

**PRAGMATISM, ECLECTICISM AND ACCESSIBILITY
IN COMPOSING AND IMPROVISING
ELECTROACOUSTIC AND AUDIOVISUAL WORK**

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A thesis submitted to
The University of Birmingham
for the degree of
Doctor of Philosophy

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College of Arts and Law
The University of Birmingham
September 2015

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Abstract

One of the primary focuses in the works presented and discussed herein is the juxtaposition of many disparate musical styles, recordings, and sound worlds within each individual piece. This juxtaposition extends to combining live improvisation, meticulously created non-realtime elements, and elements of generative processes in the creation of individual works. A secondary theme is my attitude to accessibility and how this informs my work with audiovisual elements.

Acknowledgements

I would like to thank Professor Gibby Monokoski (1950 – 2014) for opening my eyes, ears and mind to the aesthetic beauty and inspiration surrounding us everyday. I would also like to thank Professors James Phelps, Scott Wilson and Jonty Harrison for their important direction and influence during my years at university. Finally, I would like to thank my family for their support while I have been living and working so far away.

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Contents of Submitted Media

Disk #1 (Audio CD)

01: Polystyrene (10:50)

02: Congeal (10:05)

03: Coagulate (8:08)

04: Curdle (8:37)

Disk #2 (Audio CD)

01: Namaste (11:33)

02: Emunah (10:38)

03: Apricot (8:39)

04: Linoleum (8:47)

Disk #3 (Video DVD)

Audiovisual:

Congeal (10:05)

Polystyrene (11:08)

Live:

Iridium (10:09)

Omega Index (7:10)

Disk #4 (Data DVD)

Disk #5 (Coagulate 8-channel version)

Introduction

Over the years, I have experienced a growing interest in trying to understand, guide and enhance the listener's experience of and emotional response to my work. The addition of visual elements and a stream of recognizable sounds and images have been a primary means of exploring this idea by directing the focus of the listener. This interest has inspired me to reconsider my view of and relationship with accessibility (as opposed to exclusivity) within my work. I have also been exploring the balance between live improvisation and the use of generative algorithmic processes, whereby improvisation can create natural intuitive gestural material and generative processes which can create unexpected and detailed results.

My work has been greatly influenced by one of my first professors in music, Gibby Monokowski (1950 – 2014), who helped me to realize that I can and should find inspiration for my music everywhere in the world around me. This inspiration can come from the visual arts, from nature, from memory and emotions and, importantly, from all types of music. I was able to understand that an element in nature, sculpture, or painting can inspire me as much as a great piece of music. This is the fundamental idea that underlies my eclectic approach to composing and choosing sound material.

It also became important for me to gain inspiration from musical genres outside of the one in which I am currently composing in order to incorporate new ideas and direction within my work. My early interest in the manic styles of IDM and drum and bass, and the aggressive and harsh sounds of extreme metal influence many aspects of my current work. Improvisation used in both performance and composition has its roots in my years of experience with jazz music. This interest in improvisation has

led me to create audio-based as well as audiovisual-based live improvisation software in Max/MSP/Jitter, SuperCollider and openFrameworks. I have also explored this concept during my three years at the University of Birmingham as a member of BEER (Birmingham Ensemble for Electroacoustic Research), a performance ensemble creating networked pieces based on live coding.

My interest in utilizing the computer as a compositional tool is based on freedom of expression. In my work, I can draw from all of my musical influences, no matter how disparate and varied, as well as having access to any sound available in the natural world or those artificially created. This freedom to draw from any sound world and style without limitations is a fundamental element within my work, which focuses on the juxtaposition of these disparate styles and recordings within a single piece. I am interested in exploring how these unrelated elements, each with their own loaded meanings and emotional qualities, interact with each other, and how this affects the listening experience. As a consequence, each gesture within a work may be a composite event containing a multitude of different, seemingly unrelated, short sound events. Individually, these events may have opposing emotional qualities, trigger a range of personal memories and come from a diverse range of unrelated sound worlds. My work has also been an exploration of the concept of accessibility: that is, trying to understand how audiences experience audio and audiovisual works. This interest has led to my work within the audiovisual medium, as well as to an exploration of emotional and memory-based triggers within my work.

Compositional Strategies

My musical background is heavily influenced on jazz and, as a result, improvisation is a central part of my compositional process. When composing fixed acousmatic pieces, I tend to improvise each gesture or gestural component in realtime. In my experience, the realtime nature of the gestural creation often leads to more natural, spontaneous and musical-sounding passages. This is often done by taking a small audio sample and recording the results of the realtime manipulations that I am applying to it. These effects are usually controlled by a number of tactile and responsive control surfaces. The shape I obtain from these small improvisations serve as the blueprint of each gesture.

After the general shape of each gesture is complete, I then add further structure and detail in non-realtime to finish the sonic event. I meticulously craft and complete each gesture utilizing short sound fragments. I pay a great deal of attention to rhythm so as to build intensity and to shape the dramatic quality of each gesture. These details begin to reveal the true character of each piece, thus allowing the direction and emotional characteristics to show themselves. I often feel that my compositional process has more in common with that of a sculptor, who reveals the finished product that somehow already exists under the stone, than with that of a painter, who adds elements to a blank canvas in order to arrive at the end result. My compositions thus range from works utilizing completely abstracted sounds, with each detail intricately designed and manipulated, to pieces built from pure recordings with little or no processing done at all.

I rarely start with a fully-formed framework at the onset of creating a piece; rather, I have a sound or interesting concept which I want to explore and certain elements that I wish to emphasize. My original

draft is always a quick and very rough sketch of the piece, full of mistakes and misdirection. I let the sound materials evolve into a full piece by exploration through my improvisations. The shape of the piece gradually begins to reveal itself over time and through trial and error. The important part of this process is that these “mistakes” often lead to unexpected and interesting paths. The rough ideas that I create during the early stages make up the important signposts within the piece, just waiting to be connected and polished. This process extends not only to the creation of the general structure of the piece, but also to the creation of the sound fragments themselves.

Pragmatism, Eclecticism and Emotional Morphologies

One important aspect of my work is that I often take a very pragmatic approach to choosing and creating sound material, as well as to composing my pieces. When it comes to sound material choices and making field recordings, I have never adhered to a “purist” ideology which dictates what material can and cannot be used. I have, at times, experienced criticism from fellow composers, and have heard other composers being criticized for using existing sound libraries to compose specific pieces. I do not agree with the idea that works utilizing sounds exclusively produced by an individual composer are automatically considered more interesting than pieces that, for instance, rely on a wide range of sound sources. The value of a piece should be judged independently of this fact and, perhaps, without any previous knowledge of the source material or the processes involved in its creation. Equally, value judgements should not be applied based on whether composers create their sounds by means of synthesis, programming or with field recordings (whether personal or from sound libraries).

The sound material itself, then, is always more important to me than its origin. An orchestral composer does not have to design and craft each violin to be able to write pieces using violin sounds - the sound itself is what is important. One of the most beautiful things about creating electroacoustic music for myself, and the primary reason I became interested in the field, is that *all* sounds, regardless of their origin, are available to me to be used in making a piece of art. While I often record my own material, I am interested in using sounds from any and all sources available that can add something beneficial and interesting to my work. In addition to my own field recordings, I feel free to include artificially-

generated sounds, material from pre-existing sound libraries, recorded instruments, field recordings made available from fellow composers, as well as borrowing from a wide range of musical styles including jazz, metal, classical, glitch, opera and dance. If I am in need of something specific that I cannot find elsewhere, I craft it, program software to create it, or record it myself; otherwise, I use what is at hand. My primary concern for each piece is the end result, not the technical means or the process used to create it. This is not to say, though, that I am dismissing the value and importance of process or the technical means of creation. Every piece I create is an exploration of new ways to compose and create. My previous professor, Dr. James Phelps, gave me some advice which influences how I work and compose: that artists need constantly to work outside their comfort zone; otherwise they risk becoming complacent in their work and begin to create the same type of piece again and again. For this reason, I choose to explore a different path, be it technical or artistic, for each piece. This leads to new and often unpredictable results and ideas.

My work manically juxtaposes many disparate types of sound worlds, ideas, and genres with sharp, abrupt cuts and transitions, often at a very high speed. What I focus on are the emotional qualities, the possible memories that may be triggered, internal rhythms, and timbral qualities present in each sound. Sounds, both abstract and identifiable, are frequently “loaded” with meaning. I often utilize sounds that I hope evoke certain memories or that at least, are easily identifiable to the listener. What I find aesthetically interesting is juxtaposing many sounds in quick succession. This evokes very different and often unrelated mental images, feelings, memories and meanings. The meaning and emotional response varies among listeners, based on personal memories and interpretations.

My compositional process is often related to stream-of-consciousness writing. This may lead to pieces that seem to lack an obvious unified theme or overall framework of ‘meaning’ uniting all the sounds in

a work. The almost chaotic stream-of-meaning and imagery in much of my work, though, is more closely related to how I feel the human mind actually works. My daydreaming mind, for instance, does not often have a linearly-evolving process in my stream of thoughts. Thought fragments dart randomly in and out of my consciousness for various amounts of time, ranging from recent to distant memories. Interestingly, a whole range of emotions can be evoked from these different thoughts in mere seconds. I know that in certain more chaotic dream states, this barrage of thoughts can often leave me quite stressed and exhausted. This is an important feeling I often like to express and represent in my work. More recent works such as *Namaste* and *Emunah*, however, explore a more unified theme and character.

The multitude of short sound fragments that I frequently use create a single gesture, when listened to at a macro level and often have a different overall feel and emotion from each fragment taken individually. I often, for instance, use humorous sounds like animals, babies and speech, to create an aggressive and, at times, sinister-sounding gesture. A notable influence regarding this fragmented style is the music of John Zorn. His quick, abrupt cuts to different sections of music, often completely changing the mood and even the entire style of the piece, is something I have drawn upon in much of my work. Some of his works with Naked City, such as *Speedfreaks* and *Karou* (Zorn, 1992), have abrupt changes between a surprisingly diverse range of styles within a short amount of time. For instance, in *Speedfreak*, the music quickly cycles through musical styles such as metal, various types of jazz, country and rock in less than a minute. The aural result is often jarring and surprising, and yet interestingly satisfying.

Accessibility

One recurring concept that is often a consideration in my work is the idea of accessibility. The motivation for my pieces over the years has varied greatly between opposing ideas. During my early electroacoustic work, I was concerned with creating purposefully inaccessible music, made to appeal only to very select and elite audiences. I am now currently investigating various ways that will allow my pieces to be more accessible and appeal, at least on some level, to a wider audience. The concerns regarding accessibility addressed within this paper are all relative. I am considering accessibility as it applies within an already relatively inaccessible field. My idea of accessibility is not an attempt to; appeal to everyone; to artistically compromise the work in any way; or to create some sort of electroacoustic/popular music hybrid. Rather, the goal is to increase and improve the various levels of appreciation, understanding, and connection that someone with no previous familiarity with this type of music can have when experiencing my work.

One of my primary and earliest compositional influences in the field of electroacoustic music was Iannis Xenakis. My early work was greatly influenced by the aesthetic qualities found in much of his work. It was after listening to *La légende d'Eer* (Xenakis, 1977-1978), that I became interested in more challenging music and art and began considering how to apply some of the qualities I found in such pieces into my own work. The experience of listening to this piece has often been described to me as: “having the feeling of traveling through hell and back”. When one is fully engrossed in the piece, the feeling can be profound and emotionally draining. For me, the first-time listening experience was extremely stressful, abrasive, harsh, and, at times, ugly – yet, ultimately, inspiring. This piece elicited

an extreme emotional response within me, and I realized that this was my goal for creating art/music: to play on the emotional reactions of the audience, be those responses positive or negative.

At this time, I became concerned with composing music dealing with what I considered the concept of anti-accessibility, or music that may only appeal to a select audience of listeners (while not appealing to the majority). Much of my work concerned with anti-accessibility works with aggression, complexity and the abstract nature of sound. My desire has been motivated and informed by the reaction of the listeners. I was interested in music that had an emotionally polarizing effect, causing people to either love or hate the work. Other musical influences (outside the electroacoustic repertoire) that I explored during this early period were IDM artists such as Autechre, Venetian Snares, and Aphex Twin; extreme metal groups such as Emperor, Ulver, and Arcturus; and various other works such as Arnold Schönberg's *Pierrot lunaire* (1912); Michael Nyman's *An Eye for Optical Theory* (1982), and *Queen of the Night* (1982); Louis Andriessen's *De Stijl* (1985), and *Hoketus* (1976); and Phillip Glass's *Einstein on the Beach* (1976). The “inaccessibility” and polarizing qualities of this music are only relative; my response was based on my level of musical exposure at the time but nonetheless qualities were influential on my early work. My first exposure, for instance, to *Pierrot lunaire* challenged me with its level of dissonance and unusual melodic figures inspiring me to investigate 12-tone harmony. Pieces such as *Hoketus*, *An Eye for Optical Theory*, *Queen of the Night* and *Einstein on the Beach*, while not inaccessible in harmonic terms, resonated with my previous interest in the loud and harsh music of extreme metal with the repetitive nature, regular pulse, constant dynamics and aggressive forward drive and attack present in these works. This combined influence can most obviously be heard in my piece *Polystyrene* at 4.19 – 4.52, 5.15 – 6.20 and 10.10 – 10.49. The manic energy and intensity found within much of my music has strong connections with my relationship albums like *Huge Chrome Cylinder Box Unfolding* (Funk, 2004) by Venetian Snares, and *Ep 7* by Autechre (Booth, Brown,

1999).

My investigation into the listening experience then changed and began to focus on exploring more positive aspects, in part influenced by my first exposure to Yves Daoust's piece *Mi bémol* (1990). It contains features that I became interested in exploring more deeply in my own work to enhance accessibility: subtlety, beauty, gentle sounds, simplicity and, perhaps most importantly, recognizable elements. I became increasingly focused on understanding which elements within my own work connect with someone and which do not. This investigation into the listening experience has been far from scientific and methodical. It has consisted of conversations with audience members and listening to their comments after various concerts, as well as speaking with my undergraduate students and fellow composers after a diverse range of listening sessions. Much of the criticism suggested that the pieces did not sound like music to their ears because the more organic sound patterns had no identifiable patterns. Therefore, they could not emotionally connect with many of the sounds. Timbral transformations and rhythmic gestures can be a difficult substitute for traditional melody and lattice-based-rhythms (Wishart, 2002). A trained ear can, of course, begin to appreciate and identify with the non-standardized rhythmic shapes found in gestural acousmatic music, but my current focus is dealing with the untrained ear.

After first listening to *Novars* (1989) by Francis Dhomont, I was inspired to return to the idea of a recurring theme and motive. This idea is, of course, central to most acoustic compositional processes but is often overlooked, hidden, or totally abandoned in many electroacoustic works, including my own. We are often presented with sound worlds so rich, detailed and complex, that multiple listening experiences are needed to truly appreciate and understand the music. So many elements can be occurring simultaneously, so the repetition of events, which allows the listener to focus and explore

different aspects of the material with each restatement, brings a sense of familiarity and understanding of the material. Some listeners who are unfamiliar with the field might inevitably find it to be a sea of noises with no organizational structure at all. Familiarity with the material will allow the listener to start to recognize an organizational structure. After spending so much time listening to a particular sound or sound event over and over in the studio during the compositional process, composers have an intimate and deep relationship with their material. This enables them to discern and focus on small rhythmic and timbral details, a necessary and inevitable component of this type of compositional practice. As a result, the composer's listening experience is very different from that of an audience member hearing the material for the first time. I have often composed entire sections, hearing all sorts of rhythmic complexity, interest and evolving drama, whereas a professor hearing it for the first time would only hear one "type" of sound texture. This often leads to the composition of sections which are too long, mainly because the interest is only in the very fine details that become audible after many, many listening sessions. This ability to listen at a micro level is very different from the listening experience of the audience, which, especially on first acquaintance with a work, is more likely to be done on the macro level.

My concerns with accessibility led me to investigate the relationship between audio and image as, in most situations involving both audio and visual components, including cinema, sound is present to support and emphasize elements within the video. My goal was to explore the inverse of this idea: that moving images could support and emphasize elements within my audio. My initial inspiration to begin investigating the possibilities of adding a visual element to my electroacoustic work was Dennis Miller's collection of audiovisual works *Seven Animations* (2008). This was the first time I experienced visuals being done well by a composer. His visuals, in my opinion, help to reinforce the audio being presented rather than the more traditional inverse relationship.

Visual Elements

Audio has the power to change our emotional response to the imagery, just as visuals affect our reaction to the audio. Our focus can be attuned to different aspects of the audio, depending on the synchronization or lack of synchronicity with the visual events. It is my intention, through utilizing visual components within my pieces, to guide the listener through the dense and chaotic musical passages which are so intrinsic to much of my work. The subtle rhythmic and timbral details that are so interesting to me, and that are lost on the listener who lacks the opportunity for multiple listenings, will be brought into greater focus and clarity. With the addition of the visual component, though, the listener's experience may be somewhat diminished. By setting up rhythmic synchronizations between audio and visual materials and events, I am taking away, to some extent, the freedom to create one's own mental images in response to the audio, thus reducing the variety of likely emotional reactions. When presented with only audio, listeners are allowed to focus on any aspect of the audio they desire and to create their own mental images and connections. Within my work, I am searching for an acceptable balance between this level of control and the freedom of experience that is gained when this control is given up.

I have done a series of interesting experiments where completely unrelated visual and sonic materials are presented simultaneously. The rhythmic events often seem to have a level of synchronicity, even though they are completely random, with no pre-compositional ideas imposed; events simply line up by chance. The interesting thing is that the brain often manages to make sense of this, and create its own synchronizations, often with complex and interesting results. Many sonic gestures seem to be

specifically and meticulously composed for individual visual gestures. When our brains are presented with complex audio and visual stimuli, they attempt to make some sense of the chaos. Thus, when we see random shapes in the clouds, our brains tell us that it looks like a dog or a face in the sky. Each time we glance at the sky, different interpretations can be made. Therefore, with complex material, the idea is that with each listening, different interpretations and experiences can result. Great care is needed when introducing the visual element into a piece, as it has great power to influence, either negatively or positively, the overall experience. The idea of cause and effect is also something we have to consider, and with which we have to contend. Our minds are always searching for a connection between cause and effect. If one solution is not readily available, our mind will create its own connection. When we hear a sound, we assume and look for a visual source. If we see an explosion, we brace ourselves for the loud bang to come. When composing these artificial causal relationships, then, one important consideration is the amount of synchronization between the audio and visual events. Chion discusses this idea in *Audio-Vision* (Chion, 1994), suggesting that the relationship between audio and video can be treated much like orchestration: we can have homophonic and polyphonic events. There can be a one-to-one relationship, where each sonic event is reinforced with a synchronized event in the video. This is something our senses expect, that any visual energy experienced and displayed will automatically have some representation as sonic energy. The idea of audiovisual counterpoint, or rhythmic events in both the audio and visual elements that move independent of each other without obvious synchronization, gives listeners much more freedom to make their own connections and choose more freely where to focus their attention.

My audiovisual work has also focused on finding the correct balance of this feature. These synchronizations need not only be temporally based, but can also be based on spectral, textural, and emotional morphologies and synchronicity. My term “emotional morphologies”, inspired by Denis

Smally's *Spectromorphology: Explaining Sound Shapes* (1997), are transitions between multiple emotional states/triggers in a short period of time. Emotional synchronizations, on the other hand, have to do with the emotional states being displayed in both the visual and audio content at any given moment in time. These states can be complementary or seem to be opposing each other. An example of this can be found in my piece, *Polystyrene*, where I use abstract images that are reminiscent of dandelion seeds blowing in the wind. This is a complimentary emotional synchronicity in which the relaxing nature of the sound is represented by the intended relaxing nature of the video. An example of an opposing emotional synchronization would be if fast moving and aggressive audio of a battlefield is presented alongside the serene slow moving visuals of a still pond. This technique is often used in cinema where the experience of violent and disturbing imagery can be transformed by pairing it with comedic or absurd sounding audio, or a funny scene can be experienced as very serious when presented with certain music.

Based on my current compositional approach and the amount of time needed to create and edit certain computer-based visual elements, accurate synchronization of audio and visual components can be tedious and time consuming to achieve. My work on *Polystyrene* and *Curdle* utilized non-realtime render-intensive visual software such as Maya, Cinema 4D, and After Effects. The benefit of this software is the level of visual detail, complexity and control which I have not found possible in a live performance setting, although it does involve some sacrifice of intuitive control and improvisation. As my compositional approach often incorporates moments of improvisation (a technique which involves immediate visual or sonic feedback), the use of non-realtime visual manipulations have required me to rethink my compositional approach. Creating non-realtime visual gestures which appear to be naturally and intrinsically linked to the pre-composed audio with which they are presented, prove to be quite challenging as each re-render in the event of a mistake, can take hours or even days. Even changes in

the video that mean only waiting 15 minutes to see the result is a creative situation very much at odds with the near instantaneous changes to which I have become accustomed with audio transformations. I have worked with many different techniques and have begun creating software to address these issues in my own audiovisual work.

Programming and Live Work

My relationship with programming has been evolving over the years. Originally, I used programming merely as a way to create tools and effects processors to enhance a DAW-based compositional methodology. Essentially, Max/MSP and SuperCollider were utilized as robust and highly complex/customizable plugin units for Logic or Reaper. This gave me the ability to design these effects units in a way that allowed me to utilize them as an improvisational tool much like a digital instrument. My focus was to have a greater degree of intuitive, live control of the audio-shaping process, which many of my effects units, at the time, did not give. Now, in my current research, programming languages are not only a central component of the compositional process, but also as part of a performance. Many of the ideas used in my current research were derived from past audiovisual collaborations with which I have been involved, including *Metabellum* (2011), a piece written by Victoria Bradbury. This piece was created for dance, interactive sculpture, audiovisual performance, and realtime projection mapping. I used software that I created in Jitter to project visuals generated in realtime onto moving sculptures and dancers. The software created for this work served as a precursor to that which I developed to create *Iridium*. Another influence was an audiovisual collaboration I did with Aaron Vermedal called *Dark Eyed Junko*. Here we explored the idea of spatialized audiovisual performance. In addition to spatializing eight-channel audio around the space, we projected the visual components onto multiple points within the room, including three walls, the ceiling, floor and multiple sculptures in the center of the space. My time spent with BEER (Birmingham Ensemble for Electroacoustic Research), a laptop ensemble led by Dr. Scott Wilson and focusing on live coding in SuperCollider, helped solidify my interest in networked data sharing, which I had previously explored

in my pieces *Iridium* and *Omega Index*. With this new software, I was able to incorporate both audiovisual aspects and networked data sharing into my improvisational process.

My piece *Iridium*, written in Max/MSP/Jitter, was my first attempt at live audiovisual improvisation. The software I wrote to perform this piece interpreted and transformed the visual effects and manipulations I performed as streams of audio. The software gives the performer access to a huge array of controls to manipulate both the audio and visual streams however, in practice, only preset states are feasible for access during performance.

Iridium was a collaboration with my colleague, Dr. Michael Olsen. Dr. Olsen and I each wrote individual audiovisual programs with separate aesthetic goals and parameters. These programs could function independently, or they could be networked together, creating an audiovisual laptop ensemble, in order to share data with multiple computers and performers. This shared data included transformation data, such as envelopes or filter processes to create unified gestures between members of the ensemble. Our research ended prematurely, though, and these networked capabilities were explored only in studio situations. Only two official performances of *Iridium* occurred, unfortunately without this additional functionality. I have included a video of one such performance here. The performance consisted of two screens, with Michael's performance projected on the left, and mine on the right. Our audio streams were spatialized through the hall. The fundamental concept behind the software is that the visuals and audio are created and manipulated simultaneously from the same data stream. I designed the program to take the video's information (such as pixel color, intensity and position), and read it as an audio signal. As the primary source of data comes from the video, the main way to control the events within the piece comes from manipulation of the visuals. With each effect

applied to the video, variations in audio are also created. This technique of translating non-audio information into sonic events is an extension of the work I began with *Linoleum*. As the audio is being generated directly from the visuals, all audiovisual events are closely related and synchronized in time. It is often hard to predict and control the type of audio created as one manipulates the video. Thus, I added a further level of audio control after the video-to-audio conversion is complete. The raw audio is sent through a matrix of audio effects in which the signal flow is manipulated and rerouted in realtime. Multiple live or pre-recorded video streams can be used and manipulated simultaneously. These streams are sent into a complex effects matrix where, like the audio section, the routing is flexible and controlled in realtime (Figure 1 shows the routing matrix used in *Iridium*). I have designed five effects units each, with 10 separate effects, and with full access to each effect's control parameters. Each effect unit controls different types of manipulations, such as pixel displacement, color manipulation and more processor-intensive manipulations such as convolution and recursion. These have the ability to be processed in both parallel and linear streams.

A struggle in creating this software was finding a balance between giving the user as much flexibility and control as possible while keeping it simple enough to be useful in performance (Figure 2 shows the performance interface for *Iridium*). With the multitude of visual and audio effects, as well as the complex routing options, the software gives access to literally hundreds of controls. This is obviously too overwhelming to be used effectively in realtime performance. One solution was to use a series of presets to switch between many predetermined states. However, traveling between these states proved to be somewhat unnatural and too abrupt to work in all situations. Another drawback of this 'solution' of predetermined states was that it greatly reduced flexibility and the aspect of exploring unexpected states.

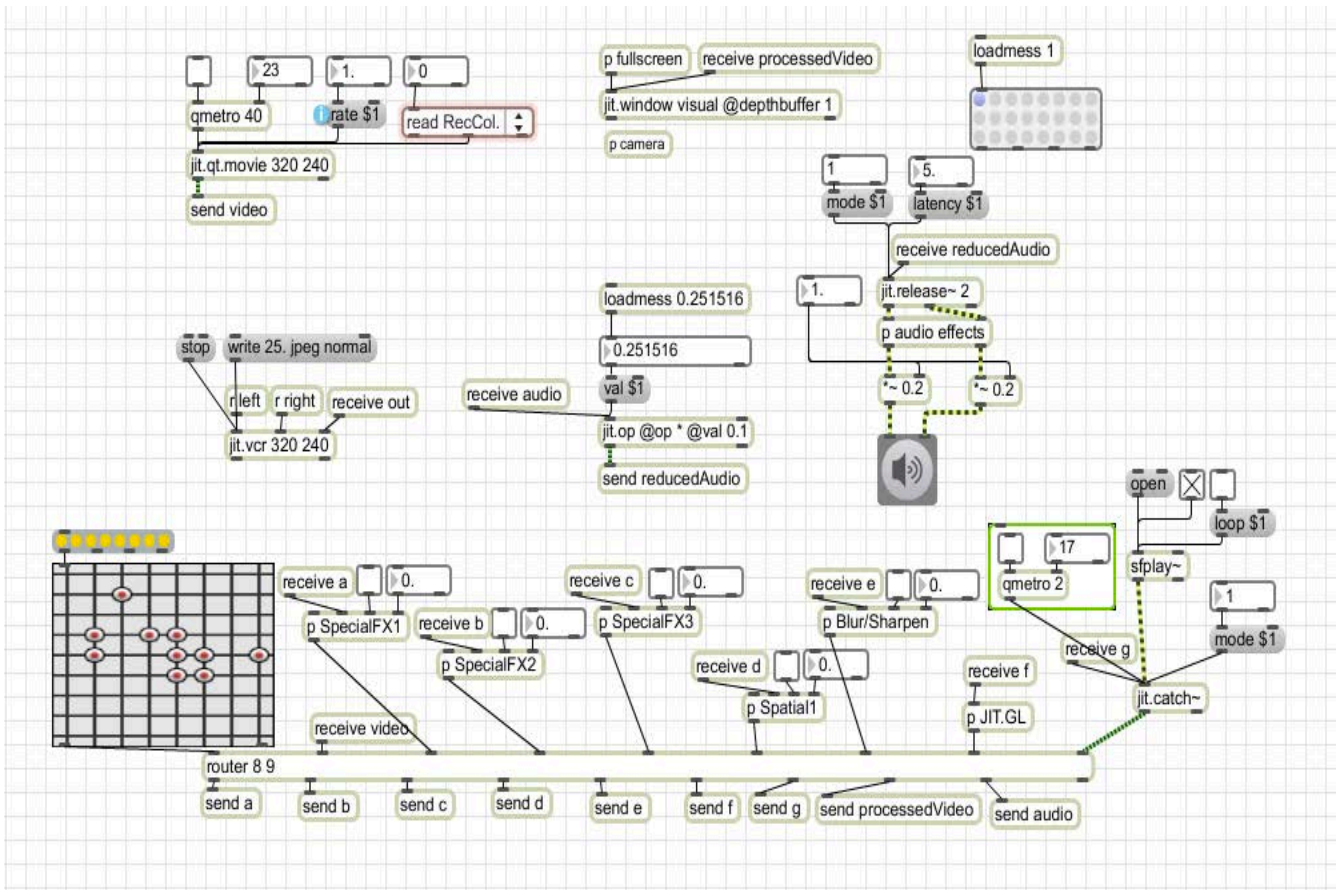


Figure 1 – effects routing matrix

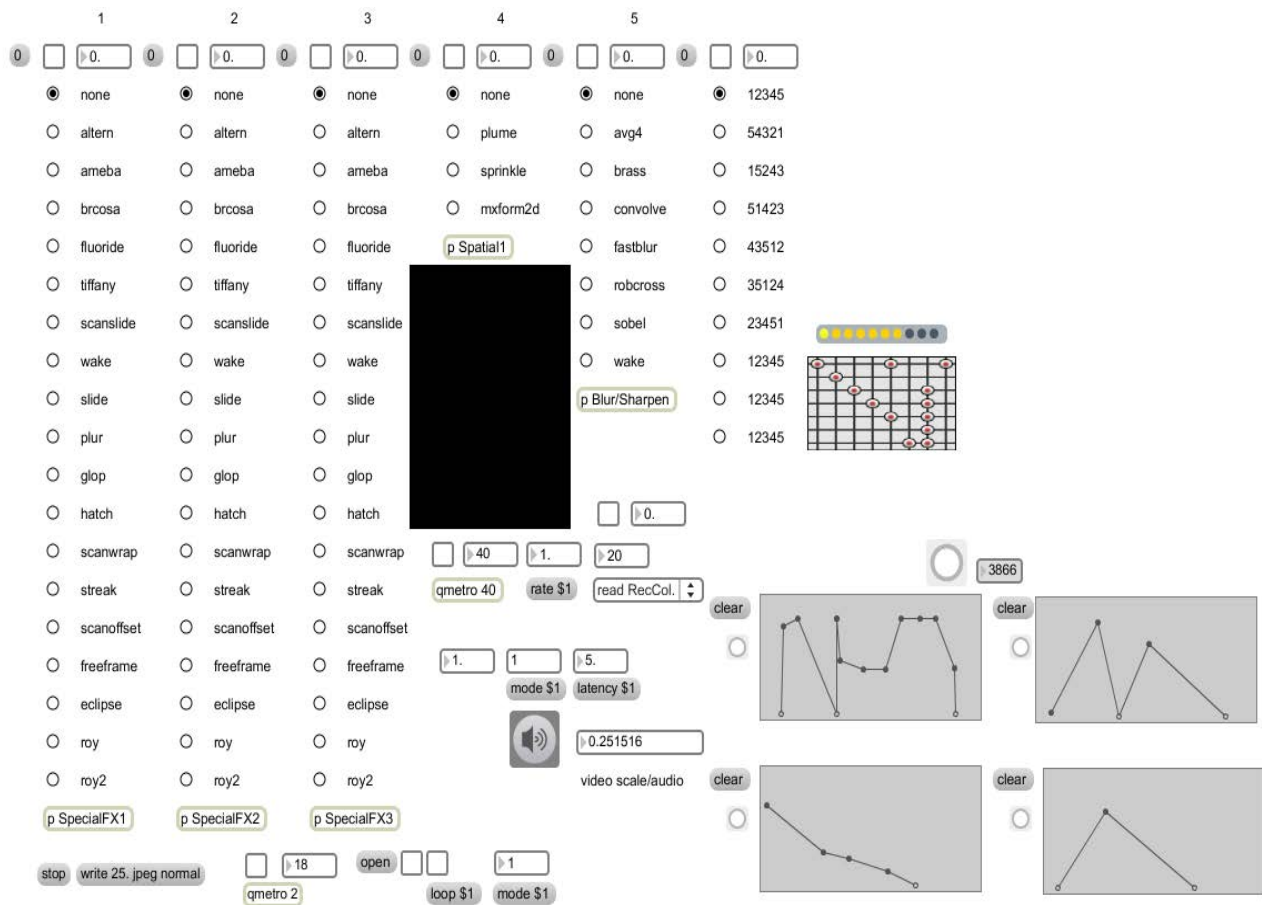


Figure 2 – interface used to perform *Iridium*

The next stage in development, used *Omega Index*, attempted to address these issues and consisted of implementing the functionality of interpolating presets. This interpolation is utilized in both the audio and visual sections and allows for exploration between presets to create more musical transitions and allow a greater sense of live improvisation and discovery, which I was missing in my previous electronic performances. Even more important is the greater gestural control now possible. Greater control was also gained by using simplified customizable interfaces created on the Lemur application on an iPad where a simple swipe of the thumb could create a complete audiovisual gesture (figure 3 shows the performance interface for *Omega Index*). This solution does have its drawbacks, however.

As the interpolation is being done over hundreds of controls, it is heavily processor-intensive. Because of these limitations, I have switched to the faster text-based programming software SuperCollider and openFrameworks for my future research. The software used to create both *Iridium* and *Omega Index* also lacks the versatility needed to veer far from a glitch aesthetic (Figures 4 and 5 show examples of this aesthetic). My future work will focus on creating more general and versatile performance software.

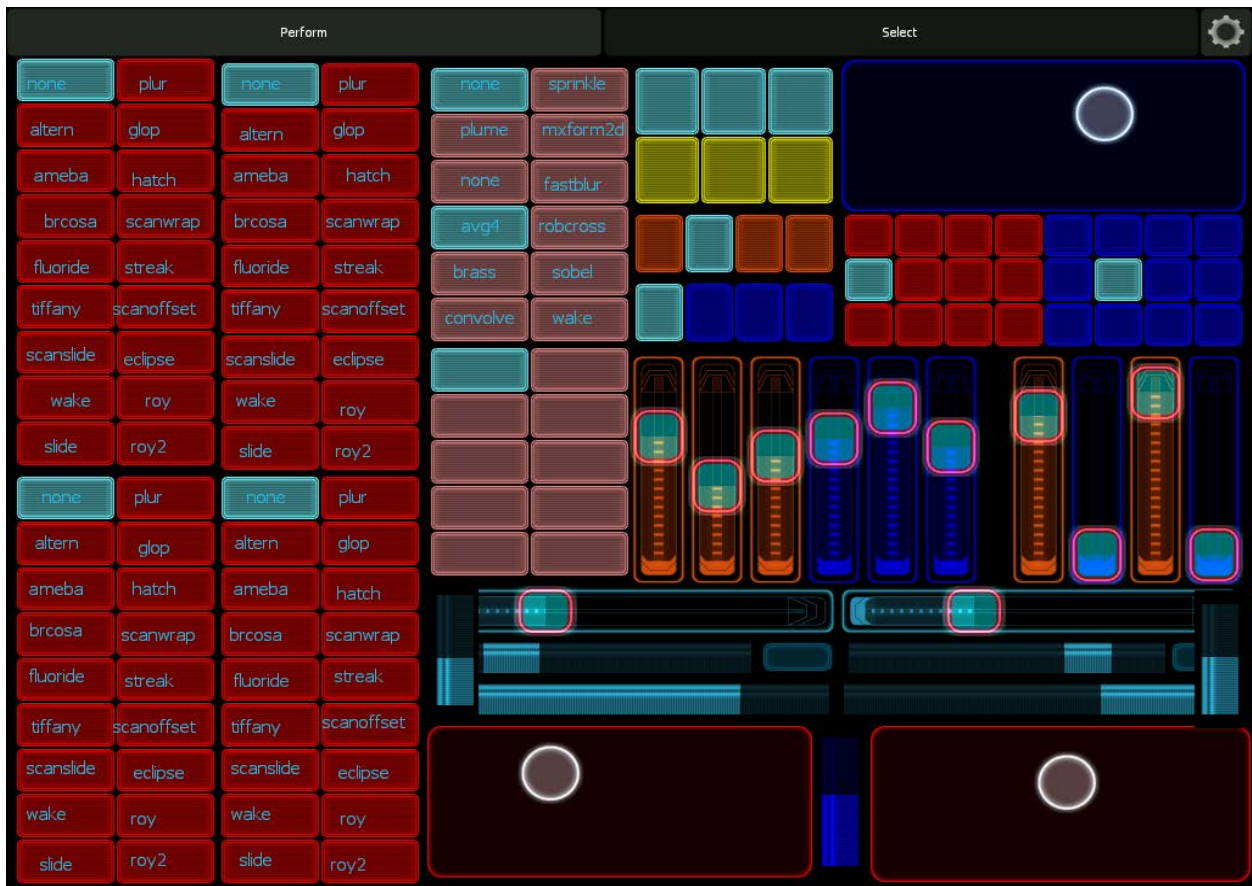


Figure 3 – interface used to perform *Omega Index*

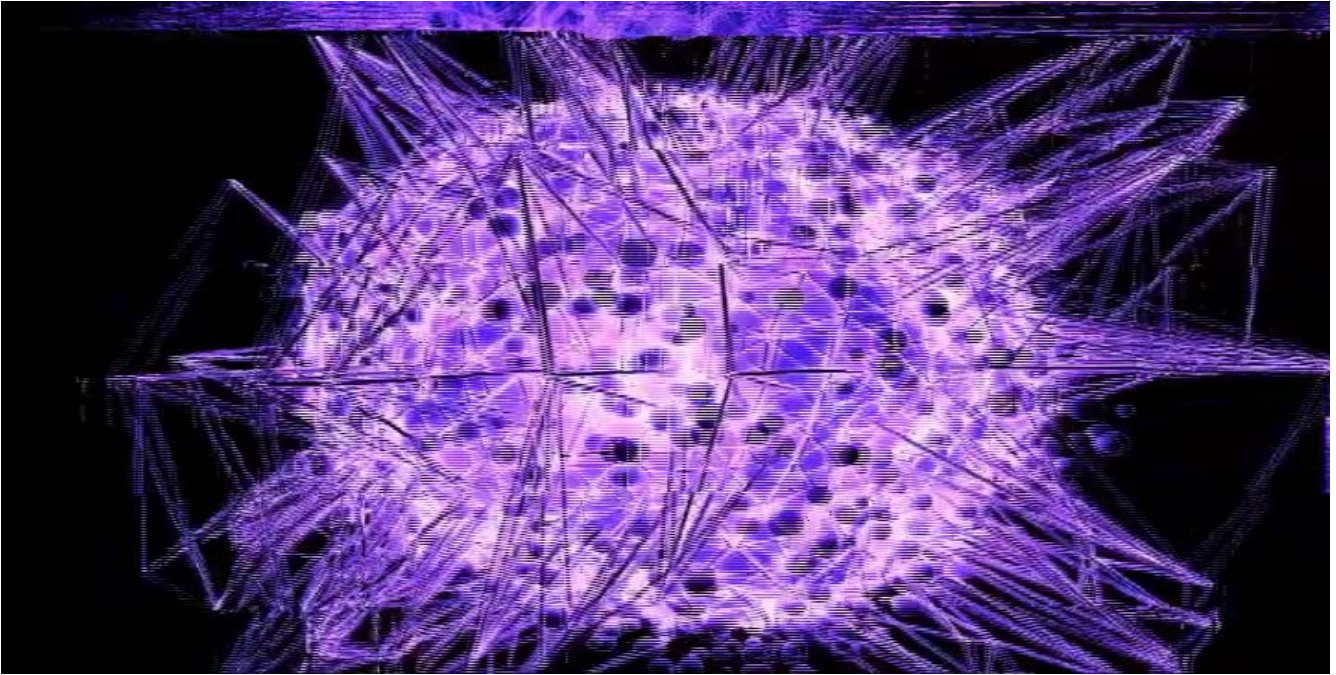


Figure 4 - sample image from *Omega Index*



Figure 5 - sample image from *Omega Index*

Polystyrene (2012)

Polystyrene is an attempt at distilling the intense and theatrical emotional characteristics I often experience in films and television. To recreate these cinematic qualities and integrate them within this piece, I chose to explore a variety of orchestral effects and musical genres by using a wide-range of instrumental sampling software. Intense crescendos and orchestral stabs are used extensively to accentuate the drama and intensity of many gestures and passages. The use of melody and instrumental orchestration as the primary framework for *Polystyrene*, represents a vastly different approach when compared to the works represented here which focus primarily on the recorded sound. The piece is built primarily around a series of flute melodies I composed that are integrated throughout the piece. In addition to the cinematic qualities I chose to represent within the piece, post-minimalist, free jazz, and metal influences can also be heard. Most of the processed sounds used within *Polystyrene* came from applying granular synthesis based techniques to many of the instrumental sounds already present within the piece.

I chose to create a visual component for this piece in part, to further explore the concept of cinema. The video was created almost exclusively in non-realtime software Maya and After Effects. This created a new set of challenges when compared to pieces such as *Iridium* and *Omega Index* which utilized audiovisual performance software which created the visual and sonic gestures simultaneously. The audio for *Polystyrene* was fully composed before I began any work on the visuals. This gave me the opportunity to explore the relationship between the sonic and visual event and how varying degrees of audiovisual synchronicity can affect the listening and viewing experience. The synchronicity found

between the sonic and visual material ranges between a one-to-one relationship where every sonic event lines up in time with a visual event, to each aspect moving in time independently.

The Rotten Milk Trilogy (2012)

The Rotten Milk Trilogy, a series of three pieces which refer to the various states milk can take as it goes “off” These pieces have the shared common factor of using aspects of recognizable popular culture to access memories and feelings within the listener. The naming of these pieces illustrates the relatively lighthearted and comical nature of the works as well as preserving my attitude of not taking my work too seriously and giving it undue weight. *Coagulate* utilizes sounds from 1940s era Warner Bros. Cartoons, whereas the audio for *Congeval* is primarily 1940s jazz. *Curdle* has decidedly more modern source material and utilizes beat-based material as its fundamental building blocks. It is the only work of the three which includes a visual component.

Congeval

Congeval is an exploration of the juxtaposition of 1930s and 1940s jazz and the electroacoustic medium. It is primarily a homage to one of my favorite jazz musicians, Django Reinhardt. The bulk of the sound material used for this piece is taken from perfectly identifiable moments of Django’s own music, as well as from another early jazz guitar master, Charlie Christian. There is a feeling of nostalgia with these recordings. Just from the recording qualities themselves, images of the past float into our consciousness: smoky clubs and the musicians of the day. This nostalgia should be clear even if one is not well versed in the jazz idiom. I composed this piece to evoke glimpses of these feelings within the audience.

The basis of *Congeval* is that it should be obvious to the listener that the material is from genuine 1940s jazz recordings. As in most of my work, these identifiable moments are used to trigger memories or elicit some feeling within the listener – such as remembering being in a club listening to the performance for a moment, until the memory splinters back into unreality. These momentary glimpses into recognizable “reality”, which then break away into chaos or abstract sound, are a hallmark of my work. To emphasize this to a greater degree, *Congeval* was originally composed/performed as a 32-channel piece. The piece utilizes the idea of stems, or groupings of particular sounds which are then routed to a particular set of loudspeaker arrays. In this case, I had four stems addressing four separate rings of eight speakers. The reason for this separation was to enhance the moments of “clarity” when the jazz sounds were playing. The ring of eight speakers used for these moments were close to the audience, at ear level. This was to simulate the intimate club environment in which one would actually have experienced these sounds. In this more realistic case, the sound of the guitar would not come from high up in the ceiling or be rotating around the room. I often placed these types of sounds at static points in the listening space, representing what might have been the actual musicians’ positions in a live performance. As the sounds begin to disintegrate into chaos, they start to move around the room in more unexpected patterns. The sound space opens up, utilizing greater height and distance within the performance space. This space, distance, and chaotic motion, enhances the idea of the chaotic nature of how our actual minds work when accessing our memories. In the majority of instances, the jazz-based material is presented unprocessed. From 4:14 - 5:40, the focus is not on jazz material but on creating an environment and space that evokes the idea of the past, as if sitting in a living room listening to 1940s newscasts and commercials. The second half of the piece gradually descends into more fragmented and abstracted representations. This notion of fragmented memory is most strongly represented from 8:30, where granulated glass sounds are intertwined with short bursts of the jazz material.

The use of previously recorded sound material in a piece can be a dangerous and controversial practice. My use of this material has been utilized in my personal research into the juxtaposition of these two very disparate sound worlds. I have made no money on the release of this piece. I also, in no way, attempt to hide the fact that the jazz elements used in the piece are from Django himself and are not composed by me. The use of these identifiable recordings is my interpretation of the jazz tradition of “quoting”, or referencing notable moments of other songs within one’s own improvisation. This interweaving of well-known material into an improvisation is a standard technique in the jazz language. I have taken this idea and applied it to my own language of electroacoustic composition. Instead of using these quotes within an improvisation, I have used them as building blocks within each gestural moment of the piece. I have used the actual recordings as source material, which is in keeping with one of my most fundamental theories behind my electroacoustic work: that all sounds can and will be explored and used. A biographical analysis of Django Reinhard or jazz in general, would be littered with actual quotations from musicians, from other books, as well as notation and references to pieces and recordings. Quotations in text based research do not have the same copyright restrictions as does recorded audio; as long as all materials are properly referenced and mentioned there is no issue of plagiarism. I feel that musical research and this type of sonic exploration should also not be limited, just as long as one is not claiming ownership of such material or hiding the fact that it has been used. An analogy: Christian Calon's piece *Les corps éblouis* (1998), which incorporates a well known and easily identifiable guitar riff from Jimi Hendrix into his work, is a great example of the juxtaposition of identifiable popular culture with the abstract sounds of electroacoustic music.

Many additional influences and interests also led me to create this piece. I am in part inspired by the work of John Oswald and his 1985 essay, “Plunderphonics, or Audio Piracy as a Compositional

Prerogative”. The concept of what is an acceptable use of recorded material, as discussed in this essay, states that “Fair dealing assumes use which does not interfere with the economic viability of the initial work.” My piece is, of course, not interfering with the sales of any Django Reinhardt recordings. I am inspired less by the sonic result of his work than by the theory behind his use of materials. The use of pop music, cultural references and sounds that are immediately recognizable and accessible to the listener, while presenting them in a completely different context and focus, is something I explore in much of my work. Marcel Duchamp's statement, “An ordinary object [could be] elevated to the dignity of a work of art by the mere choice of an artist” is how I view and utilize all sounds, even if the sounds are works of art in and of themselves. After experiencing Duchamp’s *Readymades*, I realized context can completely change one’s conception of art and sound. Duchamp’s 1919 piece *L.H.O.O.Q.*, a parody of Leonardo da Vinci's *Mona Lisa*, he simply pencils on a mustache and beard, utilizes a piece very well-known to most of the world and puts it into a new context. I am also inspired by the work of the British audio-visual collage artist, Vicki Bennett. Her work under the name *People Like Us and Ergo Phizmiz*, combines original material with found footage and archives from music, film, and radio.

Coagulate

The vast majority of electroacoustic music that I have experienced has been of a very serious and heavy nature. I have read many program notes which seem to try to convince the listener that grand concepts and important ideas are being represented and discussed within the music. Of course many times, without these program notes, these concepts are not conveyed at all within the abstract audio. *Coagulate* is my attempt at creating a piece which is humorous, absurd and light in nature, not intent on representing some grandiose theory or taking itself too seriously. During my first year of PhD studies,

while still attending Ball State University in Indiana, I had access to their extensive sound effects libraries that are used in creating student films. One library that I utilized in the creation of this piece was the actual sound effects library used in creating the old Warner Bros. Cartoons. As with *Congal*, nostalgia and evoking memories (both good and bad) of one's past are central themes of the piece. Originally composed as an 8-channel piece, the movements and trajectories of the sounds are extremely chaotic and over-exaggerated. This extreme energy and absurdity within the spatialization of the sounds represents these traits found within the sound materials themselves. The original qualities and "age" of the sounds have been preserved. The lack of fidelity and the fact that the sounds are all mono places the piece in a specific point in time. This temporal placement and reference is fundamental to the theme of the piece.

The chaotic nature of the piece periodically "calms" to reveal clear spaces and scenes of normal life; this is particularly noticeable in the section 2:02 – 3:15. The space I imagined is that of a living room in the past, with music playing from the radio in the background, while someone is washing the dishes in a nearby room. This calm space quickly disintegrates back into fragmented chaos until it eventually calms again, leading to sounds of a quiet field and lake (5:34 - 6:22). This, in turn, is quickly disturbed by the sounds of loud construction, until the fragmented sounds come back with even greater intensity. Short scenes of children's classrooms are also interspersed throughout the piece. This back and forth between chaotic fragmented sounds (which represent the fragmented way memories can naturally fill our minds), opening up into calm, almost serene scenes, was, in part, influenced by Kurt Vonnegut's book *Slaughterhouse 5* (1969). This depicts a man whose descent into madness takes him back to various moments within his life. One moment, he finds himself sitting quietly with his wife as a middle-aged man: the next, he is experiencing the horrors of World War I as a teenager. In addition to the common theme of attempting to represent one's memories as they naturally occur, these oases of

calm in *Coagulate* serve a further purpose. They offer the listener an aural break from the assault of manic sounds which are present for the majority of the piece. These “spaces” stand in stark contrast to the other sections in both sonic energy content and spatial motion.

Curdle

Curdle is an audiovisual piece created to reference aspects of popular culture, both modern and old. I did this by using heavily beat-based material to create most of the gestural events in the work. As in other pieces, I have used sounds found in everyday life to trigger memories within the listener. These sounds are juxtaposed within the piece with very quick cuts and transitions. I added a synchronized visual component to enhance and emphasize the abruptness and sharp nature of these transitions. The inspiration for this piece was from the visual aesthetic found in the work of motion graphics artists such as Ion Lucin, Simon Holmedal and Nick Campbell.

The main focuses of the visuals was to use simple geometric shapes, such as the sphere, cube and pyramid, and give them organic qualities through motion. The inspiration for the movement of many of the spherical images was taken from a beating heart and a plastic bag's motion as it moves about as if underwater. As *Curdle* features a multitude of different images appearing at a relatively high rate, I chose to create a sense of continuity in the piece by restricting my color palette to primarily red and white. The visuals for this piece were done almost exclusively using Cinema 4D, a non-realtime 3D animation software package. I found two drawbacks in the use of this software: the amount of time needed to render each scene, and the amount of space required to save the image data. I rendered approximately 1.5 minutes of video for each shape used in the piece. As I was creating this piece on my laptop, each render took anywhere from one to seven full days to complete, and required at least fifteen

gigabytes of disk space each. Obvious problems arise with this compositional technique when mistakes are found in the finished product. I was able to obtain the results I was searching for through this painstaking process, but this was another indication that I should begin exploring different ways to create my audiovisual work.

Namaste (2013)

Nearly all of the source material used to create *Namaste* was taken from field recordings that I made while traveling through Myanmar (Burma) and Nepal in the summer of 2014. This piece represents a departure from my previous work in the level of seriousness, emotional continuity and personal connection present in the work. It is a sonic documentation of my travel experiences in these countries. *Namaste* displays the emotional chaos that many westerners feel when first experiencing Asia. I wanted to convey the contradictions and complexity of these places. At one moment, there is a complete bombardment of the senses, in which a chaos of unfamiliar sounds, sights, and smells almost completely overwhelms you, whereas immediately afterwards, you find yourself in the serene quiet of an ancient temple or in a local back alley. There exists such beauty and purity partnered with such despair and, at times, horror.

I tried to capture the profundity of the religious rituals of Nepal by recording sounds of the animal sacrifices, burning of the dead, and religious prayer, chanting and music. The juxtaposition of the screams of the baby goats (as their throats were slit and the actual splatter of the liters of blood during the sacrifice), with the sounds of children laughing and prayer bells continue in the background, made for some particularly strong source material. Most powerful though, were the moments I was unable to record out of respect. The emotion and absurdity I experienced while witnessing the wails of despair as family members watched as their dead relatives were being burned and their bodies slid into the river leading into the Ganges, while at the same time, happy Western tourists were smiling and snapping pictures of the scene, just meters away from the families, was an inspiration to the piece. The main

thread and original sound I used to create the piece was my improvisations using a Tibetan singing bowl I purchased in Nepal. What I found interesting was experimenting in striking it with different materials in addition to playing it in a traditional fashion. Of particular interest was the buzz produced by the vibrations of small metal objects like coins and bolts when placed in the center of the bowl. Even with the rather abrasive metallic buzzing, the pitch produced created a calm, meditative atmosphere. Juxtaposing this serenity with chaotic street noises and aggressive gestural materials created the overall conflicting atmosphere that I experienced.

My primary interest with *Namaste* was to explore the culture through the recordings captured during my time in these two countries. These recordings created snapshots in time of my experiences whilst in these colorful countries. Naturally, the most interesting and important recordings were those of the people. Their speech and language often have very musical and percussive qualities, so I utilized each recording of speech as I would as if I recorded a percussive instrument. The material was separated and organized into fragmented rhythmic patterns and phrases. These rhythms, derived from the vocal phrases, were then used as the fundamental building blocks to create each gesture. All other material was then “hung” around this rhythmic framework.

Emunah (2014)

Like *Namaste*, *Emunah* is of a more serious nature and has much more of a linear narrative than most of my previous work. The title comes from the Hebrew translation of the word faith. This piece is based on the *Book of Job* found in both the Hebrew and Christian bibles. The *Book of Job*, considered to be the oldest book in the Bible, is the story of the extreme suffering of Job at the hands of God. Satan urges God to test his most faithful and devoted disciple through a series of painful trials, including the deaths of all his children. Throughout these trials, Job miraculously keeps his faith and retains God's favor.

Emunah is my sonic interpretation of this story and the many theological questions and problems posed by it. This is my attempt at illustrating the emotions Job must have felt during his trials, including suffering, horror and sadness, and even the feeling of love and security he felt from God. I have combined traditional prayers in Latin and Hebrew, as well as actual readings from the *Book of Job* in both Dutch and English, to illustrate the universality of the spiritual issues presented here. The intention in combining these elements in an electroacoustic setting was to consider how this ancient story of enduring faith can apply to life in the modern world.

Apricot (2011)

The majority of the sound material for *Apricot* comes from my exploration of different materials with which to play and strike an African thumb piano, or kalimba. Some of these materials include: an egg, wine glass, violin bow, steak knife, various tools, a pencil and plastic tubes. I also experimented playing these materials together, for instance, bowed wineglass, and even bowed egg. I then further manipulated and isolated interesting sound elements from my various "performances" with the instrument(s). By time stretching or slowing each sound, one is able to hear short sound events that otherwise would go unnoticed. This is similar to looking under a microscope and seeing an entirely new world unavailable to the naked eye. I then isolated and exposed the microscopic sound events, resulting in the chaotic sounds found within the piece.

Linoleum (2011)

Linoleum was an early attempt at encapsulating the idea of inaccessibility within my work. I wanted to create an aggressive, loud, chaotic and abrasive piece that would be both challenging and polarizing, with people either loving or hating it. This piece is also unique in my repertoire, in that my primary focus was on the process and techniques used in creating it through the severe limitations I placed on myself in terms of sound material selection. For the source material for *Linoleum*, I veered away from my standard found sound material and use completely synthetic sources. I began researching and working with various unconventional sources to generate the sound material, such as image, video and data files. I experimented with various visual techniques to create glitch art. This included data bending or the reinterpretation of data into different, unintended formats creating distortions and errors within the media, leading to highly unpredictable and unexpected results. Since all digital media and information, including both audio and visual data, are simply stored as a stream of numbers, any source of data could be read and interpreted in a variety of ways. This means that a picture, video, spreadsheet or book could be used as an audio source by forcing the software to treat it as an audio file. An image or video could be loaded into audio-based editing software and any number of audio based effects applied to the data. The techniques I learned in creating this piece served as the primary foundation and inspiration to write the software used in creating *Iridium* and *Omega Index*.

All of the material for *Linoleum* was generated from a single PDF file of a Pro Tools product manual. I previously experimented with multiple image and video files, but I found that most of the results were

unusable and uninteresting to my ears, as the results of these types of conversions were too noisy, harsh and glitchy. Most of the results verged on pure white noise with very little rhythmic or timbral variations. Only a small number of files seemed to display brief moments of complex rhythmic material before deteriorating again into static noise. These short moments of rhythmic clarity had to be edited away from the overall mass of noise and collected for use within the piece. This technique proved to be a useful (although tedious) way to generate unexpected and interesting rhythmic patterns and, in a sense, the piece became a study of these rhythms. Much of the original material, though, lacked much in the way of interesting timbral variation, and remained too harsh and abrasive to listen to for an extended period of time. To address this, I added various timbral transformations and effects to each sound fragment in order to sculpt the piece to achieve the end result.

Omega Index (2013)

I wrote and utilized realtime audiovisual performance software in Max/MSP/Jitter to create *Omega Index*. This software is capable of generating and manipulating visual and sonic events simultaneously allowing for synchronized audiovisual events. The sonic material is generated by translating the live visual information and effects into streams of audio. By converting one form of information into another though, very unexpected and often harsh sounding results are achieved. To account for this in some way, the streams of audio are sent through a complex matrix of effects and envelopes to shape and color the sound. This matrix can be reconfigured and rerouted in realtime to allow for a wide range of control. A similar matrix routing system is used for the visual effects.

The glitch aesthetic that is obvious in *Omega Index*, is a characteristic that is intrinsic to the software and many of the resulting performances and pieces created with it. The improvisation that led to *Omega Index* used a variety of video clips and images from my piece *Curdle*. These clips were triggered and manipulated by using the Lemur application, a fully customizable tablet-based control surface. Through this touch-sensitive application, I was able to design an interface in which I could interact with the important aspects of the software during a performance. Due to the large amount of parameters to be controlled however, a series of preset states were created. During a performance I was able to explore the interpolated states that existed between the presets allowing for gestural audiovisual evolution.

Live Composition and Improvisation of Audiovisual Works Utilizing SuperCollider and OpenFrameworks Programming Environments

My intention for my future research is to create software that integrates live improvisation and generative processes in both the composition and performance of complete audiovisual works in realtime. The visual component will be programmed, controlled and, in a large part, generated in the programming environment openFrameworks, while the audio portion and control data will be handled completely within SuperCollider. This control data will manipulate the audio and visual components simultaneously. Used as a compositional tool, the composer will have the ability to control the balance between human interaction and automated generative processes in the creation of each piece. This allows for pieces that are either fully algorithmic, fully improvisatory or that are composed within the interesting space between the two. The composer will be able to utilize the organic structure, gestural possibilities and intuitive inspiration found in improvisation, alongside the control, emergent complexity and unexpected possibilities found in generative work. The software will have the functionality to spatialize both audio and visuals, as well as wirelessly communicate gestural control information within an ensemble. As the software will be a realtime compositional tool, generated visual material will be combined with pre-rendered video and imported 3-D objects. This combination is important, as live-generated visuals often lack the complexity and detail of those rendered in non-realtime software, such as Cinema 4D, Maya and After Effects. On the other hand, intuitive human interaction and realtime control is often lacking when using this type of render-intensive software.

Because of processor limitations, certain complex and extremely detailed images cannot be fully generated live, but the user will be able to control, interact with and manipulate all three types of visual information in the same way.

The simultaneous gestural control of audio and visuals is the fundamental idea behind my future work. One gesture can control many parameters in both worlds. This simplified control structure gives not only a sense of cohesion and unity between the audio and visual elements, but it also allows for simple programming control of the algorithms, as well as a more intuitive way of improvising in realtime. This control is possible through the communication between SuperCollider and openFrameworks using streams of OSC messages and SuperCollider's powerful JIT library. Streams of data, patterns and sounds can be changed and altered in realtime, permitting huge variety and many complex transformations with only a relatively simple set of instructions. One type of control within the software utilizes the idea of the "empty gesture", as discussed by Scott Wilson and Julio d'Escriván in *The Super Collider Book*. The "empty gesture" could be any stream of data used to control a process within the software. This could be a pattern, an array of envelopes, a recorded physical gesture, or even a mathematical function: "[these] gestures are not linked to any sound in particular..." (Wilson, d'Escriván, 2011, pp. 81-94) – or, in this case, are not linked to any sound or visual in particular. The gestures are simply waiting to be assigned to a parameter and can be re-applied, changed, and used to control any function one wishes. One simple example of an "empty gesture" in this software is an envelope. One can have an array of various envelopes, each having different shapes and durations that can be cycled through to control the audio and video streams simultaneously. In SuperCollider, this information may simply be used as an amplitude envelope to shape the sound, but this exact information, when routed into openFrameworks, may control the opacity of a video, "grow" a recursive organism, or even construct and deconstruct a generated image. These gestures will also be able to

control a visual granular synthesis process, where each particle of sound is represented by a visual particle: the spatialization applied to the audio grains can be mimicked by the video's visual grain cloud components. In a situation where several audiovisual performers are working as an ensemble, these gestures can be shared wirelessly between the group. This creates an opportunity for a wireless audiovisual laptop ensemble where performers share data, influence and react to each other's gestures, and manipulate each other's audio and visual streams during performance. Global gestures can also be used and shared to create unified gestural moments within the ensemble as a whole. Instantaneous cuts and changes in the performance, as well as gradual changes in the global output, will bring a sense of cohesion, unity, and form to the improvisation – something that is often seriously lacking in many laptop ensemble's performances.

An audiovisual laptop ensemble will have the ability to spatialize not only the audio, but also the visual aspect of the performance using projection-mapping techniques found within openFrameworks. The idea of spatialization in the audio realm using a multichannel system has been something I have had the opportunity to experience while working with BEAST (Birmingham Electroacoustic Sound Theatre) during my three years at the University of Birmingham. Spatialization in the visual realm, on the other hand, is something I wish to explore further. A sound gesture moving across a space could be enhanced by using a corresponding visual gesture. A performer could do this simply by moving the images on the screen, but this motion cannot match the possibilities of motion available in a 96-channel sound system! An attempt to come close to such range of motion would be to project an image over a multiple projector array, each individual projector positioned to display at a different point in the concert space. Visual trajectories throughout a room could function in a similar way to sound trajectories in a multichannel system. In an ensemble, each performer could be addressing a single projector, but since data is being shared between all the performers, images can travel between projectors to create the

visual trajectory through the entire space. With the use of projection mapping, these gestures and trajectories need not be limited to a rectangular screen, so more organic visual motion over objects within the space can be achieved. Another use of the software will be its application in audiovisual installations. Since it can generate material algorithmically, the system can be used to create an ever-changing piece of any duration, incorporating interaction from the viewer. One implementation would be the use of an X-Box Kinect sensor, which senses the distance and motion of each viewer. This information will affect the data controlling the audio and/or visuals. The primary reason for using a Kinect is its power to assist the projection mapping process. It can scan a series of objects, whether stationary or moving, giving access to each item's spatial coordinates. Each physical item can then be addressed individually within openFrameworks as well as have visuals mapped specifically onto its surface. This mapping can even be projected onto dancers or moving objects in realtime.

Bibliography

Cabanne, Pierre. *Dialogs with Marcel Duchamp*. Da Capo Press, Inc, 1979.

Chion, Michel. *Audio-Vision: Sound on Screen*. New York: Columbia University Press, 1994.

Oswald, John. "Plunderphonics, or Audio Piracy as a Compositional Prerogative." *Musicworks* 34 (Spring 1985): 5-8.

Smalley, Denis. "Spectromorphology: Explaining Sound-Shapes." *Organised Sound* 2 (2) (1997): 107-126.

Vonnegut, Kurt. *Slaughterhouse Five*. New York, New York: Dell Publishing, 1991.

Scott Wilson and Julio d'Excriván. "Composition with SuperCollider." *The SuperCollider Book*, eds.

Scott Wilson, Nick Collins and David Cottle, 81-94. (London: MIT Press 2011).

Wilson, S., N. Lorway, T. Moyers, R. Coull. K. Vasilakos. "Free as in BEER: Some explorations into structured improvisation using networked live coding systems." *Computer Music Journal: Live Coding Issue*. (Spring 2014). MIT Press, Cambridge, MA.

Wishart, Trevor. *On Sonic Art*. New and Rev. ed. London: Routledge, 2002.

Discography

Andriessen, Louis. "De Stijl." *M is for Man, Music, Mozart*. Nonesuch, 2008.

Andriessen, Louis. "Hoketus." *Gigantic Dancing Human Machine: Bang on Can Plays Louis Andriessen*. Cantaloupe, 2002.

Autechre. *Ep7*. Nothing Records, 1999.

Calon, Christian. *Les corps éblouis*. empreintes DIGITALEs, 1998.

Christian, Charlie. *The Original Guitar Hero*. Columbia, 2002.

Daoust, Yves. "Mi bémol." *Musiques naïves*. empreintes DIGITALEs, 1998.

Dhomont, Francis. "Novars." *Cycle du son*. empreintes DIGITALEs, 2001.

Glass, Phillip. *Einstein on the Beach*. Nonesuch, 2012.

Miller, Dennis. *Seven Animations*. 2005.

Naked City. "Speedfreaks." *Grand Guignol*. Avant, 1992.

Naked City. "Kaoru." *Grand Guignol*. Avant, 1992.

Nyman, Michael. "An Eye for Optical Theory." *The essential Michael Nyman Band*, Argo. 2014.

Nyman, Michael. "Queen of the Night." *Nyman/Greenaway Revisited*. MN Records, 2009.

People Like Us and Ergo Phizmiz. *Perpetuum Mobile*. Soleilmoon Recordings, 2007.

Reinhardt, Django. *The Best of Django Reinhardt*. Blue Note, 1996.

Schönberg, Arnold. *Pierrot lunaire*. Decca, 2012.

Venitian Snares. *Huge Chrome Cylinder Box Unfolding*. Planet Mu, 2004.

Xennakis, Iannis. "La légende d'Eer." *Xenakis: Electronic Works 1*. Mode, 2005.

Appendix

I have submitted the majority of my work here in stereo format to ensure the pieces can be experienced and appreciated anywhere without the need of a multichannel sound system. I have decided to include an 8-channel version of *Coagulate* though, as the exaggerated and cartoonish nature of sonic motion is an important aspect of the piece. While this motion exists within the stereo version, the multichannel version displays the manic energy I originally envisioned with greater clarity.

Coagulate 8-Channel Speaker Setup

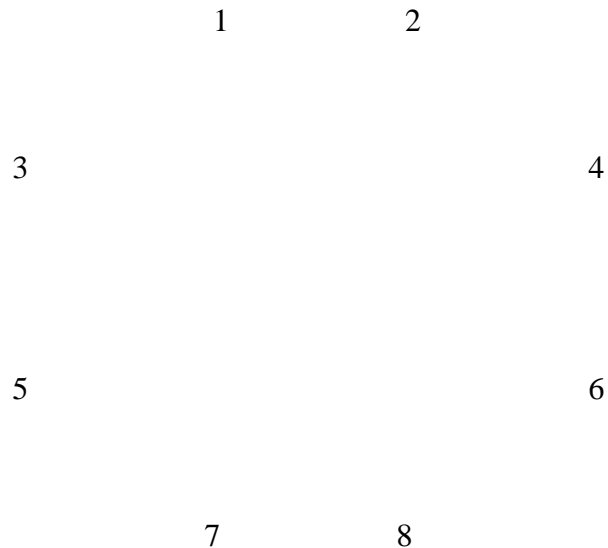


Figure 6 – *Coagulate* speaker setup