

So Late So Soon

By

Garnet Willis

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Abstract

So Late So Soon: A thesis exhibition positioned on the crossroads between sculpture, installation and sound, investigates the line between subject and object as well as the means by which the listener/viewer can be physically integrated into the work.

Some of the works function through direct performative bodily interaction while other works explore heightened awareness of sound, requiring active or enhanced listening to nearly inaudible sound. In all cases the manifestation of sound is visually cued by clues provided by the visual apparatus of the physical installation.

The intention is that the four pieces comprising this exhibition will reveal their overarching thread of experiential meaning to deliver an environmental message speaking to interconnectedness-made-urgent under the imperative of time as it ticks ever onward, to spur a shifting... an uneasea political response.

Keywords:

Anthropocene Climate Change Inaudibility Installation Latour Listening

Perception Sound Sculpture

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Dedication

To the living memory of my Father and our family workshop, to his good humour, patience and love of building things, to his sensitivity to materials, and the skills he imparted.

Table Of Contents

List of Figures	viii
Preface	2
Research Questions	3
Intentions Behind This Project	5

The Over-Arching

Part One: <i>Agency</i>	6
Part Two: <i>Time</i>	13
Interregnum	19

The Pieces

Part Three: <i>Gaia's Banjo</i>	21
Part Four: <i>The Sound That Severs Now From Now</i>	36
Part Five: <i>Clarion Call: The Heat of a Million Voices</i>	47
Part Six: <i>Now The Ears of My Ears Awake</i>	52

Contributions

Concluding Remarks	56
Works Cited	58
Appendix: Arduino Code	60

List Of Figures

All works produced by Garnet Willis.

Figure: Title	pp.
fig. 1. <i>Now the Ears of My Ears Awake (Francesca)</i> . 2016 Photo by Cylla von Tiedemann	1
fig. 2. <i>Gaia's Banjo (Artist)</i> . 2016 Photo by Cylla von Tiedemann	6
fig. 3. <i>Gaia's Banjo (Shadow Details)</i> . 2016 Photo by Kevin Neshevich	13
fig. 4. <i>Gaia's Banjo (Detail)</i> . 2016 Photo by Cylla von Tiedemann	19
fig. 5. <i>Gaia's Banjo</i> 2016 Photo by Cylla von Tiedemann	21
fig. 6. <i>The Sound That Severs Now From Now (Detail)</i> 2016 Photo by Cylla von Tiedemann	36
fig. 7. <i>Clarion Call: The Heat Of A Million Voices (Details)</i> 2016 Photos by Kevin Neshevich	47
fig. 8. <i>Now The Ears Of My Ears Awake (Detail)</i> 2016 Photo by Cylla von Tiedemann	52
fig. 9. <i>Now The Earthbound</i> 2016 Photos by Garnet Willis Post Production Montage by Alberto Barattucci	56
fig. 10. <i>The Sound That Severs Now From Now (Detail)</i> 2016 Photo Cylla von Tiedemann	60



fig. 1. Garnet Willis. *Now the Ears of My Ears Awake (Francesca)*. 2016
Photo by Cylla von Tiedemann

So Late So Soon
By Garnet Willis

Interdisciplinary Master's in Art, Media and Design
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Preface

I have always been fascinated by the world of sound and the revelatory beauty that is inherent in all sound environments when they are listened to actively. My background as a musician, composer, instrument builder, multivariate electronics geek and audio engineer all reflect this predilection - this common sound-thread, woven like passion, into the work.

Since the mid 1980's I have designed, built and/or produced many objects specifically for the production of sound: some of these have been self-playing "physical scores" that have incorporated chance and chaos into their compositional probabilities, while others have been more to do with interface, and how to approach/change/extend our bodily and performance efficiencies. A third aspect of my work has involved the research, development, and implementation of technologies to mediate and modify acoustic spaces, refining approaches that change the way in which we perceive both the acoustic space and our bodily position within it.

With hindsight, I can see a trend through all of this, which has been a slow evolution, away from the abstract ephemerality of music as "the signal of sound in the air" towards works that have become increasingly sculptural in both a physical sense (bodies in space) and in a sound sense (mapping of sound morphologies onto space.)

One of the prime objectives underscoring my motivation to enroll in the Interdisciplinary Master's in Art, Media and Design program has been to

explore and develop an interdisciplinary methodology that can enable me to take my priorities (previously rooted in composition with sound as a cornerstone) and flip them upside down to favour the physical and its manifestations of form in space, to enable SOUNDsculpture to become soundSCULPTURE.

Research Questions

There are three research questions that have continued to be operative in forming the basis of this thesis investigation.

- 1) Does sound, which contextualizes and affirms our bodily relationship to our acoustic surroundings, still embody us when its temporal/spatial aspects are intentionally scrambled and presented in a way in which we are sensorially unaccustomed?
- 2) When presented with very quiet sound on the cusp of perceptibility, does the intensive listening that is necessary to apprehend sound (and its related visual phenomena) heighten one's awareness? When does hearing become listening, what qualities of sound assert themselves, such that they demand to be listened to, rather than simply heard?
- 3) Is it possible to "transform materiality that seems at first self-contained so that it reveals what it needs to subsist through a complex ecology of tributaries, allies, accomplices and helpers?" (Latour, *Networks* 799)

While the preceding questions have formed the basis of this thesis, they have also changed through the process of writing and making, morphing into new forms. The questions have primarily served a dual function, firstly shaping my thoughts about how we may experience the *art in situ*, and secondly as prime motivators – a series of *actants* (more on this later) behind the development of both the artwork and this support document. As this project has unfolded, further questions have emerged, and these *open questions* are scattered throughout this text... perhaps dangling - searching for connection in some future expansion of this work.

Intentions Behind This Thesis Project

It is my intention to create a cohesive body of work that engages observer/participants and acts as a carrier of an eco/political message that is impactful on multiple levels. Key to this is the way the sound element is tied to the visual in the work, to present interconnections in time and space to our perception in such a way as to give palpable form to the sound while serving both to map the gallery space sonically, and to locate observers bodily within it. Further to this, it is my hope that this work will serve to foster re-engagement that entices and challenges our powers of perception through nuanced sonic explorations at the cusp of new experience. Revolutionary change is brought about through the agency of a myriad of small influences and my hope is that we can, in small ways, orient ourselves through our active perception, so perhaps we can also connect at a more intimate level with our communities and planet.



fig. 2. Garnet Willis. *Gaia's Banjo (Artist)*. 2016
Photo by Cylla von Tiedemann

The over-arching PART ONE: Agency

A good deal of this thesis support document will be dedicated to mapping out the notion of ‘feeling one’s way’ as a methodology. I am an artist with a highly rational and scientific nature. Nonetheless, my working process and my very ideas are the results of many decades of what I can best describe as an ongoing creative collaboration between myself and my materials: materials who’s specific properties, be they luster, density of grain or tactility have come to be my trusted guides. I therefore feel it is important for me to document pragmatically, the process of crossover and interface that bubbles through the cracks not only between the various disciplines within which I work, but also between subject, object, agency and even authorship that is my working process. In this regard I

agree with artist, author and art theorist Graeme Sullivan who advocates that one of the main motivations behind a document like this should be to lend weight, to make - as he says: “the visual arts provide a way of coming to know the world that is real and relevant” (224).

My work has involved two primary production methods that I draw upon as needs be to best create the various aspects of my art. For these methods I have borrowed the names *Holistic* and *Prescriptive* from Ursula Franklin, who penned them in her Massey Lectures cum book, “The Real World of Technology.” Her analysis and observation of production methods, and ways in which they influence thinking, closely parallels observations I have made when reflecting the various ramifications of process in my own work.

The majority of the time I work *holistically*, where my work is done from an interrogative stance that privileges sensitivities to the process, materials and conditions and uniqueness of creation over efficiency and economies of scale. As Franklin writes:

Holistic technologies are normally associated with the notion of craft. Artisans, be they potters, weavers, metal-smiths, or cooks, Control the process of their own work from beginning to finish. Their hands and minds make situational decisions as the work proceeds, be it on the thickness of the pot, or the shape of the knife edge, or the doneness of the roast. These are decisions that only they can make while they are working. And they draw on their own experience, each time applying it to a unique situation. The products of their work are one of kind. (10)

On the other hand, often embedded within a larger *holistic* approach, I will

employ methods that parallel those Franklin describes as leading to *prescriptive technology* where, she writes, the steps of the process are:

prescribed with sufficient precision to make each step fit into the preceding and following steps... orchestrated like a piece of music - it needs the competence of instrumentalists but it also needs strict adherence to the score in order to let the final piece sound like music. (16)

When I am working prescriptively, my 'score' comes as a set of steps pre-planned (by me) using a computer aided design system with a designerly emphasis on efficiency. This process assumes that economies of scale are important, as are rational efficiencies, and does not allocate time to *listen* to the materials. I acquiesce to the process and adopt a mindset to *become* the technology so as to fit within what Franklin refers to as a "*design for compliance*" (16).

This *prescriptive* approach takes precedence over my default *holistic* mindset when I have a causally specific intent, one often with an eye to the production process within which materials must be prevailed upon through a pre-determined set of steps as a way of ensuring they submit to their new context - usually a noun, such as 'pulley' - at the end of the chain.

I have always done what I used to call *collecting inventories*, which is my term for a *holistic* cataloguing process that involves either a gathering of objects and materials themselves, or a process of making sure I know where to get those objects (and more importantly their collected potential agencies) in the future,

should I require them to integrate themselves into something not yet conceptualized. Later perhaps some object, idea or chance happening would suggest some potential to me, which would cause some other collected item to connect in my mind. At that point, with two linked objects, a critical mass would be started. Overlapping concepts, functionalities and potentials working much like gravity would then attract more collected objects, thoughts, ideas. All of this would result in a slow accretion of objects and influences coming into the fold allowing for the creation of a kind of *remix planetoid* - a work that could not have happened without having granted influence to those objects and their potential agencies all along.

Actor Network Theory, (A.N.T.) has recently become integral to my way of thinking and is central to the development of this body of work. It is a set of conceptual tools developed by scientific philosopher Bruno Latour with Michel Callon and John Law to enhance ways of thinking about scientific progress. The curious name, which, according to John Law:

...is a name, a term which embodies *tension*. It is *intentionally oxymoronic*, a tension which lies between the centred 'actor' on the one hand and the decentred 'network' on the other. In one sense the word is thus a way of performing both an elision and a difference between what Anglophones distinguish by calling 'agency' and 'structure'. (5 emphasis in original)

A.N.T. focuses on the *how* of how things get done and sees agency and interconnectedness as being far more important than static knowledge and nomenclature. What I realized, was that the thing I had called *collecting*

inventories was actually - from an A.N.T. perspective - a process of multiplying agencies, which greatly increased the potential for things to “click” by allowing objects to sit in the back of my mind dangling with inchoate agency extending outward like time-lapse tendrils on a vine, sweeping back and forth searching for purchase... for connection. Latour, in his book “We Have Never Been Modern” argues that many suppositions we have taken to be modern truths fail to stand up when placed under the lens of his methodology. Rather than bracketing human knowledge and experience into categories, where knowledge of people and politics (the social sciences) are put to one side, and knowledge of objects and things (the hard sciences), are put on the other, Latour simply proposes that everything was – and always will be – a hybrid of the two. Furthermore, conceiving of these hybrids within the social circumstances in which they evolved, cleverly avoids a lot of contortions we have been forced to make to accommodate binary opposition over the past several hundred years. Latour defines what we call *Modernity* as a kind of aberration in thinking that has abandoned rigorous pursuit of networks of interaction beyond a certain point, the unmanageable complexity of it all prompting us to cut the thread into specializations. Once this thread is lost, pure disciplines spring up and a series of reductive theories are deduced for each section of thread. Latour writes:

This fragile thread will be broken into as many segments as there are pure disciplines. By all means, they [the modernists] seem to say, let us not mix up knowledge, interest, justice and power. Let us not mix up heaven and

earth, the global stage and the local scene, the human and nonhuman. ‘But these imbrolios do the mixing’ you’ll say, ‘they weave our world together!’ ‘Act as if they didn’t exist,’ the analysts reply. They have cut the Gordian knot with a well-honed sword. The shaft is broken: on the left, they have put knowledge of things; on the right, power and human politics. (Latour *We have 3*)

Through the logic of specialization, *Modernity* comes to be characterized by an impatience of thought and one of its results is the imposition of disciplinary boundary upon the idea or the concept itself, whose form as well as its content is now dictated by the very specialization within which it is artificially suspended.

The A.N.T. approach questions the distinctions we posit between humans, objects and concepts, placing them on a level plane, giving equal agency to all. It recognizes that we are constantly influenced by objects that traditional rational thought has tended to de-animate. A.N.T. is about the doing, the following of threads of agency through the myriad moments when our ideas, resources, skills, tools interconnect and change us and each other. It is about both the science, and the social world in which science has evolved and in which it is sustained. A.N.T.- through its dogged insistence on the primacy of verbs over nouns helps us understand the mechanisms by which innovations happen by placing humans in a milieu in which they are loops in a network of interactions. As its agency is recognized, the object itself is raised in status, given, as Levi Bryant has observed, “ontological realism” in which the object is infused with being as a fellow subject. (18) Laced throughout this approach is the initially counter-intuitive idea that actors “deploy” their networks, Latour states:

Network – a mode of enquiry that learns to list at the occasion of a trial the unexpected beings necessary for any entity to exist. Like a Geiger counter that clicks anytime a new element - invisible before - becomes visible to the enquirer. Network is the shock that reveals around any given substance the vast deployment of its attributes. Or rather take any substance that seems at first self contained and transform it to reveal what it needs to subsist through a complex ecology of tributaries, allies, accomplices and helpers. (*Networks* 799)

This statement elucidates the surprising and ephemeral nature by which evidence of networks and their deployment comes to us: that agencies remain hidden until some trial or activity causes them to be deployed. When we think of a network in a traditional sense as a noun, we see dull lines on paper connecting things together. What A.N.T. (and hopefully the body of artwork comprising this thesis) does is provide ways to animate these lines (that exist in the first place to fill a need to represent interconnection.) What Latour sees is pure fecundity *inside* the thickness of the pencil line and would insist that what happens there *is specific and important*. By extension, he believes it is possible to engage beyond the local – but only through rigorously pursued threads of agency, one at a time - to create networks that could be understandable on a global scale. He writes, “yet there is an Ariadne’s thread that would allow us to pass with continuity from the local to the global, from the human to the nonhuman. It is the thread of networks of practices and instruments, of documents and translations” (*We Have* 121).

An important consideration within this paper with respect to the works

themselves is the way in which A.N.T. can frame the means by which the project steers itself. In the following sections of this thesis support document I will often refer to actor network theory, focusing on the ways in which the agency of abstract concepts, social consensus, iterative/recursive decision making, tools, competencies, objects and materials trace their way back to the work, and it is my hope that this bit of background may help to shed light on those references.



fig. 3. Garnet Willis. *Gaia's Banjo (Shadow Details)*. 2016
Photos by Kevin Neshevich

The over-arching PART TWO: Time

There is a temporal thread that spins its way through all aspects of this show that is embedded in the very nature of sound, for sound is an energy form that exists *temporospatially*. First and foremost, I consider sound as playing the lead role in these works and it is my hope that each work's three dimensional

sound field can be apprehended, contrary to habit, as sculpturally positive space mapped at any point in time by a pair of ears listening at some proximal location within. This apprehension of sonic morphology may be either the result of a parsing of momentary interrelations between source and observer location in both time and space, or of sound transmitted and transmuted by a tug on a cable from afar, perhaps to answer the question: What is the size and shape of a sound, moving outward in time to trigger the agential action in each molecule of air?

Visually, physical elements in this work serve to cue, to reinforce, or subvert expectations and to perform in a lesser capacity acting as sound transducers¹ or enhancers, extensions of individual or collective bodies: interfaces more akin to instruments than they are to sculpture.

More importantly, these works are intended to parse the acoustic space into different types of sonic experience that have a changing *form in time* that can be experienced as a series of states differentiated one from the other. These changing forms, which borrow from the logic of ethnomusicologist, Martin Daughtry, can be mapped as a set of boundaries that cross (or are crossed by) our ears in space (28). These boundaries are the edges that define what I call *sound figures*. These have a morphology that comes of movement, not only of the sound, but also of the listener/participant, to offer a kind of answer to the question posed above about the size and shape of a sound. Further to this, I see these *sound*

¹ Transducers are devices that change one form of energy into another, in this case, producing sound from other forms of energy

figures as having volume akin to positive space in sculpture: louder or more strident sounds having a larger volume than softer or more muted sounds which we hear as smaller. These volumes - these positive spaces - mappable through active listening, are easily differentiated from silence, and can also be experienced as separate entities - as *figures* – set against a ground, consisting of either environmental or constructed sound.

One way of making the structure of the sonic form more vivid, one which inculcates a recursive and evolving interrelationship between time and density, is to set up the work to be indeterminate, and embrace the risk of unexpected outcomes as a means of increasing the density of potential information over time. This approach can provide a means to amplify meaning similar to that observed by Umberto Eco in his description of *Musique Concrète*:

The sounds themselves will consist of unusual frequencies that bear no resemblance to the more familiar musical note and which, therefore, yank the listener away from the auditive world he has previously been accustomed to. Here, the field of meanings becomes denser, the message opens up to all sorts of possible solutions, and the amount of information increases enormously. (96)

The idea is to set up some constraint, while leaving a larger degree of freedom for the works to breathe into the future - forever formed and reformed through interaction and *irrepeatability* of sound. As Sculptor Robert Morris wrote of his own work “chance is accepted and indeterminacy is implied... disengagement with preconceived enduring forms is a positive assertion. It is part of the work’s refusal to continue aestheticizing the form by dealing with it as a

prescribed end” (qtd. in Kalina 3).

Just as Morris’s sculptural works became theatrical upon the addition of time-based performative elements into the equation, so too it is my hope that my works will function in a similar way, such that time-based indeterminate surprise will both provoke and defy expectation (Krauss 203). This presupposes an optimum balance of information between expectation and the unexpected, which is where the idea of constraint comes in. These constraints - these limits - to the morphologies of sound as they fill space over time, determine how much information should be included and demand what limits must be put on them to avoid pure randomness which contains no information, as observed by Umberto Eco:

An excess of equiprobability [read indeterminacy] does not increase the potential for information but completely denies it... the richest form of communication – richest because most open – requires a delicate balance permitting the merest order within the maximum disorder. This balance marks the limit between the undifferentiated realm of utter potential and a field of possibilities. (98)

The challenge, for me, is to get the time density of the show right via a meticulous, iterative and *holistic* process. This process of testing and developing ultimately necessitates the setting of limits within the structure of the work itself to contain the more indeterminate sonic aspects (density of flame crackles, spatial and time-based density and loudness of plucking sound masses, speed of a beam of sound in a reflective space, frequency distribution of reflected sound in the ear goggles etc.) This balance has to be correct and is incumbent upon an ever-

shifting understanding of the complex interrelations between time, energy distribution, and space. But time is not only about density and balance in space, it is also about perception: we all know that time flies when we're having fun. In other words we perceive time as fluid and flexible, stretching and contracting in a way that is centrally embedded in our experience, each moment irreducible to the dimensions of the last *in its every aspect* and in defiance of whatever the clock might indicate. This points to a further question: does increasing the density of information over time influence time itself?

Thoughts about the nature of time, on the cusp of ideas that question the very Cartesian references we have used to shelter ourselves from coming rationally adrift are difficult but not impossible to entertain. Lurking behind these questions is a larger idea that is somehow related to a notion that time space and perception are interlinked within what philosopher Gilles Deleuze touched on and called *intensity*, an idea not completely fleshed out, but one which he considered important to the concept of perceived space (*Difference* 238). Although time is experienced as a more flexible medium than the clock can convey it is difficult to grasp how things might be, had not universalized time been stamped onto us each and every second of our journey from enlightenment to modernity. From our very linear and regulated-by-machines time-based perspective, time becomes strange when looked at in oblique ways such as those considered by Philosopher Henri Bergson, who claimed that "Time is the Open, is what changes – is constantly changing in nature" (qtd. in Deleuze *Negotiations* 55). I am not advocating a leap

of faith or something counterproductive, no unsubstantiated modernist categories here! As Deleuze observed: “When you invoke something transcendent you arrest movement, introducing interpretations instead of experimenting.” (*Negotiations* 146) On the contrary I am advocating for experiment, and the nature of these very abstract ideas are the sort of thing that can be explored experientially and are probably well suited to artistic exploration... as Deleuze writes aptly in this call to rigour:

There are notions that are exact in nature, quantitative defined by equations, and whose very meaning lies in their exactness: a philosopher or writer can use these only metaphorically, and that's quite wrong, because they belong to exact science. But there are also essentially inexact yet completely rigorous notions that scientists can't do without, which belong equally to scientists, philosophers, and artists. They have to be made rigorous in a way that's not directly scientific, so that when a scientist manages to do this he becomes a philosopher, an artist, too. This sort of concept's not unspecific because something's missing but because of its nature and content. (*Negotiations* 29)

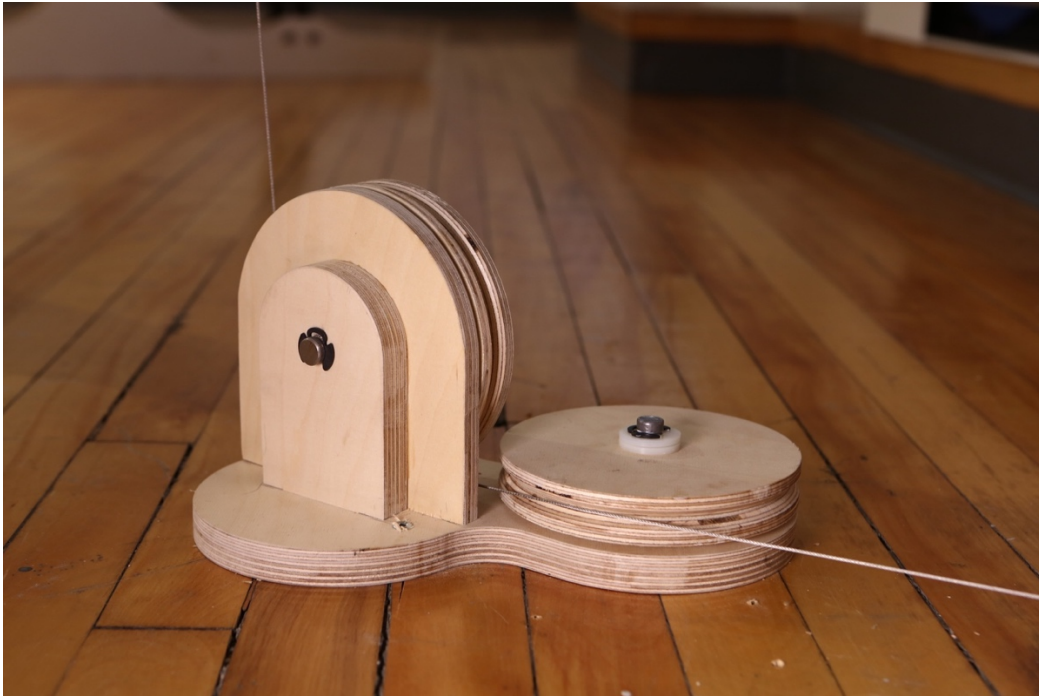


fig. 4. Garnet Willis. *Gaia's Banjo (detail)*. 2016
Photo by Cylla von Tiedemann

Interregnum

Through A.N.T. we can see that disciplinary specialization, while helping to illuminate certain subject-based particularities, has rendered opaque the remarkable complexity of interactions that defy apprehension by reason alone but that are nonetheless the unfolding of history. Where our sensory perception is our primary means of engaging with this complexity and is our most finely tuned tool with which to negotiate its unchartable terrain, what we see is that our modern linear conception of time imposes an order within this complexity that nonetheless subtly undermines the ability of our perception (which as we saw encounters time in a non-linear and fluid fashion) to operate as our guide. Our

perception takes the hint. It bows out gracefully where it knows it is not wanted and we help it on its way: we override its subtle interactions with the brute forces of the artificial flavor, the synthetic perfume, the saturated dye, the grid-like structures of our cities.... We create an environment simple enough for reason to believe itself to be in control. We cannot go back in time to turn ourselves into the creatures of raw, unmediated sensual engagement that we once were. But, in my own work, I am attempting to build a bridge to the further shores of our latent perceptual capacity by drawing on some of the hard worn truths of our modernity. As we saw from Eco, Bergson and Deleuze, linear time, in part, is connected to our drive to make future predictions based upon current experience, which is in conflict with our need for *Surprise* and for *Wonder* – for the *unexpected* that is the nourishment upon which our perceptual capacities thrive. So the challenge for me in this project is to reveal the natural limits of my pieces beyond which they would be unintelligible, while allowing the materials to exert themselves within these limits in as unconstrained a way as possible. To solve this equation – to balance the respective densities of the ‘expected’ (or that which is apprehensible by reason) and the unexpected that is made available to us through our senses, I have used the outer edges of acoustic perception as my guide.



fig. 5. Garnet Willis. *Gaia's Banjo* 2016
Photo by Cylla von Tiedemann

The pieces

PART THREE: *Gaia's Banjo*

Piece IN a Nutshell

IN the main space of the grad gallery is a large circular platform. Attached to the gallery walls and floor are two main clusters of sound producing objects strung together on springs tensioned in space. Outside the gallery main space there will be a third cluster, tensioned overhead, above those coming up the entry stairs from outside. The public, as observer/participants, are free to intermingle with the installation, seeing, listening, and even entering into the largest sound-massing cluster. They can also alight the platform individually or in groups at any time. The platform tips slowly under the distribution of weight of those aboard with the heaviest point of the distributed collective weight moving downward to reflect momentary, yet always shifting collective balance of those in movement above. The sound-producing clusters elsewhere in the space are stimulated into a sounding state as they adjust to their own internal

stresses transmitted to them via tensioned cables linked to the tilting movement of the platform. These somewhat farraginous, distributed clusters are made from divergent materials, each yielding differing qualities to the masses of sound produced indeterminately in time and space. This large instrument/installation *played* through distribution of weight, physically triggers acoustically produced sound masses at a distance. Sounds produced consist of many thousands of short, randomly-pitched, percussive plucking sounds in the ideal frequency range to enable our ears to experience intense, aural location of each sound. This vibrant cascade of sound is intended both to map the internal architecture of the space itself, and to locate the observers aurally and bodily within the space.

Throughout the process of developing this body of work, I have read and re-read transcripts of the Gifford Lectures presented by Bruno Latour, entitled “*Facing Gaia: Six Lectures on the Political Theology of Nature*”(2013)² In these lectures, Latour builds his ideas and arguments atop a foundation laid by inventor and scientist James Lovelock with his famous *Gaia Hypothesis*. This hypothesis posits the Earth as a system of deeply interconnected planet-wide symbiotic relationships that are self-regulating such that they produce ideal conditions for life. Latour expands upon this in a thorough and rigorous analysis of the political/religious and ecological ramifications inherent in the increasing tensions between the endeavours of man and the ideas encompassed by Gaia. Calling Gaia

² Clearly printed on the title page of the transcript of his lecture is “Only for discussion with the author, not for quotation.” I emailed Bruno Latour, asking for permission to quote this transcript and the next day, Feb 26 2016, I received a two-word reply that read “permission granted”!

“this most secular figure of the earth ever explored by political theory,” Latour sketches out a new set of relationships that are made implicit by humankind’s expansion, which is increasingly pressing the limits of the carrying capacity of the planet (*Facing* 8). Using the loosely defined term “the Anthropocene,” a proposed but not-yet-adopted name for our new geological era, Latour reinforces the idea that telluric territories that once seemed an infinite space for *eco* expansion of the *nomos*, have hit finite limits such that we can no longer belch forth waves of environmental stimuli without those waves reflecting back to us with deleterious consequences. Latour strongly refrains from any deification of Gaia, although his attribution of many characteristics to this “secular system” that habit has traditionally seen as belonging within the realm of theology makes it easy to assume he is trying to draw parallels.

His argument is predicated on Lovelock’s notions that the meta processes that regulate atmospheric oxygen/carbon balance as well as ocean salinity, are at a tipping point where homeostatic negative feedback loops that have regulated these systems are at risk of becoming positive feedback loops causing global temperatures and other processes to accelerate and augment past a critical point of no return. Latour posits a panacea to these ills, calling for the creation of a new kind of human collective – a political movement he coins the “Earthbound” – a movement riskily infused with a new kind religious fervor that recognizes and engages with the notion of massive multiplication of agencies buried within each human action. Implicit in the name is also the notion of staying on this planet and

to making things work under our newly-apparent and very finite condition.

Much of this thesis project has been developed at a time when my thoughts have been infused with notions twiggled by these lectures. The installation *Gaia's Banjo*, the largest and most ambitious of the four works in this show is a case in point as it was first inspired by Latour's "Geiger Counter" (referred to above on pg. 12): that ticks every time a network is deployed (*Networks* 799).

My thought was to imagine a sound piece employing a structural dynamic that could in some way produce sound that would in turn cue the observer to the underlying network-deploying phenomena: to create what Latour describes in Artist/Architect, Tomas Seraceno's work, a "Direct and sensitive way to prefigure living in the Anthropocene where every move is a fusion of social relations, abrupt atmospheric change, and chemistry – The whole *theatrum Mundi* taking place in a highly artificial and controlled technical space. (*Facing* 124)

The idea was to produce some sort of apparatus that could perform the task of measuring (in both a physical and metaphorical sense,) the presence of the observer/participants of the work either individually and/or collectively, and translate that presence to Latour's Geiger Counter idea. Also influential was Latour's reference to translation tables: something I was previously unaware of. These tables, once used by merchants sailing the ancient world, listed and translated the function of various deities as a way of showing commonality with gods worshipped by peoples they encountered in foreign ports. The

fundamentally xenophilic idea of the translation table was to get beyond the *name* of specific deities, and show what those deities *did* and how that *doing* was similar to the doing of one's own deities: the distillation of these functions providing a kind of empathic map of the human condition, while "shifting from Names to Agencies" (*Facing 11*)

Latour-as-actant also served, through his use of the word "table," to shift my original Arduino-and-sensors-based approach to this piece to a piece employing an actual table functioning at the centre of a system that is un-reduced, less mediated, much more complex in its inner analog workings, all-the-while wearing its easy-to-parse functionality on its sleeve. This physical *translation table* sports a pivot point, at its centre, acting physically/metaphorically as its fulcrum/archimedian point, projecting the traditional "Scale of Justice" into a third dimension. The notion that historic translation tables listed commonality as a means to empathy, is also important to my intent that this work proposes an interrelatedness that approximates the universal condition of "precarity" delved into by Judith Butler in her Book *Frames of War*.

Gaia's Banjo is divided into two main types of structures, each demanding differing approaches in terms of building methodologies and expectation of results. At its centre is the table serving as the actuator/interface (Law's "central actor" seen earlier) and in the periphery, attached to walls and floor are the sound producing structures (Law's network). Connecting the two are tensile cables (Latour's Threads of Ariadne), which marry the entire system into

one large tensile instrument where movement in any one part, affects the entire system causing it to readjust across its central pivot, to produce masses of articulated sound.

The movement of this table is dampened by six structures radially projecting outward from the platform like petals of a mechanical flower. These employ pairs of hydraulic dampers to slow the speed of tipping to a snails pace. Energy injected into the system, by stepping onto the platform or climbing up the slope of the platform, is converted either to motion of cables transmitted to sound or to heat inside the hydraulic cylinders. Three of these petal structures have the second function of converting and distributing the movement of the platform to the tensile cables comprising the network.

Although the overriding methodology of this work is *holistic*, in Ursula Franklin's sense of the word, the central table – its mechanics, its tilting and measuring - all very rational in a device translating rational forces - lead me to the decision to build it in the most completely *prescriptive* manner possible. This *prescriptive* island - this fashioning of rationality in the midst of a *holistic* piece – this like-begets-like experiment, has been designed to the *nth degree* in a computer-aided design environment and then milled by robots, presenting itself as the ultimate end in the evolution of division of labour!

My hope is that the means of manufacture may provide a different perspective to the feel imparted by this portion of the piece, whether it be derived from ideas such as modern use of robot systems employed to ensure robustness

and time efficient success over materials, or, perhaps as Massumi writes, “They [the materials] are less active than the tool, their action is slower, their force weaker. They have an encounter with interpretation, and are overpowered” (12).

I wanted to employ a *prescriptive* approach, more specifically, as an experiment to see if this production method could influence the way this portion of the piece may be read by those who step on it to be weighed, parsed and commodified. Following Franklin’s logic, a pre-planned production process, which by its very nature disallows the inherent agency of materials, will produce a production mindset untroubled by the loss of its own agency. Nor does this mindset balk more specifically at the loss of that creativity which is necessary to the observing of those local effects – effects that motivate one to take charge and make *principled* decisions in one’s work *mid process*. It is my hope that the product of such a process may be imbued with a different feel that may render as critique all those on the platform closer to the speed of the materials and the consuming mindset those materials engender. It is my further hope, that threads of agency will pile up to embed and encrust this work like layers of meaning in a palimpsest. These layers – balanced over the crux of the work – layers of a mindset made physical within the very tools used to overpower materials.– layers reflected back to those who step on the platform – who may, as Massumi writes, have an “encounter with interpretation, and [be] overpowered”(12). This in turn, I hope, may provide a strong critique that may serve as a metaphor for the measuring of humanity – hemmed in by the boundaries of the platform, the

unease of shifting earth under our feet: of staring into the mirror implied by our newly understood Anthropocene planetary boundaries.

As Franklin reminds us, as we keep our fixed gaze on our stuff-producing-goals “one has to keep in mind how much technology of doing something defines the activity itself, and, by doing so, precludes the emergence of other ways of doing ‘it’, whatever ‘it’ might be” (9). These processes in which, in the modern sense – knowledge is power – provide us with the most direct route to an outcome (read objectified object in a world increasingly defined by our manufacturing mindset.)

With respect to this work, it makes perfect sense that the system that quantifies the observer/participants be made via a process which has also quantified us all. Since this whole enterprise has been motivated by the desire to see what happens, I ask the circular question: can the manner of doing the work embed a message into the work that can in turn provide a critique of the manner of doing that produced that work?

The second aspect of this piece, the sound producing aspect, finds its inspiration in the Gieger counter idea previously mentioned in Latour. Given that the motion meted out across the cables coming from the central platform is manifested in the constant adjustment within the tensile structure of springs strung in opposition, it was important to find a material structure that could change motion to energy through the juxtaposition of forces changing within it. Latour’s idea that networks deploy as a result of some sort of trial peaked my interest in a

material that would quantize and allocate changes of state in some way that could be readily perceptible. It was at this point, that I remembered some springs I had *inventoried* at a previous date at Active Surplus that made a barely audible clicking sound when stretched.

The sound of these springs, being too quiet, demanded that I find a way to amplify the clicks by increasing their compliance with the air through the employment of small resonators. These (I will call them *resonatelets*) serve, as Daughtry would say, to *increase the size* of the sound by extending the threshold of audibility to a larger territory in the air by increasing the agency of each mechanical click through the recruitment of many trillions more air molecules bouncing off the *resonatelet's* surface such that the evidence of internal stress becomes aurally apparent at a distance – a distance which is adjustable through manipulating the size and type of material in the *resonatelet*.

What followed was a very holistic process of experimenting with a wide range of materials by connecting them between the springs and then pulling! I came up with four materials that reflected my projection of needs into the space where the piece will be installed. These materials, consisted of small cardboard boxes, laminated pieces of maple veneer and thin planar squares made from copper and aluminum – each imparting a different sound quality when actuated by the springs. The characteristic shape of the sound of each spring click, amplified by each *resonatelet*, starts with a short noise transient followed by a short and much quieter pitched sound deriving its spectrum from the momentary length and

tension within the spring-in-flux combined with the resonant predilections of the local resonatelet. I had to imagine what a *lot* of these would sound like in the gallery space and make executive decisions about limits. These limits, discussed above in the section on Time involve a number of factors:

- Adjusting how much movement will be transferred from the platform to each cluster of springs (adjustability already designed into the translation table mechanism)
- Calculating the number of resonatelets in each cluster, such that the mass of sound creates a sound object of appropriate size and intensity within the gallery space to both work alongside and enhance the other clusters.
- Resolving the size of each resonatelet so its individual sound contributes appropriately to the sound within the mass of sound generated by its cluster – something that is in inverse relation to the numbers used in the above step.
- Determining the spring length as a means of setting limits within which an indeterminate range of pitches produced by each spring can serve to better *orchestrate* the unfolding sound form of the installation as a whole.

A final consideration has to do with the balance of the overall mix that will affirm the sound of the work as sonic deployment of networks to indicate without a doubt, the internal stresses on the contentious boundary between the physical world and the weight of humanity. This *broad brushstroke mix* needs to

couch itself within main space of the Grad Gallery, which is a very miserable space sound-wise, and thus cannot be considered as a blank canvas for this work. A lot of unwanted noise in the space comes from badly designed air handling systems, which are added to a considerably loud layer of sound coming from the badly designed (in a sound sense) world outside the windows. Inside the space the acoustic is reflective – which is good in the sense that the masses of sound that will come from the many resonators will map the morphology of the space through reflection, but bad in the sense that *all* the noise is reflected around.

There are six points within this design where vertical motion around the platform can be translated to cable movement. These points are diametrically opposed in three pairs, each pair being able to produce two inverse cable movements. At one point, I had entertained the notion of using these inverse motions to drive six sound massing clusters. More recently, after many tests, and imagining what these masses will sound like in the space of the grad gallery, I have decided to use only three cable take-off points driving three sound clusters. The three cable points will come from the three damper mechanisms closest to the north wall of the grad gallery. This provides the best combination of efficient cable routing as well as avoidance of trip hazards, achieved by positioning the platform so that cable runs on the floor are as short as possible and out of harm's way between the platform and the northwest corner where they then run up the walls and then across the space overhead.

A secondary consideration in this three-cable plan involves how the work will *invite* participants to step onto the platform. Taking the lead from elephants trained to kneel as a way of easing the process of riders climbing on their backs, it is my hope that this work may *kneel* as well – that the combined tension of all the springs in each sound cluster, will make itself known to the position of the platform by tilting the platform to a default position once the humans have stepped off. This potential correction (if it does happen) will happen slowly, and has to be considered in terms of how the platform will invite participants once this *kneeling* position is attained. This in turn makes it necessary to define where the front (the inviting side) of the platform will be. To determine this, I have thought about how the greater installation will invite movement around the gallery, and this consideration in combination with the sound density of the overall mix within the grad gallery has led to the shapes and locations of the sound clusters.

My decisions about these details have arisen from the balance between sound density punctuating the already busy sound canvas of the grad gallery space, visual density of the work in the space, mechanics of the work and predictions about audience movement. The shape and location of the sound masses I am proposing have been chosen within these various constraints, in part, to draw a visual line within the installation with intent to feed participants through to the platform.

As you enter the main gallery space, to your right, you will see a large lateral *cone* shaped tensile mass of small cardboard box resonatelets/springs

fastened to the east wall and tensioned to a point on the west wall just to the right of the window. In front and slightly to the left, will be the *curtain* tensile mass in a long line running eastward and somewhat parallel to the south wall and more or less centred between that wall and the large pillar. This *curtain* tensioned between floor and ceiling will consist of a line of vertical springs with aluminum resonatelets. On the floor at the bottom of the line of springs will be a long plain wood plinth about a foot tall and a foot wide that serves as both an amplifying sound-board and a visual line defining the vertical space above, within which the sound mass will quiver. A secondary line implied will be the open space directly ahead between the *curtain* and the pillar leading openly to the platform. It is my hope that the presence of the massive *cone* on the right will constrain motion forward. As you move west toward the pillar, you will hear a mix of the vertical sound of the *curtain* to your left, which will punctuate the space with sharp twangy metallic resonance. The directionality of the *curtain's* aluminum resonatelets will throw sound very strongly in the vertical dimension, giving presence to both the floor and ceiling in the form of reflections animating the space. On your right, you will hear the sound of the *cone*, which is fuzzier, omnidirectional and softly infusive.

Moving past the pillar brings you to the place from where the platform will make its invitation. If there are people already on the platform then you can simply join them, but if the platform is vacant, the default position should be one that is tipped down toward you from this introductory standpoint. This

requirement leads back to my decision to employ only three cable points on the far side, the idea being that the many hundreds of springs distributed across the three sound masses, will conspire to tip the platform so it *kneels* as an invitation to climb aboard. This also reinforces the idea of agency - of rebound - that the combined force of a myriad of small tensions (like those created by planetary boundaries) can reflect back to the source and can drive change. As this reactionary agency manifests itself, also apparent will be the *playing of the banjo* as a sonic indicator of deployment of networks indicating internal stresses of rebound and correction.

This leads to the question of the third sound mass. My original intention was to have this located on the south wall of the gallery space. Consideration of sound density created by both the *cone* and *curtain* - their sonic intermix and visual presence filling the space - led me to the initial conclusion to eliminate the third sound mass. This however would leave the third axis cable pickup point unused- something I was loath to do, since the work was originally devised to distribute circular tensions *hexagrammatically*.

Musing on this problem for several days, I finally came up with an ideal and novel solution. First I had to determine that this could be done within building/institutional regulations (it can,) then I had to make some very specific measurements of the gallery and surrounding space.

The third cable pickup point will travel from the platform up the north wall then overhead due south to pierce the south wall across to the stairs that lead

from the Duncan Street entrance to the Grad Gallery. Suspended laterally above the heads of those on the entry stairs will be a triangular *double cone* structure. This sound mass will consist of a thin plywood resonator suspended by two spring cones on either side, to form a triangular bipyramid (also called a hexahedron.) Two layers of resonatelets will comprise this smaller tensile mass. The outside layer will be made from laminated maple veneer, and the inside layer will consist of small planar copper squares. These two materials – this *instrumentation*, related to the paper and aluminum used in the main space, have been chosen for sonic qualities of intermix/orchestration that combine the sharper metallic sounds with the softer organic sounds in two mostly non-competing frequency ranges.

This choice to relocate *double cone* to another space brings better focus to Latour's notion mentioned above, of the necessity to trace rigorously all threads of agency to their global limit. In this case, the remoteness of this cluster to the platform in the other room serves to both isolate sound masses (so they don't become too sonically dense in the other space) as well as becoming a metaphor for remote agencies removed from direct experience: to glacial melting, to the pacific gyre, the path of the gulf stream and a myriad of other fine balances under threat by human stimulus.

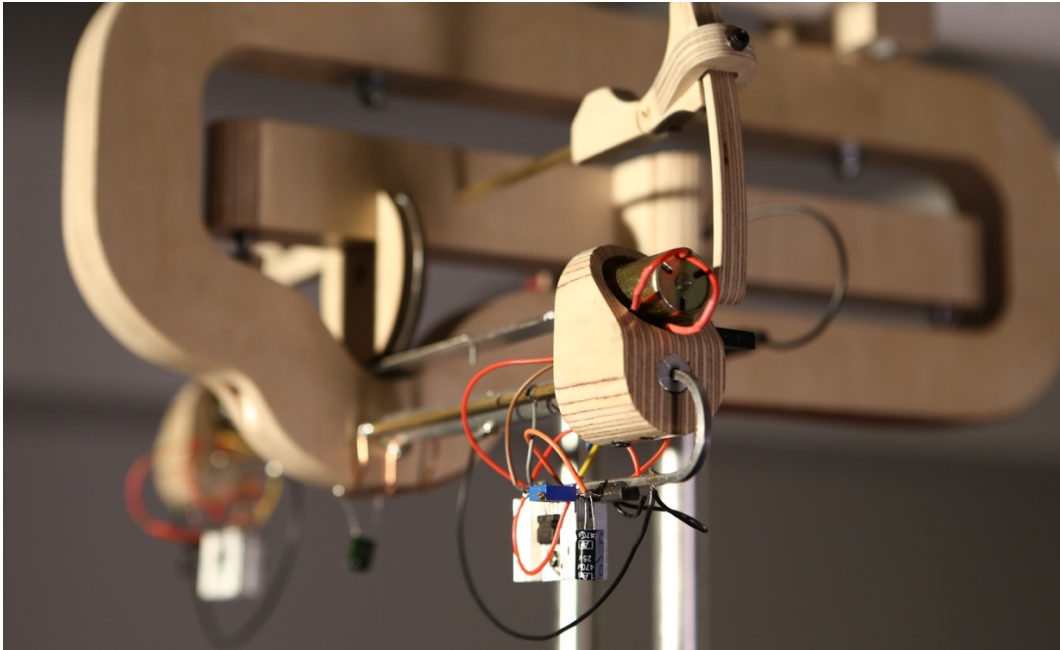


fig. 6. Garnet Willis. *The Sound That Severs Now From Now (Detail)* 2016
Photo by Cylla von Tiedemann

The pieces PART FOUR *The Sound That Severs Now from Now*

Piece IN a Nutshell

IN the small and very acoustically reflective experimental media space, hangs a large Pendulum, swaying back and forth keeping regular time. At either end of a lateral beam at the bottom of the swinging pendulum are two downward facing mirrors mounted half an arm's length apart. These mirrors are connected to the beam with servo-motors that automate movement of the mirrors with two degrees of freedom to form a pan/tilt mechanism. The mirrors are programmed to move so that they sweep and rotate, dancing a digital choreography that keeps them in dialectic opposition to one another. Sitting on the floor directly beneath the pendulum is a tidy wooden box. Within this box is an array of piezzo transducers producing sound that is projected as a beam straight up into the swaying pendulum.³ As the mirrors pass the sound beam, they reflect it

³ This utilizes open source ultrasonic heterodyning hardware produced by Richard Haberkern.

around the space to create a perceptually-unfamiliar, three-dimensional, moving reflection-space that extends and retreats from the physical piece while incorporating both the rhythm of the pendulum and the trajectories of the oppositional mirrors into its sonic form. The signal heard floating on this beam – the sonic content, imbued with eco/political meaning - is the sound of glacial ice melting in Greenland.

The Sound That Severs Now from Now employs its large pendulum swinging in time as a visual/sculptural means of mechanically diffusing a beam of sound around the experimental media space. This specialized beam of sound exhibits an extremely narrow diffraction angle and as such can be reflected with a small planar surface to allow one to experience a new way of hearing which is more akin to a passing object making the sound than it is to a sound radiating from a central source.⁴

Stemming from ideas elucidated in Bruno Latour's *Facing Gaia* lecture series referred to previously, this work proposes a critique that moves beyond the statement in my other pieces to specifically explore global political inaction regarding climate change. This sculptural and sound-based work is premised upon friction created between a *ground* consisting of the slow ticking of time, and a beam of sound sonically punctuating the space to create an aural-spatial map that confirms, in a familiar, or perhaps even comforting and embodying way, the

⁴ Diffraction is the degree by which waves bend outward from their central direction as they travel through a medium (in this case air) Bass tones exhibit a high degree of diffraction – which is why you can hear bass in all rooms of your house – even though the stereo is only in one room. Higher frequencies exhibit less diffraction.

viewer's aural perceptual location within space. The presence of the piece is intended to imbue the exhibition space, both sonically and visually, with cultural cues that come hand in hand with motion and sound of the pendulum mechanism. This work plays with the ideas implicit in the term *keeping time*: that these mechanisms somehow contain time within their motion – materializing it and in so doing, making it compatible with the very rational models which led to their development. Drawing on the sound of the ticking pendulum – this historical anthem of rational positivism –meting out time as regular commodified packets, provides the means by which this pendulum can supply both a central visual point of focus and apt point of cultural reference, setting the stage for a symbolic juxtaposition, against which the second part of the work is balanced. This second part - in the form of a quietly destabilizing *sonic figure* - will propose a subversion that calls into question the objective historical pride and increasingly apparent eco-folly represented by such devices as they slice, measure and render the world, serving it up to the utility-maximizing calculus of human appetite.

This piece has gone through many changes, which I will trace chronologically in this section. I have made it my task to share all of the failures, foibles and wrong turns, as well as aesthetic decisions, and other sources of inspiration in an attempt to make more intimate the constellation of agencies that this development process has comprised. This not only makes the contextualization of this *holistic* method consistent with both science and the arts, but also does what I believe Latour would do - to extend the analysis to include

agencies that would not usually see daylight in most “Modern” analyses and to approximate what Latour says of the sciences when he states: “Science and technologies are remarkable—because they multiply the nonhumans enrolled in the manufacturing of collectives and because they make the community that we form with these beings a more intimate one” (*We Have*108).

With specific reference to the sound of this work, I had originally decided that the audio content that would be *floating on this beam* would be comprised of intermixed recorded speeches of climate scientists and climate change deniers mixed into sound-scapes drawn from a range of sources germane to the topic. This was to explore the function of the work as fulfilling what Graeme Sullivan would call “arts practice as a form of transformative research [making] full use of the potential of visual [read aural] images to reveal insights about issues of human concern” (225). Through consultation with faculty and peers, it became apparent that the sound of the rapidly melting Eki glacier that I recorded while in Greenland in 2006 would supply a much more compelling sound source. In this recording, the collective sound of cubic kilometers of melting ice - the popping crackling and bubbling of ancient air escaping millennia of entrapment under ice into the comparatively warm Anthropocene salt water of Disko Bay provides strong poetic argument - especially when propelled around the room, in a completely new way. This new form of sonic presentation combined with this specific content not only continues to reflect the function as defined by Sullivan, but also increases the poetic nature and impact of the work.

In the first conception of the work, the pendulum was to be actuated by a recreation of historical wooden gears copied from an antique clock propelling the swinging back and forth. Added to this would be a single Arduino driven servo-operated disk on the downward end of the pendulum. The sound beam would face upward throwing its sound up and into the swinging disk to be interrupted by the disk mid swing as it passes by, allowing the servo as it passes to reflect the beam, diffusing the sound around the very reflective space of the EMS creating a host of constantly moving sonic images.

A second major revision to the design of this work drew its inspiration from a reply made by Prof. Eric Cazdyn to a question about junk climate science, posed during the “Post Atomic Eyes” conference (2015). He said, [loosely quoted] “Unfortunately, for every doctoral dissertation, there is also published somewhere in the world, an Equal and Opposite doctoral dissertation.” This statement, while funny at the time, later resonated with me, as I began to think of “objectively measured reality,” and how our interpretation of the “world out there” - can generate validly arguable conclusions so diverse - so atomized within various specialties that they can effectively cancel each other out. These “opposing arguments,” ultimately serve to deflect, scatter and confuse public consensus and slow the process leading to changes necessary with regards to climate and many other pressing issues.

In the process of trying to dream up ways to actualize this systemic problem of opposing argument – the catastrophic stasis of the well-informed disagreement

that is the disabling of our own agency through well-reasoned intellectual debate, *even as we hurtle towards disaster* – I realized that it would be possible to counter the motion of the single servo-controlled disk hanging on the bottom of the pendulum by adding a second servo controlled disk that would always deflect the sound beam diametrically in the opposite direction to create a kind of physical dialectic - an argument characterized by an imposed sonic opposition in space. If these two opposed deflectors could each centre themselves on opposing ends of the pendulum swing, then the swing could also be integrated and potentially read as the swing of the argument (and its discontents) as they wend their way toward the sea of public consciousness.

My two-reflector design was thus born. Shortly thereafter, while out with my daughter, I noticed a small magnifying mirror in a shop window that had a similar diameter to that of my reflecting disk. This twigged the idea for me of using a mirrors rather than wooden disks to deflect the sound. This in turn would thus strengthen the relationship between what we know in seeing the piece (reflection of light by a mirror) by providing a launching point to what our “distribution of the sensible” will be “redistributing itself to know” through exposure to this new technology couched within the greater meaning of the work. This “distribution of the sensible” is, in Rancière’s words: “the system of self-evident facts of sense perception that simultaneously discloses the existence of something in common and the delimitations that define the respective parts and positions within it” (12).

To clarify, in my own words, Rancière intimates with his “distribution of the sensible” a certain legibility as a kind of pre-politics - as a means of establishing the system by which we can recognize the difference between governing and being governed: that what is around us and available to our senses may not actually be perceived until we become cognitively predisposed to recognize it - this new awareness of previously unrecognized stimuli becoming what he calls the “distribution of the sensible.”

Thus it is my hope that the piece, through its use of space parsed as both familiar techno-culturally rooted ground and as juxtaposed disembodied *sound-as-figure*, may – through the inclusion of content with an environmental message, subtly impact and influence observers, to reinforce, and “redistribute their sensible” to make easier the notion of including these issues as something worthy of their attention.

The development of the pendulum mechanism involved a long process fraught with unanticipated snags and issues. My first idea in the realization of a driver mechanism for this pendulum portion of the piece was to use C.A.D. plans derived from historical clocks and posted by clock makers online. These escapements, as they are called, are all variants of the mechanism employed in grandfather clocks. They use the energy of a slowly descending weight to power a train of gears that slow the fall the weight. This is achieved through a mutual, rational, and Newtonian interaction employing a controlled pitting of inertia, kinetic energy and potential energy against one another within the swinging

pendulum as it metes out regular time. Utilizing this approach would entail a relatively simple building process that would have seen the respective parts CNC milled out of wood from the online plans and then *prescriptively* assembled, allowing me to take advantage of centuries of innovation in clock making design. However, there was general concern between myself, my peers and my committee, that a beguiling set of wooden gears (they are beautiful to look at) would distract from the intended meaning of the overall work. I thus decided to tone it down creating a much more minimal electronic version of my own design. Interestingly, this change came about as the result of the agency of many actants ranging in form from recursive processes to crowd sourced opinion to critical reflection regarding aesthetic sensibility that lead to potential ways of reading of the work.

The second version of pendulum driver design, as a means of eliminating the gear train, employed a hall effect sensor and an Arduino microprocessor to interpret the swing and then intelligently control powered electromagnets, pulsing them on and off to give energy to the pendulum. Designed in part through consultation with Prof. Doug Back, The Arduino simply looked at the increase or decrease of voltage, which the hall sensor had created as an analogue of flux density sensed from a passing magnet on the pendulum, to energize the electromagnets driving the pendulum accordingly. This system worked well in an electromechanical sense, with the pendulum beating regular time after only a few tweaks of code. However, once swinging, this new entity revealed a huge

oversight in my pursuit of this overly tidy design. The elimination of the mechanical gear train had rendered the pendulum completely silent! In the interest of simplification, I had engineered away and eliminated the sound! As Ursula Franklin would say, my development had been “holistic” - a slow process of development, of subtle apprehension of inchoate notions then recognized as nascent ideas, of building and of discarding. Each step of the way informed by the progression preceding it - all aspects of each process influencing what making method will come to the fore - all processes my responsibility. All aspects of the process from the selecting of available and affordable natural or industrially produced materials for their qualities of appearance, strength and workability, are tempered with pre-knowledge of machines in both my workshop and the rapid prototyping lab at school, with their own inherent strengths and weaknesses (as well as mine) steering the success of one process and the avoidance of another – a bustling and intense network of actors and actants all deployed and pulling!

My perhaps overly obsessive intention was to explore the possibility of powering the swinging motion with solar panels, which are inherently low power output devices. This would require the work to balance its internal energies in a way that would allow the pendulum to swing freely with the most natural motion possible by injecting only the minimum energy necessary to keep it energized. Unfortunately *minimum energy applied* also meant *none wasted* on extraneous sound – a quality intrinsic to the concept of the piece.

I decided to bring the sound back in, but did not want the sound to be

added like a post production sound effect, I wanted to have the sound be part of the process and integral to the design, so I decided to design and build a hybrid system that would incorporate the advantages of electromagnetic drive while at the same time allow a bit of *sound producing slack* in the system. This also allowed me to regain some of the visual interest inherent in antique clock design while not having to go as far as having a large train of gears that would likely dominate the visuality of the work.

This newer hybrid escapement is ticking as I write this, and designing and developing this system has proven to be a great deal more difficult (and far more surprising) than I had originally anticipated. I did not get lucky and was forced to re-invent the clock, and this process has taken me on a fascinating tour of the intricacies of not only clock making, but of time and special relativity, and ultimately to a still foggy notion of an alternate reality I have mind-warplyingly “popped into” a few times when trying to visualize (from the perspective of time) why my clock was stopping.

After a month or more of clock stoppages, ultimately what was needed was an adaptive toehold to measure the state within which the opposition of kinetic and potential energy was unfolding in the swinging pendulum. Motion without opposition truly averages itself over time and “moves time” to the centre of the motion – stopping the clock. Through this trial, a network has deployed itself to me in the form of knowledge, and I have finally come to understand the principle of opposition and, in tandem, the reason my clock failed to tick longer

than a few minutes at a time. This principle is traceable back to Aristotle who wrote “if it is always true that a thing is at rest when it is opposite to something equal to itself, and if a moving object is always in the now, then a moving arrow is motionless” (161). In my case, the pendulum without an appropriate rationale for parsing the internal oppositions of forces *became* Aristotle’s arrow and stopped all motion. My practical solution to this was to outfit the clock mechanism with two optical sensors that sense position, enabling exact *knowledge* of where the oppositional forces within the system are in the swing and then serve to inject energy into the system only at points when those energies add to the kinetic side of the equation as a means of cancelling out friction. To this measuring system I added analogue timing circuitry that would provide a means of regulating the amount of power to be converted into pendulum motion. All of this together means that the pendulum has become smart – and can adjust to a variety of mitigating factors – always moving when undisturbed to a more refined and accurate *keeping* of time.



fig. 7. Garnet Willis. *Clarion Call: The Heat Of A Million Voices (Details)* 2016
Photos by Kevin Neshevich

The pieces PART FIVE *Clarion Call: The Heat of a Million Voices.*

Piece IN a Nutshell

This is a sculptural work consisting of two large horns that resemble very large megaphones. These horns, most likely once used in a penitentiary, are mounted on stands such that their large ends are facing each other an arms length apart with the centre of each horn at ear height above the gallery floor. You can walk between the horns and all around them. Mounted near the smaller end of each horn is a lit candle, positioned so that its flame is right where your mouth would be if you were speaking into the horn. The flame is bright and hot, but even more importantly, it employs a special kind of wooden wick that crackles and pops much like a small fire. Sound from these diametrically opposed sculptural forms flows through the horns to the space between. The vanilla and eucalyptus smell of the wax in combination with the soft sound, creates a quiet infusive environment with sound on the cusp of the inaudible. This sound, in quiet

juxtaposition to the implied authority of the horn structure subverts the original function of the horn – namely the acoustic re-enforcement of power structures inherent to the centralized distribution of information from one to the many. Here, there is not one voice but the *heat* of a million voices, directed to the one observer located in the space between the horns.

“Hearing is a physiological condition, whereas listening is actually a psychological act.”

(Barthes 245)

This piece began with a text message containing a photo of two antique horns from a friend, who came across them in an antiques shop in Gananoque. The text read “crazy sound piece?” A few days later, after some haggling by my friend, I had the horns in Toronto. I was not sure what to do with them at first except yell at people through them with the stentorian phrase “Voice of Authority.” These spun aluminum horns, probably made in the 1940’s, aged over the years and beautiful forms in and of themselves, sat around for a few months at loose ends. Meanwhile, one day at work (when I am not in school I am an audio engineer) I was describing to a younger engineer how acoustic sound absorbers function. These absorbers, used to treat acoustical reflections in the studio environment, eliminate sound by changing acoustical energy of sound into heat. He asked why, if that was the case, did they not heat up? To which I informed him that “there’s not much heat in sound, and the amount of heat contained in a

million voices would be about equal to the heat of a candle flame.” Upon hearing the words as I was speaking them, the door to the idea of this piece flew open. Immediately I knew I had to try combining candles and these large horns. Something about the idea/title byline “The Heat Of a Million Voices” seemed an irresistible poetic juxtaposition: this farrago, these two incommensurate things, the flame against this old “apparatus of authority”.

As to meaning, this work poses many questions about the individual, about collective power and about established power. Notions about the united political power of those “million voices” comprising the energy of the flame, juxtaposed, transmuted and amplified by the still functioning structure of the horns, traditionally associated with a more centralized distribution of power, perhaps can only be adumbrated through the experiencing of the work. The use of these horns – these re-purposed found objects so imbued with authority - does raise the question of what they become when we consume them, when they are integrated into the new art-contextual frame? If we follow Marx’s logic that “A dress becomes really a dress only by being worn, the house which is uninhabited is indeed not really a house,” then we must “live in the house” to answer these questions, or experience the work in the gallery during the exhibit. (qtd in Bourriaud 24).

Technically there were a few details that needed to be looked after. My first concern was the candles.... since candles burn down, I needed to come up with a way to keep the flame at the same place, so that it would remain stationed

in front of the aperture of the horn input. Secondary technical concerns had to do with sound. I also needed to determine if the horns make the sound of a candle louder if the candle could be made to crackle? The flame-in-place problem was potentially solved by re-purposing parts taken from candle lanterns used for canoe camping. These lanterns employ a clever design that places the wax body of the candle in an aluminum housing. This housing is located an ideal distance away from the flame to be warmed by the flame, and this warming is enough to heat the wax at the flame end of the candle to a consistency that is soft enough so that a spring located under the candle can push the candle body upwards to constantly feed the candle and wick into the flame at the same rate as the flame burns. I knew this mechanism worked well with the hard paraffin wax candle refills sold for these lanterns, but I was still unsure if it would work with whatever I would have to come up with in order to furnish the candle flames with an audible crackling. I started to search for some sort of chemical I could soak the wick with that would make it crackle, but quickly found reference in the candle making internet subculture to wooden wicks crackling like a fire. This launched a period of making many experimental candles out of different consistencies of wax with wicks made from veneer of various thicknesses, wood species and dimensions. I cut the veneers into fine strips and poured candles around them. The first few veneer wick prototypes showed promise, but it was when I tried cherry veneer that things literally *snapped* into gear. I tried and tested many different configurations of wicks and quickly found that large wicks heat the metal cylinder

around the candle too much, causing the candle to drip excessively. The solution was to make the wicks smaller ... but as wick dimension decreased, they outstripped my ability to make them with cutting tools due to increased fragility. My solution was to have a set of wicks with a range of dimensional variations laser cut out of cherry veneer. The first and smallest ones burned up under the laser and later on, slightly larger ones with the laser turned down in power rendered good and excellently crackly wicks. I further found out that soaking the wicks in oil of eucalyptus added to their crackle content as well adding to the pleasant smell they create. The next step was to make a candle mould, I did this in the mold-making lab at OCAD with top-notch help and support from technician Mason Mummery.

From a more theoretical perspective, perhaps ideas along the line of Barthes' difference between hearing and listening (quoted above) are what have motivated me, doggedly, to pursue this piece. As the sound of the world comes at us, some of us tend to become passive in its wake, while others quite actively shut down and hide behind headphones. I want people to be coaxed out of this retreat and to actually *listen* to this work. It is my hope that this dangling carrot of a crackling candle can become the seat of an exploration of the idea that *active listening* can function to “redistribute the sensible” and, in small ways, effect change in the listener's world-view to steward a process of re-alignment of the ways in which we relate to one another through the very notion of experiential perceptual recognition as a “skillful bodily activity” (Noë 2).



fig. 8. Garnet Willis. *Now The Ears Of My Ears Awake (Detail)* 2016
Photo by Cylla von Tiedemann

The pieces PART SIX *Now the Ears of my Ears Awake.*

Piece IN a Nutshell

On a wooden shelf is a line of four sets of concrete forms consisting of symmetrical pairs of mirrored cast shapes. Sitting on these forms, and removable from them, are four sets of adjustable plastic headgear. Each of these sets of headgear consists of two forward facing plastic cups formed to a concave semicircular shape with a headband between. These are *meant to be worn*, by placing the headband onto your head – hat like, which faces the cups forward, placing your ears at a prefigured location within each cup. The internal morphology of the cups has been calculated and designed to reflect high frequencies to your ears from sound sources located directly in front of you – enhancing the presence and articulation of those sound sources. The range of frequencies that is favoured by the overall size of the reflecting cup serves to restore at least some of the frequencies that people lose due to industrial

hearing damage, prolonged exposure to loud music, and the urban environment in general. These four sets are to be used at will, to travel around the show to enhance people's ability to hear the details of the various works.

This work draws inspiration from an Anish Kapoor piece *Monochrome* (2015) that I experienced at Galleria Continua in San Gimignano Italy. *Monochrome*, which consists of a powder blue parabolic reflecting surface mounted to the wall, draws upon acoustical lens principles employed in whispering galleries to create an area of intensely focused acoustic reflection for those standing in front of it. My thoughts about this piece and its nature – its creation of a sonic space of concentrated acoustic reflections that pop above the acoustic noise floor and into one's consciousness – a static *sound figure*, became blended with thoughts I was having about a wearable piece at the time. This work of Kapoor's speaks by reflecting the sound of the space back to the observer when the observer's ears are located at the focus point of the parabolic surface. If one is listening, and if one's ears pass through this implied space-made-physical via its concentration of reflections, then this zone can be discovered as a space of acoustical difference. Once discovered, one feels compelled to explore its morphology by moving one's ears in various dimensions to effectively map its shape through movement. Whereas Kapoor's reflector is fixed to the wall, and his observer is mobile within its reflective zone, the early germ of my idea leading to the development of *Now the Ears of my Ears Awake* was to change this relationship by mounting the reflector to the observing head rather than the wall.

Kapoor's *Monochrome* employs a relationship of fixity between acoustic space and zone of focus which couples with a mobile observer. My work fixes the ears of the observer so that they are consistently within the area of sonic focus, while making the space mobile through head movement. This trade of functionality – this mobility – allows the observer to choose where the focus lies simply by facing in that direction. This, in turn, lets one move that focus and take it to the other works in the exhibition. Further to this idea is an attempt to restore the hearing to some degree, of those who may otherwise not be able to hear the finer articulations of sound content that are so important to this show while also carrying the added bonus, for those with good hearing, of enhancing quieter sound elements (such as crackling candles.) A second main consideration in this design returns again to Rancière's ideas about re-distributing the sensible – by returning sensitivity to hearing precisely in the range where we become deficient after childhood. It is my hope that this heightened sensory experience will serve to return observers to a state of childhood wonder - to further cement the message of the show through a process of engagement with subtlety of sound – in this case augmented through the re-introduction of crisp upper frequencies, perhaps unheard since childhood.

The production methodology of this piece was quite straightforward. Once I had determined how to define a mathematically precise three-dimensional parabolic surface, I designed a positive form in CAD and had it CNC milled out of high-density polyurethane foam. Then I vacuum-formed the parabolic cups

over this form to create a concave negative space within the vac-formed plastic – the shape of which, serves to concentrate reflections – effectively creating a *wearable whispering gallery*. The adjustable headbands themselves have been removed from woodworking face shields and re-purposed. Experiments in the plastics shop, where I made many variations eventually lead to the selection of materials and finish used in the final four headsets to give each a different look while at the same time maintaining a broad brushstroke - lending a degree of visual consanguinity to all four.

A secondary set of concerns involved the matter of framing - of how to present this as a work, and how to wrangle these headsets during the exhibition. Drawing inspiration from heads that are used to display wigs, I had the idea of creating a kind of display case from which the headsets can be removed and returned. Inspired and aided by fellow student Esmaa Mohamoud, who was pouring moulded concrete forms in her own work, I had the idea of employing the opposite of a reflective space – of creating a sonic null space that retains the morphology of the active acoustic space functioning within each headset. Sound in air cannot reflect inside a solid object. By converting the negative space of the inside of the parabolic reflectors to positive space of the retaining concrete forms, my idea was to create a kind of ear-plug for the headsets, to – in a poetic sense – allow them to *rest* while on their forms waiting to be donned. This resulted in my making eight disposable moulds for pouring concrete into. This concrete was all poured by Esmaa over a period spanning several weeks.



fig. 9. Garnet Willis. *Now The Earthbound* 2016
 Photos by Garnet Willis
 Post Production Montage by Alberto Barattucci

Concluding Remarks PART Seven

One of the overarching themes of this thesis is listening, and even more specifically, listening to interactions that point to an eco-political call to arms: a *Clarion Call*. In consultation with committee and peers, I came up with the idea of the photo-montage that has been used on my invite card. This montage integrates two elements: a landscape photo taken while I was in Greenland with melting icebergs in the background, and people (photographed in a park in Toronto) posed face down listening to the Earth. Those in the photo are a form of summary - a one frame movie of Latour's *Earthbound* who are impossibly

listening *through* the cast concrete earpieces – a material of the earth transmuted through human activity – to the sound – perhaps of fracturing icebergs, in situ, perhaps as a metaphor for the necessary tracing of Latour’s “threads or Ariadne”, that we must become aware of. The sound that would be audible at that location in Greenland is the same sound that is flung around the room on the end of a sound beam, as is done in *The Sound That Severs Now From Now ...* The people (family and friends) lying face down with concrete forms-as-earpieces are arranged in the same hexagonal pattern as the axes of pickup used to tension the network generating stresses in the work *Gaia’s Banjo*. This creates a single still image as a summation of the large brushstrokes of all four works in this exhibit.

This group of works threaded together with central themes of agency, engagement, perception, and time explores the realm located between organization and disorganization. The success of humanity has been built on our predilection for rationality, and while it is true that we need organizational structures in the form of conceptual frameworks to first perceive, then parse the world to create meaning, it is also true that we are most engaged when we are confronted with new experience, rich experience, and that the experiencing of these things does influence our perception of time.

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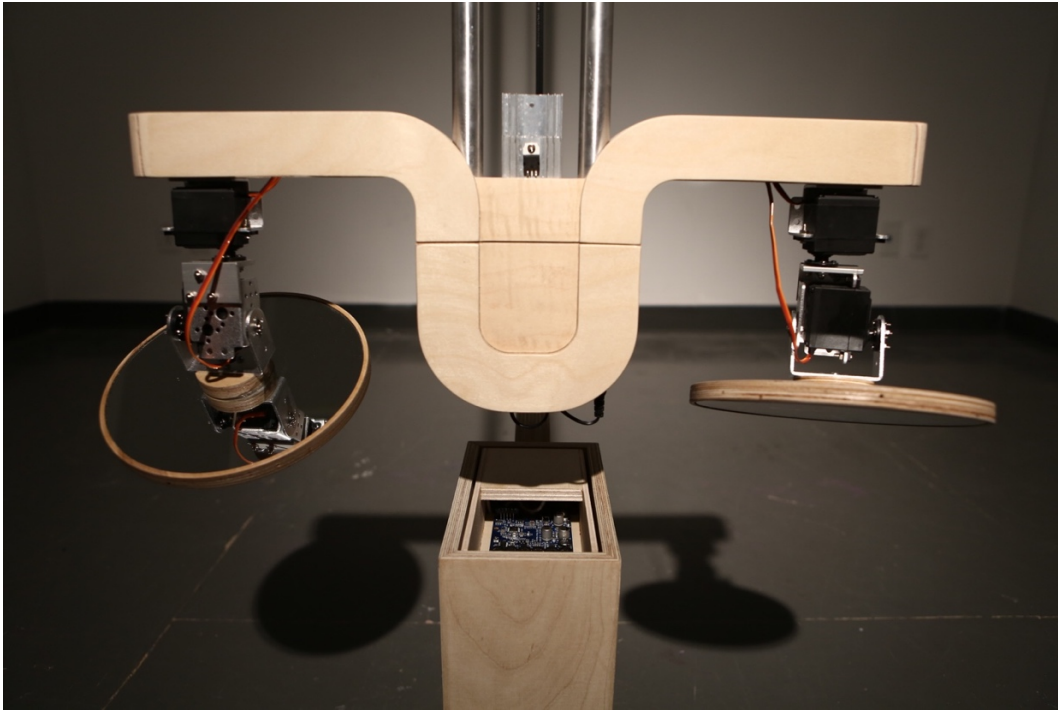


fig. 10. Garnet Willis. *The Sound That Severs Now From Now (Detail)* 2016
Photo Cylla von Tiedemann

Appendix: Arduino Code

```

/* The Sound That Severs Now from Now
   Beam Servo Arduino Code
   Substantially modified by Garnet Willis Dec 2015 from code
   originally written by BARRAGAN <http://barraganstudio.com>
   and later modified by Scott Fitzgerald
   This example code is in the public domain.
*/

#include <Servo.h>                                     // load servo Library

Servo myservoA;                                         // create servo object to control a servo
Servo myservoB;                                         // twelve servo objects can be created on most boards
float easing = 0.7;
float pos = 1450;                                       // variable to store the servo position
long RandomNumberA = 13;
long RandomNumberB = 9;
long RandomNumberC = 1;
long RandomNumberD = 1;

void setup()
{
  myservoA.attach(9);                                  // attaches the servo on pin 9 to the servo object
  Serial.begin(9600);                                  // open the serial port at 9600 bps:

```

```

}

void loop() {
  RandomNumberA = random(1, 16);
  RandomNumberB = random(1, 16);
  RandomNumberC = random(1, 4);
  RandomNumberD = random(1, 4);

  for(pos = 700; pos <= 2300; pos +=RandomNumberC) . // goes from 30 degrees
                                                    //to 170 degrees
  {
    myservoA.writeMicroseconds(pos); // in steps of 1 to 4 degrees randomly
    delay(RandomNumberA);           // tell servo to go to position in variable 'pos'
                                   // waits random # for the servo to reach the
                                   //position (random speed)
    Serial.println(pos);
  }
  for(pos = 2300; pos >= 700; pos -=RandomNumberD) // goes from 170 degrees to
                                                    30 degrees
  {
    myservoA.writeMicroseconds(pos); // tell servo to go to position in variable
    delay(RandomNumberB);           // 'pos'
                                   // waits random # for the servo to reach the position
                                   // (random speed)
    Serial.println(pos);
  }
}

```

```

/* The Sound That Severs Now from Now
Mirror Servo Arduino Code
Substantially modified by Garnet Willis Dec 2015 from code
originally written by BARRAGAN <http://barraganstudio.com>
and later modified by Scott Fitzgerald
This example code is in the public domain.
*/

#include <Servo.h>

Servo myservoA;                // create servo object to control a servo
Servo myservoB;                // twelve servo objects can be created on most boards

float easing = 0.7;
float pos = 1450;              // variable to store the servo position

long RandomNumberA = 13;
long RandomNumberB = 9;
long RandomNumberC = 1;
long RandomNumberD = 1;

void setup()
{
  myservoA.attach(9);          // attaches the servo on pin 9 to the servo object
  Serial.begin(9600);          // open the serial port at 9600 bps:
}

void loop() {
  RandomNumberA = random(1, 16);
  RandomNumberB = random(1, 16);
  RandomNumberC = random(1, 4);
  RandomNumberD = random(1, 4);

  for(pos = 950; pos <= 1950; pos += RandomNumberC) // goes from
                                                    // 30 degrees to 170 degrees in steps of 1 degree
  {
    myservoA.writeMicroseconds(pos); // tell servo to go to position in variable
                                     // 'pos'
    delay(RandomNumberA);           // waits random # for the servo to reach
                                     // the position (random speed)

    Serial.println(pos);
  }
  for(pos = 1950; pos >= 950; pos -= RandomNumberD) // goes from 170 degrees to
                                                    // 30 degrees
  {

```

```
myservoA.writeMicroseconds(pos);    // tell servo to go to position in variable
                                     // 'pos'
delay(RandomNumberB);    // waits random # for the servo to reach the position
                                     // (random speed)
Serial.println(pos);
}
}
```