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EXPLORING MATERIALITY BY CONSTRUCTING THE VISUAL THROUGH SOUND

SEAN RYAN

A thesis submitted to the University of Huddersfield in partial fulfilment of
the requirements for the degree of Doctor of Philosophy

The University of Huddersfield

January 2018

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Acknowledgements

I would like to thank my brilliant tutor Dr. Julio d’Escrivan for his unwavering belief in my abilities. His insightfulness, diligence and creative mind have ingrained in me, a new enthusiasm for the future.

Thank you to Prof. Pierre Alexandre Tremblay for screening my films at Electric Springs, and for his insightful comments and corrections offered as an examiner of my PHD thesis.

Thank you to Prof. Victor Lazzarini for committing the time to examine my PHD thesis, and for your valuable and constructive comments about my research.

I am extremely grateful to the University of Huddersfield for giving me the opportunity to pursue my research interests alongside a group of inspiring and creative colleagues.

Thank you to my family who have kept my spirits high throughout the course of this challenging endeavour.

Abstract

This thesis provides an autoethnographic account of my exploration into sound and its capacity to shape the experience of materiality in audiovisual media. I demonstrate through film and installation works how different sound and image combinations facilitate ways of viewing that blur the boundary between seeing and hearing to form imaginative and engaging sensory experiences. The project expands on phenomenological frameworks examining the connection between embodiment and cinematic experiences, by positing how sound materiality is capable of manipulating the processes through which experience is formed. I argue that synchronous sound heightens or skews the experience a viewer has of visual objects, depending on the level of congruence observed between their respective materialities. The project has implications for the development of sound in video and artistic virtual reality works, where scoring techniques are sought to enhance immersion and expressive embodied experience. This project will be of particular interest to creative coders in the Processing and Csound community who seek to incorporate sound or visuals into their art works.

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figure 1) Test Pattern [n°3], Audiovisual Installation, 2010
Materials - 4 DLP projectors, computers, 8.2ch sound system
Dimensions variable (suggested: W12.0 x H12.0 x D25.0 m)
Date | Place DEC 1-11, 2010 Théâtre de Gennevilliers, FR
Concept, Composition: Ryoji Ikeda
Computer Graphics, programming: Tomonaga Tokuyama
Commissioned by Théâtre de Gennevilliers, 2010
Supported by ARCADI, projection design

INTRODUCTION

‘Our bodies and movements are in constant interaction with the environment; the world and the self inform and redefine each other constantly. The percept of the body and the image of the world turn into one single continuous existential experience; there is no body separate from its domicile in space, and there is no space unrelated to the unconscious image of the perceiving self’ (Pallasmaa, J., 2005)

Modern Influences: Inspired by Materiality

I imagine creeping slowly into a dark empty hanger, struggling to make sense of the space, lit only dimly by an emergency sign hovering above the door. Moving further in I become fixated on the silhouette of a monolithic grey shape, stretching upwards into the dark abyss and quietly stop a few body lengths away ! The silence draws in, my breathing slows, and my nervous system starts to fill with a heavy static charge, expecting something to destroy the silence.....



Figure 1. Test Pattern [n°3]. From “ryojiikeda.com”, by R. Ikeda, 2010, (<http://www.ryojiikeda.com/project/testpattern/>). Copyright 2010 by Ryoji Ikeda. Reprinted with permission.

It hits, faster than high speed train, moving so fast that my eyes struggle to keep up. Stroboscopic flashes of the darkest black and the brightest white morph the monolithic rectangle into patterns of light. I can hear the explosive malfunction of a speaker, ripping infinitely fast to every switch. My eyes are overwhelmed, and I let go of my sight, but my

body begins to flicker mechanically, as the flashes of light now shoot through my body instead. I am now absorbed by rhythm, moving effortlessly between spaces, a hundred times a second, and start to feel the machine. Never resting, but relentlessly carving my way through time and space with great power. I am consumed with awe.

Ryoji Ikeda's stroboscopic *Test Pattern* (2008) challenges the upper speed limit of sensory perception, in an attempt to express the materiality of data and its incredible pace in our digital surroundings. The work uses a real-time system to translate a barrage of explosive glitch sounds into enormous barcode projections, as seen in Figure 1, resulting in a rapid stream of tightly synchronised audiovisual phrases. Ikeda's complex rhythms are largely undecipherable through vision alone, given that binary forms flicker at a rate approaching and exceeding the threshold of visual persistence. This causes a fast succession of images to smear into a continuous stream of light, which masks the temporal discontinuities that constitute rhythmic phrases. The work overcomes this visual limitation by exploiting the higher temporal resolution of hearing and inducing audiovisual sensory entrainment, a process that Bolger, Trost and Schön (2013) and Ronconi and Melcher (2017) demonstrate is the rhythmic parsing of attention through sound, to which visual perception becomes sympathetic. By embodying the rhythms of the soundtrack, temporal experience is segmented into perceivable intervals of time, around which attention and visual perception is primed, particularly during repetitive phrasing. This allows sound to reveal rhythm to sight by orchestrating the sequence of accentuated moments at which the eye perceives. For viewers engaged by audiovisual rhythm, the installation may evoke an impression that sensory perception has been accelerated, resulting in a sensation of intense presence that offers a tangible grasp on the precise and rapid processing of data in the digital domain. This attentive perception will undoubtedly fatigue over time, causing visual rhythm to be discerned less precisely, and making a viewer aware of the perceptual limits of their senses in contrast to the relentless performance of the machine. Being more absent from the

installation turns audiovisual rhythm into a wash of sound and light, which highlights the immateriality of data and the incomprehensible speed at which it is moved, perceived and discarded in modern technology.

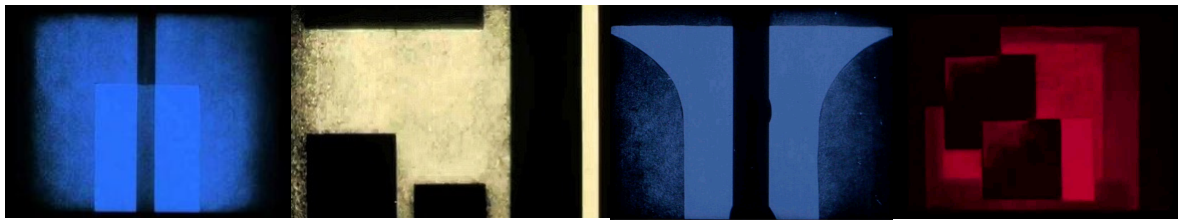
At the other end of the spectrum, Ikeda's (2002) *The Radar*, showcased on the sands of Devils Beach in Rio de Janeiro, tries to encapsulate the seemingly impossible vastness of the universe. A galaxy of naturally flowing data points are contrasted with a rigid grid that fails to organise them, while waves of light caress a great stretch of beach gracefully. Highly reverberant digital blips and transients embody the vastness of space as they accompany the flowing visuals and disappear into a spatial abyss. Rhythmic bursts of dry beeps and static white noise accentuate flashes of geometric squares, that represent the inner processes of a machine trying to comprehend the incomprehensible. In a video interview with given to assistaOiR (2012), Ikeda explains that his work strives to evoke a sensation of 'awe', by offering an experience that the 'brain can't handle'. This idea of being unable to comprehend the sheer scale of the universe has clearly materialised in the contrasting gestural themes of the work. Ikeda does not impose his emotional viewpoint on the materials, but rather lets the experience unfold through a search of meaning. For me, Ikeda's work is derived from pure sensation where sound and image are always crafted with the upmost respect to their effect on a way of being.

The exploration of audiovisual materiality often opens new pathways for creative composition processes, exemplified by a collaborative work between Ryuichi Sakamoto, Alva Noto and Ensemble Modern (2008). Inspired by a plan of Mannheim city, a visual score was created that consisted of computer generated surfaces distorted by the interference patterns of sine waves in three dimensional space. The composition process started by capturing a series of orchestral improvisations that strived to embody the gestural and textural developments of materiality in the visual score, such as graininess and

horizontality. The sound material was digitally manipulated and restructured by Noto and Sakamoto to function as an electronic score, enveloped by their personal response to the visuals. The acoustic ensemble were asked to reinterpret the materiality of the electronic score live, while referencing the visual score to invite further inflections of visual morphology in their sound gestures. In this example the materiality of the visual score permeates through a number of aural stages within different technological mediums. This forms an immersive audiovisual synthesis of the entire process that is embodied by the viewer in the final performance.

I feel the artists in each of the works discussed have exploited a truly audiovisual language that is capable of evoking vivid tactile, kinaesthetic and visceral experience. Sakamoto and Noto's audiovisual language draws attention to a cross-sensory way of intending towards the world, which embraces haptic and kinaesthetic viewing modes, and results in a tangible grasp of their visual forms. Ikeda turns real world phenomena into audiovisual abstractions and embellishes their essence using suggestive materiality such as expansive spatiality, intense speed or agonising noisiness. Over time an overarching concept emerges that gives meaning to the embodied experience of each expressive abstraction, which reveals Ikeda's personal impression of the phenomenon. I am fascinated by the idea that experience can be shared through expressive audiovisual language, which takes the viewer on a journey through hyperrealistic and unusual sensory dimensions. My work with non-narrative art film and interactive installation explores the nature of highly sensory audiovisual experience, and the role that embodiment, imagination and expression play in the manipulation of perception. I am particularly interested in the capability of sound to modulate visual perception by exploiting the interplay between sense impression, memory, mental imagery and expression.

My Journey Towards Materiality and Film Experience with Walther Ruttmann



Walther Ruttmann, *Opus III* (1924)

My journey into film and the senses was sparked after coming into contact with the films of Ruttmann, Eisenstein and Vertov, and the strong sense of musicality imbued in the structural form of their art. I was immediately immersed by Walther Ruttmann's *Opus III* (1924), and resonated with the fugue like musical flow of geometric and anthropomorphic shapes as they swirled and crashed across the screen. A beautiful play of light and shadow through layers of vivid saturated colour gives life to Dada inspired abstractions, which subtly resemble natural or mechanical materials, spiritual dimensions and emotional contexts. The tactility of the hand painted film stock and elegant morphology of shape, spatiality and texture, evoked a detailed soundtrack in my mind that caused me to completely phase out Hans Eisler's (1927) accompanying string score. The sound I imagined was sourced from a wide array of objects, with detailed textures and spectral morphologies that flowed effortlessly with the transformations of shapes. Each sound exhibited a distinctive spatial signature with amplitude variation and frequency dissipation, that responded to Ruttmann's sophisticated use of colour gradation, opacity and perspective projection to convey visual depth. Eisler's orchestral score imparts its own momentum onto the visual counterpoint, forming expressive moments of synchronised audiovisual unity, however, I felt Ruttmann's suggestive visual themes were frequently ploughed over using repetitive melodic lines and flat orchestration. As Valcke (2008) explains, the Dadaist aesthetic around this time favoured a symphony of kinaesthesia through which the world of mechanical noise and chaos could be appreciated. I went about

composing a sound design score (see enclosed USB / Walther Ruttmann / Opus III) for *Opus III* using concrete sound, to imbue the images with the organic materiality I had imagined. The audiovisual elements were highly synchronised and as a result, some of the rhythmic impetus provided by Eisler's string score was lost, however, I think the connection to the material world of the film was greatly enhanced¹ The metadiegetic² narrative was more vivid, allowing a juxtaposition of spiritual, physical and emotional contexts to shine through, which I felt were elements of a larger expression that described the human condition. The objects assumed a more interesting haptic quality and were embedded in a tangible spatial dimension. My analysis of this work observed how the material qualities of highly tangible sound were consumed and transcribed by vision to better grasp the abstract images. I was intrigued how the change from an instrumental to sound design score, shifted the experience of Ruttmann's work from a predominantly kinaesthetic engagement, to one emphasising a tangible connection with texture and spatiality in the images. It was here that the seed for my fascination with the manipulation of materiality through sound was sown, as I sought to better understand how I could harness this powerful audiovisual language effectively in my work.

After scoring *Opus 3*, I encountered Ruttmann's city-symphony film *Berlin: Symphony of a Metropolis* (1927), which is a meticulous depiction of human and industrial movement in

¹ My scores for Ruttmann's *Opus III* (1924) and *Berlin Symphony* (1927) acts 1 & 2 are practical works predating my PHD studies and are therefore not components of the PHD portfolio. They are important to the contextualisation of my research and feature in this thesis to demonstrate how historic film theory and practice has informed my approach to audiovisual montage.

² In literature, a metadiegetic narrative is a secondary narrative that is told by a character in the primary narrative. Gorbman (1987) was the first to define metadiegetic film music, which is music that plays over a shot in the primary narrative, but originates from a character's mental space as part of a personal story that is imagined or remembered. Chion (1994) extended this definition and categorised all sound originating from a character's mental space as subjective-internal sound. In the case of my score for Ruttmann's *Opus III* (1924), sound engages the primary representation by accentuating immanent visual motions and rhythms of the abstract images. Concrete sound working on the primary level, may simultaneously evoke mental imagery and sense memory of objects and contexts beyond the primary film representation. These secondary level images stem from my imagination, and overtly modulate perception of the primary representation, which makes my score a form of secondary narration.

Berlin over the course of a day (see Appendix A for a summary of Ruttmann's city symphony aesthetic). I was intrigued to see if a modern music and sound design score could flesh out a more tactile experience of the coal powered industrial city, while embellishing a kinaesthetic empathy with the energetic motions of the subjects shown (see enclosed USB / Walther Ruttmann / Berlin Symphony). The score is a montage of contrapuntal guitar phrases and rhythmic sound gestures, which help to parse Ruttmann's complex visual rhythms, while outlining the dynamic rise and fall of visual momentum across the opening two acts. Littered throughout the score are concrete sound gestures that function as hyperreal snapshots of the materials and diegetic³ sounds suggested by the images. The spatial signature of these gestures, which were recorded using close microphone techniques, is distinctly mismatched with the spatial perspective of the camera. This creates a psychoacoustic impression of being in close proximity to the materials, and perhaps conjures memories of manipulating similar objects and hearing their sound characteristics from this perspective. I felt that this overt mismatching of aural and visual spatiality heightened the tactile experience of the images greatly, by offering an experience that reflected being in the city, rather than passively observing it.

My experience scoring the abstract images of Ruttmann's *Opus III* (1924) demonstrated that a more investigative exploration of aural and visual materiality could be provoked, by restricting the ability to definitively identify the objects being viewed. This technique is exploited throughout my film and installation portfolio, where the level of congruence observed between aural and visual materiality is varied, to evoke imaginative and expressive viewing modes that change how the visuals are grasped. I was inspired by Ruttmann's exploitation of visual kinaesthesia in *Berlin: Symphony of a Metropolis* (Ruttmann, 1927) to explore audiovisual montage with fast paced editing, and saw potential in dynamically shifting between audiovisual techniques to diversify viewing

³ Diegetic sound is that which appears to originate from a source that could be seen onscreen.

modes and evoke a range of sensory experiences. My films *CineBlips* and *Cineflow* explore contrasting styles of audiovisual montage, and look at how different levels of congruence between aural and visual materiality and continuities of movement across shots, change the kinaesthetic and tactile perception of sound and image. Both of my scores for Ruttmann's films demonstrated that the tactile experience of a visual object was enhanced, when synchronised with sound that has been recorded with close microphone techniques. My portfolio exploits close microphone recording techniques and the intimate rendering of sound through contact microphones and hydrophones, to evoke sense memory associated with a physical manipulation of materials, which heightens the tactile and proprioceptive experience of their material properties.

Eisenstein and Overtonal Montage

In the decade of the 1920s there were opposing schools of thought between Western and Soviet film theorists surrounding the role of film in society, and the ethical duty of the film maker to convey social truths. My encounter with Soviet avant-garde film revealed the work and theory of Sergei Eisenstein, who pioneered a dramatic style of audiovisual montage to push communist ideals through propaganda films. Eisenstein's approach to film as a unity between sound and image was strangely refreshing, given that the ideas were nearing a century old. Reading *The Film Sense* (Eisenstein, 1975) and Robert Robertson's (2009) historical overview of Eisenstein's audiovisual journey, provided a fascinating account of the influences that lead towards his theory of 'overtonal montage'. Robertson (2009) outlines how this montage style was influenced by a counterpoint of oppositions appearing throughout an eclectic mix of artistic disciplines, from James Joyce's poetry, to the principles of Taoist Chinese scrolls and Kabuki theatre. From these influences, Eisenstein set out to liberate the potential of film as art and create a truly audiovisual film language to unite the senses. He aspired to develop a controlled flow of consonant and

dissonant interactions between sound and music, that when summed together imparted an expressive emotion or meaning greater than the individual elements could alone. Eisenstein's explains that,

piece A derived from the elements of the theme being developed, and piece B, derived from the same source, in juxtaposition to give birth to the image in which the thematic matter is most clearly embodied. (Eisenstein, 1970, p.60)

Eisenstein's unity of the senses stems from a belief that all artistic forms are a synthesis of planes, which encompass the multiple perspectives of an art work that fold together over time. In this sense, different perspectives might take the form of spatiality, rhythm, emotional development or colour, which are interwoven or juxtaposed to create a rich and flowing tapestry from which a higher meaning emerges. With this line of thought, Eisenstein can be seen to match the development of melodic phrase and timbre with the visual flow of lines that draw the eye across an image. His tendency to organise the flow of spatial or temporal planes in shots, and match this analogously in music, represented a truly audiovisual approach to the film medium. The verticality of Eisenstein's montage technique was employed effectively in Soviet propaganda films such as *Battleship Potemkin* (1926) and *October* (1927), which were commissioned to immortalise the 1905 sailor mutiny against the failing tsarist government, and the 1917 October revolution against a dysfunctional bourgeois provisional government respectively. In *October*, chaos and emotional oppression is expressed through iconic images of military power juxtaposed with working class suffering, and is embellished by the ever growing rhythmic drive of a non-synchronous full orchestral score, punctuated by a host of percussion rolls and brass bursts. The music moves between consonance and dissonance, beckoning the provisional government army in one instance and oppressing the working people in another. O'Pray (2003, p.27) suggests that Eisenstein's anti-humanist theme reflected his 'disgust, horror

and outrage' at the old crooked bourgeois system, and that psychological investigations into emotionally engaging a mass audience shaped the style.

I was inspired by the verticality of Eisenstein's audiovisual montage, particularly the synaesthetic translation of an multifaceted experience into planes of aural and visual materiality, which converge to instil a highly tangible impression of the events unfolding onscreen. I adapt the concept of overtone montage in my own work, which exploits audiovisual synchronisation to fuse sound and image with incongruous materialities. The audiovisual objects formed evoke mental imagery and sense memory associated with different source objects, and the conflation of these contrasting impressions manipulates the perception and tangible experience of the visuals. Eisenstein's *Battleship Potemkin* (1926) demonstrates that the kinaesthetic experience of instrumental rhythm and gesture, can be used to greatly energise visual movement. My work compares how the kinaesthetic and tactile experience of concrete, instrumental and electronic sound, changes the manner in which visual materiality is grasped.

Dziga Vertov and Constructivist Montage

While Vertov had resonated with Eisenstein's montage technique and its liberation of film from being a simple photographic tool, he felt that a narrative format and choreographed acting shrouded the kinopravda or film-truth that emerges when an ensemble of natural moments are brought together. He sought to renounce ties to other artistic forms, which he refers to as 'foreign matter' (Vertov, 1984, p.7), instead eager to develop a new art arising from experimentation with the camera viewpoint itself. Vertov's constructivist style was formulated around the kino-eye, which explored the ability of the camera apparatus to render a deceptive and often politically influenced version of reality using factual material. His documentary films such as *Man With a Movie Camera* (Vertov, 1929) promote the achievements of a socialist city population, who work together in harmony and prosper

through modern technology, however, this meaning is only revealed by embracing the kinaesthetic portrayal of the collective rhythm and effort of the work force. In this way, Vertov exploits the veil of film-truth that characterises observational documentary footage, to inconspicuously weave a positive perspective on communist ideals through the embodied experience of exciting and progressive movement. Vertov (1984, p.90) explains that his approach to editing is a highly structured ‘montage battle’, focusing closely on an idea of ‘intervals’, which is to correlate movement, spatial representation, framing, light and shadow, and recording speeds between shots to forge overall sections of movement. The emergence of an overarching movement through montage, inferred by the sum of all the micro motions in shots, reinforces the idea that technology had permitted a new high speed in society.

Vertov (1984) had welcomed sound to cinema as an ‘audible kino-eye transmitted by radio’, and was prescient to the Musique Concrète movement of 1942, which is apparent in his synchronous and non-synchronous sound experimentation in *Enthusiasm* (Vertov, 1930). He rejected the statement on sound put forward by Eisenstein, Pudovkin and Alexandrov (1985), that only a non-synchronous use of sound would further the artistic achievements of silent film montage, and instead saw the potential to use synchronous methods as political audiovisual metaphor sympathetic to the socialist cause. Smirnov (2013) outlines how Vertov, during his studies at the Psychoneurological Institute in Petrograd, experimented with the rhythmic arrangement of phonetics to subvert the understanding of prose, and create interesting listening experiences that resulted in new perceptions of familiar sound. This early experimentation clearly manifests in Vertov’s later works, such as *Enthusiasm* (1930), where highly rhythmic industrial sound is used subversively to embellish a visual analogy between worker and machine. The kinetic rhythms of concrete industrial sound are layered over repetitive and explosive movements of workers, and cut into a montage of mechanical intervals with contrasting tempo. This

forms an elaborate audiovisual flow that imbues the motions of men and women with perfect mechanical timing, and taints their bodies with a materiality suggestive of extreme strength and force. Vertov structured sound as expressively as the image to create a symphony of movement and tangible experience, using a diverse mix of concrete factory sounds, brass ensembles, radio excerpts and more. His creative audiovisual combinations generate a counterpoint between the glorification of ordinary motion and tactile sound, with the deeper meta-diegetic analogies of the hardened man, assuming the material qualities of the machine. Fisher (1985) points out that Vertov's use of sound functions to 'sabotage' all filmic illusions in true commitment to the kinopravda.

I was inspired by the engaging momentum evoked by Vertov's kinaesthetic structuring of movement by intervals, and the subversive synchronisation of mismatched aural and visual objects to evoke analogy, which collectively results in a highly tangible whole bodily engagement with the images. Vertov's rhythmic montage technique would influence my later portfolio works, which exploit a kinaesthetic empathy with a stream of audiovisual movement, to propel a viewer through a quick succession of contrasting embodied experiences. By pressuring the viewer to make sense of perceptually challenging audiovisual combinations in short time, I explore the effect of editing pace on the manner in which materiality is engaged and experienced. My audiovisual language develops Vertov's technique of subverting causal relationships between sound and image, by varying the degrees of congruence perceived between aural and visual materiality. This results in a dynamic interplay between mental and physical impressions, which modulates the relationship between imagination, expression, sight and the resulting experience.

A Starting Point

I began to reflect on my own approach to sound for film and the highly tactile and imaginative process that goes into creating a sound design score from everyday objects. It

requires me to consider every visual and aural facet of an object, and translate these qualities into the being of screen bound objects. It dismantles any kind of void between myself and the screen, because I exert effort to see in a ways that are haptic, tactile and kinaesthetic. When sound is finally combined with the image, the resulting experience is vivid. The once silent object takes on a new life, making sound in its motions and communicating back to me what I had strived to see in the first place. I wanted to create audiovisual works that shared these tangible embodied experiences of audiovisual objects, by evoking highly imaginative and sensory exploratory modes of viewing. Perhaps my investment in the essence of simple items allows me to reconnect with something primal and escape the sensory void that constitutes a large part of daily life. It is ironic that I delve into the virtual world of film and installation to explore my relationship with the materiality of the real one. On the other hand, it probably requires the sensual shock of the unreal to remind me what my body is capable of experiencing, and what is subdued by the everyday slog.

What follows documents the creative process through which my cinematic style emerged. I explore the works and theories that inspired my design and consider the effectiveness of my films through reflection. I move on to explore installation as a natural extension of my practice and consider how my core artistic aesthetic has materialised in this medium. In approaching this task I heeded the advice of Tarkovsky and let the creative process flow naturally from my own sense of intrigue.

A mass of preconceptions exists in and around the profession, And
I do mean preconceptions, not traditions: those harkened ways of
thinking, clichés that grow up around traditions and generally take
them over. You have to work out your own position, your
individual point of view - subject always, of course, to common

sense - and keep this before you, like the apple of your eye, all the
time you are working

(Tarkovsky, 1986, pp.59 - 60)

CHAPTER ONE: The Appeal of Materiality

What is so appealing about about expressing materiality? We take for granted the ability to explore our own sensations, and synthesise a grasp of the worlds materials without making physical contact with them. Perhaps the hyperreal and uncharted experience of an engaging artwork is required to rekindle a childhood fascination of texture, sound, light, colour and motion seen for the first time. I often wondered why my nephew and nieces found bashing spoons on everything at the dinner table so compelling. Of course, the experience is old for the adults and has been categorised as inappropriate for the social context, therefore becoming annoying. The children are learning about materiality. It is clear as they testing the sound of the plate against the spoon compared to the spoon against the table, regardless of how unmethodical. There must be a wealth of information garnered in this one activity, linking force to amplitude, understanding source coupling, realising the room has a spatial signature and more. In his musings, Merlau-Ponty considers the vast tacit knowledge we have of sensory experience.

But the spectacle of perceived does not partake of pure being. Taken exactly as I see it, it is a moment of my individual history, and since sensation is a reconstitution, it pre-supposes in me sediments left behind by some constitution, so that I am, as a sentient subject, a repository stacked with natural powers at which I am the first to be filled with wonder. (Merlau-Ponty, 2002, p.249)

When I consider the work of Ikeda or Vertov, the experience is only possible by drawing simultaneously upon every sense, and combining this sensory knowledge of sound and light and movement in a thousandth of the time that one breath can be taken. Why then does art work make us more aware of this unification of the senses? Sobchack (2004, p.70) posits that we are unaware of our synaesthetic capabilities because it is the general ‘rule’,

and that we only become aware when faced with some form of sensory overload. This is potentially why Ikeda's work is so ensnaring, because it puts us back in touch with the senses that whirl in an endless feedback loop, searching an unexplainable object for meaning that can't be resolved.

Cinema has a fantastic ability to retain just enough of reality that the real permeates our sense of the images, only to shock us by weaving the surreal in and out of everyday causal events. It is like being given access to the magical world we dreamed would exist as a child, and no doubt tried to take back with us into the real world. Vertov was a pioneer in exploiting these limits and drawing attention to his own subversive method. Of particular interest to me, was his synchronised sound experiments and the transplanting of haptic qualities between man and machine. This overt mismatching of sources seemed to elicit an array of tangible material qualities that competed and fused in a final image that was familiar and unfamiliar. I was interested by how connected I was to the material qualities of sound and image and the competition between the seen and my imagination. A similarity I observe between Vertov, Noto and Sakamoto is a deeper exploration and subversion of causal relationships, in order to draw upon some form of remembered bodily experience. Sounds that are 'source bonded' (Smalley, 1997) to an object different to what is being shown, immediately evokes this competition and discussion between the senses about what correlation can be found in the seen and heard. Ikeda's rhythmic pattern of squares have no direct correlation to my perception of the computer or space, but through sound I feel the rhythm of data, the surface of the electrified squares and the galaxy in which it propels itself. In all the works there is an inherent balance to the sound-image hierarchy, where sound and image enter into a dialogue and convey through nuance rather than explicit statements. Important to the premise of this technique is the tight matching of movement in a temporal frame. Chion (2009, p.38) terms this process 'synchresis', a word that encapsulates a synthesis of objects joined by motion, regardless of how unreasonable the

combination. Synchronesis is a pre-reflective process geared specifically to observe causality in the real world, and is therefore ripe for manipulation by the surreal and unbounded potential of film. I was inspired to develop a refined form of montage that exploited causal relationships, and explored the boundaries of truly audiovisual viewing modes. My work would aspire to manipulate a viewer into rediscovering their synaesthetic capabilities, and explore their own repository of materiality, in order to connect them to my experience of materiality through imagination and creation.

Synchronising Sight and Sound

Lastra (2000) observes how exhibitors of early cinema profited from an exploitation of synchronesis, and used sound troops to exert realism onto silent image by performing sound as seen onscreen. This created the illusion that sound emanated directly from the diegesis. The potential problem with this method was dependant on how egocentric performances were, and whether the audiovisual hierarchy shifted so that imagery appeared to be manifested by the 'virtuoso displays of sound' (Lastra, 2000, p.105). Lastra (2000, p.107) observes how exhibitors like Lyman Howe who respected the audience and realism, gained notability for his attention to detail and attempts even to 'scale match' the sound appropriately to convey spatial distance. What is interesting about these accounts is the subversion of the sound image hierarchy that occurs with the egocentric drummer. While Lyman Howe's approach appeals to realism, the drummer appears to have enforced his synaesthetic experience of the film onto the perceptual processes of the audience. This viewing mode was challenging for early cinema audiences, but I wonder if cultural expectation prevented them from seeing the interesting effect of having their perception subverted. The Cinematic Orchestra's (2003) score for *Man With a Movie Camera* uses this percussive technique to subvert temporality and create an illusion of images moving to musical sound. Jump cuts are synchronised with snare hits that fall on dominant beats of

highly syncopated drum phrases, which contrasts with the rich texture and flowing phrases of brass and wind sections. Our kinaesthetic engagement with the images is tuned to the syncopated rhythm of the drum, explicitly drawing our attention to the film edit, and the film apparatus by association, in true constructivist style. In this instance the music also functions as the diegetic embodiment of the rapid physical gesture that is shown and repeated in the jump cut. In contrast, a kinaesthetic flow is reinforced by non-synchronous energetic wind phrases that blend the chaotic edits and rhythmic actions of workers together. Here temporality is allowed to become an amalgamation of the workers speed in individual shots, the editing pace and the sum of all these movements appreciated over time. The conglomerated sensation of different layers of movement is extremely effective, and draws our attention to the ability of sound to constitute temporality depending on its diegetic or non-diegetic use. I find this subversion of musical hierarchy interesting because it highlights how elastic the temporal resolution of listening can be, given our perception of where sound and image are unified.

Cartoon Synchronicity

The musical cartoons of the late 1920s are characterised by their creative exploitation of instrumental gesture, to amplify the kinaesthetic and tactile experience of animated movement and texture. These kinds of audiovisual interaction incite listening modes where the viewer engages with what Smalley (1997) terms the ‘spectromorphology’ of sound, by extracting ‘special intrinsic features’ of a sound gesture to understand how it fits into the ‘extrinsic’ context of the visuals. Smalley (ibid) notes that the spectromorphology of a sound communicates a wealth of information, including the material properties of the source object heard, the contour of the source object’s movement in space, the muscular gesture enacted to excite the sounding material and the manner in which energy is transferred by the source material. Tactile impressions are also evoked where the ‘energy-motion trajectory’ of the gesture used to excite a material, infers an interaction between the

skin and the source material identified (Smalley, *ibid*). The acousmatic instrumental gestures of musical cartoons therefore meld to the energetic movements of the visuals, because their synchronous spectromorphologies suggest visual movements, transfers of energy or musculature gestures that correlate with the same properties of visual morphologies. Tactile and proprioceptive experiences additional to this common motion conflate, to accentuate or distort the experience of visual texture and the frictional forces implied by visual interactions. Altman (1985, p.46) explains that at the time of the early cartoon, the limitations of sound mixing technology ‘practically forbade postmixing of multiple tracks without audible loss of quality’. In order to overcome these technological limitations, a pragmatic decision was made to record the soundtrack first and coordinate the movement of drawings to the fixed aural morphologies. This synaesthetic translation of visual movement into drawn images, results in a soundtrack that traverses the diegetic non-diegetic boundary, where instrumental gestures function as diegetic sound effects in one instance, and as a non-diegetic rhythmic force in another. Chion (2009, p39) notes that the audiovisual language of the cartoon was acclaimed by Eisenstein and other prominent filmmakers worldwide, given that the indeterminate identity of the audiovisual objects forged, liberated imagination and enticed creative sensory interpretations and experiences of the visuals. For Carl Stalling and Walt Disney, the coordination of musical timings and visual actions during the pre-production of a cartoon must have been a highly imaginative and synaesthetic process. After conceiving an idea for a detailed audiovisual morphology given a temporal frame, they must have expressed this idea as a mental film and perceived the sensory impressions evoked by their audiovisual imaginings, to check that the experiences evoked were suitable. Perhaps it is the traces of this wild multisensory creativity in the finished cartoon that we take up and find so enjoyable, because we must indulge a similar cross-sensory exploration and expression of sound and image, to embody the energetic movement of the visuals. Curtis (1992) notes that for the Mickey Mouse

series, visual sequences were devised first and music was orchestrated to match the visual morphologies as best as possible, however, the high degree of audiovisual synchronicity achieved, similarly blurs the music directing action and action directing music relationship. In the opening of Walt Disney's *The Skeleton Dance* (Walt Disney Animation Studios, 2015), Stalling's translation of ferocious gales through portamento wind gestures and thunder through crescendoing brass, conveys the sheer force of the storm as well as any real recording. For Chion (2009, p.238) this 'rendering' or translation of sensations from one modality for another, works somewhere between code and 'simulacrum', and can offer a more tangible impression of an event than if the real sound was used. Stallings flurry of instrumental wind traces the morphology of the gales shape explicitly, yet retains only small timbral similarity to the bands of noise that wind sounds like. In this instance the recalled feeling of wind and its volatile tactile variation is called up by the image, and amplified by the bodies kinaesthetic engagement with the instrumental morphology. This is an effective inversion of the audiovisual technique used by Vertov, where the materiality of objects conjured in imagination by acousmatic sound gestures, modulate the kinaesthetic and tactile experience of a visual objects movements and textures. The prevalent use of Stalling's scoring technique in cartoons today, stands testament to how engaging and effective cross-sensory modes of scoring can be, especially considering that young children understand and enjoy them. Watching these early musical cartoons is as much pleasurable now as it was as a child, potentially because my worldly experience grants access to a wealth of kinaesthetic and tactile memory to throw back at the images. The holistic fusion of music with an animated world that dances in time with it, has direct parallels with the montage techniques employed by Vertov and Eisenstein, where the emergence of an all encompassing rhythmic force heightens a kinaesthetic empathy with the movements of people and mechanical objects. There are notable differences between the way sound interacts with the drawn images of cartoons and the photographic imagery of the soviet

films, particularly where the vague spatial and textural qualities of cartoon imagery, neither confirms or denies the veracity of sound as it relates to these domains. When scoring Ruttmann's *Opus III* (1924), abstract painted shapes absorbed the textural information provided by concrete sound gestures like sponges, granted that the kinaesthetic relationship was matched. Any spatial signature seemed to stick to the image without resistance because the background was typically black, thus being infinitely far and infinitely close at the same time. Birtwistle (2010) feels the cartoon is a compression of focused space with no background, where the isomorphic⁴ conflation of sound and image focuses perception on a few isolated and highly exaggerated details, and causes sound and image to reside and fold in a dominant foreground. Perhaps this accounts for Chion's (2009, p.41) suggestion that 1930's cartoon music functions in its primary state of 'rhythmic sound', given that it is inherently folded or bound up as the physical force that is the cause for all foregrounded movement on the screen. Delicatessen (Caro, 1991) opens with an interesting variation of the cartoon aesthetic, that demonstrates the ability of highly synchronous audiovisual morphologies to focus perception on a foregrounded plane, where movements or textures are observed in isolation from other regions of the image. The sound of bouncing springs during a sexual encounter functions as a rhythmic force, which coordinates the synchronised motions of people lower in the building. As the acousmatic sound speeds up, the activities of the people below also increase in speed. The source of the spring sound gesture is initially revealed in the diegesis and becomes acousmatic later. This audiovisual relationship is engaging because the sound image hierarchy is effectively subverted, where a sound gesture transcends its initial role as a simple diegetic sound effect, to command a kinaesthetic empathy that modulates the temporal experience of the scene, and which focuses perception intently on the foregrounded movements of the characters. I was interested in the concept of an audiovisual fold as a dominant plane where sound and

⁴ An isomorphic sound gesture has the same perceived shape and a visual gesture.

image met, depending on their mode of interaction. This made me wonder if the sensory impressions evoked by images could be folded into the experience of a mental space conjured by sound. Synchronous acousmatic sound would be required to engage causal listening and evoke mental imagery that ran parallel to the images. The synchronisation of audiovisual morphologies would bind the materialities of sound and image, and potentially allow the sense impressions originating in visual and imagined spaces to infiltrate one another. I also wondered if the sensory experience of photographic images could be folded onto the perception of sound materiality. This could potentially be achieved where sensory impressions stemming from highly textured imagery, fold into the perception of synchronous electronic sounds with little tactile detail and no definitive source object. I was curious if the incongruence perceived between the materiality of synchronous acousmatic sound and image, would cause a viewer to indulge imaginary listening as a means to reveal and grasp sound that is suggested by the images, but missing from the audiovisual gesture offered. D'Esquivan (2007) explains that sound designers employ imaginary listening when conceiving appropriate sound gestures for film.

The sound designer must 'reverse engineer' a sound 'source' from a visual image. They must work backwards by trying to imagine how a given image should sound. This process of imaginary listening consists of listening in advance of the actual sound being perceived. They see the means of production (the image on screen) and have to imagine, browsing and recombining their memories of sound, what it could sound like. (d'Esquiván, 2007, p.3)

In this viewing mode, the images function as a sensory repository that enable causally related sound gestures to be mentally synthesised, expressed and cross referenced with the acousmatic gesture. For this viewing mode to be actively indulged, it would perhaps be important to create an expectation for a specific type of sound to be heard, so that when

this expectation was not met or a previously heard sound was taken away, the viewer expressed the missing sound element of the interaction. This technique would effectively fold the detailed imagery into an imaginative aural domain that is foregrounded in perception.

As I reflected on the engaging hyperreal experience evoked by cartoons, it was clear that a highly imaginative and cross-sensory approach to conceiving audiovisual gestures, would more likely result in a viewer to adopting similar viewing modes when grasping the film. As Chion (2009) argues, audiovisual combinations that retain some level of indeterminate identity are more likely to entice creative sensory interpretations of materiality, and result in engaging embodied experiences. The audiovisual language of my work would therefore aspire to push the limits of my own imagination and perception, to ensure that space was left for a viewer's imaginative interpretation and creative cross-sensory expression, and allow them to partly create their final embodied experiences.

Sense Residue

During the scoring process of Ruttmann's *Berlin Symphony* (1927), it became clear that there were combinations of synchronised concrete sound and image that required different efforts or modes of viewing to comprehend. I decided to break these relationships down anecdotally and broadly generalise the process through which my perception of materiality underwent change. The crucial rule for these relationships was that sound and visual objects were subconsciously linked together by synchronous movement over time. The correlations after this fact were dependent on matching morphologies over time. The two distinct interactions I saw potential in exploring and exploiting were:

- Diegetic sound is perceived have a causal relationship with the object shown, however its spectral characteristics accentuate, subtly modify or draw attention to specific material qualities of the object.

- Acousmatic sound is linked by synchronised morphology to a visual object, but there is incongruence between the materiality of sound and image in planes such as texture, mass and spatiality. An interplay between images seen and images heard, sound heard and sound seen occurs, resulting in the evocation of contrasting sensory impressions that compete, fuse and take hold in the experience of real imagery and mental imaginings.

In the first type of interaction, ‘causal listening’ is engaged and we recognise material indices that equate our sound object with the image object (Chion, 1994, Schaffer 1967). This correlation of impressions is close to what was expected and so sound appears to emanate directly from the visual object as ‘visualised’ sound (Chion, 1994, p72). The exaggerative indices of sound manipulate the sensory perception of the images in an inconspicuous manner, resulting in an ‘enrichment’ of certain planes of visual materiality (Chion, 1994, p5). For example, the subtle mismatching of timbral or spatial planes of aural and visual materiality may make an object feel closer or further away than visually suggested, become more perceptibly tactile, or demonstrate greater levels of energy, mass and force in its movements. This audiovisual technique falls short of distracting perceptual attention, because the general expectation for the experience is met, and instead has an unusual and interesting quality. The allure of slightly incongruous impressions is exploited in Aronofsky’s *Pi* (1998), where the simple actions of main character Max, such as clunking away at the keyboard or obsessive setting of door locks, are rendered too intimate in the soundtrack and amplified to the point of being hyperreal, emphasising the overwhelming and chaotic nature of his mathematical thinking.

In the second type of audiovisual interaction, sound and visual gestures with incongruous materialities are linked by their synchronised morphological developments, which mimics a natural causal relationship between them. This manipulates the subconscious into

perceptually linking the incongruent objects, which are then passed up to conscious perception as a unified object, where the causality between sound and image is further explored. A source object for the acousmatic sound gesture is conjured in imagination through causal listening, and the sensory impressions evoked by this object are expressed against the incongruent materiality of the visual object, resulting in a conscious perceptual resistance. The reverse is also true, where imaginary listening to the visual object evokes a mental sound object that clashes with what is actually heard. Some parts of the signified are present, namely temporal motions, but others such as texture and mass might not be. Depending on what material characteristics are foregrounded in perception at any one time, it is possible to be with the scene seen or with the scene imagined, though one always has a suggestive presence in the other. This fusion of incongruous materialities results in the evocation of unrelated sense impressions, which impinges the ability to correlate sound and image with a single identifiable object. Cognitive dissonance therefore ensues where the causality perceived by the subconscious is negated by conscious perception, given the emergence of incongruent object identities for sound and image. This dissonance perhaps entices a more active sensory exploration of materiality in imaginary and visual domains, in an attempt to better resolve or differentiate aural and visual objects. Where aural and visual gestures are synchronised, but have different recognisable source objects with incongruous materiality, I find it difficult to consciously separate sense impressions stemming from sound or image. My subconscious perception flits irresistibly between salient features of the aural and visual gestures, resulting in a barrage of sense impressions and experiences from visual and mental objects, which layer and become less differentiated. Munsterberg (2002, p.96) notes that we focus on the events we find most interesting, and these are the thoughts that start ‘fusing in our field of vision’. This quick back and forth of attention between image and sound, visual and imagined materiality, appears to overlap and fuse the contrasting sensory experiences originating from either

perspective. I felt that this fusion of sensory impressions was perhaps similar to the manner in which Vertov exploited the persistence of vision or ‘phi-effect’ to merge consecutive images on the retina, which as Petric (1987, p.139) explains, transpires when visual edits occur within a critical time frame, and results in an embodied sensation of stroboscopic pulsation. I made an assumption at this point, if only to test my ideas creatively later, that rapid shifts of sensory perception between a cluster of materialities causes overlaps or *residues* of contrasting sense experience to build up and merge. I posit that the flickering of attention between the contrasting sense impressions evoked by sound and image, builds a *reservoir* of commingled experience that forms a material lens through which perception and future experience is tainted. The continuous synchronisation of sound and image with incongruous materiality, has the potential to draw conscious perception into a perpetual sensory investigation and cross-referencing of sound and image. If this technique persisted for a long time, a viewer may begin to differentiate aural and visual materiality more actively by dominantly attending to sound over image or vice versa, which would result in less engaging sensory experiences. This technique will perhaps be most effective in sequences where the audiovisual interaction changes dynamically, thus ensuring attention is maintained. The unresolvable disparity between what the subconscious pairs and what reflection separates is ripe for manipulation in any number of audiovisual formats.

A variation on the second type of interaction occurs where an unrecognisable visual object is synchronised with an identifiable sound object, or alternatively where a highly textured recognisable image is synchronised with electronic sound that has no identifiable source object. The audiovisual interaction will likely engage a kinaesthetic viewing mode, given that the main correspondence observed between sound and image is the synchronisation of morphologies. Importantly, this synchronisation may also give rise to the impression that the aural and visual objects are causally related. An unrecognisable visual object that is perceived to have a causal relationship with an identifiable sound object, will perhaps

assume an identity that corresponds with the source object imagined for the sound gesture. The abstract visual object is then likely to be attributed with the materiality of the identified source object, and the sense impressions associated with this materiality will taint how it is perceived and experienced. For instance, a white rectangle that moves up and down periodically may take on the material qualities of a synchronous water sound, if the spectral shape heard corresponds to the oscillatory movements seen. This relationship would be less effective if the white rectangle rapidly appeared at random locations with the same sound accompaniment. If the rectangle flowed smoothly around the screen, sound could be used to manipulate perception and morph it into an ant, a plane, or a person running. In each case, the material characteristics of the imagined source object for the sound gesture, readily infiltrates the perceived materiality and experience of the abstract visual object. Where a recognisable visual object is synchronised with an unidentifiable or electronic sound gesture, imaginary listening may ensue, and the causally related aural gesture evoked in imagination is likely to be cross-referenced with the material qualities of the electronic gesture heard. This conflation of aural impressions and the overriding tactile experience of the images, will perhaps taint the sensory perception and experience of the electronic sound gesture. For instance, a highly detailed image of a spitfire flying acrobatically may conjure the mental sound of its roaring engine and the tactile impression of air being ripped through the propellor, which will perhaps taint the perceived materiality and tangibility of a simple portamento sine wave accompaniment.

The audiovisual techniques I have outlined exploit audiovisual synchronisation to obfuscate causal relationships and evoke cognitive and perceptual dissonance. This dissonance will perhaps entice a viewer to engage a more attentive and expressive viewing mode, where audiovisual gestures are explored and embodied to better differentiate the incongruent materialities united by the subconscious. Alternatively, a viewer who is conscious of the experiences that the work intends to engage, may indulge a more

synaesthetic and imaginative mode of viewing, and resolve these clusters of contrasting sense impressions into engaging conglomerated experiences of audiovisual objects. In either of the viewing modes suggested, residues of sensory impressions stemming from sound and image will overlap, causing contrasting experiences to conflate and form a truly audiovisual experience of materiality.

It was through a relationship of incongruent materiality and synchronised morphology that the essence of a design for my work was formulating. I would explore my own ability to perceive sound and image with creative cross-sensory viewing modes, then see if this process manifested in the work through the evocation of engaging multisensory experiences of materiality. A more attentive sensory exploration of materiality could perhaps be evoked where different types of audiovisual interaction are deployed in a contrapuntal manner, thereby challenging sensory perception to dynamically change the mode in which aural and visual gestures are grasped. I wondered how Eisenstein would relate to my exploitation of audiovisual synchronisation, incongruent materiality and perceptual resistance, given his firm belief that sound and image should be exhibited with distinct non-synchronisation, to evoke new meanings that enhance the intended experience of a film.

Electronic Interactions

Our understanding of environmental sounds is habituated by our everyday experience, therefore our relationship with them is highly contextual and will result in immediate associations with objects, forces and tactile memories when heard. Electronic sound on the other hand is man made phenomena, often created using discrete electronic components or digital instruments, and as such, it has no definitive material properties or causal event. Truax (1996) notes that electronic sound has ‘none of the corporeality’ of environmental sound, because it is difficult to recreate the complex spectral and temporal shapes of

natural sound, with the tools we currently use to parameterise and musically organise component waveforms. Truax (2008) later acknowledges that electronic sounds are becoming a part of everyday life, and therefore contextualised alongside natural sounds. Its not uncommon to hear the iconic Apple ring tone in a cafeteria and see ten people simultaneously reach for their pockets. Perhaps the material world is being replaced by the digital equivalent of sonic advertising, where each ringtone and computer start up reminds you of the brand to stay loyal to. I was interested in the extent to which synchronous electronic sound could enhance the kinaesthetic and tactile experience of visual objects when viewing film. When crafting electronic gestures for moving image, I make multiple passes with more discrete temporal resolution each time, to tightly correlate aural and visual morphologies. When these gestures are attached to a visual object, the inability to bond the sound to a identifiable source causes me to listen more attentively to its morphological shape, which is accompanied by a kinaesthetic look that searches for corresponding motions and shapes in the image. The embodied experience of the electronic gesture seems to take hold on perception, and skew the forces observed and the temporal frames into which visual movement is subdivided. Electronic gestures are perhaps so effective and engaging in film scores, because of their ability to expressively outline the energies and forces of complex visual movements, in a temporal resolution that is more accessible to human ears. While the kinaesthetic relationship between electronic sound and image can be readily exploited by a sound designer, I wondered how the tactile experience of the images could be modulated by electronic interactions. When manipulating a physical organic object, the tactile sound produced will often have an incredibly complex spectral envelope with irregular transient variations. The concept of working at a temporal resolution small enough to compose the spectral variation one might hear in a performance of pine cones seems like an inconceivable task. It is the incredible complexity of this spectral chaos that human gestures struggle to recreate, and is a predominant reason why

natural recordings are used so frequently used as source material in acousmatic music. Çamci (2016) observed that electronic music listeners often interpreted electronic sound gestures to represent environmental objects moving through an environment, and would ‘superimpose’ their semantic associations on top of their embodied experience to imaginatively visualise this scene. If the morphologies of an electronic gesture evoke an impressions of a physical object and a type of movement, the muscular and haptic expressions of this object’s material characteristics during listening, perhaps change the perception of the sound’s material properties. Where an electronic gesture is synchronised to a visual object in film, the relationship between sound and image is highly kinetic, and the tactile experiences conjured largely stem from a haptic exploration of visual materiality. If the electronic gesture exaggerates the perceived kinetic energy of the visual object, the tactile impressions evoked by the haptic gaze will perhaps be intensified, where the expressed contact force between skin and material is amplified. Smalley (1997) states that the spectromorphology of a sound reveals the muscular gesture and forces that were involved in exciting a source object, from which expectations are developed about the ‘continuant’ and ‘terminatory’ phases of the sound. Where the attack phase of an electronic gesture’s spectral envelope matches the shape of the physical gesture or interaction that excites a visual object, the continuant phase of the sound gesture will perhaps be perceived as the propagation of energy in the object over time. The continuant phase of the electronic gesture could therefore be exaggerated to manipulate the perceived density and resonance of a visual object, and evoke impressions associated with vibrotactile experiences. Tranchant et al (2017), confirmed that we have an innate ability to coordinate our movement and parse temporality through ‘vibrotactile’ sensation. While watching Robert Henke’s *Lumière II* (Boiler Room, 2016) audiovisual laser show, it is clear that the vibrotactile experience of his soundtrack, embellishes the kinaesthetic and tactile experience of his abstract imagery. In a concert setting Henke’s explosive sound gestures

rhythmically vibrate the skin and viscera, which generates an embodied rhythm that helps parse the stroboscopic display of morphing geometric and organic shapes. Through audiovisual synchresis, the visual shapes become the source of physical sensation, and so we perceive a direct tactile connection with the imagery. This tactile accentuation of visual rhythm through sound works at high and low temporal resolutions in the piece, where impulse based interactions give way to steady state tones with jagged and coarse timbral qualities. An effective moment occurs (Boiler Room, 2016, 14:00) where a sound resembling radio static or high voltage crackle evokes a tactile impression one might perceive as a rapid static discharges on the surface of the skin, which is synchronised to a chain of segmented lines that rotate rapidly and randomly around a central object. The spatial discontinuities observed in the lines as they flow through space, infer a visual rhythm that is translated extremely well by the clicking sensation conjured by the sound. It is as if the line segments are discharging energy, with each click making contact with the skin. I explore how highly energetic and raucous electronic gestures are capable of enhancing tactile connections with objects that have an electrified quality in my last installation piece *CineTouch*. The morphologies of electronic gestures are exploited throughout my works, to amplify and rhythmically subdivide the kinaesthetic expression of visual movement, which enhances proprioceptive and tactile experiences of the visual materials.

The Phenomenology of Film Experience

The senses intercommunicate by opening on to the structure of the thing. One sees the hardness and brittleness of glass, and when, with a tinkling sound, it breaks, this sound is conveyed by the visible glass. One sees the springiness of steel, the ductility of red-hot steel, the hardness of a plane blade, the softness of shavings. The form of objects is not their geometrical shape: it stands in a

certain relation to their specific nature, and appeals to all our other senses as well as sight. (Merleau-Ponty, 2002, p.267)

Ponty colourfully outlines how aural and visual impressions evoke sense memory across all the sensory modalities, which describe the various properties of an object's materiality, and enable a tangible experience of an object to be expressed. Twenty five years ago, Altman (1992) recognised that traditional semiotic analysis of cinema sound as text had neglected theoretical enquiry into the experience of sound as a material event. This sentiment has been repeated over the years and appears again in Birtwistle's (2010) *Cinesonica*, who argues that the neglect of the material in Sassurian linguistics has been detrimental to the fuller understanding of experience leading the signifying process. An insurgence of film studies have gravitated to the concept of materiality in order to redefine what constitutes the experience of film, however they are framed with a highly visual bias. My exploration of Merleau Ponty, Sobchack and other phenomenologists sought to explore the pre-reflective processes of embodied experience that I would inevitably need to target in order to elicit different modes of viewing.

Sobchack's interpretation of Ponty's philosophical view of phenomenology provides a framework for understanding how the embodiment of cinematic events shapes the experiences that materialise while viewing film. I will take a moment to summarise the main concepts of Sobchack's framework which inspired the aesthetic of my work. At the heart of the theory is the notion of a 'cinesthetic subject' (Sobchack, 2004, p.67), a term which encapsulates the role of synaesthesia and coenaesthesia in forming tangible multisensory experiences from audiovisual impressions. Cytowic (1993, p.52) explains that synaesthesia is a medical condition where the stimulation of one sense causes an involuntary and unrelated perception in another. Sobchack likens the synaesthetic condition to a normal facet of everyday sense experience, whereby a stimulus reaching one

modality evokes associated sense memory across the other modalities, which helps to understand an object and establish a meaningful relationship with it. This intersensory communication allows us to navigate the world safely, where sense memories can be called upon to describe familiar facets of an object, and expressed in the context of a future interaction with this object to simulate the resulting experience. This extends into an ability to subjectively experience the familiar actions and interactions of another person, or infer the forces and stresses an object undergoes in its movement or interaction with other objects, through an expression of the muscular effort and tactile experience associated with moving oneself, or an object, in the manner observed. Coenaesthesia is both the perception of ones own sensorial being and the general hierarchy in which the senses become organised by our individual history. Our grasp of the worlds materiality is therefore mediated by the perception of our own re-synthesis and expression of previous experiences. In cinema viewing, a cinesthetic subject enters into a sensory relationship with the film that has a 'commutable reversibility' (ibid, p.61). Sensory impressions reaching the body evoke a plethora of sense memories associated with the experience. These sensations are directed or mapped back onto the correlating screen objects. The act of expressing experience is perceived, causing perception to turn inward on itself and grasp the sensations that now resonate in the body. In grasping ones own bodily expressions, an experience of the image is enabled across all the sensory domains. It is the interplay between subjectively expressing a perception of an object, and objectively perceiving this bodily expression that constitutes the 'primacy of communication' (Sobchack , 1992, p.42).

Sobchack's notion that we have to express in order to perceive, is perhaps why we feel so violated by the highly tactile and disturbing images in Buñel's (1929) surrealist *Un Chien Andalou*. The oozing of a cows eye as it lays dead on the piano, conjures thoughts of infection and swelling, leading to a sensation of repulsion as these disturbing materials are thrust upon us through our embodied engagement with them. Our connection with the

animated plastic figurines of Stéphane Aubier and Vincent Patara's (2009) *A Town Called Panic* is nostalgic as we express the tactile memories of the toy soldiers, and farm animals that littered the bedroom floor. The extremely close foley and sound design in this work, recreates the perspective of being down on the floor with the toys inches away from our face, paying no attention to the reality outside of this creative imaginary world.

My Inscription as the Other

The ability to become an object of our own perception extends into an ability to subjectively express an 'others' existential experience. Sobchack (1992, p.165) posits that this 'other' emerges through the camera view, which functions as an 'intentional technology', enacting its desires and intentionally selecting the 'limits of the seen and the situation of the seer' (ibid, p.87). Emanating beyond the camera vision is the 'other' as film maker, who by virtue of experiencing and expressing through a lens, offers an extension and 'amplification' of their 'perception with the world' (ibid, p.183). Sobchack (ibid, p. 212), summarising Merlau-Ponty, observes that a filmmaker's style can be equated to the inscription of a 'bodily way of being in the world' encapsulated in the 'gesture of its own experience'. It is possible therefore to bring the viewer into an 'indirect perceptual engagement' with the film maker via a film world that becomes their 'mutual intentional object' (ibid, p.173). It is the anthropomorphic quality surrounding the intentional camera view and the presence of a conscious maker inscribed in the looking that Sobchack (1992) posits is the 'film body'.

Samuel Beckett's *Film* (1964) explicitly reveals the presence of a film body and maker as other by using the camera as a character. The camera character chases a reclusive unidentified man, played by Buster Keaton, who is unusually aware of a camera's presence in the film space. The camera whips, pans and scours the room, trying to realise a shot of Keaton's face, who in return runs and deceives the camera to escape. In the final moments

a sleeping Keaton is awakened in his chair and meets the camera's gaze. The haunting realisation sets in that he is nothing more than an exposure on optical film in the camera apparatus, which is being projected for an audience in the real world. The revelation of the film apparatus through Keaton's horror is jarring for a viewer, who must now question their own surrendering of disbelief and anthropomorphising of the camera view, in order to invest in the illusion of a filmic reality.

I was intrigued by the idea of representing my consciousness through the film body and wondered to what extent I could portray my imaginative exploration and experience of materiality to the viewer. If the camera shot is capable of rendering a filmmaker's visual perception and intentionality, the point of audition captured by the microphone and manner of integrating sound with image could also communicate my aural perception of the image. Shimamura (2013) explains that a viewer will often develop a schema for a filmmaker's audiovisual style, which sets expectations about the sensory experiences a work intends to evoke, and defines ways of viewing that deviate from the habitual viewing mode engaged in everyday life. There was potential in using scoring techniques that created resistance between aural and visual materiality, to accentuate my imaginative interpretation and expression of visual materiality through aural gestures. By drawing attention to the overt manipulation of perception through sound, a viewer may become aware of the expressive viewing modes they are being intended towards, and the types of cross-sensory experience the work seeks to evoke. This will perhaps allow them embrace challenging audiovisual combinations more readily and actively assume exploratory, expressive and imaginative viewing modes, to access the experience of materiality I indulged when crafting the work.

Sight as Movement and Touch

I drew inspiration from Marks' (2002) discussion on 'haptic visuality', in which all bodily sensations can be translated through the eyes as an 'organ of touch'. This differs from

optical visibility, in which a viewer distances oneself to ascribe signification to a figure against a background, as with gestalt psychology. Haptic visibility occurs close to the surface of filmic objects as a caress of texture and line with the eyes, in an attempt to address the ‘unknowability’ of the object by allowing oneself to be tangibly affected by it. Marks’ (2002) likens this to an intersubjective eroticism, where one must become a ‘being-for-the-other’, allowing the materiality of the image to act on the body, before reciprocating the effect. Merlau-Ponty (1962, p.22) explains that recognition requires an object to assume a form resembling a previous experience to a present consciousness. A highly textured surface that is abstracted from its identifiable source object, would inhibit identification and provide a continuous unknowable state, encouraging the viewer to explore the ‘boundary of that knowability’ through an expressive bodily exploration rather than a cognitive one (Marks, 2002). The eschewal of object identification in haptic visibility, has a direct parallel in spectromorphological listening. Both may indulge a proprioceptive and tactile exploration of the intrinsic qualities and morphologies of an object, without fully ascertaining a concrete identity or sign. The synchronisation of highly textured sound and detailed abstract imagery, where the respective materialities are incongruent, has the potential to elicit an attentive sensory exploration of the tactile and kinaesthetic qualities of sound and image, given that the material indices offered are unresolvable and so an unknowable object is formed. If an intimate visual perspective encourages a synaesthetic visual caress of texture, a viewer may be inclined to grasp the detailed internal morphologies and timbre of sound in a similar manner. This would involve a more active expression of the proprioceptive properties of an aural gesture, as a means to embrace the tactility of the source object. The gestures heard being performed on sound objects may shape the form and energy that a caress of visual materiality takes, which in turn could modulate the intensity and contour of haptic impressions evoked by the object seen.

Barker (2009, p.81) explains how bodily movements are often required so that our mental structures can access and discern information about the physical world. For example, movements of the head or body towards the surface of an object are often made to achieve a detailed view of its textures and material composition. Barker (ibid) suggests that viewers indulge a ‘mimetic’ muscular empathy with camera movements that demonstrate these familiar and intentional movements, in order to assimilate the mental structure that is opening upon a mutual filmic object. Therefore, a work that entices a viewer to empathise with intentional camera movements, can potentially direct the manner in which a viewer explores and grasps an objects materiality. I realise the importance of camera movement in my last film *Cineflow* as a device capable of heightening tactile experience, by drawing the viewer closer to objects in the scene both visually and on a mental level. The work also explores how a kinaesthetic empathy with the motion of objects can be heightened, as they are tracked and followed by my lens. Barker (ibid) outlines that our embodiment of a visual object’s movement stems from a subjective muscular expression, whereby the muscular gestures and efforts associated with a personal experience of moving or being moved, are related to similar movements performed by the object. My portfolio explores how the proprioceptive properties of sound gestures, such as energy transfer and spectral contour, elicit muscular expressions that accentuate or distort the kinaesthetic engagement with visual objects. *Cineflow* explores this technique by evoking a muscular empathy with a malleable force that surges through a stream of contrasted materials. Sound gestures are then used to manipulate the perceived properties of the materials being moved through, such as their density, rigidity and tensile strength, to modify muscular and tactile expressions simulating the forces resistant and abrasive encounters with the materials.

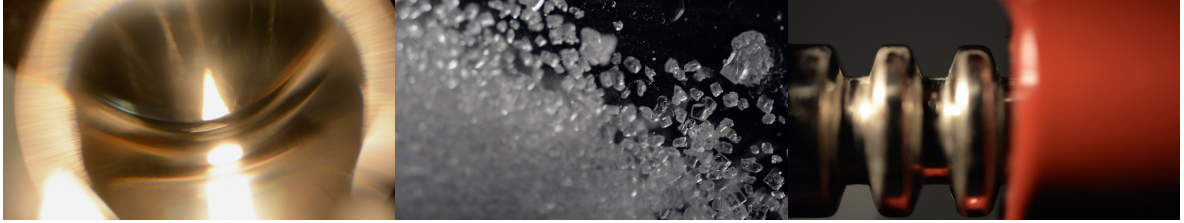
Embodying Space and Sound Making

I was interested in Blesser & Salter's (2009, p.48) suggestion that our grasp or 'cognitive map' of spatiality is formed through multisensory experience, which includes auditory, visual, tactile and proprioceptive impressions that are wrapped in a temporal framework. This idea suggests that spatiality is broken down into perceptual units relative to the modality used to measure it, whereby the same space might be measured by a time to walk across, or for sound to leave and reflect back to the perceiver's position. I considered how this relates to the framing of objects in a film, and whether macro photography would evoke tactile units of spatiality associated with the visual distances between undulating and weaving spaces in the geometry. If the spatial signature of the soundtrack is incongruent to the perceived closeness of the lens, which perceptual units do we refer to? Are we out in the room, or at the surface of the object, or both? Does time run faster for intimate viewpoints of materiality with close microphone recordings, because the direct to reflected sound time is minimal? Blesser and Salter (2009) points out that all spatial experiences are either 'allocentric', where the distances between external objects constitute spatiality, or 'egocentric', where space is expressed relative to the perceiver's position. In my first film *CineSensorium*, I explore how acousmatic sound gestures with spatial signatures incongruous to the visual, constitute allocentric or egocentric positions, and how different perceptions of spatiality might coexist or fold into one another.

Smalley (1997) explains that the spectral morphology of a sound, is inherently related to the 'energy-motion trajectory' of the gesture performed and type of implement used to excite the sounding material. When listening to spectromorphologies, the listener can often draw from past proprioceptive experiences, and deduce the gestural activity that was enacted upon a material to excite it in the manner heard (Smalley, *ibid*). This gesture is a composite of visual, tactile and muscular impressions that when expressed, heightens the

tangibility of the sound object. In my second film *CineBlips*, I explore how the hyperreal rendition of sound produced by everyday items, can engage proprioceptive memory that enhances the tactile and muscular grasp of these items seen in motion, when sensory perception is pushed by fast editing. My installation work, particularly *Cinecell* and *Cinetouch*, also exploits the proprioceptive experience evoked by sound to enhance the tangible grasp of a virtual object. When the participant exerts control over the virtual object's motion using expressive hand gestures, their physical impact is made tangible by the interactive response of sound gestures, which evoke proprioceptive and tactile experiences of materials that have been excited by the hands. While developing my audiovisual technique, it has been useful to consider how a kinaesthetic empathy with a visual object, as outlined by Barker (2009), is transformed by proprioceptive experiences associated with the spectromorphology of aural gestures. By varying the degree of congruence between the materiality of sound and image, musculature expressions empathising with the movement seen and heard will conflate, to modulate the overall experience of an objects energy and force over time.

CHAPER TWO: Blowing up Ants and Recording in the BathTub



If the film body offers a window into my perceptive consciousness, and the close-up mimics the observing of an unknowable object in great detail, then macro cinematography offered the perfect expression for my exploration of visual materiality in detail. The intensity with which surface texture and micro motions are blown up creates an immediate sense of intrigue. Visual familiarity dissolves into a sea of new geometries, intertwined fibres and micro motions. This new view of familiar textures is compelling, and draws out a curiosity in the viewer that causes them to explore and look at an object as if it was the first sighting, and they were a child again. When I first got the macro lens I did what all people would, and went running around the garden peering in as close to everything as I possibly could. I observed the rapid movement of ant legs, the alien innards of dusty colourful flowers and streams of grain in wood and pine cones. The macro perspective revealed details I had never encountered before, and my act of looking took on the form of a caress, embracing the tangibility of this hyperreal level of reality.

My early camera shots explored Marks' (2002) notion of haptic viscosity and employed a surface scanning of textures with the lens. I followed d'Esquivan's (2007) technique of imaginary listening to express a soundtrack to the recorded footage, which explored congruent interactions between sound and image, and featured concrete sound gestures and electronic timbres. At this early stage of imaginary listening, it was clear that the movements of the camera across the textures of an immobile object, did not produce imagery that elicited a strong impression of sound. In order to evoke any kind of internal sound score, cognitive effort was required to imagine manipulating the object and hearing

this interaction, a burden that would inevitably cause a viewer to switch off over time. Incongruent sound textures and electronic morphologies would also be experienced as purely acousmatic phenomena, given the lack of correlating movements between sound and image that would be required for the subconscious to perceptually merge them. Truppin (1982) explains how in *Stalker* (Tarkovsky, 1979), Tarkovsky focuses the lens on a stationary object, then overlays this image with the non-synchronous sound of the object in motion. This infuses the shot with a spiritual quality that transcends its more immediate material portrayal. The technique dissolves any sense of linear temporality in the scene, with sound perhaps emerging from a time past. This results in a more cognitive or thoughtful exploration of the object for meaning, rather than an invested gaze that is primed to explore its material morphologies. The overall design I wanted to focus on required a presentation of movement, so that the subconscious melding of incongruent planes of sound and visual materiality could be exploited. I felt that the movement of visual objects should retain an impression of autonomy, allowing the object and gesture used to induce movement in the materials to remain undefined. I believe this unknowable quality of the visual gestures, allows acousmatic sound gestures and incongruent aural materiality to manipulate causal relationships between sound and image more effectively. This is perhaps because incongruent sound gestures are not definitively rejected as a cause, and as such, a viewer is inclined to explore any correlations between the experience of sound and visual materiality more actively. I would therefore be required to perform visual objects in a manner that did not portray my immediate authorship on the image, and that communicated sound through an engaging array of visual morphologies.

Barker (2009) suggests that the camera close-up mimics a muscular movement towards the surface of an object, which gratifies a viewer's desire for a detailed visual exploration of its composition. The hyperreal expansion of detail that characterises the macro perspective, arguably gives the impression of seeing materials with enhanced visual acuity, from a

viewpoint much closer than normal visual perception would permit. Naturally, the point of audition is drawn into the incredibly intimate space of this visual perspective, which creates an expectation for the amplification of intricate spectral details and micro-rhythms in the soundtrack. In my early attempts to recreate this aural perspective, I recorded performances of natural materials using very close large diaphragm condenser microphone techniques. I then listened back to gauge the overall tactile experience of sound materials, and my proprioceptive response to traces of human gesture captured during sound production. When considering Sobchack's (2004) thesis on the cinesthetic subject, I wondered where expressing the materiality heard in a recording of yourself performing materials, fit on the spectrum of sense expression of an 'other'. Collision interactions between objects opened up a plethora of complex micro-rhythms, singing in a symphony of wooden, stone and fibrous ranges. Listening back to the detailed sound rendition of these interactions proved to be an engaging tactile and kinaesthetic experience, which effectively conveyed the composition of materials, the manner in which they were excited, and the forces induced by their movements. The performed materials were not large enough to excite the surrounding room, which resulted in recordings with incredibly dry spatial signatures, that established a psychoacoustic impression of intense closeness to the inferred source objects of the sound. I felt this intimate reproduction of sound correlated well with Marks' (2002) concept of haptic visuality, and would effectively exaggerate the focused caress of a surface texture with the eyes, which closes off the surrounding environment. The exciting of natural materials with the hands created a unique tactility in the lower middle region of the audio spectrum, that effectively embodied the tactile sensation of rubbing, scratching and tensing the materials when listening back. My experimentation with the proximity effect demonstrated that the microphones accentuation of mid and bass frequencies when recording at small distances, could be used to emphasise the tactile experience of this abrasive contact between skin and materials.

I considered how I could get even closer to the sound of the objects and saw potential in Jez Riley French's hydrophones and contact microphones. Just as I had done with the camera, I ran around the house sticking the contact microphones to all manner of objects. I listened to the innards of pans as I bashed them, the knotted and fibrous spectrum of wood, and the rain as it hammered down on the plastic roof of the conservatory. In some ways I had become the child at the dinner table, bashing the spoon on the plate. The displacement of my body when auditioning the objects was quite surreal in headphones. The absolute rejection of spatial signature and intense focus on a bandwidth of frequencies centred around abrasive touch, made certain interactions sound like bone conductive listening. I would manipulate an object, and the tactility in the sound felt like a touching of my own ears. My point of audition had been completely subverted, and it was as if the haptic sensation at my ear was also somehow inside the object. I should mention that this is a stereo set up of the contact microphones with each resolving a highly mono impression of interactions to either ear. The experience certainly made me think whether tactile gloves and this technique of sound design could be used to transplant a player's sense of touch into the virtual environment. The process works as an amplification of Sobchack's cinesthetic subject, but in this case, the expression of tactile interactions heard over headphones is reinforced by a physical tactile impression at the hand. Of course, this calls into question how much of this effect is retained when the audio is spatialised in a performance hall. Perhaps a contrast of microphone perspectives would allow this rendering of materiality to differentiate itself. A very similar experience was achieved by the hydrophones, where the 'enveloping reverberation' truly recreated the feeling of being submerged, causing me to express what it felt like to audition from this perspective (Blessner & Salter, 2009, p.63).

I will proceed to look at my video portfolio (see enclosed USB Sean Ryan/ Film_Portfolio) and discuss the main audiovisual techniques explored in each film. This will be followed by a closing discussion, evaluating whether these techniques have been effective at

engaging expressive and imaginative relationships with materiality. I consider how phenomenological and sound theory can be combined to explore audiovisuality more comprehensively, and uncover how a viewer's experience of materiality is coordinated by the coalescence of impressions evoked by aural and visual gestures.

A Summary of the Creative Filmmaking Process

Here is a summary of the creative process that was undertaken in the making of these films.

1. A visual object is selected, then incorporated into an imagined audiovisual gesture, in which sound uses congruent or incongruent materiality to amplify or manipulate perception of the object's materiality.
2. Filming commences and visual materials are performed to recreate movements that emerged in the imagined audiovisual gesture. Shots are reviewed to determine if the textural detail and motion of objects evokes engaging kinaesthetic and haptic impressions that will integrate well with sound gestures.
3. Sound materials are performed and recorded, ensuring that appropriate spectromorphologies are captured that will enable sound gestures to closely follow the shape of visual morphologies. Particular attention is given to transient attacks, steady state tones and the internal morphologies of sonic textures, that will be used to embellish visual interactions such as collisions, friction and turbulence. The same source may be recorded using different microphones such as hydrophones or contact microphones, which will confer different points of audition and spatial relationships between viewer and visual object. The combination of these aural perspective can offer a holistic impression of the way energy moves through, and is emitted by an object to produce sound when excited. Recordings should emphasise the physical

human gesture used to excite the sound objects, if appropriate for the intended experience of an audiovisual technique. This connects with Smalley's (1997) concept of gestural surrogacy, whereby the human gesture inscribed in a sound recording will engage a viewer's proprioceptive modality, and cause them to express the manner in which the sound object is heard being manipulated. This in turn will accentuate the haptic and kinaesthetic experience of the visual object. In general, recordings should strive to evoke defined haptic, kinaesthetic and spatial experiences when listening back.

4. Film editing begins by isolating specific movements of visual gestures that command attention, and lend themselves to engaging sound relationships. In works with a faster editing pace, camera movements and visual morphologies can be sequenced to create a continuous gestural flow across a series of shots. These sequences may indulge similar or repetitive movements to establish sensory expectations or habituated experiences. This will enable sound to dynamically change its relationship with image and subvert perception, leading to an experiential flow that is continuously modulated. Juxtaposition can also be introduced into these sequences to set up effective sensory shocks. Alternatively, the visual morphologies of individual shots can be frequently juxtaposed to create fast staccato sequences, where audiovisual interaction and sensory experience will change quickly.
5. When visual sequences are locked, individual gestures are viewed using d'Esquivan's (2007) technique of imaginary listening, to mentally try out the preconceived aural gesture against the film imagery. By reflecting on the embodied experience of this process, sound materials featuring appropriate envelopes, material textures and spatial signatures can be selected from the pool of audio recordings, that will enable effective aural gestures to be crafted during the scoring process. These audio samples

may be processed with equalisation and compression, to emphasise spectral regions of the sound that evoke heightened tactile or kinaesthetic impressions.

6. While composing sound gestures, the films fixed visual morphologies are constantly referred to as a guide for sonic morphology. Granular synthesis and automated filtering techniques offer a high degree of control over the temporal progression of complex spectral envelopes, enabling tight morphological synchronisation to be formed between sound and image. Synchronisation should be refined so that sound and image emerge from the subconscious as a unified object, especially in the case where incongruent audiovisual materiality is used.
7. The audiovisual gesture, or perhaps a sequence of gestures are viewed in their entirety, and the experiences evoked are reflected upon to determine where editing and sound interactions can be refined, to further push sensory manipulation and engaging embodied experiences.

Exploring Materiality in CineSensorium

CineSensorium (see enclosed usb Sean Ryan/ Film_Portfolio/CineSensorium) is an in depth exploration of how different techniques for combining sound and image, change the manner in which materiality is perceived and experienced. The work strives to evoke expressive and imaginative viewing modes, where a viewer attentively explores sound materiality and sense impressions sourced from imagination, to indulge multifaceted embodied experiences of the imagery. The film does not focus on the effect of montage technique and editing speed on sensory perception, as this would be explored in my subsequent films. I have used a reduced palette of visual materials in the form of water, oil, light and colour, in order to highlight the effective ability of sound to manipulate the experience of this narrow spectrum of texture and spatiality. During some sequences of the

work, an event is conjured in imagination by sound, and the interpreted context surrounding these events will perhaps give rise to emotional overtones. The abstract style of the visuals downplays emotional engagements with the film, to direct attention towards the sensory experience of the imagined materials, and their unfolding movements and interactions within the mentally visualised scene. The film uncovered some interesting methods of layering sound and image with incongruent materialities, while also demonstrating weaknesses that arrive from a lack of camera movement and rhythmic montage.

Here is a summary of the audiovisual techniques explored in the *CineSensorium*, followed by an analysis of the film that discusses how different viewing modes are established by each technique. I consider how sensory perception is coordinated in these viewing modes, and the kinds of experience a viewer might have of audiovisual materiality as a result.

1. Aural and visual gestures are connected through synchronised morphologies, but represent different objects that have incongruent materialities, leading to the coalescence of sensory experiences evoked by what is seen and heard.
2. The manner in which electronic or instrumental sound engages the visuals, shifts from a non-diegetic interaction, where sound provides scenes with a general impression of temporality and spatiality, to diegetic interactions, where the same sound appears to emanate from or be the cause of visual morphologies. Non-synchronous sound gestures, which typically have no identifiable source object, engage the viewer kinaesthetically and provide the scenes with a general temporal flow. The cognitive map conjured by the spatial signature of these gestures, appears to extend or shorten the spatial characteristics of the undefined space encapsulating the imagery. Where the sound appears to be diegetic, the tactile experience of the

visuals permeates the tangibility of the sound, while the morphological profile of the sound amplifies the kinaesthetic experience of visual movement.

3. A theme, environment or object is suggested by text and is represented analogously by visual objects. For instance, a cell like nucleus that is confined within an oil membrane, draws an analogy to the gestures of a prisoner, confined by the metal bars of their prison cell. Acousmatic sound is used to establish a mental image of the suggested scene and its material properties, while also retaining a strong impression of the human gestures used to excite the sounding materials. The morphologies of sound and image are tightly synchronised, and so their incongruent materialities conflate when unified by the subconscious. A myriad of sense expression can take place depending on whether the viewer's perception is biased towards the imagined or visual materiality. Sound and image appear to function for one another interchangeably, and experiences stemming from the materiality of visual and imaginary scenes begin to merge.
4. Acousmatic sound is used to conjure a mental scene in which a highly energetic event such as an earthquake occurs. The forces induced by the inferred movements of imagined materials, appear to have a causal impact on the morphologies of objects in the visuals. Visual objects have incongruent materiality and spatiality to the materials evoked in the mental scene, and are connected to sound through tight morphological synchronisation. A kinaesthetic empathy with the movements of objects in the imagined scene, is emphasised by the morphological profile of the visual object. Conversely, the forces and gestures inferred through proprioceptive listening to aural morphology, energise the observed movements of the visual objects. A conflation of tactile experience occurs, where an influx of sensory impressions evoked by imagery,

sound and imagination fold together to form an engaging conglomeration of experience.

5. Acousmatic sound is used to suggest a meta-diegetic narrative that moves through a sequence of contrasting events and spaces, each of which is comprised of different materials. Aural and visual objects are linked through their synchronised morphologies, but have incongruent materialities. Causal listening will be engaged to identify the source objects of sound gestures. The visual motion inferred from aural spectromorphologies, will be expressed to help visualise the gestural movements and interactions between objects in the imagined scene. These imagined movements will correlate with the movements of objects in the visuals, linking the gestures of imagined and visual scenes together. The flickering of sensory perception between visual and imagined scenes, results in tangible experiences where the tactile characteristics of aural and visual objects appear to be amalgamated. The proprioceptive experiences evoked by aural and visual gestures contrast, where the characteristic properties of their source objects, such as mass, tensile strength and the frictional forces induced during movements, are different. Where perception oscillates between sound and image, the muscular expressions of these contrasting proprioceptive experiences intermix, and the tangible experience of object movement in visual and imagined scenes fuses. Objects may, for example, appear heavier, move more violently or take on a more fluid character.
6. Sound gestures throughout the film will appear to be diegetic if morphological synchronisation is observed and a high degree of congruence is perceived between aural and visual materiality. However, certain planes of aural materiality will be subtly incongruous to visual materiality, which conjures contrasting sense impressions that conflate, resulting in the manipulated perception of the visuals. For

instance, the tactility of visual objects is often heightened, where sound is offered that is more spectrally rich and dynamically energised than the sound that would naturally result from the visual gesture. If the spatial signature conferred by sound suggests an intimate point of audition, but the visuals negate this intimacy with a distant viewpoint, the spatial relationship resolved with the object will feel noticeably closer than visually suggested.

Matched Morphology with Incongruent Material Identities (1)

In an opening sequence of *CineSensorium* (0:35), the synchronisation of aural and visual morphologies is used to coalesce the incongruent material properties of oil cells and metallic mechanical objects, the latter of which are conjured in imagination by sound. The shot begins with the acousmatic sound of a heavy rolling train that is synchronised to the movement of small cells running along the surface of an oily membrane. An analogous relationship is therefore evoked between the cell movements and that of train carriages cruising along a railroad. The recognition and expression of the incongruent train materiality, will perhaps emerge as a visceral memory of being carried along smoothly on a transport vehicle. A viewer may also interpret and proprioceptively express the massive forces inherent in the heavy vehicles motion, which will embellish the perceived mass and momentum of the synchronous cell movement. The impression of motion inferred through listening, will likely conflate with the kinaesthetic experience of the graceful and fluid cell movements, to evoke an overall sensation of smooth and progressive momentum. The calm opening of the sequence effectively sets the viewer up for an aggressive tactile transition. A long strand of oil breaks away from another membrane (0:41), and slides across the image under elastic tension as the smaller oil cells run quickly across its surface. Metallic objects can be heard crashing together, perhaps conjuring mental imagery of crane like structures collapsing under their own weight. Attentive listening to the spectromorphologies of the aural gestures will perhaps evoke tactile impressions associated with the collision

interactions of rigid materials, and muscular expressions interpreting the intense forces involved. The morphological profile of the sound matches the kinaesthetic experience of the sweeping visual movement exactly, evoking a highly tangible experience of heavy materials breaking under tension, and falling chaotically before colliding and settling. This cross-modal correlation of aural and visual movement creates a compelling impression of causality between sound and image, which causes subconscious perception to join sound and image as elements of a unified object. Conscious sensory perception then oscillates between the tactile and proprioceptive experiences of resonant rigid metals and turbulent flowing liquids, where the causality between sound and image is perceived to be unnatural. During this attempt to differentiate the materiality of the unrelated source objects, a plethora of contrasting sensory experiences are evoked, and the residues of these experiences build and overlap. This conglomeration of sensory experiences makes it seemingly difficult to separate the contrasting materialities of aural and visual objects in perception. The resulting experience of sound or image is therefore tainted by superfluous experiences stemming from imagined or visual materiality, which in turn evokes the impression that the imaginary and visual scenes are folded into one another. Despite being conscious of the disparity between sound and image, the subconscious will keep joining these incongruent aural and visual gestures, where the morphological synchronisation observed between them promotes causality. Conscious perception is therefore embroiled in a perpetual exploration of these incongruent combinations of aural and visual materiality, to check the viability of their causal relationship. The technique is perhaps engaging because the final experience of the film is partly constituted by the viewer, who must explore their own embodied experience of visual and imagined materials, then express a convolution of these experiences to fully grasp the film. This type of interaction is prevalent throughout the work, and is used to turn oil cells into a sea of bottles (2:10), cells into organic creatures (2:20), dyes into wood and rocks (7:20) and more.

Traversing the Non-Diegetic Diegetic Boundary (2)

In the opening sequence, the relationship between electronic sound gestures and the visuals changes, from non-diegetic sound that sets a general mood and temporality for the scene, to a diegetic force that causes oscillations in a body of water. The non-synchronous electronic sounds initially function in the background of perception, offering gestural waves that instil a free flowing temporal rhythm on the images and a sensation of calm. Attention is primarily given to the movements and materiality of delicate oil cells, that flow, expand and divide on the surface of water. The cells movements are synchronised with sound gestures featuring critter like vocalisations, resulting from the granular manipulations of closely recorded organic matter. Here, the tactile impressions of liquidity and flow gleaned from the visuals, conflates with the insectile and fibrous materiality of the synchronised acousmatic aural gestures. Electronic gestures then assume a physical presence within the diegesis, by demonstrating morphological synchronisation with oscillations of the water's surface. This causes the subconscious to perceive a causal relationship between electronic sound and image, and so they are perceptually united. Electronic sound is perhaps experienced as a diegetic force at this point, that energises the motions of objects observed in the imagery. The turbulent movements of the rippling liquid are multiplied exponentially through a kinaesthetic empathy with the defined and energised contour of the aural gesture. The perceived force involved in producing movement in the liquid, is perhaps increased by the density and heavy weight that the rich spectrum of the sound gestures conveys. As the electronic gesture decays, sensory perception is directed back towards the oil cells and the sound they exhibit. The tactile experience of ripping oil membranes is effectively heightened through proprioceptive expressions of sound and image, which respond to the elasticity and material stresses seen, and the exaggerative sound of stretched and snapping rubbery materials. It is perhaps the perceived reversal of cause and effect that makes this particular shift between diegetic and non-diegetic sound

interactions engaging, where visual interactions give rise to sound, then sound imparts forces on visual materials to cause movement. In contrast to Henke's (Boiler Room, 2016) audiovisual laser show, which features electronic sound and abstract imagery, the organic materiality of the objects seen in this film conjure haptic and proprioceptive sense impressions, which taint the kinaesthetic and tactile experience of synchronous electronic gestures. I agree with Chion (2009, p.112) and feel that expressive gestural sound can often provide a greater sensation of being in the image than a source recording. In this example, the proprioceptive expression of the electronic gestures energetic morphology, greatly accentuates the haptic experience of the watery undulations, by amplifying the expressed force with which the materials are mentally perceived to make contact with the body.

A variation on this technique occurs later in the film (5:24), where I attempt to fold the haptic experience of visual objects into the perception of synchronous electronic sound gestures. At the beginning sequence non-synchronous electronic gestures reside in the background of perception, evoking spatial and temporal impressions that are suggestive of an expansive space. The cognitive map conferred by this spatial signature conflates with the short focal length of the image, and expands the undefined boundaries of the submerged watery scene to convey the spatiality of a surreal sea. An interplay between concrete and electronic sound gestures occurs, where bubbles passing upwards through the shot are sometimes synchronised with organic sound, and at others are rendered by electronic gestures. Electronic gestures therefore shift from a non-diegetic to a diegetic role, using aggressive filter sweeps and distortion to create a synchronised doppler like morphology that traces the passing movement of the bubbles. The technique attempts to instil an expectation for bubble movements to be rendered by the more natural and tactile organic sound, so that when electronic gestures are instead matched to the motion, the real sound and associated tactile experience is intuitively expressed. An expression of the omitted organic sound gesture and also the sound evoked through imaginary listening, will

perhaps taint the tactile perception of the electronic gesture, where conscious perception attempts to fill in the sensory information missing from the interaction. This shift between electronic and concrete sound interactions, highlights how congruent aural materiality is capable of immediately heightening the tactile experience of imagery, while electronic gestures predominantly modulate and enhances a kinaesthetic empathy with movement. The technique also demonstrate the ability of electronic sound to blur the non-diegetic diegetic boundary, and command varying levels of attention depending on the degree of synchrony it has with the visuals. Upon cutting to the surface of the liquid, the morphing shape of emerging and popping air bubbles is matched by the expanding and contracting frequency spectrum of electronic sound, which is achieved through the synchronous movements of a low-pass filter's cutoff point. The haptic impressions conjured by the visual textures, conflate with the kinaesthetic impression of force and motion evoked by the electronic gestures, creating a highly exaggerated tactile experience of the bursting bubbles membranes. Where imaginary listening is engaged, the expression of bubbling and popping sounds will perhaps taint the tactile experience of the electronic gestures, and allow them to meld more naturally with the visual objects.

During a sequence of the biologically themed section of the work (10:44), an amassing of red blood cells is conveyed by clusters of pizzicato melody lines that merge to form a dense chromatic chaos. The function of instrumental sound changes at this point, from a non-diegetic provider of flowing temporality and momentum, into a gestural expression that matches the spatial and kinaesthetic constriction of cell motions more closely. As more melody lines enter and congest the soundtrack, it becomes impossible to perceive individual musical phrases and so the habituated temporal progression and momentum of the sequence is lost. This evokes an impression of claustrophobia that is emphasised further by the reduction of space between cells in the image. In this sequence, the silence between melodic notes is perceived and experienced as a diegetic unit of spatiality, that

maps onto the spaces between cells. The congestion of both visual and aural space will perhaps evoke an impression of muscular compression, that accentuates the tactile experience of cells which burst under pressure, and the laboured movements of cells through the viscous liquid and crowded spaces.

In the opening scene I incorporated a long breath panned hard left (0:22) to instil the feeling that I am right behind the images in a diegetic offscreen space, and in control of the unfolding events. While the gesture is slightly indulgent on my behalf, it connects with Sobchack's (2004) concept that we actively empathise with the intentionality and conscious perception of an 'other' while viewing film. A viewer who reflects on my control over the images, may be more conscious of how their sensory perception is being coordinated by sound and image, and consider the experiences the work is attempting to evoke. This will perhaps cause them to indulge imaginative and expressive viewing modes more readily, to align themselves with my own creative interpretation and experience of materiality. Vertov attested to the verisimilitude of his films, which documented everyday life, by revealing the film apparatus and his own presence amongst the reality that he captured. My revelation of a manipulative filmmaker perhaps has the inverse effect, whereby drawing attention to the intentionally distorted reality of the film, encourages creative modes of viewing to be actively engaged.

Visual Analogy and Incongruent Material Identities (3)

An intertitle reading 'cell' appears at the start of this sequence to highlight the analogical representation of a prison setting by the objects and gestures of the images. Synchronous acousmatic sound is used to manipulate the perceived materiality of visual objects, and imbue them with the material properties of the objects they analogically represent. The opening intertitle plays on the word cell (0:58), which alludes to the biological type of cell seen in the image, and a prison cell that is conjured in imagination through acousmatic

sound. Gritty and heavy swells of a synthesised electronic sound appear to engulf and resonate throughout the space of the image, which imbues the dark scene with a tangible density and heightens the claustrophobic encroachment of shadows on the shallow focal point of the image. The nucleus of the cell takes on an anthropomorphic quality as it shakes violently in what is perceived as an attempt to escape the confines of its oily membrane. The analogy between the movement of the cell nucleus and an aggressive prisoner or creature trying to break out of a confined space, is solidified using acousmatic metallic sound gestures that are reminiscent of shaking prison bars, and which synchronise with the nucleus' movements. Where a viewer is more present to the visuals, the tactile experience of the steel sound imbues the cell's membrane with a rigid and metallic quality. The transient attacks of the metallic sound's spectromorphology evoke an impression of the violent muscular gesture enacted to produce them, and the empathetic expression of this gesture renders the synchronised movements of the nucleus with an equal explosive muscular force. The sound of flowing liquid appears diegetic where congruence is perceived between aural and visual materiality, however, the proprioceptive expression of the sound's exaggerated turbulent morphologies, greatly enhance the tactile grasp of the dark water's viscosity and the force with which it moves. The spatial signature of sound gestures is more expansive than the suggested space of the images, causing a conflation of spatial perspectives that perhaps stretches the perceived depth of the scene to make the cell appear isolated. Alternatively, the exaggerated spatial signature appears to accentuate the degree to which the aggressive cell collisions excite the surrounding space. This amplifies the implied force of the action and perhaps intensifies the empathetic muscular expression of the movement. Where the viewer's perception is biased towards the meta-diegetic scene, experiences stemming from aural and visual materiality will be expressed and mapped onto imagined objects and events. A kinaesthetic empathy with the morphological motions of the oscillating cell nucleus, will potentially exaggerate the proprioceptive expression

simulating the aggressive shaking of metallic materials or prison bars, and heighten the associated tactile experience of the interaction. This expression will perhaps conflate allocentric and egocentric spatial perspectives, where the gesture is grasped through an egocentric expression, but the spatial signature of the sound places the excited object away from the viewer in the imagined space. The short and reflective qualities of the metal sound's spatial signature, offer an impression of the confined space and discomforting hard surfaces that constitute the cell's structure. Expressing the tactile experiences of the water seen and heard into the imagined scene, will perhaps confer the space with a dampness and coldness commonly associated with subterranean spaces, such as a castle prison block. As sensory perception flickers between the imaginary and visual scenes, residues of experience from both perspectives coalesce to form an amalgamated experience of the sequence, which incorporates contrasting spatial perspectives and incongruent tactile impressions. The analogical relationship between the visuals and suggested inmate's cell setting, seemingly enhances the impression that the incongruent materiality of sound and image is naturally connected, which dissolves the boundary between the imagined and visual spaces. The tangibility of acousmatic sound objects and imagined spaces is perhaps heightened, where perception is primed to identify defined source objects for sound that relate to a suggested setting, and which offer a rich array of sense impression to express back towards the film.

Acousmatic Causal Sound (4)

In this scene I attempt to push imagination and expand the boundaries of the visuals, using acousmatic sound to evoke and layer mental spaces over the images. The sequence explores what Smalley (1997) terms 'spatial simultaneity', where a mental scene conjured by sound has defined near and far spatial zones, which are stacked in parallel to visual space, perhaps as offscreen spaces. In the scene we see a play of refracted colourful light

through a vibrating body of water, and hear the incredible low pass filtered roar of an acousmatic earthquake tearing through an urban environment (3:00). Variations in the intensity of seismic sound are matched by calm or turbulent movements of the water, which reinforces the causal relationship perceived between the earthquake's vibrational energy and visual movement. Blesser and Salter (2009) explain that in listening, the perceived distance of an object from the point of audition is typically proportional to the high frequency degradation observed. Quantifying the amount of degradation that has occurred requires a comparison of the sound heard, to the sound recalled when the object is similarly excited in close proximity. Seismic sound gestures exploit this facet of listening and mimic high frequency degradation, to establish the presence of a massive force in a distant spatial zone of the imagined scene. As these gestures build dynamically and develop higher frequency content, an impression is evoked that the force is encroaching towards and into the viewer's personal space. Additional acousmatic sounds of vibrating metals and crumbling concrete debris are heard, which have spectral and dynamic profiles matching the morphological shape of the water's movement. These sounds have more intimate spatial signatures and richer high frequency content than the seismic rumbling gestures, and will perhaps evoke mental imagery of an unstable small space in which the source objects of the sounds are seen vibrating and disintegrating.

I feel that the natural causal relationship linking aural and visual gestures to the earthquake event, cause the spatial zones of the imaginary scene to appear as extensions of diegetic offscreen space. In order to grasp the interactions occurring throughout this extended space, the viewer is compelled to engage their imagination and indulge a highly cross-sensory and expressive viewing mode. A kinaesthetic empathy with the morphological motions of the water, traces and amplifies the visual movement evoked by the seismic and metallic sound gestures, which helps to visualise the destructive vibrational energy coursing through the materials of the imagined environment. Proprioceptive muscular

expressions interpreting the forces of the movements seen and heard, modulate the intensity of tactile experiences where the expressed contact force between the skin and materials rises and falls. This expressed tactile contact will perhaps be enhanced by the physical vibrations of the viscera and skin in the performance space, which will seemingly draw the real world into the visual and imagined spaces of the film. Incongruence between the materiality of the water seen and the structural materials heard, fuse the recalled tactile experiences of free flowing liquids, abrasive textures and vibrational energies flowing within dense materials. I envisage that the viewer's attention will flit between the various spatial perspectives of the visual and imagined scene, causing rapid changes to perception and experience of space. This will perhaps evoke an impression of moving into and away from the different zones, especially if a viewer assumes a first person perspective in the imagined scenes, and moves beyond performance space and visual scene on a mental level. I believe that this technique is extremely effective in folding the embodied experience of the visuals into an imagined scene constructed by sound. This is perhaps because the natural energy-motion relationship between acousmatic sound and image, provokes an expression of visual motion to better grasp the energy of the imagined causal event, as opposed to a more attentive cross-referencing and differentiation of aural and visual materiality.

Meta-Diegetic Narrative and Incongruent Material Identities (5)

This sequence serves as an inquisitive and indulgent moment during my film making process, observing the effects of a meta-diegetic narrative sequence on the perception and experience of materiality. I believe that narrative thread imparts a highly biased presentation of materiality depending on the context and emotional value associated with objects. For instance, the lapping of waves in an unbiased scene is inclined to be relaxing and gritty, while a transition to this view in the context of the D-Day landings is incredibly sombre and perhaps bloody, detracting from a purely sensory engagement with the

materiality on display. The sequence was inspired by the unsettling feeling that swept across the world as suicide attacks increased, and a barrage of reports concerning the Syrian conflict came in, that showcased humanity's capacity for hate. The experience of materiality will be highly variable depending on the history of the viewer, and their experience of conflict. The visuals are abstract and feature a play of lights refracting through water, which compels the viewer to engage imaginatively with sound materiality, in order to reveal the environmental objects and events that the images metaphorically represent. I considered Tarkovsky's wise words when designing sound gestures, to ensure that space was left for the viewer to imaginatively interpret the events unfolding in the scene.

The artist has a duty to be calm. He has no right to show his emotion, his involvement, to go pouring it all out on the audience. Any excitement over a subject must be sublimated into an Olympian calm of form. That is the only way in which an artist can tell of the things that excite him.
(Tarkovsky, 1986, p.78)

My personal interpretation of the scene is that a group of people are caught in a shelling attack, which results in a character being struck by shrapnel. This character hovers between real and spiritual dimensions as they move in and out of consciousness in a medical facility. An uplifting and energetic mood is conferred on the opening sequence, using sound gestures that fuse the rich and warm timbre of brass and string instruments (3:55). The morphological profiles of these gestures embody the kinaesthetic flow and morphing shape of passing lights, as they expand and refract colourfully across the centre of the screen. Flowing gestures give way to the more erratic stuttering motions of point lights, which are anthropomorphised by the sound of scuffling feet on a stone floor, and potentially evoke tactile and kinaesthetic memories of running in play. The viewer is

primed at this point for an emotional and tactile shock. Deep and punctuated shots are synchronised to distant flashes of light, which causes the footsteps to become erratic and panicked in the presence of danger. As the scene decays into explosive chaos, the ricochet of shrapnel and debris can be heard flying around the scene. The intimate spatial signatures of these gritty impacts, will perhaps propel the viewer into the middle of the chaos in their imagined scene. If the viewer places the sequence in a hotter desert landscapes, sensory impression related to intense dry heat and the abrasive stinging of sand striking the face will perhaps be evoked. Following a punctuated impact and exhalation of breath in the soundtrack (4:31), the sequence transitions into a more spiritual dimension where refractions of light are synchronised with intimate whispers, and a horizontal stream of elliptical discs is accompanied by the smooth sound of a passing train (4:40). The spatial signature of these sounds is more expansive and rich than previous sound gestures, which in tandem with the abrupt shift to a contrasting environment, alludes to lapses of consciousness and out of body experiences. This spirituality inferred at this point could enhance the evoked sensation of weightlessness that is associated with the visceral experience of commuting on a train. The transcendental atmosphere is aggressively interrupted by a discharging defibrillator sound, as a sequence of vertical lights plays out against the noisy wheels of rolling medical trolley. A viewer may express the visceral and tactile experience of this bumpy movement, and associate the more present and tactile rendition of sound to represent a regaining of consciousness. The spiritual themes return before culminating in a descending watery gesture that transitions into a dark variation of the passing train gesture. The water gesture is heard over a black screen, which will perhaps heighten the kinaesthetic empathy with the falling spectrum of the sound, and give rise to visceral and tactile experiences associated with submersion. The viewer might consider this gesture to represent dying and passing permanently to the transcendental dimension.

The imaginative meta-diegetic narrative evoked by synchronous acousmatic sound in this sequence, is extremely effective in transforming the perceived materiality of the abstract visual objects and imbuing their movements with emotional value and meaning. In order to embrace the metaphoric relationship between sound and image, a viewer must engage a highly imaginative and cross-sensory viewing mode. The materiality of each sound gesture is explored extensively, which gives rise to a plethora of impression including source objects, visual movements, textures, spaces and mental imagery. Expressing these proprioceptive and tactile sound properties, transforms the perception and tangibility of the visual objects, which appear to merge into the parallel mental imagery. It is perhaps the lack of physical material characteristics in the visuals, that allows them to readily absorb mechanical, anthropomorphic and organic properties with little resistance. Sensory experience is intertwined with the narrative and emotional arcs of the scene, where each audiovisual gesture is perceived relative to the history of events that have unfolded before it. For instance, the context of war connotes death, which imbues the materiality of whispers, trains and the space they occupy with a transcendental weightlessness. The sequence is inspired by my experience with Ruttmann's *Opus III* (1924), and tries to remain true to a Dadaist aesthetic.

Temporality and Embodiment in CineBlips

CineBlips (see enclosed usb Sean Ryan/ *Film_Portfolio/CineBlips*) employs many of the techniques explored in *CineSensorium*, but relies on montage to deploy them quickly over a few seconds each. In their experiments Lang, Shin, Bradley and Wang (2005) concluded that fast editing causes arousal, leading to more resources being allocated to memory and task processing centres of the brain. This type of pacing has become more prevalent in advertising, with Apple (Apple Canada, 2016) exploiting the boundaries of information retention during high speed sequences, in order to engage the memory more actively while

product details are offered. My aim in *CineBlips* is to reduce the time a viewer is afforded to process imagery, thereby challenging sensory perception and making the experience of materiality susceptible to being distorted by manipulative soundtrack techniques. Throughout the work an audiovisual gesture will build temporal and kinetic energy leading towards a cut, which will be diffused by an entirely contrasting gesture after the cut. This results in a staccato rhythms, where each new shot functions as a tactile and kinaesthetic shock that the viewer must readjust their senses to. The technique is designed to build a sense of anticipation, where the viewer is primed part way through each shot to anticipate the coming of another. This is inspired by Shimamura's (2013, p.16) concept that we develop schema for a filmmakers audiovisual style, and adjust our viewing mode to indulge the sensory experiences that we perceive the work is trying to evoke. The technique will hopefully maintain a high level of arousal, and invite an investigative gaze that searches the senses more actively with each new cut. The piece is inspired by sequences in Aronofsky's *Pi* (1998), where tangible human gestures, like aggressively scratching the head, taking pills or typing on an old typewriter, are ripped out of normal time, compressed, then exploded through the screen. I avoid using acousmatic sound to evoke meta-diegetic scenes in this film, and instead contrast highly tactile concrete sound and expressive electronic gestures to engage the viewer in a flurry of haptic and kinaesthetic viewing modes. Dynamic camera movement features prominently in this film, in order to explore Barker's (2009) concept of muscular empathy with camera movement and Marks' (2002) notion of haptic visuality. The intentional movements of the camera draw the viewer's gaze across the surface of the objects in all directions, imitating an intimate visual exploration of the intriguing tactile world at the surface of everyday items. I intend for the soundtrack to mark my presence as a guiding force, that reveals imaginative sonic interpretations for the movements and rhythms of micro textures. The overall density of the mix is greatly reduced from *CineSensorium*, allowing the texture and morphology of

sound to become more prominent, as it permeates through the relative silence of the background. This recognises Blesser and Salter's (2009, p.33) concept that an acoustic space demonstrating silence, displays the intention of the architect to allow small sound to add 'nuance' to a communication. This spatial intimacy will perhaps cause visual objects to encroach on a viewer's 'personal space', and cause them to be watched more carefully in anticipation of coming into contact with them. The work embraces my experience as a sound designer and offers unusual perspectives for everyday objects typically seen in someone's home. This alludes to my relationship with simple items, where I imaginatively explore and manipulate their material properties to create new sound object and surreal worlds. By viewing the objects in quick succession, the work is like a cross section of an evening exploring sound objects, or a catalogue of memories recalling moments when imaginary listening turned the real world into an extended score for sonic gestures. I will now analyse the main audiovisual techniques explored in *CineBlips*, and discuss how the integration of sound and image results in engaging and manipulated experiences of materiality.

Empathy with the Actions of Others

A number of sequences suggest the presence of another person existing somewhere outside the boundary of the frame, manipulating the objects seen in the image. While subtle, this presence is enough to evoke a muscular empathy to a sequence of interactions that people might have on a daily basis. We are presented with a quick succession of close-up shots, such as roasted coffee beans falling into a glass container, a mason jar lid opening violently, and a traditional handle wound coffee grinder whining politely as its abrasive joints creak. There is little continuity across the edit, thus emphasising the shift between subject matter, and the highly tactile rendition of the object's sound as each punctuates a relative silence. This emergence from silence to sound, stasis to movement, creates a

impression of imminence or importance that results in a detailed viewing of the object. It's similar to a chiaroscuro painting separating a figure from a dark background. The close-microphone recordings are treated with equalisation and dynamic processing, to accentuate the most tangible regions of material interactions. This intimate reproduction of sound enhances the proprioceptive qualities of the sound gestures, which assists the expression of the event from the perspective of the perceived other in the frame. In this viewing mode, haptic experience is mediated by a muscular expression that simulates the performance of similar actions upon the materials. A viewer's perception will perhaps shift between the expression of control over images and a more observant state, in which tangible experiences is garnered through a visual caress of surface texture, and a kinaesthetic empathy with the movement of the object itself. The rhythmic edit of the work results in an overlapping of these tactile experiences, where the viewer has no sooner expressed and reflected upon one interaction, that another sensory perspective or the materiality of an entirely new shot is rising up through the subconscious to take its place. This segmentation of experience and expression creates an overarching experiential momentum in the work, which becomes habituated by its consistency throughout the film. Audiovisual textural incongruence is used to modulate the speed at which the rhythmic flickering between perspectives occurs, leading to embodied rhythms that abruptly push and pull the viewer through different experiences. I feel that the fast editing pace makes these simple sequences highly engaging, given that the senses are pressured to explore materiality quickly in order to understand the objects shown, which results in an engaging and rapid interplay between sense memory, sense expression and kinaesthetic empathy.

Shaping Experience Through Electronic and Concrete Sound

A dynamic relationship between concrete and electronic sound is employed throughout the film, using quick transitions between their isolated or simultaneous use, to frequently

subvert the manner in which the modalities access the experience. In simultaneous use (0:31 - 0:37, 1:34 - 1:47), concrete sound will define a haptic experience, and electronic sound will modify the temporal resolution and energy contour of this embodied experience. This technique can be seen to function like Henke's (Boiler Room, 2016) segmented line work, where the natural inclination to trace out the morphological profile of electronic gestures, effects the temporal frames into which continuous visual movement is parsed. Ronconi and Melcher (2017) point out that this occurs because visual perception entrains to low frequency auditory rhythms, where attention is primed to observe salient events occurring at the onsets of sound. During rotational movements, the morphological profile of electronic gestures helps to establish a point that moves around the circumference of objects, which becomes the focal point of a viewer's gaze. As the dynamic of the electronic gesture increases, the eye is drawn onto a segment of the object that synchronises with the peak of a morphological vector in the sound. The most intense tactile experience typically occurs as the aural gesture rises to its highest volume or frequency range. I use this technique in the latter sequence to create an engaging succession of rhythmic tactile experiences. This interaction between sound and image was inspired by Vertov's editing of movement through intervals, where the kinaesthetic experience of a sequence results from a summation of editing pace and the individual rhythms of each shot.

Electronic gestures are often used to vectorise an image and create tension leading towards a cut, at which point the build up of energy is diffused through a granular sonic event. In the following examples, a viewer's kinaesthetic expression of a rising or falling spectral profile and empathy with the musculature movement of the camera, invites a feeling of displacement from a bodily centre. Concrete sound is then used to diffuse the experience back into a normal and rooted position. This process is analogically represented (0:46), where the arm of an old set of kitchen scales rises synchronously with a pirouetting electronic gesture, and diffuses literally through a highly tactile rendition of coffee grinds

melting into liquid on a spoon, which dwells a little on the satisfying crackle of the crusting surface. This synchronous diffusion of texture is highly tangible, because it maps extremely well onto the release of muscular tension. We are required to shift our viewing mode from a kinaesthetic empathy with motion, to a haptic exploration audiovisual granularity, therefore our feeling of restitution is emphasised by a loss of directed embodied movement. A variation on this process (0:08) uses a breath gesture with a rising morphology, to vectorise a camera movement closer towards a glass covered in condensed water. We empathise with the camera and the human quality of the aural gesture, which potentially evokes tactile and muscular memories of breathing close to glass. The shot is diffused by a granular bubbling, which releases the tension built in the previous shot. The sight of condensation and boiling liquids in tandem with the camera's lean towards the materials, may evoke an impression of heat in a somewhat claustrophobic manner, given that the object appears to inhabit our personal space. Variations of this technique occur throughout the work, such as the hyperreal close-up of a filling coffee cup, which is vectorised into a tactile rendition of relaxing rain (0:52). The tactile rendition of water falling turbulently down a claustrophobic plug hole, expands into a calm sea of broccoli segments, which is embodied by the flowing temporal contours of a submerged tidal sound gesture, and the slow decaying reverberation of an electronic melodic motif (1:12). A more surrealist version shows a glass pipe sucking water up into a turbulent tube, which vectorises into a shot of a white marble in a dark space, that falls in tandem with a time lapsed bed of crackling melting ice (1:00). I believe these sequences reaffirm Barker's (2009) suggestion that we empathise with the suggestive muscular movements of the camera, while also demonstrating that the morphology of sound is capable of shaping the intensity of this empathy. It is clear that the morphological profile of sound instils its own kinaesthetic impression of movement across or within shots, even where camera movement is not prominent.

Revealing the Filmmaker Through Incongruous Interactions

A number of the audiovisual interactions explicitly highlight the manipulative power of synchresis to meld highly incongruent aural and visual objects. This reaffirms my presence as the auteur of the work, exposing a highly imaginary and manipulative perspective through which the viewer is forced to see. For example, the morphology of a highly energetic and incongruent electronic sound can be seen to embellish the vibrotactile impression of a leaf (0:37), which causes resistance between the effortless kinaesthetic melding of sound and image, and the cognitive separation of the causally unrelated gestures. A slight variation of this occurs out in the world, where an unusually dense rendition of afterfeathers provides an insight into the imaginary sound play at work (1:24). The cinesthetic subjects expression of the downy softness of the visuals, is skewed by the chaotic and staccato temporal framing of the aural gesture. There are extremely subtle moments where audiovisual morphologies fall out of synchresis, and the viewer is relinquished to briefly register these differences of temporal rhythm. The eye is inevitably drawn back into synchresis by the unconscious pairing process of the subconscious, which reinforces an awareness, when reflecting on the experience, that sensory perception is being directed by the film makers intentionality through sound. Perhaps the realisation that the intention of my work is to indulge creative modes of viewing, will ease cognitive resistance to audiovisual incongruence. If a schema is developed for the work, a viewer might explore their own embodied experiences more actively, and be more intentionally expressive back towards the film, to better grasp the manipulative perspectives of visual materiality offered by sound.

Montage by Materiality in Cineflow

Cineflow (see enclosed usb Sean Ryan/ Film_Portfolio/Cineflow) is my final video work and combines the manipulative acousmatic techniques of *CineSensorium* with the faster

diegetic sound techniques of *CineBlips*. The concept was to establish an overriding force that propels the viewer through seamless stretches of material experience, existing anywhere between the screen and imagined dimensions. The technique is influenced by Dziga Vertov's theory of montage by intervals, whereby a grand theme of movement emerges through the summation of editing pace and smaller intervals or movements experienced in each shot. I combine Vertov's technique with Eisenstein's theory of overtonal montage, and apply this to a contrapuntal use of congruent and incongruent materiality, to drive experiences arising from the sensory perception of objects seen and imagined. The viewer's attention is focused by a fast editing pace, and frequent subversion of viewing modes, while continuity is achieved by carrying movement across cuts allowing a perceived force to flow effortlessly between shots. This work represents the culmination of ideas explored in *CineSensorium* and *CineBlips* and I believe it to represent the most refined practice of the three works.

The Experience of a Fast Material Flow

I am going to discuss three of the longer linked sequences of the work, which I think cover the overall technical process employed in the *Cineflow*, and demonstrate how sensory residues result in an engaging coalescence of embodied experiences. We are propelled through a sequence of nine shots (1:20-30), that are intrinsically linked by an overarching force, which emerges through the summation of object movements as they flow across the screen. Some frames occur in less than one second, which pushes all the modalities to investigate the images in an alert and focused state. A high degree of attention is given to the spectromorphology of aural gestures, where causal listening and proprioceptive expression must be coordinated, to quickly ascertain information about the identity of objects, their structural and textural properties, the forces being exerted upon them and their overall trajectory. In the first four shots, sound materiality is used to evoke a hyperreal

experience of the visual object's coarseness, rigidity and density as the force surges through and excites them. Where the kinaesthetic experience of the forces movement, conflates with the muscular resistance exaggerated by aural materiality, the tactility and physicality of the interactions will perhaps be made more tangible. For example, spaghetti strands are imbued with a heightened textural rigidity, as the force pings them in sequence, and produces a taught metallic nylon sound (1:21). A musician might recognise the abrasive muted tone of instrument strings, and merge the recalled tactile experience of this string interaction into the haptic perception of the plucked spaghetti strands. While the shot is less than a second long, aural materiality effectively imbues the strands with a perceived metallic rigidity in contrast to the brittleness evoked by the image. In the second set of four shots, synchronous acousmatic sound evokes tactile and kinaesthetic sense impressions that contrast and taint the perceived materiality of the images. The energy-motion contour of the acousmatic sound also appears to modulate the shape of the overarching force driving visual materials. In the first two shots we are confronted with the winding movement of a cotton strip through the metallic tuning pegs of an old autoharp (1:23). This winding motion is highly reminiscent of undulating waves or a meandering stream of water. A haptic viewing of the tactile image will perhaps evoke impressions associated with the coarse texture of fibrous cotton and the sharp edges of dense steel against the skin. Acousmatic water gestures exploit the analogical movement of the object, and conjure tactile impressions associated with smooth liquid movements, that embed themselves into the texture of the cotton with little resistance. The final shot of the sequence depicts a crystalline like water falling through the centre of an abyss, which is matched with the acousmatic sound of liquid filling a resonant old bucket. The intimacy of the water stream draws the background closer to the viewer, while the incongruent spatial depth of the bucket sound pushes back in the other direction. The short shot evokes a plethora of interpretations, depending on what part of the sound a viewer finds salient. The experience

conjured of the imagined bucket is particularly tactile, with sound conveying the resonant vibrations as it fills, its rigid metallic structure and the turbulence of water in the bucket's base. A kinaesthetic engagement with the water's falling motion, may heighten the musculature experience of the force with which the water is heard impacting the bucket's base. The more violent bucket interactions imagined will perhaps taint the graceful flowing motion and materiality of the water stream, so that it appears heavy, resonant and metallic.

The interplay between congruent and incongruent audiovisual materiality is enticing in this fast and fluid temporal framework, where the viewer is poised to change their viewing mode dynamically, and explore sense impression quickly to form a coherent perception of the imagery. The synchronisation of incongruous sound and image objects causes perception to flicker between imagined and visual materiality. This causes residues of sense experience to build and coalesce, and form an amalgamated embodied experience through which the materiality of sound and image is tainted and appears to be fused. The continuity of movement across shots instils an engaging sensation of seamless and directed momentum, that infiltrates the urgency with which objects flow and the force with which they interact onscreen. The embodied experience of the sequence is much like a wave, where the intensity of kinaesthetic and tactile experience morphs constantly, in tandem with the imaginative and more present viewing modes engaged by the viewer.

Priming Experience through Schema and Surreal Sound

In the following sequence acousmatic sound is used to evoke a stream of mental imagery, which is synchronised to the flowing and seamless morphologies of abstract imagery. To resolve meaning for the sequence, conscious perception is challenged to quickly find causal correlations between the kinaesthetic and haptic impressions communicated by sound and image. The relationships interpreted are typically tenuous, and a viewer may begin to consciously reflect on how their sensory perception of the visuals, is being

coordinated by the filmmaker's personal interpretation and expression of materiality. A viewer who reflects on the kinds of sensory experiences the sequence intends to evoke, will perhaps be more conscious of the manipulative techniques of the audiovisual language used to achieve it. This will potentially result in a schema being formed that encourages more intentional expressions towards the film, that indulges the conglomeration of impressions stemming from imaginary and visual domains.

The sequence (0:27) opens with an image of falling dust like particles, which morphs into a partial and unrecognisable view of a vinyl turning. Falling particle motion is encapsulated by the descending swooping of a granular metallic sound, emphasising the flow of particles down through the image like a waterfall. The initial engagement is designed to resemble a transition into a dreamlike state, by exploiting a kinaesthetic empathy with the graceful descent of the audiovisual gesture into the dark abyss of the imagery. This granular sound becomes morphologically cyclical, possibly alluding to the engine of a train cruising in a high gear, and instigates a sensation of flow, direction and speed. This is coordinated with the flattening out and streaming of the dust particles. A new acousmatic sound begins here, entering initially with a smaller chugging engine sound that personally evokes the mental image of riding a chopper style motorbike. From this perspective, the stream perhaps becomes a road lit dimly by the motorbikes lights, as it cruises through the darkness. The momentum of the underlying metal pad remains, and accumulates with the kinaesthetic expression of motoring smoothly along, to instigate an overall sensation of propulsion. New associated experiences potentially emerge, such as the tactile sensation of wind on the face, or the embodiment of spatial isolation at night time. The image begins to morph from dust particles into the obscured shot of rotating vinyl grooves, streaming and undulating through a slither of light as scraping and wailing steel sounds rise up. A new mental context begins to emerge, perhaps of heavy machinery moving or trains rolling by with carriages, where particular focus is given to the friction between heavy industrial objects or

the recalled timbre of metallic wheels running down a track. The slightly rotational momentum of the visual, reinforces a kinaesthetic expression of the heavy objects steady momentum and rocking motions. A musical gesture calls out that is reminiscent of an iconic train whistle, and is used to steer perception towards the materiality of a train and perhaps the visceral experience of commuting on one. For me, the image resembles a window view from a train carriage as we watch the light shine down onto a slither of the ground rushing by, perhaps evoking an impression of a calm night time journey through a vast open landscape. This meta-diegetic world comes crashing down when the intimate sound of a vinyl record sweeps up through the mix, vectorising the sequence into a shot of the vinyl player spinning around, while playing a diegetic vocal motif that is recognisable as the unaltered version of train whistle. The shot is abrupt and effective, because it shuts off the highly imaginative connections that the viewer had made with the sound. The subconscious starts pairing highly causal sound, and so the sequence of mental imagery and the associated sense impressions vaporise, much like the experience of waking from a dream. The perceptual shift highlights my control as the filmmaker over the flow and perception of the images, asserting how and when the viewer sees.

The degree to which this sequence challenges visual identification will perhaps cause a viewer to explore and embrace sound more readily as the gateway to creative mental scenes, which give meaning to the unfolding events. This mode of viewing encourages a viewer to be more present to their imaginative interpretations and embodied experiences of materiality, which in turn will greatly heighten their grasp of the film. The sequence expands upon my previous exploration of acousmatic sound and meta-diegetic narratives in *CineSensorium*. The omission of an overt emotional context in this sequence allows a more free interpretation of the visuals. This may enable a viewer to embrace more personal and vivid experiential memories to project onto the image, which will greatly heighten the sequences effect. This fusion of experience from present and mental domains is

fundamental to the experience of my work, where sound is not subordinate to a dominant image, but an equal source of materiality with which to synthesise experience.

Distorting Perception through Similarity and Repetition

The last section I want to discuss uses repetition and expectation to force an incorrect or highly tainted experience of materials displaying similar motions between cuts. We are introduced to the acousmatic sound of a continually vibrating steel string, that defies the natural attack and decay of a normal string (1:10 - 20). Causal listening occurs and the string object is identified, leading to a kinaesthetic expression of the morphological profile of the vibration, which also evokes tactile sensations associated with the thickness and rigidity of the metal. The camera moves slowly from left to right, and the viewer mimics this search, employing haptic visuality in search of the source. Revelation of the string occurs through a jump cut, which is matched by further excitation of the metal that swells into a spatially incongruent version of the sound. This temporally vectorises the sequence towards a series of hyperreal plucks across the other strings, which punctuate the soundtrack with cathartic release of energy. The image quickly shifts to a highly contrasting image of red petals shaking, and is combined with the acousmatic sound of more delicate and higher frequency autoharp strings vibrating. The material experience or residue of sense experience from the previous frame, is carried over into the new image of the flower, finding correlation in the morphological shape of the quivering petals. The petal becomes tainted with the metallic composition of the strings, and we likely express the petal as being more metallic and rigid. I attribute the visceral effect of this shot to the seemingly fleshy and delicate quality of the petal's interior, which conflates with the sharp and rigid string vibrations, to evoke an impression of abrasive and forceful contact with sensitive skin. The flower also envelopes the shot, which draws the viewer much closer to the internal body of this quivering, blood red, anthropomorphic creature. We return to the

vibrating string and find satisfaction in the correlation between our aural and visual sources. The string gesture swells again to create anticipation for an explosive metal pluck, which diffuses over the vibration of a cotton strip, stretching across the centre of the screen. The metallic texture of the sound, is expressed back onto the texture of the cotton in a manner that dominates the actual haptic impression of its fibrous structure. Once more, correlation between the senses is achieved as we see the autoharp strings being plucked, before moving into a shot of a very thin strand of cotton, that has larger vibrational displacement than the other materials. The sound of a particularly low vibrating string is synchronised with this image, alongside a hyperreal rendition of the turbulent air it is displacing. The lower pitched vibration, evokes a kinaesthetic expression of motion for a string that is much less taught than the previous images. The correlation observed in the motion of the cotton strand, allows the haptic expression of the vibrating metal sound to permeate the resonating core of its fibres.

This sequence demonstrates that repetitive audiovisual events and spectromorphological vectorisation, can be used to build expectations that effectively prime the viewer for sensory shocks when incongruent materialities are offered. The creation of conglomerated embodied experiences in this manner, is perhaps most effective in a faster temporal framework, where the senses and cognition are pushed closer to their perceptual speed limits. This means that a viewer is pressured to explore audiovisual materiality quickly and decisively, and may prime their viewing mode ready to explore an audiovisual combination or object that they have been conditioned to expect. The cognitive realisation that perception has been misled by a kinaesthetic correlation between sound and image, pushes causal listening and haptic viewing, to better identify, express and differentiate the incongruent materialities. These differentiated tactile and musculature experiences rapidly branch out from the initial kinaesthetic unity between the objects, causing an array of

sensory impression to flicker in and out of perception, which causes sensory residues to build and merge over time into a unique and unified embodied experience.

Reflections: Sound as Sight

I believe my film portfolio engages with the artistic principles set forth by Eisenstein and Vertov, who thought film sound should embellish the visuals with new and interesting perspectives, which heighten the embodied grasp of materials and movements in the unfolding events. I have tailored their theories and techniques to develop my own unique audiovisual aesthetic, where sound manipulates sensory perception to heighten or distort the experience of materiality. My work adapts Eisenstein's (Robertson, 2009) theory of overtonal montage, where the incongruent materiality of aural and visual objects is combined through synchronisation, to evoke a plane of imagined impressions that runs parallel to the visuals, and which manipulates the sensory experience of the materiality observed. These audiovisual techniques exploit the manipulative power of morphological synchronisation, to deceive subconscious perception into joining sound and visual objects that have no causal relationship. The results is a cognitive dissonance, where conscious perception determines the incongruent audiovisual combination to be unnatural, resulting in a cross-sensory exploration of aural and visual objects that seeks to identify and differentiate the objects. This process results in highly tangible an engaging fusions of experiences, where perception flickers between the materialities of imagined and visual objects, causing residues of sensory perception to layer and merge. I have explored this facet of perception throughout my portfolio, using different temporal frameworks and varying degrees of congruence between aural and visual materiality, to fold an entire spectrum of mental and embodied impressions into engaging experiences. I have found that a faster editing pace is more successful at commanding a high degree of viewer attention when audiovisual resistance is a key component of a montage style. The natural arousal and increase in processing resources means that the viewer is stimulated to quickly

explore audiovisual objects in a highly synaesthetic manner, to gain a better understanding and tangible grasp of the materiality offered. My final film *Cineflow* demonstrates that fast pace editing pushes sensory perception closer to its limit over time, and makes a viewer susceptible to engaging sensory shocks, where the expected outcome of repetitive or vectorised events is subverted. A viewer's attention is perhaps best maintained when using electronic, concrete, congruent and incongruent sound techniques contrapuntally. This induces dynamic shifts between kinaesthetic, haptic and imaginative viewing modes, which results in engaging streams of sensory experience and embodied rhythms. Overtly manipulative sound techniques are likely to make a viewer reflect on how their sensory perception is being aligned with my own imaginative interpretation of visual materiality. This will perhaps make them consider the intended experience of my audiovisual aesthetic, and evoke a schema for my work which sets expectations about how impressions stemming from sound, images and imagination, should be fused and expressed to grasp materiality. Such a schema will encourage a viewer to actively express their sensory impressions and imaginative interpretations towards the film, and be highly present to their embodiment of these expressions, as a means to objectively grasp a tangible experience of the film.

My films have explored Marks' (2002) concept of haptic visuality, looking specifically at how tactile impressions derived from aural materiality modify visual perception, resulting in heightened or subverted tangible experiences of an object. Macro photography is used throughout the film portfolio because it offers an ideal visual perspective to indulge haptic visuality. The macro lens resolves much greater detail than human visual perception is capable of achieving, revealing the unexplored intricacies of shape and structure within familiar textures, and energising the morphologies of materials so that their presence and physicality is greatly enhanced. This intimate perspective encourages a caress of texture and shape with the eyes as a means to embody and know the object. The close spatial

relationship induced between viewer and object by macro imagery, is effectively emphasised by the spatial signature of synchronous sound gestures that have been recorded with close-microphone techniques. By positioning the microphone diaphragm extremely close to sounding objects, quiet and intricate material interactions are rendered with a high degree of spectral detail, while reflected sound is largely excluded from the sound gesture's spatial signature. The immediacy of this aural perspective perhaps conveys the experience of sound when the ear is moved towards or pressed up against an object's surface while it is manipulated. A combination of macro photography and close microphone recording therefore results in a hyperreal expansion of detail, where objects encroach upon a viewer's perception of personal space, creating a perspective resembling that when touching and being touched by materials. My work has exploited this intimate aesthetic in an attempt to evoke haptic and proprioceptive memories that are specifically associated with close and explorative experiences of materials. As Sobchack (1992) outlines, it is through the expression of sensory impressions towards the image that graspable sensations arise, enabling a tangible experience of a work. I believe the sense of intrigue that this explosion of detail evokes, compels the viewer to actively express the sensory impressions evoked while viewing, and be present to sensations that arise in order to grasp the hyperreal materiality offered. Mark's (2002) outlines that proprioceptive expression plays a fundamental role in haptic visuality, whereby a viewer will imagine manipulating and touching an object, then express the tactile sensation that may result from the physical encounter. This kind of proprioceptive expression is also employed during listening. Smalley (1997) explains that the spectromorphology of a sound will have proprioceptive qualities that are unique to the gesture which caused the source object to be excited. The musculature expression of this gesture will perhaps infer contact between the skin and sounding material, which results in tactile impressions with defined friction and force components. My portfolio has explored how various levels of congruence between aural

and visual materiality, bring proprioceptive expressions together that modulate one another. This conflation of expressions can result in accentuated or manipulated perceptions of an object's texture, or perhaps change the intensity of the tactile experience over time. Where the materiality of sound and image are deemed to be causally related, the tactile impression of the visual object can be enhanced by exaggerated characteristics of the sound. For instance, if the sound object has slightly greater density, abrasiveness, or energy than the visual object, the proprioceptive expressions for sound and image conflate at the surface of the object observed, and the visuals take on a hyperreal and energised quality. This technique is most effective when the sound is approximate enough to appear causally related to an visual object, but the actual source of the sound is perhaps much denser, sharper or brittle, to evoke much stronger grasp on the visual object. Tactile exaggeration also occurs where the spatial signature of sound is more intimate than the point of view offered in the image, and where the upper frequency spectrum is rich, as this gives an impression of the unevenness and undulations in the micro-textures of the object's surface. Where incongruent aural and visual materialities are synchronised, contrasting source objects are identified, and the impressions from imagined and visual objects are conflated by a rapid shift of perception between them. This experience is both engaging and surreal, where the expression of one object permeates the perceived texture of the other, resulting in an amalgamated embodied experience that merges the visual and imagined objects into one. The intensity of tactile experience is largely modulated by a kinaesthetic empathy with the perceived force and movement of the aural object, which coordinates the expressed pressure with which the skin engages visual textures.

My film portfolio has explored Barker's (2009) notion that a viewer mimetically empathises with camera and object movement, that is relatable to their own experience of moving. Many of the techniques in my work have exploited audiovisual synchronisation to merge contrasting experiences of aural and visual movement, which demonstrate that the

proprioceptive experience of sound is capable of manipulating the perception and experience of visual movement. Smalley (1997) outlines that during listening we habitually infer an impression of movement from the morphological developments of spatial and spectral planes in sound. Our proprioceptive modality feeds into this impression by synthesising the physical gesture and muscular effort enacted to excite and move the source object. My portfolio demonstrates that where the source object identified for an aural gesture correlates with the visual object it is synchronised to, planes of materiality which are incongruent, such as mass, rigidity, size, energy contour and spatiality, conflate to modify how the visual object's movement is perceived and grasped. When viewing my work, the muscular expression of these exaggerated planes typically results in an object's movement seeming heavier, faster or more energised. I have exploited the intensification of visual force through sound to heighten the tactile experience of objects, where the expressed contact force between the skin and surface textures is increased. The empathetic experience of the friction induced between visual objects, particularly the resistant force applied by the medium being moved through, is also enhanced by this sound technique. I feel that the proprioceptive expression of aural movement interferes with the musculature expression of visual movement, in the same way that sine waves interfere with one another when they are superposed. By considering that proprioceptive expressions conflate in this manner, I have attempted to subdivide the energy contour and tactile experience of visual movement into rhythmic patterns, using the spectral profiles of sound. This technique has perhaps been most successful where highly detailed imagery and electronic sound has been merged. When an electronic gesture is morphologically linked to a visual object's movement, the viewer is inclined to empathise with the perceived intentionality of the human expression that shaped the sound, and the manner in which the energy and temporal flow of the visual event has been interpreted. Qualities in the electronic gestures spectrum, such as rate of spectral change, richness of the frequency spectrum and amplitude contour,

can either simulate the envelopes of an excited object's real sound, or outline a musculature interpretation of visual movement in a cross-sensory manner. I have observed how concrete and electronic gestures with different spectral vectors can be simultaneously synchronised with the motions of a visual object, allowing a viewer to empathise selectively between two contrasting perceptions of movement. Engaging and proprioceptively expressing either perspective results in different temporal experiences, where the energies and forces of the visual object's movement progress differently over time. When considering Ronconi and Melcher's (2017) findings that visual perception entrains to the rhythm of sound, this modulation of musculature experience perhaps occurs where sound manipulates the perceived temporal and spatial distribution of significant sensory events. Throughout the portfolio I exploit aural gestures that feature defined rising, falling or expanding spectral shapes, to evoke muscular tension and create a sense of displacement in the images. This type of gesture has been extremely effective in enhancing the experience of camera movement, where both the aural and visual gestures appear to be driven by an intentional human movement. Sound frequently enhances the experience of moving in towards an object for a closer viewer, or whipping the head and eyes horizontally to follow the energetic movement of a visual object. This sense of directed bodily displacement can be effectively dissipated by the diffuse spectral paths of highly tactile concrete sound, or the steady state timbre of flatter electronic gestures, which convey a less definitive directionality. Where synchronous aural and visual gestures have incongruent materialities, a conflation of experience occurs between the imagined movement of the sound's source object, and the movement of the visual object. As perception flickers between the imagined and visual scenes, residues of muscular experience coalesce and meld the perceived forces, speeds and frictional properties of either object. The experience of visual movement can be largely manipulated by this technique, where sound objects with greatly different mass, energy contours or states of

matter are conflated. The amalgamated experience of movement expressed towards the film appears to fold the motion of imaginary and visual events together, where each object permeates into the core of the other.

CHAPTER THREE: Touching The Material

In 2013 the augmented reality viewer Oculus Rift was released to the masses, and since then, there has been an explosion of enthusiasm for the virtual world. In anticipation for this surge in virtual activity, Leap Motion had been developing a sensor enabling gestural control of a computer with the hand. I was intrigued by the prospect of using this device to connect someone with a virtual object, and through these interactions, create a realtime soundtrack that explored different modes of experiencing materiality. I observed that Leap Motion had created a library for Processing, a visual software for creative coders created by Casey Reis and Ben Fry, which enabled people with low coding experience to prototype visual experiences. During my time learning to use the system, I was particularly inspired by Shiffman's (2012) *The Nature of Code* and Bohnacker, Grob, Laub and Lazzaroni (2012) *Generative Design*. Shiffman provides an overview of creating virtual physics systems where complex interactions emerge from a collection of well devised simple processes. Bohnacker et al (2012) offer an interesting insight into the creation of highly tactile images through the movement of simple geometric shapes across a canvas, much like a drawing pendulum. I realised that the aesthetic of my installation would be different from that of the videos, which featured a rich array of macro photography and highly detailed surface texture. I would challenge myself therefore to create an installation that harnessed the potential of sound to transform the low texture presentation of processing, into something exponentially more tangible. I also challenged myself to implement a system that incorporated the montage style developed in *CineFlow*, which would allow a user to move effortlessly through a stream of materiality in expressive sweeping gestures. All I had to do first was to learn to code.

I selected Csound as the sound engine for my project and referred to the works of Bianchini and Cipriani (2011) and Lazzarini et al. (2016), to become acquainted with the language. Csound provides the ability to deliver or receive packets of data from Processing

via Osc, enabling any number of physics based interactions to function as control values for sound processing. After some time with Csound, I considered how to approach the soundtrack for my installation and what kind of pre-production process were suitable for the overall aesthetic. I had developed a rigid creation process for my film practice that interpreted and reinterpreted materiality, encompassing performance and composition to ensure that the final experience was as tangible as possible. It would be necessary to work with highly tactile recordings, which were composed into gestural streams that would be accessed according to some physical interaction with the virtual object. The work should use sound techniques that retained my gestural expression in the sound, while also allowing a suitable degree of control over temporal, dynamic and spectral qualities to enhance the interactive experience of the soundtrack. After reading Lazzarini et al (2016) I realised that granular synthesis was the way to approach this work. Partikkel is a granular opcode in Csound, offering a comprehensive set of granular facilities for the breaking down and reorganisation of sound, using any number of the principles outlined by Curtis Roads (2004) in *microsound*, which is a seminal work on granular synthesis. I would try to implement a pre-production process similar to that devised for my films, and relinquish only the amount of control to the computer that was necessary. This way I could approach the project as an expressive sound designer, and use Csound as an effective gateway to my expression.

Concerns for Interactive Design: The Gothic Cathedral Story

In a random encounter I met an American music technologist who was tasked with recording the Lincoln cathedral choir for an ambisonic installation, which was to be set up in the adjacent castle prison. Needless to say I volunteered to help, and he thankfully said yes. After measurements were made, the decca-tree and outriggers set up, we stopped very still and hit record. The choir sang a soothing piece about the closing of summer, while the audio team bathed in rich reverberations, each telling a story about the impossibly high

ceiling or the hidden crooks and crannies that only sound can find. As the eight minute piece came to a close, the main engineer listened back on headphones, put his hand up and spoke, “Okay, we need to record again and find a way to get rid of the buzz from the lighting”. Unfortunately, the reverberant tails of the ethereal choir phrases were not permitted to fall secretly through the threshold where sound meets silence, instead being smothered by noisy 1950’s wiring. The decision was made to turn off all the lights, and use modern, quieter lamps to illuminate performance area. The lights went off. In the flick of a switch the building morphed instantly back in time five hundred years, taking on its dark gothic form, made even more dramatic by the illuminated fog caressing the windows outside. The second performance was an awe inspiring experience. The sound took on a haunting quality and the reverberations seemed to reach deeper and darker places than before. It was impossible to distinguish the moment sound became silent and so the phrases continued to ring out for an eternity.

This experience highlights our modern desire to make the technology that mediates our everyday lives as transparent as possible. We want faster internet, bigger mobile phone screens, better aural spatialisation in headphone mixing, until the technology we are using is a virtual replacement for reality. While the second choir recording was more representative of the aesthetic qualities one associates with cathedral spaces, the recording severed from the gothic scene could not do justice to the holistic experience of being in that dark space, and feeling the sound expand in a magical way. In approaching my installation work I wondered how the apparatus might change the engagement with materiality and had three main questions to address regarding the use of a Leap Motion sensor. Is immersion affected by having to interact with a controller? Do my viewing modes still apply in a framework that features user control? How does intentionality change the experience?

I was concerned that the Leap Motion sensor would become a barrier to immersion and expression during the installation experience, functioning as a sign post to the mediation of intentional hand movements. In order for expression and engagement with my virtual objects to be high, it would be necessary for the control to feel like a natural extension of the body. Chisholm, Risko and Kingstone (2013) conducted a study looking at the effect of second-order mediation of gesture, which refers to actions conducted with a virtual extension of the hand in teleoperation. They observed that people controlling objects in a virtual environment would perform overt movements associated with the remote goals they intended for them. For instance, wanting to turn a car to the left, resulted in leaning this way. They also observed that reverse mapping controls did not affect the performance of a driving simulation, and that overt gestures still correlated with the intended movement for the object on screen. With this information I was confident that I could integrate the Leap Motion seamlessly into my installation experience and do so in a manner that allowed the controller to disappear. My previous experience with Ruttmann's *Opus III* (1924) and research of Henke's (Boiler Room, 2016) laser shows led me to believe that a plain background would offer the best option for the installation, offering me the ability to imbue the image with any spatial impression and it would appear natural. I envisaged that the participant would engage with the spatiality of sound gestures more readily when starved of any visual markers of space. In a study testing the effect of incongruent aural spatiality in virtual church environments Larsson, Västfjäll, Olsson and Kleiner (2007) concluded that in all but an extreme anechoic case, the spatial signature was deemed as natural. Their reasoning for this was that a lack of visual texture accounted for an inability to judge spatial distance accurately. Spatial variety or incongruence would inevitably have to be achieved through the contrast of spatial signatures for the same object. By using the hand as a mediator of control in the virtual environment, I pondered what relationship could be created between a virtual object and a visitors sense of touch. Altinsoy (2012) conducted a

study looking at the modulation of tactile stimulation by audio and concluded that auditory stimulus modulate the intensity of our tactile perception. This is particularly interesting because it implies that habitual experience, namely louder sounds equate to larger forces, modulate our cognitive processing of tactile perception by way of a cross-modal processes working at the subconscious level. I would therefore implement a similar design in my installation, equating proximity to a louder and more present rendition of soundtrack materiality in order to emphasise this increase in tactile sensation. In recent years more people are engaging with audiovisual media on small mobile devices, leading creative and advertising industries to question whether this has resulted in less immersive experiences. Bracken, Pettey, Guha, & Rubenking (2010) observed that when viewing fast paced visuals, immersion was higher when wearing headphones and watching small screens, while spatial presence was higher for larger screens. When considering the nature of my work, this information would assume that the best format for an intimate interaction with materiality would be through headphones, given that a closing off from social distractions would allow more focus to be given to the virtual object. I anticipate that there is a trade off between the intimacy of a small screen and losing the vibrotactile sensations of amplified sound that engages the skin and viscera during large screen performances. There would inevitably be a distancing of the intimate point of audition achieved when rendering sound through contact microphones into headphones, via an imbedding of the spatial signature of the performance area onto the recording. These are factors that are variable however, and so it may be interesting in future installations to observe the different levels of immersion achieved by the perceived social or private qualities of the performance space.

Installation Settings: Large Scale Public Performance

I envisage that my installations will be deployed in a large scale public format, where the visuals are projected onto a twenty meter high screen, and are accompanied by high definition sound from a powerful audio system including subwoofers, perhaps in a 3.2 arrangement (see Appendix B, Large Scale Interactive Installation Design). The perceived speed and force of the virtual object's motion will likely be very high, given that visual movements will span great distances of the performance space in short time. Indulging a kinaesthetic empathy with this movement, even without the powerful morphologies of the accompanying aural gestures, will result in intense muscular experience. The tactile experience of the virtual object is likely to be heightened by these highly energised kinaesthetic expressions, given that the expressed caress of textures identified through causal listening, will likely indulge a much greater contact force between skin and material. High amplitude sound that covers the full spectrum of audible frequencies, will energise the performance space and engage the viewer physically by vibrating the viscera and skin. Sound gesture's featuring expressive spectral sweeps will potentially give rise to streams of felt vibrations, that have similar sweeping contours. Kinaesthetic experience will potentially be intensified as a result, where these vibrotactile shapes explicitly outline the contour and force of audiovisual movements, which are simultaneously being expressed on a musculature level. Vibrotactile sensations may also trace the transient fluctuations of highly tactile sound, that could help coordinate the imaginative expression of skin moving over the abrasive undulations of a surface texture.

The spatiality of the large performance space will effect the embodied experience of my work both positively and negatively, given that its reverberant characteristics will extend the intimate spatial perspective established by close microphone recording techniques. As Blesser and Salter (2007) note, a performance space extends and modifies sound by

spreading a sound gesture both temporally and spatially. This temporal smearing and diffusion of sound gestures has the potential to enhance the perceived three dimensionality of the virtual space, by merging virtual reverberations with the real spatial qualities of the room, thus enhancing the presence and tangibility of the space that connects and separates viewer from object. This fusion of real and virtual space will inevitably smear the more transient details of an aural gesture's spectrum, and elongate the intimate spatial perspective achieved by close microphone recording techniques, which will distance the viewer from the sound's source object on a mental level. The tactile experience of sound will perhaps be changed as a result, where the proprioceptive expression of the gesture causing the sound will assume a less intimate perspective, and incorporate the excited space of the surrounding environment rather than closing it off. Blesser and Salter (ibid) note that the material properties of the performance space, such as hard plastered walls, change the tonal of colour of direct sound, given that our grasp on an objects materiality is linked with the amount of sound it absorbs or reflects. The material properties of the performance space, which is inclined to have hard surfaces at this scale, will inevitably permeate and modulate the tactile experience of the virtual events. This could potentially be a problem if the room has significant temporal flutter, which would taint all material experiences with what Blesser and Slater (ibid) suggest is reminiscent of a 'coarse growl'. I suspect that the loss of sonic intimacy is balanced by the sheer size and presence of the visuals, which will evoke the impression that the virtual object is encroaching on the personal space of the viewer.

It is important that the staging of my installation invites the viewer to fully immerse themselves in an explorative and expressive engagement with the virtual object. The ability of the work to evoke highly tangible experiences, is dependant on the viewer's commitment to partake in the creation and elaboration of the unfolding audiovisual events through expression. They must be highly present to their own imaginative interpretations

of sound and image, and to the embodied sensations evoked during their engagements with the virtual object, to fully grasp the intended experience of my audiovisual language. Waterworth and Waterworth (2001) explain that the most vivid experiences of virtual worlds occur when the interactions offered conjure a highly present state of viewing, which avoids events that require heavy cognitive processing to properly coordinate and understand. It is therefore important that a viewer can quickly become proficient at controlling and interacting with the virtual object, so that attention can be maintained on exploring and engaging the unfolding events. The gestural controls for *CineCell* and *CineTouch* resemble the simple control mechanisms of everyday portable devices, where a virtual object's size is changed with vertical hand motions, and its material form with horizontal hand motions, and can therefore be mastered very quickly. The ability to quickly acclimatise to the installation controls is important in a social context, as this will allow a viewer to overcome uneasiness about performing badly and being critiqued by other audience members. In order to ensure that visual attention is maintained on the virtual object, I have zoned off all areas within the performing visitor's visual field, where the distracting movement of other audience members would diminish the ability to maintain a highly immersive relationship with the virtual object. I anticipate that members of the audience will project their own embodied experience of the virtual object onto their perception of the performer's experience, to infer the intentionality behind the hand gestures observed. By engaging this viewing mode, the audience may start to consider how they themselves would control the virtual object, and anticipate the actions of the performer to see if their own intentional desires are fulfilled. This desire to engage the virtual object will perhaps encourage members of the audience to overcome their reservations and assume the position of the performer. Alternatively a viewer can view the installation more like a film, and explore their own subjective expressions and experiences of acousmatic sound and image, to reveal the various transformations of the virtual object's

materiality. Either viewing mode has the potential to evoke a highly engaging experience of the installation, given that they both require a high degree of presence to one's own embodied sensations and an active outward expression that is grasped.

Small Scale Intimate Performance

My installations could alternatively be deployed in a smaller gallery style format, where a series of interactive audiovisual objects would be distributed around the gallery space, with sound that is delivered through headphones (see Appendix B, Small Scale Interactive Installation Design). Bracken, Pettey, Guha, & Rubenking (2010) concluded that a high degree of immersion or a sense of 'being there' was achieved when viewing film on smaller screens and wearing headphones, perhaps because the spatial and social environment of the performance space was more closed off. Listening through headphones would prevent the intimate spatial perspective conferred by the sound gestures of my work, from being temporally and spatially spread by the reverberation of the performance hall. This means that the sound in the smaller installation will retain a level of intimacy that is very close to the sound heard during the performance and recording of the original organic materials. When expressing the proprioceptive qualities of these sound gestures, the tactile and muscular impressions evoked will likely stem from memories of intimately manipulating the source materials with the hands. The imagined source objects will perhaps encroach on the viewer's sense of personal space, and the conflation of this perspective with the visuals will enable a more private and tangible experience of the virtual object. The varying degrees of intimacy achieved by contact microphones, hydrophones and close microphone techniques, will perhaps be better differentiated in headphones than when sound is delivered over speakers in a large performance space, allowing a more comprehensive tactile experience of a sound object's surface textures, density and rigidity. Wearing headphones will perhaps lessen the reservations about

expressing in a public setting, where there is a barrier between the real and virtual world, allowing the relationship established with the virtual object to remain partially private. The setting could embrace some degree of social interaction by introducing two or more headphones at each art work, thus enabling an audience member to empathise with the intentional gestures of the performer. Both viewers will perhaps rotate control of the installation, and build on the gestures that they observed the other performer exploring previously. As an audience member not wearing headphones, the gallery will perhaps become a space for imaginary listening, where interpretations of each virtual object's sound will give rise to a series of imaginary soundtracks as they move around the gallery. An audience member who indulges imaginary listening while waiting to explore an audiovisual object, is perhaps perfectly primed to indulge the imaginative and expressive viewing modes required to achieve the most tangible experience of the virtual materials. Compared to a large screen setting, this format perhaps loses some of the hyperreal character and energy of expansive visuals and enveloping sound, however, the impression of greater privacy and spatial intimacy, will perhaps open the viewer up more readily to being effected by, and freely expressing towards, the virtual object.

Influential Works: Visual and Aesthetic Interaction

Shiffman's (2012) exploration of interactive physics-based simulations, had provided me with a good foundation for creating a work that emerged through engaging motions. I had been inspired by Noto & Sakamoto's (2008) use of interference patterns to create a compelling array of wave like variations of texture, which led me to think about similar interference patterns in swarm like clusters of particles. My mind was turning to smooth and rotational movements, which lead me to find the work of David Roy (Boston University, 2016) and his organic kinetic sculptures. I thought his work functioned like an analogy for many of the montage techniques I had encountered in my film studies and

practice. The work viewed as a whole offers a comprehensive and engaging theme of movement, which is inferred by an appreciation of all the smaller components and their individual journeys. It could quite easily be a reimagining of Vertovian montage in kinetic sculpture form. I find the way I view his work intriguing, whereby I move between seeing the whole, or the individual motions according to what my subconscious is drawn to. I begin to anticipate how certain mechanical parts are going to interact, and this engages my gaze and focus more attentively on the outcome of these interactions. I felt that these types of movements, between many parts that swirl and blend into one another, would make for an engaging design focusing on interactions with materiality. It would cause the visitor to explore audiovisual gestures occurring on both the macro sound texture level and micro synchronised gesture level, that would help the work feel dynamic and interactive. *CineTouch* explores these motions and the processes for applying sound to create fluid phrasings of gesture.

I found inspiration in the use of an elastic membrane in Contraband International's (2014) *Firewall* installation to draw a connection between a force exerted by the hand, and the intensity and temporality of sound resulting from the interaction. When considering my own use of the Leap Motion, I wondered how I might transplant this sense of push and pulling a virtual object, in order to have a tangible grasp on the virtual space. This transpired in *CineTouch*, and *CineCell* as the casting and retrieving of the object, through vertical movements on the y-axis.

Daniel Rozin's *PomPom Mirror* (*The-Code-Of-Entertainment*, 2015) provides an interesting take on tactile viewing, whereby a visitor's reflection is sketched through a contrasting interlaced mesh of white or black pompoms. The visitor's gestural expression sums with the synchronised kinaesthetic and tactile impressions they receive from the mirror, morphing their experience into a tangible combination of kinaesthetic empathy and

fibrous tactility. I was particularly drawn by the sensation of lightness and flow that the white image conveyed, while the jet black was both an abyss or immediately present space depending on the perspective taken. I would exploit this spatial shift in *CineTouch* as a means to suggest a filmic cut to an entirely new location. White spaces render a feeling of being out in the world at daytime, in comparison to the underwater, outer space and spiritual dimensions alluded to in the darker worlds.

Testing Interaction: Bezier Sphere

BezierSphere (see enclosed usb stick SeanRyan - BezierSphere) is a test sketch exploring an interaction between user and virtual object, where the user has complete control over motion through a Leap Motion sensor. I wanted to evoke the sensation of exerting a repellant force directly from the hand, which would be made tangible by representing the inertia of objects through a gradual acceleration and expanse into highly energised sound. This test would ascertain whether the mediation of the user's expression through the leap motion sensor, created a barrier between themselves and the experience of the virtual object, or if a participant did in fact displace their haptic perception into the images.

How the patch works

The participants position relative to a node is calculated and an acceleration value proportional to this distance calculated. The vector from hand to node determines the direction that the spherical rotation takes. If the hand force is persistent, the node accelerates until it reaches a terminal velocity. Upon removing the hand force, nodes begin to decelerate. For particles that are moving, velocity and horizontal displacement from the centre of the screen are averaged, then sent over Open Sound Control to Csound. An increase in velocity results in an increase in volume and rising of pitch. Panning values are written into Partikkel's panning tables to spatialise the sound gestures within a stereo field.

For this test I have used an implementation of granular convolution reverb developed by Lazzarini (2016), that when excited over time with highly energetic electronic gestures and rising frequency content, creates a wall of energy that resembles the rotation of a turbine engine.

Experience of Materiality

There is an energy felt in the hand resulting from the muscular expression of moving the nodes, especially in their low velocity high inertia state. Sound plays a fundamental role in rendering and regulating a muscular empathy to the building force that grows within the mass of electrified tangled wires. Immersive tactile engagements with the virtual object are often distracted by an overly conscious translation of sensor position to virtual world position. This act of translation is particularly apparent in first time users who struggle to coordinate their hand position precisely with the nodes onscreen. It is for this reason that I rejected the design.

Reflection on Design

I anticipate that a user will spend around four minutes with my installation, which means the barrier to access is required to be low. In this design, the boundaries of the sensor need to be learned, and it is only then that the hand can be translated precisely to move nodes in the manner intended. Another distracting quality of the work is the ability to remain still in the middle of the virtual world, and remain within range of nodes to exert an ever increasing force. I wanted to create an installation that functioned similarly to my film works and this meant crafting a design that could be watched with a high degree of investment as well as manipulated. To this end, I decided that some level of autonomy was required in the interactive object, and that regardless of sensor position, a natural causal effect would be enacted on the virtual object. In this way I hoped the sensor would

disappear altogether, and so set two goals for sensor interaction. A child should be able to control the installation and at no point should readjustments be required to function in the way intended.

CineCell: Design Choices

CineCell (see enclosed usb SeanRyan - CineCell) is an intermediate work that provided the foundations for my main installation *CineTouch*. I retained the spherical theme from bezier Sphere because I enjoyed the concept of viewing deformations of an iconic shape into a variety of textures. The shape would also focus interactions on the centre of the screen, which granted the opportunity to devise systems for volume, panning and effects based upon relationships linking motion with the centre of the sphere. From the outset, I wanted to implement a simple but effective hand interaction that met the criteria I had set myself. I therefore took the decision to avoid z-axis functionality, which to use precisely generally requires some sprite to convey the depth at which the sensor position is being translated. This would allow interactions to function on the simple premise of left, right, up and down. I mapped the up and down hand interactions to an expansion and contraction of the virtual object. This gave the illusion of expanding or contracting the distance to the virtual object, and functioned like an analogy for bringing the object close to get a detailed view of its surface textures or casting it away to regain personal space. Depth interactions work in conjunction with an increase of convolution reverb level and filtering of the upper frequency content, reinforcing this spatial displacement aurally. This illusion is possible because the black background offers no reference comparative distance or scale, therefore the audience is given a sense of Z-dimension interactions.

My criticism of BezierSphere was the lack of autonomous filmic movement in the interactive object, so I set about applying oscillatory motion using sine waves. Particles were randomly distributed around the circumference of a sphere, and vectors orthogonal to

this displacement were amplified with sine wave motion, to create pulsating surface waves that radiated in a manner that resembled breathing or oceanic surf. The natural ebbing and flowing of this cycle would be used to suggest an abrasive interaction between particles, as they accelerated towards or away from the zero point cross over. A general rotation is also applied to the whole sphere and is varied across the width of sensor interactions to help maintain interest in the flow of the cluster. When the hand near the sensor on the vertical plane, these rotations are stopped in order to draw attention to the orthogonal wave motions which are amplified and more aggressive.

Zones of Materiality

Cinecell is split into six zones across the horizontal axis of the sensor with temporality being faster on the right and slowing slightly towards the left. The themes from left to right are: ice, water, static dust and streams, heavy dust/light dust, electrified storms and abrasive metals. For the left hand side of sensor interactions, I created a transition between streaming lines that form infrequently if particles are closer than a certain threshold, leading into a web of connections at the very edge of the sensor field. This visual transition is treated in a tactile manner with sound that progresses from furls of water into more aggressive waves and finally a compacting of ice. The middle zone is a fusion of static energy, wind and organic materials moving in turbulent conditions. For the upper half of sensor interactions, particles ebb more softly and are treated with recordings of calming wind and tactile collisions of light debris. This morphs into more aggressive rotational behaviours towards the bottom of the sensor, accompanied by coarse and dense sound material that accentuates the amplification of particle motions. In the right half of the sensor, I devised a system to group a collection of particles within certain proximity, and draw a trapezoidal shape for the duration of time they had united, expanded and contracted. Faster rotations in the middle right cause formations to appear sporadically, and rotate

aggressively around the sphere. When trapezoids are formed, a message is sent via OSC to Csound that triggers an amplitude gate associated with an amplitude table for Partikkel. This causes the rapid firing of flapping and diving electronic gestures, which draws connotations to stormy weather. In the upper portions of the screen the global rotation is tamed and high frequency sound subdued, evoking the experience of a storm in the distance. The right side of the screen focuses on an oscillatory expansion and contraction of these trapezoidal forms, revealing a hoard of rigid glass materials. From top to bottom the cluster becomes more present and aggressive with greater amplitude, rising pitch, and increased spectral variation.

Grains upon Grains

In my approach to the sound for this installation, I thought about the processes through which Curtis Roads (2004) creates larger bodies of sound from smaller samples of spectral information. I wanted to incorporate a method of triggering audio that would allow the performative quality of my recordings and gestural composition of natural materials to shine through. I decided to use the concept of overlapping grains and expand this temporally to work with streams of gesture, which would be triggered by a simple gating and envelope system to phase the volume of aural streams over time. This method allowed me to compose for interactions prior to their integration into the interactive experience. In doing this, I was required to think about the internal morphologies of the sounds, and how subtle intonation of pitch, spectral timbre and dynamics would allow any window of the gestures to contain enough motion for synchresis to take effect. This technique responds to Smalley's (1997) distinction between 'gesture-framing', whereby clusters of streams would be used to encompass the agglomerated motions of particle swarms, and 'texture-setting', where spectral morphologies in individual streams emerge from the texture and form moments of tight synchresis with isolated particle motions. The appeal of this sound

integration method is in the ability to loosely associate aural morphology to a general kind of visual motion. The audience will naturally draw particles and sound together that they find have correlating movement, allowing me the freedom to work with textural developments rather than explicitly linking morphology to individual streams of sound. By virtue of accessing these gestures in an interactive fashion, an impression of a dynamic realtime flow of sound would be instilled. A variation of the gating system works at the extreme edges of sensor interactions, whereby an angle value is used to scale volume according to its position relative the zero crossover point. In this region, the object appears to present material collisions, and so volume is scaled proportionally to rise and fall with perceived contact.

Material Experiences

As with my film works, equalisation and effects processing is applied to sound to push the spectral regions of the audio I found most tactile. As the object is brought closer to the user, the revealing of detailed morphologies in the higher spectrum of organic sound gives an impression of intimacy, mirroring the action of a camera close-up. This is contrasted to the rise in convolution reverb level, and smothering of detailed morphology when the object is pushed away. The expression of this spatial transition is satisfying, because the viewer's cognitive map is continuously changing, therefore evoking a sensation of pushing and pulling oneself through space. A subtle colouring and delay of spatial reverberation during the larger trapezoid oscillations allows the visitor to energise the environment in a highly tangible manner. This is especially effective when ramping into this reflective environment from the more expansive subdued collisions at the top of the scene. The visual appearance of my processing designs has very little in the way of real organic texture, as is common with all of the creative coder examples I had encountered. In this way the material deficiency of the visual allows the material richness of the accompanying sound design to

inscribe its qualities on the substrate of the canvas. The iconic use of colour such as watery or electric blues, reinforces a natural connection between sound and vision, allowing the composition of particles to more readily assume the material characteristics of the soundtrack. An interesting facet of the experience is a tangible connection with the resistant medium that the particles flow through. This matter is entirely contrived by the turbulent morphologies of the sound design, which is expressed and translated through vision into the spaces between particles. The overall kinaesthetic engagement with the ebbing and flowing of particles evokes memories of waves, which heightens the tactility of water and ice gestures. As the visitor becomes tuned to the rhythm of the particles their relationship with the sound becomes more anticipatory, allowing more focused expressive gestures to be performed. As the audience gestures towards a material zone, they will perhaps prime their senses for a specific kind of tactile experience, which when satisfied by the event, amplifies the embodiment of the materials and evokes a highly tangible grasp of the virtual object. I imagine the audience will be poised between a state of expression and watching closely to see that their intentional choices are being fulfilled.

Reflection on Design

I believe that the simplification of hand interaction in *CineCell* offers a much lower barrier to entry than *BezierSphere*. As the audience becomes more familiar with the possible interactions and flow of the work, they begin to see spaces within the autonomous movements of the visual object to interject and fulfil the desire for a specific tactile or kinaesthetic experience. There is a less intense focus on the tactile experience of the hand embodied by the screen, as was the case with *BezierSphere*, and a greater kinaesthetic engagement with the envelopes of sound that help phrase expressive control. I feel that the persistence of autonomous motion in this work helps to maintain a sense of an other, provoking a dialogue between the virtual object and participant that results in watching and

absorbing materiality, as well a controlling and defining of the intensity of this material engagement.

CineTouch

CineTouch (see enclosed usb SeanRyan - CineTouch) is a culmination of my work in Processing and Csound and implements a balance between participant expression through interaction and a virtual objects autonomous motion. I wanted to address the principle of montage in the work, and at the same time offer a schema that would allow someone to move beyond learning the work to becoming expressive with it in the three to four minutes I anticipate they would spend with it. The intention was to craft a feeling similar to that achieved in *Cineflow* and feature a driving force that propelled through a variety of objects, resulting in streams of highly material sound. This force would be materialised by the performer's gestures, allowing them to decide how and when material interactions would change, and how strong they would be. I would retain the idea of pushing the object away and bringing it closer for more detailed access to the interactions.

Zones of Materiality

I designed a system that divided the work into four zones, left, right, middle and sub middle and made temporal resolution move from static in the middle to faster at either side. All zones are subject to change between three variations in accordance with a timer, except for the one that the visitor is exploring. With this design, a fluid motion across the sensor will result in a stream of three material forms. The continuous changing of scenes outside the current one being explored allows a randomness to form in the progression of scenes. Therefore, the participant can not always predict which scene their gesture will fall through, resulting in stimulating tactile shocks that cause them to readjust their interpretation of the swarming particles. These quick changes are an interpretation of

montage with the editing pace and temporality of scenes being controlled by the visitors gestures.

The Organic Swarm and Gates

At the heart of the piece is a cluster of particles which use a pattern of interfering sine waves to move and rotate about a central axis. There are three variations of movement consisting of two interfered oscillatory motions and a globe like rotation around the y-axis. Each zone has three visual variations giving nine in total and consist of: organic debris, turbulent liquid, mechanical clockworks, space/abyss, virtual kinetic paper/plant sculpture, birds/bees/scribbles/nature, energy, energy variation and finally, viscous insectile. An additional three variations are available in the very centre band where all motion grinds to a halt and a static world of sound is entered into. When particles fall within a certain distance a message is sent via OSC to Csound that triggers an amplitude envelope attached to a volume table in Partikkel. Each zone has four instances of Partikkel making sixteen individual gestures available, and totalling around twenty minutes of composed audio material for the whole installation. These gate connections are sometimes present in the images, where subtle hints of colour are used to signify an association with water or organic leaves for example. The gates sample the waveforms in roughly three second slices, though this amplitude value is modified by a sample of four angle values that invite further dynamic variation. Variation in the overall sound composition is achieved by altering the speed at which Partikkel gates are being triggered, therefore increasing or decreasing the number of sounds in a cluster at one time. This speed is determined by the participant's hand location, affecting the temporal progression of particles and persistence of triggering. Granular playhead positions are also varied according to the panning value of a cluster of particles, inviting variation by phasing speeds at which regions of the sample are read. Waveforms are split into four groups and panning is applied as the average

horizontal displacement of a group from the centre of the screen. The average vertical displacement is also split into four groups and used to alter pitch in a subset of waveforms.

Expectation and Gestural Expression

The work tries to strike a balance between randomness and familiarity so that the visitor is quickly able to ascertain the general flow of particles but is always engaged by a changing sound world. As the rhythms of the work become learned, anticipation of sound production will result in a more focused expression of motion control on the virtual swarm. The movements of the swarm are entangled in the energy of the sound world, thus the visitors kinaesthetic expression of motion is amplified by the swelling or decaying of frequency, the expansion and contraction of space and the speeding and slowing of temporality. The design of the trigger system creates phrasing in the soundtrack, which in turn helps orientate an expression onto individual moments of movement in the particles. In the near silent spaces between gestures, there is a sense of anticipation just before silences collapses into a rush of sound as particles excite one another again. The slowing of particles and sound gestures in the middle zone effectively subdues the kinaesthetic experience of the performer, and can be moved to as a means to escape the erratic energy of the outer sensor interactions. This slowness is inscribed by the less frequent and sometimes laboured sound world of the soundtrack, reinforcing an extension of time in a calming manner. A user wanting to energise their experience will perhaps anticipate the faster activities engaged at the periphery of sensor interactions, and their muscular expression leading into these zones will be amplified by a launch into a more energetic and frequent clusters of sound. In order to access the static zone, the user must remain very still in a small centre band while the soundtrack encapsulates the essence of being static through different compositions at each level. The imitation of the temporal stasis through physical stasis imbues the sensation of loosing time in a highly mimetic manner.

Material Experiences

The user can wrap themselves in plethora of seamless organic and electronic sound gestures, with each boundary cross requiring an adjustment of gaze and sensory exploration. Every focused gesture is rewarded by a confident material response, while frantic interactions result in snippets of materiality emerging like stroboscopic scenes from a Dziga Vertov film. The soundtrack greatly heightens tactile experience of the virtual object, where the textures and resistant interactions heard and expressed, permeate the particles and the space between them. The kinaesthetic experience of the swarm's motion is dynamically modulated and accentuated by sound, depending on the materials identified and the expression of force with which the objects are perceived to move.

Pulling the cluster closer feels very much like peering down at small sample of material in nature and manipulating it as we once did as children, watching as it swirls and curls in a crackly, gooey and turbulent fashion. The rapid playback of gooey spectral peaks in the viscous insectile zone, creates harmonic vocalisations that transforms the black particles into a mass of intertwined insects writhing and dancing in their sticky nest. Rigid and tensile kinetic metals transform the black on white bars into an old grandmothers clock, falling into a hundred pieces and swirling around in a vortex of sound. Raw energy takes on a haptic quality through mangled and energised organic material featuring erratic micro rhythms and aggressive morphological shifts. Electronic sound assists the tangibility of the energy theme effortlessly, being that it is composed of a rich cluster of interfering phases, singing with raucous tumbling and stuttering morphologies. The laboured motions of the virtual kinetic sculpture are rendered slow, abrasive and heavy by grinding rotational stone sound, while the papery and organic spectrums offer a haptic sensation of folding the structure with our own hands. A flurry of pencil scribbles, flitting of bees, flapping of birds and expansive spatial signature of nature recordings recreates the atmosphere of a summers day, perhaps laying on the grass and writing thoughts in a journal.

Stasis is conveyed differently for each layer of the work. Familiar sounds are bathed in a thick convolution reverb that disguises their spectral profile, making identification difficult, but evoking intrigue and inviting more than one listen to grasp. Blesser and Salter's (2009, p.152) description of these expansive reverberations as having 'infinite extent ... without orientation' encapsulates my conception of using them to slow temporality. This encourages the controller to stay still and listen for a while, therefore embracing stasis. The first layer uses the recordings of amplifier hums, fridge whirs, radio static and phone dial tones that have very flat morphological profiles. Some of the sounds are those of technology that wake up a night, when all else is still, drawing attention the silence and stasis that has settled on the world. The dial tone, and radio static speak of stasis through unfulfilled potential. In the second layer, we hear the repeated trying of keys in doors, sliding of doors, slamming of doors, tapping of keys, water droplets and shifting of chairs. The actions are so familiar that the image of a person in a great room, existing in some hidden pocket of the world, is in an endless cycle of rearranging and looking for something but can't ever find the right door. The sound of tapping keyboards and water droplets water envelopes the space with the quietness that allows these delicate gestures to speak out. The performer's experience of stasis is perhaps accentuated by focusing on being still long enough to grasp the narrative unfolding in the soundtrack. In the natural stasis zone, musical notes are allowed to ring out into the distance, some with slight tuning imperfections that instil a sense of bent temporality, and others with a perfect ethereal smoothness that speaks of higher transcendental dimensions.

Reflection on Interaction: Materiality and Gesture

As the creator of the systems, I found my initial interactions consisted of learning the controls and letting the virtual object unfold in its own course to see how various hand positions made it respond. I quickly gained an understanding of how to trigger different variations and intensities of the audiovisual gestures. Immersion began to take hold when I

expressed my desires confidently on the installation using the information I had learnt to play the object like an instrument, where I flowed between filtered and effected sounds and rhythmically energised the movement of the particles. The sound is more pleasing when actions are deliberate and calculated. Erratic behaviour results in erratic sound, less flow and less immersion, while medium to slow gestures create movements that have a greater connection to my expression. If I am erratic, I begin to understand the limitations of the system and therefore my behaviour is modulated to work within boundaries that I find engaging. My installation work has demonstrated that anticipation and expectation are important to the experience of materiality. It is through anticipation that a user will develop future goals for an interaction and is therefore inclined to observe materiality in more detail when watching the causal outcome of their gesture. The integration of autonomous motion has been important to my installation, not only because it allows this relationship based upon anticipation to occur, but also because it generates an interactive relationship with a dynamic other, whose dialogue responds to your communication in a symbiotic union of expressive subjects. The overall presence of motion in the absence of active control is important, because it continuously stimulates a kinaesthetic gaze, and allows a visitor to catch specific movements that they can't resist indulging in. While future works will aspire to incorporate realistic renditions of texture, this low texture visual aesthetic is perhaps one of the reasons sound is embraced and expressed so readily. The inability to strongly identify an environmental source object for the visuals, compels the viewer to listen imaginatively and express the materiality heard to achieve a tangible grasp of the materials seen. I feel that the performer's intense kinaesthetic empathy with the motion of the particles, enhances the kinaesthetic and tactile expression of the aural gestures inner details, as they look readily for any coherent morphological synchronisation to get a grasp on the more intricate interactions between individual objects and materials. An interesting effect of direct control seems to be that the exertion of effort or perceived force through

hand gestures, grants the motion of particles with an impression of mass that is commensurate to the input. Perhaps one of the most engaging interactions is the expressive control of spatiality in *CineCell* and *CineTouch*. The playing of one's own cognitive map, and embodying the various gradations of an expanding and contracting world is highly engaging. I have been able to incorporate filmic ideas into the installation experience to some extent, particularly in the case of *CineTouch* which adapts the dynamically changing material streams explored in the montage of *CineFlow*. The work tries to implement the intimate viewpoint that Marks' (2002) outlines is indulged in haptic visuality, whereby pulling the object closer results in highly intimate and tactile sound that sonically mimics a movement into the object for a more detailed view of its surface textures. Overtone montage is also present in *CineTouch*, where the natural theme where materiality transforms the squiggling particles into birds, bees and scribbles, each suggesting a different elevation, or focus, therefore recreating new context and space through sound. Material incongruence is particularly hard to achieve with the aesthetic of my visuals, given that there are no surface textures to cross reference with sound. While I used this as a feature of the installation, future installations will incorporate accelerated graphics to enable realistic renditions of texture and tactile deformations of meshes that react to a performer's hand gestures. The randomisation of scenes is perhaps one of the most important features of *CineTouch*, offering the material shocks that are highly effective in the montage sequences of *CineBlips* and *CineFlow*. In general I find the addition of control to be a valuable asset of my portfolio, and I will explore more ways to bring the engaging qualities of film into the installation world.

Conclusion

My work has aspired to put a viewer back in touch with their embodied experience of materiality, by creating intriguing and challenging audiovisual combinations that compel an exploration of movement and texture, much like a child encountering a new object for the first time. We have an innate ability to feel the world simply by expressing ourselves touching every interesting facet of an object's surface. We can move at incredible speeds in any direction and through any medium, by expressing our muscles tensing and relaxing as we empathise with the objects seen and heard to embody their movements. As Sobchack (2004) notes, we are largely unconscious of these synaesthetic capabilities because they are a normal facet of everyday experience. My hyperreal audiovisual language aims to shock and challenge sensory perception, to make a viewer highly conscious of their fascinating ability to experience and express in a cross-sensory manner.

Chion (2009) observed that audiovisual combinations that retain some degree of indeterminacy, liberate the imagination by leaving space for personal interpretations of an audiovisual event. I have exploited indeterminacy throughout my portfolio to place a viewer's imagination, sense memory and sense expression at the centre of each work. By doing so the viewer is invited to be more actively involved in the creation of their own tangible experiences, by indulging and expressing imaginative interpretations of sound and image, and being present to the embodied sensations that result as a means to grasp the materials and movements presented. To achieve this type of viewing mode, I have exploited audiovisual synchronisation to unite sound and image objects in perception, which have varying degrees of incongruous materiality. Chion (1994, p.63) refers to this illogical welding of unrelated sound and image as 'synchresis', and highlights its ability to create 'irresistible agglomerations'. The technique evokes cognitive dissonance, where synchronous aural and visual objects are subconsciously perceived to be causally related, however, this causality is consciously rejected when sound and image are identified as

being unrelated, or have largely incongruent planes of materiality. A rapid flickering of perception between sound and image occurs in an attempt to better differentiate the incongruent materialities paired and handed up by the subconscious. I believe this results in the overlapping of what I have termed *sense residues*, where each shift of perception bunches contrasting embodied experiences together, which eventually fold into one another. The amalgamation of aural and visual experience makes it difficult to separate the unrelated objects in perception, and so their materialities appear fused together. The aesthetic of my work is defined by the manipulation of causal relationships, where a viewer is offered aural and visual materials they know, but in a form that is resistant to being resolved into a defined and meaningful object.

A Summary of Audiovisual Techniques and Viewing Modes

My portfolio has explored a number of different techniques where sound is used to transform the perception and experience of the visuals. When sound and image are perceived to be causally related, the perception of properties such as mass, force, weight, density, abrasiveness and spatiality can be modulated where incongruence is created between these planes of aural and visual materiality. Where acousmatic sound and detailed imagery are fused, contrasting sensory impressions are evoked that stem from the materiality of the visual object and the imagined source object for the sound. This results in a high degree of cognitive dissonance, however, highly engaging and tangible conglomerated experiences of their respective properties, such as texture, force and density, are evoked as a result. When acousmatic sound is synchronised to abstract visual objects, a highly imaginative and expressive viewing mode is evoked, where the materials and events unfolding in an imagined scene appear to fold into the visuals, giving them meaning and making them highly tangible. An interesting variation on this imaginative listening mode can be achieved where an acousmatic sound event is perceived to have

some causal effect on the movement of a highly detailed object in the visuals. This technique is explored in my film *CineSensorium* and resulted in the near and far spatial zones of an imagined environment to appear as an extension of the diegetic offscreen space of the visuals. I believe the sequence evokes an impression of what Smalley (1997) terms ‘spatial simultaneity’ across imaginary and visual domains. By correlating kinaesthetic and tactile experiences between the visual and imagined perspectives, the viewer can effectively move themselves through this extended space. Where acousmatic sound gives rise to a sonic narrative, the viewer must imaginatively explore and express the spectromorphologies of sound gestures, to achieve a kinaesthetic and tactile experience of the suggested object movements, human gestures and materials within this imagined scene. By actively expressing, grasping and then correlating these impressions with gestures in the visuals, a highly tangible experience of materiality is achieved that fuses the imaginary and visual scenes together. I believe that these kind of acousmatic scoring techniques rebalance the hierarchy between sound and image, and allow sound to be explored and expressed in equal measure to the visuals, which are typically dominant in film viewing. Where acousmatic sound engages imagination and gives rise to vivid mental imagery, the visuals will often appear to function like a repository of kinaesthetic and tactile sense impressions, which are folded into a sound space to better grasp the source objects of aural gestures.

I have explored the ability of expressive electronic gestures to enhance the kinaesthetic and tactile experiences of the visuals throughout my portfolio. The inability to source bond electronic timbres to definitive environmental objects, results in a predominantly kinaesthetic experience of their spectromorphological development, to interpret how the sound is moving in space and what sort of speeds and forces may be present. It is evident that when electronic gestures are synchronised to visual movements, human gestural activity is perceived behind the spectromorphology of the sound. Electronic sound can

therefore function as an energy contour that outlines a human kinaesthetic experience of visual movement, which has been synaesthetically translated and expressed through a sound gesture. Where electronic gestures exaggerate the energy and force of a visual movement, the viewer's empathetic relationship with the sound will potentially cause their perception and kinaesthetic experience of the visual object's speed and force to increase in equal measure. This intensifying of the kinaesthetic experience of a visual object's movement can perhaps function to heighten the tactile experience of its surface textures, or the perceived friction of its interactions with other visual objects. I envisage this is because the proprioceptive expression of caressing or coming into contact with the visual object, exaggerates the force with which the skin would be contacted by its surface textures and mass. I have attempted throughout the portfolio to exploit a kinaesthetic empathy with the energy contour of electronic gestures, to rhythmically subdivide or shape the kinaesthetic and tactile experience of a visual object. This technique is prominent in *CineBlips*, where the spectral and amplitude contour of electronic sound vectorises the muscular expression of camera and objects movements, and at times can be seen to rhythmically divide repetitive movement, such as rotations or pages flicking in a book, into its own temporal frames.

Audiovisuality and Embodied Experience

I have found Sobchack's (1992, 2004) phenomenological framework, which outlines the role of cross-sensory perception in the evocation of embodied experiences while viewing film, extremely useful when considering how audiovisual techniques will be experienced by a viewer. I have used the framework to break experience down into a more linear process that transitions through sense impression, sense memory, sense expression, self reflection and finally, embodied experience. Given that many of my techniques involve the fusion of causally unrelated sound and image objects, this linear process helped me

consider how the individual planes of each object's materiality would sum and interfere when brought together through synchronisation. I imagine the conflation of sensory experience to work similarly to the superposition of sine waves, with the resulting experience being somewhere between the two inputs, as perception oscillates between them. In this way, I have thought about planes of a sound or visual object's materiality as units of experience, to better understand the final experience that will result when different units are brought together.

It is clear that a merger between phenomenological film theory and electroacoustic music offers a more comprehensive analytical tool to evaluate the embodied experience evoked by different audiovisual techniques. Smalley's (1997) spectromorphological framework for electroacoustic music has been extremely useful when considering how the kinaesthetic and tactile experience of sound gestures are likely to modify the perception of visual materiality. The framework inspired me to conceptually break down the proprioceptive qualities of a spectromorphology into the muscular gestural event that caused it, the tactile experience of the object's material properties as it is excited, and the visual motion inferred by either the muscular gesture or the source object's trajectory. These individual elements could then be contrasted or correlated with the proprioceptive experience of visual objects, to evoke a range of conflated or accentuated sensory experiences. The concrete sound gestures used throughout the portfolio are exclusively made from close microphone recordings of gestural play with organic and household materials. Spectromorphologies produced by this recording technique are imbued with proprioceptive properties conveying the highly tactile experience of manipulating objects with the hands, the muscular gestures involved in exciting the object, and the intimate spatial perspective assumed when performing the actions. When these sounds are synchronously merged with visual objects, their intimate spatial signature conflates with the spatial perspective of the imagery and appears to draw visual objects closer to the viewer. Traces of human gesture perceived in

the sound evoke empathetic proprioceptive expressions of the muscular actions heard, which result in highly tactile experiences that either accentuate or conflate with the materiality seen. The hyperreal presentation of surface textures in macro photography is perhaps the visual equivalent of the amplification of intricate sonic detail by close microphone recording techniques. I feel the intimacy achieved by the combination of these two representations in my films, compels an engaging haptic exploration of sound and image that seeks to caress and embrace the materiality of the objects offered. My use of this visual perspective was inspired by Marks' (2002) concept of haptic visuality, where a viewer uses their eyes as an 'organ of touch' to know an object, as opposed to simply identifying it as a figure against a background. The explosion of textural and structural details perhaps reveals properties of familiar objects that were previously unknown to the viewer. I think this new found unfamiliarity evokes a sense of intrigue which encourages the viewer to actively express their history of sense experience with familiar materials through a kinaesthetic and tactile caress, and be present to their embodied experience to better understand these new forms. I believe that indulging haptic visuality naturally causes the ear to function as an organ of touch, where a viewer explores the proprioceptive qualities of sound, and expresses the gestures heard being enacted on the texture of an imagined source object, to embellish their grasp on the visuals. The expression of what Smalley (1997) terms the 'energy-motion trajectory' of the muscular and visual motions suggested by sound, seemingly interferes with the mimetic muscular empathy that Barker (2009) notes we indulge to embody camera and object movement. This appears to be the case regardless of whether the aural and visual objects are perceived to have a natural causal relationship. The rapid flickering of perception between the kinaesthetic and tactile experience of sound and image, builds residues of experience which I believe causes the energy contours of the two events to merge. Where sound taints the perceived force that a visual object exerts and experiences in its movements, the tactile expression of coming into

contact with the object, or kinaesthetic expression of moving like the object is changed, therefore distorting and perhaps heightening the embodied experience of the visual object's materiality. It is clear that the individual proprioceptive experiences of sound and image can redefine the experience of a film, especially when incongruent planes of materiality are brought together through audiovisual synchronisation. I believe my portfolio demonstrates that phenomenological film theory, as it currently stands, can be further expanded to consider the major role sound plays in coordinating and manipulating the embodied experience of materiality. I propose that the morphology of visual gestures could be broken down into the same component attributes that Smalley (1997) identifies as making up the spectromorphology of a sound gesture. This resource could be a valuable tool when creating a film for sound, and planning how various planes of aural and visual materiality will converge to evoke engaging experiences.

The Emergence of My Audiovisual Aesthetic

As I reflect on the development of my works, it is clear that a more sophisticated audiovisual aesthetic emerged over time. *Cinesensorium* progresses much like a sequence of science experiments, with intricate objects being injected with sound to see how our perception of them is transformed as a result. The work demonstrates the power of acousmatic sound to evoke muscular, tactile and visual experiences of imagined source objects, which distort or accentuate the experience of visual materiality depending on the level of congruence perceived between the identities of sound and image, and the causality of their movements. While I find the work engages expressive and imaginative modes of viewing, the lack of directed movement and anticipation allows immersion levels to rise and fall over the course of the piece. *CineBlips* demonstrates that entraining a viewer to a faster editing pace evokes a more consistent level of immersion, where sensory perception is primed to explore the materiality of sound and image quickly, to understand the

audiovisual objects offered in the short time afforded. I believe the familiarity of the objects featured in this film allows the viewer indulge a vast repository of sense memories, which are associated with the tactile and kinaesthetic experience of manipulating the objects to move in the manner observed. The expansion of detail offered by the macro perspective and exaggerated impression of intimacy conferred by sound, greatly enhances muscular expressions of visual motion and the intensity of the imagined contact between skin and surface textures. I believe this heightened hyperreal energy and unfettered access to detail causes the contrasting materials offered in consecutive shots to evoke a series of engaging sensory shocks that must be quickly readjusted to. The work could be developed further by varying the editing pace across the sequence between slow and very fast speeds. Sensory perception would become more progressively challenged as the time between shots reduced, evoking a highly engaging sensation of acceleration and an immersive state of viewing. I feel that *Cineflow* is the most engaging of the three works, which exploits a continuity of movement between shots to create a stream of embodied experience that is constantly morphing. The work embraces the flow of Vertov and Ruttmann's kinaesthetic audiovisual style, while adapting Eisenstein's (1975) 'overtone montage' technique using acousmatic sound to fold the sensory experience of imaginary and visual scenes. The fast editing pace of the work reduces the time afforded to resolve cognitive dissonance, which arises when aural and visual gestures are offered that have incongruent materiality. This primes the viewer to explore and express the materiality of aural and visual gestures rapidly, in an attempt to resolve a coherent experience and understanding of each audiovisual object. The film demonstrates that when sensory perception is pushed in this manner, repetitive sequences can be exploited to create expectations for an audiovisual event, which when partially met with subversive combinations of aural and visual materiality, evoke surreal but highly tangible amalgamations of tactile and kinaesthetic experience. I feel that the kinaesthetic momentum established throughout the work

heightens tactile experience, by consistently energising muscular expressions, which simulate a manipulation of the object in the manner observed. To develop or extend this work it would be important to determine how long a viewer can attentively engage with audiovisual language that challenges sensory perception, and requires constant expression and self reflection to effectively evoke tangible experience. Changes to the temporal flow and viewing mode could be introduced at these critical time limits for attention, in order to ease the viewer's cognitive burden and maintain a positive and engaging experience.

Exploring the embodied experience of audiovisual materiality in interactive installations was a natural extension of my work, and allowed me to observe the kind of viewing modes evoked when physically expressing toward and reacting to a virtual object. *CineCell* demonstrated the importance of having a virtual object that moved autonomously, given that this would allow the audience to be effected by and to effect the installation. As the audience watches the virtual object closely, anticipation grows towards moments where they intend to interject and shape an unfolding audiovisual gesture. This intersubjective relationship creates an immersive viewing mode where rising anticipation gives way to an expressive enacting of desire. Watching the virtual object entails exploring sound materiality and imaginatively expressing the evoked tactile and kinaesthetic impressions towards the screen, which reveals the materials that the abstract imagery represents. Controlling the virtual object also indulges explorative and expressive listening to discover how the intentional gestures expressed towards the installation manifest in the energies of, and interactions between, materials in the sound world. While the work offered an ability to move through a stream of textures, the interaction perhaps became repetitive in short time and so interest would decline after a few minutes. *CineTouch* aspired to offer a more dynamic experience of materiality by randomly changing the materials that the viewer found themselves exploring when changing zones. I feel this creates engaging sensory shocks that maintain a visitor's interest and attention for a longer period of time, given that

repetitiveness is diminished and anticipation is built when gesturing towards a new zone of materials. The work adapts the audiovisual montage style of *Cineflow* for an installation format, and allows the viewer to control the equivalent of an editing pace by moving through different materials at a speed of their choosing. The greater control over temporality in this work offers an engaging ability to energise materials when gesturing outward, and then subduing their flow by returning to a more stable and rooted central position. I think the heightened anticipation and surge of muscular expression that occurs with each gesture outwards greatly enhances kinaesthetic and tactile experience, where the viewer is primed to express and correlate the energised visual motions with the more aggressive proprioceptive qualities of the sound gestures. In both *CineCell* and *CineTouch* the ability to cast the object away or bring it into a close-up position, evokes a highly engaging feeling of moving oneself through space. The experience is perhaps enhanced because the monotone backgrounds of the installations offer no reference of real world scale, and so perception latches onto the spatial signature of sound gestures more readily to determine the distance of the virtual object. The aural streams of both installations are crafted from close microphone recordings of gestural play with highly tactile materials. As a result the spatial intimacy and human gesture communicated by the spectromorphologies of the soundtrack, imbues the virtual object with a high degree of presence, especially when pulled from the depths of the virtual reverberation. I believe this type of sound is highly effective in an installation controlled by hand gestures, given that the desire to reach out and grasp the material properties of the virtual object, is repaid with highly tactile sound that amplifies the expression of skin contacting the textures heard. Overall, I feel that *CineTouch* effectively adapts the montage style developed in *CineFlow* to work in an audiovisual installation context, and embraces the unknowability of the abstract imagery to evoke a highly imaginative and expressive relationship with acousmatic sound, which transforms the experience of the visuals.

Appendix A

A Summary of Walter Ruttmann's City Symphony Aesthetic in *Berlin*:

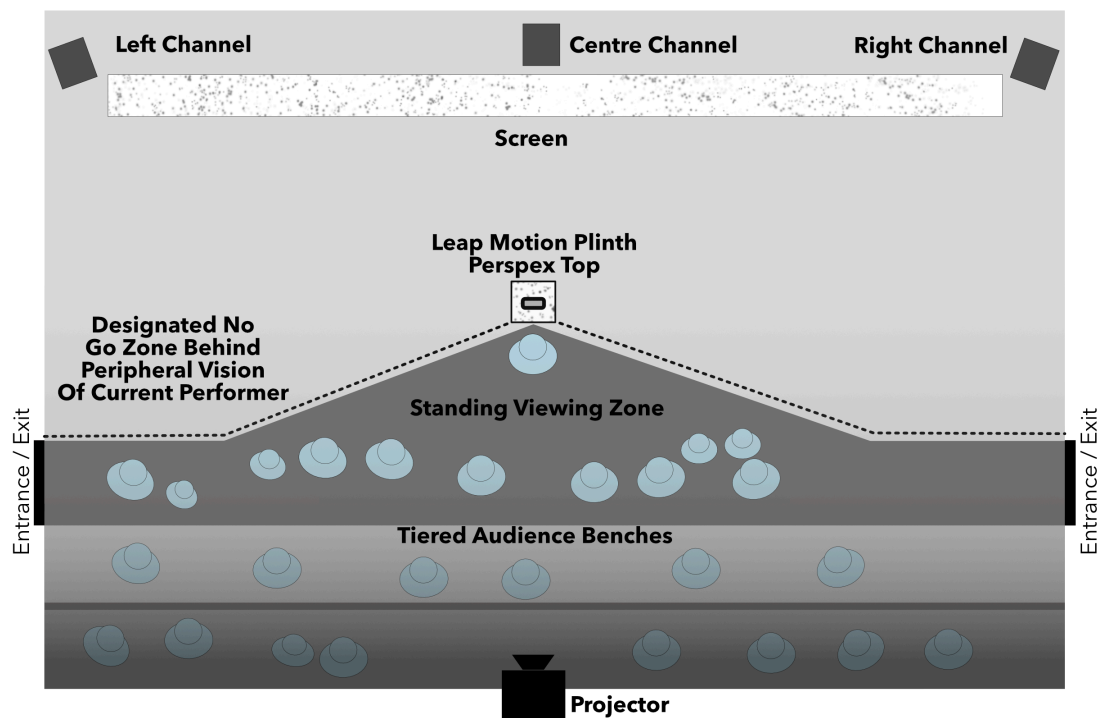
Symphony of a Metropolis (1927)

The city-symphony film of the 1920s portrays a cross-section of city life over the course of a day, and is defined by a montage technique that weaves the movements of people and machines into a seamless symphony of rhythm. Works in this genre merge the aesthetics of observational documentary with the musicality of avant-garde styles like *absolute cinema*, to offer a palpable experience of life in the hustle and bustle of industrial work places through to nighttime social gatherings. This driving momentum captured an enthusiasm for modernity and celebrated the exciting pace of city life that was introduced by mass industry. A number of film theorists including Kracauer (1997) had criticised Ruttmann's city symphony style as being overly formalist, resulting in a documentary that did not divulge the material experience of the people it featured, and failed to build a compelling narrative through which social criticism could emerge. Valcke (2008, p.193) attributes the criticism of Ruttmann's style to its perceived pre-narrative cinema qualities, which indulge the 'pleasure of looking' through an omnipresent camera perspective, rather than communicating a higher meaning through dialectical montage. I feel that Ruttmann's city-symphony is less concerned with social commentary, and instead reinterprets the format with an aesthetic closer to his musically organised animated art experiments in works such as *Opus III* (1924). Ruttmann's portrayal of Berlin perhaps falls at the intersection between narrative film aesthetic and visual music. Montage sequences expose the contrasting lived experience of working and upper class citizens, but the mise-en-scène of shots remains indifferent to this narrative, and instead celebrates the individual movements of people as part of the greater symphony of city motion. Given this line of thought, human subjects are abstracted into a counterpoint of rhythmic and spatial relationships, where the dynamic

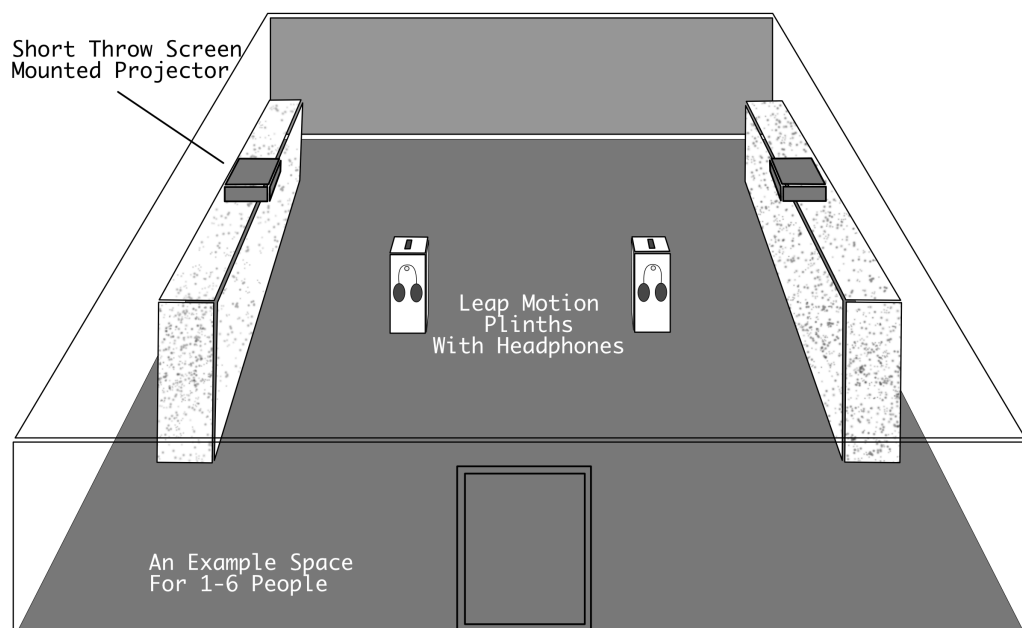
interaction between parts of a greater ensemble is revealed through montage. Individual groups of people moving are treated like musical motif, who merge into much larger crowds to give the impression of a building ensemble, and increasing activity throughout the day. Ruttmann conveys the plethora of simultaneous movements that occur in a living breathing city through a musical analogy. A viewer is offered a tangible appreciation of the mass effort and motion required for a metropolis to thrive, by embracing a kinaesthetic empathy with the building momentum across sequences.

Appendix B

Large Scale Interactive Installation Design: Public Performance



Small Scale Interactive Installation Design: Intimate Performance



BIBLIOGRAPHY

- Altinsoy, M. E. (2012). The quality of auditory-tactile virtual environments. *Journal of the Audio Engineering Society*, 60(1/2), 38-46.
- Altman, R. (1992). *Sound theory sound practice*. London: Routledge.
- Barker, J. M. (2009). *The Tactile Eye: touch and the cinematic experience*. University of California Press: London.
- Belton, J., & Weis, E. (1985). *Film sound: Theory and practice*. New York: Columbia University Press.
- Bianchini, R. & Cipriani, A. (2011). *Virtual Sound*. Rome: ConTempoNet s.a.s.
- Birtwistle, A.(2010). *Cinesonica: sound film and video*. Manchester: Manchester University Press.
- Blessner, B. & Salter, L. (2009). *Spaces speak, are you listening? Experiencing aural architecture*. The MIT Press: Cambridge, MA.
- Bohnacker, H., Gross, B., Laub, J., Lazzeroni, C., & Frohling, M. (2012). *Generative design: Visualize, program, and create with processing*. New York: Princeton Architectural Press.
- Bolger, D., Trost, W., & Schön, D. (2013). Rhythm implicitly affects temporal orienting of attention across modalities. *Acta Psychologica*, 142(2), 238-244. doi:10.1016/j.actpsy.2012.11.012
- Bracken, C. C. (2005). Presence and image quality: The case of high-definition television. *Media Psychology*, 7(2), 191-205. doi:10.1207/S1532785XMEP0702_4
- Bracken, C. C., Pettey, G., Guha, T., & Rubenking, B. E. (2010). Sounding out small screens and telepresence: The impact of audio, screen size, and pace. *Journal of Media Psychology*, 22(3), 125-137. doi:10.1027/1864-1105/a000017
- Brown, R. S. (1994). *Overtone and Undertones: reading film music*. London: University of California Press.
- Burr, D., Gori, M., & Sandini, G. (2010). Cross facilitation of visual and haptic motion. *Journal of Vision*, 9(8), 704-704. doi:10.1167/9.8.704
- Çamci, A. (2016). Imagining through sound: An experimental analysis of narrativity in electronic music. *Organised Sound*, 21(3), 179-191. doi:10.1017/S1355771816000169
- Chion, M., & Gorbman, C. (1994). *Audio-vision: Sound on screen*. New York;Chichester;: Columbia University Press.
- Chion, M. (2009). *Film: a sound art*. New York: Columbia University Press.

- Chisholm, J. D., Risko, E. F., & Kingstone, A. (2014). From gestures to gaming: Visible embodiment of remote actions. *Quarterly Journal of Experimental Psychology*, 67(3), 609-624. doi:10.1080/17470218.2013.823454
- Curtis, S. (1992). Early Warner Bros. Cartoons. In Altman, R. (Ed.). *Sound theory sound practice*. London: Routledge.
- Cytowic, R. E. (1993). *The Man Who Tasted Shapes: a bizarre medical mystery offers revolutionary insight into emotions, reasoning and consciousness*. New York: G. P. Putnam's Sons.
- d'Esquivan, J. (2007). *Imaginary Listening*. In: EMS07 - The 'languages' of electroacoustic music - Leicester, 2007. Leicester, UK.
- Eisenstein, S. (1951). *Film form: essays in film theory*. London: Dobson.
- Eisenstein, S. (1975). *The film sense* (Rev. ed.). San Diego: Harcourt Brace Jovanovich.
- Eisenstein, S., Pudovkin, V. I. and Alexandrov, G.V. (1985) A Statement. In Weis, E. & Belton, J. (Eds.), *Film Sound: theory and practice* (pp. 83 -85). New York: Colombia University Press
- Farrow, R., & Iacovides, I. (2014). Gaming and the limits of digital embodiment. *Philosophy & Technology*, 27(2), 221-233. doi:10.1007/s13347-013-0111-1
- Fisher, L. Applause: the visual and acoustic landscape In Weis, E. & Belton, J. (Eds.), *Film Sound: theory and practice* (pp. 232 -246). New York: Colombia University Press
- Garro, D. (2012). From sonic art to visual music: Divergences, convergences, intersections. *Organised Sound*, 17(2), 103-113. doi:10.1017/S1355771812000027
- Gorbman, C. (1987). *Unheard melodies: Narrative film music*. Bloomington: Indiana University Press.
- Hommel, B. (2009). Action control according to TEC (theory of event coding). *Psychological Research*, 73(4), 512-526. doi:10.1007/s00426-009-0234-2
- Kane, B. (2007). "L'objet sonore maintenant": Pierre schaeffer, sound objects and the phenomenological reduction. *Organised Sound*, 12(1), 15-24.
- Kim, J. H., & Seifert, U. (2006). Embodiment: The body in algorithmic sound generation. *Contemporary Music Review*, 25(1-2), 139-149. doi:10.1080/07494460600647592
- Kracauer, S. (1997). *Theory of film: The redemption of physical reality*. Princeton: Princeton University Press.
- Lang, A., Shin, M., Bradley, S. D., Wang, Z., Lee, S., & Potter, D. (2005). Wait! don't turn that dial! more excitement to come! the effects of story length and production pacing in local television news on channel changing behaviour and information processing in a free choice environment. *Journal of Broadcasting & Electronic Media*, 49(1), 3-22. doi: 10.1207/s15506878jobem4901_2

- Larsson, P., Vastfjall, D., Olsson, P., Kleiner, M. (2007). When what you hear is what you see: presence and auditory-visual integration in virtual environments. Paper presented at the 10th annual international workshop on presence, Barcelona, Spain. Retrieved from <https://pdfs.semanticscholar.org/b27a/b117c36cecfe7646f1cf73d471e8153a9a4c.pdf>
- Lastra, J. (2000). *Sound technology and the american cinema: Perception, representation, modernity*. New York: Columbia University Press.
- Lazzarini, V. (2016). *Csound: A sound and music computing system*. Cham, Switzerland: Springer.
- Lewald, J., Guski, R. (2003). Cross-modal perceptual integration of spatially and temporally disparate auditory and visual stimuli. *Cognitive Brain Research*, 16(3), 468-478. doi:10.1016/S0926-6410(03)00074-0
- Marks, L. (2002). *Touch: sensuous theory and multi sensory media*. [Kindle Edition]. Retrieved from www.amazon.co.uk
- Munsterberg, H. (2002) *Hugo Munsterberg on Film: the photoplay a psychological study and other writings*. London: Routledge.
- O'Pray, M. (2003) *Avant-Garde Film: Forms, Themes and Passions*. Chichester: Columbia University Press.
- Paine, G. (2002). Interactivity, where to from here? *Organised Sound*, 7(3), 295-304. doi: 10.1017/S1355771802003096
- Pallasmaa, J. (2005). *The Eyes of the Skin*. Chichester : John Wiley & Sons Ltd.
- Perrott, D.R., Saberi, K., Brown, K. et al. Perception & Psychophysics 48(3), 214-226 <https://doi.org/10.3758/BF03211521>
- Petric, V. (1987). *Constructivism in film: man with a movie camera : A cinematic analysis*. New York: Cambridge University Press.
- Pettey, G., Bracken, C. C., Rubenking, B., Buncher, M., & Gress, E. (2010). Telepresence, soundscapes and technological expectation: Putting the observer into the equation. *Virtual Reality*, 14(1), 15-25. doi:10.1007/s10055-009-0148-8
- Ponty, M. (1962). *The Phenomenology of Perception*. London: Routledge.
- Roads, C. (2001). *microsound*. London: The MIT Press.
- Robertson, R. (2009). *On The Audiovisual: The Montage Of Music Image And Sound In Cinema*. New York: I.B Tauris & Co Ltd.
- Ronconi, L., & Melcher, D. (2017). The role of oscillatory phase in determining the temporal organization of perception: Evidence from sensory entrainment. *The Journal of Neuroscience : The Official Journal of the Society for Neuroscience*, 37(44), 10636 -10644. doi:10.1523/JNEUROSCI.1704-17.2017
- Schaeffer, P. (1967). *Traite des objets musicaux* (Rev. ed.) Paris: Seuil.

- Shiffman, D. (2012). *The Nature of Code: simulating natural systems with processing* (n.p.).
- Shimamura, A. P. (2013). *Psychocinematics: Exploring Cognition at the Movies*. New York: Oxford University Press.
- Smalley, D. (1996). The listening imagination: Listening in the electroacoustic era. *Contemporary Music Review*, 13(2), 77-107. doi:10.1080/07494469600640071
- Smalley, D. (1997). Spectromorphology: Explaining sound-shapes. *Organised Sound*, 2(2), 107-126. doi:10.1017/S1355771897009059
- Smalley, D. (2007). Space-form and the acousmatic image. *Organised Sound*, 12(1), 35-58. doi:10.1017/S1355771807001665
- Smirnov, A. (2013). *Sound in Z: experiments in sound and electronic music in early 20th century Russia*. London: Koeing Books.
- Sobchack, V. (1992). *The Address of the Eye: A Phenomenology of Film Experience*. Princeton: Princeton University Press.
- Sobchack, V. (2004). *Carnal Thoughts: embodiment and moving image culture*. London: University of California Press.
- Tarkovsky, A. (1986). *Sculpting in Time: reflections on the cinema* (K. Hunter-Blair, Trans.). Austin: University of Texas Press.
- Thomson-Jones, K. J. (2013) Sensing Motion In Movies. In: Shimamura, A. P. (Ed.) *Psychocinematics: Exploring Cognition at the Movies*. New York: Oxford University Press.
- Tranchant, P., Shiell, M. M., Giordano, M., Nadeau, A., Peretz, I., & Zatorre, R. J. (2017). Feeling the beat: Bouncing synchronization to vibrotactile music in hearing and early deaf people. *Frontiers in Neuroscience*, 11, 507. doi:10.3389/fnins.2017.00507
- Truax, B. (1995). Sound in context: Acoustic communication and soundscape research at simon fraser university. *The Journal of the Acoustical Society of America*, 97(5), 3407-3407. doi:10.1121/1.412535
- Truax, B. (1996). Soundscape, Acoustic Communication and Environmental Sound Composition. *Contemporary Music Review*, 15(2), 49-65.
- Truax, B. (2008). Soundscape composition as global music: Electroacoustic music as soundscape. *Organised Sound*, 13(2), 103-109. doi:10.1017/S1355771808000149
- Truppin, A. (1992) And Then There Was Sound: the films of Andrei Tarkovsky. In Altman, R. (Ed.). *Sound theory sound practice*. London: Routledge.
- Valcke, J. (2008) . *Static Films and Moving Pictures. Montage in Avant-Garde Photography and Film*. (Unpublished doctoral thesis). University of Edinburgh, Edinburgh.

Vertov, D., O'Brien, K., & Michelson, A. (1984). *Kino-eye: The writings of dziga vertov*. London: University of California Press.

Waterworth, E. L., & Waterworth, J. A. (2001). Focus, locus, and sensus: The three dimensions of virtual experience. *CyberPsychology & Behavior*, 4(2), 23-213. doi: 10.1089/109493101300117893

VIDEOGRAPHY

Apple Canada. (2016, Sep 7). *Apple – iPhone 7 and iPhone 7 Plus in 107 seconds* [Video file]. Retrieved from <https://www.youtube.com/watch?v=CS8IC5LXqIw>

Aronofsky, D. (Director). (1998). *Pi* [DVD] USA: PATHE.

AssistaOIR (2012, Nov 3) *Ryoji Ikeda - The Radar* [Video file]. Retrieved from <https://www.youtube.com/watch?v=TU140hHeb4A>

Aubier, S., & Patara, V. (2009). *A Town Called Panic* [DVD]. France: La Parti Productions.

Boiler Room. (2016, Jan 5). *Robert Henke: Lumière II Boiler Room Mexico x MUTEK MX Live Set* [Video file]. Retrieved from <https://www.youtube.com/watch?v=7cmkZfkuMR8>

Boston University. (2016, Apr 15) *How to Make a Kinetic Sculpture* [Video file]. Retrieved from <https://www.youtube.com/watch?v=nxdcj2tLQGE>

Buñuel, L. (Director). (1928). *Un chien andalou* [Motion Picture]. France: Les Grands. Films

Caro, M. & Jeunet, J.(Director). *Delicatessen* [DVD]. USA: Momentum Pictures.

Contraband International (2014, May 21). *Firewall - Interactive Art Installation* [Video file]. Retrieved from <https://www.youtube.com/watch?v=OYf9dY8LC6w>

Eisenstein, S., & Aleksandrov, G. (Director). *October* [Motion Picture]. USSR: Sovkino.

Eisenstein, S. (Director). *Battleship Potemkin* [Motion Picture]. USSR: MosFilm.

Ikeda, R. (2002). *The Radar* [Audiovisual Installation]. Exhibited at Praia do diabo, Arpoador, Rio De Janeiro SEP 7-9 2012.

Ikeda, R. (2008). *Test Pattern* [Video file]. Retrieved from <https://vimeo.com/73812494>

Jeunet, J. (Director). (2010). *Amélie*. [DVD] London: I.B.Tauris.

Noto, A. and Sakamoto, R. (2008) *Alva Noto + Ryuichi Sakamoto / Ensemble Modern – utp_ . Japan: Raster- Noton* [DVD]. Japan: Raster-Noton.

Ruttman, W. (1924) *Opus III* [Motion Picture].

Ruttman, W. (1927) *Berlin: Symphony of a Metropolis* [Motion Picture].

Schnieder, A. (Director). (1964). *Film* [Motion picture]. USA: Evergreen.

The Cinematic Orchestra. (2003). *The Cinematic Orchestra: Man With A Movie Camera* [DVD]. UK: Ninja Tune.

The-Code-Of-Entertainment (2015, Jun 3). *Interactive Fur Mirror PomPom* [Video File]. Retrieved from <https://www.youtube.com/watch?v=RdGpF2aslgw>

Vertov, D. (1929). *Man with a Movie camera* [Motion Picture]. Soviet Union: VUFKU.

Vetov, D. (1930). *Enthusiasm* [Motion Picture]. Soviet Union: Ukrainfilm.

Walt Disney Animation Studios (2015, Oct 15). *Silly Symphonies - The Skeleton Dance* [Video file]. Retrieved from <https://www.youtube.com/watch?v=vOGhAV-84iI>