instruments* (2017) discusses about how sound reproduction technologies work “either by storing sound (taking it out of its time) and by transporting it or amplifying sound (taking sound out of its place)” (p. 12). In the end, it is through both processes that sound reproduction technologies work, but Van Eyck’s book is also accurate in defining how microphones and loudspeakers are crucial tools in the sound reproduction technological network. A crucial point in the invention of sound reproduction technologies was the invention of the telephone by Thomas Edison in 1876. Trying to imagine what that moment was like and the importance and relevance to the points brought by this work is significant. When the telephone was invented, a new way of accessing the sonic space was invented and, therefore, a new boundary was set¹³. The sonic space was no longer the domain of where sound waves could reach through air, given that electrical impulses could transfer the information in almost real-time across long distances. As of today, this technology is somewhat democratized and available almost universally, but

¹³ This is an example of how the ‘sonic materiality’ suggested new possibilities of the sonic space, related to the discussion pages above between the sonic *place* and the sonic *space*. The sonic event or materiality of a telephone conversation is a singular event, but it suggests a whole network of telephone conversations that add an extra layer to the sonic space. Marshall McLuhan also refers to this, specifically with the telephone conversation. McLuhan discusses how little the importance of the specific conversation an individual might have on the telephone, but how important the network is, in developing his theories on *The Medium is the Message*, in his book *Understanding Media: The Extensions of Man* (McLuhan, 1964).

at that moment, the access to this new region of the sonic space was only possible by few. If that particular technology would have remained in the hands of, say, only police or military forces, then they would have been the only ones with access to that area of the sonic space, hence controlling access and 'privatizing' access, or 'monopolizing' access to this particular region of the space.

Sound reproduction technologies since then have become enhancers of a number of cultural changes, many of which have happened in urban public space, in political contexts. Addressing a speech to a crowd of 10,000 or 100,000 people would have not been possible without microphones and amplifiers¹⁴. The power that an amplifier, a microphone or even a megaphone is incredibly important to the point that the creation of the 'People's Microphone' mentioned before was the result of a prohibition by the New York Police Department to use any kind of amplification equipment during the 'Occupy Wall Street' movement. In other cases, the production and deployment of sound systems are key to cultural movements, extending their roots into music, politics and the history of whole countries. Such is the case of Jamaican sound system culture, that originated also a love for the low frequencies that has expanded worldwide in a global sound system culture, of contributive 'DIY' groups that get together and celebrate the technology that allows them access to an otherwise impossible area of the sonic space (Goodman, 2010; Papenburg & Schulze, 2016; Silver, 2014)¹⁵. In the case of sound system culture, instead of understanding a culture of 'dominance', a culture of resistance is more clearly portrayed, having usually bottom-up, or horizontal non-commercial (at least not ferociously commercial) activities and actions around them. The culture of resistance will be addressed later in this thesis.

Another interesting way in which sound reproduction technologies have been used throughout history can be centered around the practice of *listening*. Peter Szendy in *All Ears: The Aesthetics of Espionage* (2017) writes about the practice of listening connected to the practice of espionage. However, and especially in modern times, espionage would be difficult to imagine without technology that enables listening in some particular ways¹⁶. For this to happen, it is important to understand that spies normally count on sophisticated technologies of interception that enable them to access communications where

¹⁴ The infamous quote that Jacques Attali refers to in the beginning of his book *Noise: The Political Economy of Music* (1985) is also absolutely true. Citing Adolf Hitler: "Without the loudspeaker we would have never conquered Germany". And a similar power in the same context is given normally to radio broadcast technologies through which the emission of Goebble's propaganda would have not reached all corners of Germany otherwise. And who controlled the radio broadcasting systems in Germany at the time?

¹⁵ A lot has been written about Jamaican sound systems and other similar cultures in other places such as the Philippines or Brazil. The subject, as fascinating as it is, would overwhelm the scope of this study if even an attempt of making justice to its complexity would be written here.

¹⁶ As Szendy points out, it is also now more common to see espionage become present in systems of data gathering, hacking and computer-related interference, but what is relevant to this investigation is more related to the listening of sound, specifically, in the world of espionage.

there are not supposed to. Technology in the shape of microphones or recording machines so small they become unnoticeable *are evidence* of the possibility to access the sonic space (paradoxically what would be a “private” space) *by listening without having a presence*, by streaming sound, by listening with far more precision than what the human ear would, among other possibilities. If only a reduced number of people or institutions control these specific technologies, then their particular way to access the sonic space becomes totalitarian or monopolistic and, therefore, grants a position of dominance to the controller of the technological means.

The possibilities in the sonic space can also be expanded beyond what human biological features can access in terms of *frequency*. Sound system culture has been mentioned before in regards to the access of the subsonic, the more ‘physical’ aspect of sound. The ultrasonic is equally interesting, also related to espionage, because it can exist without being easily noticed. According to a recent study (Arp, Quiring, Wressnegger, & Rieck, 2017), portable telephones using the Android operating system have been found to give access to hundreds of ‘free’ applications that run, on the background, open and constant microphone checks in search for ultrasonic ‘beacons’. These beacons, according to the researchers, are normally released in commercial areas where, if matched to engaged smartphones, start a profile on the user and the possibility to track the device in further events or activities. In other words, corporate espionage, or as they call it “a serious threat to the privacy of users, as it enables spying on their habits and their activities” (p. 1).

These activities happen secretly in order to dominate a specific layer of the sonic space. Other technologies, however, surface to fight against the secret position of dominance that corporate espionage tries to maintain, and it is significant because when this happens one has *evidence of the conflict and of the contestation of the sonic space*, and the politics that occur behind the development of sonic technologies. This evident contestation of the sonic space proves the ‘public’ characteristic of the sonic space. In the case of ultrasonic spying, an example of a project counter-acting can be found at the St. Pölten University of Applied Sciences in Austria. A team of young researchers developed a smartphone app called ‘SoniControl’¹⁷. This app looks for the ultrasonic beacons that are sent by commercial trackers in stores and, if detected, the app generates an ‘ultrasonic firewall’ to make the

¹⁷More information available at:
<http://sonicontrol.fhstp.ac.at/> and at <http://www.aec.at/ai/en/sonicontrol/>

espionage impossible¹⁸. It's an open-source effort, meaning that it can gain strength from other communities globally, and it is effective, available for download.

Numerous other projects, technologies, counter-projects and reactions can be listed, and the list would be extensive. The idea, however, is to understand how a specific technology can open up a region within the sonic space that otherwise would not be accessible. Not by biological means, which have been discussed already as limited, and not by a democratized technology that can be to the reach of most people. New technologies create new possibilities in the sonic space and whoever controls these technologies also controls the access to these specific layers of the sonic space. It's interesting, however, to question oneself and think about who creates mostly technologies in the economic global system. As an expensive endeavor, institutions with the biggest pockets are the ones investing more in technology development, sometimes hoping to register a patent to later make a profit from their research, some other times to augment their power and their possibilities against enemies, or against their inferiors. As of lately, however, the production of technology has been starting to develop a path of democratization, and, among other things, the internet has developed the possibility of collaborative work among citizens of all over the world. Open source projects are constantly in the making, and not only producing software, but also developing, producing and reproducing machines and artifacts that were believed to be under the domain of industrial agents. It is, perhaps, the shift that is now being labeled as the third digital revolution, around digital fabrication, maker spaces and a certain societal control over the production of technology.

¹⁸ From SoniControl's website description:

"Novel technologies like Google Nearby and Silverpush build upon ultrasonic sounds to exchange information. More and more of our devices communicate via this inaudible communication channel. Ultrasonic communication enables to pair devices, exchange information but also to track users and their behavior across several devices similar to cookies in the web. Every device with a microphone and a speaker is able to send and receive ultrasonic information. The user is usually not aware of this inaudible and hidden data transfer. To overcome this gap, within the project SoniControl we research the current capabilities of ultrasonic communication and raise awareness for this unknown communication channel . . . We develop a mobile application that detects ultrasonic activity, notifies the user and blocks the information on demand. Thereby, we want to raise the awareness for this novel technology and help users to protect their privacy."

Maker Culture (of Resistance)

Neil Gershenfeld, director and founder of the Center for Bits and Atoms at MIT, together with his brothers Alan and Joel write in *Designing Reality: How to Survive and Thrive in the Third Digital Revolution* (2017) about how the third digital revolution is starting to shape manufacturing practices globally. Although, as he clarifies, (Thompson, 2018) the future is uncertain, so far every two years the number of fabrication labs part of the 'Fab Lab' network has been doubling. There are over 1000 'Fab Labs' in the world now, each one of them sharing very similar tools, components and knowledge bases, meaning that if someone learns how to use a Fab Lab in Arizona, can later be apt to fabricate and use a Fab Lab in Berlin, Lima or Mozambique.

The Fab Lab network is not only about machinery and fabrication spaces, it also has an educational component brought by the Fab Foundation that offers every year the Fab Academy, a one semester course on the use of the Fab Lab and all of its tools. It is a course based on *How to Make (almost) Anything*, Gershenfeld's famous MIT class that every fall dozens of students take at MIT. Instead, every spring Gershenfeld teaches the class long-distance and relies on a network of Fab Academy alumni to exercise as local instructors. The Fab Lab network of spaces and people is open, where students are required to document their projects and learnings also as a way to create a knowledge base accessible to future students or external teachers or learners from around the globe. Most projects remain within an open source 'Creative Commons' legal structure, and the collaborative aspect of their productions is later paid back with the open access to the codes and designs used to make their own. For this and more, Neil Gershenfeld has been labeled the 'intellectual father of the maker movement' and is a strategic actor in the digital fabrication world.

Gershenfeld and the Fab Lab Network are particular to the digital fabrication world. There is much more outside of this specific network, 'maker spaces' have multiplied all over the world also as a commercial model where people are offered a production facility for a monthly fee, similar to going to the gym, where one pays a fee and in exchange a number of machines are available. 'Maker Faires', an event created by 'Maker Media' ('Make' magazine) is extremely popular globally¹⁹. Gershenfeld is accurate in describing that the two main reasons for this expansion have to do with the global community's

¹⁹ According to Maker Faire's website at:

<http://makerfaire.com/makerfairehistory/>, "In 2017, over 190 independently-produced "Mini Maker Faires" plus over 30 larger-scale Featured Maker Faires will have taken place around the world, including Tokyo, Rome, Shenzhen, Taipei, Seoul, Paris, Berlin, Barcelona, Detroit, San Diego, Milwaukee, and Kansas City."

enthusiasm and, what is more important, with the fact that all of these machines are getting every year cheaper.

Dimitris Papadopoulos in *Experimental Practice: Technoscience, Alterontologies and More-Than-Social Movements* (2018) devotes an entire chapter to “Crafting Ontologies”. Papadopoulos introduces the idea of understanding the notion of the ‘maker’, the one connected to the Maker Faires, to TechShops²⁰, to the particular western ‘maker culture’ as a dominant “project that can be linked to a vision of re-Westernizing production, of insourcing industrial capabilities to the Global North and possibly also to white backlash politics and the reemergence of nationalist protectionism” (p. 170). Although, he identifies the other side of making:

But then there is much more to making than that: there is World 2, the abject spaces of Western modernity whether they are outside the Global North or inside it Making here is about the survival of disintegrating communities, about enhancing self-organization, about supporting livelihoods. There is much more to making that I want to reclaim here than the universalist story of M [the logo on the Maker Faire robot] -not only because making is involved in building and maintaining diverse ways of being that radically depart from the dominant Global North maker culture but also because it seems to resonate with the political sensibilities within more-than-social movements. It is this speculative dimension of making that I look to unearth here.
(p. 172)

Papadopoulos then asserts “Within the speculative framework that I am advancing here, making could be seen as a contribution to a decolonial project” (p. 172). Indeed, making can be a project of autonomy, a project of resistance instead of one of submission to the dominant plan. To be so, one has to be conscious of the panorama, as Papadopoulos points out, that ranges from re-Westernizing production to re-appropriating production. Hackerspaces, independent makerspaces and even some of the units of the Fab Lab network are close to the project of autonomy, independence, indigenization and decolonization. In opposition to the Global North, Papadopoulos cites Maker Faire Africa and their manifesto in trying to bring the ambition of the Global South. The Cuban society is another example of a ‘maker culture’ that has thrived over the past decades in a project of decolonization and resistance, especially resistance to the USA economic sanctions. ‘Every Cuban is a mechanic’ is often heard in the streets of Havana, when one realizes that the automobile park is not *vintage*, it’s just old. But it hangs on, and cars from the 50’s

²⁰ The description of a TechShop, according to Papadopoulos is “a large membership-based chain of maker workshops across the United States that represents the rather entrepreneurial and commercial side of the multiplicity of spaces that emerged as part of the maker culture ‘Build your dream here’ is the motto of TechShop, which calls itself ‘a playground for creativity’” (p. 169-170).

and from the old Soviet days continue to work thanks to the constant reparations and repurposing that the Cuban inventive has provided to its objects.

A young Cuban industrial designer and I engaged in a conversation in Havana, during an MIT trip in 2017. He explained his job was to design port forklifts. I was surprised by the fact that Cuba promoted the fabrication of forklifts, and my surprise came from the fact that, as a Peruvian, I would see commerce machinery come always imported, lately mostly from China. The young Cuban industrial designer explained his designs were not meant to create forklifts from scratch. Rather, they were meant to re-utilize the parts from a forklift cemetery that Cuba inherited from a constant flow of damaged, unused, forklifts from donating countries. Basically, they had a pile of garbage with some parts functional and some other parts functional from different brands and models. The job of my friend was to create the connections between these parts in order to re-assemble Frankenstein forklifts and have usable power to work with in the port company.

Assembly, in this regard is also crucial to the idea of the resistance maker culture. Papadopoulos explains, “objects are indeterminate and incalculable because the way humans relate to them in each specific situation does not reveal their essence or all their qualities but only a partial and specific aspect of them. Objects exceed what humans think of them and what humans do with them” (p. 179). The author explains this under the title of “compositional objects” and further describes: “Craft and crafting becomes a key way to describe the relation to such compositional objects Compositional culture is defined by commensality: actors just leave stuff (techniques, ideas, objects, practices, concepts, tools, and so on) around, and other actors use them (or not)” (p. 181).

The first Fab Lab implemented by Gershenfeld at MIT was up and running by 2003. Since then, the number of machines and possibilities continue to grow in number and reduce in price. Additionally, the global communities that exchange information, designs and ideas is constantly growing. Like the title of Gershenfeld’s class, one thinks that almost everything is possible under this scheme, at least in terms of *how* things can be done. If we bring back the definition of technology that is close to ‘know-how’, we can understand how these places of fabrication and resistance and the third digital revolution are, in a way, a technological revolution in its closest link to the technological artifact or device.

What can be done is a different question. Different spaces are devoted to their own research and some are just facilities available for people to do, basically, whatever they want. For the intentions of this thesis, the focus on purpose will be set on artistic production. There is still a strong relationship between a number of art practices and maker culture. On the one hand, the link is strong between practices that aim to produce objects, things, sculptures, artifacts etcetera. This means that if the goal is necessarily

linked to the production of a *thing*, then it is likely that the way it is produced will be somehow affected by these new ways of fabricating, because it is faster, cheaper or easier. In particular forms of art, for example within the scope of sound and music, invention becomes necessary. Papadopoulos introduces the synthesizers invented by Dirty Electronics in Leicester Hackspace (UK) and notes:

[the synths that the collective Dirty Electronics constructs] are truly compositional objects not only in the sense that they mix found materials with other purpose-built or acquired equipment and that they fuse the digital and the material, but also in the sense that the synths acquire their full potential within an experimenting community. Social interaction, movements of the body, and more-than-human dimensions such as gestures, temperature, and light all compose what a synth is. The performance of playing the synth, the performance of making the synth on the workbench, and the shared experience of experimenting with the synth are continuous. This continuity of experience and materiality is a crucial dimension of compositional objects.
(p. 181)

The potential does not remain in the fact that now art can be now more 'technological'. Papadopoulos approach to 'compositional' objects and a maker culture of resistance is key in understanding how the artistic project has the potential to contest not only the final scope of the project itself (in this case, sound). The artistic project has the potential to contest *also* its autonomy of production, its capacity to assemble, its ability to re-signify objects that are thought to be designed for a specific purpose, its capacity to contest its performance and, finally, its capacity to open its meaning to the explorations that the project promises.

The responsibility doesn't stop only in having to produce, but also in releasing designs, ideas and concepts that can be reproduced. In the case of open source networks and hacker spaces and digital fabrication labs, reproduction is meant to happen aggressively not only as a way of disseminating a specific project, but also as a method of improvement. People develop other people's ideas, concepts or designs and dismantle them, mutate them, re-shape them and then again throw them into the stock of possibilities in the great global network of collaborative design and fabrication. This is powerful. And it is the only way that a certain practice of innovation, fabrication and production will be able to be as stronger than the well-shaped, well-funded organizations that end up, otherwise, producing and reproducing all of the machines that we now use. These well-funded organizations have the added advantage of benefiting also from their strategies of user surveillance (also "data gathering") by embedding a number of programs, chips or instructions to the devices that they sell, because they are connected to the net, the so-called 'internet of things'.

To summarize, a call that this thesis aims to respond to is a call to produce and reproduce machines and artifacts openly to *keep up the pace in the claim of the sonic space*. To 'keep up the pace' means that one has to respond to other endeavors that have produced and continue to produce their own sonic devices to claim the sonic space, on the one hand, and on the other, one has to create new technologies and assemble new ways of accessing this sonic space to put it to the service of the 'people's claim'. This, however, stands on a thin line, on the limit of solving a problem, being efficient and practical about it; or addressing the problem, and releasing on the necessity of being too practical about it. The function of art in this case has to be further discussed, and it has to be understood as a tool that engages socially, politically and technologically without necessarily calling itself the remedy to the situation it points to.

An Artistic Approach

The Mexican artist Rubén Ortiz-Torres, resident in San Diego and professor at the Visual Arts Department of UCSD was asked in an interview (DXIX, n.d.) “What is your position in relation to those, let’s say, ‘pragmatist’ modes of art practicing that advocate for implementation and intervention as the main operational strategies in order to make politically engaged or socially progressive art?” To which he replied with the following:

Art is a form of expression, a language. Once we start calling art those “pragmatic” forms of social participation and practice we subject their practical effect to one of signification. Their original purpose and function is conditioned while it drags their linguistic function. If, for Plato, art had to imitate reality now it has to be a “real” action that we have to interpret as a representation of itself. Not to even mention that artists are usually ill suited to do such actions that need expertise.

One thing is to make political art and another propaganda or politics. For some reason those differences seem to be clearer in relation to sex. We can distinguish more clearly the difference between erotic art, pornography and having sex than between political art, propaganda and politics.

What Ortiz-Torres transmits is relevant to the framework being built up in these pages. There is no necessity to release or escape any practical effect an artwork has. But, at the same time, that does not mean that the artistic project and its productions are subject to judgement on whether they ‘work’ or not in those terms. If a practical effects exists, it does not mean that it is the main goal of the project. It does not mean, in other words, that the problem addressed is under an attempt to be solved, even if the artwork itself does provide with a momentary solution in a specific context.

Additional examples in this regard can be found in the work of Krzysztof Wodiczko, specifically in the ‘Homeless Vehicle’ project, deployed on the streets of New York City (Wodiczko, 2017). About it, Wodiczko claims, “it sought to act as a shock-absorbing mechanism between the homeless population who inhabit these streets and the many others for whom the streets serve as a mere passageway”. As Wodiczko explains further, the Homeless Vehicle project aimed to legitimize the presence of homeless people in New York City providing with a legitimate tool for bottle collection and other activities, even as shelter. As it is somewhat obvious, Wodiczko’s homeless shelter has several practical effects and features. Even beyond their most pragmatic elements such as the bottle storage compartment, the fact

that it is a unique piece of equipment, with a particular identity and meant to legitimize homeless people's work in the city also could be discussed could fall within the practicality of the project. But this does not mean that Wodiczko is trying to solve the homelessness crisis, not even by providing a model. It does not mean that, if nobody ever re-creates the Homeless Vehicle, or if homeless citizens of New York aren't equipped with it massively, then the project would be a failure.

Wodiczko also explains, "its success prompted ideas for new equipment additions to meet its emerging communicative role. The vehicle operator, no longer perceived as a faceless urban character, became a real person and an actor, a performer-present, conscious of their entertaining and instructing role" (p. 200). What success is the artist describing then? The author further explains that the vehicle "was born of the homeless scandal and it aims at further scandalizing it", adding "the 'utopia' of the vehicle is based on the assumption that its articulating function and scandalizing presence will contribute to better public consciousness of the homeless situation and evoke thoughts of a world where this kind of vehicle would be unnecessary" (p. 209, *endnote #3*). This is, perhaps, where the success of the project can be measured. Its artistic success, in trying to address the problem by raising awareness.

The artistic project doesn't necessarily even have to address a problem. However, if dealing with one, there are other ways to focus on them. One's art could attempt to *understand* a problem, for example, by abstracting aspects of it and by creating a model to work around it with a different point of view. One's work could try to highlight a problem, in a similar way to what Wodiczko did with the Homeless Vehicle project, or even highlighting the absurdity of some situations, such as Michael Rakowitz 'paraSITE'²¹ project that proposes inflatable shelter for the homeless by capturing exhaust heat from city buildings. Similarly, Rakowitz also proposed in 2003 "Enemy Kitchen"²², where he tried to address the fact that "Iraqi culture is virtually invisible in the US, beyond the daily news, and Enemy Kitchen seizes the possibility of cultural visibility to produce an alternative discourse" (quote?). Problems can be intervened, recreated, even created. In any case, it is important to understand the fact that the responsibility to provide with solutions, as Ortiz-Torres claims, is perhaps in the field of doing politics, which is different from having an art practice that is politically engaged.

²¹ More information can be found at:
<http://www.michaelrakowitz.com/parasite/>

²² More information can be found at:
<http://www.michaelrakowitz.com/enemy-kitchen/>

Ethnographic Research and Art

Art can provide a way and an angle from which to interrogate a certain subject. But it can also happen that, other than a clear intention, most of the clarity from a project comes *after* the fact and not really before, as an objective. This has to do with the fact that this is not about problem-solving initiatives, where having specific ambitions and goals, schedules, timelines, budgets, variables and indexes to monitor performance would be the norm. Since addressing a particular issue can be about understanding it, or about talking about it, or about learning more from it, then the unexpected plays a role that often continues to shape the work of art, at least put in these terms. These thoughts don't apply to many forms of art, but they do apply to the ones discussed in this investigation, or fit within this framework to a certain degree. Borrowing from anthropology is useful at this stage, specifically in understanding better with what energy ethnographic research can be performed. In "Tradition and Improvisation in Ethnographic Field Research", Liisa Malkki (2007) explains a view that is particularly in tune with many artistic projects, especially the ones with the spirit introduced in this thesis.

"Ethnography is, and always has been an improvisational practice", she adds, "the ethnographer . . . must take on the risk and responsibility of improvisation, the creative use and perhaps remaking of the repertory" (pp. 180-181). Malkki discusses also how the methods of the field researcher such as interview techniques, photography, recording, etcetera are meant to be understood as all "possible techniques in an open, flexible, highly context-dependent, and time-sensitive *repertory* of possibilities" (p. 180). Perhaps the tools of the artist are their art. Or perhaps that is the case for which this discussion is being held, in these pages, as a proposition. What if the tools of the artist are their art? In this sense, understood to perform as vehicles that can conduct further research, or broaden the knowledge on even the unexpected subjects that they touch upon. This is not to say, however, that one is arbitrarily decided where it takes the conversation. There is *intent*, and there are a number of preoccupations, questions and matters that are perhaps raise certain suspicions about certain subjects. But, with the aid of an artistic project it is possible to further advance in what otherwise would remain dark. And this 'vehicle', of course, is an *artistic* vehicle, meaning that the connections and questions that are posed are interrogated with what can be called 'artistic intelligence', creativity, provocation, and absolute desire to decompose what appears to be evident. These similarities continue to be close to the modern social and cultural anthropologist.

In the previously described "Homeless Vehicle" project, Wodiczko explains "soon after making and deploying the vehicle, it became clear to me that it operated in a more complex way than intended", embracing the unexpected. "It was used not only as an object that articulated conditions of life, but also

as the communicative instrument for its user to help each of them open and share their lived experiences, their techniques of survival, and critical vision. Further, it lured in street audiences as an 'excuse' to come closer to the homeless operator, ask questions, and listen" (p. 200). This description could be understood as how Wodizcko learnt from the experience in ways he was not foreseeing, and how those learnings became also a crucial part of the project.

Another example can be centered around another endeavor of Michael Rakowitz. One of his projects, also associated to "Enemy Kitchen" is discussed in an interview (Johnson, 2007). In "Return", Rakowitz re-opened his grandfather's store in Brooklyn offering some products and services, but for a big part trying to import dates from Iraq that would be labeled as dates from Iraq²³. "These dates were going to make people stop and ask questions", he explains "I wanted this to be something more than just a business transaction, however. The project inevitably became personally meaningful, since I am half Iraqi" (p. 15). "I really thought the dates would interrogate what was happening on this side of the ocean. I never thought they would become surrogates for the people waiting at the border" (p. 16). In this case, it is perhaps even more clear how the artist's intentions are linked to the possibilities of discovery and having the artwork, the performance, the set-up become a vehicle to learn more, or to research more.

It is important to differentiate scientific research from artistic research, however. And it could also be important to separate artistic research from that of looking into references. Although there could be similarities, the scientific method has its particularities: purpose, research, hypothesis, experiment, analysis and conclusion. These separate stages seem to work well for the sciences, and the lack of fear for the unknown seems to be a point in common. There is, however, a more chaotic and blurry approach in the arts, and the 'production of knowledge' is perhaps closer to the one that is produced within the social sciences. Even perhaps closer to the one produced through research in social and cultural anthropology. Aiming to achieve better understanding and knowledge of particular situations.

²³ At the time of the interview importing dates from Iraq labeled as dates from Iraq was virtually impossible. At least nobody was doing it and all dates from Iraq would go to either Saudi Arabia or Syria to be relabeled and then shipped to the USA as a product of another country. Michael Rakowitz was attempting to break that barrier.

A Practical Conclusion Field Research? The Case of the Speaker Wheels

As I have discussed and noted in the introduction, the ideas and reflections written in this thesis are meant to serve as a theoretical framework to support most of the artwork I have produced in the context of the program in Art, Culture and Technology at MIT. I clarify “most” of the artwork because other projects, events and activities have been explored during my time in the program that would not fit inside this framework. Similarly, this theoretical framework is not supposed to cover only the artworks and performances that will be mentioned below. Rather, it is meant to reflect upon them to draw conclusions, thoughts and new ideas that will naturally evolve into new experiences.

These projects, past, present and future, are also meant to be deployed and used in different ways and within different contexts multiple times, meaning that they are not ‘finished’. They have barely started and, in the future, more conclusions will grow out of practice. Furthermore, these projects are meant to nurture an on-going curiosity over the theory that they touch upon. The projects (and the experiences that have happened with them) that will be explained and analyzed, together with other projects that have been produced in the context of the program in Art, Culture and Technology at MIT are the main ingredients of this thesis. They are responsible for this momentary perspective on public space, sound, technology and art. It is momentary because I am certain these concepts will evolve, as they have from my understanding of them in the past. For example, as someone with a background in architecture, my ideas on public space used to be very much focused around the urban dimension. Now, my explorations around sound have provided with a wider understanding of the concept of public space and, in the future, unexpected new interests and projects will provide with new perspectives.

The production of artwork has led me to research, although the production of research leads me to produce artwork too. It is a feedback mechanism and that also means that the artwork should be understood as unfinished the same way this thesis should be regarded as unfinished. Unresolved perspectives, at least. The projects and performances that are going to be described below have been produced with that spirit. They must be understood as ‘vehicles’ to conduct research, meaning that they are machines that mean to produce more questions than answers. These questions are raised by way of conversations with interested peers, by interactions with people in connection to the work, by situations triggered by the work itself, by analyzing aspects of its construction, by defining and re-defining the keys that these projects touch upon, among many other options. There is no systematic strategy, and there will not be one, since having one reduces the possibilities of new findings and new ideas thereafter. The

only plan, in this sense, is to create, deploy, understand, analyze, find meaning, re-create, deploy again and so on –in no particular order.

These projects could also be regarded as vehicles to conduct field research. Close to Liisa Malkki's cited text on how ethnography is an improvisational discipline, these artifacts present themselves as conductors of new discoveries both regarding the people that I engage with throughout the expeditions and adventures that have been led with them and concerning the built artifacts themselves. As field researchers in anthropology would know, the number of activities I have pursued with these devices is too scarce and too little to even call this a 'field research' by professional and rigorous means. However, the projects do hint on the discipline of ethnography, and they leave an open door to drive themselves into a more engaged and expanded set of activities with groups of people and communities that I have engaged with already, and of whom I could believe I could contribute with my machines.

The projects and performances here presented the Speaker Wheels #1 and #2, and the performances and deployments that with them happened. It is through these deployments that the projects have provided some input in understanding better and further the role of sound in public space, as well as the reach that it can have as seen from a political perspective. The Speaker Wheels rely on an original artifact that then changed, mutated or created new additions, as if the original device, when born, represented the mother of a future family of objects that adapt, every time differently to the experiences they were meant to be part of. These projects and the experiences lead through them have also provided self-criticism and have made possible the understanding of aspects that need correction into better experiences in the future.

The Speaker Wheels are mobile loudspeakers, born out of the combination of a loudspeaker and a wheel. The first Speaker Wheel was created as a group project, together with other participants of the 'Introduction to Sound Creations' class²⁴ as part of the MIT Art, Culture and Technology class program on the spring 2017 academic semester.

The class had two marked sections. The first one, led by Jan St. Werner, a German sound artist and musician, also known for his participation in the electronic music duo 'Mouse on Mars'. The second one, led by Sam Auinger, an Austrian sound artist, known for his international installations and performances as part of his practice with Bruce Odland at 'O+A'. It was during the first part of the class, under the

²⁴ Class participants: Rainar Aasrand, Samantha Adler De Oliveira, Jessica Adams, Andrea Carrillo, Walker Peterson Downey, Martin Joshua Elliot, Kyle Jobe-Woodruff, Nicolás Kisic Aguirre, Alexander B Lefell, Alexander K Souvannakhot. Teacher Assistant: Jose Rivera. Teachers: Jan St. Werner and Sam Auinger.

guidance of Jan St. Werner, that the idea for the group project to create a 'speaker wheel' became a challenge. Most of the class participants were thoroughly involved with the creation of the Speaker Wheel. My participation was committed both in the design and in the fabrication stages, reason for which I feel entitled to describe the ideas behind its design and I further felt entitled to create a second Speaker Wheel, this time with mutations and as an individual project.

The design of the Speaker Wheel was meant to satisfy the need to have 'sound moving in space', which was a research concern the class had. As sound is a dynamic force, it was interesting to understand how it could also affect space differently depending on the location of the source for the sound emission. Having a mobile speaker was at that point considered a great tool to further participate in this kind of research. On another note, the design of the wheel was also largely influenced by one of the references Jan St. Werner brought to the class the examples of moving sculptures created by students of Manuel Casanueva for the Valparaíso Open City²⁵ Edros Vs. Oidos beach games²⁶.

As an entry into the course's website²⁷, I wrote:

Alex mentioned during the last class potential stability issues if the speaker-wheel ended up being too thin, proportionally. It made me think of how we could build the moving speaker ... with limited resources. An extension of the driver with a light structure is an option, it reminded me of class inspiration Manuel Casanueva's Edros Vs. Oidos game experiment in Valparaíso. Choreographic potential, economy of resources, sound amplification and a fast construction. Maybe two speakers, each facing opposite sides. Rims can be metallic, sticks can be wooden. If it's big, it's also proportional to a group of ~10 handling it and a large space like the ACT cube.

The same website displays a sketch drawing of what was the first design idea for the Speaker Wheel. Later, during construction, the fabrication associate of the ACT program, Seth AVECILLA, recommended materials and fabrication methods that ended also influencing the design. We fabricated the Speaker Wheel welding metallic parts together. I personally saw that we successfully constructed an object that surpassed its original purpose and suggested a much more interesting use than just understanding sound moving in space. We had a presentation during which we used the Speaker Wheel as originally intended, and walked as a group pushing the wheel towards a different location from where it started.

²⁵ More information on Valparaíso (Ritoque) Open City at:
http://amereida.cl/Ciudad_Abierta

²⁶ More information on the games developed by Manuel Casanueva in the 70s until the 90s at:
<http://despina.org/jugador-como-pelota-pelota-como-cancha/?lang=en>

²⁷ More information at:
<http://mitsoundcreations.tumblr.com>

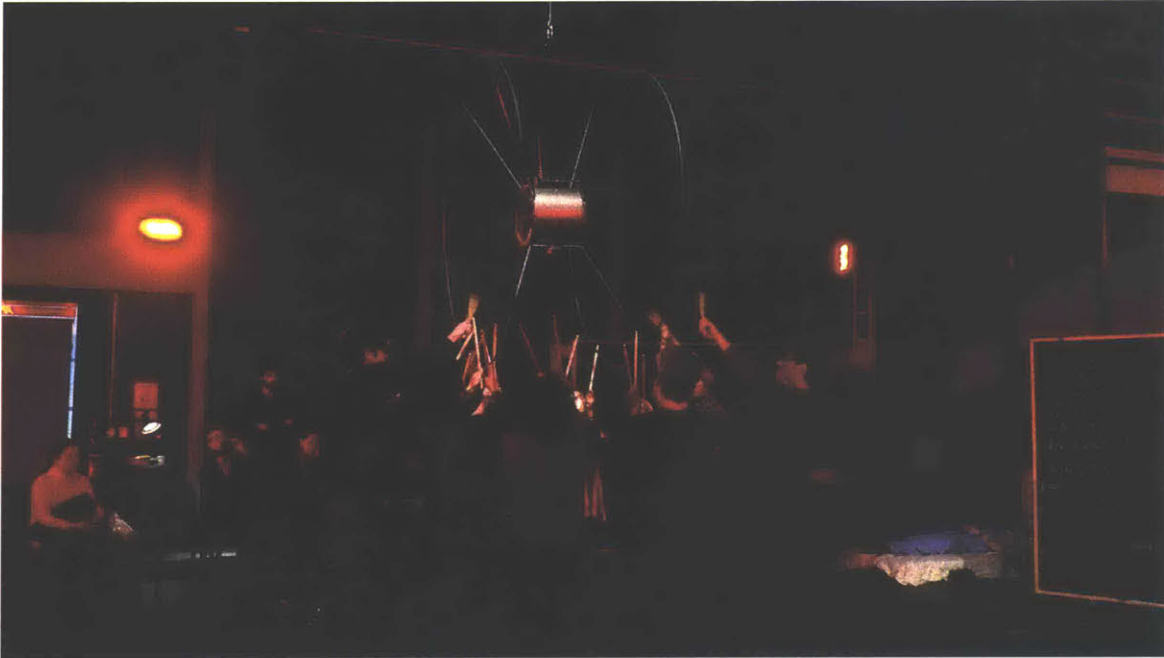


Figure 2. The Speaker Wheel #1 in its inaugural performance, where we were exploring sound moving in space. The Speaker Wheel was hung from the ceiling at the 'ACT Cube', but then released and used on the ground to be pushed throughout the space while emitting sound. *Courtesy of the Author. Photo: ACT Media Team 2017 (John Steiner / Madeleine Gallagher).*

The reason I felt the Speaker Wheel surpassed its original purpose had to do with scale, an observation that in this case has two sides. On the one hand, there is a scale of the object in relation to its user: the human scale. In between the two peripheral wheels, just enough space is available for a single user to fit, grab the wheels with both hands and 'operate' the wheel. This aspect was not part of the design of the artifact, but it ended up being accidentally perfect. As with bicycles, where the saddle, the steering rod, the pedals and the distance between these produce a perfect design for a person to operate it, the Speaker Wheel demands a user to be in charge of its handling. This does not happen often in relation to other objects. The same happened with the Speaker Wheel, it could have been an object that suggested a different type of handling, but it accidentally ended up suggesting an artifact-operator kind of connection.

On the other hand, there is a scale of the object *and* its user, together, in relation to the city: the urban scale. When a human is riding a horse, it becomes a new hybrid that reacts to its context through the possibilities of its new 'extended' body. A human on a horse might feel faster, stronger, etcetera by connecting to the abilities of the animal it is relating with. In the case of the hybrid species of the

operator with the Speaker Wheel, the operator becomes aware of its possibility of been louder, bigger and perhaps more protected, since the Speaker Wheel could even act as an armature.

Specifically this urban scale motivated me to attempt new adventures in the city with the Speaker Wheel, I wanted to understand how the Speaker Wheel could enhance protest. Consequently, in two separate occasions I brought the Speaker Wheel out on protests in the Boston area. First, to support the 'March for Science', and second, to support the 'International Worker's Day' march on mayday (May 1st), both during the spring of 2017. Both experiences became highly valuable in providing insight on how the sonic atmospheres during the marches behaved, how people reacted to the Speaker Wheel and how the design could be improved. This last point became important to produce an individual mutation of the Speaker Wheel #1 that I later called the Speaker Wheel #2.

The March For Science in Boston occurred during Saturday, April 22 of 2017. It was mostly a demonstration against climate change deniers and their influence in the federal government. President Donald Trump been the most important and influential of all deniers. By the time of the March For Science, Trump had threatened to leave the Paris Agreement. Later that year, he effectively removed the United States from the agreement. The March for Science in Boston was, in that sense, a demonstration of outraged citizens that claimed the recognition of scientific proof of climate change and the link between human activity and temperature increases. Naturally, the March for *Science* in Boston was organized by the scientist community of the area which is fundamentally composed of people somewhat linked to the academic institutions surrounding the area, such as Harvard University and the Massachusetts Institute of Technology (MIT). In fact, speakers at the 2017 March for Science in Boston were people like Joi Ito, director of the Media Lab at MIT.



Figure 3. The Speaker Wheel #1 at the March for Science in the Boston Common. Note the faces of surprise in people surrounding the Speaker Wheel. *Courtesy of the Author. Photo: Nicolás Kisic Aguirre.*

The March for Science in Boston was held in the Boston Common, although there was a massive attendance from Cambridge, where Harvard, MIT and other universities are located. To attend the march, people walked from Cambridge to Boston, already marching. People would cross the Harvard bridge next to MIT and then walk all the way to the Boston Common following the route of Commonwealth Avenue. I joined the March for Science with the Speaker Wheel #1 leaving from the MIT Media Lab building and gathering with the rest of the crowd at the Harvard Bridge. Before leaving MIT I had to prepare and think about the sounds that I would play from the Speaker Wheel while it was rolling through the bridge and Commonwealth Avenues. Since I had never done this before, it was difficult to understand what could work and what couldn't. I decided to look for interesting speeches on climate change that had happened in the past and bring these 'absent' voices to the present, play them loud and have people hear other ideas on climate change that were not necessarily coming from the official speakers.

The March for Science in Boston was highly organized, and it felt like the hierarchy of the speakers and the ideas to be spread was very vertical. Scientists like MIT Media Lab's head Joi Ito 'preached' with their

messages to large crowds and their discourses set the tone for the whole event. It was not really very political in that sense, not very militant, not very disruptive, not very provocative. My idea with bringing different speeches and different voices was also related to the possibility of disrupting this hierarchy imposed in the march, and have alternative voices also access an amplified voice. I was not able to provide with an 'open mic' because of technical difficulties, but I was able to amplify speeches that had occurred in the past that I thought had been powerful. I became, in a way, a curator or a selector of content for the Speaker Wheel. With it, great responsibility came.

I selected speeches from climate change deniers in power such as Marco Rubio to be provocative as well, and even a whole Radio Show²⁸ that dealt with climate change denial. But I also chose to broadcast through the Speaker Wheel the words of scientist Ernest Moritz explaining climate change to Rep. McKinley on 2013 (depicting McKinley as a climate change denier in power). I also chose to emit the words of Severn Cullis-Suzuki (age 12) at Rio Summit in 1992, words with high emotional value and of historical relevance, considering it had been 25 years since that speech and things had gotten only worse. Finally, I also decided to play the words of Yeb Sano, from the Philippines, speaking in 2013 at the UN about the Haiyan Typhoon that had deeply affected his country, trying to give voice, in this way, to the most affected by climate change, down in the 'Global South', the *third world*.

Although I believed I had a good plan in terms of content, the reality of the strategy to deliver the content was different. First, most attendants were very optimistic with the line-up of speakers on the big stage. There was not much of a critical audience as far as I could see, meaning that perhaps not many people were seeking alternative voices. Second, there were two modalities that I had the chance to participate in. The first one was the 'marching', walking and rolling the wheel from the Harvard bridge to the Boston Common. The second one was, already at the Boston Common, where I was 'parked' near the back, instructed by the police 'not to go too in front'. While marching and rolling the wheel, people around me were engaging in conversation, including with myself, having pleasant discussions about the wheel itself, and talking about the inventive behind it.

People were impressed about the object, not so much about the content I was trying to deliver through it. In fact, I don't really think anybody was paying attention, as it was not really a moment to pay attention to specific speeches. The loudness of the loudspeaker was not helping either. During the second part, people were really paying attention, although, because of the enthusiasm with the line-up already described, they were paying attention mainly to the official speakers. Their sound system was also much more powerful and it was difficult to dispute the space in such conditions. Attendants were

²⁸ Radio Ecoshock – Machinery of Climate Denial 11-07-27

engaging and would interact to talk about the Speaker Wheel, but more out of impression and playfulness and less about the criticism I was trying to convey with it. It is somewhat interesting to understand this experience as trying to disrupt a march, something that in itself is supposed to be a disruptive activity. I believe that with further experiences more can be done as I learn more about the sonic ecosystem of such an event. In that sense, the second event I attended, the International Workers' Day march on Mayday, provided with a new opportunity to apply what had been learnt during the March for Science, and provided new lessons too.

The International Workers' Day is celebrated on May 1st and for the occasion the organizations that sponsored the march were primarily announcing support and fight to gain proper immigrant workers' rights, denouncing deportations, asking for \$15 minimum wages, among other claims. This demonstration was not as popular as the March for Science, in part because it occurred during a weekday (Monday, May 1st 2017). But it also was not that popular because it was organized by highly political organizations that were looking to confront and had a somewhat radical discourse, mainly coming from the left, the socialist, the communist, the immigrants, the unions, the activists, the militants. On a personal note, I felt identified with the claims, I had political affinity the statements called to be supported, I had some friends attending and a group from MIT was organizing people to march all the way to the Boston Common. This organization encouraged me to join the march with the group of MIT with the Speaker Wheel, and this time I prepared different kinds of sounds not to disrupt the march but to enhance it, encourage it and make it stronger.

Since the climate change speech strategy had been deficient in trying to gather listeners, and since the situation was different since I was not trying to provide an alternative to the dominated organized march, I considered music. I had been working with a project that researched percussion²⁹, and had been investigating the power of percussion in situations such as marches, protests, military parades and other events. Logically, I thought, the sounds of percussion would be perfect for this situation. I imagined walking with the group departing from MIT, rolling the Speaker Wheel and empowering the small group march with sounds of percussion from different cultures and contexts, like providing with a 'soundtrack' to a specific situation with the intention to enhance it. I somewhat naively downloaded and created a playlist of drumming patterns from Pow Wow (Native American), Burundi (Eastern African) and Aztec (Ancient North American). The reason for the specific selection was not ideological, it was rather practical: I searched online, listened, and considered these specific sounds would be the most successful.

²⁹ The Modular Rhythm Machine, more information at: <http://www.aec.at/ai/en/modular-rhythm-machine/>



Figure 4. The Speaker Wheel #1 heading to the Mayday march on International Workers' Day 2017. Pushing the wheel for miles is not an easy task. *Courtesy of the Author. Photo: Jesscia Adams.*

When we were finally crossing the Harvard Bridge, me rolling the wheel and the rest of the MIT group organized with chants and coordinated marching, I started playing the drumming patterns. After a minute of playing the drumming patterns from the Speaker Wheel, I started receiving some attention, but as if something was wrong. I was sonically disrupting the group that I was trying to enhance, the chants and the coordination they put together as a group were not enforced by the drumming, they were interrupted unexpectedly. The sonic ecosystem within a protest is more fragile than what I thought was. Of course drumming was not working because the drumming was performed through a loudspeaker that was alien to a group. Drumming is powerful when it is performed by the entire group, I understood then. It could also be as powerful if a single performer or a group of performers are authorized and supported by the entire group. When people in different cities bring noise objects such as pans and pots, massively, producing a driving effect and a group manifestation that is truly enhancing, it is because a big percentage of the participants are performing the percussion as well. When a group of football fans chant fiercely to support their team, there usually is a bass drum, only one, but the bass drummer is almost a leader for the group, and constitutes an authorized figure that

conducts most of the chants to empower and raise the energy of the group. When the Pow Wow Native American drum ceremonies take place, the Pow Wow drum is the center of the ceremony, gathering participants around the drum to channel the spirit of the drum through themselves. Together, they constitute the collective, powerful expression that percussion brings into a cultural situation (a ritual, a ceremony, a competition, a protest).

The Speaker Wheel was failing again, at least sonically. After attempting to regulate better the loudness (lowering the volume), I realized it was best to reduce the loudness to a point where it was not audible anymore. In other words, it was better to shut up. And it was: the chanting and the marching of the MIT group gained more power when it was not interrupted by the Aztec epic drumming that I had brought with me. However, even with the Speaker Wheel been silent, I felt that the object itself was contributing to the enhancement of the group. We were a more powerful group with the wheel, not necessarily with the wheel playing those sounds. There was hope. When we arrived to the Boston Common the wheel was 'parked' in the middle of the garden near the stage and was silent because there was music coming from the stage, and speakers were getting ready to begin with their speeches. Other participants of the march approached me to have interesting conversations about the project, and offered suggestions and interesting insight. A particular gentleman talked to me as he introduced himself as one of the organizers of the march. He thought it was an interesting sound system to use in the later stage of the protest, after marching to Copley Square where a sound system would not be set up properly with a stage like at the Boston Common, and they had only a small megaphone to improvise a speech. I still had not achieved a proper system to use with a microphone, I had problems with feedback and latency, so I could not provide with a solution for that same day.

As the Boston Common section of the event finished, people started gathering to march together as a large group to Copley Square. It was not the small group that marched from MIT to the Boston Common, it was the entire congregation of protesters that were going to march together to another part of town. As I was gathered with a small group of friends, they started suggesting for specific songs to be played on the Speaker Wheel to go together with the march. My friend Kim suggested to play "Somos Sur" by Anita Tijoux, which has lyrics³⁰ that were very much in tune with the ideas and claims that the people were marching for:

³⁰ Translated from Spanish from:

<http://lyricstranslate.com/en/somos-sur-we-are-south.html>, original lyrics:

Tu nos dices que debemos sentarnos / pero las ideas solo pueden levantarnos / caminar, recorrer, no rendirse ni retroceder / ver, aprender como esponja absorbe / nadie sobra, todos faltan, todos suman / todos para todos, todo para nosotros.

Soñamos en grande que se caiga el imperio / lo gritamos alto, no queda mas remedio / esto no es utopía, es alegre rebeldía / del baile de los que sobran, de la danza tuya y mía / levantarnos para decir "ya basta".

You tell us we should sit down / but ideas can only rise us / walk, march, don't surrender or retreat / see, learn like a sponge absorbs / no one is surplus, all fall short, all add up / all for all, all for us.

We dream big that the empire may fall / we shout out loud, there is no other remedy left. / This is not utopia, this is a joyful dancing rebellion / of those who are overrun, this dance is yours and mine / let's rise to say "enough is enough".

Neither Africa or Latin America are for auction / With mud, with a helmet, with a pencil, drum the fiasco / to provoke a social earthquake in this puddle.



Figure 5. The Speaker Wheel #1 on the Mayday march on International Workers' Day 2017, heading from the Boston Common to Copley Square, playing Anita Tijoux and engaging successfully with participants. Next to me, my dear friend Kimberly Barzola. *Courtesy of the Author. Photo: Jesscia Adams.*

People around us knew this song and captured the message of it, were familiar with the genre and, at that point, finally, the Speaker Wheel felt as a support and tool of empowerment for the marching

Ni África, ni América Latina se subasta / con barro, con casco, con lápiz, zapatear el fiasco / provocar un social terremoto en este charco.

group both viewed as an artifact and listened to as a sound-emitter. Up to that point, I had been avoiding pop or commercial music as a means of sonic expression because I was biased to think that music would be too easy, not serious enough, too distracting and somewhat banal. After playing Anita Tijoux, someone else came to me asking for a hip hop song called FDT, with a chorus insulting the current president of the United States –something that turned out very popular among participants. Aside from the insulting, the interesting aspect of having a very clear chorus on a song with which people around could identify with made me think of two advantages on delivering musical messages with the Speaker Wheel.

The first one, as to precisely delivering a message. My attempts during the March for Science to broadcast whole speeches to participants that are overstimulated by messages, people, media coming from multiple points would have never worked. Instead, the repeated chorus of the FDT song was short, simple, clear and looped 8 times every chorus, meaning that the phrase was heard 32 times during the whole song. After the first time, people were able to sing-along if desired and it had a similar value to the political chants that sometimes spontaneously emerge during a rally. The second one advantage of delivering music with the Speaker Wheel had to do with setting an atmosphere, or helping with the atmosphere to empower it. In that sense, the drumming sounds that were offered during part of the march and were disruptive to it instead of supportive perhaps were disruptive because the lack of familiarity with such sounds. Intense drumming is not something people are prepared for habitually, whereas music could be something that participants can engage with a better attitude.

Popular or commercial music normally has a number of layers and characteristics that make it easier to digest, in proposing harmony, melodies, rhythm, lyrics and the repetition of a formula that provides with the familiarity that precisely is absent from ceremonial drumming at high volumes in the middle of Boston. Far from being ideal, these particular experiences did prove the fact that music had a place in empowering the specific mayday march in Boston, with the particular songs selected at the moment. In this sense, to highlight the specificity of these correlations is also an exercise to avoid generalizations and to bring formulas to an artifact that is precisely made to investigate and explore its own possibilities in different situations, differently.

The Speaker Wheel had been through a number of experiences and experiments, and as an object it also provided with some insight on its fragility. It almost broke completely during the March for Science while rolling it to the Boston Common. It was not loud enough to really take advantage of a potential massive amplification, especially if a microphone system was to be installed. Precisely because a microphone system was one of the future goals, it was preferred that someone such as a speaker could use the wheel also as a stage; meaning that it could serve as an elevated platform to facilitate visibility

between an audience and a speaker. The Speaker Wheel was too fragile to allow that and electronics were on the outside. Finally, I was considering how important it would be to produce an object that could be easily imitable by others just by seeing it, meaning that an easy and somewhat cheap construction could inspire others to make their own. These reasons motivated me to pursue the construction of the Speaker Wheel #2, this time as an individual project, born of the mutation of the original Speaker Wheel.

The Speaker Wheel #2 was made with a similar design, although with different elements in mind. I bought two discarded parabolic satellite dishes from a junkyard-style seller on the internet. I modified the satellite dishes so that they could be stronger and, at the same time, allow for a large barrel in the middle that would be the 'speaker' part of the Speaker Wheel. I got a steel drum, generally used to store oil or hazardous substances that I modified too to fit in the design of the new Speaker Wheel. Using elements that can be found in the for cheap, such as 'junkyard' pieces or massively produced elements is meant to set the example of its own fabrication. If someone wants to make one, they should understand by the transparency of its fabrication and the pieces used, that it is not a difficult task. Finally, I got the speaker drivers, the electronics, the batteries and started assembling a stronger, bigger and louder Speaker Wheel. Perhaps without considering the downside: it was also heavier and difficult to fit through many doors. But definitely operable and ready for new adventures.



Figure 6. The Speaker Wheel #2 as part of a noise performance near MIT's Media Lab building. The Speaker Wheel #2 was stronger, hence it could resist me standing on top of it. It was also louder, and it was made through a

strategy of assembly from discarded parts. *Courtesy of the Author. Photo: ACT Media Team 2017 (John Steiner / Madeleine Gallagher).*

The Speaker Wheel #2 has not been yet to a massive public event, demonstration, rally or protest. It has been 'deployed' once, as part of a performance when it was presented for the first time. During this presentation I composed a noise piece, which I regarded as highly successful for the purpose of the performance. This performance, evidently, was not an act of 'joining forces' with protesters, or an enhancement of a political act. In reality, the performance could be regarded as artistic act, with a political load. In this sense, the selection and composition of a noise piece was key to loading the performance politically, and understanding what noise is also led me to understand that, in reality, the Speaker Wheels are, ultimately, noise machines.

Some years ago, learning about social and cultural anthropology I came across Mary Douglas' assertion on defining dirt as 'matter out of place'. In *Purity and Danger: An Analysis of Concepts of Pollution and Taboo* (1970), she writes:

As we know it, dirt is essentially disorder. There is no such thing as absolute dirt: it exists in the eye of the beholder. If we shun dirt, it is not because of craven fear, still less dread of holy terror. Nor do our ideas about disease account for the range of our behavior in cleaning or avoiding dirt. Dirt offends against order.

(p. 2)

If we can abstract pathogenicity and hygiene from our notion of dirt, we are left with the old definition of dirt as matter out of place. This is a very suggestive approach. It implies two conditions: a set of ordered relations and a contravention of that order. Dirt then, is never a unique, isolated event. Where there is dirt there is system. Dirt is the by-product of a systematic ordering and classification of matter, in so far as ordering involves rejecting inappropriate elements. This idea of dirt takes us straight into the field of symbolism and promises a link-up with more obviously symbolic systems of purity.

(p. 36)

A definition of noise can be related to the definition of dirt as 'matter out of place'. I even thought I had been enlightened by a link that no one had ever thought about in the history of knowledge, but I was surprised to learn that, according to Hugh Pickering and Tom Rice in "Noise as 'Sound Out of Place': Investigating the Links Between Mary Douglas Work on Dirt and Sound Studies Research" (2017) already had explored the association. Moreover, they write: "Indeed, when reading the literature, it is striking

just how often this appropriation of Douglas' famous line takes place." Pickering and Rice then link this definition to some 15 scholars that both explicitly and implicitly have assumed a similar approach.

I clearly was not the first to make the connection. However as relevant as it is to the work described in this thesis, and to the work that I will continue producing, and I shall continue to understand 'noise' as 'matter out of place'. And I shall continue to borrow from Pickering and Rice's suggestions:

Each of Douglas' theoretical points about dirt can be applied to noise Whilst dirt, excrement, violence, and crime can all be 'shut out' both literally and figuratively by the closing of a door, noise has the unique power to penetrate. What noise symbolizes in the wider discourse remains roughly the same: it is disorder, rebellion, instability, and contravention of the expected (or dominant) order In short, to be quiet is to be good, to agree to cherished classifications, to uphold the sonic and social order and to follow accepted ways of being. To be noisy is to be bad, to disregard convention, and to confuse or ignore classifications and have different and unacceptable ways of being. Noise, far more than just 'sound out of place,' is indicative of an entire moral system.

Rather than thinking of noise as similar or equivalent to dirt, we should instead say that noise *is* dirt, an aural type of pollution. Thinking about noise in this way heightens our consciousness of noise as a charged and challenging presence. If we see noise as dirt/pollution in the Douglassian sense, then we can appreciate with more immediacy the revulsion, fear, and danger which noise can evoke as well as the potential it holds as a creative force for use in acts of deliberate aesthetic and social transgression.

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