an interlude between two nothings: A Musical Composition for Flute, Clarinet, Violin, Cello, Piano, Augmented Electric Guitar, and Fixed Electronics, with Accompanying Document.

by

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Abstract

an interlude between two nothings is a musical work approximately thirty-five minutes in length. It is scored for flute, clarinet, violin, cello, piano, fixed electronics, and an augmented electric guitar. The work is divided into six movements, which alternate between two contrasting streams. One stream attempts to evoke a rational quest for knowledge through the metaphor of the universe's origins and evolution, while the other stream suggests the absurdity in such quests by my imagining of the universe's ultimate destruction. The contrasting goals of these streams is reflected in their respective creative approaches: the former is composed primarily for the acoustic medium, and develops increasingly fixed and ordered musical materials; the latter is improvised exclusively in the electronic medium—namely, an augmented electric guitar that I designed and constructed—and uses a variety of destructive and/or deteriorative signal-processing effects. The separation of fixed/ordered materials in the acoustic medium and improvised/destructive materials in the electronic medium is reflective of my overall creative practice in recent years.

This thesis is divided into two broad sections: an analysis of *an interlude between two nothings*, followed by the score itself. In the analysis, I begin by contextualizing the work within my own creative output as well as the broader repertoire. I then analyze the entire work, beginning with broad considerations such as narrative and formal structure, and then moving to more a more detailed discussion of specific creative approaches in each of the respective streams.

Dedication

For my grandparents: Mary and Ben Mallette, and Doug and Ellen Labadie.

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Chapter 1 – Introduction

> *The life of the universe, like each of our lives, may be a mere interlude between two nothings.*
>
> — Jim Holt, Why Does the World Exist? (Holt 2012, 27)

1.1 – Presentation

an interlude between two nothings is a 35-minute musical work scored for flute, clarinet, violin, cello, piano, fixed electronics, and augmented electric guitar. Through the lens of cosmology, the work juxtaposes rationality with the absurd as a personal reflection on my own creative process and, more broadly, existence as a whole.

The work is divided into six movements: the odd-numbered movements (movements I, III, and V; hereinafter O-N movements) are scored primarily for the acoustic medium. In these movements, I seek to develop a trajectory of increasingly ordered musical materials to represent a search for meaning through rational constructs. In contrast, the even-numbered movements (II, IV, VI; hereinafter E-N movements) are scored exclusively for the electronic medium—specifically, an augmented electric guitar that I designed and constructed. For these movements, I use improvisation and signal processing to represent the absurdity in searches for rational meaning.[1] The effect of alternating regularly between these two streams is that the E-N movements act as an absurdist foil that continually interrupts the more logical and linear progression of the O-N movements.

Both streams use cosmology as a metaphor to achieve their respective goals. The O-N movements draw on scientific theories related to the origins and development of the universe; the emergence of increasingly ordered materials in these movements is meant to

[1] I am using the term "absurd" in the philosophical sense of the word, which "holds that the efforts of humanity to find meaning or rational explanation in the universe ultimately fail (and, hence, are absurd) because no such meaning exists" (New World Encyclopedia 2012). I will provide a more detailed discussion of absurdism in Chapter 3.

evoke the universe's progression from a formless opaque soup to larger and more complex structures, as outlined in the Big Bang theory, as well as the quest for knowledge and meaning that such theories invite. In contrast, the E-N movements draw on theories concerning the ultimate fate of the universe; by my imagining of three different destructions of the universe, these movements are meant to remind us how our eventual fate renders any quest for meaning ultimately absurd.

Beyond the cosmological metaphor, the two interwoven, contrasting streams are also connected to trends in my own artistic practice. My recent output is characterized by two independent streams of activity. The first comprises fixed works written primarily in the acoustic medium that rely heavily on ordered materials—ordered in the sense that they are fixed, fully scored, conventionally notated, and rely heavily on audibly (quasi-) symmetrical and/or (quasi–) systematic processes, techniques, and formal structures. The second comprises an improvisatory practice that uses the electronic medium to explore freer, non-ordered material. The emergence of ordered materials in the O-N movements is intended to reflect the increasing importance of ordered materials in my acoustic works, while the E-N stream is intended to reflect how my improvisatory practice counterpoints and balances those ordered materials. In this respect, *an interlude between two nothings* is a reflection on the relationship between the two streams of my artistic practice, as well as a step toward integrating the two previously independent streams, wherein they coexist and interact (albeit non-simultaneously), thereby allowing for greater depth in my artistic expression.

1.2 – Document Overview

The following document is divided into six chapters. Chapter 2 establishes my aesthetic position by providing some personal background, as well as further details concerning the cosmological metaphor and my aesthetic goals.

Chapter 3 provides some historical context for *an interlude between nothings*. In this chapter, I provide some background for the numerous historical trajectories that intersect in the work: cosmology as metaphor, absurdism, instrument augmentation, improvisation, and temporal dissonance.

Chapter 4 provides details about the larger-scale concerns of *an interlude between two nothings*. These include instrumentation, narrative, large-scale formal structure, score design, and performance considerations.

Chapter 5 comprises the bulk of the document, and explores the materials, methods, and techniques employed in the work as a whole. I discuss the O-N and E-N movements separately. In the former, I pay special attention to how pitch and temporal relationships evolve within each movement, as well as across the movements as a whole. For the latter, I discuss the construction of the augmented electric guitar and the associated software, as well as my particular approach to improvisation and how it fits into the broader context.

Chapter 6, the conclusion, summarizes the ideas presented in this document, and identifies some potential avenues for further exploration.

Chapter 2 – Aesthetic Position

2.1 – Personal Background

Having grown up playing electric guitar, I have always had an affinity for exploring the artistic potential of electronic media. When I began composing concert works for the acoustic medium, it seemed natural to incorporate electronics. Though numerous composers have had success in this realm, I was never quite satisfied with my own results. I felt that my respective visions for the acoustic and electronic medium were somehow at odds with one another, that the electronics had no *raison d'être*, and that the works consequently lacked depth and focus.

In 2009, I co-founded the improvisational duo MUGBAIT with Daniel Brophy. MUGBAIT was a means of exploring our growing interest in a variety of electronic media including instrument augmentation/modification, circuit-bending, hardware hacking, and other forms of DIY electronics. Aesthetically, MUGBAIT reflected our mutual interest in free improvisation as well as aggressive music genres such as extreme metal and noise. The resulting music was unapologetically loud, brash, chaotic, abstract, textural, and abrasive. Somewhat ironically, MUGBAIT also became a vehicle for humour, often using odd and absurdly ill-fitting song titles such as *Highspeed Bearhug*, *Garden Gnome Chomsky*, and *Munich Eunuch*, as well as an unusual recurring character named *The Boohbah*, a hacked plush toy that acted as a darkly comical narrator for several performances.

MUGBAIT became a means to express many of the things I was having difficulty incorporating into my concert works. Having that outlet, I no longer had a strong need or desire to incorporate electronic media into my concert works for the acoustic medium. Consequently, I was able to focus more exclusively on the aspects of the acoustic medium that truly interested me: patterns, subtle variation, gradual change, and complex temporal

relationships. By allowing myself to separate acoustic and electronic media in my practice, I felt that my work in both areas became stronger and more focused.

My creative output in recent years therefore comprises two distinct streams of activity. The first stream is characterized by fixed works for the acoustic medium that focus extensively on the elements mentioned above: patterns, subtle variation, etc. The second stream is characterized by non-fixed (i.e., improvisatory) works for various electronic media that are generally abstract, textural, and sometimes abrasive. *an interlude between two nothings* was born out of the desire to explore further both streams within the context of a unified work, and to contemplate their relationship to one another in shaping my creative process and artistic voice as a whole.

2.2 – Metaphor: Cosmology

I found an apt metaphor in one my growing interests, namely cosmology, which George F. R. Ellis describes as

> the study of the large-scale structure of the Universe…[it] considers the vast domain of galaxies, clusters of galaxies, quasi-stellar objects, etc…examining their nature, distribution, origins, and relation to their larger environment (Ellis 2007, 1183).

Ellis also considers its importance to science as a whole. He writes:

> cosmology is of substantial interest to the whole of the scientific endeavor, for it sets the framework for the rest of science, and indeed for the very existence of observers and scientists. It is unique as the ultimate historical/geographical science (Ellis 2007, 1183–1184).

Ellis goes on to explain that cosmology first gained traction as a discipline after Albert Einstein published his theory of general relativity in 1916, and was furthered by Edwin Hubble's discovery in 1929 that the universe is expanding. Since then, it has transformed into a "mainstream branch of physics" (Ellis 2007, 1184).

Because cosmology seeks to understand the nature of the universe—and, by extension, the nature of our own existence as humans—it is not surprising that cosmology often bleeds into the realm of philosophy. For example, in his book *Why Does the World Exist*, philosopher Jim Holt (2012) traces the question "why is there something rather than nothing?" through the history of science and philosophy, using it as a springboard to explore the philosophical implications of cosmological theories through discussions with several modern thinkers.

At one point, Holt discusses how the emergence of the Big Bang theory[2] shifted the prevailing scientific view of the universe as being infinite (i.e., eternal) to one in which the universe has a finite beginning and ending. In a rather poetic passage (that inspired the title of my work), Holt states:

> the finding that [the universe] came into existence at a finite time in the past…appeared to make a mockery of the idea that it was ontologically self-sufficient. Anything that exists by its own nature, it seems reasonable to assume, must be eternal and imperishable. The universe now looked to be neither of these things. Just as it winked into existence with an initial Big Bang…so too it might wink out of existence in some distant future…The life of the universe, like each of our lives, may be a mere interlude between two nothings (Holt 2012, 27).

Though I do not believe it was explicitly his intent, Holt has identified a fascinating philosophical tension. There is no doubt that science's rational approach to gaining knowledge is responsible for some of the most profound discoveries that have shaped our understanding of our environment, in turn fuelling debates about the most fundamental questions concerning the nature and meaning of existence. At the same time, that the universe may have been completely doomed from the outset renders any rational quest for meaning to be, in a way, completely absurd. The absurdity of the universe is a macrocosm for the absurdity of our own lives; in Jean-Paul Sartre's 1939 short story titled *The Wall*, the main character Pablo Ibbieta, facing his death, exclaims:

[2] The Big Bang theory is the prevailing theory on the origins of the universe. It holds that the universe began as an infinitely small point (a singularity) that then rapidly expanded. I provide more detail in Chapter 5.

> In the state I was in, if someone had come and told me I could go home quietly, that they would leave me my life whole, it would have left me cold: several hours or several years of waiting is all the same when you have lost the illusion of being eternal (Sartre [1948] 2010, 12).

I interpret the tension described above as stemming at least in part from the fact that these two poles—the rational (quest for meaning) and the absurd(ity therein)—seem to be mutually exclusive; as Franz Kafka stated, "[l]ogic may be unshakeable, but it cannot hold out against a human being who wants to live" (Kafka 2009, 164). At least part of the reason for this exclusivity is that, as Neil Cornwell points out, "for most commentators, absurdity is to be equated with nihilism" (Cornwell 2006, 4). If absurdity were truly nihilistic, it would certainly preclude any rational search for existential meaning.

Yet I believe that absurdity is not necessarily nihilistic, and that logic and the absurd can can coexist and balance one another as two sides of the same coin. The quest for meaning brings us to contemplate the profound scale of existence and to see the beauty therein, while the absurd reminds us to not take such things too seriously—to also accept the ephemerality of life and to see beauty in the mundane.

2.3 – Aesthetic Goals

This relationship between rationality and absurdity resonates strongly with my creative process and artistic practice as a whole, as my broad aesthetic goals for each stream (acoustic and electronic) in many ways parallel the rational and the absurd, respectively. I am not so lofty or deluded to believe that my acoustic works inspire the audience to contemplate the meaning of life; rather, one of the primary aesthetic goals of the repetition, variation, formal structures, and temporal relationships that characterize my acoustic works is to somehow translate the sense of awe I experience when contemplating life and the universe. In attempting to achieve this goal, I often draw on highly ordered musical materials—ordered in the sense that they are fixed materials composed of audibly (quasi-) symmetrical and/or (quasi–) systematic processes, techniques, and formal

structures. In contrast, the primary aesthetic goal of my practice in the electronic medium is to create art that, through improvisation, is more immediate, visceral, and ephemeral, with no logical processes or intended specific meanings—in a sense, absurd. Though these two aesthetic goals appear to be at odds with one another, I feel that they counterpoint and balance one another in a symbiotic relationship that characterizes both my creative process and my artistic practice as a whole; in short, an aesthetic nexus that defines who I am as an artist.

The primary aesthetic goals of *an interlude between two nothings*, then, is to explore further my respective approaches to the acoustic and electronic media within the context of a single work, and to express—through the metaphor of cosmology—both the tension and harmony between rationality and the absurd that characterizes each media in my practice as a whole. Virtually every aspect of *an interlude between two nothings*, both macro (overall design) and micro (surface detail), reflects these goals in some capacity.

After a brief historical contextualization, the remaining chapters will be devoted to exploring these aspects more thoroughly.

Chapter 3 – Historical Background

3.1 – Historical Trajectories

an interlude between two nothings represents an intersection between a number of historical trajectories that bear consideration in situating the work within the broader literature and repertoire. Such trajectories include cosmology (as inspiration/metaphor for an artistic work), absurdism, instrument augmentation, improvisation, and temporal dissonance.

3.1.1 – Cosmology (as Inspiration/Metaphor)

The relationship between music and cosmology (and the related field of astronomy) dates back to at least as far as the Pythagoreans, who believed that "the distances between the planets would have the same ratios as produced harmonious sounds in a plucked string" (Calter 1998, n.p.). Each planet would thus produce its own tone, with all of the planets' tones forming a harmony collectively referred to as *Music of the Spheres.* Subsequently, the idea appeared in many influential works, including in Plato's *Republic*, and Johannes Kepler's *Harmonices Mundi* (Calter 1998).

In Western art music, several composers have used astronomy and cosmology as overt inspirations for the creation of artistic works. Andrew Fraknoi (2008) identifies several dozen such works, such as: John Cage's *Atlas Eclipticalis* (1961–62), in which pitches were determined by placing a musical staff on top of a star atlas; or George Crumb's *Makrokosmos* (1972–79), which contains references to a spiral galaxy, Stonehenge, and Corona Borealis; or even Karlheinz Stockhausen's *YLEM* (1972), which depicts the theory of the oscillating universe somewhat literally, going so far as to having the players "expand through the concert hall, just as the universe does, and then return and expand again" (Fraknoi 2008, 4). Other more literal depictions of the universe include percussionist Rick Sacks' *Ten Planets* (2006), in which he overdubs ten improvisations

based on click-tracks whose respective tempi relate proportionally to the orbital periodicities of the planets (Sacks 2007), or Ryoji Ikeda's *Datamatics* (2006) which features an electroacoustic audio track accompanied by three-dimensional visual renderings of the universe based on precise data (Ikeda 2015). These works represent merely a small cross-section of pieces inspired by astronomy and cosmology, and indeed the historical relationship between music and the cosmos is rich and extensive.

3.1.2 – Absurdism

Absurdism as a philosophical perspective is historically connected to existentialism, and "holds that the efforts of humanity to find meaning or rational explanation in the universe ultimately fail (and, hence, are absurd) because no such meaning exists" (New World Encyclopedia 2012, n.p.). Absurdism has its early roots in the writings of the nineteenth century Danish philosopher Søren Kierkegaard, particularly in his works *Fear and Trembling* (1843) and *The Sickness Unto Death* (1849). However, the seminal text on absurdism does not appear until one hundred years later with Albert Camus' 1942 essay titled *The Myth of Sisyphus*. The New World Encyclopedia identifies Camus' position as follows:

> [Camus] defines the human condition as absurd, as the confrontation between man's desire for significance/meaning/clarity and the silent, cold universe. He continues that there are specific human experiences that evoke notions of absurdity. Such a realization or encounter with the absurd leaves the individual with a choice: suicide, a leap of faith, or acceptance. He concludes that acceptance is the only defensible option (New World Encyclopedia 2012, n.p.).

Absurdism has been a central theme in many artistic works, particularly those categorized as Theatre of The Absurd, a term coined by Martin Esslin (1960) to identify tendencies in a number of plays coming out of Paris in the 1950s by playwrights such as Samuel Beckett, Arthur Adamov, and Eugene Ionesco.

> For while the happenings on the stage are absurd, they yet remain recognizable as somehow related to real life with its absurdity, so that

> eventually the spectators are brought face to face with the irrational side of their existence. Thus, the absurd and fantastic goings-on of the Theatre of the Absurd will, in the end, be found to reveal the irrationality of the human condition and the illusion of what we thought was its apparent logical structure (Esslin 1960, 5).

Musical works that draw on the absurd are considerably less prevalent. The word "absurd" is often used in reference to the music of Mauricio Kagel, though a thorough study of the relationship between Kagel and absurdism is lacking—Ian Pace (1997), for example, titles his article "Music of the Absurd? Recent Thoughts on Kagel," though he does not actually draw an explicit connection to the Theatre of the Absurd as the title suggests. Nevertheless, Kagel's works certainly exhibit absurdist qualities, exemplified in his first opera, *Staatstheatre* (1967–70).

> Each of its nine sections involves performers—soloists, chorus members, dancers and players—in a set of actions that subverts the normal performance hierarchy: members of the chorus sing overlapping solos; soloists sing in ensemble; and non-dancers perform a ballet (Atinello 2015; n.p; Kagel).

The term absurd has also been used in conjunction with works by György Ligeti, albeit to a lesser extent. His short musical-theatre pieces, *Aventures* (1962) and *Nouvelle Aventures* (1962–65), for example, are

> [l]ittered with protracted silences during which both performers and audience are directed to remain absolutely still, both *Aventures* have 'meaningless' texts made up of phonemes and fragments of words. The cast are instructed to sing down cardboard tubes while the percussion section have to burst paper bags, rub suitcases with sandpaper, and scrape their feet against the floor (Boyden 2002, 572).

Absurd elements can also be found in the music of La Monte Young, particularly *Compositions 1960*, one of which calls for a performer to feed a bail of hay to a piano (Grimshaw 2011). Likewise, the anti-art works of the fluxus movement from the same era are also ripe with absurdity. To date, however, a thorough discussion of absurdism in relation to music—something like Esslin's look at theatre—seems to be lacking.

I do not want to overstate the relationship between *an interlude between two nothings* and philosophical conceptions of the absurd. Though absurdity is an important concept in *an interlude between two nothings*, the work is not *about* the term as a philosophical stance/perspective, nor is it overly concerned with the various philosophical interpretations or debates. I draw primarily on my own experience and interpretation of the absurd, which is not characterized by the same *malaise* as conventional absurdist discourse. Rather, I see it as an essential counterforce that balances the rationality characteristic of both the scientific method (especially in relation to cosmology), as well as my approach to composing for the acoustic medium.

3.1.3 – Instrument Augmentation

Instrument augmentation emerged roughly twenty-five years ago, as computer processors became powerful enough to process sensor data and audio in real time. Instrument augmentation typically involves attaching to individual instruments various types of electronic sensors designed to capture pressure, light, motion, position, acceleration, physical gestures (either physical or musical), or even biological processes like heart rate, blood pressure, body temperature, and others. The data captured by these sensors is then used to manipulate the sound of the instrument in real time through digital signal processing techniques. Notable augmented instrument projects include the group of hyper-instruments developed at MIT (hyper-cello, hyper-viola, hyper-violin) (Machover 1992), the augmented violin developed at IRCAM (Bevilacqua et al. 2006), Peter Beyls' IR violin (Chadabe 1997), Curtis Bahn's SBass (Bahn and Trueman 2001), Johnathan Impett and Bert Bongers' meta-trumpet (Impett 1994), and Palacio-Quintin's Hyper-Flute (Palacio-Quintin 2003), among many others.

The electric guitar poses a particularly interesting case in the realm of instrument augmentation; in contrast to the instruments mentioned above, it is *already* an augmented instrument, in a sense. The advent of the electric guitar in the first half of the twentieth

century[3] was brought on by a very basic problem: how to increase the volume of the acoustic guitar (Millard 2004). The integration of an electromagnetic pickup as a means to address this issue, though relatively simple, exemplifies the basic desire of instrument augmentation—integrating electronic components into an existing instrument to increase its functionality. Born out of this spirit of technological experimentation, the electric guitar has subsequently had a close relationship with technology, providing fertile ground for technological innovation. As Otso Lähdeoja observes:

> [t]he electric guitar incorporates key electronic live music issues in itself, such as signal processing, amplification, interface and control. Moreover, this "live electronic" praxis is, and has been, widely shared, tested, and discussed by a worldwide community of users, in a wide variety of musical styles and expressions. With all its effects, pedals, amplifiers, and more recently computers, the electric guitar stands out as a pioneer instrument in the area of acoustic–electronic hybridation (Lähdeoja 2008, 53).

Recent guitar projects include the mobile augmented guitar project developed at McGill University (Bouillot et al. 2008), as well as Lähdeoja's own augmented guitar, which was developed at the Centre de recherche Informatique et Création Musicale (CICM) in Paris (Lähdeoja 2008). Guitar augmentation has bled into the commercial realm with products such as Guitar Wing, made by Livid Instruments, a wireless control surface designed to fit onto any standard electric guitar (Livid Instruments 2015), and Robocaster, an off-the-shelf augmented electric guitar co-designed by Visionary Instruments and experimental pop/rock artist Moldover (Visionary Instruments 2015).

3.1.4 – Improvisation

Musical improvisation, or, as George Lewis puts it, "real-time forms of musicality" (Lewis 1996, 91), is so ubiquitous, diverse, and pan-cultural that it is nearly impossible to summarize in a few paragraphs. Indeed, As Bruno Nettl points out, scholars have "come to realize that what they call improvisation consists of so many clearly discreet phenomena and processes that it may not make sense to discuss them as a single

[3] For a more comprehensive history of the electric guitar, see André Millard's excellent book *The Electric Guitar: A History of an American Icon* (Millard 2004).

category"—so much so that "one might consider a conception of the musical universe in which what we now call 'improvisation' is the overarching category of musical creation, with precomposition one important subdivision" (Nettl 2015, n.p.). The subtext for Nettls' comments about "precomposition" (i.e., pre-conceived, notated works) is that in Western art music, improvisation is often conceptualized as a subset of composition, or as a tool to be incorporated into a composer's practice. This attitude is expressed by Philip Alperson when he states that "we can think of the activity of improvisation as a species of composition, a conception which we find implicit in definitions such as this: 'Improvise *v.t.* to compose (verse, music, etc.) on the spur of the moment'" (Alperson 1984; definition quoted from Random House Dictionary 1967, 717). This contrasts attitudes in other cultures such as "the Middle East and North India," for which "the improvised portions of a performance carry the most prestige," according to Nettl (2015, n.p.).

Part of the reason for improvisation being conceived of as subordinate to (pre)composition is that improvisation was virtually nonexistent in Western art music between the late-eighteenth and mid-twentieth centuries—approximately 150 years. This marked a period of "great emotional exactitude" (Griffiths 2015, n.p.) wherein composers generally favoured fixed works based on conventional notation, with a few notable exceptions such as figured bass, improvised cadenzas, and the somewhat obscure French school of Organ improvisers (Lewis 1996). It was not until the 1950s that improvisation experienced a renaissance in Western art music, largely spearheaded by the mutual influences of jazz and composers such as John Cage (Lewis 1996).[4] In the time since the 1950s, improvisation has become an increasingly accepted practice in Western art music,

[4] George Lewis (1996) argues convincingly that Western art music composers and commentators tried to downplay the influence of improvisation from jazz, stemming from the desire to distance themselves from the "epistemological other," or what he dubs the "Afrological" perspective (as opposed to the "Eurological" perspective). Though he does not deny the historical significance of the Eurological perspective, as exemplified by John Cage, he is highly critical of texts such as Michael Nyman's (1974) and David Cope's (1993), which he interprets as "simplistically racialized taxonomies" (Lewis 1996, 110). Though my improvisatory practice stems primarily from the European tradition of "free" improvisation (such as that practiced by the British group AMM), I do not deny the influence of jazz improvisation; indeed the desire for a highly personalized expression that characterizes the Afrological perspective as outlined by Lewis resonates with my own practice.

to the extent that numerous texts have attempted to explore it from a variety of practical, educational, aesthetic, and philosophical perspectives (Alperson 1984; Bailey 1980; Belgrad 1997; Berliner 1994; Borgo 2005; Cardew 1971; Day 1998; Dean 1992; Lewis 1996; Nettl and Russell 1998; Nettl and Solis 2009; Nunn 1998; Peters 2009; among others). More telling is the number of performing artists for whom improvisation is one of (if not, *the*) primary means of expression—this includes groups such as AMM, The Art Ensemble of Chicago, the Association for the Advancement of Creative Musicians (AACM), and Musica Elletronica Viva (MEV), as well as (relatively) high-profile individuals such as Laurie Anderson, Anthony Braxton, Shelley Hirsch, David Moss, Ikue Mori, Pauline Oliveros, Zeena Parkins, Terry Riley, Jim Staley, La Monte Young, John Zorn, and countless others. In terms of the guitar, improvisation is crucial in the creative practices of Derek Bailey, Eugene Chadbourne, Nels Cline, Fred Frith, Arto Lindsay, Thurston Moore, Stephen O'Malley, Elliot Sharp, and Hans Tammen. Though many of these artists may regard themselves as composers, most would not consider improvisation as a means to an end (i.e., a subservient tool to be incorporated into their overarching compositional practice), but rather an end unto itself.

3.1.5 – Temporal Dissonance

Temporal dissonance[5] has been a feature of Western art music for several centuries. Harald Krebs (1987, 1997, 1999), for example, has shown how temporal dissonance—specifically, metrical dissonance—was a feature of common-practice music, and Schumann in particular. Drawing on Krebs' ideas, different authors have explored metrical dissonance in other common-practice composers such as Mozart (Cohn 1992a), Haydn (Grave 1995), Beethoven (Cohn 1992b), Chopin (Dodson 2009), Brahms (McClelland 2006), and German lied in general (Malin 2006).

[5] I define temporal dissonance as two or more simultaneous temporal layers that are non-integer multiples of one another. This includes polyrhythm, polymeter, and polytempo, though there is some degree of overlap between the three. This definition is not universally accepted—Conlon Nancarrow, for example, considers only polytempo to be temporally dissonant (Thomas 2000/2001).

However, whereas common-practice composers worked primarily within the realm of pitch relationships and harmonic progression (with temporal dissonance being a secondary feature), the twentieth century saw the development of music in which temporal dissonance is one of the primary and defining characteristics of the music. One notable example is Steve Reich, who said of his music: “that ambiguity as to whether you're in duple or triple time, is, in fact, the rhythmic life-blood of much of my music. In this way, one's listening mind can shift back and forth within the musical fabric, because the fabric encourages that" (Reich 1985, n.p.). Additionally, whereas metrically dissonant layers in common-practice music typically shared a common pulse, the twentieth century saw the rise of more complex temporal dissonance, such as multiple tempi (Thomas 2000/2001). Temporal dissonance characterizes the music of many composers from the twentieth century, including Reich, John Adams, Elliott Carter, Henry Cowell, Philip Glass, Charles Ives, David Lang, György Ligeti, Meredith Monk, Conlon Nancarrow, Julia Wolfe, and many others. Outside of Western art music, temporal dissonance is an important feature in progressive rock/metal, having been used extensively by bands such as Rush, Yes, King Crimson, Tool (Hegarty 2011), and Meshuggah (Pieslak 2007), among others, and in electronic dance music as well (Butler 2001). It is perhaps not surprising that temporal dissonance has become such a popular area of exploration considering, as Nancarrow stated, that “time is the last frontier of music” (Garland 1982, 185).

3.2 – Original Contribution

an interlude between two nothings marks a significant contribution to the contemporary music repertoire. Within each creative trajectory, I am building on a tradition I have inherited from artists and theorists, while adding my own artistic voice to the tapestry. Additionally, I do not know of any existing works that incorporate all of these trajectories into an aesthetically unified work. The uniqueness of *an interlude between two nothing* thus lies not only in its contribution to each trajectory, but also within its overall breadth

of creative practices. For me, it is representative of my eclectic interests and influences, and how they interact to form my unique voice as an artist.

Certain trajectories have received less attention among artists and/or theorists. Considering the historical relationship between the guitar and electronics, for example, there have been a surprisingly small number of augmented guitar projects, and virtually none that are featured prominently within a broader concert work.[6] Also, while complex temporal dissonance has become an increasingly common feature of Western music, especially in the latter half of the twentieth century, it has still received relatively little attention compared to pitch relationships. My hope is that *an interlude between two nothings* will contribute toward further artistic and theoretical explorations within these areas.

[6] Many concert works do incorporate a standard electric guitar; I am referring here specifically to the lack of concert works that incorporate an *augmented* electric guitar.

Chapter 4 – Macro: Large-Scale Considerations

4.1 – Instrumentation, Narrative, and Overall Formal Structure

an interlude between two nothings is composed of six movements. However, the odd-numbered (O-N) movements are wholly different in character from the even-numbered (E-N) movements. The O-N movements are written primarily for the acoustic medium (with the exception of the first movement, the reasons for which I will address later): the first movement is written for flute, clarinet, violin, cello, piano, and a fixed electronic track diffused through loudspeakers on stage; the third movement is written for the same instrumentation, minus the fixed electronics; and the fifth movement is written for solo piano.

Each of these three movements corresponds to a different broad cosmological era: the very early universe, particle formation, and the formation of larger structures, respectively. The very early universe includes the moments immediately following the Big Bang, which was characterized by a period of rapid expansion, intense heat, and a formless opacity (i.e., lacking discrete structures). The second era includes the formation of elementary particles, which were some of the earliest discrete structures to appear in the universe, and upon which all other matter was built. The third era includes the formation of larger structures such as planets, stars, and galaxies. In this respect, the overall trajectory of the three movements can be interpreted as a large-scale gesture from formlessness to increasingly large and complex structures, paralleling the evolution of the universe itself. They are intended to evoke a search for rationality and meaning through the emergence and development of increasingly ordered musical materials.

The E-N movements, on the other hand, contrast the O-N movements in several respects. In terms of instrumentation, these movements are to be performed exclusively in the electronic medium—specifically, an augmented electric guitar that I have designed and constructed. In contrast to the search for rationality that characterizes the O-N

movements, each of the E-N movements attempts to suggest the absurd by loosely depicting an imagined destruction of the universe. I accomplish this through improvisation, and intentionally avoiding any semblance of ordered materials such as overt meter, strong pitch/rhythmic relationships, or systematic processes. I also use signal processing effects that have destructive or deteriorative quality, as well as a certain amount of unpredictability built in, which contrasts the desire for stricter control in the O-N movements.

In terms of narrative, *an interlude between two nothings* can thus be interpreted as two separate streams intertwined. The O-N movements are inspired by the origins and evolution of the universe, and attempt to evoke its transition from an early formlessness to progressively large and more complex structures. In contrast, the E-N movements convey my own imagined deaths of the universe; through digital signal processing and improvisation, each of these movements seeks to deliberately avoid any semblance of structure as a kind of absurdist foil that keeps interrupting the more linear trajectory of the O-N movements. Symbolically, the O-N movements seek to evoke a sense of awe and curiosity about the universe, while the E-N movements seek to remind us of its ultimate fate. This also serves as a personal reflection on finding balance in my own artistic practice between deliberately constructed materials versus those that are freer and more ephemeral.

The only anomaly in this narrative lies within the first movement. Though I have positioned it as part of the O-N stream, it in fact uses both the acoustic and electronic medium, and employs improvised materials. The reason for using including the electronic medium in the first movement is to reinforce the sound of the acoustic ensemble, which helps to convey the sense of raw power that characterized the very early universe. Additionally, the precise materials of the electronic track—which consists primarily of relatively unchanging, highly distorted soundfiles—serve to evoke the formlessness (i.e., opacity or lacking discrete structures) that also characterized the very early universe. The semi-improvised materials in the acoustic instruments are meant to work with the

electronic track to create a textural opacity, thereby further evoking a sense of formlessness. Despite the potential confusion, I feel that the opening movement is still firmly situated in O-N stream for several reasons. Although it uses the electronic medium, the electronic track makes use of sounds very different in character from those of the augmented guitar, and is diffused through different loudspeakers in a separate area of the stage. Similarly, the improvised materials in the acoustic instruments are very different than those of the E-N movements, as they are more strictly controlled. Finally, the instrumental similarity between the opening movement and the following O-N movement (i.e., movement III, which is the same instrumentation minus the electronic track) serves to further establish the opening movement as belonging to the O-N stream.

4.2 – Score Design

For the most part, *an interlude between two nothings* uses standard notation. I employ a few extended techniques, for which I either draw on established notations or devise my own, both of which are outlined clearly in the performances notes. The only notable deviation from standard notation is in the first movement, owing to its use of improvisation. Similar to Louie Andriessen's *Workers Union*, it uses a central line that represents the middle of the register, with performers choosing individual pitches. Instead of precise rhythms, however, it uses a box notation whereby the performers improvise using the contents of the box for the duration of the solid horizontal line. It also uses a time grid in lieu of a tempo. For the electronic part, I provide an image of the soundfile's waveform to illustrate its general profile in relation to the time grid, as well as a prose description of the types of sounds used.

Decisions about formatting, size, and layout were made with ease of performance in mind. This is especially true of the fifth movement, for solo piano, titled *Formations II*. Because of the nature of the movement, which combines several layers of temporally dissonant material, it would have made sense conceptually to use three or even four staves in many of the systems. At the very least it would be have clearer for score analysis. However, in

consultation with Dr. Sandra Joy Friesen—for whom *Formations II* was written—I decided to use only two staves. Although the individual layers are less clear at first glance, it provided the advantage of fewer page turns, and, more importantly for Dr. Friesen, less distance for her eyes to travel on large leaps, of which there are many.

One notable omission from the score is any notation or directions for the E-N movements. Originally, I had intended the E-N movements to be semi-fixed, using a specially devised notation system that provided details about the type of effects used and how they progress through a given movement. However, I came to find this approach at odds with my vision for these movements, primarily because the augmentations to the electric guitar are intended to be tools for free improvisation. I also found that composing these movements went against my aesthetic goals for the work as a whole, since I wanted to use improvisation as a counterpoint to the more devised O-N movements. I therefore opted to include only the titles and duration of the E-N movements in the final score. I considered including prosaic descriptions of each movement within the score; however, because the sound of the augmented guitar and the style of improvisation are highly personal and idiosyncratic, I intend be the sole performer of these movements, and do not wish for anyone else to re-create them. Though this may seem counterproductive for securing future performances, I would compromise where necessarily with audio or video recordings that I would prepare for a given performance. Additionally, I anticipate that the augmented guitar will evolve over time, and want to allow room for the E-N movements to evolve alongside it. For all of these reasons, I felt that an overall description in the performance notes would be more appropriate than any notation or description in the score itself. For the purposes of this document, I have included video examples of the E-N movements, which I will explore in more depth in the next chapter.

4.3 – Performance Considerations

Despite the aesthetic separation between the O-N and E-N movements, the entire work is intended to unfold seamlessly, without breaks between any of the six movements. The

transitions between movements should dovetail smoothly, with the last instrument(s) to play in a given movement allowing their sound to ring out for five-to-ten seconds into the following movement. Where possible, lighting cues can be used to help visually separate the movements by lighting only the performers that play in any given movement.

Although the work is conceived as a whole, movements three (*formations I*) and five (*formations II*) were written for a specific ensemble and individual, respectively: Ensemble Paramirabo and Dr. Sandra Joy Friesen. As such, I designed these movements to work as standalone pieces, and they can therefore be extracted and performed separately. In this case, the juxtaposition between the rational and the absurd that lies at the centre of *an interlude between two nothings* is sacrificed. This is a willing compromise made in order to encourage future performances of these two movements, which comprise the most substantial portion of the entire work (approximately 25 minutes combined).

Figure 1 illustrates the suggested staging for *an interlude between two nothings*.

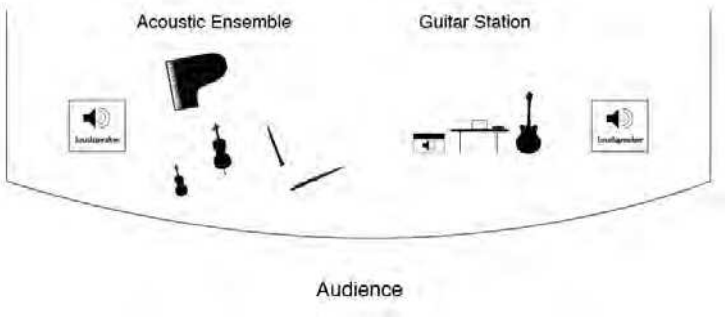


Figure 1 – suggested staging

I wrote the work with the traditional proscenium concert hall in mind (i.e., performers on a stage in front of an audience). Special care should be taken to visually separate the acoustic ensemble from the augmented guitar station—which consists of an amplifier and small table for a laptop—to highlight the separation between the O-N and E-N movements. Two loudspeakers should be placed on either side of the stage to diffuse the electroacoustic part in the opening movement. If I am performing, I will operate and cue

the electroacoustic part; otherwise, an offstage operator will need to fulfill that role. The acoustic ensemble should be positioned in the conventional piano quintet arrangement—ensembles may modify this depending on their preference, so long as the separation between acoustic ensemble and guitar station is maintained. If it is not disruptive to do so, the flute, clarinet, violin, and cello players may leave the stage (or move to the side) after the third movement so that the audience can have a clearer view of the pianist in the fifth movement.

Having considered the large-scale aspects of the work, I now turn to the materials and methods used in the individual movement

Chapter 5 – Micro: Materials and Methods/Techniques

5.1 – Stream I: O-N Movements (I, III, V)

In 1929, Edwin Hubble first discovered that the universe was expanding. Previously, the universe was thought to be infinite and static, even by such esteemed scientists as Albert Einstein. Hubble's discovery had a serious implication; the universe as we know it may not have always existed. By reversing the clock, scientists concluded that at some point (roughly thirteen billion years ago, as it turns out), the universe must have begun as an infinitely small point—a singularity. It then rapidly expanded and cooled, forming increasingly complex and intricate structures, eventually transforming into the modern universe (Robbins 2006). This cosmological model, coined by Fred Hoyle as the Big Bang theory (Mitton 2011), has since been adopted as the prevailing model in the scientific community.

As mentioned previously, the aim of the O-N movements is to draw on the metaphor of the universe's evolution to evoke a search for rationality and meaning. This is accomplished through the emergence and development of increasingly ordered musical materials. Virtually every aspect of the O-N movements in some way reflects this aesthetic goal. In general, materials and methods/techniques become audibly more fixed and ordered as the three movements progress, as well as within individual movements themselves. To illustrate my point, I will analyze each movement separately, paying special attention to pitch relationships, rhythm/temporality, and formal structure.

5.1.1 – I: *inflation*

The first movement, titled *inflation,* is inspired by the earliest known moments in our universe's history. The intense heat during this era was such that even subatomic particles could not form. The early universe was thus hot, opaque, and "formless" in the sense that it lacked any discrete structures save for a few quantum fluctuations. As the universe

continued expanding it began to cool, which would eventually lead to the formation of elementary particles (Robbins 2006). My goal for *inflation* is to evoke the early universe, focusing particularly on the formlessness and intense power that characterized this era, as well as the transitional period of cooling that set the stages for later structures to develop.

In terms of formal structure, *inflation* is divided into two sections. The first 30 seconds are intended to evoke formlessness and power, while the latter 60 seconds evokes the transitional cooling period. Figure 2 illustrates the first section.

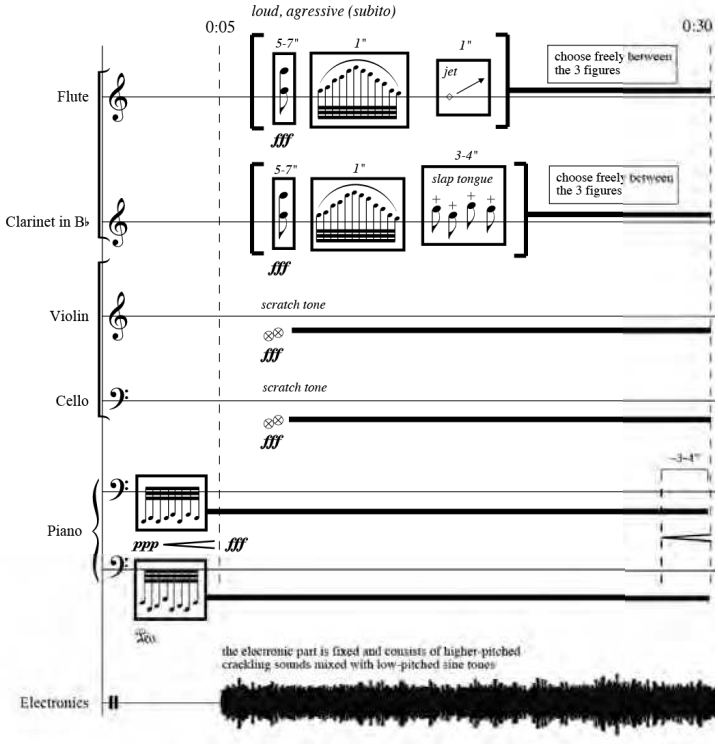


Figure 2 – *inflation*, 0:00–0:30

Conveying formlessness is largely dependent on the treatment of pitch and rhythm. In terms of pitch, I deliberately avoid any overt sense of a tonality or logically devised pitch relationships, which is accomplished in two ways. First, I employ aleatoric techniques whereby performers choose the individual pitches, and are given only broad contours and registral guidelines. Individual pitches will therefore differ for each performance. This

contrasts the later O-N movements, in which nearly all pitches are fixed and pitch relationships/quasi-tonalities begin to emerge. Second, I create textures that obfuscate any sense of strong individual pitches. For example, the strings generate a "scratch tone" by over-pressing the bow—a noise-based sound that occupies a wide range on the frequency spectrum rather than any one precise frequency. The piano plays many close-proximity pitches in its lowest register while fully depressing the sustain pedal, the effect of which is a "muddy" texture with no individual pitches asserting themselves. The clarinet and flute use multiphonics, rapid flourishes, and extended techniques (jet whistle and slap tongue). Although these techniques have a stronger sense of individual pitches than the other parts, they are not so strong as to establish any sense of broader pitch relationships or tonality, especially within the context of the larger texture.

In terms of rhythm, the first section comprises homogeneous (consistent) rhythms that lack any strong sense of localized pulse(s). Similar to my approach with pitch, this contrasts later O-N movements in which several pulses with increasingly complex relationships to one another begin to emerge and develop. Most of the parts in *inflation* are demonstrative of this rhythmically homogeneous approach. These may be dense, rapid figurations as employed in the piano part, or long, sustained tones as employed in the string parts. The only exception to this homogeneity lies within the flute and clarinet parts, which choose freely between three contrasting figures, each with an approximate duration. These are intended to suggest the random quantum fluctuations of the early universe. The figures themselves are relatively short and do not have any strong sense of pulse; in this respect, they do not compromise the overall lack of pulse in *inflation*, especially when contrasted against the strong sense of pulse and complex durational relationships that characterize the later O-N movements.

The electronic part parallels the acoustic ensemble in that it comprises a dense, abrasive, and homogeneous texture that lacks any strong sense of individual pitches or localized pulse. Specifically, it is composed of two distinct layers: high-pitched "crackling" noises derived from soundfiles that are sped up and put through a high-pass filter; and a low-

pitched sine-tone cluster composed of twelve individual sine tones with randomly generated frequencies within 20-100 hertz. The beat-patterns that arise from the differences in frequency between the sine tones do create a subtle pulse, but this is masked by the other sounds in the electronic part as well as the acoustic ensemble.

The second element I aim to convey in the first section of *inflation* is the sense of intense power that characterized the early universe, which I achieve quite simply through sheer amplitude. The electronic part is intended to be played quite loudly, and the acoustic parts are all marked with a *fff* dynamic. The overall amplitude is thus very loud, to the point where it should be nearly uncomfortable for an audience.

The second section of *inflation* is intended to evoke the period of cooling that immediately followed the Big Bang. This is accomplished by gradually eliminating the density, abrasiveness, and amplitude that characterized the first section, eventually fading out the acoustic ensemble completely, leaving only the electronic part. Figure 3 illustrates the score for the second section.

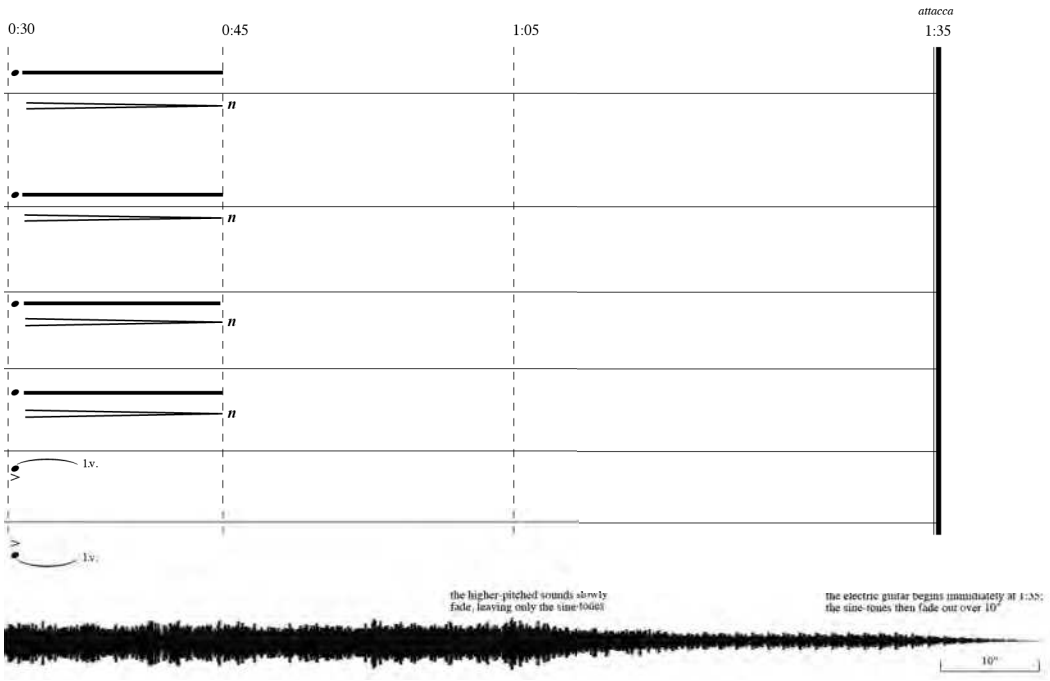


Figure 3 – *inflation*, 0:30–1:35

At the 0:30 mark, the flute and clarinet abandon their quasi-improvised figures and move to individual pitches. Likewise, the violin and cello move away from the scratch tone into individual pitches. All four instruments then decrescendo to *niente* over the next 15 seconds. Simultaneously, the piano stops playing the fast figures in the low register, but allows the sound to decay naturally by continuing to hold the sustain pedal. By the 0:45 mark, the acoustic ensemble has completely receded, save perhaps for some lingering sound from the piano. At the 1:05 mark, the remaining electronic track also begins to recede as the crackling sounds fade out, leaving only the sine-tone clusters for the remaining 20-25 seconds of the movement. At this point, the subtle pulse arising from the beat-patterns in the sine tones that was previously masked is now audible. This is the first instance of a pulse (albeit gentle), vaguely foreshadowing the development of more complex pulse relationships in the remaining O-N movements.

The cumulative effect of *inflation* with respect to the materials and methods described is an overall texture that is quasi-random yet homogeneous, moving from loud, dense, abrasive, and powerful to calmer and more introspective. This is intended to evoke the earliest moments of the universe, which was characterized by an extremely intense energy and lack of discrete structures, eventually cooling down and setting the stage for larger structures to form and evolve. By avoiding any strong sense of ordered musical materials (with perhaps the exception of the subtle pulse toward the end), *inflation* is intended to provide a contrast against which such materials emerge and develop in the remaining O-N movements. In other words, by creating a texture devoid of any ordered materials, the gradual emergence of such materials in later movements becomes more audible, further highlighting the search for rationality as described earlier.

5.1.2 – III: *formations I*

The third movement (second of the O-N movements), *formations I*, is inspired by the era immediately following the early universe. During this era, the universe expanded and cooled sufficiently enough that the smallest known subatomic particles such as quarks,

leptons, bosons, and electrons—called elementary particles—could begin to form. As the universe continued to expand and cool, these elementary particles combined to form increasingly larger particles such as protons and neutrons, atomic nuclei, and eventually atoms themselves (Robbins 2006).[7]

For their part, elementary particles certainly seem to comprise the basic building blocks of all matter, and their formation made it possible for more complex structures to develop, including life itself. My goal in *formations I* is to evoke this era of structural formation by introducing and developing more logical threads of musical materials. This occurs on multiple levels: each of the five broad sections progresses in an audibly similar fashion, creating a sense of repetition at the formal level; simultaneously, materials become increasingly ordered across the movement as a whole, particularly with respect to pitch and rhythmic relationships.

As mentioned above, *formations I* is divided into five sections, labeled in the score as 1st formation, 2nd formation, etc. Each formation features one of the instruments more prominently, with each of the five instruments being featured once. Table 1 outlines this overall formal structure.

Section	**Measure Range**	**Feat. Instrument**	**Approx. Duration**
1st formation	mm. 1–25	cello	1'45"
2nd formation	mm. 26–58	violin	2'20"
3rd formation	mm. 59–82	piano	1'40"
4th formation	mm. 83–102	clarinet	1'30"
5th formation	mm. 103–132	flute	2'10"

Table 1 – *formations I*, overall formal structure

[7] This is a highly simplified history of particle formation. In reality, the process was considerably more complex (see Robbins 2006 for more detail). Additionally, this description provides a snapshot of our current understanding; particle physics comprises a vibrant area of research and its theories are continually evolving based on new evidence.

From this table, it is already apparent that *formations I* progresses more logically than *inflation* in that it moves through each of the five instruments in a clear and systematic way. Additionally, each of the five sections possesses a similar internal structure. The featured instrument plays several melodic phrases, with parts of those phrases highlighted by the other instruments in various ways. Over the course of any given formation, the phrases become increasingly complex in terms of pitch, rhythm, register, density of notes, and, by extension, technical difficulty for the performer. This is intended to mirror the growing complexity of the earliest particles as they formed and evolved. I also adopt an increasingly systematic approach across the movement as a whole; specifically, the earlier formations draw more heavily on indeterminate and intuitive compositional techniques, while the later formations introduce more systematic techniques such as canon and isorhythm.

What follows is a more in-depth analysis of each formation, paying special attention to the development of complexity within the formations, as well as the development of increasingly ordered materials across the entire movement.

The first formation features the cello, though heavily shadowed by the piano. The formation is composed of four separate melodic phrases. Figure 4 shows the first phrase.

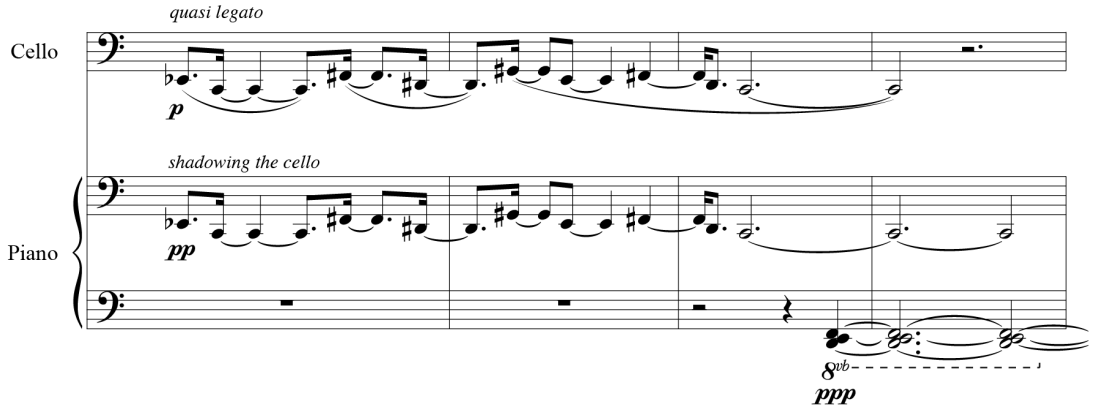


Figure 4 – *formations I*, mm. 1–4

A significant aspect of this excerpt is the basic structure of the phrase: a short melody in the cello (shadowed by the piano), followed by a brief rest in the cello and a low cluster in the piano. Broadly speaking, this motive of activity followed by a brief rest or calm in fact permeates the entire movement. My goal in using this motive is to provide a stable base on which to develop increasingly complex materials—a point of reference against which one can hear such development more clearly. It creates a sense of repetition and expectation, drawing stronger attention to change occurring in the realm of pitch, register, duration, and orchestration, which is quite apparent by the third phrase (figure 5).

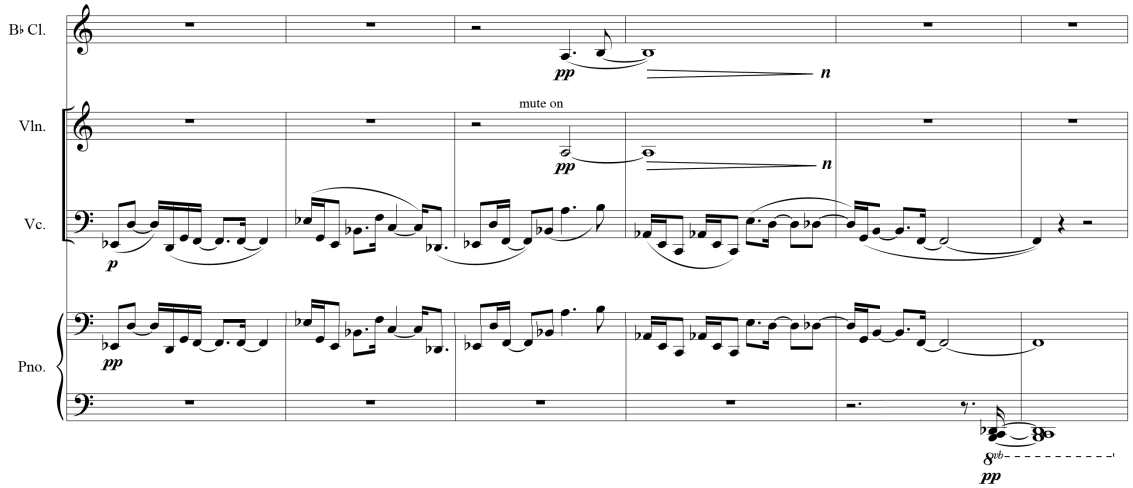


Figure 5 – *formations I*, mm. 10–15

Visible in this excerpt is an increase in the number of different pitches, as well as the significantly wider register that they cover. The rhythmic profile is also denser, with a noticeable increase in the number of shorter note values (i.e., sixteenth and eighth notes). Additionally, the clarinet and violin make their first appearance, highlighting the largest leap in this third cello phrase. The increase in complexity between the first and third phrases is clear; that it happens relatively quickly makes this development quite audible to the listener.

The actual materials for the first formation were generated using a quasi-random technique. Specifically, I created a program in Max[8] that randomly generates a melody based on collection of pitches and durations provided by the user (see appendix A for details). I say this technique is quasi-random since there is still a measure of choice involved. However, I tried to highlight the random aspects of the process by choosing melodies that lack any sense of tonal centre and did not articulate every downbeat. In other words, I chose melodies that have a random quality to their sound. In doing so, I am attempting to provide contrast against which systematic techniques in the latter formations can audibly emerge—a counterpoint that serves to highlight their emergence. In spite of the randomness, however, the introduction of strongly identifiable individual pitches as well as an implicit pulse gives the first formation an overall sound that is more logically structured than *inflation*. In this respect, the first formation still fits within the broader trajectory of the O-N movements, and in some ways provides an apt transition between *inflation* and the remaining O-N movements. This is supported by the first formation occurring in the low range of both instruments and the fully depressed sustain pedal in the piano, which combine to create a somewhat opaque texture reminiscent of *inflation*.

Measures 19–25 (figure 6) marks the transition between the first and second formations.

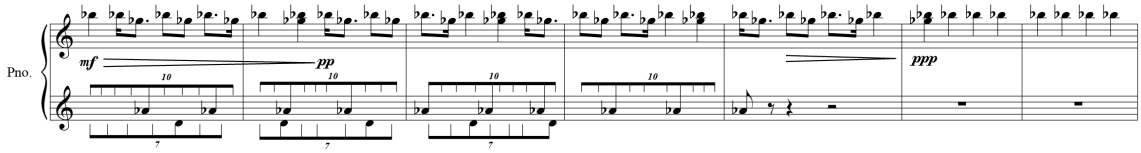


Figure 6 – *formations I*, mm. 19–25, piano

[8] Max/MSP/Jitter (commonly referred to simply as Max) is a graphical programming environment developed by Miller Puckette and David Zicarelli in the mid-1980s (www.cycling74.com), whereby "objects" with various functionalities are connected via virtual patch cables. Max provides extremely powerful control over both data and audio. I will discuss Max again a bit later, as I used it to write most of the software for the augmented guitar.

This is a significant moment, as it comprises the first instance of what Maury Yeston would term *strata*. For Yeston, as articulated in his book *The Stratification of Musical Rhythm*, a stratum, or level of motion, occurs when like events "recur at equal intervals of time" (Yeston 1976, 38). Types of events that can define a stratum are attack-points, timbre, dynamics, density, and pattern recurrence. In figure 6, the strata are defined by attack points in the piano. There are four such strata, the periodicities of which are non-integer multiples of one another. Under Yeston's definition, the strata are thus *rhythmically dissonant*, though I will use the broader term *temporally dissonant* since Yeston was concerned with fairly specific ideas around meter. The use of temporally dissonant strata (hereinafter TDS) is one of the most important and defining features of O-N movements (particularly the fifth movement) and their emergence and development comprises one of the most audible in terms of increasingly ordered materials. As such, I will identify TDS frequently as I move through the analysis.

Over the next five measures, all but one of the strata gradually recede, giving the effect of a quarter-note pulse emerging from the more complex rhythmic texture. This is meant to depict loosely many particles coalescing into a single atom. After the transition, the second formation begins at measure 25, featuring the violin. Figure 7 shows the first three phrases of the formation.

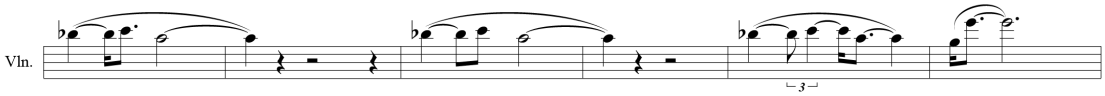


Figure 7 – *formations I*, mm. 26–31, violin

This excerpt demonstrates how the activity/calm motive described earlier is maintained, albeit with much shorter phrase lengths. The theme of increasing complexity reappears subtly by the third phrase with the addition of a tuplet and two pitches. The formation progresses in a similar fashion, each time beginning with the same three pitches and each time adding additional pitches with more complex rhythms—the only exception being

the fourth phrase, which reverts back to the original three pitches. However, by the seventh and final phrase, the melody has transformed drastically (figure 8).

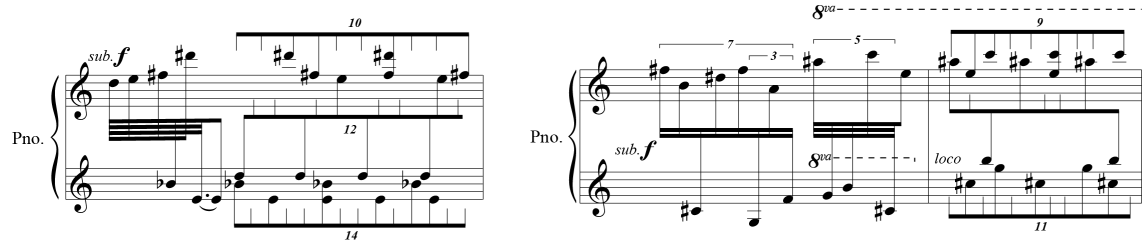
Figure 8 – *formations I*, mm. 51–57, violin

The original two-measure phrase has been transformed into a seven-measure phrase, adding numerous pitches, an accelerating/decelerating figure, several tuplets, and an expanded register. As with the first formation, the increase in complexity happening over a relatively short period of time makes the transformation quite striking.
However, unlike the first formation, the second formation does not rely on quasi-random processes. In fact, to contrast the randomness of the opening formation, each phrase begins with the pitches B♭, A, and C, thereby marking the first instance of melodic repetition. In order to maintain some level of unpredictability, the rhythm of these three pitches is deliberately and intuitively altered for each iteration.

The material following the initial three pitches in each phrase is generally through-composed. Yet, in keeping with the overall O-N trajectory, I sought to create musical materials that sounded less random than the first formation. This is accomplished in a few different ways. For one, each of the phrases ends in a similar fashion, tending toward upward motion and landing on a relatively high pitch. Additionally, I draw mostly on stepwise or smaller-interval motion that contrasts the more angular, quasi-random motion of the first formation. Finally, I make oblique reference to previous material; for example, measure 54 is composed of the A, B♭, and C found at the beginning of each phrase, though altered with an accelerating/decelerating gesture.

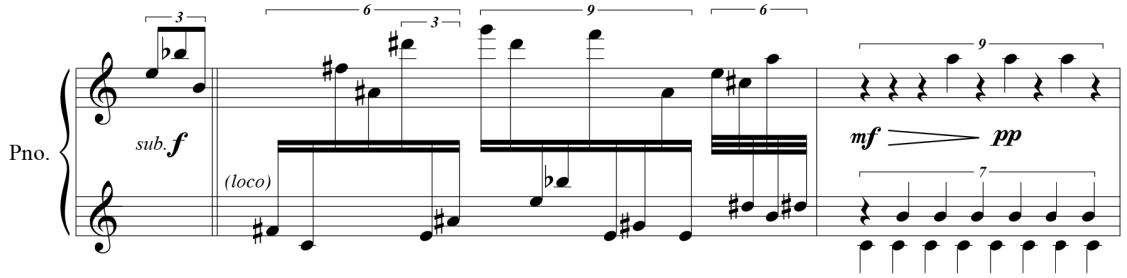
The third formation begins at measure 59 and features the piano. The formation is composed of four phrases; these are based on the transition between the first and second formations, in that each phrase features a short TDS that recedes to a single stratum of

repeated notes (with the exception of the third phrase, which, for the purposes of variation, is interrupted by the fourth phrase before it has a chance to recede). In this way, the phrases continue the activity/calm motive from the first two formations. In contrast to the transition, each phrase leads with a broad gesture that then moves into the TDS. Figures 9a–d illustrate the opening gesture and the first measure of the TDS for each phrase.

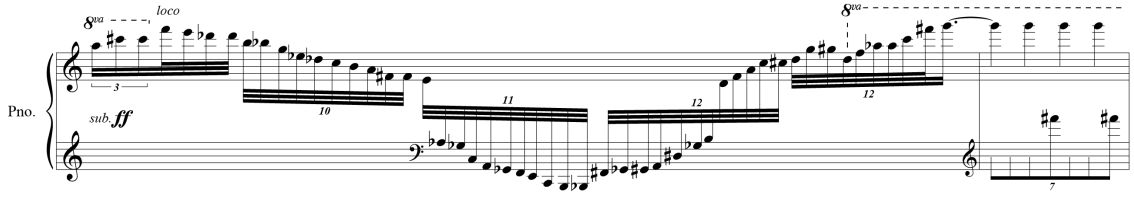


a) mm. 59

b) mm. 65–66



c) mm. 73–74



d) mm. 75–76

Figures 9a–d – *formations I*, third formation, phrases—initial gestures and TDS

As evident from these examples, the initial gesture becomes the vehicle for increasing complexity in this formation. Each gesture is slightly longer than the previous, contains more pitches/attacks, and has more rhythmic variety. By the fourth phrase, the gesture is quite dramatic; the fast tuplets played fortissimo across a large range with a fully depressed sustain pedal make this one of the fastest, loudest, and most dramatic moments in the entire movement.

Similar to the second formation, the third formation relies on pitch repetition to give the impression of increasingly logical materials. In this case, the pitch repetition happens in the latter portion of each phrase, as the TDS are composed of pitches from the initial gestures. In the first phrase (figure 10a), all of the pitches in the initial gesture (D5, E5, F♯, B♭4, D♯6, E4) are then used as the pitches of the TDS. As the initial gestures become longer, the TDS are composed of the latter pitches from the gesture. For example, in the second phrase, the TDS is composed of the latter six pitches of the initial gesture (A♯6, G5, B5, C7, C♯5, E6). The third phrase varies slightly, using two of the latter pitches from the initial gesture (B4, A5), as well as the C4 from the beginning of the gesture. The last phrase also has a slight variation; although it uses the latter two pitches from the initial gesture (F♯7, G7), the F♯ is played an octave lower.

The result of the pitch relationships described above is a set of harmonic fields that emerge from the initial gestures and last for several measures (with the exception of the third phrase). Although the pitches were chosen intuitively, the lingering quality of the harmonic fields creates a sense of more ordered pitch materials than in the previous formations. Likewise, the use of TDS gives an overall impression of a less flighty and more cogent rhythmic structure.

Up until this point, I have been focusing heavily on the featured instruments in each formation. For the most part, the role of other instruments in the first three formations is to highlight in a subtle way various aspects of the featured instrument's melody, generally by quietly shadowing selected pitches. The relationship of the non-featured instruments

changes drastically in the fourth formation, which features the clarinet. Specifically, the other instruments (with the exception of the piano) accompany the clarinet by playing its melody in canon. Figure 10 shows the first phrase.

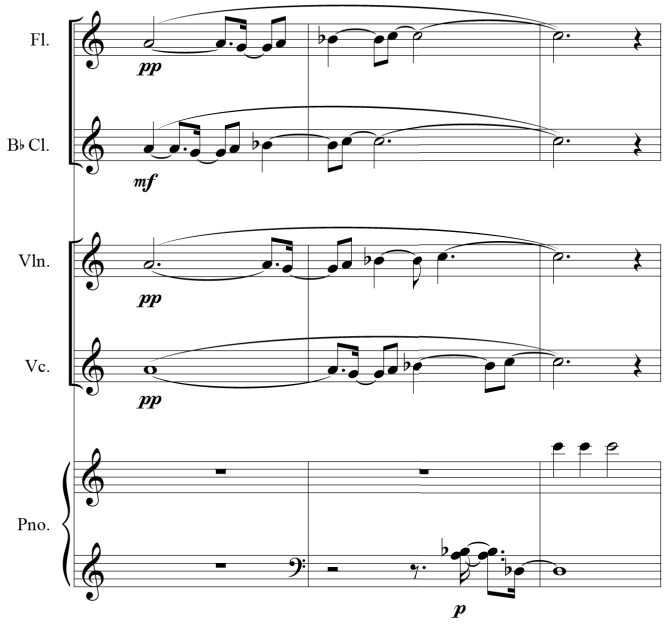


Figure 10 – *formations I*, fourth formation, phrase 1

All four instruments begin on the same pitch—A. The clarinet then initiates the melody, followed canonically at quarter note intervals by the flute, violin, and cello, respectively. After all instruments have arrived on the final pitch, C, the piano plays a short figure. In keeping with the sense of repetition at the phrase level, similar figures in the piano delineates all six phrases in the formation. The use of canon fits into the overall O-N trajectory of increasingly ordered materials, since the melody moves systematically through each instrument at regular intervals. In other words, the materials in the non-featured instruments are determined through a systematic process rather than purely intuitive decisions.

Another systematic technique occurs in the order of entries for the non-featured instruments, which is determined systematically by moving through all but one of the six

possible permutations. Assigning each of these instruments a number—flute (1), violin (2), cello (3)—table 2 illustrates the order of entries.

Phrase	Order of Entries
1 (mm. 82–84)	1 2 3
2 (mm. 85–87)	2 3 1
3 (mm. 88–90)	3 1 2
4 (mm. 91–93)	1 3 2
5 (mm. 94–96)	2 1 3
6 (mm. 97–99)	2 3

Table 2 – *formations I*, order of canonical entries

A basic algorithm determines the order of entries. Beginning with the sequence [1 2 3], the first element is moved to the end to produce [2 3 1] and [3 1 2]. The pattern changes in the fourth phrase, so as not to repeat the first sequence; the second and third elements are switched to produce [1 3 2], and the last number is then moved to the front to generate [2 1 3]. Based on this pattern, the last sequence in the series should be [3 2 1], thereby completing all six permutations; however, the pattern is broken and the flute is deliberately omitted from the final phrase, in part so it can prepare for its solo in the next formation. Beyond this anomaly, the algorithmic order of entries adds a higher-level systematization that contributes to a sense of increasingly logical materials.

Like the first three formations, the fourth is also characterized by increasing complexity in the featured instrument's melodic material. What is different in this formation are the precise places in which I develop complexity. Whereas the third formation developed complexity in the former part of the phrase, the second formation in the latter part of the phrase, and the first formation somewhat randomly, the fourth formation develops complexity *between* the notes of the melody. In other words, the melody remains intact, though additional notes are increasingly interwoven. This is especially evident by the fourth phrase, illustrated in figure 11.

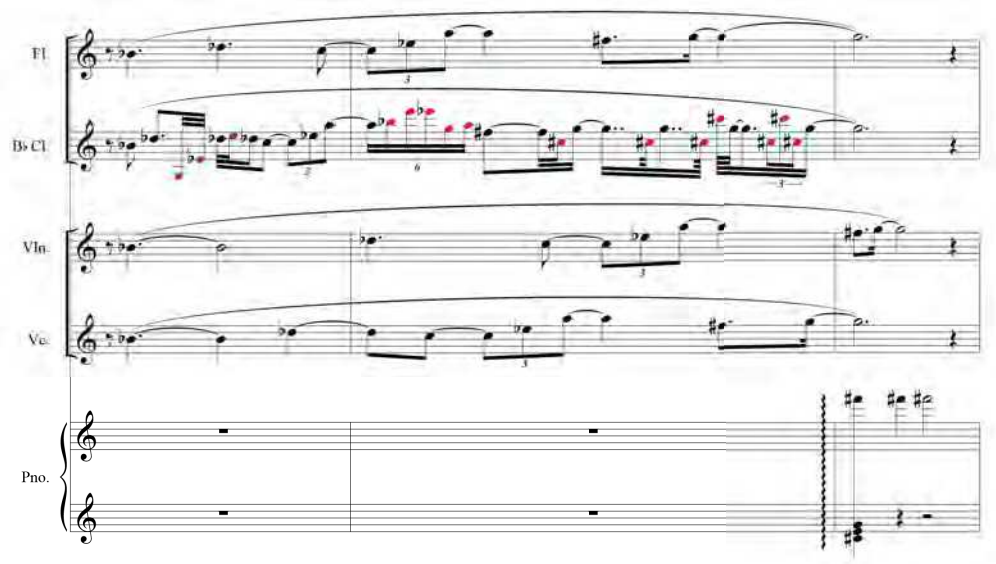


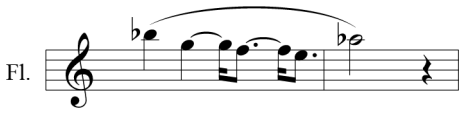
Figure 11 – *formations I*, fourth formation, phrase 4

All of the notes that do not belong to the main melody are highlighted in red in order to illustrate how the additional notes are woven into the melody's fabric. In spite of the systematic nature of the canons, the melody itself as well as the interwoven embellishments were both through-composed, using trial and error as well as intuition to choose pitches and rhythms essentially on a note-by-note basis.

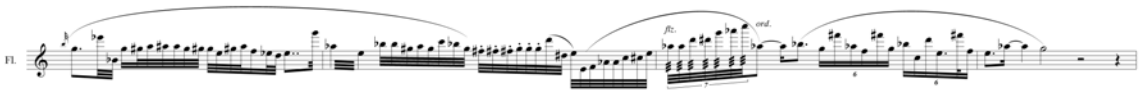
The fifth and final formation features the flute. In fact, the flute is featured more prominently than any of the other instruments since it plays solo for an extended period of time; measures 103–117 comprise a true solo, while measures 118–128 ostensibly comprise a flute solo, as the other instruments play long tones at an extremely soft dynamic. This separation of the flute from the other instruments loosely symbolizes the era known as recombination, wherein the universe cooled sufficiently enough that protons (light particles) "escaped" their bond to other particles and were able to move freely. It was at this moment that the universe became transparent. Prior to that it was still opaque, meaning had we been there during that time we would not actually be able to see anything. Having a higher-pitched instrument play solo is also intended to directly contrast the first formation, where the cello played in its lowest register and was closely

connected to another instrument (piano). This contrasting relationship between the first and last formations is meant to reinforce the progression toward ordered materials across the movement as a whole.

As with the first four formations, the fifth formation is composed of numerous phrases characterized by the activity/calm motive. Likewise, the overall trajectory of the melody over the course of the formation is a gradual increase in complexity. To give a general impression of this trajectory, figures 12a–b illustrate the first and second-to-last phrases.



a) mm. 103–104



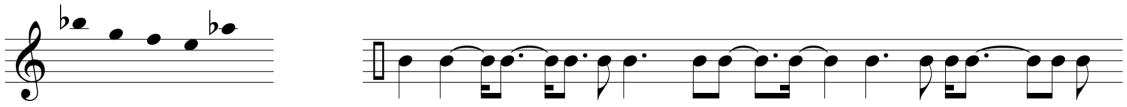
b) mm. 121–124

Figures 12a–b – *formations I*, fifth formation, phrases 1 and 9

The materials themselves become quite dramatic and technically difficult, more so than in any other formation. In this respect, the fifth formation represents the climax of the movement.

In contrast to the other formations, the melody was generated using a highly systematic technique, namely isorhythm. Isorhythm was a technique developed by fourteenth-century Ars Nova composers, wherein a repeated rhythmic pattern (talea) was often combined with a repeated pattern of pitches (color), both of which had different lengths respective to one another (Bent 2001). Thus, the melodic pattern has a different rhythm

every time it repeats, until the patterns realign. Figures 13a–b show the color and talea of the fifth formation.



a) color **b) talea**

Figures 13a–b – *formations I*, fifth formation, isorhythm

In terms of the featured instrument's melody, this marks the first instance in *formations I* of strict repetition occurring simultaneously in the realm of both pitch and rhythm. The result is that the flute's melody is the most systematically composed of all five formations. However, the isorhythm also has the effect of softening the systematic nature of the melody, since the counterpoint between the respective periodicities of the pitch and rhythmic patterns makes it difficult to identify the process clearly. This is somewhat intensified by the increasingly complex figures that are woven in. The aural effect is a vague sense of patterning that lies somewhere between the earlier formations and the final O-N movement, *formations II*.

The overall impression of *formations I* is a movement characterized by more ordered materials than *inflation* with respect to pitch, rhythm, and formal structure. The activity/calm motive gives a sense of repetition at the phrase level, mirrored by the sense of repetition at the structural level, since each of the five formations has a parallel trajectory of increasingly complex materials across its phrases. The higher-level trajectory of increasingly systematic techniques such as the TDS, canon, and isorhythm, give an overall impression of increasingly ordered materials that acts as a microcosm for the broader O-N trajectory. The goal in creating these materials was to evoke the structural formation that characterized the era of subatomic particle formation—structural in the sense that particles became the building blocks for larger structures. Similarly, the increasingly logical materials in *formations I*, particularly the idea of multiple periodicities

present in both the TDS and isorhyhtm, are important features in the next O-N movement, *formations II*, to which I now turn.

5.1.3 – V: *formations II*

Stars form within clouds of gas and dust called *nebulae*. The earliest nebulae arose from slight quantum fluctuations in the otherwise homogeneous early universe. As the universe cooled and expanded, these fluctuations formed filaments of more densely clustered atoms. Gravitational forces pulled the atoms together to form larger objects through the process of *accretion*. When the mass and energy of an object is such that it can sustain nuclear fusion (the fusion of hydrogen atoms into helium), it becomes a star. As more stars began to emerge, they clustered along the filaments, forming galaxies.

Stars also form within nebulae, which are leftover from the aftermath of a supernova (exploding star). The gas and dust emitted during the explosion become the building materials for new stars, also through the process of accretion. A supernova has enough energy to fuse atoms into even heavier elements, such as carbon—the basic element of human life. In this respect, humans have their origins in the explosions of dying stars (Robbins 2006). *formations II* was inspired by the formation of these larger structures.

formations II is in some ways the centerpiece of *an interlude between two nothings*. It is the longest of the six movements, and is unabashedly loud, aggressive, and virtuosic. As the last of the O-N movements, it also represents the culmination of the trajectory, and thus draws heavily on deterministic techniques; virtually every pitch and rhythm is the product of a systematic or quasi-systematic process.

In terms of formal structure, *formations II* is divided into nine episodes, which are reflected in the nine rehearsal letters in the score. These episodes are divided according to the character of the overall texture and/or the (often related) introduction/removal of significant material. On a higher formal level, these episodes are grouped within three

larger sections—coalescence, explosion, and reflection—articulated by broader textural shifts. Figure 14 outlines the relative position/placement of these formal divisions and illustrates their relationship to one another.

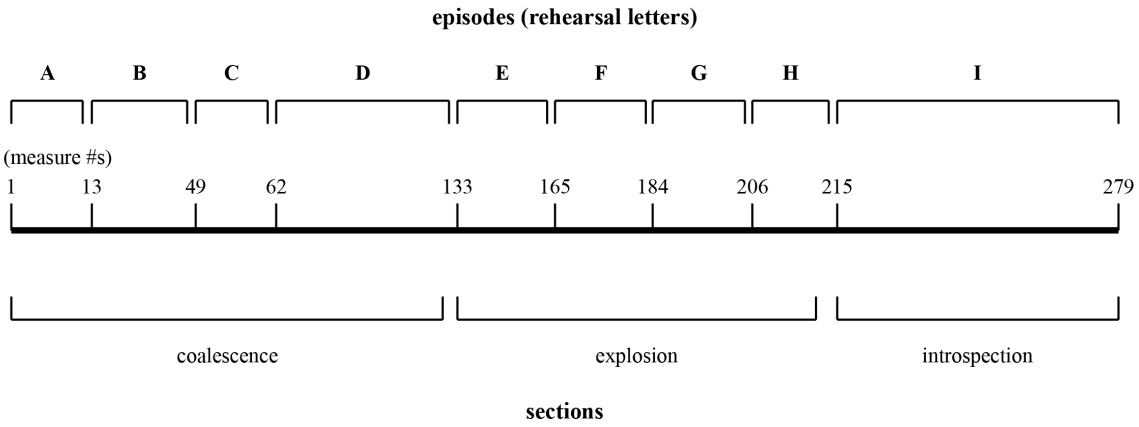


Figure 14 – *formations II*, formal structure

The opening of *formations II* (rehearsal letter A) is intended to evoke the early filaments described above. Because I imagine these filaments to be opaque in the sense that they still lack discrete structures, I chose to use clusters in the piano (white and black note), as their harmonic density and lack of clarity gives them an opaque quality. The exposition of these clusters is significant since they are one of the prominent features of the entire movement.

There are nine clusters in total (figure 15):

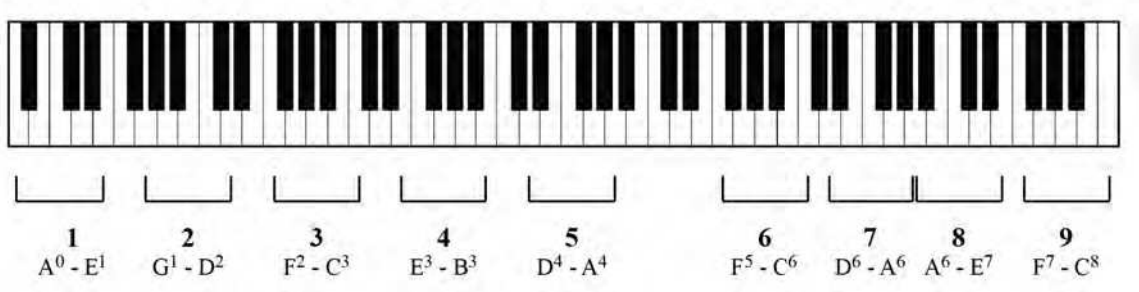


Figure 15 – *formations II*, clusters

Each of the clusters spans a perfect fifth, and they are spread quasi-symmetrically across the keyboard. I use the word quasi as they are not perfectly symmetrical: there is a gap from B4 to E5, owing to the large portion of other material occupying that space, as I will demonstrate later; also, the lower register clusters are typically separated by a third while the upper clusters are separated by a second (the only exception between clusters 7 and 8, which share the A6).

The exposition of the clusters also offers a glimpse into their underlying rhythmic structure. Each cluster recurs at a regular interval, thereby constituting a stratum. Additionally, because the ratios between these cluster strata are not integer multiples of one another, they are TDS. Figure 16 illustrates the proportional relationship between the cluster strata.

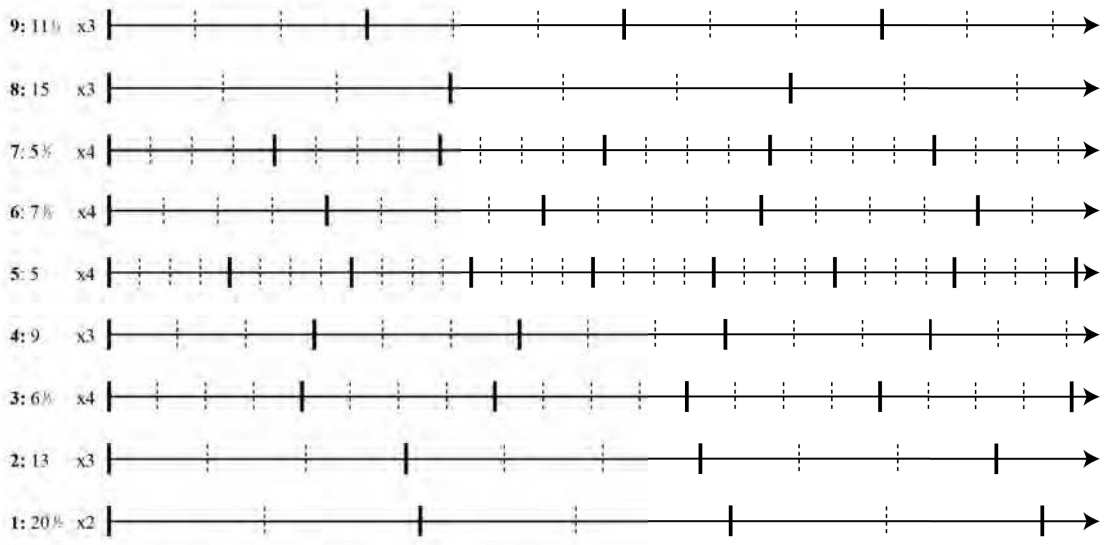


Figure 16 – *formations II*, proportional relationship of cluster strata

In this figure, each of the horizontal lines corresponds to one of the nine clusters outlined in figure 16, identified by the number on the far left-hand side. The second number

represents the basic rhythmic interval[9] in number of eighth notes (e.g., cluster five = five eighth notes = two-and-a-half beats), represented proportionally on the grid by the dashed lines. The third number indicates the prevailing number of basic rhythmic intervals between cluster attack-points, represented by the solid lines. For example, cluster five is articulated once every four basic rhythmic intervals—one basic interval equals two-and-a-half beats, therefore cluster five attack-points occur every 10 beats (two-and-a-half multiplied by four). In general, the respective speeds of the clusters are faster in the middle registers and slower in the more extreme registers.

It should be noted that figure 17 is only a small sample of a much larger structure, as indicated by the arrows on the right. Because of the complex ratios, cluster strata do not realign within the movement. In fact, the particular arrangement found in figure 17 never actually occurs; in order to get a more even distribution of clusters in the opening section, I start the movement further along in the rhythmic structure than what is illustrated here. In this respect, figure 17 does not directly correspond to the opening section, but is intended to visually demonstrate the proportional relationship between the TDS of clusters.

The second section begins at measure 13, and here I introduce a stream of sixteenth-note pulses in both hands, which acts a bed layer upon which higher-level strata are built. This pulse stream[10] is one of the most salient features of the entire movement, lasting virtually uninterrupted from here until section E (measure 133). Within a few measures, I begin to

[9] The reason for having a smaller rhythmic interval (i.e., the "basic rhythmic interval") than that of the actual cluster strata is because I originally I intended to play with the perceived speed of those strata by altering the number of basic rhythmic intervals between cluster attack-points (the lower the number, the faster the perceived speed). However, when I actually composed the movement I ended up doing this very little, with a few exceptions. In this sense, the basic rhythmic intervals act more like rarely used subdivisions of the cluster strata rather than functional basic units. I show the basic rhythmic unit here to offer some insight into the compositional process.

[10] Grosvenor Cooper and Leonard Meyer define pulse as "one of a series of regularly recurring, precisely equivalent stimuli" (Cooper and Meyer 1963, 3). John Roeder extends the idea with the term *pulse stream*, which emphasizes "the independent nature of each pulse in a multipulse texture." (Roeder 1994, 234). I use the term pulse stream partly as a matter of convenience to refer quickly to the sixteenth-note pulses that permeate *formations II*.

establish different groupings of the pulse stream by stressing certain pitches at regular intervals. The first occurs at measure 17, with the A4 in the right hand accented every 18 pulses (or four-and-a-half beats). Almost simultaneously, I introduce a second grouping with the tenuto-marked C5 in the right hand and E4 in the left hand, which occurs every 21 pulses (or five-and-a-quarter beats). Both of these groupings constitute individual strata, and since their periodicities are not integer multiples, they are temporally dissonant. It should be noted that the two strata are meant to occur at different volumes, hence the distinction between accents (marked fortissimo) and tenuto (marked mezzo-forte). In this way, there is a hierarchical distinction, with the A intended to be more foregrounded than the C and E.

In addition to offering dynamic nuance and layering, having multiple dynamic levels also allows for creating strata within strata. For example, I introduce a third stratum at measure 22 (rehearsal letter B3) with a D♭ that occurs every 11 pulses (what I will call the D♭ stratum). However, whereas the stressed pitches in the first two strata maintain the same dynamic level, the stressed pitches in the D♭ stratum alternate between accent and tenuto (strong and medium), creating a higher-level recurrence pattern (i.e., a second stratum) within the D♭ stratum. I then take it a step further by adding a C5 to the D♭5 (a minor-second dyad) at every third occurrence, creating a third stratum within the D♭ stratum. The relationship between the three strata would fit loosely into what Harald Krebs would term a "grouping dissonance," since the latter two strata (what Krebs would call the "interpretive levels") create groupings of the D♭ stratum (what Krebs would call the "pulse level") whose cardinalities[11] are not integer multiples of one another (two against three). In this sense, the interpretive levels form a TDS within the D♭ stratum. This compositional technique of layers within layers creates a complex network of temporal relationships intended to challenge the listener's perceptual abilities for perceiving individual layers and their relationship to the whole.

[11] By "cardinality," Krebs means the number of beats in the pulse level between adjacent beats in the interpretive level. For example, if eighth notes are taken as the pulse level, then quarter notes (interpretive level) would have a cardinality of two, half notes a cardinality of four, and so on.

In continuing the trend, I add another strata at measure 28 (rehearsal letter B4), with a D♯4 in the left hand occurring every 13 pulses. Like the D♭ stratum, the D♯ stratum has a stress pattern of alternation between accent and tenuto. I also introduce a minor-second dyad into the D♯ stratum; however, in contrast to the D♭ stratum, the dyad occurs every fourth repetition. Because the respective cardinalities of the stress pattern (two) and the dyad pattern (four) *are* integer multiples, they are not temporally dissonant.

At measure 34 (rehearsal letter B5), I simultaneously introduce two new strata: an F5 in the right hand that recurs every 14 pulses; and a B3 in the left hand that recurs every 17 pulses. Again, like the previous strata, both the F and B alternate between accent and tenuto. At this point, this section has reached its full saturation in terms of strata. There are six strata in total, all of which are temporally dissonant against one another, and one of which—the D♭ strata—is temporally dissonant against itself. The aural result is a dense and intricate network of complex temporal relationships, held together by the common thread of the underlying pulse stream.

I will now turn the harmonic structure that underlies the emerging strata. Figure 17 illustrates the order in which pitches appear in the section.

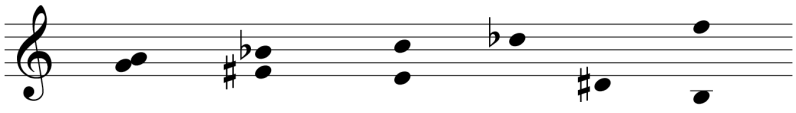


Figure 17 – *formations II*, section B, order of pitch appearance

Pitches generally appear as dyads, with the exception of the D♭5 and D♯4, which are slightly displaced. Ignoring this exception for a moment, visualizing these dyads on a keyboard quickly reveals that they in fact expand symmetrically outward from a central axis—namely, A♭ (figure 18).

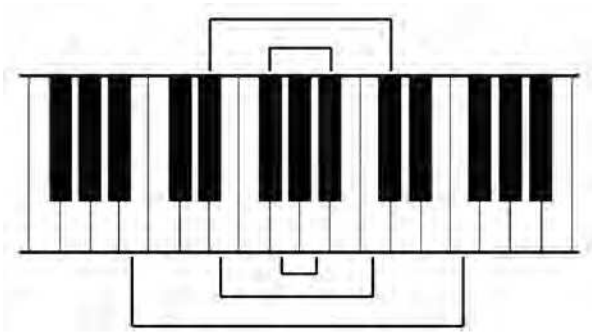


Figure 18 – *formations II,* section B, pitch symmetry

The pitches in each dyad are therefore chromatically equidistant from A♭. For example, the pitches in the first dyad—G4 and A4—are both a semitone away. At the other extreme, the B3 and F5 are both nine semitones away. All of the dyads in between have the same symmetrical relationship to the A♭ axis. This kind of harmonic structure built symmetrically around a central axis is by no means new, and in fact has been found in the music of composers such as Béla Bartók (Lendvai 1971). What it accomplishes in *formations II* is to reinforce the overall sense of increasingly ordered materials that characterizes the O-N movements. Though the precise axis symmetry may be difficult to perceive, especially in the context of densely layered, temporally dissonant material, I believe that the systematic expansion of register is fairly audible.

The idea of registral expansion bears further exploration, as it constitutes one of the most important themes of the movement, and in fact the O-N movements as a whole. As I demonstrated earlier, each of the five formations in *formations I* is characterized by an expanding register, which is key to conveying the sense of increasing complexity. The theme of expanding register is meant to convey a broad sense of growth, since the O-N movements are concerned with increasingly large structures, as well as the physical expansion of individual structures—physical expansion in the sense that stars, for example, are continually growing and, at their extreme, exploding. On the other side of the coin, the idea of contraction is also important, since large clouds of dust will often contract and coalesce into objects that then grow. I explored the idea of contraction briefly in

formations I when the TDS in the piano formation gradually receded into a single pitch. The theme of contraction is a much more important feature of *formations II*, as I will soon demonstrate.

Returning to the section at hand, the theme of registral contraction bears relevance, especially with regard to clusters. Throughout the section, the clusters have continued in the manner established in the opening section, though they briefly disappeared and were reintroduced while the pulse stream was being established. The clusters are played very quietly, with their temporally dissonant quality both supporting and counterpointing the emerging strata discussed earlier. They may appear to be somewhat thinned out when compared to the opening section; during the compositional process, if a cluster and an accent from the pulse stream occurred simultaneously, the pulse stream took precedence meaning some clusters were omitted.

The clusters remain in a background role until measure 43. At this point, cluster seven (D6–A6) begins to systematically contract. At each iteration, one pitch is removed, culminating in a single A♭6 at measure 49 (rehearsal letter C1). Each iteration is also played louder, which reinforces the sense of motion created by the contracting cluster. The pitch contraction and dynamic increase give a sense of climax and arrival at measure 48, which is supported by a coinciding low-register cluster and a sudden change of texture. Simultaneously, the accents from the pitch-stream strata disappear, leaving only a kind of residue of the stressed pitches from before. The A♭ that emerged from cluster seven continues to repeat at the same interval; however, it now has the same stress pattern of accent-tenuto that previously characterized the pulse stream strata, signifying that the background and foreground from the previous section have switched roles.

Measure 59 marks a curious interruption of this calmer texture (figure 19).

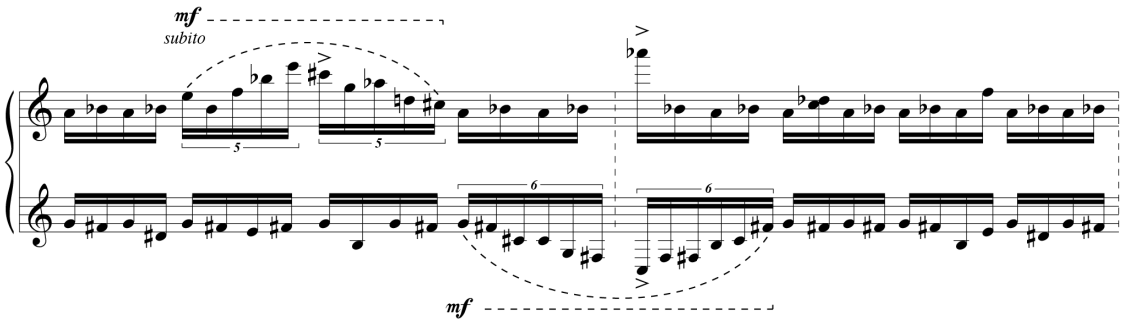
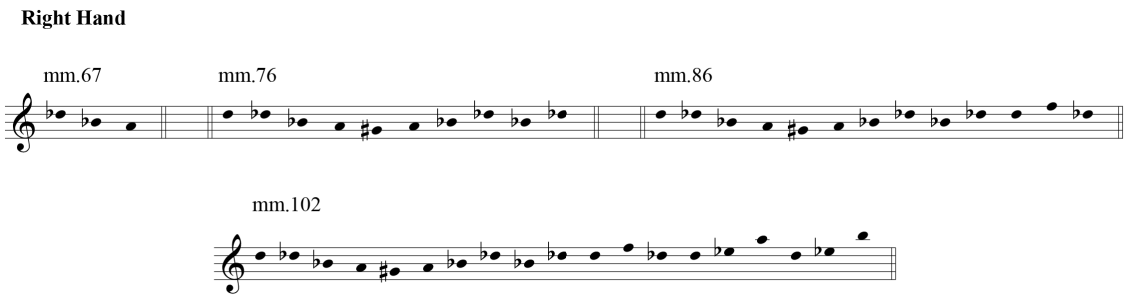


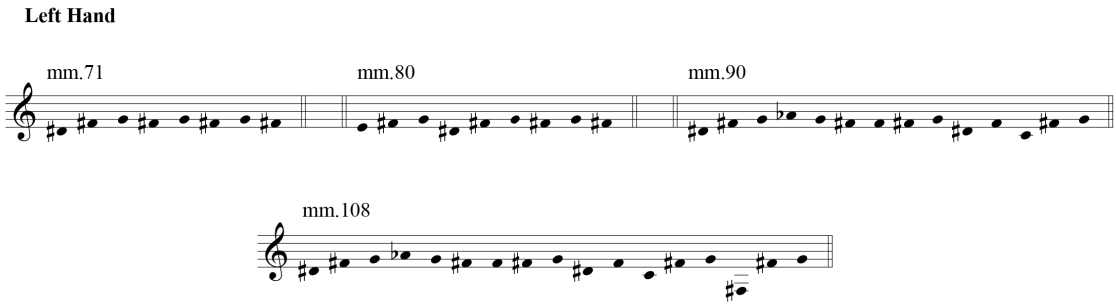
Figure 19 – *formations II,* mm. 59–60

The quintuplets (right hand) and sextuplets (left hand) disrupt the pulse stream that had been previously gone undisturbed. The disruption is meant to be a kind of anomaly, though it begins to recur more frequently in the next section.

At rehearsal letter D1, the residual strata disappear, and the pulse stream returns to its initial state (i.e., B1). This moment is intended to reset the overall energy of the movement in preparation for the development of an even more complex network of strata, which occurs over the entire D section. In the previous section, the non-stressed pitches in the pulses stream consistently alternated between A4 and B♭4 in the right hand, and G4 and F♯4 in the left hand. This created an underlying stratum with a cardinality of two that remained consistent throughout the B and C sections. In contrast, the D section features increasingly complex pitch-based groupings of the pulse stream. This begins to happen almost immediately in the D section; at rehearsal letter D2, the right hand plays D♭5, B♭4, and A4, creating a stratum with a cardinality of three. At rehearsal letter D5, the right hand switches to a ten-note figure, divided subtly into two groups of five by a tenuto on the A4. This trend of adding notes to create longer patterns persists through the former part of the D section. Figures 20a–b shows the evolution of pitch-based groupings in both hands, omitting the occasional truncations that occur.



a) right hand



b) left hand

Figures 20a—b – *formations II*, evolution of pulse-stream groupings

As the figure illustrates, the evolution of pitch-based groupings of the pulse stream follows the theme of expanding register discussed earlier. As with the B section, the D section begins with a span of a major third (F♯4 to A♯4 (notated B♭4)); however, the D section expands even further than the B section, eventually spanning two octaves plus a perfect fourth (F♯3 to B5). This theme of expanding register is mirrored in the cardinalities of the respective patterns, which begin at 3 and eventually expand to 24 (though occasionally truncated). The increasing complexity that arises from the expanding register and cardinalities is reminiscent of *formations I*, though on a larger scale since it occurs over a longer period of time. This parallel relationship symbolizes the relationship between the smallest and largest formations, in that the latter is composed of the former.

Returning to rehearsal letter D2, I introduce two other strata that persist throughout the D section. The first is created by accenting the D♭5 in the right hand, which occurs every 18 pulses (every sixth occurrence of the D♭). The second is created by is accenting the D♯4, which occurs every 24 pulses (every third occurrence of the D♯) beginning at rehearsal letter D3. Although these strata are temporally dissonant with one another, both are temporally consonant with their respective lower-level strata (i.e., those created by pitch-based groupings of the pulse stream as outlined above), since their cardinalities are integer multiples. However, this relationship changes as the groupings of the pulse stream begin to evolve. For example, when the grouping expands in the right-hand at rehearsal letter D4 from a cardinality of 3 to 10 (as outlined in figure 20), accents still occur every 18 sixteenth notes. Yet because of the cardinality change, these accents no longer fall consistently on D♭5. Instead, they fall on a various pitches until the phases re-align, creating a counterpoint through temporal dissonance, illustrated in figure 21.

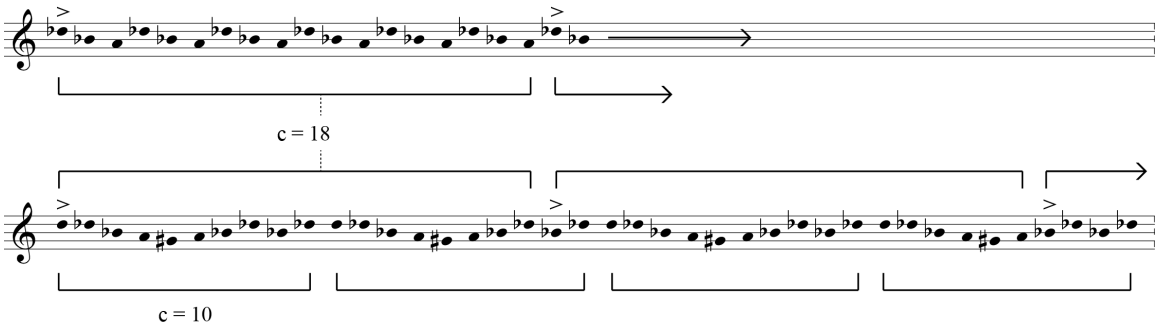


Figure 21 – *formations II*, temporally dissonant counterpoint, right hand (c = cardinality)

The left hand features a similar relationship—the accents that occur every 24 pulses initially are temporally consonant with the corresponding pulse-stream strata, but become dissonant as those strata expand and develop. The result is that the accent strata, which were initially quite foregrounded, become somewhat backgrounded and residual as the pitch-based groupings of the pulse stream evolve. Yet that residue continually acts as a

temporally dissonant counterpoint that adds depth and complexity to the already (and increasingly) dense and complex texture.

The D section features a second trajectory that runs simultaneously but independently from the strata outlined above. The trajectory is connected to the contraction of clusters at rehearsal letter B6 as illustrated earlier. This contraction was actually the first of many; four of the remaining eight clusters systematically contract into one or two pitches over the course of the D section. The respective start of each cluster contraction is marked in the score with one of the small-case roman numerals from i–iv, beginning just before rehearsal letter D4. Figure 22 outlines the formal position of each contraction.

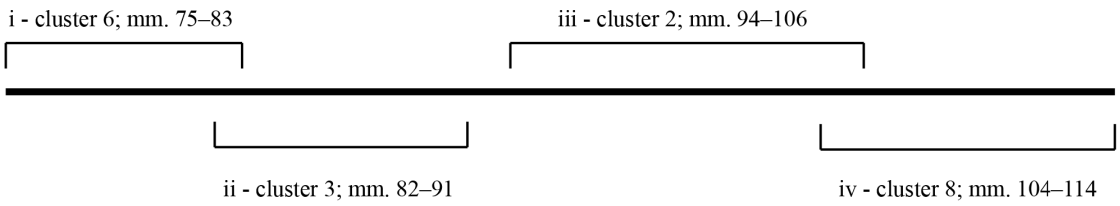


Figure 22 – *formations II*, relative formal positions of cluster contractions

Like the earlier cluster contraction at B6, the systematic contraction of each cluster is meant to evoke the process of accretion, whereby opaque material such as dust coalesces into an area of density (e.g. a star or galaxy). It is also meant to contribute to the overall sense of rational development that is crucial to the movement as a whole.

Once the four clusters have all contracted, they begin to systematically expand and "explode" in the same order they contracted. By expand, I mean temporally; for example, beginning at roman number v (measure 126), the A♭6 is played once, then twice, then three times and so on. This particular expansion is meant to create a sense of motion that culminates in measures 132–133 (figure 23), in which the repeated A♭5 moves to triplets and is repeated over two full beats, followed immediately by the first "explosion."

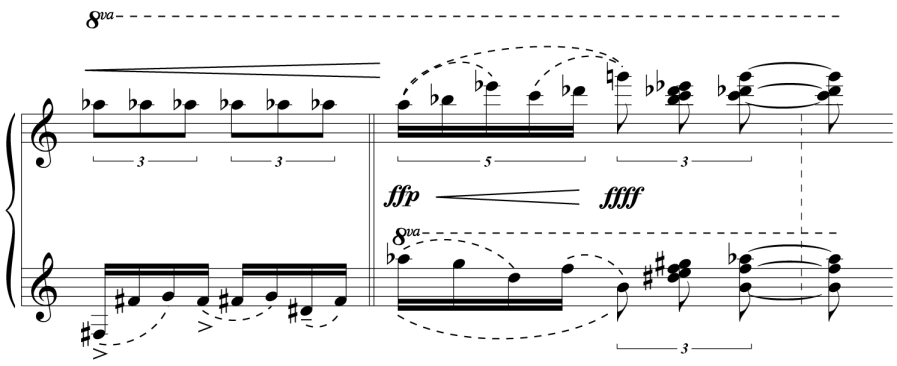


Figure 23 – *formations II*, mm. 132–133, first explosion

This explosion is characterized by a gesture that expands outward in both hands away from the A♭, followed by chords whose outer pitches also expand outward. The gesture itself is composed of three-note groups; these will become an increasingly important feature of the E and F sections, and one that I will explore in further detail shortly. A "falling" gesture composed of similar three-note groups occurs immediately after the initial explosion, which is meant to evoke residual dust leftover from the explosion. At measure 135, the residue settles back into the texture from the D section. Immediately, at roman numeral vi, the next cluster begins the process of temporal expansion that will eventually lead to its explosion. All four clusters go through a similar process of temporal expansion followed by repeated explosion and residue.

Once the last of the four clusters explodes, the next section begins (rehearsal letter F1). In contrast to the previous section, gestures in the F section are not always characterized by the explosion/residue idea. Instead, gestures are initiated by chords, followed by lines in both hands characterized by parallel motion (ascending or descending), contrary motion, or suspended motion (i.e., repeated ascending/descending figures that stay in one register). In the first half of the section, the gestures are composed primarily of three-note groupings that ascend or descent by a third (based on the first note from each group). These groupings are themselves composed of various permutations of a minor second and a fourth/fifth, the general contours of which are outlined in figure 24.

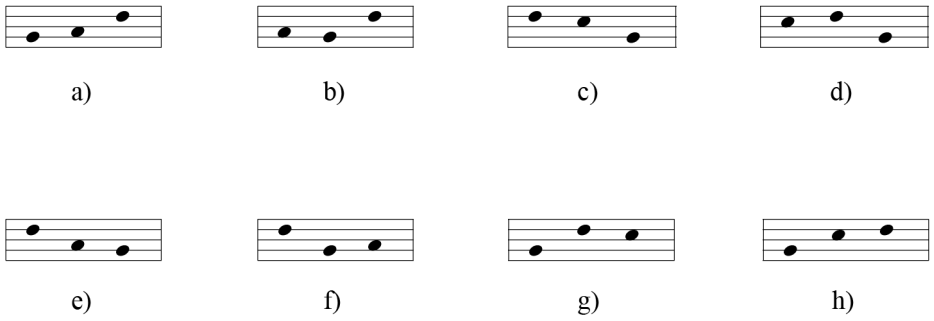


Figure 24 – *formations II*, three-note permutations

In order to keep the three-note groupings fairly audible, I tended to keep the general shape similar for each hand, favoring permutations a and e for the right hand and permutations c and h for the left hand. The only exception to the three-note grouping occurs when both hands are moving downward in parallel motion within a close register. Because the left hand moves slower than the right (owing to the sixteenth notes in the left hand versus quintuplets in the right), the right hand could catch up to the left hand. To counteract this, I occasionally truncate the three-note grouping in the left hand, allowing it to remain ahead of the right (measure 168, for example). Beyond these anomalies, the three-note groupings create mini strata that are temporally dissonant on two levels: with each other, since the hands move at different rates; and within themselves, since they work against the five- and four-note groupings implicit in the quintuplets and sixteenth notes, respectively.

In terms of precise pitches, figure 25 only illustrates the basic form, as the second and third notes are often altered by accidentals. Decisions about accidentals were based on favouring minor seconds, perfect fourths, and tri-tones. Decisions about chords were arrived at somewhat intuitively, although they fall in the general register of the cluster on which they are based, and are composed primarily of pitches from adjacent gestures, or share similar intervals.

The second half of the section draws more heavily on suspended gestures. Figure 25 illustrates one such gesture, found in measures 176–177.

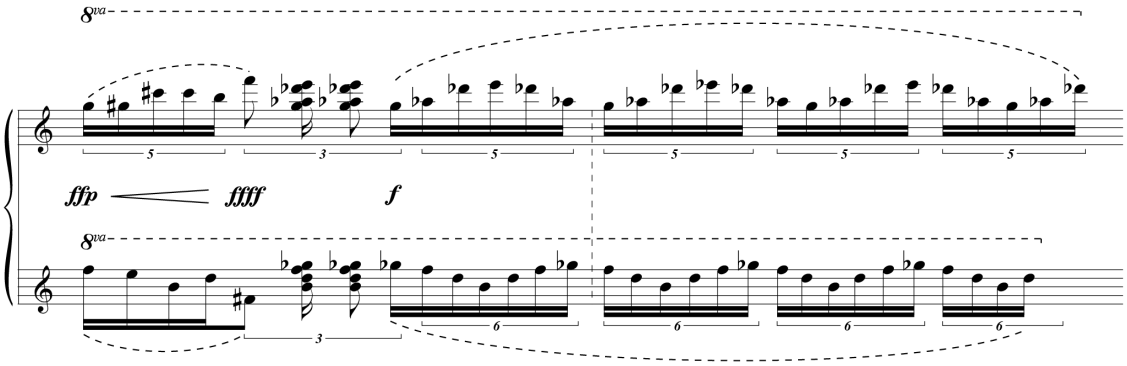


Figure 25 – *formations II*, mm. 176–177, "suspended" gesture

As you can see, the suspended gestures are composed of a blocked chord, followed by an ascending and descending arpeggiation of that same chord. The chords each contain four pitches, and thus the arpeggiation repeats every six notes. As with before, the different rates of the right and left hands (though the left has moved to sextuplets, creating a five-against-six between the hands) give rise to TDS. There are two suspended gestures, one residing in the lowest register of the piano and the other in the highest. The function of highlighting the extreme registers of the piano is to set up the final gesture of the section at measure 182. This is one of the most dramatic gestures in the entire movement; beginning on opposite ends of the piano, the two hands move toward one another, eventually converging with a tremolo on the A♭4 that formed the central pitch axis in the B section. The drama and scale of this gesture make it perhaps the most obvious example of the registral contraction theme.

Before moving onto the next section, I should mention that, to a certain degree, the chaotic nature of the E and (particularly) the F section, combined with the more intuitive choices therein, destabilizes the increasingly ordered trajectory of the O-N movements. In reality, the O-N trajectory is not intended to be perfectly linear. The E and F sections are meant to evoke the power, destruction, and chaos that characterize supernovae. As

such, a slight regression was necessary to convey that destruction and chaos. And in fact the materials are not as chaotic as they may appear to be on the surface; the explosions in section E, as well as the chords in section F, are still based on the attack-point grid outlined in figure 17. Additionally, the relatively short duration of these sections, combined with the return of more audibly ordered materials in the next section (which I will discuss below), help to preserve the overall trajectory of the O-N movements.

Returning to my previous point, the convergence on the tremolo A♭ marks the beginning of the G section. If there was any doubt that the underlying attack-point grid had disappeared, it is eliminated in this section. This is because the clusters from the opening section reappear, and because the pulse-stream and related strata are no longer present, the proportional relationships inherent in the attack-point grid are much clearer. As with the opening section, clusters are introduced gradually to allow a sense of repetition and increasing complexity to emerge. In contrast to the opening section, once all the clusters have been introduced, they are allowed to continue longer, creating a greater sense of cluster density. This, combined with the faster tempo, much louder dynamic, and convergence on the tremolo A♭ make this section quite climactic in nature. And although the return to material from the opening section again may seem like a kind of regression, I feel that it serves to re-calibrate the sense of underlying structure that was disrupted somewhat in the previous sections. It is symbolic of how the current structure of the universe, in all its complexity, is still fundamentally connected to its origins, as the stars and galaxies continue to form along the original filaments from the early universe.

Section H comprises a brief transition, in which I introduce the major-second dyad (C♯4 and D♯4) that will come to dominate the final section beginning at rehearsal letter I1. During this transition, I alternate between iterations of the dyad and gestures reminiscent of sections E and F, while systematically adding a repetition of the dyad each time it returns. The dynamics are substantially quieter and the tempo noticeably slower, the effect of which is an overall calmer feel that will come to characterizes the remainder of the movement. Besides balancing out the intense energy of earlier sections, my intent in

introducing this calmer feel is to invoke a more introspective state of mind that is reminiscent of contemplating the night sky; if the previous materials are metaphorically connected to the universe's past, then the final section is its present.

At rehearsal letter I1, the transitional materials recede, leaving only the dyad. This dyad articulates a repeated rhythmic pattern, outlined in figure 26.

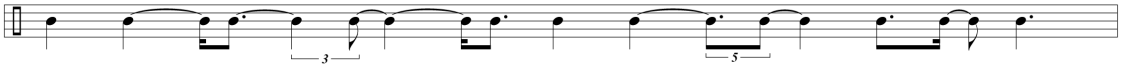


Figure 26 – *formations II*, mm. 215, underlying rhythmic pattern

This repeated pattern comprises the sole rhythmic material for the entire final section. It also provides a talea upon which I begin to build quasi-isorhythmic material. At rehearsal letter I2, I begin introducing a color; however, unlike a conventionally static color, this one evolves, continually expanding throughout the remainder of the movement. In fact, this expansion of the colour comprises the primary stream of activity that characterizes this final section in *formations II*. Figure 27 outlines this evolution.

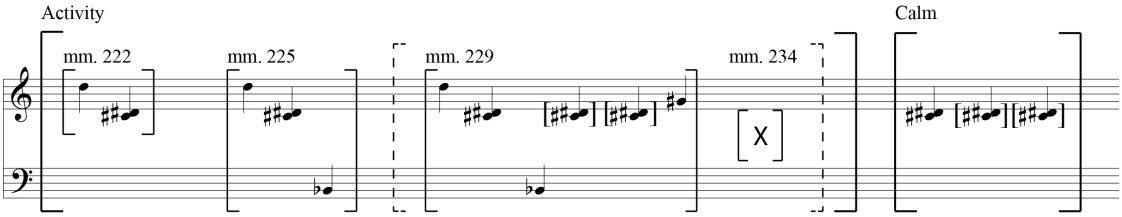


Figure 27 – *formations II*, evolution/expansion of color

The color is composed of an area of activity followed by an area of calm (not completely unlike *formations I)*, delineated by the largest brackets. Each iteration of the color is composed of one of the smaller brackets from the area activity followed by the area of calm. The area of calm is composed of one-to-three dyads that serve to briefly reset the energy at the end of any given iteration of the color. The area of activity unfolds linearly:

the first few iterations of the color are composed of the first bracket followed by the area of calm; the next few iterations of the color would be composed of the second bracket (beginning at measure 225, as indicated), followed by the area of calm; and so on. The dashed lines indicate that once the x is reached (I will discuss the meaning of the x below), the third and fourth brackets are combined, such that the color would be composed of the third bracket, followed by the fourth bracket, followed by the area of calm.

The smaller brackets around the dyads indicate that they may or may not appear in a given iteration. In this sense, it is not a true isorhythm since the color is constantly shifting. I did this to give myself a mechanism in which to adjust the proportions between smaller brackets; because of the shifting rhythmic pattern, the outer notes (i.e., the first in each bracket) would sometimes fall too close or too far apart from one another. The bracketed dyads were thus a means to maintain proportional balance.

The x in the fourth bracket represents a second expanding trajectory within the main color. This trajectory is additive, with one additional pitch being added at each iteration of the color. Each pitch is selected from one of the nine clusters outlined in figure 16, with no register occurring twice in the same iteration of the color. The trajectory systematically expands until all nine registers occur in a single iteration of the color, at which point the movement ends. While this sub-trajectory expands in a systematic way, it also has random characteristics, which have to do with the selection of registers and the precise pitches therein. To determine the order in which the registers appear in a given phrase, I used a random permutation generator. I generated several permutations (no two alike), using only those needed for a particular phrase. For example, if I was generating the fifth occurrence of the trajectory—which would contain five pitches—I would use the first five numbers of a given permutation to determine which registers pitches would be drawn from, and in what order they would appear. Precise pitches were chosen by assigning a number to each pitch within a cluster, then rolling dice to select the pitch.

The final section is thus characterized by systematic, intuitive, and random processes and techniques alike. The reason for reintroducing random techniques in spite of the desired trajectory for the O-N movements is because of the particular conception for this section. As I mentioned previously, I conceive of the final section as evoking contemplation of the night sky. What is interesting about the night sky is that because the distances are so large, the light from stars and galaxies has to travel many light years before reaching our eyes. Consequently, the light from these structures that we see may in fact be quite old—the further away the structure, the older the light. In this respect, when we look at the night sky, we are literally looking back in time. Thus the reason for introducing random techniques is because I imagine the second trajectory as looking deeper and deeper into space, to the point where we begin to see some of the "older" techniques found earlier in the O-N movements.

formations II represents the culmination of the O-N trajectory, in which in a trajectory of increasingly ordered materials is meant to evoke a rational search for meaning. This search is viewed through the metaphor of cosmology, which tries to understand the nature of the universe—and, by extension, our own existence (perhaps the quintessential quest for meaning)—through the rational study of its origins and development. The increase in ordered materials is evocative of the formation of increasingly larger and more complex structures, but in a way it is also symbolic of our own knowledge about the universe, which continues to expand and evolve, allowing us to look further backward in time.

5.2 – Stream 2: E-N Movements (II, IV, VI)

Although our rational quest for knowledge and meaning has led to profound discoveries about the universe, it has also revealed some darker implications. Just as Edwin Hubble turned the clock backward to draw conclusions about the origins of the universe, scientists have also turned the clock forward to understand how it may potentially end. There are several theories about the ultimate fate of the universe; the "Big Chill" posits that the expansion of the universe will eventually cause so much heat loss that the universe will no longer be able to sustain life; in contrast, the "Big Crunch" theorizes that the expansion will reverse, causing the universe to collapse onto itself.

I find these theories fascinating because they point to something fundamentally absurd about the universe and, by extension, existence itself—why search for meaning in something that is ultimately doomed? This question is not meant to be defeatist or nihilistic, nor is it a critique of rational thought. Rather, for me it serves as a reminder not to always take such things overly seriously, and to also see beauty in the mundane and quotidian.

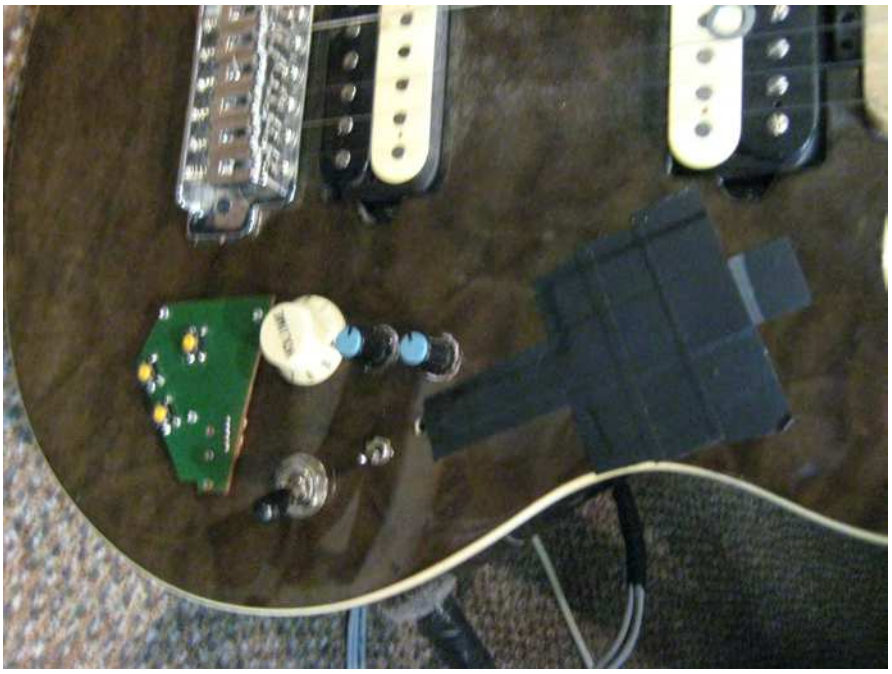
As I described earlier, this relationship between rationality and absurdity (insofar as I have characterized it here) in many ways parallels the relationship between my composed concert works and my practice as an improviser. The goal of the E-N movements is thus to use improvisation and the metaphor of the universe's destruction as an absurdist foil that interrupts the more rational trajectory of the O-N movements. There are three E-N movements, which I intend to improvise on an augmented electric guitar; each movement attempts to suggest an imagined death of the universe by using digital signal processing to increasingly alter the sound of the guitar.

The remainder of the chapter will be dedicated to discussing the design/construction of the guitar, as well as my particular approach to improvisation and how it relates to the aesthetic goals of *an interlude between two nothings*.

5.2.1 – Augmented guitar

As a guitarist, I am familiar with the conventional electronic augmentation techniques for the standard electric guitar. Besides the pickups themselves, examples of typical augmentations include effect pedals (a.k.a. “stomp boxes”), multi-effect processing units, and more recently, signal-processing software. Because control over these augmentations is generally assigned to either the hands (when they are not engaged with the strings) or to other body parts such as the feet, the expressive potential of the augmentations is extremely limited. This limitation inspired me to develop new augmentations that are better integrated with the design of the guitar and the technique of the performer, thereby providing greater potential for expressivity.

I first designed an augmented guitar prototype in 2010 while completing my Masters degree (figures 28a–b).



Figures 28a–b – prototype augmented guitar (2010)

The augmentations were limited to a force-sensing resistor (pressure), two potentiometers (knobs), a switch, and three buttons. The overall design was not overly sophisticated; the cable used for getting data from the sensors into the computer[12] was permanently affixed to the guitar, which created mobility and durability issues. Nonetheless, the experience of building the prototype provided valuable insight into identifying and addressing many of the issues related to instrument augmentation.

There were three particular issues with the prototype that I wanted to improve upon for the second version of the guitar: mobility, durability, and sensor placement. I alluded to mobility/durability in the previous paragraph; the permanent cable was roughly ten feet in length, which meant I had to remain relatively close to the computer. This poses issues for performances in which I need to move around, or if I want to keep my computer offstage. In terms of durability, some of the small wires connected to the

[12] In the interest of portability, I generally use a laptop computer to run the signal-processing software.

hardware/software interface were somewhat exposed, making it quite fragile—a highly undesirably quality when playing in a bar, for example.

These two issues were connected, since they both stemmed from getting data from the sensors into the computer. For the prototype, I used an Arduino microprocessing environment[13] to convert the raw electrical current from the sensors into data that the computer could understand. The particular board that I used was a Duemilanove, which connects to the computer's serial port via USB. Figure 29 is an illustration of the prototype's signal path.

Figure 29 – signal path, augmented guitar prototype

Because the Arduino is separate from the guitar and computer, it required cabling to both, and this is precisely where the issues of mobility and durability stemmed from. It was clear to me that these issues could be mitigated through a wireless solution, which I found in the Arudino Fio. The Fio is designed to pair easily with Digi International's XBee, a communication module that transmits wirelessly using radio frequencies. Figure 30 illustrates this design for the new augmented guitar.

[13] The Arduino microprocessing environment is "an open-source electronics platform based on easy-to-use hardware and software" (Arduino 2015). Colloquially, "an arduino" usually refers to the hardware interface, which can convert raw current into data and vice versa.

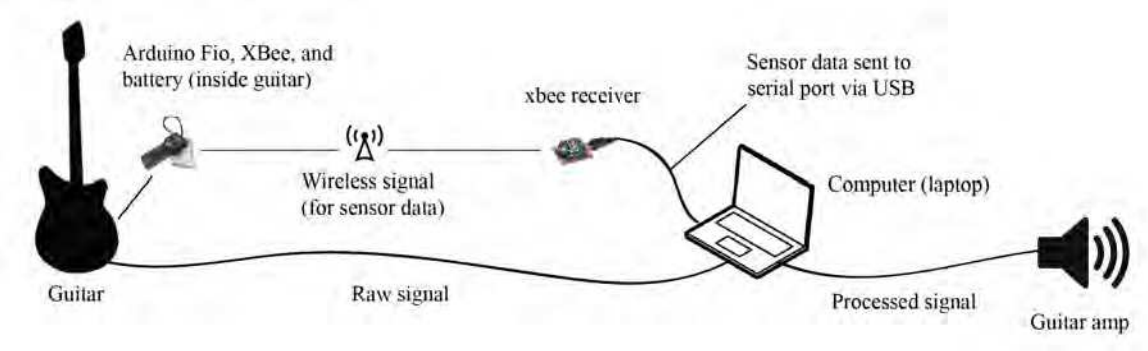


Figure 30 – signal path, new augmented guitar

The issue of mobility is solved, since the permanent cable to the Arduino is no longer needed. The issue of durability is solved as well, since the fragile wires are now housed inside the guitar.

The second issue as alluded to above is the placement of sensors. When I built the prototype, I was severely limited by how much space was available for sensors. This is because the electric guitar I was using had a solid wood body (as most do). Installing sensors such as potentiometers requires a fairly thin surface for proper installation. Unfortunately, only a very small portion of the guitar's surface was thin enough to install the sensors (above the chamber that housed the guitar's original electronics) and house the associated wiring. I concluded that a hollow-body electric guitar would offer several advantages in comparison. First, the entire top surface is quite thin, allowing for more sensors and a variety of placements. Second, because the guitar is hollow, the entire body can be used to house electronics. Finally, because the back of a hollowbody guitar is also quite thin, I could install a kind of "hatch" that would allow for easy access to the housed electronics should I have to perform any maintenance.

In the end I settled on a semi-hollowbody guitar. The advantage is that it was less expensive and slightly smaller than a full hollowbody (i.e., more portable and easier to play). The disadvantage is that there is a large wooden spine that runs through its centre, which eliminated a section of the guitar just behind the bridge for mounting certain

sensors. It also had less room inside the body, though it was more than enough for my purposes.

Based on my experience with the prototype, as well as my research into other augmented instruments, I decided on several different types of sensors: force-sensing resistors (pressure), potentiometers (i.e., knobs), buttons, switches, a photoresistor (light), an X-Y touch surface, and an accelerometer (tilt). Figure 31 illustrates the sensor layout.

Figure 31 – sensor layout

The area immediately above and below the strings is prime, since I can access it while still being able to pluck the strings. I therefore decided to place the most useful sensors in those areas; based on my experience with the prototype, these were the force-sensing resistors (FSRs) and buttons. I placed three FSRs in such a way that I can push all three while still plucking the strings with my thumb. Similarly, I placed the three buttons in such a way that I could access them easily with my thumb while still plucking the strings with my remaining fingers. I placed the switches within reach of the FSRs, so that if I find a particular setting I like, I can lock it in with my pinky finger without moving the fingers engaged with the FSR(s). As for the potentiometers, I was already quite used to

manipulating the guitar's existing volume and tone knobs (i.e., the gold ones), so it seemed natural to place the new knobs next to those. The accelerometer does not need to be accessed with my hands, so it is placed inside the guitar body; however, I placed it as far forward (i.e., toward the guitar neck) as I could, since upward tilt of the guitar is wider in that area.

The X-Y touch surface is a bit of a special case. I decided to incorporate it after realizing that the portion of the guitar surface behind the bridge was not useable for surface-mount sensors. I purchased Apple's Magic Trackpad because it was relatively inexpensive, off-the-shelf, supports multi-touch, and also because it communicates via Bluetooth technology, thereby eliminating the need for running wires to the Arduino and freeing up room on the Arduino for another sensor. I was able to simply affix it to the surface of the guitar with minimal issue.

Figure 32 illustrates how the Arduino itself is housed within the guitar.

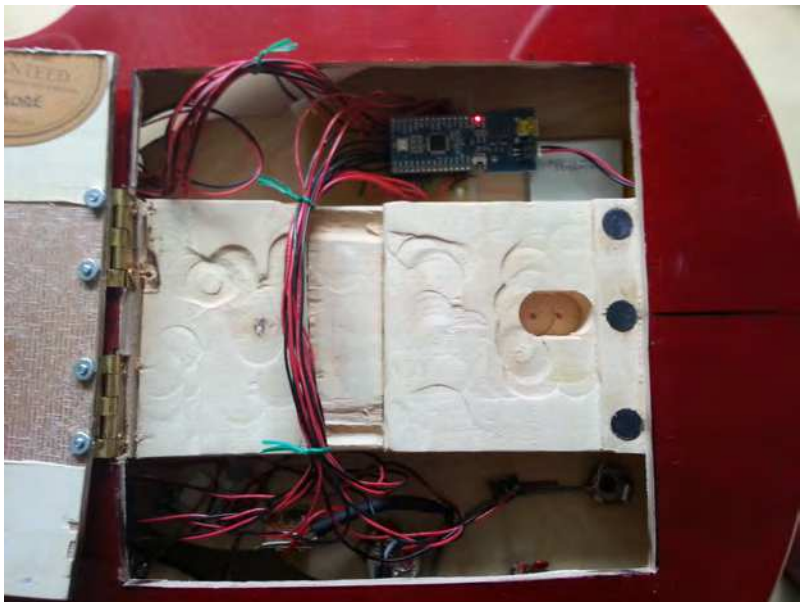


Figure 32 – inside the augmented guitar[14]

[14] Additional photos of the augmented guitar's construction can be found at http://www.colinlabadie.com/projects/augmented_guitar_2.html

I knew I wanted to be able to easily remove or replace it if necessary. This is difficult if the sensors are soldered directly to the Arduino, so instead I soldered the sensors to a perfboard.[15] I mounted the perfboard to the guitar using plastic standoffs[16] in order to leave room for the wires and solder joints, and so that I could remove the board if necessary. The Arduino connects to the perfboard via male and female headers,[17] such that it can be removed or replaced quite easily.

Once the sensors and Arduino were physically installed into the guitar and wired up to one another, the next step was to get the data from the sensors into the computer. Here, we move away from the realm of hardware and into that of software. In order to convert the sensors' raw electric current into something the computer can understand, the Arduino must first be programmed. For this step, I used the Arduino software, a programming environment in which code can be written, compiled, and uploaded directly to the board.[18] Figure 33 is an image of the Arduino code used for the augmented guitar as it appears in the Arduino software.

[15] A perforated circuit board used for prototyping.
[16] Used for separating components, often one surface from another.
[17] Pin connectors that solder to electronic components for easy connection/removal.
[18] This type of software is commonly referred to as an *integrated development environment* (IDE)

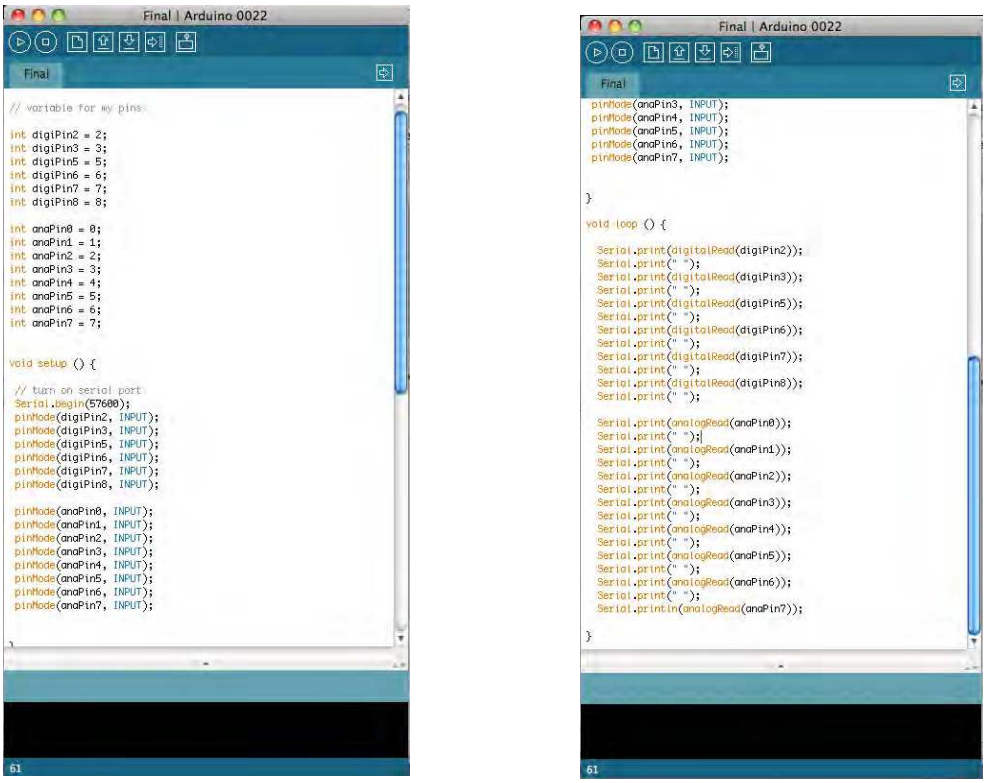


Figure 33 – Arduino code

There are several functions at work in this code. The first section assigns names—called variables—to the actual *pins* on the Arduino, which are the physical points on the board to which electronics are wired. There are two types of pins: digital and analog. Digital pins are binary, and are therefore used for sensors such as buttons or switches, which only have two positions: on or off. Analog pins can send or receive a continuously variable signal, and are therefore used for sensors such as FSRs and potentiometers (which are essentially both resistors). The Fio has thirteen digital pins and eight analog. In the variable assignment section of the code, you can see that I am using six digital pins (numbered 2–8), and eight analog pins (numbered 0–7).

Pins on the board can be used for either input (data comes in from the electronics) or output (data goes out to the electronics). The second section of the code, under "void setup" configures each pin as either *input* or *output*. Because I am trying to get data in

from the sensors, I have configured all pins as input pins. This section also defines the baud rate, or rate of data transmission in bits per second, in this case 57600.

The final section of code (under "void loop") is the operational part of the code—that is to say, the portion of code that actually runs when the Arduino is active. The code loops indefinitely; at each iteration of the loop, the amount of electronic current in each pin is read using either the *digitalRead* or *analogRead* functions. That current, expressed as a numerical value, is sent to a virtual serial port[19] using the *Serial.print* function. In order to actually get data from the Arduino to the computer's virtual serial port, the data is transmitted wirelessly from one XBee attached to the Adruino to a second XBee connected to a computer via USB.

Once the data arrives into the serial port, other programs can access it. The Arduino software is not designed for signal processing, so a different program is required. The specific program I use for signal processing is Max, a graphical programming environment developed in the 1980s by Miller Puckette and David Zicarelli (Dechelle 2015)[20] in which objects performing various functions are connected using virtual patch chords to perform more complex functions. A program written in Max is typically referred to as a *patch*. For my purposes, Max is used to map the sensor data onto various signal-processing parameters, so that sensors can be used to manipulate the sound of the guitar in real time.

[19] The serial port is an interface (either physical or virtual) that sends and/or receives data serially, i.e., one bit at a time.
[20] For a more detailed history of Max, see http://web.archive.org/web/20090603230029/http://freesoftware.ircam.fr/article.php3?id_article=5.

Figure 34 shows the Max patch used for the E-N movements.

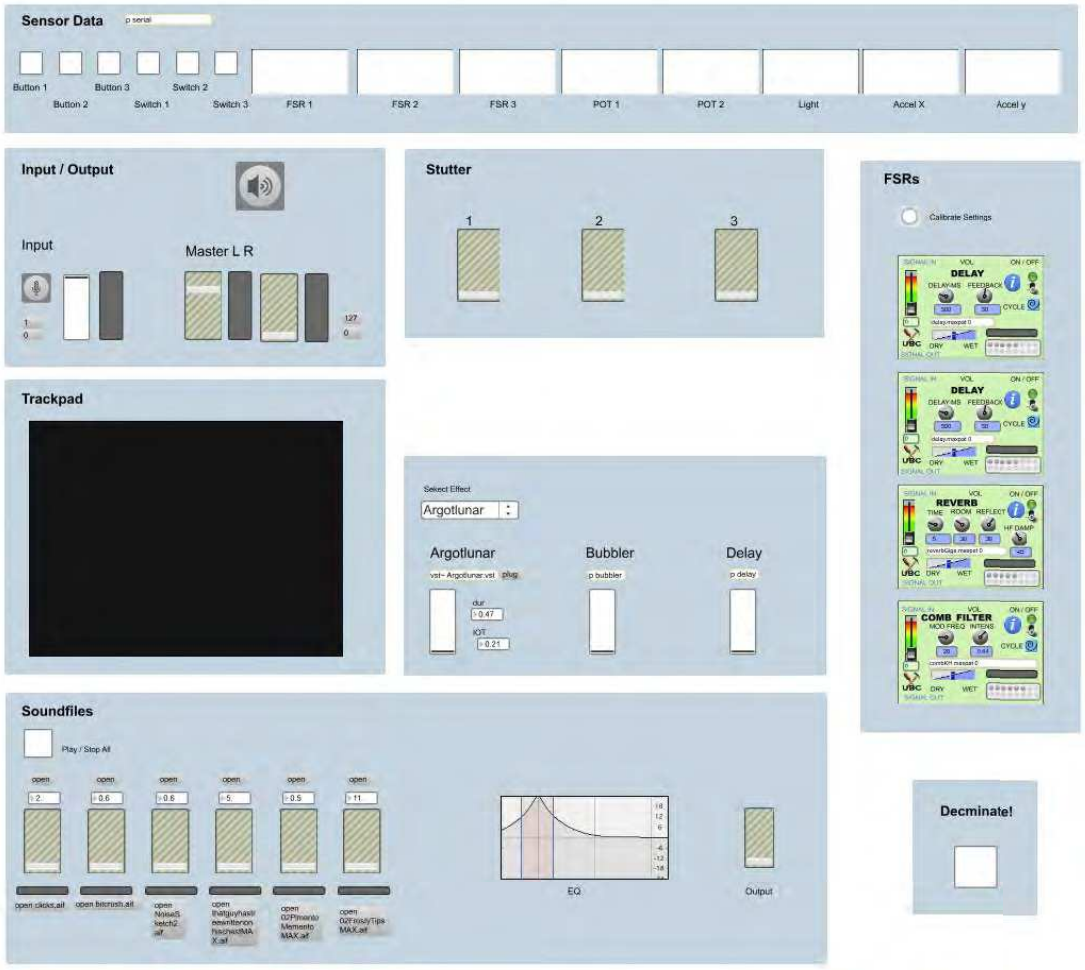


Figure 34 – Max, augmented guitar patch

There are various parts to this patch, each of which performs different functions ranging from data parsing and visualization to audio input/output and signal processing. In the following paragraphs, I will examine many of these sections in greater detail. I should point out that this particular view of the patch is referred to "presentation mode," in which many of the inner workings of the patch (patch chords, certain objets, etc.) are omitted for clarity. The actual "guts" of the patch look quite different.

Before any data can be mapped, it must first be parsed. The serial sub-patcher (the object labeled "p serial"—a smaller patch embedded within the larger patch) contains a *serial* object that imports the raw sensor data from the serial port, which comes in as a continuous list of numbers. A series of objects parses the numbers and scales them into useable values (the various boxes at the top of the patch are visualizations of the scaled data). Once it is parsed, the data can be mapped to any one or more parameters. Max enables the nature of that mapping to be quite dynamic and complex, and it can also change in very sophisticated ways. However, because the instrument is still relatively new to me, I chose to keep the mapping fairly straightforward; each sensor or group of sensors is mapped to only one or two effect parameters, as I will demonstrate later.

Figure 35 illustrates the part of the patch that handles signal input and output.

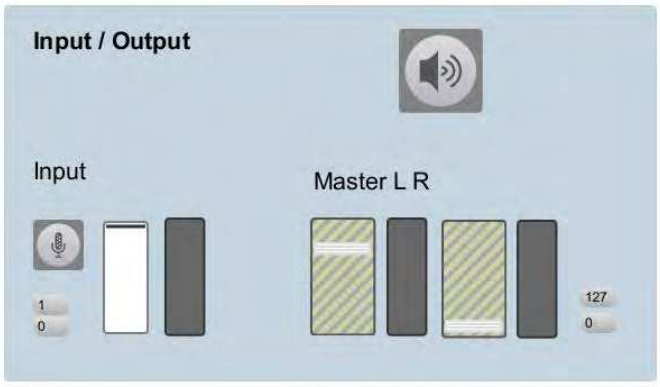


Figure 35 – augmented guitar patch, input/output

The analog sound of the guitar is routed into Max via an audio interface, and then converted into a digital signal using Max's ADC~ object (analog to digital converter—the object that looks like a microphone).[21] The dry guitar signal is sent to each of the various signal-processing areas via the *send~* object. Once processed, the signal is sent to the master output, which converts the processed digital signal back to analog via the DAC~

[21] The analog to digital (A/D) conversion technically does not happen Max. Rather, The ADC~ object (and its opposite, the DAC~ object—digital to analog converter) provides an access point (digital bus) to the A/D converter in the computer's sound card.

object (digital to analog converter—the object that looks like a loudspeaker). The processed and converted signal can then be sent out to a transducer of some kind, such as a guitar amplifier.

The sound of the guitar is processed using various digital effects, with the sensor data mapped to specific parameters. For example, the three red buttons above the stings are each mapped to the on/off function of a quasi-random delay based on an object called *stutter*. Figure 36 illustrates the inner workings of the *stutter* effect (is in contrast to the presentation mode seen earlier).

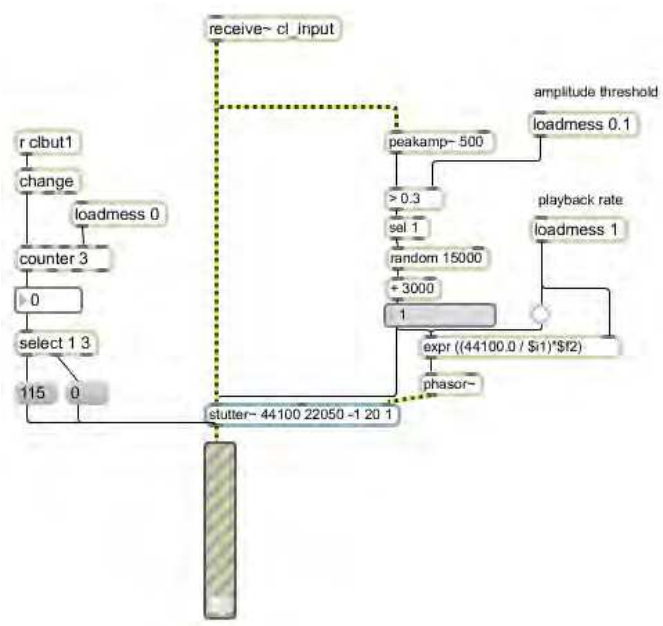


Figure 36 – *stutter* effect

This particular version of the stutter effect was developed by Andrew Benson (2008). When it detects audio above a certain volume threshold, it records a short sample, which it then plays back indefinitely with a random delay time (i.e., the amount of time between repetitions of the sample). The aural effect is a "glitchy" sounding delay. Each of the three buttons is connected to a separate stutter "unit" (i.e., an instance of the effect). Pushing a button activates one of these units by turning the output volume on. Pushing it

again deactivates the unit by turning the output volume off. Using the three buttons, up to three units can be activated simultaneously, and because each of the stutter units generates its own delay time randomly, the three units will always be out of sync. Therefore, by layering two or more units, I am able to create interesting cross-rhythms effects that shadow the dry signal of the guitar. Though this bears some resemblance to some of the compositional writing in the O-N movements, the resemblance is quite vague, since the cross-rhythms last only until I play another note, giving them an ephemeral quality that contrasts the more linear and logical development of TDS in the O-N movements.

The second effect I want to examine is called *argotlunar*, an external virtual studio technology (VST) plugin created by Michael Ourednik (2015). Although the plugin was intended for granular synthesis,[22] I use only two parameters that manipulate the sound in ways not typically associated with such synthesis. Figure 37 illustrates the interface for *argotlunar*.

Figure 37 – *argotlunar* external VST

Through trial and error, I found that pre-loading the values 0.47 for the "Dur" parameter and 0.21 for "IOT" parameter created a kind of "warbly" effect that I found interesting. These values stay static, while the two potentiometers are mapped onto two other

[22] Granular synthesis is a type of signal processing whereby a sound is broken down into very short samples (grains), then reconstituted using a number of parameters including grain size, grain density, feedback, transposition, etc.

parameters. The first controls the amount of "wet" (i.e., processed) signal present in the overall sound. The other controls the "feedback" parameter. This behaves somewhat unpredictably, with sharp feedback spikes occurring randomly in terms of rhythm, volume, and spectra. As the value of the parameter is increased (i.e., as potentiometer is turned), the feedback becomes louder, more frequent, and more aggressive.

The potentiometers can also be switched over to control parameters of a different effect, named *+bubbler*. *+bubbler* is part of the Soundhack externals[23] developed by Tom Erbe at the University of California, San Diego. Erbe describes *+bubbler* as "a granular delay in which grains are pulled from the delay line with randomized start time, delay time and pitch shift" (Erbe 2008, n.p.). One potentiometer controls the volume of the dry (i.e., unprocessed sound) guitar signal, while the other controls the wet guitar signal. In this way, any gradation of wet/dry signal can be achieved. This is significant, since the wet signal is sometimes unrecognizable as a guitar.

The other sensor used for *+bubbler* is the Apple trackpad. Using the *fingerpinger* external developed by Michael & Max Egger (2008), I was able to extract X-Y data from as touch points— theoretically *fingerpinger* would accept as many touch points as I could physically get on the trackpad, though in practice I only need four, one for each finger. Each finger is assigned to a bank of parameters, depending on the order in which it is placed on the trackpad—whichever finger is placed first is assigned to the first bank of parameters, the second finger to the second bank, and so on. The types of parameters controlled by the trackpad include grain size/density, resonance, octave variation, feedback, and filter frequency. By allowing each finger to manipulate several parameters simultaneously, the aural results are often unpredictable and slightly unstable.

[23] External objects (usually referred to simply as "externals") are those not included with the program. Generally, externals are built by various users and made available online; this is a common practice, since Max is capable of exporting patches that can then be used as externals in other patches.

The next sensor I want to examine is the accelerometer. The particular accelerometer I installed has the capability for three axes; however, due to the limited number of analog inputs in the Arduino, I was only able to use two. The X axis is connected to the tilt of the guitar's neck, while the Y axis is connected to the roll of the guitar's body. The effect I chose for the accelerometer is *+delay*, another of the Soundhack externals, though this one behaves more like a conventional delay unit. Like the touchpad, both the X and Y axes are connected to multiple parameters (many of them similar to *+bubbler*) including resonance, feedback, filter frequency, time, and LFO[24] speed. The time parameter is particularly interesting since, as with most delay units, when you change the delay time on the fly, it also affects the pitch; speeding up the time shifts the pitch up over time (like a glissando) and slowing down the time shifts the pitch down. The Y axis is connected directly to the time parameter, meaning I can control the pitch shift in a relatively predictable way. However, as with + *bubbler*, having the axes connected to many other parameters simultaneously makes the effect as a whole difficult to control.

There are three switches attached to the guitar. Two of the switches "lock" sound into place; one switch locks the FSRs, and the other locks the trackpad. Because the data values associated with these sensors returns to zero when the hands are not engaged with them, the processed sound also returns to a neutral state. This way, if I come across a sound I particularly like, I can use the switch to lock the sensor values into place, thereby maintaining the processed sound while freeing up my hands to use other sensors.

The third switch is connected to + *decimate*, another of the Soundhack externals. *+decimate* is a bitcrusher, a type of effect where the signal is distorted by reducing its resolution or bandwidth. + *decimate* produces a "warmer" distortion similar to that of distortion effects conventionally associated with the electric guitar. The distortion is much more saturated, however, giving much more sustain. + *decimate* also differs from conventional distortion effects in that when the guitar is not being played (i.e., no signal

[24] LFO stands for low-frequency oscillation, which usually involves a subsonic signal (i.e., below 20Hz) used to modulate various audio technologies including synthesizers and delay units.

is being sent), it produces harsh and slightly unpredictable "popping" noises that I find quite interesting. Additionally, if I slowly mute a note or allow it to fade, these popping noises will gradually emerge—a compelling effect.

Finally, I come to the FSRs. I have saved these for last because they are somewhat unique among all of the sensors. This is because all of the effects associated with the other sensors are actually routed into the effects of the FSRs, meaning any of the processed sounds can be processed additionally by effects controlled via the FSRs; as of now, the other effects are independent from one another. Each FSRs is connected to its own effect, which are produced using modules from Keith Hamel's UBC toolbox (Hamel 2011). These modules are: a delay unit, a reverb unit, and a comb filter (figure 38).

Figure 38 – UBC Toolbox modules

For each of the units, the main parameters are preset, and the FSR controls the amount of processed signal present in the overall signal. For the delay unit (there are actually two delay units with slightly different delay times), the FSR controls the overall volume of the delayed signals. For the reverb unit, the FSR controls the dry/wet mix such that when the FSR is not pushed, the sound is completely dry, and when it is fully pushed the sound is completely wet (i.e., only processed sound). I have the processed signal set to be quite reverberant and "muffled," thereby giving the processed sound a distant and ephemeral quality. For the comb filter, the FSR also controls dry/wet mix. The settings for the comb filter create a kind of controlled feedback.

As you can see, most of the actual signal processing is controlled by external software. Though I programmed the environment, I consciously borrowed code where I felt it was appropriate. The advantage to external objects/VSTs is that they provide and efficient off-the-shelf approach to exploring a variety of effects with relative ease. This is very much in keeping with the culture of the electric guitar, whereby commercial effect units are combined in various ways to explore new sonic territory. The main difference with the digital effects is that, in general, they provide more parameters with which to work, in turn providing greater sonic possibilities and control over the sound. For me, then, the creative aspect of the software (aside from choosing the type of effect) lies in choosing which parameters to manipulate, and how the sensor data maps to those parameters. As evident in previous paragraphs, I tend to favour mappings that produce quasi-random results. This has interesting implications for the improvisatory aspect of the E-N movements, to which I now turn.

5.2.2 – Improvisation

Though my intent is to wholly improvise all three of the E-N movements on the augmented electric guitar, I do have a few rough guidelines in mind. First, they should have an approximate duration of three-to-four minutes each. Second, they should avoid any overt and/or deliberately ordered materials such as those found in the O-N movements. This is not overly difficult since I tend to instinctively avoid such materials in my improvisatory practice. Granted, I sometimes use pulse and repetition; however, I generally use them in a vague way, and nowhere near the level of the ordered materials in the O-N movements. Finally, because the E-N movements draw on the metaphor of the universe's eventual destruction, the corresponding effects should all have some kind of destructive or deteriorative quality. Improvisation seems an apt avenue through which to explore the ultimate fate of the universe, since both have the quality of the unknown. Although we can hazard a guess as to the outcome of an improvisation or the ultimate outcome of the universe, we can never truly know until it has been experienced.

The improvisatory nature of the E-N movements makes them difficult to analyze. Each performance will be slightly different, and the sounds themselves will likely evolve over time as I continue to explore and develop new signal-processing effects. In order to provide some frame of reference from which to discuss the movements, I have included three video samples in the supporting material—***destruction I.mp4***, ***destruction II.mp4***, and ***destruction III.mp4***. These samples comprise instantiations of the E-N movements based on where the guitar and my approach to it currently stand. I will examine these samples as a way to explore how I conceive of the E-N movements, and how they fit into the broader scheme of *an interlude between two nothings*.

Though the E-N movements represent absurdity and destruction, I still want them to maintain a certain focus. I therefore chose to focus on one or two particular effects (and their associated sensor) for each movement. I also wanted each movement to have a unique sonic identity, and so each of these effects is quite different in character. In the samples provided, *destruction I* uses +*decimate*, *destruction II* uses +*bubbler* (the trackpad and potentiometers for wet/dry signal), and *destruction III* uses +*delay* and *argotlunar* (the accelerometer and the potentiometers). In addition to these base effects, I also allow myself to use the FSRs and red buttons at anytime. This is because their close position to the strings makes them accessible, and also because they use fairly standard time-based effects that do not dramatically alter the sound of the guitar (or at least not as dramatically as the other effects).

destruction I.mp4 is an instantiation of the first E-N movement. The main effect used in this sample is +*decimate*, a bit-crush distortion connected to the second switch to the left of the FSRs (the effect stays engaged through the entire movement, so you do not actually see me use the switch). As mentioned, I also use the red buttons immediately above the strings, which are connected to the *stutter* effect. Each button is connected to a different *stutter*, allowing for three simultaneous instances of the effect. I also use the three FSRs, which are connected to a delay unit, a reverb unit, and a comb filter, respectively.

The sample begins with the *+decimate* effect engaged, as apparent by the heavily distorted sound of the guitar. *+decimate* is similar to standard guitar distortion; however, it is much more saturated which creates a high degree of sustain (i.e., the length of time a note(s) can last). It also creates feedback when the open strings are left unmuted, which you can hear in the first few seconds of the sample. The particular feedback created by the *+decimate* is quite warm and pitched, varying between a G♯ and an A. The improvisation begins with a continuous melody that can be characterized as stream-of-consciousness—there are very few repeated ideas, and no real sense of tonality or modality. This is largely due to thinking in terms of either intervals or geometric shapes on the guitar rather than particular modes or scales while improvising.

At 0:15 in the video sample, you can see me use the FSR closest to the neck of the guitar. This FSR is connected to two standard delay units with slightly different delay times. Though the moment is quite short, you can distinctly hear the sound "widen" slightly, owing to the extra layers of sound created by the delay. I tend to use the FSRs in a similar way throughout the sample, using them briefly to slightly alter the colour of a particular note or sound.

At 0:39, you can see me push the red button closest to the neck of the guitar with my thumb, which initiates the first instance of the *stutter* effect. The sustain created by the *+decimate* effect actually mitigates the *stutter* effect somewhat, but it is still audible—particularly when I change notes, as you can often hear a remnant of the previous note. At 0:57, I activate the other two *stutter* units, and they remain on for the rest of the movement. The interaction between the three *stutter* units is quite audible, especially on sustained notes. For example, at 1:02 I allow the *+decimate* effect to create feedback, and the *stutters* can clearly be heard creating an inconsistency in the sound.

After the 1:00 mark, the melodic playing becomes less active, and I tend to start honing in on particular pitches as a way to draw focus toward the effects themselves. This is

significant because, in contrast to the more stable sound in the melodic playing, the sounds created purely by the effects are noticeably more chaotic and unpredictable. This is especially visible around the 1:55 mark. Here, I begin muting the strings such that the sound alternates unpredictably between feedback and an inconsistent static-like sound, both created by the *+decimate* effect. When I stumbled across this combination of sounds, I was immediately struck with the image of destruction and deterioration that I had set out as a guideline for myself, as explained earlier. I therefore continued to explore this sound intermittently for the remainder of the sample.

destruction II.mp4 uses a different effect—namely, *+bubbler*, controlled by both the trackpad as well as the potentiometers. The former controls the actual parameters of the effect, while the potentiometers control the ratio of wet to dry signal. Like the previous sample, I begin with stream-of-consciousness melodic material, though this time I also include some double stops and quasi-contrapuntal lines. In contrast to the previous sample, I begin with a completely dry signal—no effects whatsoever. This continues until approximate the 1:00 mark, at which point I introduce two *stutter* units. It is worth noting that because the *+decimate* effect is absent, the stutter units are slightly clearer and more audible than in the first sample.

At 1:25, I use the potentiometer to bring up the volume of the *+bubbler* effect's wet signal, which at first has a crackling, static-like quality. Through the remainder of the improvisation, you can see me placing my fingers on the trackpad and moving them around to make slightly adjustments to the *+bubbler* effect. Sometimes it changes the quality of the static, while at other times it creates flighty lines of delayed, pitch-shifted material—at the 1:38 mark, for example.

This texture continues until about the 2:25 mark, at which point I gradually start to fade out the dry signal of the guitar, leaving only the wet signal from the *+bubbler* effect. By the 3:00 mark, the dry signal is completely absent. This is especially clear at the 3:10 mark, as the processed sound is such that the notes I am playing are scarcely audible.

Instead, any notes I play seem to simply increase the density of static. Realizing this, I begin to articulate the left hand material using only hammer-ons, pull-offs, and slides,[25] which frees my right hand up to manipulate only the trackpad. With the exception of some very subtle pitch material from the left hand, the sound from her to the end of the sample can be characterized as distorted, and muffled, and churning.

destruction III.mp4 is the last of the E-N movement samples. The two primary effects used for this movement are the *+delay* effect, controlled by the X and Y axis of the accelerometer, and the *argotlunar* effect, controlled by the potentiometers. Like the second sample, this sample begins with a pure, unprocessed guitar tone. However, it is also accompanied by the only non-guitar-based sound in all three samples. At the beginning of the video, you can see me using the trackpad (in this case I am not using it to control an effect, but actually just using it as a mouse); here, I am increasing the volume of a sped-up soundfile, not completely unlike the one used in the electronic part of the first O-N movement. This is intended to be a kind of bed of abrasive (i.e., destructive) sound to accompany the guitar.

The opening material is similar to the first sample in that it comprises single-line, stream-of-consciousness melodic material, although it is livelier and relies to some degree on loose repetition. Like the first sample, I also insert brief splashes of signal processing from the FSRs. This proceeds up until the 0:50 mark, at which point I begin to incorporate the *+delay* effect by tilting the guitar along the X and Y axes. The resulting processed signal is characterized by quick echoes (i.e., fast delay times) that are generally accompanied by upward pitch shifting. At first, I tilt the guitar only occasionally, but from about 1:20 onwards, I consistently tilt the guitar while gradually increasing the range of motion, which in turns increases the amount of processed signal.

[25] These are guitar techniques that involve articulating notes with the fretting hand only (e.g., the left hand, for a right-handed player).

At the 1:18 mark, you can see me quickly turn one of the potentiometers to its maximum value. This increases the wet signal of the *argotlunar* effect to its maximum volume, though the dry signal remains present. The effect is immediately apparent, as the guitar takes on the "warbly" sound I described earlier. Not too long after, at the 2:15 mark, I gradually start to increase the value of the second potentiometer, which increases the amount of feedback in the *argotlunar* effect. The feedback is quite erratic, and jumps randomly across the frequency spectrum. Combined with the *+delay* effect, the overall sound of the improvisation becomes extremely chaotic and volatile, probably more so than any other moment in the three samples. This is in keeping with the theme of destruction and deterioration.

As I alluded to earlier, one aspect of the signal processing effects is their unpredictable nature. With the exception of perhaps the FSRs, all of the effects have a certain degree of randomness or unpredictability that makes them slightly unstable and difficult to control. In the first sample, both the feedback and the crackling noise that occurred as the guitar input signal approached nil behaved slightly unpredictably. Similarly, in the second sample I am not always sure precisely how my finger motions on the trackpad will affect the sound. In fact, there is a telling moment at roughly the 2:48 mark where the sound behaves erratically for a couple seconds, and I am clearly not sure which sensor to engage. In the final sample, both the *argotlunar* feedback and the *+delay* effect behave in a highly unpredictable manner, especially when combined.

The unpredictable quality of the signal-processing effects was an intentional design, and in fact is an important aspect of my improvisatory practice. Much of the rhetoric around technological innovation focuses on having greater control. Certainly, there are aspects of the augmented guitar that seek to have at least more nuanced and expressive control over signal processing. However, it is also important to me to not fully understand what a given effect does. As a result, the improvisation becomes at least in part about exploring the relationship between the sensors in a kind of innocent and curious way—in other

words, to play. It often leads to unexpected territory, as the combination of effects or the particular behaviour of a certain mapping can create surprising sounds.

In the context of the overarching narrative in *an interlude between two nothings*, the unpredictable quality of the effects represents a purposeful giving up of control. This directly contrasts the O-N movements, in which materials become increasingly controlled as the movements progress; in other words, I exert *more* control as the O-N movements progress. Emphasizing this contrast is the destructive or deteriorative quality of the effects in the E-N movements; the O-N movements attempt to build up structures while the E-N movements, in these particular instances, attempt to obliterate the sound of the guitar. This contrasting relationship stems from the broader aesthetic goal of juxtaposing rationality with the absurd, as outlined earlier. For me, the deliberate relinquishing of control represents acceptance of the absurd.

There is an underlying paradox here that should be addressed. Though the giving up of control and the lack of linear progression (which deliberately contrasts the O-N movements) is a deliberate stance and integral aspect of the E-N movements, I do exert a certain will in each of their overall formal structures. These particular instantiations of the E-N movements are each characterized by a gradually increase in signal processing, thereby exhibiting a kind of progression from x to y. The implication is that there is a certain logic in any progression (even if it is a progression toward the absurd) that has the potential to betray the intent of the E-N movements. However, I believe the perception of an underlying logic is undermined by the fact that, unlike the O-N movements, this progression does not unfold in a strictly linear or systematic fashion. Moreover, these movements need not necessarily progress this way every time; as these video samples were meant to be a point of reference, I chose to begin each sample with a relatively unprocessed sound in the interest of demonstrating the range of the effects. In other instantiations, they could certainly behave completely erratic or even explore (heavily processed) stasis. Because the E-N movements unfold over time (like most music), there is always the potential that I may unintentionally imply some sort of logic, however much

I try to avoid it. I believe, however, that the high degree of signal processing and the destructive and/or deteriorative quality therein will be the more salient feature.

Another related aspect of the E-N movements is precisely how their general character and energy fits into the work as a whole. Because *an interlude between two nothings* is meant to unfold seamlessly, the E-N movements have a stronger impact on how the O-N movements are perceived than if they were a break between movements. I had originally considered using descriptive words to set guidelines for the character of each E-N movement—words such as dense/sparse, loud/quiet, intense/calm, abrasive/soft, etc. I had also considered giving a general outline of the formal shape for each movement. In the end, I chose not to be prescriptive about the E-N movements. This is because I realized that the motivation for such descriptions was to create a smooth flow between movements. For example, I thought that if the last E-N movement was characterized by an intense energy (such as that in the sample provided), that it may somehow spoil the delicate and introspective ending in *formations II*. However, I decided that I am not overly concerned with having smooth transitions between movements; the E-N movements are meant to contrast and interrupt the O-N movements, and so I am quite happy with the respective energies of the O-N and E-N movements working against one another. Additionally, the particular ensemble, venue, or audience may affect the overall energy of the work, and I enjoy the freedom of being able to make adjustments as I see fit.

Chapter 6 – Conclusion

In this document, I have tried to show how I use the metaphor of cosmology in *an interlude between two nothings* to juxtapose rationality with the absurd. The work is composed of two distinct and contrasting streams. The O-N movements, written primarily for the acoustic medium, are characterized by increasingly ordered materials, beginning with loose, semi-improvised materials in *inflation* and culminating with a complex network of temporally dissonant strata in *formations II*. These movements are meant to evoke a rational search for meaning through the emergence of order, as well as the awe I experience when I reach the limits of my perception, especially with regard to the nature and scale of existence. In contrast, the E-N movements imagine three different deaths of the universe as an invocation of the absurd. They are improvised in the electronic medium, and are composed of intentionally unpredictable materials characterized by destruction and deterioration. These movements interrupt and contrast the linear development of order that characterizes the O-N movements, intended as a reminder of the absurdity inherent in any rational search for meaning.

The audience may not have a strong working knowledge of cosmological theories; even if they do, the cosmological metaphor may not be readily apparent in the materials themselves. I do not see this as a shortcoming, since my intent is not to depict the evolution of the universe and its eventual destruction literally, but rather to draw on these elements as a metaphor to evoke the contrasting ideas of rationality and absurdity. I believe, especially on repeated listenings, that the audience can perceive a fundamental difference in the two streams, especially with respect to the increasing order in the O-N movements, and the distinct lack of order in the E-N movements.

Beyond the cosmological metaphor, I also regard *an interlude between two nothings* as a reflection and deepening of my current artistic practice. As I described earlier, I was previously unsatisfied with my results when trying to mix acoustic and electronic media. By separating the two, I found my work in both realms became stronger and more

focused. When I originally conceived of *an interlude between two nothings*, I considered retrying to mix the two media as I had in the past. However, after reflecting on my practice in recent years, I thought it would be more appropriate to keep them separate in seemingly contrasting though actually interconnected roles. This is in part because the theme of rationality versus absurdity that plays out in the cosmological metaphor also characterizes the relationship between the two media in my practice as whole. My recent works in the acoustic medium are serious in tone, and aim to play with the listener's threshold of perception by creating densely layered, temporally dissonant structures that draw heavily on ordered materials. In contrast, my practice as an improviser leans toward electronic media and eschews ordered structures in favour of more visceral and ephemeral materials. Despite their differences, these two seemingly disparate practices influence one another in profound ways; in the same way that absurdity is intended to remind one not to take rational searches for meaning too seriously, my practice as an improviser gives me the confidence to depart slightly from the ordered materials in the acoustic medium when necessary, and to allow for human error.

I believe the innovation in *an interlude between two nothings* lies particularly within the temporally dissonant strata, as well as the augmented electric guitar. I agree with Nancarrow that, as noted earlier, "time is the last frontier of music" (Garland 1982, 185). Indeed, the realm of pitch relationships has received a disproportionate amount of attention in Western music. I can distinctly remember being mesmerized as a teenager by a simple three-against-two and later a four-against-three; to this day I still have a wide-eyed fascination with allowing my attention and perception to drift and shift among a tapestry of temporally dissonant layers. I feel strongly that there remains a great deal of exploration to be done in the realm of complex and nuanced temporal relationships.

Likewise, I believe the electric guitar, which has become somewhat stale as of late, is ripe for new exploration. In the 1960s, the electric guitar was a cultural icon for innovation and experimentation. Now, many of the experimental effects and techniques developed during that time have become codified and conveniently packaged. Considering the

history of experimentation associated with the electric guitar, I believe the instrument is ready for a renaissance; even while writing this document, I am continually hearing about new and interesting DIY electric guitar projects. I am hopeful that my guitar will constitute a meaningful contribution that will encourage similar kinds of exploration.

In the future, I may start to re-incorporate electronic media into my acoustic concert works. I believe the reason for my previous frustration stem from the fact that I did not feel the electronics had a *raison d'être*. Considering how temporal dissonance and the augmented guitar for me represent the most innovative features of *an interlude between two nothings*, it seems that at least one potential avenue for exploration would be to compose fixed works for the augmented guitar that draw on temporal dissonance. Indeed, the effects available to the guitar offer great potential for precisely such works. For now, however, I am content to allow the two streams of my artistic practice to continue evolving in parallel.

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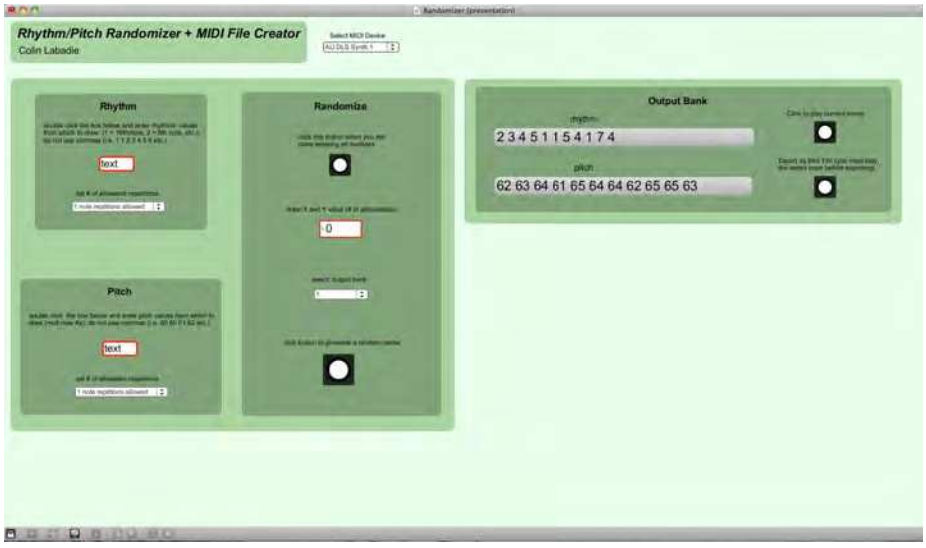
Appendix A

The following is a screenshot from the Max patch I used to generate the quasi-random melodies in the opening section of *formations I*.



The "text" objects (outlined in red) store data related to pitch and duration, allowing the user to input as many values as needed. For pitch, values are inputted as MIDI note numbers (60 = C4, 61 = D4, etc). For rhythm, values are inputted as the number of sixteenth notes in duration (1 = sixteenth note, 2 = eighth note, 3 = dotted eighth note, etc.). The user can also enter values multiple times to create weighted probability; for instance, a collection of [1, 1, 2] in the rhythm field would result in a sixteenth note being twice as likely to be chosen as an eighth note. After the values are set, the user chooses the number of notes they wish to generate. These are then outputted in the grey boxes on the right, with the top box representing duration and the bottom box representing pitch. The values are combined in order; for example, the first value in the top box (2) would be combined with the first value in the bottom box (62) to create an eighth-note on D4.

Musical Score for *an interlude between two nothings*

Colin Labadie

an interlude between two nothings

for flute, clarinet, violin, cello, piano, electric guitar, and fixed electronics

in six movements:

I.....inflation
(flute, clarinet, violin, cello, piano, and fixed electronics)

II.....destruction I
(improvisation – solo electric guitar)

III.....formations I
(flute, clarinet, violin, cello, and piano)

IV.....destruction II
(improvisation – solo electric guitar)

V.....formations II
(solo piano)

VI.....destruction III
(improvisation – solo electric guitar)

with special thanks to Ensemble Paramirabo and Sandra Joy Friesen

dedicated to Mary and Ben Mallette & Ellen and Doug Labadie

This work exists in three different perfomance versions:

i - conventional
all movements with live improvisation by the composer

ii - conventional
all movements with recorded improvisation to be provided by the composer

iii - sectionals
movements III and V extracted and perfomed individually or as a set

Program Notes

"The universe now looked to be neither of these things. Just as it winked into existence with an initial Big Bang, so too it might wink out of existence in some distant future...The life of the universe, like each of our lives, may be a mere interlude between two nothings." – Jim Holt, *Why Does the World Exist?*

an interlude between two nothings is, in a sense, two separate pieces intertwined. Though the entire piece is inspired in part by my interest in physical cosmology, the odd-numbered movements (I,III, V)—performed primarily by acoustic instruments—are inspired by the origins and evolution of the universe, and attempt to evoke its transition from an early formlessness to progressively large and more complex structures. The pulseless, semi-improvised opening movement gives way to increasingly structured melodies in the third movement, eventually moving toward highly ordered and complex layered rhythms in the fifth movement. In contrast, the even-numbered movements (II, IV, VI)—performed on an augmented electric guitar—are inspired by theories of how the universe might end, such as the Big Chill or the Big Rip. Through digital signal processing and improvisation, each of these movements evokes an imagined death of the universe s as a kind of Absurdist foil that keeps interrupting the more linear trajectory of the odd-numbered movements. In this sense, an interlude between two nothings juxtaposes the rational and the absurd as a rellection on the nature of the universe and existence as a whole.

Beyond the cosmological metaphor, I regard an interlude between two nothings as a reflection of my current artistic practice. My creative output in recent years comprises two distinct streams of activity. The first stream is characterized by fixed works for the acoustic medium that are focus extensively on patterning, subtle variation, gradual change, systematization, and complex temporal relationships. The second stream is characterized by non-fixed (i.e. improvisatory) works for various electronic media that are generally abstract, textural, and sometimes abrasive. an interlude between two nothings was born out of the desire to further explore—within the context of a unified work—both streams independently, and to contemplate their relationship to one another in shaping my creative process and artistic voice as a whole.

Performance Notes

The entire work is intended to unfold seamlessly, without breaks between any of the six movements. The transitions between movements should dovetail smoothly, with the last instrument(s) to play in a given movement allowing their to sound ring out for 5–10 seconds into the following movement. Although the work is conceived as a whole, movements III (formations I) and V (formations II) were written for a specific ensemble and individual, respectively: Ensemble Paramirabo and Dr. Sandra Joy Friesen. As such, I designed these movements to work as standalone pieces, and they can therefore be extracted and performed separately.

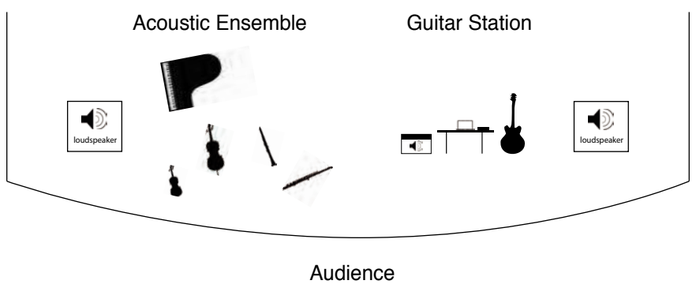
Movements II, IV, and VI are intended to be improvised on an electric guitar that I have custom-modified with the use of electronic sensors. These sensors send data to computer software, which then manipulates the sound of the guitar in real time via digital signal processing. The sound of the guitar and style of improvisation are highly personal and idiosyncratic. As such, these movements are intended to be performed solely by me and should not be recreated through any other means (with the possible exception of a recorded improvisation that can be provided upon request). I have therefore omitted any type of notation in the score; instead, I have included only movement titles which indicate each movement's approximate duration and relative position within the larger work.

Based on these considerations, the work thus exists in three possible versions for performance:

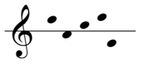
i - conventional: all movements with live improvisation
ii - conventional: all movements with recorded improvisation diffused through loudspeakers on stage
iii - sectionals: movements III and V extracted and perfomed individually or as a set

Movement I makes use of a fixed electronic track that will need to be diffused through two loudspeakers placed within the ensemble (see staging). An operator will have to cue the electronic part and balance its volume with the acoustic instruments. For performance version ii, the recorded improvisation can be diffused through the same loudspeakers as the fixed electronic part.

Staging



Notation



Movement I uses an approximate pitch notation; the centre line represents roughly the middle register of the instrument; individual pitches are left up to the performer

Scratch Tone (strings): extreme overpressed bow to the point of obliterating all pitch, leaving a scratchy, gutteral sound

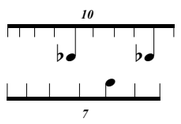
Jet Whistle (flute): completely cover the mouthpiece and blow forcefully, creating a loud whistle sound

Slap Tongue (clarinet): use tongue on the reed to create a slapping or popping sound, while still allowing the pitch to resonate briefly

Multiphonic (movement I): choose any multiphonic that speaks clearly and loudly

Cluster (piano): white and black note cluster (use palm)

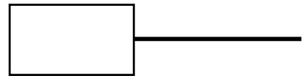
Accidentals (global): accidentals apply only to adjacent pitches



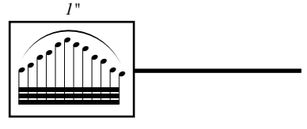
Stemmed Tuplets (piano): only play pitches with noteheads; extra stems are for ease of performance

Slurs (global): regular slurs have normal function (articulation/phrasing), dashed slurs (movement V only) are less strong and are intended to show pattern grouping for ease of performance

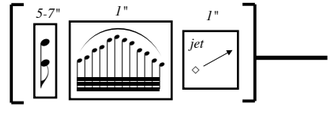
Boxed Notation



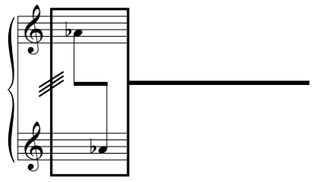
Box: in general, a box signifies to play its contents for the duration of the solid line



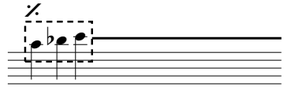
Standard Box: improvise drawing on contents of box; the number above the box represents the approximate length of the figure for each iteration



Bracket: choose freely between boxes



Tremolo (piano): tremolo on the given pitch(es)

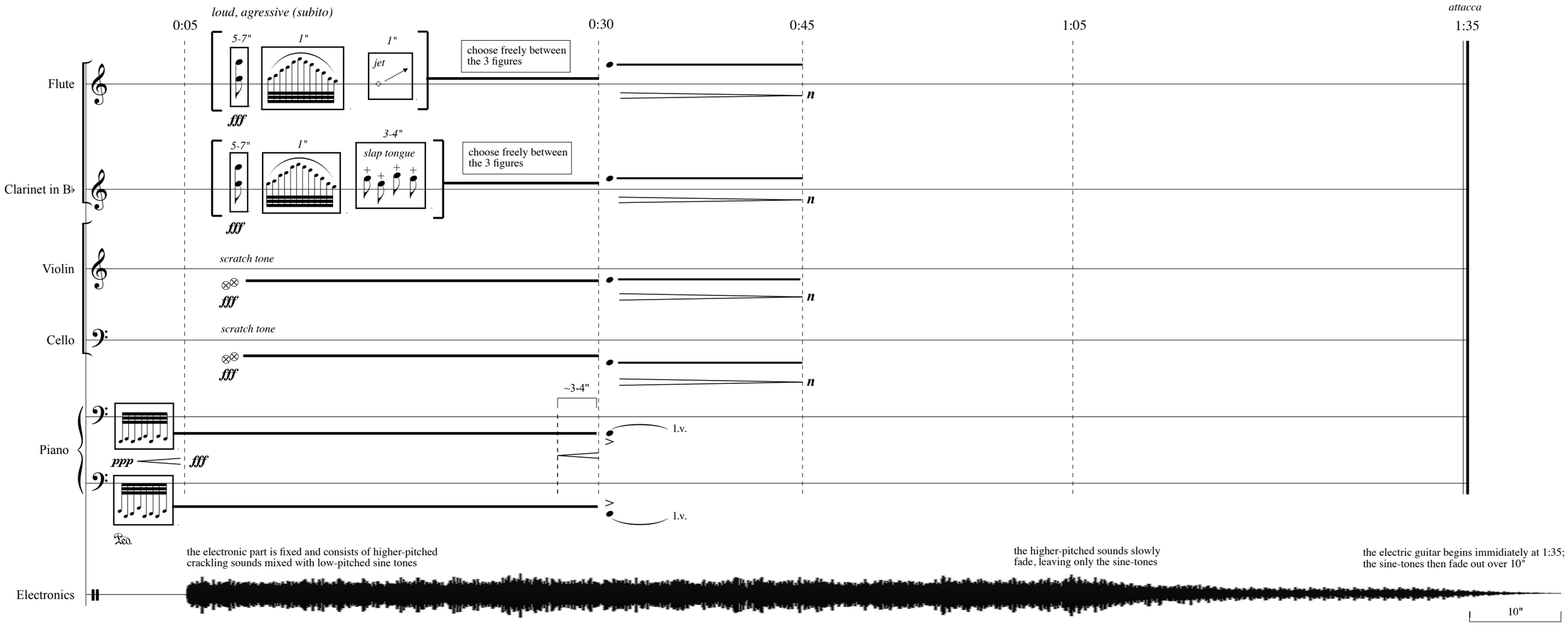


Dashed Box w/ Repeat: repeat pitches in the order given

Colin Labadie

an interlude between two nothings (2014)

I – inflation



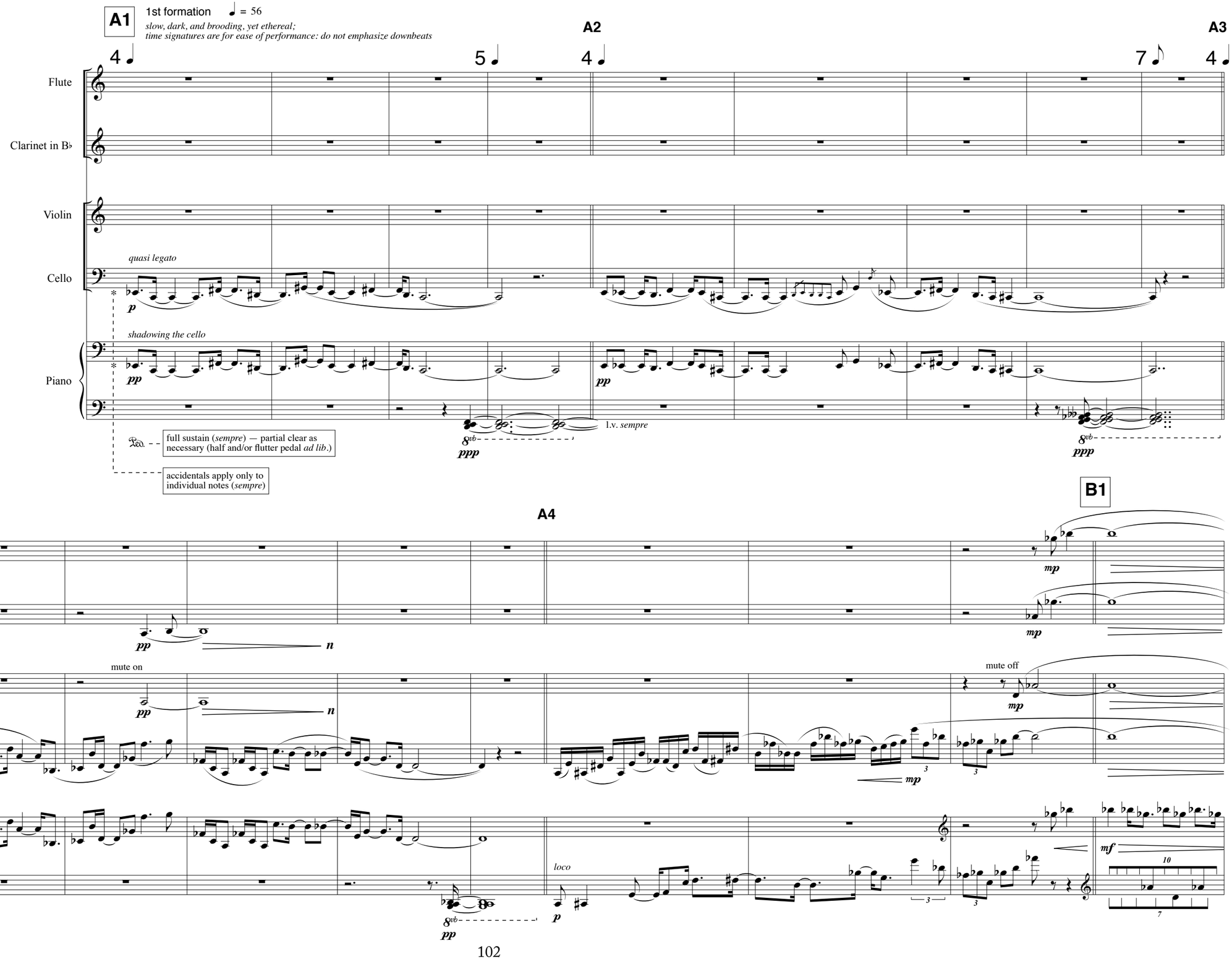
II – destruction I

improvisation – solo electric guitar (see performance notes)

c. 3 – 4'

attacca to movement III

III – formations I



C1 2nd formation
light, delicate

C2

20

Fl.

B♭ Cl.

Vln.

Vc.

Pno.

quasi legato; freely

33

breathe if/when necessary (*sempre*)

breathe if/when necessary (*sempre*)

C3

43

Fl.

B♭ Cl.

Vln.

Vc.

Pno.

(p)

n

mp

ppp

8va

loco

(pp)

C4

molto legato (to mm. 56)

p

3

sub. f

pp

53

3 4

D1

3rd formation

still delicate, though more mechanical and assertive

5 4

mf

63

D2

D3

Fl.

B♭ Cl.

Vln.

Vc.

Pno.

mute on (*sempre*)
sul tasto

mute on (*sempre*)
sul tasto

74

ord.

ord.

E1 4th formation
flowing; molto legato

81

Fl.
B♭ Cl.
Vln.
Vc.
Pno.

gradually getting more agitated

E2

E3

92

E4

E5

F1 5th formation ♩ = 66
freely, yet methodical and obsessive

98

Fl.

B♭ Cl.

Vln.

Vc.

Pno.

mf

* play all slurred passages as legato as possible;
re-artculate large leaps if necessary

(*p*)

(*pp*)

(*pp*)

(Ped.) ⟶ continue holding sustain pedal during flute solo (and through to the end)

with a subtly increasing energy and sense of urgency (to mm. 125)

F2

110

Fl.

118

Fl.

B♭ Cl.

Vln.

Vc.

ord.

flz.

ppp

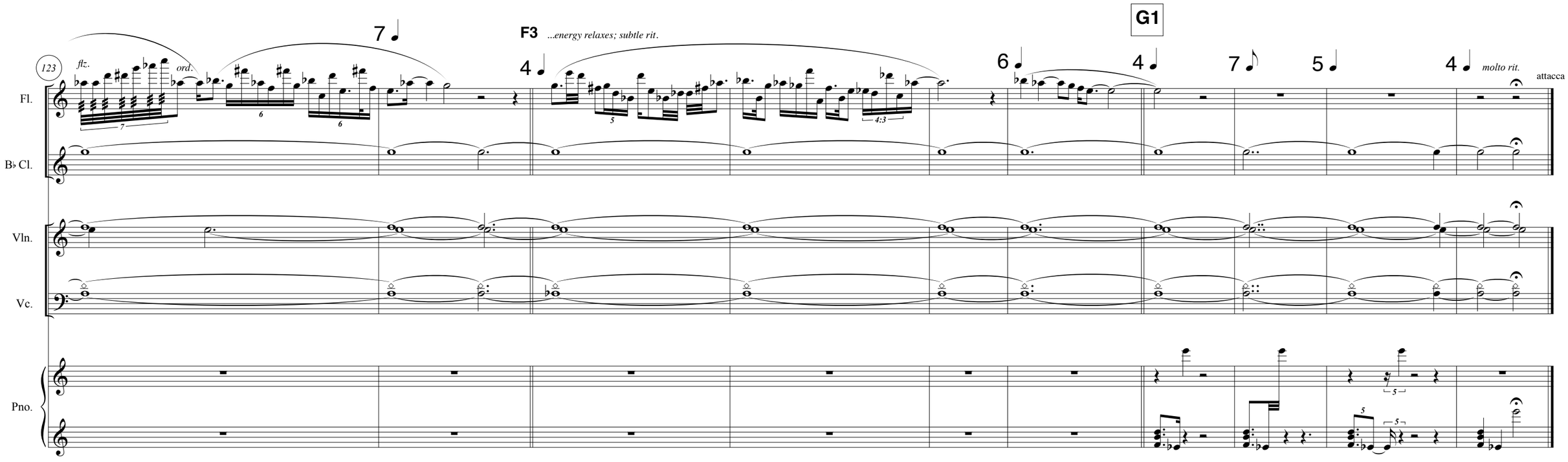
mute on
sul tasto

II

ppp

mute on
sul tasto

ppp



IV – destruction II

improvisation – solo electric guitar

c. 3 – 4'

attacca to movement V

V – formations II

Piano

spacious, ethereal

p

8vb

5"

(black/white note cluster)

8vb

Ped.

Full sustain, or the effect of full sustain; partial clear as necessary (half and/or flutter pedal *ad lib.*)

A1 ♩ = 75

8va

sim.

pp

barlines are for ease of performance only; do not emphasize downbeats.

8

8va

8vb

p

7"

Ped.

8vb

B1 fast but comfortable: ♩ = 90 - 96

energetic, but with an effortless sense of seamless continutiy and momentum.

clusters and accented/tenuto notes should feel independent from each other and from the underlying sixteenth-note texture

notes adjacent to large leaps are optional (*sempre*)

let clusters ring (*sempre*)

fff

pp

accidentals apply only to the corresponding pitch (*sempre*)

8vb

16

B2

> = *ff sempre*

8va

– = *mf sempre*

15mb

8vb

Ped.

21

B3

8va

8vb

15mb

8vb

8vb

Ped.

27

B4

8va

8vb

Ped.

32

B5 *with an subtly increasing intensity until C1*

8va

15mb

8vb

38

dynamics outside of the staff apply only to the clusters over/under which they appear (*sempre*)

B6

p

8va

(*pp*)

15mb

8vb

8vb

pp

44

C1 *suspended, as though the energy has ossified; transitional*

fff

8va

mf

f

15mb

8vb

mp

8vb

mf

sub. ***pp***

8vb

mf

50

ff

8vb

55

mf

subito

8vb

8vb

mf

D1 *the first section has receded and the energy resets*

60

6

Ped.

(*mf*)

8vb

8vb

D2 slurs apply only to the underlying texture; large leaps and clusters should feel independent

D3

66

Ped.

8vb

i (clusters turn to pitches)

D4

72

3

3

3

mf

5

Ped.

8vb

8vb

8vb

8vb

D5

77

f

5

3

Ped.

8vb

8vb

81

ff

fff

5

3

3

Ped.

8vb

8vb

mf

ii

8vb

f

85

D6

D7

8va

8vb

ff

91

8va

iii

fff

8vb

15mb

mf

95

8va

8vb

15mb

f

D8

100

D9 *with a subtle increase in focus and intensity*

iv

f

8va

8vb

15mb

ff

105

8va

mf

8vb

15mb

fff

D10

ff

8va

mf

109

D11

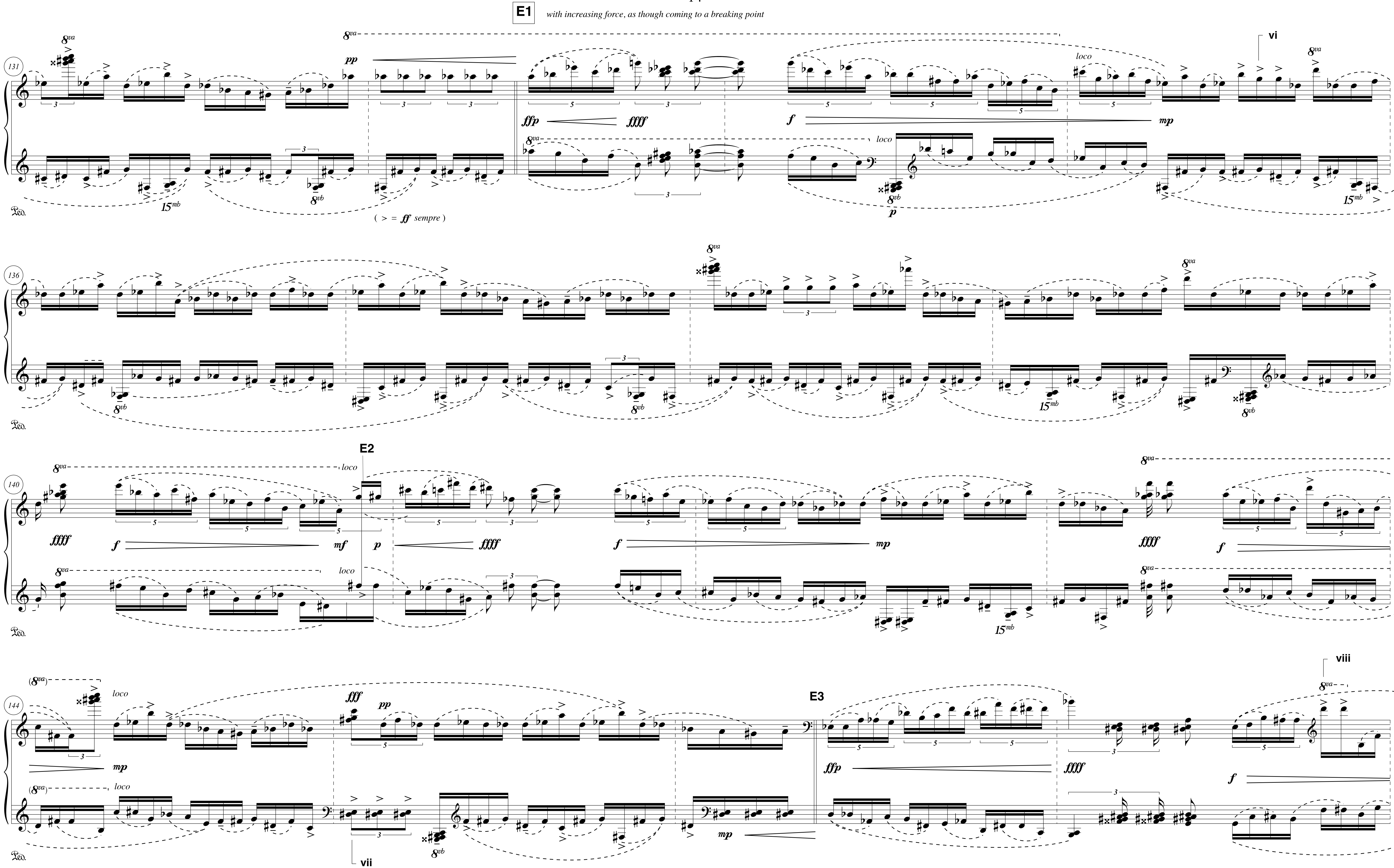
114

D12

119

123

127


E1
with increasing force, as though coming to a breaking point
(> = ff sempre)
E2
E3
vi
vii
viii
loco

149

8va

ffff

mf

ffff

mp

mp

8va

8va

15mb

8va

8va

8vb

E4

ffp

ffff

8va

Ped.

154

(8va)

(8va)

loco

loco

f

mp

15mb

viii

E5

ffp

ffff

f

ffff

8va

8vb

Ped.

159

f

ffff

f

ffff

f

ffff

8va

8va

loco

f

loco

8va

Ped.

163

F1

with as much intensity and energy you're able to give, from here to H1

ffp

ffff

mf

ffff

8vb

8vb

Ped.

167

8va

loco

8va

loco

Ped.

171

8va

8vb

loco

loco

F2

ffff

f

Ped.

8vb

176

8va

loco

ffp

ffff

f

ffp

ffff

f

8va

8va

loco

8vb

Ped.

180

8va

loco

ffff

mp

fff

mp

ffff

mp

ffff

Ped.

(8vb)

loco

G1

184

tremolo (for duration of solid line)

ff - fff ad. lib

Ped.

195

8va

8vb

Ped.

203

7"

8vb

Ped.

H1 ♩ = 56

transition to I1

mp *descrescendo to ...*

Ped.

Full sustain; no partial clear or flutter/half pedal from here to end

211

... ppp

Ped.

I1 *with a sense of awe*

pp

loco

217

I2

ff (dynamics outside of the staff apply only to the clusters over/under which they appear)

ff

(*pp*)

Ped.

224

I3

ff

ff

f

I4

mf

mp

mp

mp

Ped.

232

f

mf

f

I5

mf

fff

8va

f

mf

ff

mp

mp

mp

mp

Ped.

239

f

I6

mf

mf

f

f

I7

mf

ff

fff

8va

ff

8vb

pp

mp

f

p

mp

Ped.

247

I8

mf

f

8va

mf

f

f

p

mf

f

8va

f

8vb

f

mp

mp

mp

mp

pp

mp

mp

Ped.

I9

I10

I11

I12

I13

I14

molto rit.

attacca

c. 14'

VI – destruction III

improvisation – solo electric guitar

c. 3 – 4'

total duration: c. 35'

November 2014 - Waterloo, Canada