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TOWARDS A DEFINITION OF SOUND AS VIBRANT MATTER

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A thesis submitted to the Faculty of Humanities, University of the Witwatersrand, Johannesburg, in partial fulfilment of the degree of Master of Arts in Digital Arts by dissertation.

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ABSTRACT

This dissertation explores different but related philosophies of material agency - the idea that all matter, human or non-human, carries some kind of agency: a capacity to affect and to be affected, the potential sociopolitical implications of such a viewpoint and the potential of sound art to explore these ideas in an experiential way. I discuss and draw connections between three materialist philosophies: the New Materialism of Gilles Deleuze, Felix Guatarri, Brian Massumi and others, the Vibrant Materialism of Jane Bennett and the Sonic Materialism of Christoph Cox, Steve Goodman, Salomé Voegelin and others. These materialist philosophies understand bodies not as static or complete, but in a constant state of flux, never fully formed but continuously form-*ing*; always in relation to and affected by the ongoing formation of other material bodies. Advocating the decentralisation of human experience, Vibrant Materialism takes into account material processes beyond the intentions or interventions of humans. Sonic Materialism understands sound as an exemplary illustration of affective matter in flux: always present, always moving, always in flux and always affecting and affected by everything it comes into contact with. As a case study, the collected works of a sound artist named Eleh show how these ideas can be implemented in practice. The research finally culminated in an exhibition of installations exploring the potential of sound to move, to act, to change, to affect and to be affected, towards a definition of sound as vibrant matter.

DECLARATION

I declare that this dissertation is my own unaided work. It is submitted in partial fulfilment of the degree of Master of Arts in Digital Arts by dissertation in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any other degree or examination in any other university.

Name

Date

Signature

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INTRODUCTION

In the second half of the twentieth century, a philosophy began to emerge that presented a way of understanding the world as a web of interconnected forces exerted and absorbed by all material bodies, human and non-human alike. Out of this New Materialism came a number of related materialist theories including Sonic Materialism, which understands sound as a material force with potential to affect change in the world, and Vibrant Materialism, which sits at the centre of this research. *Vibrant Matter*, a book by political analyst Jane Bennett, outlines a theory of material agency towards developing more ecological practices by decentralising human experience and attributing a certain vibrancy to all material bodies. Ecological practices for Bennett look beyond human cause and effect, allowing a recognition of the capacity of non-humans to act, to catalyse change, to guide our political responses to public problems (viii).

These materialist theories share an ambition to dissolve, at least in part, the dichotomies of subject/object, human/non-human, life/matter, towards the recognition of wider notion of agency. While a world view that splits matter into camps of active human subjects and passive material objects "may be indispensable to the action-oriented perception on which our survival depends" (xiv), Bennett considers this a fiction that may be detrimental in the long run. The question becomes how to begin to recognise the agency of non-human material bodies and, more specifically in the context of this research, how to explore these ideas in an embodied experiential arts practice.

This research discusses and draws connections between New Materialism, Vibrant Materialism and Sonic Materialism, towards a definition of sound as vibrant matter. A case study shows how these ideas can be implemented in practice. The research finally

culminated in an exhibition of installations exploring the potential of sound to move, to act, to change, to affect and to be affected, to be considered vibrant.

One of the most significant shifts offered by the New Materialism of thinkers such as Gilles Deleuze, Felix Guattari and later, Brian Massumi, is the idea that all material bodies are not static, fully formed objects, but dynamic and in continuous ongoing formation. This was a response to and departure from the dominant view at the time, which understood the world through language, symbols and signs. New materialists argued that language imposes a hierarchy of things with perceiving subject at the centre of existence and all "others", or objects, subordinate to that subject. Understanding bodies or things as fully formed guides us towards questions of what that body *is*, what its external characteristics are, how it is different from other bodies. New Materialism asks rather what a body *does* (Cox, Beyond Representation 157). What are the body's capacities to affect change? By shifting our understanding of bodies towards one of continuous ongoing formation, an ontological commonality can begin to take shape between all bodies, human and non-human, for all bodies possess some capacity to affect change.

If all bodies are in continuous ongoing formation, what is referred to as a *flux ontology* by materialist thinkers such as Christoph Cox (Sound Art 20), then we must say that movement, change and novelty are inherent and essential to life, for in this flux lies infinite potential. All bodies are continuously affecting and affected by other bodies in contingent encounter, in relation. This potential in contingent encounter gives rise to new ways of understanding the world, which in turn may lead to more ecological practices, environmentally, socially and politically.

Jane Bennett, in her book *Vibrant Matter*, outlines a framework for shifting the way we think about non-human bodies, ultimately towards developing more ecological practices with regards to politics, waste management, energy management, and other environmental and social issues by developing the capacities of non-human material bodies as agents in a world of flux. A major difficulty here is the dethroning of humans from the top of a hierarchical arrangement of the natural order. Bennett turns this hierarchical structure on its side to decentralise human experience and allow for more commonalities between human and non-human bodies (112). These capacities surface in the inherent capacities of all bodies to act, albeit to differing degrees. The difference between humans and non-humans then becomes one of degree rather than of polarised ontologies (Bennett 108).

Bennett attributes some of humanity's seemingly insurmountable problems to the way we understand material agency. One example being the illusion that we are able to throw rubbish away, when in fact there is no away, only somewhere else (Bennett 6). Once somewhere else, different assemblages of the materials that constitute that rubbish will act beyond our human intentions and control to affect changes in the environment at a local level, which in turn affect changes at a global level, which can, over time, be detrimental to humanity as a whole (Bennett 13). The world becomes an interconnected web of forces, material agencies continually affecting the unfolding formation of all bodies everywhere. Taking these material agencies into account, in other words thinking ecologically, in Bennett's view, may have profound consequences for humanity.

In what is known as Sonic Materialism, thinkers such as Christoph Cox, Steve Goodman, Salomé Voegelin and others combine aspects of New Materialism with sonic studies and artistic practice, situating sonic practice as a particularly effective framework

for presenting these ideas in an embodied, experiential manner. Sonic Materialism understands a sound not as a representation of something outside of itself, but as an autonomous particular, an agentic body in itself. A sound is independent from its source. For example, under this view, a 'bark' is *not* 'the sound of' a dog barking. Once the sound has left the dog, the sound is now autonomous, or independent of the dog. The materiality of the sound is not changed upon being heard and so we can say that the sound is also independent from a potential listener. It is exactly this autonomy, this capacity of a sonorous body in the space *between* cause and effect that is the focus of Sonic Materialism.

Sound exemplifies the flux ontology laid out by New Materialism in that sound is temporal but also continuous. Individual sounds emerge and dissolve from and into noise, where noise is the ever-presence of sound. In this view, noise is the unfolding of potential, the precondition for the existence of individually perceivable sounds. Sounds need not, however, be heard to be affective. Infra- and ultrasound (frequencies below and above the threshold of human hearing respectively) are in constant motion around us, exerting force on everything they come into contact with to sometimes great effect, forming an interconnected web of forces and pressures filling what appears to be empty space. Attuning to these forces and their potential agency in excess of human intention may heighten our understanding of a shared material agency, our interconnectedness with all of materiality.

The purpose of this research project is to find ways of working with sound that speak to hierarchies of value and are in line with my artistic practice. Bennett's theory of matter as vibrant shines a light on a path towards a more horizontal view of the way we assign value to the materials that make up the world. Applying Bennett's theories to arts practice

allows for a direct connection between theoretical understanding and a more direct embodied experience towards breaking down these hierarchies in favour of an inclusive ecological daily practice of being. I have found great resonance in the philosophies of the material agency of non-human bodies and the non-representational view of sound as an agentic material body. Looking at sound from the point of view of its capacities to affect change, there is a potential to raise its status as vibrant matter and begin to loosen the accepted hierarchy of presumed intrinsic value of different types of bodies and forms. The loosening of this hierarchy allows for the establishment of an ontology of flux in which we might begin to make sense of the pulsing forces at play in the world. It is my view that hierarchies, especially hierarchies of value, are intrinsically unjust and the philosophies which I present in this dissertation have provided me with a way to interrogate these concepts through a process of exploratory and experimental sonic arts practice. I have also found comfort in the validation of the nature of intuition and its role in the process of making. Where the unknown is a necessary condition for the formation of new ideas and new ideas necessary for advancement and life, intuition becomes a tool for navigating the unknown.

This dissertation begins with a discussion of the major points of New Materialism, in order to provide sufficient context for the more specific focus of this research, Vibrant Materialism. Bennett's theories will be discussed in depth from the specifics of how material bodies act to the socio-political implications shifting our world view towards a shared distributive agency and responsibility. Next, a path towards Sonic Materialism will be sketched out from its origins in music and composition up to contemporary sonic arts practice. Aspects of acoustics and the physical properties relevant to the practical processes will be briefly discussed. As a case study the collected works of *Eleh* will be

described and connected to the materialist theories above. The final chapter will detail the processes involved in applying the theories to practice and a reflection on the potential of sound as vibrant matter.

MATTER AND MATERIALISM

Chapter Two

During the early 20th century the dominant philosophy of ontology was characterised by what was known as the *Linguistic Turn*: an understanding of the world and all of perceived reality through language, symbols and signs. Under the linguistic turn, as Karen Barad states, "matter is figured as passive and immutable, or at best inherits a potential for change derivatively from language and culture" (801). In the second half of the 20th century, in response to the linguistic turn, Gilles Deleuze, Felix Guatarri and others began developing an alternative philosophy of ontology, often termed New Materialism. This new materialist philosophy understands matter itself as non-static, always in flux, in the process of becoming otherwise than it already is (Seigworth & Gregg 2-3). Barad calls this a "performative alternative to representationalism" (802). Understanding matter in this way opens questions of *how* matter changes moment to moment. Rather than asking what a thing *is*, we ask what is opened up in an interaction between two or more constantly changing, moveable bodies as opposed to two dumb inert solids.

This is a decidedly unscientific approach to dealing with matter, most often defying definite measurement and quantification. This is perhaps the very reason why such a materialist view is well suited to the arts in general and the sonic arts in particular. It is my view that cultural production is in itself a process that poses a question - not with a goal to finding an answer, but rather to open up further questions - prompting a dynamic and inclusive process. Brian Massumi describes this process in "Sensing the Virtual, Building the Insensible": "For in complexity there is life. A good problem is a gift of life, the provision of an opening for others' activities, for uptake by other processual dynamisms, a contribution to the collective surface of continuing variation" (9). I will adopt this approach to the 'problem'. I will take this 'problem' not as a negative to be solved, but as an adventure, full of questions which may never be answered.

This chapter will provide the wider foundation on which Jane Bennett's Vibrant Materialism, the focus of Chapter Three, is built. The dominant linguistic structure of understanding the material world will be examined and dismantled in order to shift perspectives towards a new materialism. Linguistic structure imposes itself on relational material structure, prioritising the perceiving subject and so placing him or her at the centre of the material world. A materialist view shifts focus from the noun to the verb, the doer to the action, asking us to rethink material form as non-static flux, forming in relation to others. I will develop an alternative ontology of an object as static, to object as unfolding process defined by its potential to vary in continuous flux. Finally, I will discuss the potential inherent in the unknown and unknowable as a force of creativity and novelty in the world. The goal will be to develop strategies to consciously encounter what may at first be imperceivable, towards a recognition of vitality in all matter.

THE SUBJECT VS. THE OBJECT

The linguistic structure of our understanding of the world places subjects and objects into a hierarchical scheme: an object is subordinate to a subject. As Barad points out, Friedrich Nietzsche "warned against the mistaken tendency to take grammar too seriously: allowing linguistic structure to shape or determine our understanding of the world, believing that the subject and predicate structure of language reflects a prior ontological reality of substance and attribute" (802). Under a materialist gaze, this changes by breaking the traditional view of an object as static to an object as thing in flux. Nietzsche believed that all of nature is "creative and transformative" and that all "forms and beings", whether subject or object, are temporary - they congeal and dissolve back into the natural flux (Cox, Beyond Representation 151-152) - and so for Bennett then, the differences

between subject and object become less a matter of kind, and more a matter of perspective (xiv, 68).

Towards narrowing the gap between subject and object, sound artist Salomé Voegelin, in her article "Ethics of Listening", expands at length on her theory that subject and object define each other in contingent encounter. Voegelin points out that to break down the structure of our understanding of reality based on linguistic structure is not only to free the object from dependence on the subject, it is also to open the subject to the contingent process of being. Instead of recognising a thing as what it appears to be, a static form with a particular use or value to a perceiving subject, we continually recognise what it *could* be, in each moment. "The object and the subject […] move past each other, simultaneously and equivalently, defining each other as one contingent possibility of all they could be" (Voegelin). According to Voegelin, to really understand a thing, we must equate subject and object, *both* as processes of being, coming together in a moment, to illuminate possible change.

THE NOUN VS. THE VERB

Another way in which language influences our understanding of the world is through the prioritisation of nouns. Language describes seemingly static objects in relation to seemingly static subjects, in other words, nouns are the "real" things, the stuff of reality. Adjectives describe nouns and verbs describe the actions and movements of nouns, filling the space between static subject and static object. As Voegelin points out, a language that prioritises nouns privileges the subject, making all other things objects without independent capacity for action and change. 'It' becomes a thing in relation to 'me', rather

than 'I' and 'it' being in relation to each other. What if we prioritise the verb and in so doing begin to focus on the action and movement and not the actor?

There is an assumption that the grammatical structure of language, the subject and predicate, "reflects a prior ontological reality of substance and attribute" (Barad 802). In order to shift focus from linguistic representations to a new understanding of matter itself, we can turn to matters of practices, doings and actions. In other words, we shift from the prioritisation of nouns, to the prioritisation of verbs. Nietzsche argues: "there is no 'being' behind doing, effecting, becoming; the 'doer' is only a fiction added to the deed - the deed is everything" (481). Raising the status of the verb - the doing above the being - means that things are not static, shaking our understanding of dumb static matter. Being becomes a process, lived out in doing, and so non-static. All things exist in time. Material form becomes less important than action and relation. As Voegelin puts it, "The subject too is a verb: I myself am not still, but a fluent substance. My self is a shape-shifting thing, a vague thinging that attains definition through its own sound". If we were to set nouns aside, replacing them with verbs, no thing would be static, but rather defined by what it does, its actions.

RETHINKING MATERIAL FORM

Physical science points towards matter as static, fixed, formed, and change comes with external force imposed on that stasis. Friedrich Nietzsche challenged this idea, opting instead for a theory of matter as creative, transformative and self organising. Nietzsche believed that all matter possesses the capacity to "temporarily congeal into forms and

beings only to dissolve them back into the natural flux" (Cox, Beyond Representation 151-152).

In this way all things are animate in that they are constantly changing, creating themselves and their relations with other material things, albeit to very different degrees. Bennett believes that we can practice the discipline of recognising the creative flux of nature (5). This however requires a very different ontology of things to that which is dominant, one that recognises change and movement above stasis (Cox, Beyond Representation 157). The movement and change of seemingly static objects is difficult to recognise because these operate at much slower speeds than we are accustomed to perceiving. Christoph Cox advocates "an ontological commitment […] to the primacy of becoming, time, and change" (Beyond Representation 157) as a starting point towards recognising the flux of natural change. For Cox, sound proves a good example of material flux, presenting objects of listening as temporary contractions of fluid processes (Sonic Philosophy).

According to Brian Massumi, our tendency to draw perceptual distinctions between forms and their attributes is limiting. "Since perception is a matter of complexes of complexities played out in surface relations", Massumi considers more useful such distinctions as "topological (cuts and continua; boundaries and transitions; fold-outs and fold-backs) and processual (aflutter or stabilised; a-run or still- standing; refreshed or habitual; functional or eventful)" (Sensing the Virtual 15). By viewing all of nature, including humans, as inherently creative and constantly changing, we begin to take steps towards "catalys[ing] newness and emergence rather than articulating universalised fixation" (Massumi, Sensing the Virtual 4). We can begin to think of seemingly static

material forms as somewhat fluid, forming in relation to and in interaction with other material forms.

THE OBJECT AS PROCESS

If an object, or thing, is not static but always changing, how then do we account for objects? In "Sonic Philosophy", Cox states that what could be called an "ordinary ontology" understands objects as stable, solid and durable, from tables and apples to larger things like mountains and planets and smaller things like sub-atomic particles. A flux ontology, on the other hand, understands the object not as a stable thing, "the appearance of totality" of completed form, but the "production of possibilities" (Voegelin).

We can say then that a thing is in fact a process, always becoming otherwise, however slowly or subtly, even when this falls outside of our normal modes of perception. Things that seem stable are not so. The ground is alive with movement, even though we as humans cannot perceive that movement. The air we breathe is in constant motion through weather patterns and temperature shifts. We speak of "a space" as a thing, when it exists only as a relationship between walls, floor and ceiling. We create the thing called "a space" as an object of perception through measurement, through creating boundaries around something that is in fact continuous. Massumi addresses movement and change in the same way as continuous, though we measure things in movement as a collection of stable positions, dots to be joined to recreate the very movement we interrupt through measuring (Parables 10).

For Eleni Ikoniadou, the same holds true for time: time does not exist in minutes and seconds, rather it is continuous (8). We impose measurements, points at which we attempt to suspend time in order to name a moment as an object. Just as time is continuous and the punctuations we use to grapple with it are a fiction of our making, form is also not fixed (Ikoniadou 12). According to Massumi, we cannot create new form, only halt a collection of constantly changing materials (Sensing the Virtual 3).

To understand an object as non-fixed, in process, is to shift focus onto the possibilities proposed by the thing as an object existing, unfolding, changing in time. We might say that rather than giving form to an object, a sense of "size, location, outline or distance", we give definition to a concretisation that emerges from a material flux. We give this definition by recognising the potential of a thing in motion, what Voegelin would define as that which a thing "proposes to be at this moment in time, producing its own contingent situation".

POTENTIAL

As we begin to define an object through its potential, we must clarify what is meant by potential. If a thing is always changing, in process, then potential refers to the infinite possibility of outcomes of how that thing changes, what that thing becomes, in each moment. We can develop a feeling for the potential in a dynamic process in order to act more effectively. Massumi calls this intuition and says that it is a real interplay of activities. We insert ourselves into this dynamic process and our insertion is returned to us in varied form and the cycle goes on (Sensing the Virtual 1). We could also call this an openness to change, motion and difference. A body's connection to its own abstractness, where

abstract means presence in flux and movement rather than in one fixed position (Massumi, Parables 5).

POTENTIAL VS. POSSIBILITY

Another important distinction in terms to clarify is the difference between "potential" and "possibility". Massumi tells us that possibility refers to a range of normative variation that can be expected from a thing. Variation outside of this range can be said to be extreme, changing the very nature of a thing and possibly rendering it a new thing altogether. Potential refers to an infinite range of as yet unknown variations to a thing, which are nonetheless real, even when not actualised. The arrow in flight towards the bull's eye is full of potential. The arrow-resting-on-bulls eye is one possibility, as a known possible outcome (Massumi, Parables 9).

Potential and possibility exist concurrently in each moment and each feeds into and affects the other as a body unfolds in process. Nathaniel Stern states in *Interactive Art and Embodiment* that the interplay between potential and possibility is continuous and points to the "always-ongoing formation" of matter (13). Andrew Murphie, in his essay "Affect - A Basic Summary of Approaches", tells us that potential, often referred to as *the virtual*, or "the autonomy of relation", encompasses all of the potential changes a body might undergo in a given relation to another body. Possibility, or *the actual,* on the other hand is a "functional limitation", a known possible outcome based on what we know about repeatable encounters between bodies (web). Eleni Ikoniadou states that potential is pure process "that does not refer to, represent, or resemble anything outside itself" (30);

changing materiality in relation to other changing materiality, where possibility can be measured, predicted and quantified.

THE UNKNOWN AS POTENTIAL

Potential is elusive, we cannot know all possibilities all of the time. At the same time, if we stick to known possibilities, nothing new can ever happen or be known and the universe would stop. All things would be caught in a loop of known actions producing known results. We tend to be afraid of the unknown and want to predict the outcomes of all things, to feel safe, death as the ultimate example. A materialist view sees excitement and adventure in the unknown.

Many of our economic, social and political prediction systems betray our fascination and fear of the future, the unknown. We generally think we can predict anything that does not yet exist, in other words, we subject the future to the realm of possibility. According to Gilles Deleuze and his reading of Nietzsche futurity cannot be predicted but is equal to change (Ikoniadou 18). Deleuze said that by yielding to the unknown, the potentiality of the ongoing process of becoming, we access creativity. As Baruch Spinoza said, "we do not know what a body can do." The potential of a body is unknown. We only know what has already come to pass (Massumi, Sensing the Virtual 11-12). The unknown can also refer to what lies outside of our perception. Our usual modes of perception and perhaps our species' current capacity to perceive our environment allows access to only portions of experience (Ikoniadou 10).

We cannot know everything but we must develop tactics to allow for new ideas, however strange they may initially seem. As Bennett puts it, "if we think we already know what is out there, we will almost surely miss much of it" (xv). The development of certain systems is governed by an emergent causality, contingent on the assemblage of bodies and forces, unknowable in the unpredictable encounter of the event (Bennett 112). Massumi theorises that although we can plan interactions, relations of bodies, there will always be anomalies, surprises, accidents. We train ourselves to perceive things in a certain way and we can miss these accidents. They surface to our perception, we don't know what to make of them and they become a passing feeling (Sensing 13-14). If we understand matter is vibrant, we understand that certain things are beyond our total control.

DISRUPTION OF THE HABITUAL

If the formation of a body is a continuous process, disrupting our perception of that process can draw attention to that very process, our virtuality, our potential to vary, our capacity to act and catalyse change (Stern 13). It can be useful to disrupt our habitual modes of perceiving or our known paths of possibility from cause to effect, subject to object, act to responsibility. We can stage situations that propel us into the unknown to open us to immanent potential of every encounter and every moment.

Paul Jasen cites the Op(tical) Art of artists such as Bridget Riley, Victor Vasarely, and Mon Levinsonis as good examples of the effective use of the unknown in cultural production, working to confuse the eye so that the experience becomes more about not-knowing what one is looking at than rendering forms pleasing to the eye. It is less about what is on the canvas and more about what Jasen states as "charg[ing] a field", soliciting a

state of confusion in the viewer, interrupting the viewer's habitual mode of seeing, perceiving, thus questioning that mode of habitual perception (Jasen 23).

Nathaniel Stern touches on the potential of interactive media to disrupt habitual modes of perception:

> Interactive installations [create] situations that enhance, disrupt, and alter experience and action in ways that call attention to our varied relationships with and as both structure and matter. I suggest that new media has the ability to intervene in, and challenge, not only the construction of bodies and identities, but also the ongoing and emergent processes of embodiment, as they happen. (4)

Sound art accesses the virtual dimension by disrupting our habitual way of perceiving sound in service of communication. We tend to divide sounds into camps of important information on the one side and noise or unwanted sounds on the other. Sound art subverts this by drawing attention to physical sensation and the act of perceiving sound (Cox, Sound Art 22). According to Christoph Cox, sound exemplifies a flux ontology of things. Such an ontology is itself a disruption to our common modes of understanding the world (Sonic Philosophy).

A sonic artwork, then, may stage such a contingent encounter between a sound-body and a human-body, drawing attention to as-yet-unknown potential in that encounter. The sound-body may possess the capacity to incite some kind of movement or change in other

bodies and other bodies may possess the capacity to alter the movement of the sound-body. The movement and action of the bodies come to the fore, drawing focus to the emergent potential of the encounter. In this scene, it is not a picture of a perceiving subject hearing a sound-object, but rather two or more bodies forming in relation to the other in action, as verbs. This not only challenges the dominant ontological status of a physical object, but also opens many questions about the ontological status of the human body.

The next chapter will unpack these ideas further through an extension of this new materialism posed by Jane Bennett in her book *Vibrant Matter*. Bennett proposes that by decentralising human experience and raising the status of all matter by assigning to it a certain vitality, humans may be able to develop more ecological practices.

VIBRANT MATTER

Chapter Three

Vibrant Matter by Jane Bennett is in itself a disruption to our habitual modes of understanding the world. Bennett takes the established opposing ideas of life and matter, turns them over and over, stretches them as far as they will go, until the words start to lose their meaning, their boundaries become porous, and a new theory of materiality starts to emerge (vii). Bennett theorises an ontology of events "as encounters between ontologically diverse actants, some human, some not, though all thoroughly material" (xiii-xiv), which challenges the established and dominant ideas of how the world functions.

Through an exploration of the possibility that all matter is vibrant, Bennett asks whether such an understanding of material agency could change our political responses to public problems. For Bennett, vibrancy, or vitality (Bennett uses the terms interchangeably), refers to the capacity of matter to act or catalyse change, without intervention from external human force. This is not to imply that the capacity of non-human matter to act is somehow purposive. Unlike conscious purposive human agency, agency at a material level is neutral, growing from contingent relation to other material bodies.

As a political scientist, Bennett's end game is socio-political in nature, looking at how we might change the way we deal with waste and resource management, consumption and publics through an exploration of material vibrancy and affect. Bennett's position is that in order to better understand our own agency, we need to develop ways of perceiving the agency of non-human things. The dominant way of seeing the world is divided into active human subjects and passive non-human objects. Acknowledging that such a reduced view may be essential to everyday survival, Bennett claims that in its extreme, it is actually a fiction and not sufficient for attaining balanced ecological world (xiv).

Bennett's position supports an ontological standpoint of all matter being vibrant and possessing agency. This position stretches accepted notions of agency, action and freedom, sometimes to a breaking point and attempts to break down a common binary view towards matter to open us to the possibility of alternative ways of engaging with the material world. In *Vibrant Matter*, Bennett begins forming a style of political analysis to account for the agency of non-human actants (x). The following subsections deal with and contextualise for this thesis the aspects of Bennett's theory of Vibrant Matter.

THE HUMAN / NON-HUMAN DIVIDE

Bennett claims that we tend to split things in the universe into distinct categories of vibrant life, humans, and dumb inert matter in what Rancière called the "partition of the sensible" (Bennett vii). Bennett believes that we do ourselves a great disservice by ignoring the potential agency of non-human things. In order to begin to theorise a broader material agency, Bennett develops strategies for focusing on the effectivity of non-human things. This is not to ignore or undermine human agency but rather to swing the pendulum wide in the opposite direction to see what might be discovered in that exploration (ix).

The call for narrowing the ontological divide between human and non-human things can be found throughout materialist discourse, for example in "Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter" by Karen Barad. Barad advocates the examination of practices that stabilise and destabilise the radical differentiation between human and non-human (808). Eleni Ikoniadou, in *The Rhythmic Event: Art, Media, and the Sonic*, says that in order to move forward, to access the virtual, the unknown, we must allow for "the intersection of heterogeneous elements, both

living and non-living, with no distinction between its natural and artificial layers" (31). In other words, we must stop hierarchising the nature of bodies.

Bennett calls on another disruptive tool to alter perspective, namely, time. We tend to understand time in relation to our own lifespan, what Bennett calls biographical time, which is of extremely short duration relative to evolutionary time. If one could 'zoom out' to observe evolutionary time, one could observe the evolution of minerals into bones. Manuel De Landa notes that up until five hundred million years ago, there was only "soft tissue (gels and aerosols, muscle and nerve)", at which point a "mineralisation" occurred and its product was bone. With the addition of bones, life forms began developing that could walk, fly and swim (26). Bennett suggests that from the perspective of evolutionary time, mineral matter could be seen as a "mover and shaker" with humans as *its* "product" (11). Not only does this point to the capacity of non-human matter to act without the insertion of human agency but also illuminates how strategies may be developed to shift our understanding of non-human material agency in relation to human agency.

Bennett also uses worms as an example of non-human agentic beings whose actions, though not purposive in any way, help to create the conditions for the possibility of human agency. Worms create vegetable mould, which among other things makes the world hospitable to humans. According to Bennett, in this case, "a certain nonhuman agency is the condition of possibility of human agency" (98).

Placing the human and the non-human on opposite sides of an imaginary fence is a symptom of a broader tendency to pit forces opposite each other, to make the world black and white. Culture opposes nature, signs oppose the world, human opposes non-human. In

Christoph Cox's contribution, a materialist view can understand symbolic life as one layer of material process (Beyond Representation 148). Bennett suggests that perhaps "the distinction between life and matter, or organic and inorganic, or human and non-human … is not always the most important or salient difference to recognise" (62-63). If we accept Nietzsche's claim that "there is no 'being' behind doing" and that "the deed is everything" (481) then the potential and process of material formation and action crosses the human/non-human divide. If being is a doing and all things exist and therefore do, then all things, human and nonhuman alike, act (Siegworth and Gregg 6).

DECENTRALISING HUMAN EXPERIENCE

To begin to raise the status of inorganic matter, to propose how non-human matter might possess the capacity to act without human intervention, we must decentralise human experience in our discussions of what makes up the world in the social sciences. A materialist view sees the human subject as non-central to *being* in general, but rather as part of an ongoing flux, process, production and destruction of the world common to all matter. All things, humans and non-humans alike, are "temporal form: formless and passing" (Voegelin).

In order to decentralise human experience, Bennett states that we must begin to view matter on a more horizontal, less hierarchical plane. We must raise the status of inorganic matter and understand humans as a particularly complex amalgam of organic and inorganic matter. Describing human agency as a kind of material agency is not to say that there is no difference between humans and their bones, but that we might benefit more from finding ways of describing that difference that do not place humans at the centre or

apex of existence but rather, as Bennett suggests through Jean Francois Lyotard "as a *particularly rich and complex* collection of materials" (Bennett 11). Students of the Greek philosopher Epicurus believed that all matter is composed of different materials of different densities, shapes and substances. The difference between organic and non-organic, then, is a matter of degree rather than kind (Bennett 68). By raising the status of matter in the social sciences, we raise raise our own status with it (Bennett 12).

Brandon LaBelle describes how audio works by artist Toshiya Tsunoda from his CD release *Solid Vibration* (1999) highlight the activity of non-human matter beyond our normal modes of perception. Employing experimental recording techniques in the industrial yards of a Yokohama port in Japan:

> Tsunoda seeks to record the environment of the port by focusing exclusively on vibrations, revealing direct relations between an object in one part of the bay and another at a distance, where the one produces a set of sound frequencies while the other resonates in response, marking the environment as an elaborate, corresponding field of relations. By tuning into the vibratory linkages surrounding a given environment, the artist gives us not only an entry point into a sonic underworld, but a spatial theory that may supplement notions of event-architecture. According to vibratory phenomena, buildings and environments are tuned and detuned by the material interactions, energetic frictions, mechanics and general movements of immediate surroundings that at times far exceed our expectations. And which radically disrupts any worldview that places the human subject at the centre. By recognising the eventness of

> the built environment as a set of energetic, metabolistic phenomena, our sense of place is immediately not our own, nor defined solely by what we do. Rather, material culture and the life of objects act as forces dynamically effecting and shaping the world around us. (Acoustic Spatiality 4)

Tsunoda's work demonstrates the existence of a universe of vibration which interconnects seemingly unaffected things in an environment by tuning into material interactions. We may impose ourselves and find ways of amplifying or tapping into these events, though they nonetheless occur, whether or not we are able to perceive them. Bennett states that the aim of decentralising human experience is not to deny the tremendous capacity of humans to act and build and destroy structures of all kinds, but to view humans as another vital materiality among many, itself composed of vital materials (10).

In a contemporary hypercapitalist society we have established the view that humans are at the top of the value chain, all other matter at our disposal, existing for us, to be consumed and discarded. Viewing matter as vital and having a respondent vitality, however, changes the meaning of "throwing something away". As Bennett states, there is no "away" in actuality, there is only "somewhere else". That discarded vital materiality continues on its own path, even when it is somewhere else (6). For example, all the things we consume and discard do not cease to exist when we discard them. Once left on a landfill, the chemical process of unforeseen combinations of decomposing matter interact with gravity, wind, insects, etc., and can have any number of effects on the environment and local communities.

While the employment of human/non-human, subject/object structure may be necessary at times for our day to day survival, Bennett states that it can also, in its extreme, lead to the abuse of nature, which can have a detrimental effect on us in the long run (Bennett 12). Thinking of all matter as lively, however, reduces the separation between opaque non-porous subject and object and emphasises a shared materiality where movement, change and relation are more significant than outward boundaries (Bennett 13). Humans are particularly powerful participants in this shared materiality and reading the differences between humans and things more horizontally, as a relationship rather than a hierarchy, can in Bennett's view lead to a more ecological sensibility (10). Bennett describes such an ecological sensibility:

> The ethical aim becomes to distribute value more generously, to bodies as such. Such a newfound attentiveness to matter and its powers will not solve the problem of human exploitation or oppression, but it can inspire a greater sense of the extent to which all bodies are kin in the sense of inextricably enmeshed in a dense network of relations. And in a knotted world of vibrant matter, to harm one section of the web may very well be to harm oneself (13).

Bennett asks us to acknowledge that humans and non-humans belong to one material flux, a web of interconnected material agency. This may not solve all of the world's problems but it may help us to understand how our own actions live on once the affects thereof are out of our sight.

ACTANTS

Towards building a definition of non-human material agency, Bennett explores the term *actant*. "An actant is a source of action that can be either human or nonhuman; it is that which has efficacy, can do things, has sufficient coherence to make a difference, produce effects, alter the course of events" (Bennett viii). Taken from Bruno Latour and similar to Deleuze's "quasi-causal operator", an actant is something that acts by intervening. It is neither subject nor object and need not be human. An intervention can take place through an actant being in the right place at the right time with other materials to catalyse an event (Bennett 9).

Bennett's view on the actant is that an actant does not act alone out of will or purpose, but rather as a deciding variable in a group of materials that pushes an event into occurrence (21). It can be a very small thing, movement or act, but can cause big things to happen (Bennett 94). In other words, the agency of an actant can emerge in ongoing relation to other actants, human or non-human. Bennett names these groupings of actants *assemblages*.

ASSEMBLAGES

For Bennett, an assemblage is an agentic group of bodies, both human and non-human, in a specific relationship so as to have altered capacity to affect change (xvii). Bennett gives the example of the very writing of her book *Vibrant Matter* as an assemblage of various macro and micro actants including "memories, intentions, contentions, intestinal bacteria, eyeglasses, and blood sugar, as well as […] the plastic computer keyboard, the

bird song from the open window" and calls them "an animal-vegetable-mineral-sonority cluster with a particular degree and duration of power" (23).

Matter can be seen as creative in its tendency to form heterogeneous groupings, without exertion of external human force. Bennett quotes Manuel De Landa in stating:

> Even the humblest forms of matter and energy have the potential for self-organisation beyond the relatively simple type involved in the creation of crystals. There are, for instance, those coherent waves called solitons which form in many different types of materials, ranging from ocean waters (where they are called tsunamis) to lasers. Then there are . . . stable states (or attractors), which can sustain coherent cyclic activity. . .. Finally, and unlike the previous examples of nonlinear self-organisation where true innovation cannot occur, there [are] . . . the different combinations into which entities derived from the previous processes (crystals, coherent pulses, cyclic patterns) may enter. When put together, these forms of spontaneous structural generation suggest that inorganic matter is much more variable and creative than we ever imagined. And this insight into matter's inherent creativity needs to be fully incorporated into our new materialist philosophies (*7*).

The autonomous grouping of heterogeneous materials does not imply a totalistic harmony or equilibrium. Bennett states that the movements and potential of each individual are slightly off from the whole and so "an assemblage is never a stolid block but an open-ended collective, a non-totalisable sum" (*24*). The capacity of the whole is

manifested and modulated by the parts that constitute it (Bennett 34). The nature of an assemblage is processual and dynamic. Individual members change over time and the membership of the whole may also change. With that the relationships between individual members and between the assemblage and other bodies and assemblages can also change (Bennett 35).

Bennett states that one part of an assemblage can at times be so well placed that it has particularly strong power to alter the assemblage as a whole and refers to Deleuze and Guattari, who call this an "operator". An operator can also be what Bennett refers to as an "assemblage converter". An assemblage converter enters an assemblage without necessarily directly substantially changing the nature or function of the assemblage but changing it over time by upsetting a relative balance state arrived at previously. Through chain reaction the change can be tremendous (Bennett 42).

Bennett refers to author Henry David Thoreau, who saw eating as the creation of an assemblage, working to make his body "better able to sense the force of things" (37). Bennett suggests that the act of eating can be seen as a collective act of an assemblage of human and non-human materials. Once eaten, food co-acts "with the metabolic agencies of intestines, pancreas, kidneys, with cultural practices of physical exercise, and so on, food can generate new human tissue." Bennett cites studies showing that different types of fats can have positive or negative effects on a person's capacity to learn or be effective in professional or personal relationships. The human body and the food body undergo change through the interaction, each responding to the other. From this perspective, the human body and the food body act together to alter the whole and its capacity to act in an effective manner (40-49).

Important here is Bennett's notion that events occur as the result of myriad forces, not necessarily out of conscious purposive action on the part of a human actor. This is an important step towards imagining the vibrancy of non-humans as emergent from contingent encounters between human and non-human bodies and between assemblages of both.

BODIES

If assemblages are dynamic groupings of bodies, then we must clarify what is meant by the term body. A body in this case is not defined by its surface boundaries or its physicality (Seigworth and Gregg 2). It is not defined by its form or generic characteristics but, as Marie Thompson and Ian Biddle state in *Sound Music Affect: Theorizing Sonic Experience,* by its capacity to affect and to be affected. It can be a human body or any other kind of body, such as a dog-body or a chair-body. Affective powers are relational, as described above within assemblages, contingent in encounters with other bodies, and so a body's affective powers can never really be fully known. If doing is being, and we can never fully know what a body can do, we can then never know fully what it is to be a body (Thompson and Biddle 9). Nathaniel Stern in *Interactive Art and Embodiment: The Implicit Body as Performance* agrees that the body is defined by its capacity to affect and to be affected, that this capacity can only be fully realised in relation to other bodies, and so bodies are always changing, never fully formed but continuously and actively forming (2).

We can think of bodies as we know them as "aesthetic forms", which to Eleni Ikoniadou are not static but rather "assemblages of tension, accumulating continually without reaching an end or resolution" (15). Drawing from philosopher of art Susanne

Langer, Ikoniadou surmises that without end or resolution there can be no concrete divisions between two bodies or two events, but rather a pulsing resonance, a building and diminishing of potential.

Melissa Gregg and Gregory J. Seigworth, in *The Affect Theory Reader*, maintain that this kind of recasting of the body as relational and manifold is essential "toward a body's becoming an ever more worldly sensitive interface, toward a style of being present to the struggles of our time" (12). Seigworth and Gregg sum up this sentiment with a quote from Bruno Latour: "If the opposite of being a body is dead [and] there is no life apart from the body... [then] to have a body is to learn to be affected" (11). To attune one's body to the forces at play around us is to be more alive.

Through a heightened understanding of material bodies as non-static and continuously forming in relation to other bodies, we strengthen the case for the agency of assemblages of human and non-human bodies. This notion of bodies allows for the narrowing of the gap between humans and non-humans by joining both under a common name 'body' and an ontology of flux.

BECOMING

If a body is never fully formed, never fully knowable, how then do we discuss the relationality and contingency that defines bodies? A useful term here is "becoming". Becoming is a word for the constant process of change, the doing of being. In *Parables for the Virtual*, Brian Massumi states that a body is never present only in one position, but rather exists always in relation to its own indeterminacy, its potential to be otherwise than

it already is, in passing, in transition. A body in position is a form of possibility, one possible bodily formation. Alongside that the body exists simultaneously in another mode as the body's potential to vary.

In the article *Sensing the Virtual, Building The Insensible*, Massumi proposes topology as a framework to reconcile the formed body with the becoming body. The topological turn, Massumi notes, is a way of understanding bodies that allows them to change form (4). In topology, some types of difference are less important than others. Applied to geometric shapes, a circle can be the same as a square or triangle, topologically, because the transformation from one to the other can be undergone in a continuous motion, without breaking. A circle may become a figure-8 continuously but in order to become a circle again, the intersection at the middle must be broken (Bruner). Seen topologically, the distinction between a body-as-formed-thing and body-as-thing-in-process are not opposites, but modes of the very same thing.

Cox points out that Nietzsche believed all matter exists as a continuous transformative flux and all recognisable forms are a temporary. Every formed thing is born of and dies back into the material flux that both precedes and exceeds its own existence (Beyond Representation 151-152). Integrating this movement or change into the definition of a body throws the ontology of thing as static object into question (Massumi, Parables 5). A body then is not static, but in a constant state of becoming, forming in relation to other bodies in contingent encounter.

THE VIRTUAL BODY

A body's capacity is constantly changing through interactions, not only through what actually happens but also through what doesn't happen, which affects the body's capacity to contribute to and respond to what will happen in the future (Murphie). Alongside the corporeal body exists what Massumi calls the virtual body, a simultaneous unfolding of the corporeal body. The corporeal and virtual body are inseparable in the same way that energy and matter are inseparable (Parables 5). Neither can exist without the other and according to Nathaniel Stern, we learn about our physical body through the interaction of the virtual body with our environment (12).

Ikoniadou states that the present moment is never singular, but implies a duration which encompasses the past, memory, experience, sensation, momentum, and the immediate future, movement (8). If a body carries with it memories, habits, tendencies and capacities, which can never all be acted out in the actual at any given moment, where do the non-acted ones go? They stay with us as the virtual body, to resurface later (Murphie).

Bennett interprets the virtual body as a kind of quivering or non purposive suspense, another modality of the body that exists simultaneously with the corporeal. Bennett quotes Baruch Spinoza stating that the virtual body exists as "a set of speeds and slownesses between unformed particles [with] . . . the individuality of a day, a season, a year, a life" (55-56). For Massumi, this "set of speeds and slownesses between unformed particles" is equal to the shifting capacity of the virtual body in relation to the actual, and Massumi calls this *intensity*.

Bennett states that Deleuze and Guatarri believed in the existence of the virtual body as a "vibratory vitality [that] precedes, or subsists within, or is simply otherwise than, formed bodies… Bodies without organs" (55-56). Deleuze and Guatarri thought of this as a kind of pure productivity which exists everywhere but is masked by the view of matter as dumb and inert. Under a vibrant materialist definition of a body, however, the varying intensity, the potential to vary in the form a virtual dimension, is not a privilege of human bodies, but is present in all bodies.

THE AUTONOMY OF SENSATION AND SOUND

As humans we have long been busying ourselves with understanding every detail of what we can perceive, to explain all of existence. How then do we begin to grapple with elements of reality that lie outside of our perception or conscious knowing? This is what Massumi calls the *remainder*. Massumi states that of any sensation, there is always some portion that is not captured, or affirmed, by a body. This remainder is inseparable from the stable position of the body and its experience but at the same time holds a semblance of independence. Without this remainder, there is no potential. Without potential, there is no movement and no change - the universe would come to a stop and die (Thompson and Biddle 10). Will Schrimshaw takes a queue from Deleuze and Guattari: "Sensations, percepts and affects are beings whose validity lies in themselves and exceeds any lived" (qtd. in Schrimshaw 32). This excess, this semblance of independence, grants affects a certain independence and autonomy.

The notion of an autonomy of sensations has implications to our understanding of matter as vibrant independent of human intervention. This notion also speaks directly to

the link between sound and vibrant matter. Ikoniadou understands the sonic artwork "as an assemblage of sensations that outlive the space, time, and bodies that make up and experience it" (5). Here, sensation is understood in the Deleuzean manner, as "an immediate visceral feeling that is unsusceptible to representation, enlarging perception of the event without belonging to a perceiving subject" (91). Applying these ideas to the sonic, Ikoniadou is looking for a way to account for the "unintentional, unnameable, and unknowable forces along the periphery of sound" (5). The sonic extends far beyond that which we readily perceive with the ears as a web of unseen forces and sensations.

The sonic artwork is by nature an event: it spans a period of time. Ikoniadou focuses specifically on the rhythmic rather than chronological unfolding of time as event in the sonic artwork. The experience is then more one of sensation and affective force than an unfolding of events on a chronological timeline. An inherent contingency in any event as an encounter of bodies and forces both seen and unseen, perceived and in excess of perception, leads us to an unknowable remainder, which we can call potential (5).

Recognition of the existence of aspects of reality in excess of that which is registered by a body is a critical step towards the development of a new sonic ontology. If the recognisable objects of human perception alone can no longer sufficiently account for sonic experience, then we must supplement this by attempting to theorise this paradoxically unknowable remainder. Massumi's remainder points towards an element of sound that escapes knowable perception. This element that is thus independent of both source and listening subject, although unheard - silent - exists nonetheless as a sound (Schrimshaw, Non-Cochlear Sound 32-33).

AFFECT

Certain strands of modern affect theory championed by Gilles Deleuze, Felix Guattari and Brian Massumi are key to this argument in that they deal directly with the becoming of bodies and the changing capacities of bodies to act. For Massumi, affect is "a pre-personal intensity corresponding to the passage from one experiential state of the body to another and implying an augmentation or diminution in that body's capacity to act" (Massumi in Deleuze and Guatarri 2004: xvii, qtd. in Thompson and Biddle 8). Distilled into other words by Andrew Murphie, "affects make up the relations within the temporary worlds we are constantly creating, and by which we are constantly being created. Affect involves the moment to moment question of being in the world, in all its constant change" (np).

This theory of affects attempts to theorise what happens to, among and in-between bodies in contingent encounter and how this contributes to the ongoing becoming of bodies. It paints a part of the picture of potential, virtuality and agency. Seigworth and Gregg ask, "[h]ow does a body, marked in its duration by these various encounters with mixed forces, come to shift its affections (its being-affected) into action (capacity to affect)?" (2). In a world of vibrant matter, all bodies are modes of a common materiality and have the capacity to act in relation to other bodies (Bennett 21) and affect helps to break down the subject/object paradigm along with many assumptions about the material make up of the world (Ikoniadou 3).

According to David Cole, "affects entail the colliding of particle-forces delineating the impact of one body on another; this could also be explained as the capacity to feel force

before [or without] subjective emotion" (qtd. in Bennett xiii). These forces or intensities pass from one body to another, affecting the ongoing becoming of each body. The next section will shift focus from the bodies themselves to the passage of intensities between bodies.

IN-BETWEEN-NESS

A body in motion is full of potential. A body standing still, as still as is possible for a body to stand, is less open to contingent encounter. However, between activity and passivity, movement and stasis, cause and effect, exists a third state, which Massumi calls *the excluded middle* (Thompson and Biddle 6). Another name for this is the *in-between*. Seigworth and Gregg state that a body's capacity to affect and to be affected "is found in those intensities that pass body to body (human, non-human, part-body, and otherwise), in those resonances that circulate about, between, and sometimes stick to bodies and worlds, and in the very passages or variations between these intensities and resonances themselves" (1).

This in-between-ness is open ended, propelling a body in constant movement and change. In this way a body is composed as much through the relative forces of encounter as its perceivable surface boundaries. "A body is as much outside itself as in itself - webbed in its relations - until ultimately such firm distinctions cease to matter" (Seigworth and Gregg 2-3). The idea of in-between-ness further illustrates the notion of a body as non-static, continuously forming and more-than-corporeal.

AGENCY

From our human perspective, we tend to acknowledge only actions we can perceive with our habitual modes and which generate immediately noticeable outcomes. Affect theory however, following from Spinoza through to Deleuze to Massumi takes the stance that all things, all bodies, human and non-human alike, are continuously affecting and being affected by other bodies. These capacities are inseparable (Bennett 21). Herein lies for Bennett the capacity of all things to act, in whatever small way: "[b]y virtue of its particular location in an assemblage and the fortuity of being in the right place at the right time, [a particular thing] makes the difference, makes things happen, becomes the decisive force catalysing an event" (9). All outcomes, all actual occurrences, are the product of a distributive agency. Distributive agency can be thought of as a swarm of strivings from multiple sources, all with continuous and shifting capacities to affect and be affected, pulsing energies contributing to concretisations that can be named an outcome (Bennett 31-32).

This requires us to break down existing ideas of cause and effect, where one cause yields one outcome. Bennett addresses this by differentiating between a cause and an origin. A cause for Bennett is "a singular, stable, and masterful initiator of effects, while an origin is a complex, mobile, and heteronomous enjoiner of forces" (33). An outcome is the result of a crystallisation process of a variety of conjoining forces and all bodies carry the potential to set off or catalyse this process (34). Humans tend to underestimate the degree to which people, technology, nature, etc., share their position in the distributive nature of the unfolding of an event (Bennett 35) and it is in fact often difficult to know what the players are in producing a particular outcome. This difficulty might be in itself integral to

the concept of material agency (Bennett 36). Humans act together with other vibrant materials to affect other assemblages. One thing affects the next in an endless chain. Everything we do and say "matters" or carries agency.

MOVEMENT IS CHANGE

Though we tend to think of time, movement and space as divisible, made up of ever smaller units of measurable time, space or points on a path of movement from one position to another, Massumi states that these are in fact continuous (Parables 6). Massumi uses as the example of an arrow and its path towards a target. The measurable points along the path are in fact only measurable in retrospect, once the arrow has stopped moving, landed on its target. To measure points along its trajectory before it has landed is to stop the arrow in thought. When we try to segment the world and define our experience of it in advance of the arrow coming to rest, we are disrupting the world's "dynamic unity, the continuity of its movements" (Parables 6). Once the arrow has landed on its target, it will have changed qualitatively. It will now be a "successfully shot arrow". It is still an arrow, though changed by the passing event. This also applies to other bodies, human and nonhuman (Parables 7). In this way, fixed position can only be derived or deduced in retrospect, as a byproduct of the more defining movement and process. Change becomes the constant and position less tangible (Massumi, Parables 7).

Ikoniadou states that movement places bodies in varying relation to other bodies or elements within an assemblage and from there emerge perceivable aesthetic forms (31). If a body is never static or entirely fixed but rather continuously formed in relation to other bodies, we can say that a body is always in motion and always changing. A human body is

never actually still. In a physical sense, "the body is always in a state of intensive micro-movement" (A. Goodman, Walking 5). On another level there is a continuous pull towards and formation of the virtual. Immediately preceding physical movement, limitless potential is being created in a tension that is resolved into actuality as a physical movement and "each choice generates another equally complex series of choices". Each step is influenced to some degree by the previous step as well as the intention to take the next step (A. Goodman, Walking 5). In movement, bodies are in ever changing relation to their surroundings and other bodies. As these relations change, so does the body's potential to affect and to be affected.

THING-POWER

Bennett ties together material agency and capacities to affect change into the term *thing-power*. As a tactic for relating to the non-human world, Bennett adopts the term *thing* as an alternative to the term *object* and attributes to all things a thing-power. Intrinsic to the materiality of all things, thing-power affords all things a certain vibrancy, "a perhaps small but irreducible degree of independence from the words, images, and feelings they provoke in us" (Bennett xvi).

Bennett elaborates the difference between an object and a thing in stating that an object can be thought of as "the way things appear to a subject". Bennett quotes W.J.T. Mitchell to whom a thing:

> [signals] the moment when the object becomes the Other, when the sardine can looks back, when the mute idol speaks, when the subject

> experiences the object as uncanny and feels the need for what Foucault calls 'a metaphysics of the object, or, more exactly, a metaphysics of that never objectifiable depth from which objects rise up toward our superficial knowledge (2).

All bodies possess this thing power, to varying degrees, dependent on the complexity of the body's material composition. This power guides things towards movement and change, for in movement, encounter is made possible and through encounter, change. Without this propulsion, nature might never have brought anything into existence (Bennett 18). Before humans existed, the universe developed and changed and so it is not unthinkable that it will continue to develop and change without our intervention. According to Bennett, thing power can help us think about materiality and agency beyond the simple binary of life/matter, towards a more holistic and sustainable world view (20).

POLITICAL IMPLICATIONS OF VIBRANT MATTER

If we can begin to change the way we think about matter, allowing it a form of agency and independence, taking humanity out of the centre position of power, to recognise all matter as vibrant, as co-conspirators towards any potential outcome, we may be able to find ways to effectively and sustainably engage with things outside and inside our bodies (Bennett xix). Bennett suggests that "in a knotted world of vibrant matter, to harm one section of the web may very well be to harm oneself" (13). If we begin to sense a kind of commonality with non-humans, we might for instance start to implement more sustainable consumption and waste management practices (17-18). Bennett states that we must awaken from what Barbara Kingsolver describes as our:

> mass hallucinatory fantasy in which the megatons of waste we dump in our rivers and bays are not poisoning the water, the hydrocarbons we pump into the air are not changing the climate, overfishing is not depleting the oceans, fossil fuels will never run out, wars that kill masses of civilians are an appropriate way to keep our hands on what's left, we are not desperately overdrawn at the environmental bank, and, really, the kids are all right (qtd. in Bennett 50-51).

In other words, for Bennett, the dominant view of matter as dumb and inert leads us to ecological practices that are harmful in the long run to the environment and to ourselves. Affording agency to non-human things and recognising a distributive agency between humans and non-humans may lead us to more holistic practices.

The way we understand matter is an extension of the way we understand our own bodies. The dominant position on how we define our own bodies - personal, political, etc. - on a set of predetermined or known possibilities leaves no room for change. This limits the movements of bodies to switching between fixed positions on a grid of possible static points. Within this view, the body can never do something new, become something new or unknown (Massumi, Parables 3). Ikoniadou looks at the hypercapitalist system and our contemporary way of life that "promises but does not deliver novelty, innovation, and pre-emption, particularly to specific strands of society" (7). These ideas speak to how we view the world and our place in it. Applying these ideas to art allows us a way to discuss and interrogate the details (Kim-Cohen xxiv).

Attention to affect and material agency is not an answer to the problems of the world, but rather a tool to examine how things come to pass, so as to increase the potential to act in a way that is in line with one's goals (Thompson and Biddle 14). We have an important role to play in creating our realities and our societies (Ikoniadou 7). Individual choices become an assertion or a creation of a certain reality, piece by piece, thing by thing. That reality itself becomes a thing or an assemblage with its own pulsing agency, affecting other realities (Bennett 37-38). Incorporating these views into art making can help to question assumed beliefs and subsequently the trajectory of humankind. We may even find ways of posing suggestions towards alternative trajectories. In a claim made by the creators of a large scale public performance project in Johannesburg in 2012 titled *United African Utopias*, "reality is not more than an agreement between seven billion people". Thinking of bodies without static form requires a willingness to engage more fully in contingent encounters with other bodies and the unknown.

I have argued in chapter two that we must develop a language that allows change and fluidity of form and meaning. Our language of nouns and adjectives is built around assigning things, and people by extension, their place on a hierarchy. Subject and object are placed on this hierarchy based on imposed rules that only seem to consider one possible reality. We are ignoring the potential of every encounter and all possible realities that may unfold. Voegelin states that we must develop an ethics that "engages and respects equivalence at the same time as it is aware of a potentially unbreachable autonomy of each and every thing. [Such an] ethics is not about authority and ideology but about negotiation and process and how that can be achieved" (np). Shifting the language of subjects and objects may help to shift the dominant hierarchical view of matter, and eventually contribute to an ethics that allows more equivalence.

An ethics of distributive agency must deviate from what Bennett calls a politics of moralism. For Bennett, a moralist politics divides acts into camps of good and evil, necessitating a perpetrator to blame, and in the worst case, promotes scapegoating. An ethics of distributive agency, however, can promote a more holistic view on cause and effect, evil doer and evil deed, and promote the finding of solutions that address the many forces at play in any encounter (38). This can also help to shift the way we think about responsibility. Responsibility becomes more about finding a considered and beneficial way of responding to situations and problems and less about finding objects to blame for events we feel are out of our control (Bennett 101-102). Understanding our own agency as a real part of a collective and powerful agency equates to understanding our own responsibility as a real part of a collective and powerful responsibility. If a distributive view of agency allows all bodies to affect change, then humans possess a particularly high capacity to affect change, and with it a responsibility to consider the implications of their actions.

Bennett makes a point of emphasising that her vital materialism stays away from the idea of a soul. The ideas Bennett presents already require some stretching of the imagination, and to attribute a soul to ordinary objects would be taking it perhaps a step too far. Further to that, the soul brings with it a hierarchy of God-Man-Nature which "easily transitions into a political image of a hierarchy of social classes or even civilisations" (84). But if we can raise the status of matter and recognise in it a vitality that places all things on more even scale than we have been previously accustomed to, perhaps we can extend this view towards all humans as well.

Bennett's goal politically is not to consider humans and non-humans as equal but to open up more channels of communication between human and non-human members of an

organised group (102-104). Separating bodies on a hierarchical plane, putting them into camps of value or importance, the "partition of the sensible", points to a way of thinking or seeing the world that promotes partitioning. This extends toward people and publics, for example in cases where marginalised groups, based on race, minority status, economic status, sexual orientation, etc., are not deemed as worthy of a political voice (Bennett 105). The wealthy and educated, who in many parts of the world are able to be educated because they are wealthy, are able to create their realities in their own image and impose that reality on what they perceive to be a minority. Bennett states that a vital materialist politics seeks to blur this heavy line separating the camps of speaking (heard) subjects and mute (unheard) objects (108). To recognise non-human materialities as participants in a political ecology is not to say that all materialities are participating all the time. Different materialities and forces carry different types and degrees of power. If winds and sea currents can commonly make waves, a different combination of the very same forces can make a tsunami. The goal here is to find more ways of recognising the participation of more non-human materialities (Bennett 108). If a moralist politics requires a conscious human actor or group of actors to blame and punish, Bennett suggests that the heightened recognition of non-human materialities sharing in a distributive agency may lead us to more effectively finding solutions to problems that affect us all.

As we begin to recognise the agency of non-human matter, we begin also to reorient our experience of the world (Bennett 51). In the following chapters I will be applying the theories of New Materialism, affect and Vibrant Materialism explored in this thesis to sound and the sonic arts, as these provide ample and effective demonstrations. In chapter four I will argue that sound exemplifies the flux ontology discussed in chapter two as a temporary concretisation of matter. I will explore the implications of attributing a certain

agency to sound independent of the sound's source or potential listener, removing human experience from the focal point, examining the in-between-ness of sound. I will ask what we might learn about the potential of our bodies through a materialist view of sound. I will argue that to the extent that we recognise the agency of *sound*, we reorient our own experience of *listening*, but also our experience of our bodies. Sound is not always heard, but it is always felt, as both cochlear and non-cochlear sound affect the body physically and emotionally. Sound might just help us to reorient our sense of *being* through a heightened understanding of our bodies, our actions and our potential to affect and be affected. Through sound there lies the possibility for new perspectives on our role in creating the world in the image of a reality we want to live in.

SOUND

Chapter Four

PHILOSOPHY OF SOUND

Chapter Four A

Sound exemplifies the materialist view explored in chapter two and chapter three. It is at once invisible and felt, tangible but not graspable. In the form of music, it can evoke deep emotion, social cohesion, or set bodies to dancing (Thompson and Biddle 5). Rhythm and music can bind bodies in collective movement (physically and politically) and at the same time connect maker and listener in a feedback loop of affective force (Thompson and Biddle 10-11). Music is however only one example of the aesthetic employment of sound. In this chapter I will explore sound as the material of music and signal as the material of sound. Signal, it will be argued, can be equated with affective force, and is present everywhere, all the time.

Affect theory attempts to explore the elements of experience that are just beyond the limits of language and interpretation. A thorough understanding of sound seems to evade language and representation and so the two seem well suited to each other (Thompson and Biddle 10-11). Thompson and Biddle open a two-way discussion between affect and sound, equating them on certain levels through notions of "agency and non-agency, of the conscious, the pre-conscious and the post-conscious" (16). Sound and music by extension offer ways into thinking about affect, and affect offers ways into thinking about sound.

If, as affect theory claims, alongside what actually happens, exists in a virtual dimension what *does not* happen, and this remainder of potential informs and influences

what *will* happen, then in relation to sound, we must interrogate not only what we hear, but what we *do not* hear (Kim-Cohen xxi). Written theories explicitly connecting affect, materiality and sound have been written increasingly over the past decade, though in practice it is quite established. Sonic artworks over the past fifty years have sought to explore the materiality of sound, "its texture and temporal flow, its palpable effect on, and affection by the materials through and against which it is transmitted" (Cox, Beyond Representation 148-149). The trajectory of the materialist theories of Deleuze and Guattari into the affect theories of Massumi paved a way for theories of Sonic Materialism over the past fifteen or so years (Cox, Beyond Representation 148-149).

The rise of sonic studies over the past fifteen years, what Ikoniadou calls the "emerging audio culture", seeks to counter the fixation in western society on vision as the foremost means of "acquiring knowledge, experience, and truth about the world" (2). Turning away from a logic of representation and language, Ikoniadou states that artists and theorists are using sound to explore "more dynamic ways of accounting for bodies, movements, and events". In other words, sound provides new ways of dealing with the nature of bodies.

This chapter will examine the development of a sonic philosophy beginning in the 1940s by composers such as Edgard Varèse, Pierre Schaeffer and John Cage, who sought to free sound from its musical context, both in terms of composition and presentation within a concert environment to more contemporary composers such as Alvin Lucier and La Monte Young, who engaged directly with the material properties of sound in their works. The work of these composers paved the way for what theorists such as Christoph Cox, Salomé Voegelin and Eleni Ikoniadou call Sonic Materialism. The following chapter

section will elaborate on what is meant by Sonic Materialism before linking that to the philosophies of New- and Vibrant Materialisms.

SONIC MATERIALISM

I will be exploring sonic theories that move away from the interpretation of sound as the representation of something outside of itself, a secondary property of a body or event that might be deemed more significant than the sound itself, or as a tool towards the production and analysis of cultural meaning. Examining sound in the world of materialities and affect, the sonic materialist asks not what sound *means* but rather what sound *does*. By focusing on the doing, the questions shift towards the "circulation, modulation and perception of sound as affective vibrational force" (Thompson and Biddle 19). In a broad sense, Sonic Materialism looks to sound as a way of exploring social, political and ecological issues. I do not wish to skip over or ignore music, though in this context, music is understood as one possible manifestation of a combination of sounds.

Sound is everywhere and we cannot shut it out the way we can shut out images when we close our eyes. Will Schrimshaw states that our experience of the world is characterised by "an 'immersive' experience of sonority considered immanent when opposed to a strictly distal or 'detached' concept of vision" (28). Cox asks how our ideas about materiality might change if we pay more attention to sound, for "sound lends credence to a very different sort of ontology and materialism, a conception of being and matter that can account for object-hood better than an ontology of objects can account for sounds". Through a sonic materialist gaze, we might find new ways of understanding

objects, not always as fully tactile stable forms, but also "energetic fluxes" (Cox, Sonic Philosophy).

Sonic Materialism is a kind of temporal materialism. Voegelin states that using sound as a blueprint of the materiality of things:

> acknowledges the substance of objects as temporal processes, autonomous from human intervention and perception, but which become real for the subject through his/her temporal process of being substance simultaneously with other substances.

This does not deny the responsibility of the acting subject, but does diminish its privilege as the centre of importance. As Cox states in *Sonic Philosophy*:

> Beginning from a fascination with sound, [the sonic materialist follows sound] where it leads, encountering a strange world in which bodies are dissolved into flows, objects are the residues of events, and effects are unmoored from their causes to float independently as virtual powers and capacities.

Sonic Materialism then is about the materiality of the natural world as much as it is about the materiality of sound itself. Sound becomes not a representation of something outside of itself but an example of a material ontology of flux. The next sections trace a trajectory of sonic theories through the contributions of composers Edgard Varèse, Pierre Schaeffer and John Cage towards the liberation of sonic discourse from the world of music. These

theories allowed sound a certain autonomy, which enabled the development of a discourse of sonic ontology that eventually gave rise to Sonic Materialism.

ORGANISED SOUND

Sonic discourse has grown out of musical discourse and the two are very much linked. For the sonic materialist, sound is thought to be "the affective matter of which music is composed or a compound" (Schrimshaw 31). Composer Edgard Varèse was a seminal figure in the emancipation of sound from the world of music. Adopting the term *organised sound* as a way to break free of musical conventions, Varèse imagined a music of the future in which sound could be composed as shapes and planes to be moved around in physical space. Varèse famously stated in a lecture at Mary Austin House, Santa Fe in 1936:

> When new instruments will allow me to write music as I conceive it, the movement of sound-masses, of shifting planes, will be clearly perceived in my work, taking the place of the linear counterpoint. When these sound-masses collide, the phenomena of penetration or repulsion will seem to occur. Certain transmutations taking place on certain planes will seem to be projected onto other planes, moving at different speeds and at different angles. There will no longer be the old conception of melody or interplay of melodies. The entire work will be a melodic totality. The entire work will flow as a river flows (qtd. in Cox, Abstract Concrete).

While this marked a big step in thinking towards sonic materialist concerns, Varèse intended his organised sound compositions to be performed and experienced within a musical context such as a concert hall (Landy).

SCHAEFFER AND THE SONOROUS OBJECT

Pierre Schaeffer, in his time as administrator of the *Radiodiffusion-Télévision Française (RTF)* in the 1930s and 1940s developed his philosophies of *acousmatic listening*, *sonorous objects* and *musique concrète* (Schaeffer ix). His work was extremely influential and remains important today. The sonorous object was by nature separate from its source (as it was recorded). In Schaeffer's hands, sound was freed of its role as a signifier, it became independent. It became a building block, a substance to be analysed and admired for its own characteristics. It could be stretched, moulded, combined with other sonorous objects into new forms.

Technology played a large role in the developments of Schaeffer's theories. At the studios of the RTF Schaeffer had access to the still fairly new sound recording and playback equipment invented by Thomas Edison, namely the gramophone. In working to develop the technology to record sound, Edison's aim was to record the human voice, but along with it he was also recording everything else in its vicinity: the reverberations in the room, mechanical movements of the recording device itself and movements of other bodies (Cox, Sound Art 22). What's more and perhaps even more importantly, the phonograph served to sever a sound from a specific time and place, allowing it a kind of floating existence, autonomous from any visual anchor in real time and space (Cox, Sound Art 23).

For Schaeffer, sound recording and playback using the phonograph allowed him a means to demonstrate his ontological view of sounds as particulars. Sounds, once captured, did not belong to their source, the thing that brought them into being. They were not qualities of objects or subjects, they could be treated as individual particulars, independent of objects and media. Schaeffer developed his theory of sonorous objects as a way to sever the sound from its role as a signifier of another thing. This is not to deny that sounds have sources in the natural world, commonly from durable physical objects. It is however possible to experience a sound without any experience of its source, pointing to an independence of sounds from their sources (Cox, Beyond Representation 156). Seth Kim-Cohen in *in The Blink of an Ear* states that, "strictly speaking, Schaeffer's method, his aesthetic, relies on a disarming or suspending of semiotic activity in the listening experience" (12). For Schaeffer, the sound signifier should signify only itself.

Schaeffer developed a new method for composing music with his sonorous objects, a music he called musique concrète, or concrete music. Here, any sound could be recorded onto phonograph discs or magnetic tape, manipulated in various ways and reassembled into new compositions. New sonorous objects could be produced by splicing tape, manipulating the playback speed of the medium and other techniques developed in the studio. Unlike Varèse, Schaeffer did not feel tied to performance and the concert hall. He felt that radio broadcasting and sound recording made a new experience of sound possible. Schaffer called this new way of experiencing sound "reduced listening" and later "acousmatic listening", referencing Pythagoras, who lectured his students from behind a veil, so they would not be distracted by any visual delivery of his words, but rather listen to his words alone (Cox, Abstract Concrete).

Schaeffer's methods would later be adopted by and developed through newer technologies by musicians who would call this "sampling", from Hip-Hop in the 1980s to electronic music in the 1990s (Cox, Abstract Concrete). Kim-Cohen notes the viewpoint of Drew Daniel of Matmos that one might say that all contemporary music is musique concrète because of the way music is recorded and constructed. Even in the most straight forward scenarios in music studios, a group of musicians typically records instruments separately, at different times. The recordings are then digitally aligned, edited and recombined to create the final recorded piece (11). This treatment of individual sounds, or sonic particulars, is rooted in Schaeffer's philosophies of the sonic object: recorded sounds become objects to be moved around in time, independent of their sources.

Sonic Materialism relies on the independence of sounds from their sources and Schaeffer's theories are instrumental in establishing that independence. With Schaeffer, a step is taken towards a definition of sound as body, as autonomous thing with a certain agency as defined by Bennett in *Vibrant Matter*.

THE AUTONOMY OF SOUNDS

Schaeffer took us far, but to properly account for a Sonic Materialism we must free sound from the necessity of its being heard. Where Schaeffer's main goal to was to free sound from its source and its role as signifier, here we must also allow sound its existence in excess of capture and affirmation by a listening subject (Schrimshaw 30). A sound does not need to be heard to exist and to affect bodies. In fact, the affect of a sound lies beyond the ear, independent of what can be heard (Schrimshaw, Non-Cochlear Sound).

Where Schaeffer's theories sought to make objects of sonic particulars, it was the work of composers like Alvin Lucier and John Cage that pushed these theories closer towards a Sonic Materialism. While Schaeffer was turning sounds themselves into objects of perception, the likes of Cage and Lucier were borrowing from science, applying the physical phenomena of sound towards aesthetic practices that would draw attention to sound as a physical entity in excess of perception, "neither reducible to nor dependent upon its being heard for its ontological status" (Schrimshaw, Non-Cochlear Sound). Schaeffer's sonorous objects relied on their being heard to be considered real, affective bodies. Cage and Lucier, as will be explored in the next section, freed sounds from their necessity of being heard, thus allowing sounds a new ontological status independent from both source and listener.

Towards strengthening the autonomy of sounds, Schrimshaw advocates the incorporation of the terms 'sound', audible material, and 'signal', inaudible affective force, into the term affect. This is largely to make use of the extensive work done towards the autonomy of affects by the likes of Deleuze, Massumi and others. In the case of affects, removing the necessity of affirmation by a feeling subject affords affect an ontologically different status to emotion. Transposing this approach onto sound, removing the necessity of symbolic content or affirmation by a listening subject allows a sound an ontological independence. The affective qualities of sound can be considered independent to affirmation through feeling and perception especially as sonic events beyond the ear, measured not in tonal quality but rather "degrees of movement, vibration or frequency in excess of audition" (Schrimshaw, Non-Cochlear Sound). Understanding sound in this way reduces the distinctions between sound and music, signal and noise. The distinction

becomes less polarised and more relative, as with subjects and objects, human and non-human (Cox, Sound Art 20).

SONIC FLUX

Another way to view sound as independent of human perception is through works of sonic art that exemplify the existence of sound not bound by the structure of musical compositions, but rather as a sonic flux, preceding and exceeding human contribution. Such works, once set up, are continuous. A listener may enter the vicinity of the work, allowing the sounds of the work to enter the listener's perceptual field, and the listener may walk away at any time. For the listener, the experience has a structure, a beginning and an ending. Even if the work may indeed be influenced by the listener's presence, the work still existed before and will persist, not bounded by or dependent on the listener's experience.

In the case of Alvin Lucier's *Music on a Long Thin Wire*, a wire is stretched across a large room and set to vibrating using a sine wave oscillator. The vibrations are in turn amplified and played back into the room:

> The installed nature of [the work] undoes any idea of fixed performative duration. The sound of the wire proceeds continuously, limited by the duration of its exhibition rather than by the timed attendance of a seated audience […] Fatigue, air currents, heating and cooling, even human proximity could cause the wire to undergo enormous changes (Rose 67).

Another example is La Monte Young and Marian Zazeela's *Dream House*, an ongoing sound and light installation occupying a floor of a building in New York City. Immersive and complex in its spatial composition, speakers throughout the space emit carefully chosen sine wave frequencies to create standing waves at different points in the space. The listener in a sense curates their own individual experience of the work by moving their body and shifting the angle of their head in relation to the space inhabited by the work and the listener (Cox, Sonic Philosophy). The work exists and persists before and after the presence of an audience, yet the experience of the work is unique to each individual.

'Music is continuous; only listening is intermittent', remarked John Cage. Cage saw sound as an anonymous flux of energy and matter, an endless flow of varying intensities. This sonic matter comprised components from any source, human or non-human, intentional or unintentional, moving "at different speeds and with different intensities, and involve complex relationships of simultaneity, interference, conflict, concord, and parallelism" (Cox, Beyond Representation 155).

In his composition for twelve transistor radios, *Imaginary Landscape #4*, Cage exemplified this sonic flux and our experience of it as intermittent in what Cox calls "a conception of sound as a continuous, anonymous flux to which human expressions contribute but which precedes and exceeds these expressions" (Sound Art 19). Performers of *Imaginary Landscape #4* are given notated instructions for how and when to manipulate the tuning, volume and tone knobs of each radio, but the sonic content is left to chance, as the broadcasts of all possible stations in a given area could never be predicted or controlled. This piece draws attention to the joining of human intention, unintentional sounds and the act of listening and how these play off of each other (Cox, Sound Art 23).

To illuminate this flux ontology, Cox draws attention to noise, which in his view is synonymous with the ceaseless backdrop of sound that makes up our environment. In our everyday, we are always hearing a stream of complex sound consisting of a mixture of traffic, the hum of electrical appliances and machines, wind, birds, etc. When we choose to focus our listening towards a specific sound, what we might consider a *useful* sound, we bring that sound to the fore, lifting it out of the bed of noise (Sound Art 20). In other words, noise becomes a kind of equilibrium state, "the condition of possibility for every significant sound, as that from which all speech, music and signal emerges and to which it returns" (Sound Art 22). For Cox, *noise* is another term for sonic flux: the flow of material forces that contract into recognisable forms.

The aesthetic organisation of sound, whether in the context of music or sonic art works, "makes audible the dynamic, differential, discordant flux of becoming that precedes and exceeds empirical individuals [presenting] a play of sonic forces and intensities" (Cox, Beyond Representation 153). Bennett takes this same idea and applies it to all matter, including humans. Although at drastically varying rates, all matter emerges from a base of material vitality. "This material vitality is me, it predates me, it exceeds me, it postdates me" (Bennett 120). In this way, a sonic ontology of flux becomes a model for a wider material ontology of flux out of which all bodies are formed.

THE VIRTUAL AND THE ACTUAL

In chapter two I refer to the notions of the virtual, the unfolding of infinite potential in contingent encounter, and the actual, a functional limitation of that potential, a repeatable outcome. Cox equates noise, the equilibrium state, with a virtual dimension of sound. The virtual is the potential, the condition of possibility for individual perceivable sounds to occur. The actual dimension of sound exists as contractions of the virtual continuum, perceived individual sounds such as speech or music (Cox, Sound Art 19). The virtual in a sense gives form to the actual but itself has no form. It is rather the unfolding of potential, the condition of possibility, and it necessarily fades from perception as clear forms emerge from it (Massumi, Sensing 12). For Cox, sound art chooses to focus on the formlessness of the virtual dimension, looking for a way to account for a sonic ontology through an expanded understanding of the conditions of sound preceding and exceeding human perception (Sound Art 25).

Sonic matter is always at play as actual and physical force, vibrating the air and the surface boundaries of bodies, as well as a virtual and affective force, moving us emotionally, hinting at potential future movements and past memories. Brandon LaBelle states that "sound is both concrete and real as well as virtual and affective. What I experience now is also already an echo of what I experienced before - my listening body still hears [performances I heard years ago] within the sound matter that currently surrounds me" (A Sonorous Body 101-103). Momentarily setting aside questions around human perception of individual sounds, we might begin to better understand the potential of sound through an ontology that includes the virtual dimension as much as the actual, much in the same way that Bennett momentarily sets aside questions of human agency in

order to begin to theorise non-human material agency. Including the virtual dimension of sound in sonic ontology allows us access to the flux ontology of bodies, the relationality of bodies never fully formed, and therewith the capacity of bodies to inject agency into the formation of other bodies.

THE AGENCY OF THE INVISIBLE

I have argued that the agency of any body lies in its capacities to affect and to be affected, and that these capacities are always relational. A body is always in flux, moving and changing as it comes into and out of assemblages. This relationality acts as an invisible force that passes between bodies and is independent from the bodies it passes between. Massumi likens affect, as a force that passes between bodies, to sonic resonance or a pattern of interference such as echo. The sonic event of an echo cannot happen without both a set of hard surfaces for sound waves to bounce from and the distance between these surfaces constituting an 'empty' space to be filled with a sound wave's doubling back on itself. This doubling back creates a complex pattern of interference which is itself an independent event. The movement of the sound wave remains continuous even through the doubling resulting from the reflection off of the surfaces. This places the sound wave in an immediate relation to itself which Massumi calls 'intensity' (Massumi, Parables 14).

These intensities may occur equally outside of the boundaries of human experience. Sound waves with frequencies below and above the threshold of human hearing can also create complex patterns of self relation (Schrimshaw 33). This has been demonstrated in physics through the exploitation of sound waves to move stable objects in space. Notable examples are acoustic levitation (levitation of solid and liquid matter through the use of

sound waves) and the audio screwdriver (physically turning screws through the careful combination of projected frequencies).

Deleuze and Guattari offer the notion of 'prodigious simplification' as a way to engage more directly with what they call the 'intensive quantity' of affects, applied to sound by Schrimshaw. Deleuze and Guattari cite the work of La Monte Young as exemplifying this idea. Young employs simple tones of extreme durations, shifting focus completely away from signification towards the relations of pure intensities. Simple tones are devoid of harmonics. Harmonics are the complexities in a sound, added to a fundamental pitch, that allow the sound to be identified as attached to an origin. For example, the note middle C played on a piano can be identified as originating from a piano and not a banjo or a human voice because the harmonics of that sound are unique and recognisable. The duration of Young's tones further alienates them from perceivable sources in that the sound of a piano is limited temporally by the sound's decay, or the time it takes for the sound's amplitude to fade to zero. What is left then, in these works, through the prodigious simplification of sound waves, are pockets of intensive quantities resulting in the interplay between sound waves both emitted from speakers and reflecting off of surfaces (Schrimshaw 34). Intensive quantity as it pertains to the sonic is separate from the experiential sonic qualities of timbre, amplitude, etc. It refers rather to what Schrimshaw calls "the internal composition" of a sound: "degrees of phase, bandwidths and magnitudes of frequencies" (Non-Cochlear Sound). Therein lie the affective capacities of a sound.

Schrimshaw cites another work of Alvin Lucier, *Music for Pure Waves, Bass Drums, and Acoustic Pendulums*, as a more functionalist conception of prodigious simplification. In this work, sound is equally distanced from signification of a source, though the focus shifts to

the interaction between and within assemblages. Electronically-generated sound waves excite the heads of large bass drums, setting into motion ultra-light pendulums which are suspended in front of the drums. The rhythms created as the tips of the pendulums strike the heads of the drums are determined by the pitch and loudness of the waves, the lengths of the pendulums and the resonant characteristics of the drums themselves. Here any external, perceivable qualities of the tones themselves are secondary if not completely irrelevant. What is important is the force exerted by the sound waves as they excite the air within the bass drums and by extension setting the pendulums in motion (Schrimshaw 34). What is important is not what the sound is, but what the sound does, its material agency.

THE WEB OF FORCES

Sound is always present, always affecting, filling spaces and forming relations between bodies. If there exists a continuous flow of sonic energy, what Cox calls noise, and sounds exist in excess of what can be heard, though nonetheless affective, then we may conceive of the urban environment as "a system of speeds and channels, dense pressure pockets, vortices of attraction, basins of acoustic immersion and abrasion, vibratory and turbulent: a whole cartography of sonic force" (Goodman 9). Understanding this flux, this push-pull, and how it exemplifies the materialist concerns of all of nature existing as such a flux, can teach us about the world, our environment, our universe.

This sonic flux is one among the many that constitute all of nature and culture. Nietzsche views all of nature as a set of "heterogeneous forces in complex relations of attraction and repulsion, consistency, and dissolution" (Cox, Beyond Representation 153). Cox notes Manuel Da Landa's view that all of nature and culture combined is a collection

of flows and pulses (Sonic Philosophy). If we can understand money, information and language as flows, then sound is also one of these flows. Cox feels that sound however stands out as an exemplary example, a model of sorts, of how these flows function (Sonic Philosophy).

Just as energy does not die but rather dissipates and transfers, sounds do not disappear once we stop hearing them. Resonances, echoes and vibrations are transferred to walls and bodies, hanging in the air, so that "every sound masks an entire history of sound, a cacophony of silence" (Evens 14). In fact, no vital material disappears when it leaves the realm of human perception. It continues its existence in another place, perhaps another form, affecting other bodies if not directly our own (Bennett 6).

Cox writes again about noise. If noise is an unwanted signal, and a signal is anything that conveys sonic information or sonic energy, the entire universe then could be said to be made up of a complex web of signals. Tuning into more of these 'unwanted' signals might give us greater insight into the universe and its flows, its powers of creation, of bodies forming and unforming continuously. A wave in the ocean can be considered as an individual wave and is yet the result of many convening forces. Varying conditions of wind, air temperature and pressure, water temperature, etc., all contribute to the formation of a single wave. And these very conditions themselves are the results of other precedent conditions and so on, so that a single wave can be thought of as a reflection of the state of the entire universe (Cox, Sound Art 21-22).

I return to Lucier's *Music for Pure Waves, Bass Drums, and Acoustic Pendulums*, which draws focus to the action of sound as signal, as force, literally setting bodies (drum skins

and ping pong ball pendulums) into motion. This small, albeit man-made, universe is aquiver with the complex relations of signals. Sound here can be thought of as the glue holding Lucier's little universe together. The bodies in this universe are connected through the affective force of sound. Any change will affect the way these bodies interact (fluctuation in air temperature, the rupture of a drum skin, a sudden and unexplainable change in mass of a ping pong ball). These bodies and this universe are a metaphor, but in our universe sound still connects bodies (Schrimshaw, Non-Cochlear Sound).

All actions are actually trans-actions. They enter into a web of interconnected endeavours, crossing paths with individual intentions and unfolding actions to affect the becoming of bodies. These conjoint actions give rise to many simultaneous consequences, effects and reactions, so that all actions and the becoming of all bodies are connected, intertwined (Bennett 100-101). In the case of a human body interacting with a sound, some of the sound is heard by the ear. Some is in excess of the ear, felt by the skin. The portion of the sound that falls outside both of these conscious perceptual frames is the portion that affects the becoming of the body. Between solid bodies, zones of shared vibration are formed, connecting these bodies to each other (A. Goodman, Noises, 6-7). As Steve Goodman puts it, "this extensive continuum constitutes a kind of rhythmic anarchitecture that unites the discreet and the continuous" (97). Through a heightened awareness of the affective capacities of sound, we might begin to better tune into these zones of shared vibration and the unifying capacities thereof to gain a deeper understanding of the relationality and ongoing formation of all bodies and our own capacities to interfere in that formation.

ATTUNING TO INVISIBLE FORCES

While hearing is the most common way of understanding sounds, there are other ways in which we sense sounds. We feel the movement of the air near the low frequency speakers at loud concerts and the vibration of the ground and walls in the presence of loud thunder or the passing of a train (Hope 51). This is what Seth Kim-Cohen calls the non-cochlear. For Kim-Cohen, the 'non' in non-cochlear does not in any way imply an absence or a negation, nor does it imply silence. Like the virtual and the actual, what happens and what does not, "the non-cochlear and the cochlear pass into one another indefinitely" (Kim-Cohen xxii).

The human ear can register frequencies from approximately 20Hz to 20kHz but the body as a whole is receptive to a much wider range of frequencies. Below 20Hz we refer to infrasound, which could be considered "hidden, ignored, [or] difficult to hear or access" (Hope 53). Above 20kHz we refer to ultrasound, which might be felt as a prickling sensation on the skin. To this we can add very quiet sounds at the threshold of hearing or just outside of our ear's capacity to hear, such as the sound of insects. We can also add extremely loud sounds, which would be felt by the skin as high pressure waves more than they are processed by the ears.

Stimulating multiple sensory modes, these types of sounds affect us in subtle ways, informing our movement and the unfolding of our bodies on a virtual plane (A. Goodman, Noises 4). Many sonic artworks, and certainly the ones that are of interest to my argument, employ non-cochlear sound in combination with the audible in the establishment of multimodal sensory experience. As an example, Paul Jasen notes the

work *Phase One: Sleeps Golden Drones Again* by Eleh. Low frequency tones vibrate the listening body in shifting rhythms, resonating and vibrating the whole body, causing unusual vibrational relationships between organs and bones, skin and flesh. Succumbing to this, "the body's image of itself rhythmically recomposes over and over" (Jasen 22). The listening body's continuous recomposition draws attention to the flux, the becoming, the shifting of potential through the interaction of sound-body and human-body. This shifting occurs on the virtual plane and is in constant conversation with the actual, with that which actually happens. These types of sonic artworks, through the use of sounds at the extremes of human hearing, exemplify a type of interaction that is occurring continuously, affecting our bodies in movement, in change and so in becoming. In other words, sound, as a non-human autonomous agentic material body, has a direct, if mostly subconscious, affect on the continuous formation of the virtual human body, and in turn the actions of those human bodies. I believe that attuning to these interactions with invisible forces can lead us to a better understanding of our own agency and responsibility in a world of vibrant matter, and that sound art can be a powerful tool in exploring this.

VIBRATION

Sound and vibration are closely linked. We can say that audible sounds are created by vibrations and amplified by surfaces and resonant cavities. The strings of a cello, for example, vibrate the bridge, which vibrates the body, which resonates and amplifies the sound. But vibration is also present in ways beyond our perception, from the shifting of tectonic plates to the rhythmic motions of subatomic particles. In his book *Sonic Warfare: Sound, Affect, and the Ecology of Fear*, Steve Goodman shifts focus away from human hearing and favours instead a synaesthetic, intermodal sensory understanding of sound. As

rhythmic vibration, sound is independent of any phenomenological subject. This vibration is intrinsically linked to the audible but simultaneously separate to it (S. Goodman 9).

Goodman advocates a sonic ontology of vibrational force that calls into question or totally rejects the linguistic hold on sound, which assumes all sound to be in service of the communication of meaning. Not only does such an assumption ignore frequencies outside of human audition, it negates the role of non-human bodies in any vibrational encounter (S. Goodman 82). Goodman notes that vibration is an integral part of all matter, that every seemingly stable whole is composed of smaller rhythmically vibrating parts. At the molecular level an object is not stable but composed of "microrhythmically mobile particles". Our perception of a situation is underscored by an "imperceptible excitation" (Whitehead, qtd. in S. Goodman 96). This ontology of vibrational force should, for Goodman, however, not be reduced to scientific categorisations of the physical, measurable phenomena of sound.

Goodman explores this sonic ontology of vibrational force through concepts and practices he calls Bass Materialism: "the collective construction of vibrational ecologies concentrated on low frequencies where sound overlaps tactility" (196). Although bass frequencies are often thought to be the enemy of clear "auditory perception and, by implication, clear thought", Goodman feels that bass frequencies deserve deeper theoretical attention. Even when such frequencies lie outside of audibility and tactility, they "transform the ambience of a space, modulating its affective tonality, tapping into the resonant frequency of objects, rendering the virtual vibrations of matter vaguely sensible" (79). The high capacity to move bodies and pass smoothly between and across modalities

of perception and the subconscious make strong candidates of bass frequencies in the creation of multimodal sensory environments.

THE PHYSICS OF SOUND

Chapter Four B

Although Goodman states that a materialist and vibrational view of sound should not be reduced to scientific categorisations physical, measurable phenomena, a general understanding of these are necessary for the process of experimentation undertaken in the creation of the practical component of this Masters. This section covers briefly the technical and physical aspects of sound that are necessary for the production of this practical outcome.

SOUND WAVES

Sound travels, or *propagates*, in forms known as *waves*. These waves are in fact rhythmic fluctuations in air pressure in the space surrounding the initial impact that causes a sound. The rate of this fluctuation, called *frequency*, is measured in Hertz (Hz), equal to cycles per second, and the human ear can register fluctuations at rates from approximately 20Hz to 20kHz (20,000 Hertz), known as the *audible frequency spectrum*. Sounds fluctuating at the low end of this spectrum are perceived as having a low pitch and sounds with a higher frequency fluctuation are perceived as high pitched. Therefore, what we hear is not air pressure itself, but rather the change in air pressure over time. Aden Evens states in *Sound Ideas: Music, Machines, and Experience* that "to hear a pitch that does not change is to hear as constant something that is nothing but change, up-and-down motion. To hear is to hear difference" (Evens 1).

Beneath the outward appearance of unity, a single sound is in fact composed of a number of complex properties that allow us to recognise it as a single sound. Frequency, amplitude and harmonic content equate to the perceived qualities of pitch, loudness, and timbre (Evens 1-2). The amplitude of a sound wave is directly related to the amount of change in air pressure produced by the sound wave. A larger fluctuation will be perceived as a louder sound (Evens 2). All sounds have what is called a *fundamental frequency*. This is the frequency that will give a sound its perceived pitch. A sine wave is the most simple waveform, a smooth and even fluctuation. However, pure sine waves are unlikely to occur in nature and are mostly encountered in electronic technologies. Real world sounds are composed of a fundamental frequency and any number of *harmonics*. Harmonics are additional sine waves, which when added to the fundamental, give the sound its character, or *timbre*. As Even states, "heard, timbre is the contraction of many regularities into a single complex variation, a singular quality" (4). This is what allows us to distinguish the different instruments in an orchestra or one person's voice from another's (Evens 3).

Evens presents this complexity one step further to include the influence of spatial conditions, materials and other bodies in the vicinity of the sound, summing up the web of shifting forces that make up our experience of sound:

> An open E-string bowed on a violin excites at once the string, the body of the violin, the other strings, the body of the violinist, the air around the violin, the material of the room, and the bodies of the listeners. When one wave meets another, they add together, reinforcing each other when they are in phase and cancelling each other when they are out of phase. Thus,

> every sound interacts with all the vibrations already present in the surrounding space; the sound, the total timbre of an instrument is never just that instrument, but that instrument in concert with all the other vibrations in the room, other instruments, the creaking of chairs, even the constant, barely perceptible motion of the air. Measured at some point in space, all of this vibration adds up to a continuous variation in pressure, a wave. Complex, irregular, and erratic, this wave changes constantly and incorporates many frequencies and shifting amplitudes, though the dominant fundamental frequency may dwarf the other components of the wave. The timbre of the sound includes not only the many other components issuing from the violin but all of the incidental vibration that already animates the space, waiting to be modulated to the point of audibility by a suitable sound (6-7).

On the other hand, the power of the sine wave in a sonic artwork is exactly the absence of timbre, allowing it to be more easily separated from association with another object or source (Schrimshaw, "Non-Cochlear Sound"). La Monte Young explains that a sine wave with only one frequency component projected into space will have a relatively regular pattern of fluctuation ("Selected Writings" 11). This will create in the space high pressure areas where the sound will be perceived as louder and low pressure areas where the sound will be perceived as quieter. Given enough amplification, the variation in perceived loudness can be quite substantial. This phenomenon was used in immersive works by La Monte Young to make, as he states, "the listener's position and movement in the space an integral part of the sound composition" ("Selected Writings" 11). By

integrating the listener's position and movement, Young effectively created a multimodal sensory environment, highlighting the relationship between bodies in space.

PHASE AND RESONANCE

Knowing that sounds move as waves at frequencies and interact with surfaces in particular ways, we can measure what happens to sound waves when they meet in physical space. The two phenomena of this type most important to the current argument, phase and resonance, are described in this section. In the following chapter, in light of a case study, I explore how phase and resonance are employed by Eleh to emphasise the effects of sound on material bodies.

When we measure the rate of fluctuation of a sound wave, the frequency, we are measuring the progression of a wave through entire 360° cycle. Beginning at 0°, the wave progresses to maximum displacement in one direction at 90°, returning to equilibrium at 180°, reaching maximum displacement in the reverse direction at 270° and returning to equilibrium again (Handel 10-13). A sine wave is depicted in figure 1.

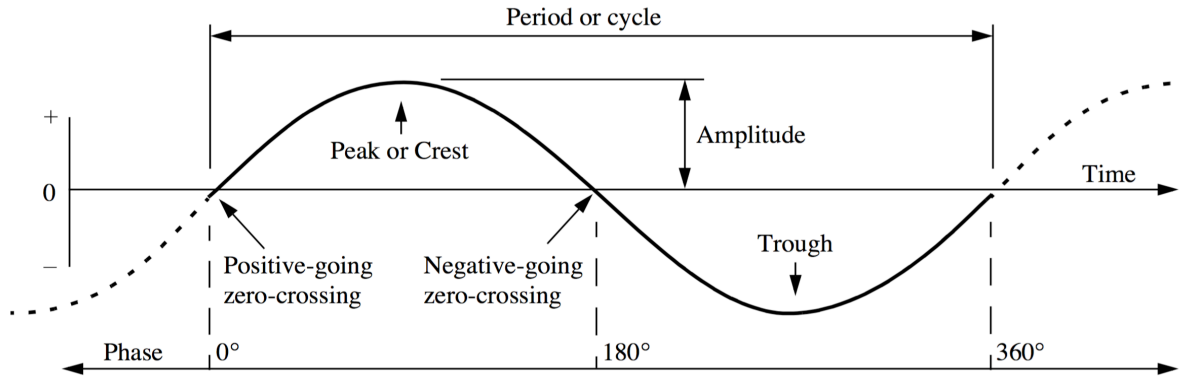


Fig. 1. The anatomy of a sine wave (Loy 140).

When two sine waves are close in frequency but not exactly the same, there is a phase shift between the two waves. As the frequencies move further apart, the conflict in wavelengths produces "beating rhythms that shift in tempo along with the drifting of the interval" (Jasen 21). This can occur naturally through spatial acoustics. When sound waves come into contact with very hard, dense, smooth surfaces, they reflect at an angle equal to that at which they arrived at the surface. When this angle is 180° (perpendicular), the wave doubles back on itself. If the wave is not at exactly 360° at the point of impact, the original wave and the reflected wave will be out of phase (Augoyard and Torgue 111).

When a sound wave is reflected and doubles back on itself, most likely to happen in an enclosed space, the patterns of compression and rarefaction of both waves may enhance or cancel each other at specific points. Two identical waves meeting exactly 180° out of phase can create what is called a *standing wave* (Handel 10-14). A standing wave does not propagate but remains anchored at certain locations in the room, called *nodes* and the air molecules of the space are "arranged into complex geometrical patterns of oscillation" (Young 214), which can be perceived by the body as subtle shifts in air pressure. Nodes are points in a standing wave where two waves effectively cancel each other out, causing the wave to appear lower in volume, where *anti-nodes* are points where two waves additively amplify each other to appear noticeably louder. A visual representation can be seen in figure 2.

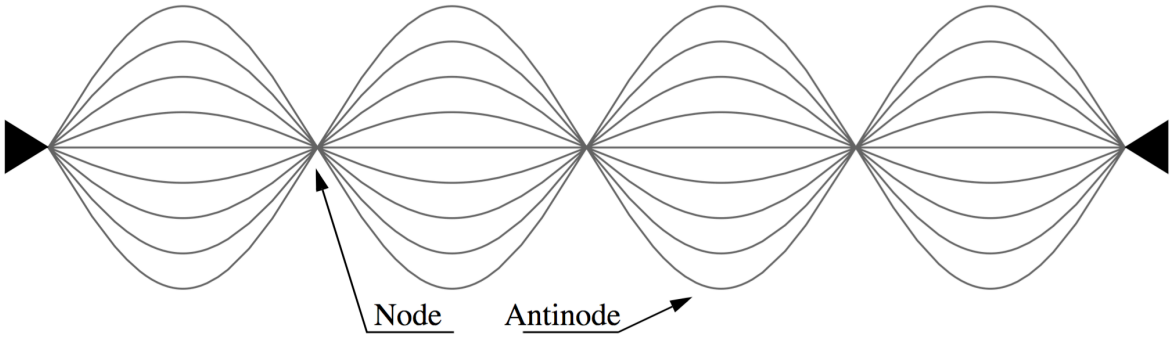


Fig. 2. Depiction of a standing wave (Loy 256).

Acoustic resonance refers to the amplification of certain frequencies through a complex relationship between the surfaces of an enclosed space and an exciting frequency. At specific frequencies, a given space will vibrate with more energy than with other frequencies. The frequency that causes a space or solid object to vibrate with the highest possible energy is called the *resonant frequency*. A sound at that frequency contained within the space will sound far louder than other frequencies (Augoyard and Torgue 99-110) and with increased volume comes increased changes in air pressure.

A thorough understanding of the physical and quantifiable phenomena of phase and resonance can provide the sound artist with opportunities for manipulating the way in which a given space is perceived by an audience. Musical compositions and sonic artworks can, as in the case of Eleh and La Monte Young, be not only temporal compositions in the traditional sense, but also spatial and relational compositions, drawing into focus materialist concerns where meaning is constructed through the interaction of sound-body and audience-body.

VIBRATION

Sound and vibration are inextricably linked. Individual sounds happen when a resonating object is set into vibration. This happens most commonly by *impact*, such as an object falling to the ground or hands clapping, or by *friction*, such as a bow on the strings of a violin or a car's tires skidding across pavement. The ear's ability to register sound is in fact the ear's capacity to register fluctuations in air pressure, which set the eardrum vibrating. A chain reaction of vibrating bones and nerves cause the brain to register that vibration as a sound (Hansen 1).

Vibration can be conducted through the bones of the body to the bones of the inner ear, causing one to "hear" a sound that was never airborne. The reason in part for a person's voice sounding different or strange when he/she hears it recorded and played back is due to the way the ear handles vibration, as Douglas Kahn explains:

> When you hear your own speaking voice the bones are in place. The bones in question are those involved in the conduit channelling the voice up from the throat through the mandible and skull, vibrating the basilar membrane in the same way as air-conducted hearing. […] Edison was known to bite down upon the horn of the phonograph to better hear its output; he was simply reconnecting the bone circuit. Air-conducted hearing is not without bone conduction, but the conduction of the hammer, anvil and stirrup is not of the order of hearing one's own speech. In fact, during speech vibrations along the path of the tiny bones are attenuated by the stapedius muscle, just as when it reacts to high intensity

> sounds from the environment, thus deploying the audition of one's own voice more completely to the route of other bones. When you speak you become a little deaf to the world (Acoustic Sculpture 6).

Hearing, then, is in fact sensing vibration, not only with the ears, but with the entire body. Hearing with ears is merely one possible way of perceiving sound.

By attuning to the multiple modes of sound's capacity to affect the human body beyond the ears, we might be able to develop a broader appreciation for the interconnected web of continuous and relational becoming of all material bodies. In such a web, all bodies carry some capacity to affect and to be affected, some kind of agency, vibrancy, thing-power.

INFRASOUND AND ULTRASOUND

Although human hearing is limited to frequencies between approximately 20Hz and 20kHz, sound exists well beyond these limits. Frequencies above 20kHz belong to what is called *ultrasound*, most commonly used in hospitals for generating images of the inside of bodies during pregnancy and other procedures. Frequencies below 20Hz are called *infrasound*, and seem to be more commonly explored by artists. Although humans cannot hear it, infrasound vibrates the air with such great force that the body begins to register the vibrations in excess of the ear. The body can react to infrasound through the "skin, through the Merkel cells, and when sufficient volume is present, the Meissners and Pancinian corpuscles [and] may also be perceived inside resonating cavities of the body, such as the ribcage or the inside of the head" (Hope 52). Cat Hope notes that the increasingly common use of infrasound in musical composition reflects "a conscious

attempt to achieve a bodily response to patterns and formations [due to a] realisation that the medium of sound is in fact a very visceral, physical phenomenon" (Hope 52).

Sarah Angliss notes that "even when infrasound comes from a mundane source, such as a faulty ceiling fan, it can give people such strange sensations, it might lead them to think they've been haunted" (web). In a paper titled the *Ghost in the Machine*, Vic Tandy and Tony R. Lawrence recount the story of their haunted laboratory. Tandy and others working in the lab would experience hallucinations, depression and cold sweats. Tandy eventually discovered that an extraction fan at one end of the lab was creating a 19Hz standing wave: too low in frequency to be heard by the ear, but certainly felt in the bodies of the workers in the lab. Some further research showed Tandy that side effects of standing waves between 12Hz and 27Hz may affect the eyes, mouth and hands, and can often cause increased heart rate, muscle tension and hyperventilation. When they switched the fan off, the standing wave, and the sensations it induced, vanished. The vibration of the fan in combination with the construction materials and dimensions of the space itself were exactly right for a standing wave to occur (Tandy and Lawrence).

To wrap Tandy's experience in the language of Vibrant Materialism we might say that all of these elements, human and non-human, entered into an assemblage with a great efficacy, a great capacity to incite change. Certain elements of this assemblage were established through conscious human action: a building was constructed, a laboratory was set up, an extraction fan was installed. Though the cumulative effect was presumably not intentional, it could also not be ignored. All of the elements of this assemblage were in the right place at the right time to create a sound so low in frequency that it could not be heard but the laboratory was set into such extreme vibration that the physical and emotional

health of its inhabitants were negatively impacted. A small adjustment to the fan mounting solved the problem completely but the experience greatly expanded Tandy's understanding of the affect of invisible forces on bodies. The extended exposure to this environment led to insights which enabled conscious action to change the conditions of the environment that were causing it to be unhealthy and unsustainable. I believe that this illustrates Bennett's objectives: to find more ecological (beneficial to the whole) ways of interacting with our environment through a heightened sense of the autonomous capacities of all material bodies to affect and to be affected and to enter into assemblages with other bodies to catalyse change. Likewise a part of Bennett's theory, blame was not sought for the unhealthy conditions, but rather a solution. By viewing the conditions of the laboratory as the result of the distributive agency of an assemblage of affective material bodies, there was no sense in assigning blame to any one body, but only a need and a responsibility to find an ecological solution.

Using the physical sonic phenomena discussed in this chapter, it is possible to intentionally create conditions similar to those in Tandy's laboratory. In the following chapter I discuss as a case study the work of Eleh, a sound artist who does exactly that.

CASE STUDY: ELEH

Chapter Five

This chapter discusses the work in general of the artist known as Eleh and how Eleh's approach to working with sound addresses materialist concerns. More than any one work in particular, Eleh's overall approach provides a strong case for sound art as a way to explore the ideas presented by Bennett in *Vibrant Matter*.

Eleh is an artist working in an unclassifiable zone between sound art and music. Eleh's works are certainly compositions, though these compositions can be thought of as spatial as much as tonal: moving air, creating standing waves, building and releasing pressure zones in the listening space. Eleh treats sounds much the same way Varèse treated sounds, as 'colliding sound masses' and 'shifting planes', felt as much as heard. Throughout the article "A Transversal Lineage: Perceptual Abstraction from Eleh to Op Art", which appeared in *The Senses & Society 9.1*, Paul Jasen suggests that Eleh's work has more in common with the work of *Op-Artists* like Bridget Riley, stating that "Eleh engineers affect as much as audio, or that the artist's medium is not vinyl, tape, or even acoustic space, as much as it is perception" (19). Sound, in the hands of Eleh, becomes affective matter and the compositions do not end on the recording but rather extend into the listening space to include the listener as an integral component of an affective assemblage.

These works are most often considered in the world of music because of the way they are packaged and disseminated: pressed onto vinyl records or compact discs and distributed by record labels. The records themselves, however, are limited and hand numbered, similar to an edition of artist prints. These records sometimes also come with instructions, "precise guidelines for positioning bodies and speakers, along with the more general dictum that 'volume reveals detail'" (Jasen 18). With the addition of instructions

and attention to spatial relationships, these compositions act more like sound installations than traditional musical recordings.

Eleh's work consists primarily of simple electronic waveforms - sine, square, triangle and sawtooth - at very low frequencies, primarily below 100Hz and at times well below the cusp of human hearing. Jasen describes Eleh's method of composing with oscillators, with which Eleh will:

> …finely tune their frequencies, layer them, and observe their interactions (amongst each other, but also in space and sensoria). There are deep and steady tones, resembling electrical hum; elsewhere, the slow pulses of waves passing in and out of phase with one another. Some tracks throb and judder; in others, the rough harmonics of mixed frequencies and wave shapes take on a more industrial character, like the vibrations of heavy machinery transmitted through a building's foundation. Throughout the recordings, tones morph and slide as frequencies shift and wave cycles encounter each other in new ways. The consonances of octave ratios create moments of stasis and intensified sonic energy, while tonal and harmonic differences produce layers of rhythmic momentum and rupture (17).

Eleh seems to intentionally create conditions similar to those created in Vic Tandy's laboratory by the exhaust fan discussed in chapter four B. Frequencies around 20Hz require up to one million times the acoustic energy of human speech in order to be perceived at the same volume. As Jasen states, "at these amplitudes, sound moves matter,

humming structures and producing noticeable shifts in air pressure" (17). The composition, projected from loudspeakers, modulates the space it is projected into by changing the movement and pressure zones of the air contained in that space (Jasen 16). The dimensions and structural materials of the listening space as well as the bodies within that space influence the becoming of the piece itself, in relation.

Eleh's compositions speak to the theories explored in this dissertation in several ways. The following paragraphs will unpack how in these compositions sounds become non-human affective bodies in continuous flux. These bodies are autonomous and independent to a degree, entering into assemblages with human and non-human bodies, drawing attention to the virtuality and potentiality of bodies, the capacity to change and to catalyse change.

The sonic material of Eleh's compositions, simple electronic waveforms that exist as, for example, 'a square wave at 97Hz', can be thought of as sound-bodies, which exemplify the conception of bodies laid out in this paper in that they are never fully formed, they are temporal by nature, always changing. They emerge from and dissolve back into a continuous flux of energy and background noise. They interact with other bodies, human and non-human, to manifest differently depending on contingent encounters with those bodies. These sound-bodies, then, enter into assemblages with new and emergent affective capacities.

These individual sound waves in Eleh's compositions, each consisting of a fundamental frequency without harmonic overtones, cannot be linked to a known natural source and so the sounds can be said to be autonomous and non-representational. The sounds themselves

do not signify other seemingly more stable, more formed and therefore more valuable objects. Rather, the work concerns itself with the materiality of the sound itself and the focus shifts towards the interaction of sound-bodies, listener-bodies, spatial-structural-bodies and any other bodies present in the listening space. Ikoniadou states that work such as this exhibits "a capacity to escape the artist's (and the participant's) intentions and to open up the work to the autonomy of its own materials" (9). In other words, the work is not a presentation of a fixed, stable object or composition, but rather creates a situation in which the contingent encounter between bodies gives rise to questions about the nature of the implicated bodies.

A passage in which Jasen describes a particular composition illustrates how Eleh's work shows us that bodies are not static, but are rather in flux, always changing, becoming otherwise than they already are:

> "Phase One: Sleeps Golden Drones Again," is [an] elaborate experiment that builds slowly over 23 minutes. It opens with a pair of low tones – one constant, the other pulsed. The continuous sine wave hums the body steadily, but when the pulse hits, every 6 seconds, it sets off short strings of fading modulations (like a slow drip rippling through standing water). When a low, triangle wave joins the mix, the modulations become more varied and more forceful. A new harmonic in the drone begins to take over the head and fill the ears. Later, a sub audible element enters and sends the whole sonic field into faster, deeper oscillations. At this point, at high volume, acoustic pressure cycles through the ears about once a second, modulating a lower hum that weighs in the oesophagus. A hollow

> drone beats incessantly behind the nose, pulsing with the insistence of a fresh burn, and the overall effect recalls something of the rough, drifting oscillations felt inside a dual turboprop plane. The final sonic element is another sine tone, which quickly rises to about 110 Hz, sustains for varying lengths of time on each repetition, then decays slowly. With each head-filling emergence, it produces a sense of tense stasis, before releasing into the lower drone and its steady pulse. By now, the room throbs and populations of disparate waves course across the body. When they change, you change: internal resonances charge and discharge; rhythms emerge between vibrating organs and bones. For 23 minutes, the body's image of itself rhythmically recomposes over and over (22).

Jasen states that this type of work stages "encounters with atypical forces that put bodies at variance with themselves, forcing sensory rearrangements and conceptual adaptations" (27), echoing Massumi's call for heightened attention to the body's potential to vary (Parables 5). Hand in hand with the body's potential to vary lies the body's potential to affect other bodies, to catalyse change, and therein lies the agency of a body, human and non-human alike.

I have argued in chapter two that the disruption of habitual modes of perceiving the continuous unfolding or becoming of the body can draw attention to that very process of becoming, our virtuality, our potential to vary, our capacity to act and catalyse change, and in turn heighten the body's capacity to attune to invisible forces at play in the world. By creating what Jasen calls an "atypical force environment", the listener's default mode of perceiving the environment is disrupted, causing the listener to question his or her

experience, catalysing imagination and the formation of novel ideas (20), which I would argue, qualifies as change. Eleh's works are, as Jasen states, "designed to charge fields and retexture felt space by subjecting implicated bodies to unusual rhythms and pressures" (18-19). These "unusual rhythms and pressures" exaggerate and emphasise the ontology of flux that categorises and connects all bodies under a materialist understanding of bodies. In other words, Eleh enables situations that immerse the listener in the unknown and unknowable, hinting at the immanent potential of every encounter and every moment.

Jasen describes Eleh's process as "a minor science of following hunches, testing relations, speculating on potentials, pursuing anomaly, and devising provisional means to intensify it" (18). This statement echoes many of the themes explored in this dissertation. In chapter two I have argued that through developing what Massumi calls intuition, we can develop a feeling for the potential in the dynamic process of becoming, and thereby insert ourselves into this process, open ourselves to change, motion and difference. Bennett advocates a temporary suspension of scepticism allowing for a "more open-ended comportment [, for] if we think we already know what is out there, we will almost surely miss much of it" (xv). Eleh intuitively projects sounds into space setting the contingent encounter between these autonomous sounds as the focus of his work. One collection of works is in fact aptly named *Intuitive Synthesis* (2006). Because of the mode of distribution of Eleh's works, each listener decides independently the exact listening conditions and can in fact vary these infinitely. The works set up the conditions for varying potential without attempting to limit the encounter to known possibilities, inviting the listener into a role of active participant and allowing him/her to consciously explore this encounter between material bodies.

Eleh's sound-bodies are autonomous, they do not belong to anyone or anything, but occupy the in-between. By activating the in-between through charging felt space with palpable vibration, emphasis shifts towards the commonality of all bodies. Bodies are connected in space by a web of affective forces and through their shared ontology of flux and in this way, we can begin to approach a less hierarchical plane where more commonalities can be recognised more of the time, differences can be viewed in new ways. Non-human bodies - sound-bodies, in this case - find agency, the capacity to catalyse change, to act, to exercise thing-power. Bennett states that when we begin to view all matter as vibrant, "we see that biochemical and biochemical-social systems can sometimes unexpectedly bifurcate or choose developmental paths that could not have been foreseen, for they are governed by an emergent rather than a linear or deterministic causality" (112). Sound, then, provides a good example of Bennett's theories in practice, and a starting point for exploration towards a wider application of these theories.

PRACTICE COMPONENT

EXHIBITION: TOWARDS A DEFINITION OF SOUND AS VIBRANT MATTER

Chapter Six

In his book *Alien Agency: Experimental Encounters with Art in the Making*, Chris Salter poignantly states that "thinking issues of materiality, agency and vibrancy through words is important, but we also need to be thrown into a lived, bodily experiential encounter with the material torrent of the world. Such encounter is the very stuff of artistic practice" (5). For precisely this reason, the theoretical and philosophical ideas explored in this research needed to be tested. To properly speak of bodies, affects and agency, there was a need to explore these ideas in an experiential, embodied manner.

In fulfilling the requirement of this Masters by dissertation and creative work I chose, in addition to the written research, to construct a series of installations as an exhibition. This exhibition assisted in meeting two ends. The first is that it allowed me to apply the theory I have explored through a series of evolving and responsive constructive processes. This has not only allowed me to evolve my thinking through practice, but has called for the development of a materially sensitive and exploratory process, that strongly reflects the philosophies in question. Secondly the installation allowed me to construct an experiential encounter for an audience; demonstrating in an aesthetic and material manner, the philosophical questions of vibrational materiality.

Through in depth case studies, Salter explores how "humans and media [are] coproduced in the act of making things" and how one may "write an account of practice with such materials" (xi). Salter's insights into the documentation of experimental practice that engages materiality as an unfolding relational process has provided the tools to tackle what is for me a highly counterintuitive undertaking: to concretise in language a dynamic and intuitive process of exploring the unfolding relational materiality of sound, space and human body, towards presenting an experiential environment for an audience to discover.

I will borrow extensively from Salter's vocabulary where my own falls short of explicitly connecting intuition and intention.

As Salter states, "no longer inert, the stuff of the world behaves and *performs* beyond us" (5). That is to say that although a great many things in the world exist as a result of our conscious human action, these things often exceed our intentions, "they become operative and, one might say, autonomous beyond the initial conditions in which they were deployed - as actors in a complex ecology of intertwined relations (Salter 6-7). In these performances lies the very real agency Vibrant Materialism attributes to non-human bodies, the real capacities to change and incite change in others by virtue of a shared ontology of flux. This chapter will discuss the exhibition as an unfolding process of the discovery of relationships between material bodies through the observation of their performances. Starting from an understanding of matter as vibrant, agentic, and in flux, I will describe my observations of the performances of sonic matter in ongoing relation to the different rooms of the exhibition space, allowing the ensuing situations a certain independence to dictate what they will become. I will describe my process of making as a kind of framing of vibrant situations for an audience to experience.

Key to my process is a willingness and openness towards the unknown. As I stated in chapter two, potential is elusive, we cannot know all possibilities all of the time. We can plan interactions, relations of bodies, but there will always be anomalies, surprises, accidents. These are the aliens in Salter's *Alien Agency*: "the unforeseen, the unpredictable, the not yet there, the virtual" (14) and are accessed through experimentation with a view of matter less hierarchical than the dominant one. "Experimentation is a process by which things come to be […] all kinds of bodies, phenomena, instruments and affects are in

continual formation, not already configured as pregiven subjects or objects" (Salter 14). In the process of making these works, I would perform two main roles. I was first a performer of experiments by creating a set of relations between non-human bodies (sound body, wall body, ceiling body, speaker body) and second an observer, an alien-spotter. My observational instrument was my own body, tuned to a multi-sensory mode. I attempted to align myself with the materials, bodies and conditions I was working with, to exist in relation rather than as subject imposing its will on objects. Set up, observe, record, adjust, repeat.

For Salter, art making is intrinsically unpredictable, "not necessarily bound to systematic models or logical chains of decision making" (14) but emergent through process. I would allow contingent encounter to dictate the outcome of the situations that would comprise the exhibition, guided by the notion that sound is an autonomous body full of potential beyond what I could know in advance. What the audience experiences as the final "product" is in fact the product of "accidents, failures, misunderstood situations, resource limitations and misused techniques" (14), a fluctuating non-visible world of interconnecting material agencies exerting force and injecting into the becoming, the ongoing formation of some *thing*.

The next sections will describe the space that housed the exhibition and my reasons for choosing that space. Following that I will describe my general approach to setting up the experiments. I will then detail previous experiments that informed the process of setting up the final exhibition and finally I will describe in detail each installation as well as the processes that lead to their eventual presentation.

The Location

The exhibition was held in the little known and seldom used eastern ramparts of the old fort section of Constitution Hill in Johannesburg on 29 and 30 January, 2016. Dense with history, the fort was built as a prison in 1892 and is now home to the South African Constitutional Court as well as several exhibition spaces and venues for functions. See figure 3 for an aerial view of the old fort.

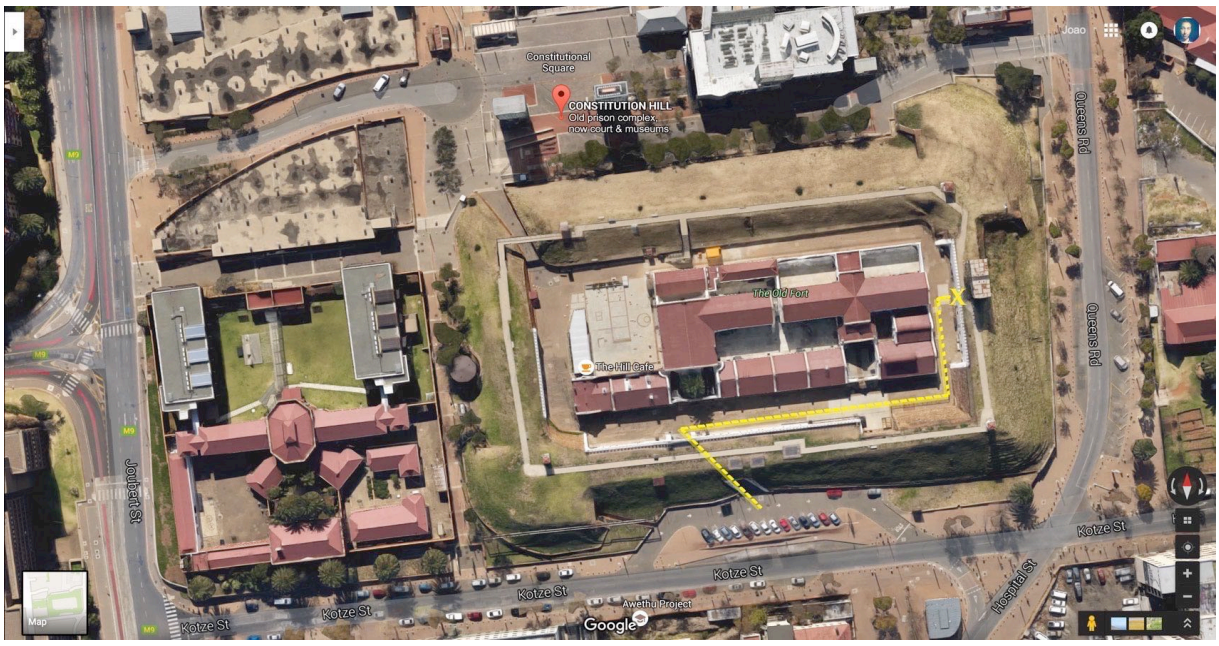


Fig. 3. Aerial view of the old fort section of Constitutional Hill, Hillbrow, Johannesburg.

The turbulent history of the site and its position in the traumatic socio-political landscape of South Africa cannot be completely ignored - thick walls, isolation cells, underground tunnels, the apartheid government, human rights violations. My interest in this particular space, the eastern ramparts, was however based on its acoustic properties

and therefore does not directly engage the overtly politicised nature of the space. I came to know this space when I took part in a group exhibition nearly one year prior and in that time noticed that the different rooms and the space as a whole reacted to sound in interesting ways. It became clear to me that there would be much to explore in these rooms and given that my focus would be on the behaviour of sounds - what sounds do - and how that can shift the way we understand our surroundings, this space seemed a good fit. Furthermore, the space had an interesting layout, with separate rooms of varying sizes and shapes as well as varied types of passages between spaces that would afford the possibility of a wide variety of experiments.

In this section I will describe the location for the purposes of clarity. Hidden away in the eastern most boundary wall, grown over with grasses, a wooden door gives way to a small network of rooms. A narrow corridor (fig. 4, 1) dead ends about five metres beyond the entrance. To the left are two small rooms (fig. 4, 2 & 3) followed by a long underground tunnel, accessible by stairs below a wooden trap door (fig. 4, 4), ending in another small room (fig. 4, 4b). Inside the tunnel, a perpendicular corridor leads to another small room (fig. 4, 4a). To the right from the entrance corridor is a medium sized room with an arched ceiling (fig. 4, 5) followed by a larger room, also with an arched ceiling (fig. 4, 6). See figure 4 below for an approximate layout of the spaces.

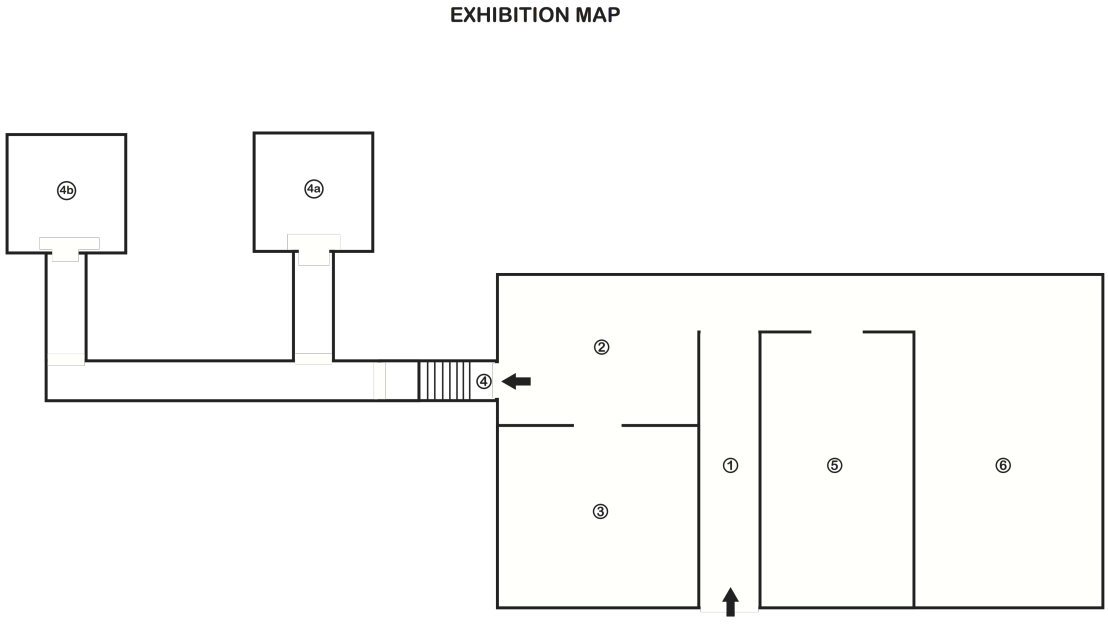


Fig. 4. Rough layout of the space, not to scale.

Each space was explored in an intuitive manner, using a wide range of sound equipment (see Appendix A) to project sound into the spaces and observe its behaviour. The question was "what does sound do in this room?" and then "what do particular sounds do in this room?". The exhibition then took the form of a presentation of findings, filtered and mediated by aesthetic choices, bracketing the rooms individually and collectively inline with the potential of sound as autonomous vibrant matter. The presentations and the processes of enquiry for each space and the respective outcomes are detailed later in this chapter.

The Process

The unfolding of the works, described below, involved devising experiments in the weeks before entering the space. Realising immediately on entering that some would either not "work" or not be relevant to the theoretical framework, I began the process of abandoning, rethinking, testing, trying, intuitively putting one foot in front of the other. Conditions would be set up, examined, adjusted and abandoned or transformed. The goal was to set up situations that were affective by examining what sounds would *∂o* in these rooms. My hope was that the audience would ask themselves upon entering each room, not "what *ώ* this?", but rather "what is this *∂oing*?" and "what am *I* doing?". By shifting the focus from the meaning of sound to the performance of sound as a material body, the audience should ask how their own bodies relate to the web of material forces they are entering into.

My general procedural approach was to connect a computer to a speaker and sweep through frequencies of a sine wave using a custom patch built with *Max for Live*, a version of Max/Msp, (a perhaps ironically visual programming environment). *Max for Live* is integrated into the audio software *Ableton Live*, my audio software of choice. Essentially a variable waveform oscillator, the patch switches between a "cycle" object (sine wave generator) and a "phasor" object (square wave generator) with real time adjustable frequency and amplitude (see fig. 5).

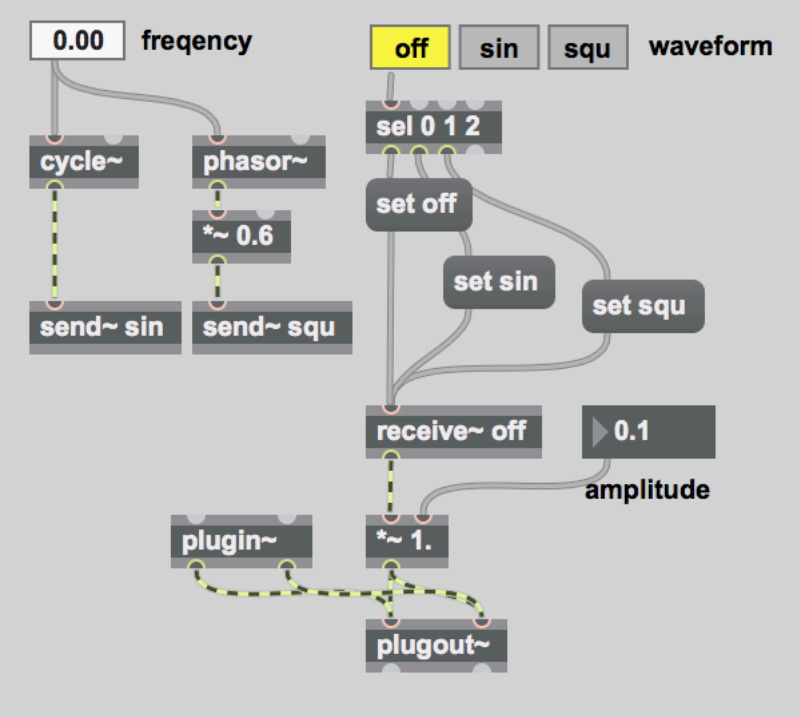


Fig. 5. Variable waveform oscillator patch.

I would be using almost exclusively sine waves in my experiments. Sine waves have a long history in these kinds of experiments (i.e. the work of La Monte Young, Alvin Lucier and others) because, as the most basic waveform, consisting of only a fundamental frequency devoid of harmonics, a sine wave carries little if any implied meaning or connection to something outside of itself. Gareth Loy explains:

> Our ears are very sensitive to the shape of pressure changes in sound waves as they strike our ears. Throughout our lives we learn to associate particular wave shapes with particular sound sources. We also use this information to identify a sound's relative location and important characteristics about our environment. The wave shape of a tuning fork is very simple in comparison to most other sounds. If we graph the average

> particle density of the tuning fork sound […], we see a shape similar to [a sine wave] (3-4).

Complex waveforms are made up of a fundamental frequency and several harmonics (Loy 157) and can be broken down to a series of individual sine waves in complex relationship. A complex waveform tends to be recognisable as "the sound of" something outside of itself, for example, the sound of a dog barking or the sound of wind. It can be said then that a single sine wave is devoid of any character other than that of a sine wave, a sine wave is a basic waveform that cannot be broken down into smaller parts. A simple sine wave rarely, if ever, occurs in nature and so, for the purposes of these experiments, provides the least chance of the audience making symbolic or semiotic connections between what they are hearing and some other real world cause. This is not to say that sine waves are free of baggage in a contemporary landscape of music and arts practice, merely that the simplest waveform comes with the least reference to real world sounds, thus hopefully allowing myself and the audience the least chance of distraction from the task at hand by making unwanted cultural associations.

My first act towards discovering what sine waves at certain frequencies *do* in each space, was to find the room's resonant frequency by sweeping through the audible frequency spectrum with my oscillator patch. Salter describes the nature of resonant frequencies:

> All material things, from electronic circuits and steel girders of buildings to the interior of rooms and cavities of human and animal bodies, have their own resonances or *resonant frequencies*. When stimulated by an

> outside vibration of the same frequency, such objects begin to sympathetically couple or resonate with the oscillating forces outside of them, building up a cycle of intense feedback between object and world (32).

In the space, the resonant frequency always felt and sounded louder than other frequencies, but had different effects in different rooms. I did not attempt to calculate mathematical relationships between specific frequencies, wavelengths and room dimensions. My interest here was whether shifts in the space through material relationships between sound-body, speaker-body, wall-body, etc., might influence my understanding of my own body in ongoing formation in relation to those non-human bodies.

Salter writes:

> [There is a] need to respect the capacities of materials - what they do. Materials abide by rules, constraints. The more one knows, that is, understands, from the experience of working with their actions and conditions, the more one can push, question and change their states (49).

This would be my approach, to learn about the capacities, the material agencies of sound though exploration and experimentation, allowing the work to unfold. In the words of Massumi, this "role requires 'following' the process, and following the process requires having a certain 'feel' for its elusiveness, for its running, for its changeability: a feeling for its virtuality" (Sensing 7). I take this to mean that making is a form of collaboration, a kind

of relationship between maker and materials in which the maker decides to take on a role of guide rather than god, leading rather than creating. The maker decides to become one part of an active dynamic assemblage rather than controller of all things, allowing a work to unfold and act.

PREPARATIONS AND FAILED EXPERIMENTS

In the time leading up to the exhibition, while reading, writing and otherwise becoming versed in materialist philosophies, experiments were conducted with a view to incorporating the findings into the final exhibition. These took the forms of two installations in group exhibitions and contained studio experiments. I will describe some of these experiments briefly in the following section.

Experiment One

In August 2014 I participated in a month long group residency at Ithuba Art Gallery in Braamfontein, Johannesburg. Camping out in a room of about twenty square metres, I experimented with the idea of moving objects in space with sound. Each day for one week I experimented with different sounds emanating from four large PA speakers, one in each corner. Sounds tested included percussion samples, orchestral samples, voice recordings, sine and square waves, and more. I designed a variety of patches in Max/Msp to choreograph the sounds' behaviours in the space. I found recorded sounds of instruments to be too suggestive of a musical composition and other recorded sounds too suggestive of natural environments, which was not the effect I was after. I therefore chose four sine waves slowly drifting in relation to each other to create beats of felt and heard fluctuations

in air pressure. I then created a room-within-the-room by hanging sheets of tin foil from the ceiling at a distance of about one metre from each wall. The vibrations in the air caused the tin foil to vibrate, adding a shimmer of high frequencies in unison with the low throbbing hum of the sine waves. The space was then lit with one red light and one blue, which reflected off of the foil in different ways at different locations in the room. The lights reflected from the foil sheets at varying angles and combinations of red and blue, causing many shades of pink, purple blue and red, which seemed to shift with the shifting air. The lights were in part a reference to La Monte Young and Marian Zazeela's *Dream House*, which uses similar lighting, but also a means of visually activating the space and "echoing" the reflections and interactions of the sound waves (see fig. 6).



Fig. 6. *How Many Sine Waves Does it Take to Unscrew a Lightbulb?* Installation view from Ithuba Art Gallery.

I learned from this piece, which I titled *How Many Sine Waves Does It Take To Unscrew A Lightbulb?* that I could activate the resonant frequency of the room to such an extent that the entire building seemed to vibrate. I gained a hands-on understanding of how two tones close in frequency interact in space and at different pressure levels. I was able to create standing waves and ultimately I was able to move an object with sound - the foil. Perhaps most importantly, I noticed that the slightest adjustment of frequencies could drastically alter the way the room was perceived by visitors. The same people (other artists working in other parts of the gallery during the residency) who complained of feeling "spacey" and "uncomfortable" even outside of the room itself, were drawn to enter and linger after small adjustments.

Experiment Two

In March 2015 I first gained access to the eastern ramparts at Constitution Hill, the site that would eventually be the focus of experiments for my Masters exhibition. I participated in a group exhibition called *Rituals of the Living*, and created a collaborative piece with visual artist Noluthando Lobese. At that time, I was struck by the historical socio-political context of the space and decided to work with objects I found stored there, such as strips of sheet metal. The idea to make recordings of the empty spaces came from a desire to tease the ghosts out of the darkness of this politically charged location: the unsaid, the unheard, the invisible, the denial. I did not yet have the language, but I was looking for what Salter calls "aliens". The official word from management was that these rooms were originally used for file storage. When questioned about the sharp hooks near the ceiling in several rooms and thick steel doors, only silence followed. In room three on the map above (fig. 4) I hung these found strips of sheet metal from the meat hooks and

attached piezo discs to them. The sheets became speaker objects performing the recordings of the empty spaces I had made (see fig. 7). The recordings had however been manipulated through a process of teasing out and amplifying hidden harmonic frequencies using a series of eight band equalisers. The result was a very soft chorus of overtone drones emanating from these hanging sheets of metal. These recordings would be used again in the same room in the final exhibition. While I intended to present the installation in its original form, the material agencies at play would dictate that the installation be developed into something slightly different as detailed later in this chapter.



Fig. 7. *Storage 1896-2015.* Installation view from Constitution Hill.

A stereo version of this harmonic drone was created, titled *Storage 1896-2015* and published in 2015 in the peer reviewed "Leonardo Music Journal", issue 25, as part of the audio companion, compiled by Lukas Ligeti and titled *Sonic Commentary: Meaning through Hearing*.

THE EXHIBITION

ROOM 1 - ENTRANCE CORRIDOR

Entering a dark corridor through a heavy arched doorway, one is enveloped in a swell of sound, which seems to fade away after one or two seconds. Walking further into the space the sound swells up again and it takes a moment to understand: the sound is not swelling and fading but standing still and the listener is moving through a standing wave.

A 15" full frequency speaker roughly 1.5 metres from the ground, cloaked in black fabric and pointed towards the entrance (see fig. 8), emits a constant tone, a sine wave at 87Hz. The corridor behaves like a tube and a standing wave is created with audible and palpable nodes and anti-nodes. The wave propagates and doubles back on itself. It effectively cancels itself in nodes where the pressure becomes low, the sound almost inaudible and amplifies itself in anti-nodes where it appears much louder and the increased pressure can be felt in the body of the listener.



Fig. 8. Room 1 - Entrance Corridor. View from the entrance doorway.

The speaker-corridor-sine-wave assemblage sets up a condition independent of and in excess of human expectation. This calls into question that which one assumes to know through previous experience of what it is to enter a corridor through a doorway into empty space. Space as we know it is in fact never empty but full of vibration, shifting forces in constant flux. The urban environment according to Steve Goodman is "a system of speeds and channels, dense pressure pockets, vortices of attraction, basins of acoustic immersion and abrasion, vibratory and turbulent: a whole cartography of sonic force" (9). By accentuating the felt space in the corridor I wanted to highlight the sonic materialist conviction that we step into and out of these types of assemblages constantly as we move through the world and Bennett's assertion that learning to be more conscious of our entanglements may change the way we move through and interact with the world.

The Process

I decided early on that I wanted to make something of the entrance that shifted a visitor's sense of space. An immediate cue to be on guard, to playfully toy with habitual modes of moving through space. I began my experiments with one 12" active full frequency speaker on a stand at roughly head-height. Sweeping manually through the audible frequencies, I found that a sine wave at 87Hz caused a standing wave in the corridor with highly audible nodes and anti-nodes as I walked through. I noticed a perceived peak in loudness at 188Hz and 548Hz.

When I opened the door I found an anti-node at the open doorway, a perceived swell in volume. In a brief internet search I found that an opening at the end of a tube constitutes a change in pressure and forces an anti-node. In *Musimathics: The Mathematical Foundations of Music Volume 1*, Gareth Loy states that "at the open end of a pipe, there is a displacement antinode because the air inside is free to move in and out of the tube" (263). This displacement anti-node followed by the subsequent nodes and anti-nodes created just the sensation I was looking for in a clear and simple manner.

Other frequencies as low as 50Hz and as high as 180Hz also created standing waves, though the sensation of fluctuating amplitude of the tone became less present above 87Hz and the distance between nodes became further apart below 87Hz, making effectively fewer nodes and therefore in some way diminishing the experience of passing through multiple shifts in perceived loudness and pressure. For example, a sine wave of 30Hz seemed to create one node at approximately two-thirds of the distance from the speaker to the door.

Deciding that a sine wave at 87Hz provided the most distinct experience of a standing wave in the corridor, I began to experiment with adding subsequent tones to the 87Hz wave to observe how these might affect the experience of the standing wave. Having introduced sine and triangle waves of various frequencies as well as white and pink noise, noteworthy experiential shifts occurred in the following configurations:

Adding a 188Hz sine wave caused the speaker to flap rhythmically and gave me the impression of the air in the corridor palpably moving back and forth. Adding white noise to that combination enhanced this feeling. Adding to the base of 87Hz a sine wave at 225Hz or 304Hz, the higher frequency wave was audible at the nodes but masked at the anti-nodes. Adding to the base of 87Hz a sine wave at 389Hz, the latter seemed to shift pitch slightly as I moved between node and anti-node.

Next I replaced the 12" speaker with a larger 15" full frequency speaker and repeated all experiments. I eventually decided that a lone 87Hz sine wave gave the most palpable sense of shifted materiality of the space and the 15" speaker emitted a fuller and cleaner sound, drawing less attention to itself and more to the shifting pressure in the space. I felt that even with no understanding of standing waves, the affects of the standing wave would still ask audience members to question their relationship to that space upon entering.

ROOM 2 - THE TABLE

A simple wooden table stands alone in front of a window. The window itself seems out of place, the half that is above ground is overgrown with tall grasses and creeping vines. On the window sill stands a black lamp illuminating the table's surface. Rough sketches in

chalk of a left and a right hand are accompanied by the message 'touch' (see fig. 9). Placing both hands on the table, one feels vibrating pulses in shifting rhythm. These vibrations transfer to the body of the audience member, and this human body and table body are connected in vibration.



Fig. 9. Room 2 - The Table.

Technically simple, two tactile transducers (surface-mounted vibratory speakers) are fixed to the underside of the table. A dismantled mp3 player is transmitting a stereo sound file consisting of a constant sine wave at 80Hz on the left and another sine wave on the right, which moves between 70Hz and 90Hz at a rate of 300ms/0.1Hz. For these purposes, left and right can be thought of as transducer one and transducer two. In unison - both transducers emitting 80Hz - the table vibrates subtly. As the sine wave from transducer

two drifts further in frequency in either direction, beats are created and are felt as rhythmic pulses.

In a tentative approach towards the table, leaning over to place both hands palms down, giving the table a moment to act, the human momentarily gives up its stature on the hierarchy of ontological value. In this vulnerable position the action of the table becomes the focus and, perhaps without realising, the human experience is removed from the centre of the creation of meaning in this moment. Only in the physical contact is the affective assemblage created. The audience member must engage the table as something other than an inert object fashioned to place things on top of. In what Bennett calls the decentring of human experience, a shift has been made in the hierarchy of active subject and passive object.

The Process

I wanted to represent the idea that all bodies are vibrating and connected in that vibration as discussed in chapter four with reference to Steve Goodman. Propagating sound waves at high pressure levels can set bodies into palpable and sometimes visible vibration and yet at the same time these vibrations can be too small for humans to perceive. In a study called "The Visual Microphone: Passive Recovery of Sound from Video", it was shown that the vibrations caused by human speech on the surface of an object - a crisp packet, in this case - could be captured with a high speed camera and the vibration subsequently decoded back to sound with the use of custom built software.

My question here was "how can I invite an audience member to place a part of their body onto some vibrating object?" Turning many scenarios over in my mind and on paper, I decided the vibrating object should appear to be an ordinary object, not some magical thing that we might anthropomorphise because it already seems otherworldly. Bennett asks us to recognise material agency in seemingly inert and ordinary objects and so I felt that the more ordinary the object the better. My first port of call for every day objects was my every day environment. I experimented with the things around me and eventually decided that my desk, a simple wooden table, would be the object. Using another custom patch designed in Max/Msp (see fig. 10), I experimented with frequencies until I found the ones that would cause a high level of vibration without much audible sound: a constant sine wave at 80Hz combined with a sine wave shifting from 70Hz to 90Hz and back in a continuous loop.

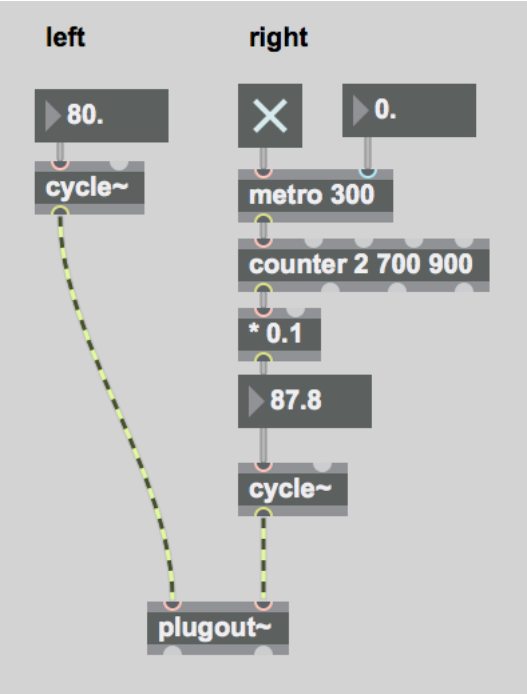


Fig. 10. Max/Msp patch designed for *The Table*.

One might draw a connection between this vibrating table and the two experiments I performed prior to this exhibition (*How Many Sine Waves Does it Take to Unscrew a Lightbulb?* and *Storage 1896-2015*). All three involve the vibration of surfaces by non-visible sound sources, asking the audience to question how they engage with those surfaces. *How Many Sine Waves* vibrated the walls of the room-within-the-room with fluctuating air pressure caused by pulsing sine waves. While one could hear the sine tones, the shimmering rhythmic sound of the foil vibrating filled the ears while the shifts in air pressure affected the body through vibration. The barely audible drones emanating from the hanging sheets of vibrating metal in *Storage* asked audience members to lean in, to place their ears very close to these evocative objects. There is submissiveness in the action of leaning in which requires more than a passive perception. One must meet the vibrating object half way in order to create meaning in relation. This was heightened further by the physical contact required to experience *The Table* as well as the act of bending to place both hands on the surface (at least for an adult of average height). This is to raise the status of non-human matter to a point of recognition of hidden potential. This is what Bennett asks of us in the world, and what I asked of my audience with this work.

ROOM 3 - LITTLE AGENTS

Bright colours and a sense complete otherness draws audience members into a strange ecosystem of playful chattering objects: a blue miniature piano, a brass parrot, a white vase hovers centimetres above the ground, a cowbell rests on bright green grass that covers the entire floor (see figure 11). The objects seem almost to speak to each other in a magical foreign language: harmonic drones interspersed with electronic beeps and glitches, all coloured by the materiality of each thing. These voices are not loud and some audience

members bend or even fall to their knees to better make out what these little agents might be saying.



Fig. 11. Room 3 - Little Agents.

Hidden inside and underneath several of the objects are different types of speakers emitting manipulated recordings of the empty rooms around the exhibition space. Dismantled mp3 players are hidden behind the room's fixtures and, with some modifications, connected to the speakers inside the objects. A tactile transducer, a piezo disc turned speaker or a small acoustic speaker was chosen for each object depending on the material, shape and size of each object. The sound files played indefinitely on a loop and each was independent of the others, allowing each mp3-player-sound-file-speaker-object assemblage a level of autonomy.

Here imagination and scale are the key to shifting the visitor's relationship to seemingly ordinary objects. The objects were all small things, many of which might fascinate a child, hinting at lifetimes of different origins, travels and uses: blue toy piano, red film canister, South African bird book, brass parrot, Peruvian copper cup, tin cup, silver maraca, Ghanaian bell, bicycle horn, cigar box, Italian decorative plate, white vase. The act of leaning into the space surrounding these objects in order to better listen to what they might have to say is in itself a gesture of recognising material agency in these non-humans, adjusting one's habitual mode of interacting with these objects. Bennett asks us to rethink the way we engage with objects, to raise their status as material bodies, and this work was aimed at achieving just that in a playful manner through playfully suggesting a type of engagement through listening as well as posture.

The Process

My initial intention was to re-install *Storage 1896-2015*, the earlier intervention in this same room as part of the exhibition *Rituals of the Living*. That work transformed long metal sheets found in the space into speaker objects that would emit manipulated recordings of the empty space, resulting in a barely audible harmonic drone. I encountered some obstacles.

Firstly, switching on the mp3 players to remind myself of the sounds stored on the micro-SD cards, I realised that although I had not used the players or removed the cards in the year that passed since the original installation, roughly half of the players did not recognise the cards in them. Having previous experience with these kinds of mp3 players

and cards (inexpensive ones procured from China Malls), I knew that I would need to test whether the malfunction lay with the cards or the players.

Inserting the cards into my computer, I found that some of the files on the cards had corrupted, resulting in the insertion of glitches, squeaks, burps, fascinating digital artefacts. It seemed to me that a non-human material agency had been exerted on or from within these mp3-player-micro-SD-card-sound-file assemblages, a reorganisation of the stored zeroes and ones, resulting in new affective sonic bodies and that, if at all possible, these should be preserved and incorporated into the magical world of agentic non-human bodies I was assembling. Many software applications would neither read nor save the corrupted files. I was however able to find a destructive sound editor called *Fission*, which was able to do both.

The second issue was a conceptual one - I had chosen this space for its acoustic properties and not for its historical context. I did not want to speak directly to the historical context of the space as I did in *Storage 1896-2015* and so the hanging metal sheets of that work from meat hooks now seemed out of place. The metal sheets in the original work were meant to evoke human bodies, hung from hooks and transformed into cold hard shadows of human bodies. For *Towards a Definition of Sound as Vibrant Matter* as a whole I wanted to avoid direct reference to the history of the space and so I would have to choose other objects that spoke more to my research into material agency. I decided then to find more playful objects that would draw more attention to themselves and create a sense of magic and wonder. This thought also led me to installing fake grass on the floor.

Because I was using objects with more "character" and more physical volume - possibilities for hiding different types of speakers with wider frequency ranges - I decided to experiment with further manipulations of the original and corrupted sound files. The originals were relatively high pitched since the piezo disc speakers used could only reproduce higher frequencies. The only manipulation I performed was pitch shifting, to bring these eight drones into some kind of relationship, to allow them to speak to each other more directly.

Once I had chosen the objects that would inhabit this magical world and become excited little agents, I began to test different types of speakers on each object. I had more objects than recordings and decided to leave some objects unexcited to heighten the sense of mystery and accentuate the different capacities of these objects. I experimented with all manner of materials and methods of connecting speakers and hanging some objects, also hoping to preserve the magical wonder by minimising the presentation of wires. A combination of stripping stranded copper wire down to single strands, careful lighting, and hiding mp3 players behind fittings and wires under fake grass, I was able to hide most of the wires.

ROOM 4 - THE TUNNEL

A large wooden trap door is propped up by a rusted piece of pipe, giving way to uneven stairs leading into a dark underground tunnel (see fig. 12). In order to make the first step one must bend at the waist to avoid striking their head on the trap door, which only opens to approximately 45 degrees. A low shifting hum emanates from the tunnel and a few steps in, one notices a fork in the corridor. To the right is a small room,

approximately three by three metres with a low ceiling, dimly lit, a large cube-like object covered in black fabric hangs by ropes from the ceiling at a height of about one metre from the ground (see fig. 13). The tones emitted from this object are barely audible yet highly palpable, shifting subtly in varying patterns of vibration. Suddenly a loud "BOOM" fills the space, reportedly causing audience members to jump with surprise. The audience member is reminded that they are indeed present, in their body, in this space, an included part of an entire pulsing assemblage. Back to the tunnel, the other corridor leads around a bend (see fig. 14). The tunnel leads further underground, the ceiling distancing itself from the floor, around another bend and into another room, quite similar to the first, except for the ceiling which is now about four metres from the ground. Another, seemingly identical object shrouded in black fabric hangs from ropes, though here substantially higher from the ground, about two metres. The tones emitted from this object are similar but not identical and one can hear the now familiar "BOOM" from this as well as the other black object down the corridor.



Fig. 12. Room 4 - The Tunnel. View of the trap door and stairs from the entrance.



Fig. 13. Room 4 - The Tunnel. Cube-like object covered in black fabric hanging by ropes from the ceiling.

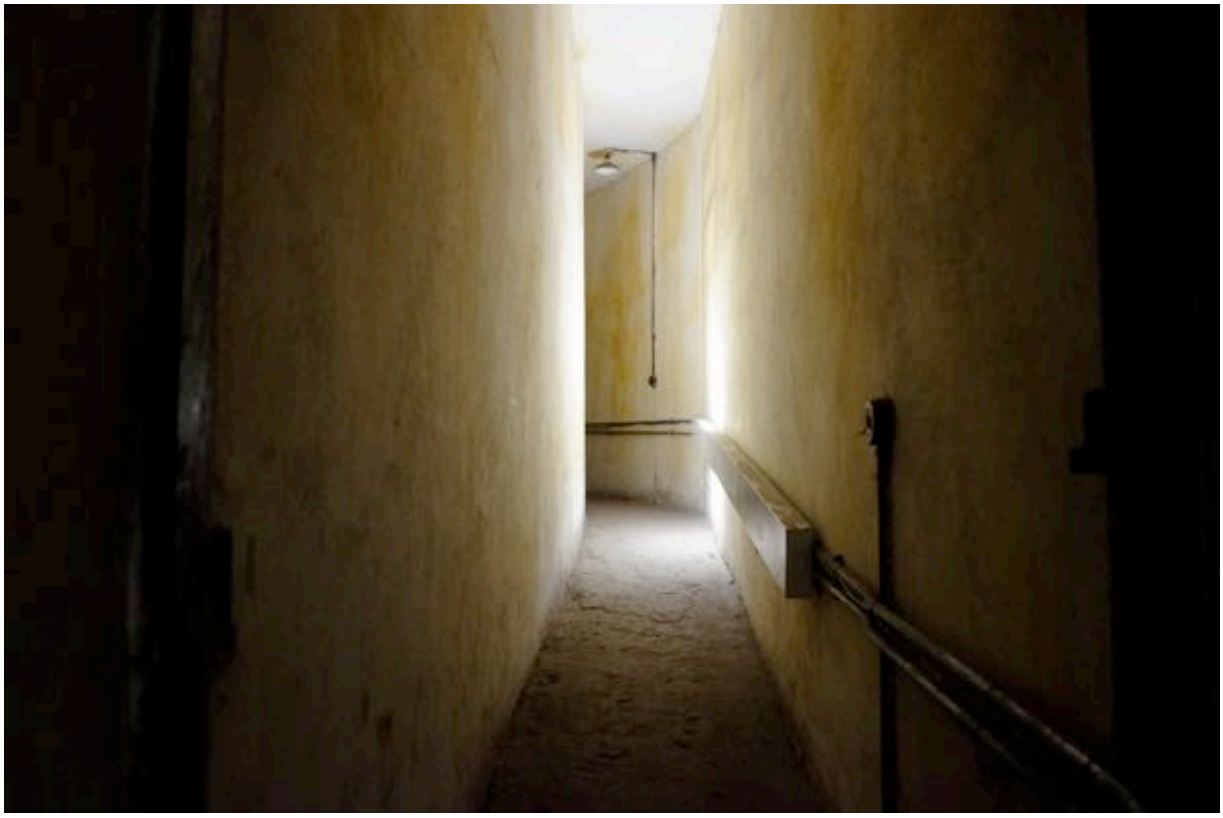


Fig. 14. Room 4 - The Tunnel. Leading to the far room.

Beneath the black fabric in each room are identical 18" bass speakers, known as low frequency emitters (LFE's). Each is emitting a series of sine waves at frequencies associated with the natural resonance of the planet Earth and thus the well being of all organisms that inhabit it. The primary frequencies used are the fundamental and several harmonics of what is known as the Schumann Resonance, explained in greater detail below.

The actual validity of claims towards the health benefits of these or any other frequencies lies outside the scope of this research and therefore irrelevant in this context. These frequencies were used as a guide towards creating a situation in which an audience member may question their habitual relationship with heard and felt space toward a recognition of the ever-presence of invisible forces at play around us by making reference

to the Schumann Resonance, a standing wave that is ever-present yet imperceivable to humans without the aid of technology. The Schumann Resonance is a global electromagnetic resonance phenomenon occurring when the space between the earth's surface and the conductive ionosphere is excited. According to schumannresonator.com, studies have shown that when deprived of the Schumann Resonance, for example in outer space or in an underground bunker, subjects have suffered health issues such as emotional distress and migraines. Brief exposure to the Schumann Resonance would restore health completely. Whether or not the findings stated here are valid, we could say that if indeed the Earth resonates at a certain frequency, it has presumably done so since the beginning of its existence, long before humans or any other organisms evolved. We might consider this a form of non-human agency that makes possible the existence of humanity.

The addition of programme notes explaining the choice of frequencies and their potential meaning creates a tension between the physical and emotional bent of the space (narrow tunnel leading to what could be isolation cells, though one cannot be certain - the official story is that these rooms were used for the storage of files) and one's own body. Beginning with bowing to enter the tunnel, audience seemed to move into and through the space with tentative uncertainty and heightened awareness of the senses. To embody a bow can be thought of as a symbolic deference or even diminution, further unsettling an approach into an unknown space. Again, by staging an uncommon encounter between audience-bodies, speaker-fabric-rope-bodies and sound bodies, the nature of and relationship between these bodies are called into question. As stated in chapter two, the subversion of the division of sound into camps of wanted and unwanted or meaning and noise draws attention to physical sensation and the act of perceiving sound. This

disruption calls attention to the virtual, the potential in contingent encounter, by obscuring the presumed hierarchy of agency.

When the sounds were transferred from the computer to the micro-SD card, a loud "BOOM" was generated each time the two-minute loop came back to its beginning. Though it was not my initial intention to include such a sound, many visitors reported being extremely startled by this sudden sound and I then decided to include it for two reasons. For one, I felt the sound and its effect drew visitors back to their own bodies and the following gradual release of tension in the muscles after the sudden contraction drew attention to the visitor's inclusion in this environment - a non-passive member of an active assemblage. This heightened the sense of relationality between present bodies. The second reason for including the "BOOM" was that, in the context of non-human material agency, that sound might be seen as the result of some kind of insertion of agency into the *ʂound-file-micro-SD-carð-mp3-player-LFE* assemblage. The very same sound file, when played from a laptop, did not include this boom artefact and so the particular grouping of individual elements exerted an addition, an unforeseen affect. Bennett states that one part of an assemblage can at times be so well placed that it has particularly strong power to alter the assemblage as a whole and refers to Deleuze and Guattari, who call this an "operator". In this case, the micro-SD card became an operator, introducing a small but new element into the capacity of the whole assemblage. The resulting addition became a memorable event for audience members.

Visually I wanted to create some sense of mystery or disconnect between the idea of a speaker emitting sound and the experience of moving through a darkened space and relating to an unknown object. In the ideal I would have been able to hide the speakers

completely, but this would have been technically and financially beyond my means. I thought of covering the speakers in black fabric as a way to negate the space they occupied. This would obviously not make them invisible, but rather invoke some idea of nothingness. A loose connection continually brought to my mind images of the artwork of Led Zeppelin's 1976 album *Presence*, depicting various mundane situations in a 1950s photographic style with the insertion of contour-less black object (see fig. 15). No explanation was given as to the nature or meaning of this object. It was for a long time a complete mystery and gave rise to rumours of religious cults among others things.



Fig. 15. Artwork of Led Zeppelin's 1976 album *Presence*.

The Process

From here the first room encountered after the right fork in the tunnel will be referred to as room 4a. The far room at the end of the longer portion of the tunnel will be referred to as room 4b (see fig. 4).

My intention here was to set up an environment that would yield a shifting experience of the space and tones projected into it relative to the position of the listener's body. I wanted to discover how sound waves might interact when projected from two different points of origin into an enclosed "networked" space, where the network in this case is created by the tunnels connecting the two rooms. The experiments began with one 15" active full frequency speaker in 4a and one identical speaker in 4b, each on a stand at roughly head height. I began by sweeping through audible frequencies in each room to find the resonant frequency of each. Room 4a had its highest resonance - a noticeable increase in perceived loudness and vibration - at 64Hz and room 4b at 81Hz. With the speakers at a high volume setting, the rooms vibrated vigorously, rattling metal grates and pipes. At a lower volume setting on the speakers, nodes and vibrating anti-nodes could be felt in the corridor.

I then continued by sweeping through audible frequencies in one room until I found something that interested me. I would then walk through the tunnel slowly to the other room and repeat that process. Each time I walked through the tunnel having adjusted the frequency of the oscillator in the room behind me, a new combination of tones was created and I recorded my impressions.

I then began testing the results of emitting two sine waves from each speaker. I found that 62Hz and 69Hz from 4a and 65Hz and 71Hz from 4b created complex patterns of vibration throughout the corridor. Further experiments included adding an attack-decay-sustain-release (ADSR) envelope generator to the oscillators, causing the tones to fade-in and fade-out over variable lengths of time, as well as projecting white noise from each speaker and boosting specific frequencies to excite vibrations within the spaces.

So far I hadn't found any combination of frequencies that provided a unique experience in relation to the other installations in the exhibition or that exhibited a significant shift in the felt space. Looking for a new direction, I decided to experiment with infrasound - frequencies below 20Hz, the threshold of human hearing - which has surfaced in different contexts in the research. Cox, Goodman, Schrimshaw and Kim-Cohen all speak about sound in excess of the ear and the capacities of those sounds to set bodies into vibration, to affect bodies as a tactile yet invisible force. I also cited in chapter four Tandy's paper about an exhaust fan in the laboratory that created an inaudible standing wave that affected all the lab workers in disarming ways. I knew I wanted to experiment with infrasound in the exhibition and so I would try it here.

I swapped the 15" full frequency speakers for 18" low frequency speakers or low frequency emitters (LFE's). I attempted to send extremely low frequency sine waves - starting at 1Hz - through the LFE, beginning with 4b only. This particular LFE is rated to reproduce frequencies as low as approximately 40Hz, and at normal volume levels, no sound was produced. However, when the input level to the speaker was increased significantly, a sound could be heard. Because the true reproduction of infrasound frequencies requires highly specialised (and highly expensive) equipment, this would have

to be my method of exploring these frequencies. Sweeping through frequencies starting at 1Hz and walking through the corridor, I recorded the following observations:

1Hz - Produces a slow throb, almost like a heartbeat or blood rushing through the ears. I am slightly confused; it feels like my own heartbeat.

1.5Hz - The pulse is noticeably faster and I can hear some overtones.

2Hz - The pulse becomes more pronounced further from the room.

2.5Hz - Nodes and antinodes begin to emerge in the corridor.

4.6Hz - The volume of the tone in the room seems to jump considerably.

7.7Hz - Palpable nodes and anti-nodes, very physical sensations of air moving. Atmospheric sounds from outside seem to shimmer in my ears, as though they are set into vibration by the moving air on their way to my ears.

8.3Hz - The volume of the tone in the room again seems to jump considerably, this time almost unbearable on the ears. There seems to be a pressure barrier at the second bend in the corridor from room 4b. The sound of my hands clapping from that point echoes back with a delay of approximately 500ms.

10Hz - Highly audible nodes and anti-nodes, highly noticeable shifts in pressure at different locations in the corridor. An extreme vibration occurs at the second bend of the corridor, causing my trouser legs to visibly and palpably vibrate.

13.7Hz - High vibration at low volume.

15.2Hz - The pitch of the tone seems to rise and fall.

19Hz - Above 19Hz the sound becomes very loud without any noticeable emergent patterns.

The emission of combinations of low frequency sine waves such as 1Hz and 3Hz from the same LFE yielded similar pulses, though faster and less affective. Again the simplicity of a single continuous tone felt most affective.

Switching the LFE in room 4b off and moving to room 4a with an identical speaker, I ran the same experiment from that position. Frequencies between 1Hz and 2Hz yielded similar results to 4b with different findings from 2.7Hz:

2.7Hz - Definitive nodes and anti-nodes plus the presence of a strong overtone at 163Hz. Adding an additional sine wave of 163Hz seems to accentuate the pulsing feeling and the higher tone is clearly audible in the nodes.

4Hz - The anti-nodes become very loud and palpable and a clear overtone of 223Hz is present. Adding a 223Hz sine wave to the original 4Hz, the combined sound is reminiscent of a synthesiser warbling.

4.6Hz - The room begins to shudder and I hear something unidentified rattle in the ceiling.

8.5Hz - Nodes and anti-nodes are especially palpable.

In addition to these frequencies, I found 5.7Hz and 10Hz somehow interesting, though for no explicit reason. I then tested numerous combinations of frequencies emitting from both speakers simultaneously but found little of interest with the exception of 1.5Hz from 4a and 1Hz from 4b. This combination produced the sensation of continuous shifting which stabilised when I stopped moving.

Feeling that the tunnel could provide a good opportunity for exploring infrasound phenomena but unsatisfied with the results of my experiments, I recalled hearing something about the possibility of the existence of a resonant frequency of the planet Earth. Considering Vibrant Materialism as a move towards more ecological practices, towards a more considered interaction with our world, an Earth tone might be a good fit. Further, considering ways to alleviate the weight of the historical context of the space, I hoped that bringing in a positive contextual connotation, however subconscious, might lighten the experience of being in the dark underground tunnel.

An internet search brought me to the website www.schumannresonator.com, devoted to the Schumann Resonance - a global electromagnetic resonance phenomenon occurring when the space between the earth's surface and the conductive ionosphere is excited. The Schumann Resonance has a fundamental frequency of 7.83Hz with harmonics at 14.3Hz, 20.8Hz, 27.3Hz, 33.8Hz and 39.4 Hz. With the fundamental of 7.83Hz emitting from 4b and the first harmonic of 14.3Hz from 4a, shifting beats and rhythms were created in the corridor. The effect was unsettling but when the volume was adjusted to the lowest possible setting to activate the speaker, it became more subtle and calming. To add more depth to the atmosphere in the tunnel I added alternate harmonics to each speaker: 7.83Hz, 20.8Hz and 33.8Hz from room 4b, 14.3Hz, 27.3Hz and 39.4Hz from room 4a. I chose to start with the fundamental in room 4b, the furthest room - furthest from the entrance to the entire space, furthest from natural light, furthest underground - because I wanted the deepest tone, the fundamental tone created in our natural atmosphere, to emanate from deep underground, as if our understanding of the world was turned upside-down, or inside-out.

The website www.schumannresonator.com also stated that other frequencies are thought to promote health in more specific areas. I tested and eventually included some of these frequencies that related to ideas that surfaced in my research. If bodies are in constant flux, and as Massumi states, that without change "the universe would be without potential, pure entropy, death" (Parables 35), then the frequency thought to "und[o] situations and facilitat[e] change" - 417Hz - seemed fitting to include. Frequencies to promote "transformation and miracles" - 528Hz - and "awakening intuition" - 741Hz - were also included. The latter carries a particular resonance for me, having found great interest and some comfort in Massumi's quantification of intuition as a real interplay of activities. For Massumi, intuition heightens a body's connection to its own abstractness, where abstract means presence in flux and movement rather than in one fixed position (Parables 5). Through intuition we open to change, motion and difference. We insert ourselves into the dynamic process of becoming (and art-making) and our insertion is returned to us in varied form and the cycle goes on (Massumi, Sensing the Virtual 1).

The choice to hang the speakers from ropes came from the same desire to cast a shadow on the nature the speakers as objects. Placing the speakers on stands or even plinths would have made the audience's relationship to these objects far more certain, something I wanted to avoid.

ROOM 5 - 50Hz to 700Hz to 50Hz. And Again.

In a darkened room an unidentifiable black object, positioned on the floor in the centre of the room, is silhouetted in a wash of red light (see figure 16). Bricks peek out of the black fabric covering the object. There is a window at the far end, which has been closed

with bricks. A slowly and steadily ascending sine wave seems to move around the room at varying speed, something like a mosquito, drifting slowly and then darting. Attempting to locate the origin of the sound leads to no conclusions. The amplitude of the sound also seems to fluctuate. When the tone reaches an uncomfortably high pitch, it reverses direction and descends, still drifting and darting.



Fig. 16. Room 5 - 50Hz to 700Hz to 50Hz. And Again.

One 15" active full frequency speaker is placed face-up in the centre of the room emitting a steady sine wave continuously ascending and descending, from 50Hz to 700Hz and back again. The sine wave interacts with the room's materials, dimensions and shape to create the sensation of a roving origin or of a sonorous body drifting around the room. As a certain frequency reflects from the surfaces of the room back towards the point of origin - the speaker - a new frequency is already being emitted from the speaker and a

momentary standing wave is created at a particular position in the room. In the next instant a new frequency is already present and interacting with all the other frequencies in the room. Because this is continuous, the web of interactions between the waves doubling back on themselves causes this sensation of the movement of the sound itself.

This sensation evokes an image of a web - a web of interacting forces - affecting, being affected, influenced to some degree by bodies entering into this web by interrupting or absorbing sound waves. There is nothing much to see here, and reduced to its smallest part, the sine wave does not provide much to listen to. The audience is left to feel and attempt to understand the relationship between their own body, the flying sonorous body and the space they inhabit together.

The Process

I knew I wanted to experiment with the resonant frequency of a room in this exhibition. In my various walks through the different rooms, I noticed that this particular room seemed to resonate at different frequencies. Its size and shape was unique in the context of the other rooms: long, narrow, arched ceiling.

I placed one 15" active full frequency speaker face-up in the centre of the room and sweeping through the frequencies of a sine wave showed that 50Hz was the lowest sensible frequency in that room with that speaker and frequencies above 1kHz didn't seem to react in any special sensory way. Certain frequencies seem to jump out, they appeared considerably louder than frequencies on either side of it. In this case, 56Hz and 84Hz. As a method to test this continuous sweep through range of audible frequencies, I programmed

a simple patch in Max/Msp that would count from 50Hz and 1kHz and back to 50Hz in a continuous loop at a specified rate.

The first thing I noticed was that counting through the frequencies in whole integers caused an audible jump in perceived pitch rather than a smooth continuous sweep. I adjusted the patch to include decimals to the second place. Now counting between 50.00Hz and 1000.00Hz at a rate of 17ms per 0.01Hz, I noticed that the sound seemed to shift position in the room in relation to myself, standing in one position. The volume of the tone also seemed to shift slightly at certain frequencies and more drastically at others. I found this made me pay closer attention to the sound as it passed from my left to my right, front to back, top to bottom. Overtones began to emerge as the sound reflected from the walls, ceiling and floor, doubling back on itself, creating complex combinations of microtonal intervals, momentary standing waves at various positions within the room. My sense of time began to shift, as if I was losing my general feeling for the length of a second or a minute. It seemed to take an extremely long time to reach the highest frequency and begin the descent back down to the lowest.

Adjusting the speed of the climb to 3ms per 0.01Hz accentuated the sense of the sound's shifting position. I experimented with the speaker's output volume, finding that below a certain level, the sensation ceased, presumably the force of the waves was then too low to reflect in the same way. Above a certain level made the sound uncomfortable on the ears without any added or different sensation. I found the higher frequencies also uncomfortable on the ears and so adjusted the upper limit to 700Hz.

ROOM 6 - SONIC FICTIONS

The final room of the exhibition is the largest, though on first entering a visitor is unable to see the edges of the room. Lit primarily by a single blue 40-watt light hanging about 1.5 metres from the ground in the centre of the room, the corners fade into shadow (figure 17). A rich texture of recorded sound comes from everywhere towards the blue light in the centre. Slowly these recordings begin to warp, they become less real. Individual sounds begin to swing around the room as harmonic overtones emerge and begin to swallow the recordings. New sounds begin to emerge from far away, sine and square waves hovering around the drone of overtones that is now fading. They appear in one place and vanish in another while a deep pulsing rumble builds in intensity. A climbing square wave becomes more present until the entire space is shaking and the audience is suddenly dropped into relative silence. The space is present simply as it is, for a moment, until seconds later the recordings return.



Fig. 17. Room 6 - Sonic Fictions.

Six speakers - two 12" full frequency, two 15" full frequency, two 18" LFE - are spread around the edges and corners of the room. These are fed by signals from a computer using a sound card with multiple outputs allowing a discrete signal to be sent to each speaker. Discrete signals can also be panned from one speaker to another and this can be automated over time, making this piece a composition of sorts. The piece begins with recordings made in the empty rooms of the exhibition space at the beginning of the process of creating the exhibition. Each speaker plays a recording from a different room so that the result is a fictional sonic space composed of the sonic identities of several rooms superimposed onto and into one another. The highest frequencies of the recordings are gradually removed and a slow crossfade begins between those recordings and variations on them resulting from their resonant frequencies being accentuated far enough to create a whole series of overtones. At this point, the sounds begin to wander between different speakers. Sine tones of the frequencies of some of the presented overtones appear at intervals at different speakers and move between them. The low frequencies sent to the LFE's are now made louder until they cannot be ignored and a choreographed drop to silence cues the last five seconds of the piece, which allows the audience a moment to breathe and return to themselves before the piece starts again.

This piece might be thought of as an intervention into our habitual mode of relating to space through a manipulation or transformation of the heard and felt. Beginning with recordings, representations of the "real", the audience has something recognisable to connect with. This sonic space is however not "real" in the sense of a representation, as it is constructed through the combination of several sonic spaces. The space becomes gradually more fictionalised bringing to the fore dimensions of space that normally go unheard and thus are not consciously experienced. This space is not defined by its physical boundaries,

now invisible, but by its sound. And when its sound is no longer anchored in position but in exaggerated flux, moving from speaker to speaker, the listener is drawn along with it, drawn in as a part of the flux. In this fictional space that combines elements of the real (material) and imagined (virtual/potential) the audience may let go of the subject/object relationship - I/room. The listener becomes a body in flux, part of a lager flow of forces that move and are moved, affect and are affected.

The Process

Deciding that I ultimately wanted to bring together much of what I had learned in my time in these rooms and at the same time begin thinking about what a departure from pure relational interactions between the materiality of sound and the physical structure of enclosed spaces might look like, I decided to create a more time-based work that would take an audience through a gradual abstraction of space. This was also a means to suggest a way forward for myself in terms of potential future exploration and output.

After drawing up a plan for positioning the remaining speakers (see fig. 18), I installed and began testing frequencies. I wanted to experiment with creating a multichannel, broad frequency range sonic environment. The sounds throughout the exhibition up to this point had been treated individually - one mp3 player with one speaker for each sound - and not run in synchronisation with each other. Wanting to allow for the possibility of synchronisation between channels, I began the experiments using a laptop and an external sound card with multiple outputs, allowing me to route signals to each speaker individually or in any combination I chose.

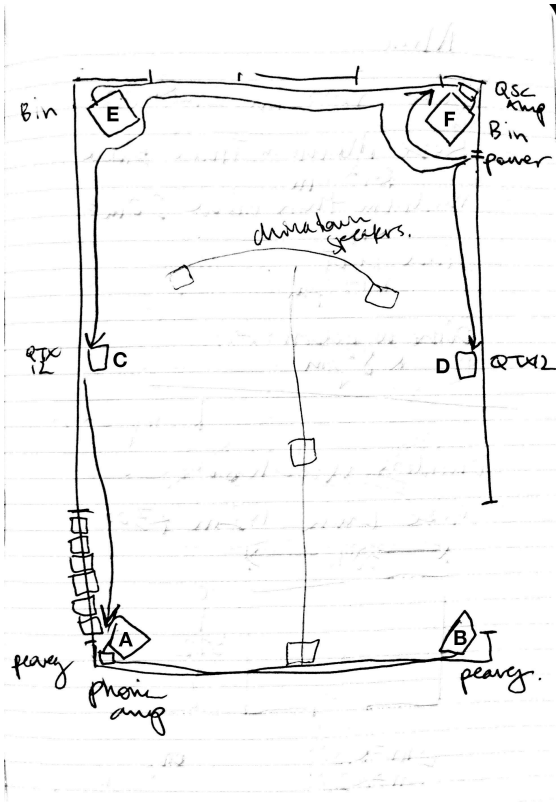


Fig. 18. Installation plan for room 6.

The following section details the experiments undertaken, first in table form (fig. 19), then described in more detail.

	SPEAKERS					
EXPERIMENTS	A	B	C	D	E	F
1	100Hz	108Hz	222Hz	227Hz	72Hz	65Hz
2	81Hz	83Hz	161Hz	157Hz	40,6Hz	41Hz
3	Room 5 Tr1	Passage Tr1	Room 3 Tr1	Room 2 Tr1	Room 1 Tr1	Room 1 Tr2
4	As above, adding harmonics using chains of EQ					
5	Various synthesized helicopter sounds					
6	Percussion sounds					
7	Max patch randomly jumping through time in the recording of Room 1 Tr1					
8	Room recordings with some filtering					

A	15" Passive Full Frequency
B	15" Passive Full Frequency
C	12" Active Full Frequency
D	12" Active Full Frequency
E	18" Passive Sub
F	18" Passive Sub

Fig. 19. Table mapping experiments to multichannel speaker array.

Experiment 1. To get started I sent sine waves of arbitrarily chosen frequencies to each speaker and walked around the room to observe the resulting atmosphere. I found

that standing waves were created at various points in the room and these seemed to shift in relation to my position.

Experiment 2. This was very similar to experiment 1, with the difference that I swept through the frequencies to find ones that seemed to excite the room in relation to the frequency range and properties of each speaker. This resulted in a more complex pattern of rhythmic pulses and emergent tones as I moved around the room. Some sounds would be masked by others at specific points in the room as I entered anti-nodes, to reappear as I moved to a new position.

Experiment 3. Next, using recordings of the different empty rooms I made on my first day in the space, I sent a different recording to each speaker, effectively superimposing the sound - the resonant characteristics and micro-activity - of each room into the space of the room I was currently working in. The space became lively with activity, a sense of bustling and movement. The LFE's were projecting rumbles which I could feel in my belly, while I could hear the sound of a fly amplified beyond any sense of realism. This was a fictional room, displaced in space and time, though thoroughly rooted in the material world.

Experiment 4. Using the same recordings, I began to tease out the resonant frequencies of each recording using the same technique I used in Room 3: Little Agents. Though I enjoyed the sounds that ensued, I felt it sounded like a larger version of soundscape created in Little Agents, ultimately not different enough in the context of the whole exhibition to warrant presentation.

Experiment 5. Walter Murch, credited with inventing the term "sound design", was one of the first to employ a multichannel speaker array in film. While working on *Apocalypse Now*, feeling his way through a then new surround speaker setup, Murch stated that he felt as though he were designing space through sound, the way an interior designer would move furniture and experiment with colour. For *Apocalypse Now*, Murch created a synthesised helicopter sound, which was assembled out of all the various smaller sounds made by the different parts of a helicopter. When played as a whole, it sounded like a real helicopter, but in different combinations, the individual sounds would be evocative of other things.

I wanted to find out what helicopter sounds might do in this room and so I downloaded various synthesised helicopter sounds I found on the internet. I chose six sounds and sent one to each of the six speakers I was using. It was an interesting atmosphere but felt too far from an investigation of the material agency of sound. In the end it was a small detour towards what the piece would become.

Experiment 6. Although at this point I was quite certain that referential sounds - the sound of a helicopter, for example - would not serve an exploration into the material agency of sound itself, I wanted try another such experiment. I sent strings of individual percussion sounds to each speaker, chosen at quasi-random, guided by frequency ranges that would suit the respective speakers: bass-heavy drums to the LFE's, cymbal type instruments to the smallest speakers, etc. The result more comical than anything, like a mad drummer flailing.

Experiment 7. For a previous project I created a Max/Msp patch that would open a sound file and continually play short segments starting at random points in the file (see fig. 20). The result is something of a cut-up, like an audio version of refrigerator magnet poetry. I ran this patch on one of the room recordings to metaphorically carve the room into smaller pieces and rearrange them. The result was a more confused version of experiment 3.

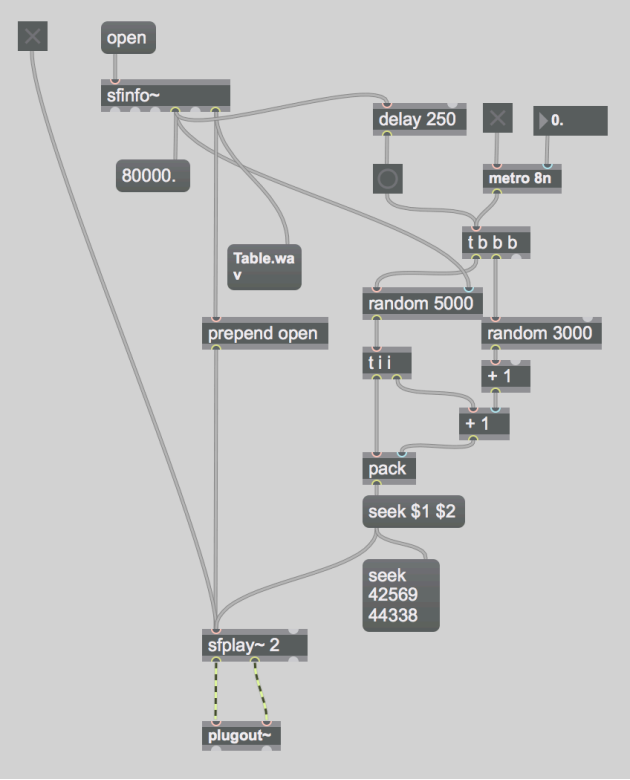


Fig. 20. Max/Msp patch designed to "shuffle" the playback of a sound file.

Experiment 8. Recalling the experience of making the room recordings, I wanted to try to recreate the sensation of heightened awareness I experienced. While recording, both the recording level and the monitoring level in my headphones were very high, resulting in everything I heard seeming to be positioned very close to me. I continually thought someone or something was in the room with me. For this experiment, I repeated

experiment 3, but at a very high volume. The result was quite similar to the result of experiment 3, though far more uncomfortable. I noticed that the very high frequencies in the recordings made them seem unrealistic and rolling them off with an EQ made the room more comfortable.

CONCLUSION

This dissertation posed the question of whether a case could be made for a definition of sound as vibrant matter and how this might be explored through an arts practice. That is, whether sounds could assist in presenting an understanding of materiality as a set of autonomous "forces with trajectories, propensities, or tendencies of their own" (Bennett viii) which can act beyond our human intentions and without our intervention and what the implications of this might be.

My initial exploration was highly theoretical, drawing connections between different philosophies of material agency as well as affect theory. These philosophies are connected by the idea that autonomous non-human forces exist in the world in a constant flux and that attuning to these forces may guide us towards more ecological practices. New Materialism reconstructs our understanding of bodies and agency as a continuous unfolding of potential in a flux ontology, a continual becoming in which a body is defined by its agency, its capacities to affect and to be affected in that becoming. Vibrant Materialism expands and focuses these ideas onto objects, things, the stuff in the world, and the implications of a greater sensitivity to the capacities of things to catalyse change to the way we handle social, political and environmental problems. Sonic Materialism then establishes sounds as autonomous material particulars exemplary of the flux ontology at the heart of New- & Vibrant Materialisms by shifting from questions of what a sound might mean towards questions of what a sound does, how a sound performs.

My dissertation and creative practice as a project contributes to the body of research and writing on material agency by presenting sound as an agentic force closely aligned with Bennett's claims that all things possess some level of power to affect change in the world. Applying this to arts practice afforded me a way to speak about issues of human

social, political and environmental practices by deprioritising human experience in an encounter with other material forces. By creating a physical outcome in which sound could perform and interact with itself and its iterations (reflections, echoes, wave patterns) through the acoustic properties, dimensions and materials of a particular space, an independent shifting pulsing ecology unfolded, into which an audience could introduce itself. The audience was clearly a visitor or a guest in this vibrant ecology of sound, an observer who must see not with eyes, but with the whole body. The primary mode of coming to understand the space was through a heightened multisensory awareness, in itself a small decentralisation of the human experience by disrupting the habitual mode of navigating the world led by the eyes. This was a demonstration of the decentralisation of human experience leading to questions of the nature of the human body's ongoing formation in relation to other bodies. This then feeds back into the human experience by highlighting a greater sensitivity to shared material agency and our capacity to influence the world. The exhibition made no categorical claims but rather sought to get under the skin, to engage bodies consciously and subconsciously in order to linger with questions of the nature of bodies and material interactions.

I am in agreement with Bennett that there are issues with our *approach* to finding solutions to human problems, that our solutions are not ecological. That is, the hierarchical structures of systems of value dictate that only the needs of a few are considered or deemed valuable. I am looking for ways to discuss and critique these imbalances and, as Salter puts it, "ultimately developing a political framework that collapses the "great divide" between nature and society" (10). Sound art provides a platform for the exploration of Bennett's theories in practice. By activating the in-between through charging felt space with palpable vibration, emphasis shifts towards the commonality of all bodies. Bodies are

connected in space by a web of affective forces and through their shared ontology of flux and in this way, we can begin to approach a less hierarchical plane where more commonalities can be recognised more of the time, differences can be viewed in new ways. Bennett states that when we begin to view all matter as vibrant, "we see that biochemical and biochemical-social systems can sometimes unexpectedly bifurcate or choose developmental paths that could not have been foreseen, for they are governed by an emergent rather than a linear or deterministic causality" (112). The recognition of a distributive agency and responsibility throughout the entire material world may be a step towards a restructuring of the distribution of value on a less hierarchical plane.

Now that I have completed my research I can say that I have learned much and I have uncovered new questions. The processes I have engaged with in this research have changed the way I think about sound, space and my relationship to the world. They have changed the way I hear, the way I perceive. I have become much more aware of sounds and how they affect my body. My ears are now only a small part of my entry into the world of sound. I am always aware of the material presence of sound filling every space that I once thought of as empty and the vibration that connects the entire material world. I encountered issues in dealing with the space at Constitution Hill. The limited scope of this thesis did not allow for a direct engagement with the socio-political historical context of the space. Further study might involve exploring histories and architectures through the materiality of sites by looking at physical structures holistically as an assemblage of active parts. Other possible areas of future research of great interest to me include investigations into other kinds of implications and alternatives to hierarchical power structures, for example within governance (anarchist politics), business and trade (cooperatives or barter systems) and ownership of artistic projects (cooperative ownership models).

As a closing statement, a poetic ending, in the words of sound artist Sam Auinger, "when we go out into the street and it's loud and disturbing, what you actually hear is our culture. You can't sit at home and order a new book on Amazon and then wonder why a truck runs screaming through the country […] Those are multiple living wavelengths generated by everything we are doing. So let's talk about what we are doing" (qtd. in Salter 45).

APPENDIX A

Technical Equipment

2 x 18" Active LFE

2 x 18" Passive LFE

2 x Amplifier

2 x 15" Active full frequency speaker

2 x 15" Passive full frequency speaker

2 x 12" Active full frequency speaker

4 x Tactile transducer

8 x Piezo disc transducer

25 x Mp3 player with built in speaker

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