UNIVERSITY OF CALIFORNIA SAN DIEGO

Manipulations and Perceptions of Time, Timbre, Texture, and Physical Gesture in Acoustic and Electroacoustic Music

A Dissertation submitted in partial satisfaction of the requirements
for the degree Doctor of Philosophy

in

Music

by

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Professor Memo Akten
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Professor Miller Puckette
Professor Shahrokh Yadegari

2024

The Dissertation of Nathaniel Haering is approved, and it is acceptable in quality and form for publication on microfilm and electronically.

University of California San Diego

2024

DEDICATION

This Dissertation is dedicated to my amazing wife, Natalie.

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ABSTRACT OF THE DISSERTATION

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Doctor of Philosophy in Music

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Professor Michelle Lou, Chair

In this paper, I will analyze three substantial works created while studying at UC San Diego, *to facilitate friction* (2020) for violin and live electronics, *Spate III* (2022) for amplified chamber ensemble, and *untitled* (2023) for amplified septet and live electronics, as case studies to convey and elucidate the compositional approaches, challenges, questions, and concerns that are most exciting to me at this point in time and most critical to the function and (at least my)

understanding of my recent works. Other pieces, both recent and from the more distant past, will be mentioned in brief to aid in connecting these works together and to better assemble a compelling narrative of how my compositional practice and resulting compositions have evolved over the course of my doctoral journey. These three works will be primarily discussed in terms of the manipulation and distortion of linear and nonlinear perceptions of time, the sculpting of granularity/microsounds, the physicality of/physical exertion inherent in extended instrumental techniques and improvisatory materials, trajectories, and vectors over time, and the spectromorphology of the interactions of instrumental and electronically produced sounds. The writings of Jonathan Kramer, Gérard Grisey, Curtis Roads, Denis Smalley, and a myriad of others will provide an analytical framework and foundation and be called upon to reinforce the arguments and perspectives put forth about my own work throughout this paper.

Chapter 1 Introduction

In this paper, I will analyze three substantial works created while studying at UC San Diego, *to facilitate friction* (2020) for violin and live electronics, *Spate III* (2022) for amplified chamber ensemble, and *untitled* (2023) for amplified septet and live electronics, as case studies to convey and elucidate the compositional approaches, challenges, questions, and concerns that are most exciting to me at this point in time and most critical to the function and (at least my) understanding of my recent works. Other pieces, both recent and from the more distant past, will be mentioned in brief to aid in connecting these works together and to better assemble a compelling narrative of how my compositional practice and resulting compositions have evolved over the course of my doctoral journey. These three works will be primarily discussed in terms of the manipulation and distortion of linear and nonlinear perceptions of time, the sculpting of granularity/microsounds, the physicality of/physical exertion inherent in extended instrumental techniques and improvisatory materials, trajectories, and vectors over time, and the spectromorphology of the interactions of instrumental and electronically produced sounds. The writings of Jonathan Kramer, Gérard Grisey, Curtis Roads, Denis Smalley, and a myriad of others will provide an analytical framework and foundation and be called upon to reinforce the arguments and perspectives put forth about my own work throughout this paper.

1.1 Perception, Manipulation, and Distortion of Time/Temporal Manipulation

Three writings on musical time and temporal perception exerted profound influence during the nascent stages of my development as a composer. I have chosen to synopsize their

core terminology and concepts at the outset of this paper as their impact permeates all three of the works to be discussed, and the concepts they present will be alluded to frequently throughout. I have since read many other books and articles on time and perception and had numerous personal experiences that have further expanded and refined my perspectives on, and approach to, manipulating time and temporal perception; however, I believe highlighting these particular writings provides an efficient and direct glimpse into how I am thinking about time, form, and structure in my works, and why my pieces are the way they are. The three writings in question are Jonathan Kramer's *The Time of Music: New Meanings, New Temporalities, New Listening Strategies*, Gérard Grisey's "*Tempus ex Machina*: A Composer's Reflections on Musical Time," and Jonathan Bernard's "Elliott Carter and the Modern Meaning of Time."

Before continuing, it is worth noting that a vast majority of writings about "time" have at their core a dichotomy or distinction between "clock time," the shared "public time" that can be measured by a clock, usually in milliseconds, seconds, minutes, etc., and "personal time," the internal, psychological time that fluctuates, accelerates, decelerates, and freezes differently for each person in response to various stimuli and that may or may not align with clock time – the classic example being that "time flies when you're having fun!" They also feature an absurd quantity of different terms and jargon to discuss these concepts, each author seeming to have invented their own slightly different terms. I prefer the terms "chronometric time" (clock time) and "psychological time" (personal, variable, fluctuating time), which will be used prominently throughout this paper.

1.2 Jonathan Kramer: *The Time of Music: New Meanings, New Temporalities, New Listening Strategies*

The first of these pivotal writings, Jonathan Kramer's *The Time of Music: New Meanings, New Temporalities, New Listening Strategies,* features discussion of the concepts of linear and nonlinear time. He defines linearity as "the determination of some characteristic(s) of music in accordance with implications that arise from earlier events of the piece. … Linearity is a complex web of constantly changing implications (in music) and expectations (of the listener)." He goes on to define nonlinearity as "the determination of some characteristic(s) of music in accordance with implications that arise from principles or tendencies governing an entire piece or section. … While linear principles are in constant flux, nonlinear determinations do not grow or change. … The dynamic of comprehending a work's nonlinearity is learning its immutable relationships." Linear time is then defined as "the temporal continuum created by a succession of events in which earlier events imply later ones and later ones are consequences of earlier ones," and nonlinear time as "the temporal continuum that results from principles permanently governing a section or piece."[1]

Kramer emphasizes that nonlinearity is "not merely the absence of linearity but is itself a structural force," and that essentially all music is brought to life through a combination of linearity and nonlinearity, as they are the "two fundamental means by which music structures time and by which time structures music." He also states that their interplay on multiple hierarchic levels of a musical structure "determines both the style and the form of a composition."[2] Building off of this, he posits an assortment of different "times" that "arise from

[1] Jonathan D. Kramer, *The Time of Music: New Meanings, New Temporalities, New Listening Strategies* (New York: Schirmer Books, 1988), 20-21.
[2] Kramer, 20.

different degrees and kinds of interaction between linear and nonlinear time," including "directed linear time, nondirected linear time, multiply-directed linear time, moment time, and vertical time."[3] Within this discussion, the concept of multiply-directed linear time, an amalgamation of both linear and non-linear aspects, was especially impactful to me and is directly reflected in a variety of ways throughout all three of the pieces analyzed in this paper.

Kramer describes pieces that feature multiply-directed linear time as:

> Pieces in which the direction of motion is so frequently interrupted by discontinuities, in which the music goes so often to unexpected places, that the linearity, though still a potent structural force, seems reordered. I call the time sense in such music "multiply-directed." There *is* a sense of motion, but the direction of that motion is anything but unequivocal. Multiply-directed time is not the same as nondirected linear time. In the former, the sense of goal-direction is acute, even if more than one goal is implied and/or more than one route to the goal(s) is suggested. In nondirected linear time there is no clearly implied goal, despite the directed continuity of motion. A graphical analogy (comparable to a straight line for goal-directed linear time or a meandering line for nondirected linear time) for multiply-directed time would be a multidimensional vector field.[4]

He also emphasizes that "passages can progress in more than one direction at once but also that their continuations need not follow them directly. When some processes in a piece move toward one (or more) goals(s) yet the goal(s) is (are) placed elsewhere than at the ends of the processes, the temporal continuum is multiple." This, of course, relies on the "underlying linearity being perceptible even when not presented in linear order." Kramer later clarifies that "it is musical processes, not abstract formal molds, that are reordered in multiply-directed linear time. To have truly multiply-directed music, linear processes need to be interrupted and completed later (or earlier!)," meaning that the reordering of, for example, sections of a typical sonata form, would not constitute the development of a multiple time-sense.[5] He also conveys

[3] Kramer, 20.
[4] Kramer, 46.
[5] Kramer, 47.

that multiply-directed linear time could facilitate the presence of multiple beginnings (which might come at the end of the work), multiple endings (which could be the first thing heard/presented in the piece), and that the ultimate "goals" of these various linear processes may or may not even be present or realized within the temporal confines of the piece![6]

Interestingly, Kramer frequently emphasizes that multiply-directed linear time works best in tonal pieces, thanks to their pre-established hierarchy and gestural conventions that he argues can more effectively be reordered and interrupted. I can sympathize with this take slightly, assuming that the alternative, non-tonal pieces he was imagining and referencing in 1988 were still primarily note or pitch-based and steeped in serialist techniques. I would argue, however, that in prioritizing every other parameter, timbre, dynamic, gesture, texture, extended techniques, and even the physical exertion and visual, choreographic aspects of a musical performance can combine to rapidly establish their own logic, conventions, and processes that can be rearranged, displaced, and subverted in equally if not more powerful ways than typical common-practice tonal materials and logic allow. Imagining how these concepts could be expanded on, extrapolated, and applied to noisy, chaotic, morphing sonic materials was exceptionally inspiring early on and has remained a powerful influence in my recent works.

Denis Smalley, who will be discussed extensively later in this paper, provides a powerful encapsulation of the kinds of materials and gestures that I am advocating could be extremely effectively reordered, disrupted, and connected across time in his description of *Motion and Growth Processes.* Smalley provides an example of this concept by saying that:

> Motion and growth have directional tendencies which lead us to expect possible outcomes, and they are helpful guides in attributing structural functions. *Unidirectional motion* provides a simple example. If we encounter a slow, ascending contour, we could expect a variety of outcomes but not any outcome. It could ascend and fade as it goes out of 'sight'; it could increase in richness leading to an impact point; it could be joined and

[6] Kramer, 46-47.

> absorbed by other events; it could change direction, turning into a parabola; it could reach a stable ceiling. Whatever it eventually does may surprise us (if there are sudden changes) or it may do what we expect particularly if its rate of change gives us clues to its future. This hypothetical description could imply a termination function (disappearing upwards), an anacrusis (increasing in richness leading to another event), and so on. Finally, this example emphasises the gestural nature of its contour (no internal, textural interest has been referred to) even if it is stretched out in time.[7]

I believe the growth processes Smalley describes above provide a far more exciting area for exploration in relation to the manipulation of multiple time senses and facilitate much more engaging opportunities for the reordering, subversion, and continuation of gestures across time than the conventions provided by common practice tonality. Like Kramer, Smalley's description of his growth processes includes the possibility of material evolving towards multiple goals. Instead of relying primarily on traditional concepts of "notes," however, his gestures can be constructed from countless interacting parameters, behaviors, and spectromorphological implications and expectations being shaped over time. For example, if a work featured a parabolic gesture made out of the transposition of the sound of a racecar engine starting up, ascending, then descending, and turning off, and the ascending and descending portions were separated in time, I would argue that the completion of this parabolic gesture could more readily be perceived as the continuation of one coherent gesture displaced in time than the resumption of, for example, an ascending, melody in the key of Bb would. Or, more likely to occur in my work, a reversed attack-decay gesture could be interrupted and fulfilled later, or earlier, in a piece. These two ideas, synergizing together, represent a compelling concept that permeates all of the works to be discussed in this paper. All of my compositions, for that matter, use the combination of these concepts extensively.

[7] Denis Smalley, "Spectromorphology: Explaining Sound-Shapes," *Organized Sound* 2, no. 2 (1997): 116.

Kramer's discussion of "moment time," based off of Stockhausen's moment form and positioned further toward nonlinearity on the temporal continuum, was also highly influential and had a profound impact on my work. Although I do not consider my works to explicitly adhere to and/or function as moment forms, the idea of having a form composed of "a series of minimally connected sections – called moments – that form a segment of an eternal continuum… self-contained sections, set off by discontinuities, that are heard more for themselves than for their participation in the progression of the music"[8] whose proportions and relation to each other could be discerned after the fact through the act of cumulative listening (assessing the total proportional relationships of what one just heard/experienced through memory after the piece has ceased), left a lasting impact. Kramer describes the process of cumulative listening in more detail:

> Memory does not simply retain events in the order they were experienced. In memory we can find connections between nonadjacent moments. Furthermore, we can relate what we are currently experiencing to many different remembered events. When discontinuities seek to destroy the connectedness of successive moments, we are led to search our memories for other viable connections, which we may or may not find. Our memory of a discontinuous piece can become an unordered reconstitution of the totality of its moments and of their possible interrelationships (or lack of relationship) across absolute time. Cumulative listening enables us to appreciate moments for their contribution to the whole.[9]

He goes on to clarify that it is often the balance and proportions of these moments or entities that end up being most important in the experiencer's memory and most critical to their understanding of these highly discontinuous works.[10]

Kramer's concept of "vertical time," essentially the idea of one self-contained moment of stasis (or process) functioning as the entire piece, almost completely unchanging and without

[8] Kramer, 50.
[9] Kramer, 206.
[10] Kramer, 52-53.

formal/gestural hierarchy or any significant temporal differentiation, an unending stasis whose layers the listener can investigate at their own pace, focusing in on different aspects of the totality at different times, as if examining a sculpture from different angles and perspectives,[11] was also critical in the development of my conception of musical time. The result of this non-teleological experience is to freeze time completely and produce psychological time perceptions that differ drastically (both contracting and expanding depending on context) from the actual measured chronometric duration of the work, heavily distorting the listener's perception of time; the listener having only glimpsed a fragment of an eternal sonic event that has always existed and will exist long after us. Although my pieces are certainly not "vertical" in nature, many of my works could be argued to provide brief glimpses of eternal vertical continua that proceed uninterrupted beyond time even when not audible or before and after the piece taps into them for but a fleeting moment, in stark contrast to the extreme gestural events and discontinuities that surround them.

Kramer is sure to clarify that it is exceedingly rare that any piece would exemplify just one of these times; most works feature a dynamic combination of many of the time varieties described above. In fact, I am arguing that these various species of time, the interaction between them, and the continuum between linearity and non-linearity that they form are often explored and invoked as a conscious, malleable parameter to be controlled, shaped, and sculpted over time in my work. "Time sense," particularly in regard to multiply-directed linear time, moment time, and vertical time, is a key parameter in all three of the works under interrogation in this paper.

[11] Kramer pg. 55

1.3 Gérard Grisey: "*Tempus ex Machina:* A Composer's Reflections on Musical Time"

Gérard Grisey's "*Tempus ex Machina*: A Composer's Reflections on Musical Time" significantly impacted my development as a composer. This article synergizes with Kramer's writings, as well as multiple more recent articles that will be integrated into this discussion, to continue to illuminate the conceptions and manipulations of time and temporal perception that are at play in my works.

Grisey presents a three-part temporal schema consisting of *the skeleton of time*, *the flesh of time*, and *the skin of time*. *The skeleton of time* represents the underlying conceptual, chronometric, spatial, or clock time structures in a composition that may or may not be actually perceptible in the resulting work, *the flesh of time* describes how the materials or meat attached to those foundational, skeletal structures influence the listener's perception of this infrastructure by manipulating their sense of psychological or perceptual time, and *the skin of time* acts as the acknowledgment that ultimately, perception is in the ear of the listener, and how their musical and cultural background, previous experiences, and even their current mood or the temperature of the concert hall can influence their perception and therefore understanding of the work.[12]

Within the discussion of the skeleton of time, Grisey presents a continuum from order to disorder and from maximum predictability to zero predictability in the structuring of events over time, which he describes as "a scale of complexity… which has the advantage of reverting to the phenomena of musical times as they are perceived and allowing a continuity to be grasped."[13]

[12] Gérard Grisey, "Tempus *Ex Machina:* A Composer's Reflections on Musical Time," *Contemporary Music Review* 2, no. 1 (1987): 239–75.
[13] Grisey, 244.

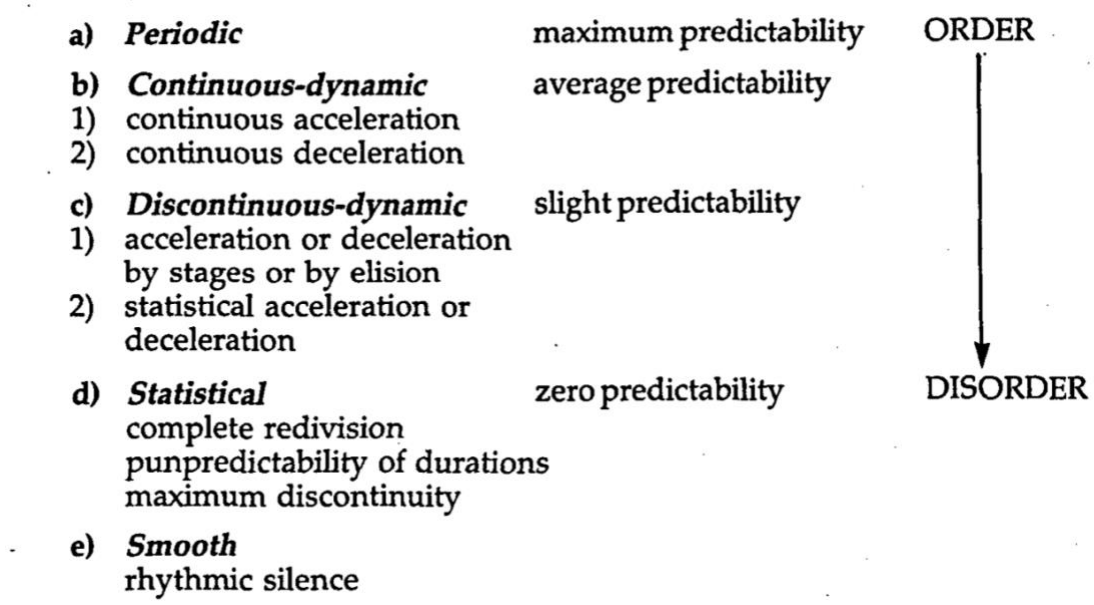


Figure 1 Order to Disorder Continuum from Gérard Grisey's (1987) "Tempus ex Machina: A Composer's Reflections on Musical Time" (244)

Within this continuum, Grisey presents a series of x/y graphs representing possible continuous-dynamic and discontinuous-dynamic acceleration archetypes and progressions. The three that are most exciting to me and important to my work are the geometric progression, acceleration by elision, and statistical acceleration. In describing these acceleration archetypes, he states that "these 'curves' bring a great flexibility to the temporal distribution of sounds whilst controlling *the degree of tension and the speed of the processes*.... It is these progressions which orientate the evolution of the sound positively or negatively, which from then on is no longer static and neutral but *dynamic and charged with directed meaning."*[14]

He goes on to describe the psychological effect of acceleration on the listener, stating that the "listener is literally propelled towards something which he does not yet know," and contrasts

[14] Grisey, 249.

this with the impact of deceleration, saying that "with deceleration, *the listener is pulled backwards,* since the arrow of musical time had somehow turned in the opposite direction. But because our listener also perceives that the arrow of his own biological time had not changed course, he will oscillate indefinitely between these two senses of time going in opposite but concomitant directions, in a sort of state of *temporal suspension."*[15] Grisey later decrees that humans prefer "a long acceleration followed by a short deceleration rather than its opposite,"[16] in other words, that they are able to tolerate longer periods of building anticipation and extended accelerations better than decelerations, proclaiming that "durations that are too long and too slow to come no longer allow a comparison of the sounds with one another, and fatigue our waiting."[17] I mention this concept here specifically because I intentionally attempt to refute, challenge, and test this proclamation in the design of the conclusion of *to facilitate friction* and because a series of irregularly increasing stimuli leading to sudden drops are critical to the concept of the *ramp-archetype* that will be discussed later in this paper in relation to Douglas Rust's writings on the perception of textural intricacy in Lutosławski's work.

Since geometric accelerations present their own kind of consistency and predictability,[18] he puts forth the idea of acceleration by elision and acceleration with statistical variation in order to add back an element of complexity. Speaking about "statistical accelerations and decelerations which proceed from a positively or negatively oriented discontinuity," he says that:

> The Gestalt of a temporal sequence thus determined remains orientated vectorially whatever the statistical meanderings. Excluded from the global form, pure chance is thus limited, held back in some way; the general dynamism takes over. It does not follow, however, that our perception is automatically able to work out the orientation of such a sequence. If the curve is too long, or if the ambitus of the differences in durations or in

[15] Grisey, 249.
[16] Grisey, 249.
[17] Grisey, 249.
[18] For this exact reason, I often prefer to interrupt any "feather beams" in my works with rests and irregular groupings.

> rhythmic densities is too large, we will pay greater attention to the surprise of the moment than to the actual sense of the sequence.[19]

Supported by Grisey's assertions that maximum chaos, disorder, and complexity corresponding with zero predictability or pure chance, where the next event is truly random and entirely unpredictable, can be just as boring and monotonous as maximum, periodic predictability, this zone of vectorially oriented dynamic progressions, right on the edge of giving way to complete disorder but still directed towards or away from goals, is my favorite kind of temporal skeleton to explore and an exciting perceptual threshold to test. Grisey emphasizes that, as one continues to play with more and more complex curves, this becomes a practice of "composing with continuity and discontinuity, with dynamism and stasis, an unstable and perceptual renewal play. Here we encounter the principle of uncertainty in perception: *what we gain in dynamism we lose in unpredictability, and vice versa."*[20] He also clarifies that these curves and categories are meant only as a reference and that musical reality will undoubtedly be much more complex and often defy such discrete classification![21]

[19] Grisey, 253.
[20] Grisey, 253.
[21] Grisey, 257.

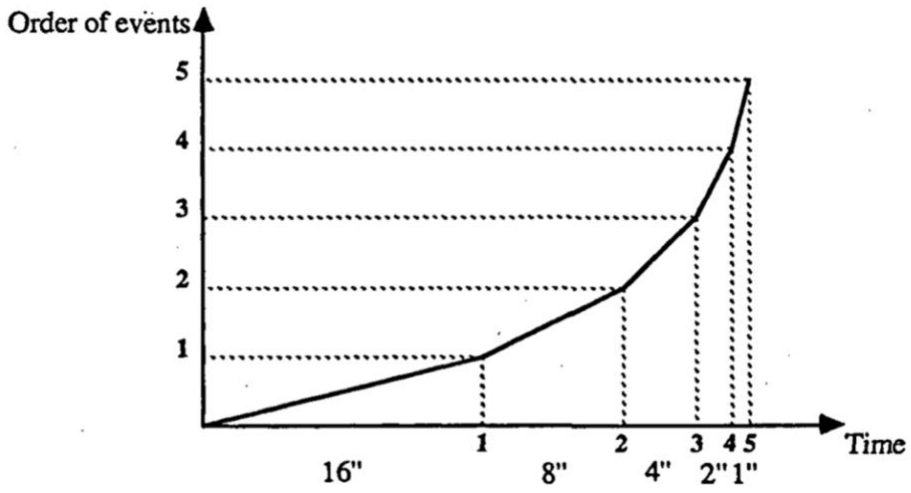


Figure 2 Grisey's example of a "geometric progression" (Grisey 1987, 248)

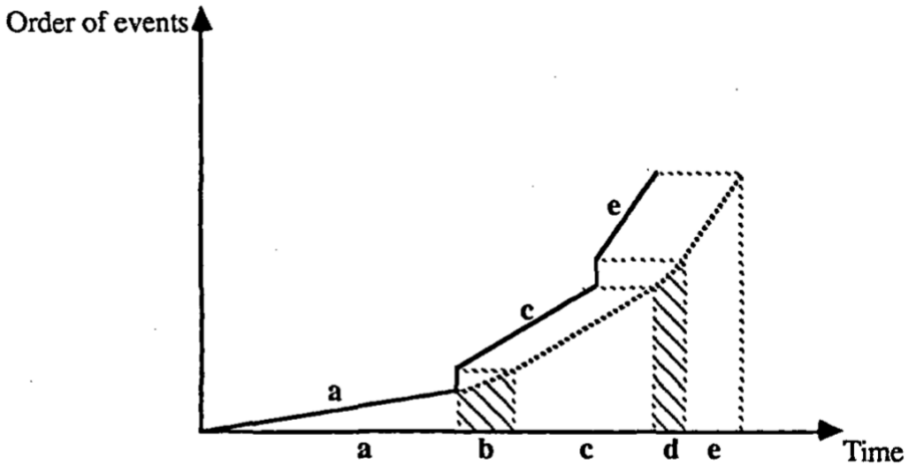


Figure 3 Grisey's example of "acceleration by elision" (252)

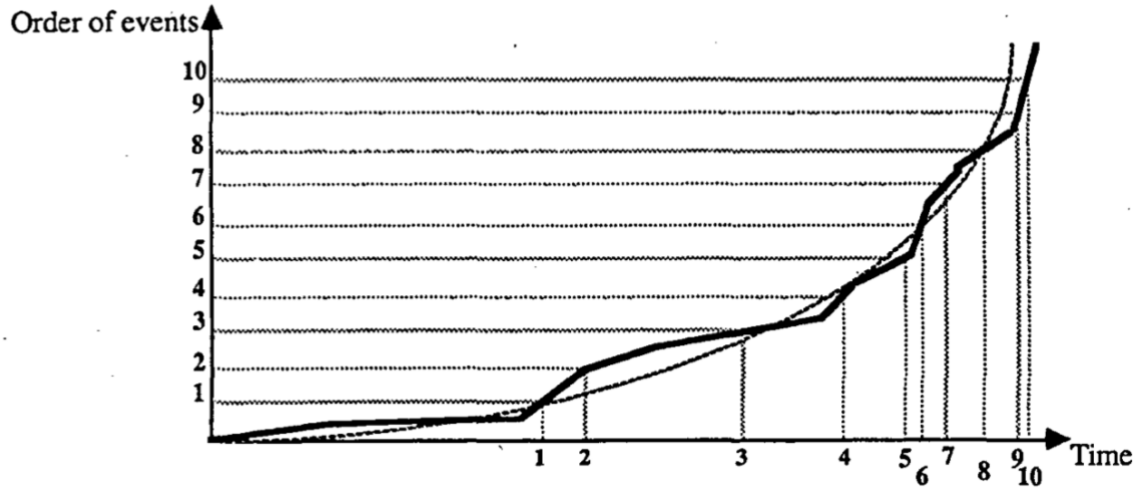


Figure 4 Grisey's example of "statistical acceleration" (253)

Inspired by the concept of statistical acceleration, I constructed my string quartet *Brunt* (2017), written for the Mivos Quartet, by creating a Max patch that generated time points based on an exponentially increasing probability of an event. The patch would generate a Boolean 0 or 1 for each 16th note of chronometric or absolute time, and the likelihood of a 1, representing some impact or structural event occurring, became exponentially higher over time. I would then write out the results as vertical lines on a sheet of graph paper and begin to sketch and sculpt the "flesh" of the materials around this barely predictable but still highly directional infrastructure. I learned a tremendous amount from this experience (at the time, I would have never allowed myself to place events so far apart or so close to each other in time), and although I now generate these structures and proportions intuitively, these underlying principles are essentially always present in my pieces.

I am almost always thinking about Grisey's periodicity to chaos continuum. It appears not only on an attack-to-attack and note-to-note basis within each gesture and chunk of material in my work but also in the placement of discontinuities, interruptions, and stasis, the density of

events, the spacing, frequency, and rate of the intercutting of materials throughout each section and piece, and the positioning of large formal markers, impacts, and arrival points. More often than not, in my works, there is an exponential or logarithmic (geometric) acceleration or deceleration towards and/or away from goals with chaotic, statistical variation occurring (discontinuous-dynamic), often on multiple structural levels simultaneously. This idea will be explicated in more detail in the analysis of all three works but is of particular importance in the investigation of *to facilitate friction.*

As stated, if the skeleton of time refers to the quantitative aspects of musical time, then the flesh of time articulates the qualitative, phenomenological, and psychological aspects of musical time. Grisey describes this part of the schema as the place where "sounds, like living cells, will come to inhabit and envelop the temporal skeleton with their density and complexity,"[22] stating that "the same temporal skeleton may be enveloped and therefore perceived differently according to the way in which the volumes and weights of the musical flesh are distributed."[23] Essentially, this section of the schema focuses on the idea that the listener's perception of any absolute time, chronometric structure or sequence will be, often drastically, altered due to how the qualities of the sonic materials that adhere to that skeleton, and the interactions, contrasts (or lack thereof) between them, as well as their evolution over time, influence one's sense of psychological or perceptual time. Grisey conveys that it is critical to consider the actual perceptual result of the relationships between sounds in time during the construction of a composition rather than assuming that abstract, underlying charts and diagrams based off of, for example, Fibonacci sequences, concentric circles, and fractals will inherently be transmitted and perceived by the listener.

[22] Grisey, 257.
[23] Grisey, 258.

Two concepts that are especially relevant to this paper are worth briefly mentioning here. One is the idea of "preaudibility," which Grisey elucidates by saying that "by including not only the sound but, moreover, the differences perceived *between* sounds, the real material of the composer becomes the degree of predictability, or better, the degree of 'preaudibility.' So, to influence the degree of preaudibility we come back to composing musical time directly - that is to say perceptible time, as opposed to chronometric time."[24] Two is the idea of *microphony*, which was particularly influential in the creation of all three of the works discussed in this paper. Grisey discusses the concept of microphony by stating that:

> A series of extremely predictable sound events gives us ample allowance for perception. The slightest event acquires an importance. Here, *time has expanded.* It is moreover this sort of predictability - this expansion of time - which we need to perceive the *microphonic* structure of sound. Everything happens as if the effect of a zoom lens, which brings us closer to the internal structure of sounds, was only able to function by way of an opposite effect in relation to time. The more we expand our auditory acuity to perceive the *microphonic* world, the more we draw in our temporal acuity, to the point of needing fairly long durations. … A law of perception therefore comes into play which could be formulated thus: *the acuity of auditory perception is inversely proportional to that of temporal perception.*[25]

Essentially, he is arguing that if a sound is exceptionally predictable, or preaudible, for long enough, a dilation of time occurs, and we are able to zoom into and focus on the nuances of its interior details, losing track of larger, formal hierarchies, progressions, and temporal concerns in favor of the exploration of a single, expanded moment or material. In direct relation to this, he excitedly shares his imagining of "*structures which are no longer fixed to a single type of perception*. Temporal structures themselves acquire a plasticity relative to the change in scale. *These scales of sound proximity* - for which one can always substitute a continuum - create a new dimension of sound: depth, or the degree of proximity. … Moreover, this play of the zoom lens

[24] Grisey, 258.
[25] Grisey, 259.

back and forth can in turn become structural and generate a new dynamic of sound forces relative to the spatial density of sounds and their duration."[26] This manipulation of the "zoom lens," and movement between different types of temporal perception, is exactly what I am attempting to achieve in the works under discussion here.

In terms of the skin of time, "a place of communication between musical time and the listener's time" where "the composer notices more than he acts,"[27] Grisey does not have much to say and instead hopes that one day sociologists, psychologists, and other cognitive researchers will back up his prophetic statements. Thankfully, Aki Pasoulas's unpublished dissertation titled *The Perception of Timescales in Electroacoustic Music* and an article written by Douglas Rust titled "Two Questions of Perception in Lutosławski's Second Symphony*"* do precisely this. Although they never directly reference Grisey, the perceptual studies, cognitive research, and current theories of psychology and psychoacoustics they engage with support his assertions perfectly, and their work will be referenced throughout this paper.

The most critical idea presented by Pasoulas in relation to the following analysis is that of a *Haste/Languor* continuum. This continuum addresses many of the same influences on temporal perception that Grisey elucidates and positions the resultant differing perceptions of time and interpretations of actual durations on a continuum between "utter haste" and "total languor," or in other words, extreme contraction and dilation. He clarifies that "at the exact centre of the continuum there is balance, where actual (measured) duration equals psychological (perceived) duration. When the selection point tends towards languor, the listener perceives a time interval as

[26] Grisey, 268.
[27] Grisey, 272.

being increasingly longer than it actually is; the opposite occurs when the selection point tends towards utter haste."[28]

Rust's discussion of the *ramp archetype,* based on the research of David Huron, is of particular relevance to this paper and approaches a musical composition as "a sequence of external stimuli that aims to maintain the passive attention of an audience."[29] Huron himself states that "on the basis of the extant research on auditory attention, we might predict that a sufficient strategy for maintaining a relatively constant stream of orienting responses would be to structure complex events as a sequence of stimulus 'ramps,'"[30] essentially conveying that "a composition can hold our interest by arranging rising and falling levels of stimuli in a terrain of peaks and valleys for our passive attention to behold." He also emphasizes that stimuli should "rise gradually and fall rapidly in order to be noticed," forming the shape of a ramp, and that this stimulus could be loudness, textural intricacy, or a myriad of other parameters.[31] This concept aligns with many of Grisey's assertions, including that a continuous increase, in this case in textural intricacy, amplitude, or other stimuli, does not adequately hold our attention. Instead, a series of jagged, leaping, highly contrasting levels of stimuli, overall trending towards higher levels of complexity and then dropping abruptly, grab a listener's attention best, just like Grisey's statistical accelerations followed by short decelerations.

In the article, Rust develops his own measure of textural intricacy, specifically designed to be applied to the music of Lutosławski, in which the quantity and dissimilarity of concurrent strands of material is used to assign each moment a score on a scale of textural intricacy, with

[28] Aki Pasoulas, "The Perception of Timescales in Electroacoustic Music" (Unpublished Doctoral Thesis, City University London, 2011), 36.
[29] Douglas Rust, "Two Questions of Perception in Lutosławski's Second Symphony," *Perspectives of New Music* 42, no. 2 (2004): 195.
[30] David Huron, "The Ramp Archetype and the Maintenance of Passive Auditory Attention," *Music Perception* 10, no. 1 (Fall 1992): 87.
[31] Rust, 195.

similar contours being worth fewer points and dissimilar contours receiving higher values on the intricacy continuum. These values are then averaged and weighted based off of their duration relative to the entire section under discussion to create a "composite gradient" with steeper or shallower angles depending on "the formal effect of each new intricacy level based upon (1) how strongly we might feel its initial increase or decrease, and (2) how long that feeling lasts."[32] This allows the ramps to represent the "long-term direction implied by the many contrasting levels of intricacy on the musical surface."[33] He also emphasizes that "timing is inseparable from our response to textural contrast" and that "the accelerating pace of musical contrast was a central concern" in Lutosławski's work.[34] The idea of highly contrasting levels of stimuli trending overall towards larger goals then dropping suddenly, often accelerating in their rate of change towards formal markers or points of arrival, was exceptionally influential early in my development as a composer. This research also synergizes with Grisey's proclamations and is represented in the construction of all three of the works analyzed in this paper.

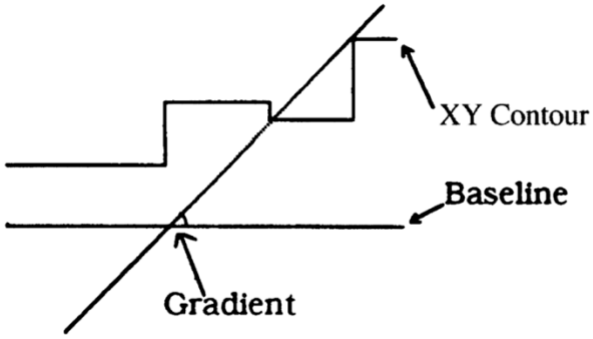


Figure 5 Rust's demonstration of the gradient of a stimulus ramp being determined by contrasting levels of textural intricacy and their relative, proportional durations, or by "measurements of time and textural contrast working together."[35]

[32] Rust, 208.
[33] Rust, 207.
[34] Rust, 209.
[35] Rust, 207.

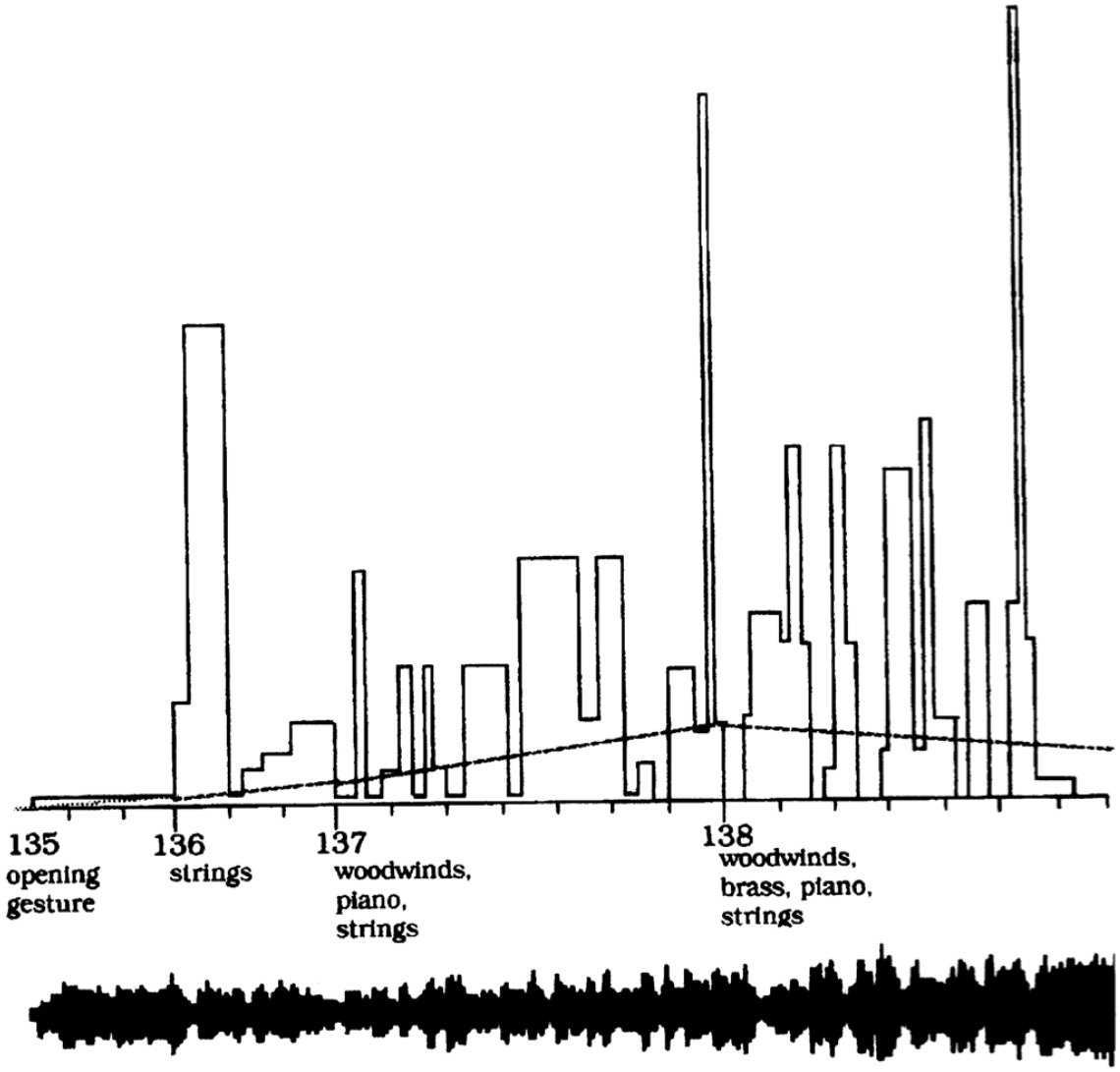


Figure 6 Rust's example of an ascending then descending ramp of overall textural intricacy in Lutosławski's second symphony, demonstrating the kind of jagged, irregularly rising and falling levels of stimuli, still trending towards larger goals, that he argues hold a listener's attention best.[36]

[36] Rust, 205.

1.4 Jonathan Bernard: "Elliot Carter and the Modern Meaning of Time"

Jonathan Bernard, in his article "Elliot Carter and the Modern Meaning of Time," discusses the influences that the art forms of literature, dance, and film had on the development of Carter's approach to time in his compositions. Particularly inspiring to me are his highlighting and interrogations of temporal perception and manipulation in James Joyce's *Ulysses,* the ballets and choreography of George Balanchine, and especially the use of montage in the films and cinematography of Sergei Eisenstein.[37] The overview of these different perspectives of time in other disciplines and how these could be applied and used as a lens to better understand Carter's structuring of the temporal dimension in his works was exceptionally influential in developing my own conception of time in my recent compositions.

In his discussion of *Ulysses,* Bernard celebrates the metaphorically simultaneous exploration of multiple characters' interior monologues that are periodically unified through the appearance of the same event as viewed from different characters' perspectives.[38] The discussion of Balanchine's choreography emphasizes just how important the movement between states, rather than any one snapshot or plateau, is to choreography's sculpting of time.[39] Both of these ideas will be expanded on and related to my works through their integration and interweaving in the following analysis. For me, the most impactful and suggestive concept by far, however, was that of Eisenstein's filmic montages.

[37] Jonathan W. Bernard, "Elliott Carter and the Modern Meaning of Time," *The Musical Quarterly* 79, no. 4 (1995): 644–82.
[38] Bernard, 649-56.
[39] Bernard, 656-60.

Montage, defined as "the splicing together of pieces of film that have been shot from different angles and distances, or with different light values, or that may even show different scenes and locations,"[40] is critical to the function of film, but also music, especially electronic music. As Kramer says, "tape can be spliced; events recorded at different times can be made adjacent," producing either "a continuity that never existed prior to recording" or, more excitingly, resulting in "overpowering discontinuity. Just when a splice may occur can be as unpredictable as the nature of the new sound-world into which the listener may be thrust."[41] Bernard provides an overview of Eisenstein's writings and concepts surrounding montage in his films, collecting his classification schemes into this powerful list:

	Description
1. *Metric*	Fundamental criterion: absolute length of film pieces content is subordinate to absolute length a "beat" is present even if not directly perceived
2. *Rhythmic*	Content the equal of length as consideration actual length of pieces may diverge from absolute lengths (relationships made more flexible) explicit violation of meter made possible through acceleration or introduction of more intense material at a different tempo
3. *Tonal*	"General tone" defines the *dominant* movement construed in wider sense: all affects taken into account rhythm usually becomes a secondary element
4. *Overtonal*	Distinguished from tonal by "collective calculation of all the piece's appeals" governed by dominant and secondary dominant(s) ultimate aim: directly physiological perception
5. *Intellectual*	Concerns "accompanying intellectual affects" and their juxtaposition distinct from physiological quality of overtonal

Figure 7 Eisenstein's "fivefold montage classification scheme" from Jonathan Bernard's "Elliot Carter and the Modern Meaning of Time" (1995, 663)

In his overview of Eisenstein's concepts, Bernard prioritizes the idea that "montage is conflict" and that, when speaking about shots in a film, "for any real meaning to arise from their

[40] Bernard, 661.
[41] Kramer, *The Time of Music*, 45.

juxtaposition, they had to be arranged so that collision would occur."[42] He goes on to state that "each such collision resulted in a higher unity" and that the methods listed in the chart above "become constructions 'when they enter into relations of conflict with each other.'"[43] In addition to the ideas presented above, he also introduces the concept of *potential montage,* in which conflict exists within a single shot. These conflicting properties can then be intensified and become their own separate, intercutting materials.[44] More of Eisenstein's concepts surrounding montage in film will be discussed in detail in the analysis of the three works featured in this paper.

1.5 Shaping of Trajectories/Improvisatory Materials Over Time – Grains/Microsound – Fields of Possibility

I have struggled for some time to find a way to articulate and describe the particular use of ad libitum, aleatoric, and/or improvisatory materials that I have become increasingly enamored with in the creation of each new work. There was a period of time when I referred to this approach to these cells as "highly-directed improvisation," however, this invites debate over whether these materials should truly be considered "improvisation" or not. I have also always tried to avoid the term "aleatoric" as this label conjures memories of educational works for wind band where the piccolos are asked to repeat a stream of high notes in any order rapidly to create "chaos" and introduce young band students and their audiences to "contemporary music techniques and unconventional notation." These pieces are valuable and admirable, but unlike what I believe is encouraged by this rudimentary example of aleatory, it is important to me that the performers are actively listening to, and interacting with, one another, responding to each

[42] Bernard, 662.
[43] Bernard, 664.
[44] Bernard, 664.

other's interpretation, and spontaneously exerting their own agency throughout these ever-evolving moments. It occurred to me recently that, in shaping overall trajectories of improvisatory materials by sculpting a multitude of parameters, ranges of variation, and probabilities of attacks, techniques, frequency content, envelopes, etc. over time, I am essentially conceiving of instrumental materials in an almost identical fashion to how I would approach the process of live granulation. Whether I was consciously or subconsciously envisioning these materials as "instrumental granulation," it seems beneficial to connect this approach to Curtis Road's *Microsound*, the go-to text on the philosophy and implementation of sonic grains.

The shaping of improvisatory materials and parameters within these ad lib. boxes is remarkably similar to how I would combine multiple layers of automation in a digital audio workstation or Max to control the overall behavior of a granulator, never producing the exact same result a second time but maintaining the gestalt trajectory and gestural and/or textural identity required for that moment of the piece. This instrumental granulation approach is applied both to elongated processes that evolve over several minutes (see the discussion and analysis of *untitled*) and to exceedingly short events that may span, and transform over, only a fraction of a second. I recognize that it is fraught to discuss this as if it is a novel approach; Penderecki used similar aleatoric cells in the 1960s, however, I noticed that his cells never seemed to evolve individually over time and seemed to be used exclusively as generators of textures. Roads even laments that, during the 1960s and 70s, "the 'stochastic cloud' was sometimes reduced to a special effect" and that since then, "little new has been added,"[45] so I believe it is important to interrogate the details and differences of my approach as it has developed in my recent works.

[45] Curtis Roads, *Microsound* (Cambridge, MA: The MIT Press, 2004), 83.

Since humans are amazing, calling for instrumental grains to evolve over time can be much more fascinating, or at least yield different advantages, than typical computer-based granulation. Not only are traditional instruments excellent devices for non-linear expression in their own right,[46] human fallibility and the aural communication of physical exertion and embodiment are some of my favorite aspects of music performance. As will be discussed in more detail in the following analysis, Stockhausen and Cassidy emphasize that different techniques take different amounts of time to time prepare and execute – this is an essential quality of the ad lib. materials I have constructed, ensuring that no two people are playing the exact same thing, even when given the same box or prompt, and that any sense of an underlying rhythmic grid or "lattice"[47] and/or any sense of regularity or periodicity (therefore preaudibility/predictability) is obliterated.

Roads, Stockhausen, and other authors advocate that granulation and many other electronic music techniques are not possible with traditional instruments. In many ways, I disagree with this, or at least find that it is a tantalizing challenge and valuable analogy to conceive of instrumental writing from a granular standpoint and perspective. I would argue that even the smooth transition from rhythm (individually recognizable attacks/grains/iterations) to pitch or tone (a continuous state) and back again is achievable through the creative use of overpressure and bow speed, or even through mixtures of flutter tongue, split tones, etc. in wind instruments. It is necessary to note, however, that much of their reservations about the feasibility

[46] In his 2000 article, *Towards a Model for Instrumental Mapping in Expert Musical Interaction,* Andy Hunt states that, in the case of the "interaction capabilities" of traditional acoustic instruments, "in many instruments the input variables are inter-related in both complex and non-linear relationships."
[47] Trevor Wishart, *On Sonic Art,* ed. Simon Emmerson. (Netherlands: Hardwood Academic Publishers, 1996), 23.

of these approaches to instrumental music are based in concerns about the unwillingness of many ensembles to learn them rather than the concepts being unattainable. Roads states that "detailed micro control of intricate multipart acoustic music is not practical. Technical, social, and economic obstacles have to be overcome in order to pursue this path, and those who try to coax unwilling institutions, performers, and instruments to realize microtemporal music go against the grain of the music establishment," instead advocating that computer music, or mixed, electroacoustic music, is the preferable path.[48] Since all sound is arguably composed of microsounds, I believe these approaches to instrumental music are reasonable extrapolations of many of the ideas expounded in *Microsound.* Granulation is, of course, not the only electronic music technique or perspective that has been massively influential in the development of my acoustic writing.

1.6 Spectromorphology (obviously not just for electronics)

Denis Smalley's writings on spectromorphology are widely considered "required reading" for those in the experimental electronic music or electroacoustic composition community. Smalley defines the "concepts and terminology of *spectromorphology* as tools for describing and analysing listening experience. The two parts of the term refer to the interaction between sound spectra (*spectro*-) and the ways they change and are shaped through time (-*morphology*). The spectro- cannot exist without the -morphology and *vice versa*: some- thing has

[48]Roads, 83. I would be remiss if I did not acknowledge how extremely grateful I am to have had the honor of collaborating with so many wonderful musicians who were willing to give these exceptionally difficult techniques and materials/my work their absolute all and full dedication.

to be shaped, and a shape must have sonic content."[49] His writings and concepts will be detailed and integrated extensively in the following analyses.

These writings and ideas, as well as related concepts and aesthetic philosophies from Simon Emmerson, Joanna Demers, and Trevor Wishart were introduced to me exceptionally early on and were critical to my development as a composer. It is clear, however, that I took these concepts to heart not just in how I treat my electronically generated materials but all sounds and aspects of my works, including in my approach to writing for acoustic instruments. Smalley, notably, does concede that "some contemporary instrumental music can also be approached spectromorphologically" citing the works of Grisey, Xenakis, Saariaho, Murail, and Dillon.[50]

Working with electronics has shaped how I think about and write music in innumerable ways. Controlling a multitude of complex parameters simultaneously and using live processes to craft highly variable, highly directional, stochastic trajectories that drive towards or away from powerful moments of arrival has directly inspired the tightly controlled and intricately sculpted improvisations that I am currently enamored with in my instrumental and vocal writing. Together, both instrumental performance and live electronics can fluctuate expressively in the moment and vary substantially between each performance and across each performer's unique interpretation, allowing a great deal of agency in both human and computer while remaining identifiable as a cohesive "piece."

Harsh, visceral electronic sounds also pair beautifully with raucous, embodied, extended techniques and can suddenly become intimate, glistening respites and entirely new sonic worlds in a fraction of an instant, a characteristic that my acoustic writing often strives to emulate. My

[49] Smalley, 107.
[50] Smalley, 109.

deep affinity and intimate working relationship with the often grotesque, rapidly malleable, and chaotically undulating sounds made possible and brought to life by technology has also encouraged me to highlight and celebrate the embodied physical exertion, unpredictability, and beautiful human fallibility involved in a performance rather than trying to disguise, obscure, smooth, and refine the tremendous effort involved as I believe is often the case in many "classical" conceptions of virtuosity.

Chapter 2 *to facilitate friction* – Violin and Live Electronics

to facilitate friction – Violin and Live Electronics

> If and when it takes place, music - and with it the artificial time that gives it life - envelops us like a kind of amniotic liquid. With nothing to muffle our ears, we remain open and receptive. Violent once more, it induces ecstasy or repulsion, or in the worst case indifference.[51]

> Of course, music is not only sound. Music is also a collection of psychological reactions, and they are not extramusical[52]

Overview:

to facilitate friction is a work for violin and live electronics commissioned as a result of winning first prize in the *ASCAP/SEAMUS Student Commission Competition* and was written for, and in close collaboration with, incredible violinist, multidisciplinary artist, and fellow UC San Diego music student, Ilana Waniuk. The piece was completed in 2020, however, due to the COVID-19 pandemic, it would not receive its virtual premiere until April 2021 during the online-only SEAMUS National Conference.

This work combines fixed media, live processing, amplitude tracking, highly directed improv. within constrained time frames, and embodied, extended violin playing to form an invigorating whole. The program notes for the piece provide insight into the intent, context, and conception of the work and its relationship with multiply-directed time, montage as conflict, and technology:

> While working on a recent piece for chamber ensemble and electronics, I was immersed in its erratic, panicked atmosphere. I became obsessed with the idea of frantic, futile solos lashing out violently from silence with such constant intensity and fervor that they resulted in a kind of horrified stasis, a unit of grotesque and vicious sustain, striving endlessly but going nowhere, grasping desperately at nothing in the pursuit of a distant unseen hope. *to facilitate friction* elicits this sense of urgent driving desperation even more potently as it is condensed, focused, and amplified by being embodied by a single

[51] Grisey, 273.
[52] Douglas Rust, "Conversation with Witold Lutosławski," *The Musical Quarterly* 79, no. 1 (1995): 210.

> performer. Acting as the sole conduit for the rapid, jarring yet intricately intertwined shifts in materials, sonic worlds, and dire emotional stakes of the piece the soloist wields, reinforces, and rallies against the electronics as an extension of themselves.

The opening of this work is meant to feel as though the electronics are emerging as a direct result of the violin performance, tethered completely to the performer's interpretation with the electronics acting as a natural extension of the instrument. As time goes on, the violin performer and electronics are increasingly independent and in counterpoint, even conflict. In the initial moments of the piece, this fusion is achieved via an amplitude tracker/envelope follower that directly applies the violin's envelope to the fixed media. This means that the fixed media track, which is designed to elaborate and expand on the instrumental material, is only audible when Ilana is playing, creating the impression that they are inextricably linked. Crackles, crunches, sparkles, and viscous impacts seem to emanate spontaneously from the live performer's expression; these incredible sonic spaces, scalding gestures, and intricate, seemingly inseparable interactions present a synergy of instrumental and electronic mediums and priorities.

As conveyed by the program notes, this piece emerged as an extrapolation, expansion, and further development of concepts latent in an earlier work for ensemble and electronics. The piece in question here is *Spate II,* for amplified chamber ensemble and fixed media electronics, which was a monumental step in my development as a composer at UC San Diego. This piece featured quick cuts between improvisatory solos, duos, and trios, each with their own contrasting materials accompanied by fixed media designed to clarify and enhance the most vital, disparate properties of these instrumental cells, and meant to sound as if it was the result of the live processing of each performer, forming a kind of augmented reality.

Building off of this, I had three main priorities in creating *to facilitate friction:* to further develop, explore, connect, subvert, and refine the extended string techniques presented in their

nascent stages in *Spate II*, to push *Spate II's* burgeoning elements of intercutting, montage, and multiply-directed time to their absolute limits to create composite phrases out of jarring, discontinuous counterpoint and cuts between drastically different materials, attitudes, personas, positions in time, and perceptions of time, and finally to create an interactive performance system in Max that genuinely reacted to the performer's real-time expression and improvisation in meaningful ways, rather than relying on pre-determined fixed media to create this illusion. All of these priorities and their resulting incarnations will be discussed in the following analysis.

2.1 **Overview of Form:**

As highlighted by the placement of rehearsal letters throughout the work, the overarching structure of *to facilitate friction* can be broken down into seven large sections for the purpose of analysis and discussion. Section 1 is the opening in which the initial gestural unit is transformed, dismantled, fragmented, and increasingly interrupted, section 2 presents rapid cuts between disparate, conflicting materials, section 3 represents a respite where the bow hair crunching material takes center stage, section 4 is the resumption of section 2 featuring increasing disconnect between acoustic and electronic materials, 5 is the ultimate form of the "sparkling respite" material, 6 is the binary climax, and 7 is a series of desperate "tries," appearing weaker and weaker with each attempt and reinjection of hope.

Although I have labeled two sections as intercutting-focused, every section of the piece features intercutting of various kinds on at least some level. The introduction re-organizes and reimagines the initial gesture from multiple perspectives and vantage points in addition to being interrupted by "future" impacts, the "Hair Time" section features interjections of previous materials, and the "Final Tries" section consists of a series of disjunct, decaying gestures.

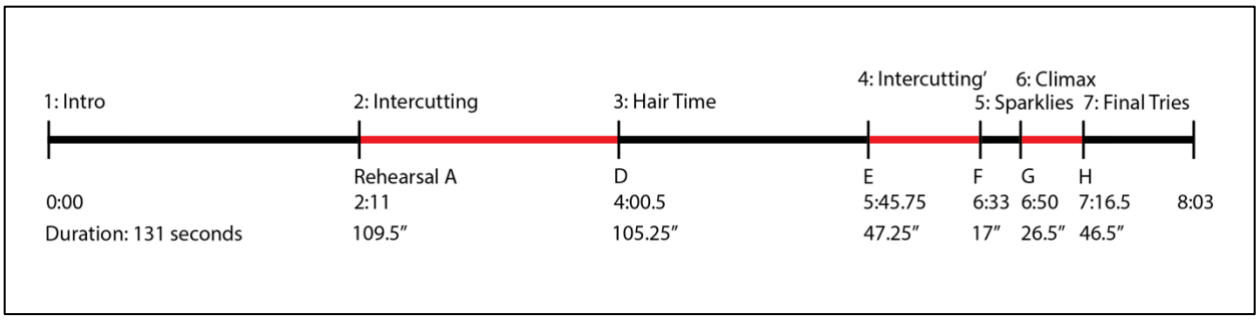


Figure 8 formal overview of *to facilitate friction*

Despite the air of freedom, flexibility, improvisation, and spontaneity that I believe the piece projects at times, these sectional timings are all completely, invariably fixed and do not fluctuate at all from performance to performance (except for the final gesture, which is allowed to fade, die, and stagger away naturally). This will be discussed in more detail momentarily in regard to the design of the work's live electronics.

Note that sections 2 and 3 are very similar in chronometric duration, however, due to differences in materials, or in other words, the living flesh attached to and inhabiting this skeletal, sectional structure, including the effect of perceptually "zooming" all the way into the interior details of the bow hair sound prominently featured in section 3 for extended periods of time, they are not perceived as equal, or arguably even similar, in psychological duration. This representation of the form, although dubious in its relevance to the perceptual reality of the piece and excluding numerous sub-sections and critical interior details, could itself be argued to present a vaguely exponential/geometric acceleration of sections towards H, the peak of the climax, with variations in line with Grisey's statistical acceleration archetype.

2.2 **Section 1 – Introduction – Bow Choreography and Morphological Hyper Units**

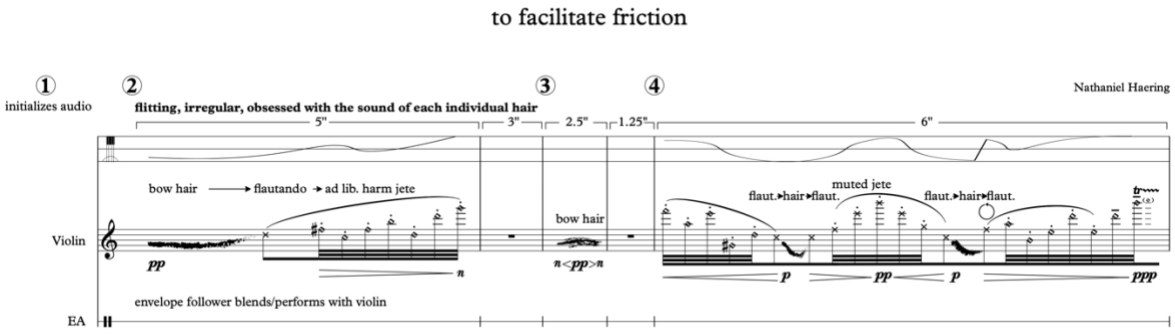


Figure 9 opening measures of *to facilitate friction*

When creating a new instrumental and/or vocal piece, I am invariably writing directly for a specific person, optimally an individual whom I already share some connection and friendship with, as well as a mutual desire to collaborate. My preferred method of composing has always been to start by meeting one-on-one with each performer involved in the work as early as possible and experimenting together to discover which techniques they uniquely excel at and enjoy. Ideally, we collaboratively reveal sonic possibilities and performance techniques that neither of us had previously imagined. The process and challenge is then to design a structure in which these fascinating, often grotesquely beautiful materials are celebrated and can transform, interact, congeal, and conflict to create a form and piece that I find exceptionally compelling and that hopefully in some way represents the artistic being and agency of everyone involved. This was certainly the process that unfolded during the genesis of *to facilitate friction.*

Having already collaborated with Ilana during the creation of *Spate II*, I was excited to work together to not only discover new extended performance techniques and possibilities, but to further develop and explore the nuances latent in the techniques we had already presented and exert even greater control and care in the sculpting and subversion of transformations within and between each technique. This manifested in an obsession with creating a smooth, continuous

evolution from a crackling bow hair crunch, to flautando air sounds, to harmonic jete facilitated by the inertia provided by the bow travelling from the bridge to the fingerboard and vice versa. The idea was that, while accelerating up the fingerboard, the bow would "catch" the string and begin to bounce due to the friction. These bowed trajectories connected each extended technique into one fluid gesture and became a form of "bow choreography," the continuity of which could be readily developed, reimagined, and subverted.

The direct result of this experimentation is the opening gesture of *to facilitate friction.* This ideal gestural unit is then systematically disassembled, fragmented, transformed, recombined, explored, and interrogated from a myriad of perspectives. Repetition of these gestures and their component materials draws attention to the nuances of each variation and the fluctuations within them. This reinforcement through repetition, combined with the smooth, connecting, congealing force and influence of the bow choreography trajectories, establishes coherent, unifying relationships between what could otherwise be considered a loose assortment of different materials and techniques.

Aaron Cassidy, in his article "Performative Physicality and Choreography as Morphological Determinants," states that "from a *morphological* perspective, the ontological identity of a musical "shape" or local "form" is highly dependent upon the physical (and even choreographic) energies involved in creating the sound or group of sounds."[53] From this perspective, these opening gestures, tied together by bow choreography, could also be described as "morphological hyper-units," which he describes as "the large-scale groupings of the combination, juxtaposition, and superimposition of groups of gestural morphemes," clarifying

[53] Aaron Cassidy, "Determinate Action/Indeterminate Sound: Tablature and Chance in Several Recent Works," Ed. C-S. Mahnkopf, F. Cox, & W. Schurig, *Facets of the Second Modernity,* (New Music and Aesthetics in the 21st Century; Vol. 6). Wolke Verlag (2008): 35.

that the appearance of a multitude of performance techniques can "create through their combination linear trajectories/vectors/shapes on the phrase level. The phrase is, as such, a composite image… in which a variety of otherwise-independent physical and aural gesture types merge together to form a new, singularly identifiable object."[54] This description of a composite unit constructed from disparate techniques aligns exceptionally well with my conception of these initial bow-choreography gestures.

As illuminated in the performance notes for the piece, the notated harmonics, which form a critical portion of the opening unit, "convey contours and behaviors rather than specific notes/placement and are meant to be ad-libbed. The performer is encouraged to adapt these contours to whatever notes/gestures work best for them. The movement and transitions between techniques, the energy and character of the material, and the choreography of the bow as it travels from extreme MSP to extreme MST should be prioritized over any specific resulting pitches." Optimally, the outcome is a mixture of fully speaking and non-speaking harmonics that vary organically with each performance, prioritizing the connectivity and expression of the opening gestures rather than dictating exact frequencies or pitches positioned on a lattice. In other words, to quote Bernard's description of Balanchine's ballets, "static positions occupied by the dancers at any particular moment, whether as imaginary snapshots or in actual photographs, can only be traces of the real content of choreography." He goes on to stress the importance and power of "connecting movements to each other with subtle care, yet at the same time emphasizing, by contrast, their continuity."[55]

Within these introductory moments where choreography and gestural continuity are of heightened importance, the halts, abrupt changes in material, and disruptions of the opening,

[54] Cassidy, 47.
[55] Bernard, 659.

bow-choreography gestures provide contrast through which these moments of continuity are elevated, and their significance is further clarified. This is even more applicable in later sections of the piece, where moments of continuity are increasingly rare, and themselves become the outlier, anomaly, and the interruption to the overwhelmingly discontinuous discourse of the primarily intercutting focused sections. Or, as Carter himself said about Balanchine's choreography, "one wanted to have very vivid moments, but what was more interesting was the process by which these moments came into being and by which they disappeared and turned into other moments."[56]

This core, smoothly transitioning, morphing, choreographic gesture remains consistently fluid and gradual throughout the opening moments of the piece. This is disrupted by a sudden, grotesque burst of grating sound and a hard cutoff in the violin at cue 9, foreshadowing the increasingly disjunct, interrupted, and jarring material to come. The first moment marked "abrupt," other than the hard cutoff of the interrupting impact at cue 9, is cue 14, where the bow-hair material is approached and attacked suddenly instead of as the result of a smooth evolution, movement, or transition from another technique from within the opening gestural hyper-unit. This subtle change helps to establish and signify the opening material's inevitable, gradual transition from being exceptionally connected to remarkably discontinuous.

These brief contrasts emphasize that the differentiation between smooth and abrupt transitions will be critical to the form and progression of the piece. Eventually, as the opening gesture is progressively interrupted and dismantled, in the spirit of Eisenstein's use of "potential montages" in his silent films, the inherent, latent differences between the techniques that constitute the opening morphological hyper-unit are amplified and intensified to the point where

[56] Bernard, 660.

they become separate, conflicting materials to be juxtaposed, thereby "shattering the quadrilateral cage of the shot and exploding its conflict into montage impulses between the montage pieces."[57] Over time, as more and more interruptions intervene and more discontinuity is introduced, this almost entirely smooth opening gesture becomes more and more fragmented, breaking apart and eventually melding with the "interruption/impact" material to become the material of the second, intercutting-focused section. The placement of these interruptions over time is, of course, not at all arbitrary.

2.3 **Interruptions/Impacts Over Time – Grisey's Statistical Acceleration Archetype**

As stated in the introduction to this paper, I am always thinking about Grisey's periodicity to chaos continuum. The influence of this progression from order to disorder on the skeleton of my work can be seen on an attack-to-attack/note-to-note basis, accelerations and decelerations, crescendos decrescendos, and density/activity over time within each chunk of material, the probability of certain materials appearing, and in the placement of discontinuities and the rate of intercutting materials as well as the positioning of large formal markers and arrival points. More often than not, there are exponential accelerations/decelerations directed towards and/or away from goals with chaotic/statistical variation throughout and represented in a multitude of parameters over time occurring on at least one, if not many, hierarchal levels simultaneously.

To provide a potent example of this, I have created a graph of every instance of the "interruption/impact" material that occurs during the introduction of the piece in the same style

[57] Bernard, 664.

that Grisey presents his acceleration archetypes, with the X axis representing time in seconds and Y axis referring to the instance number or order of events.

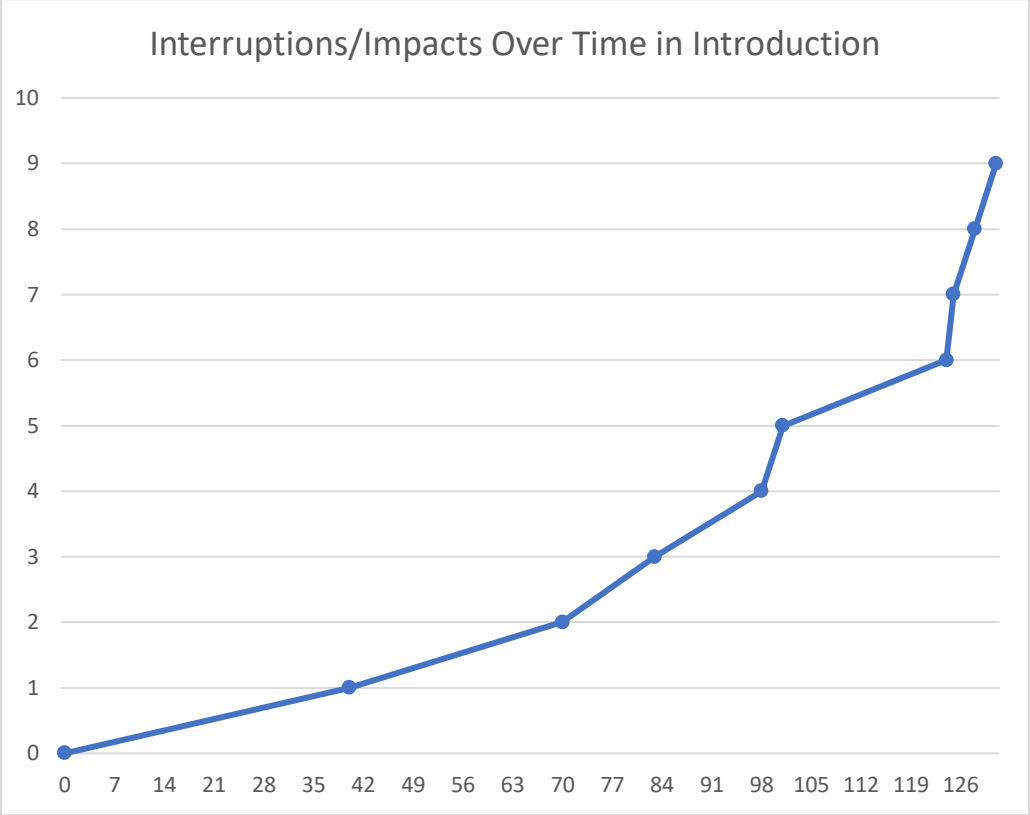


Figure 10 an X-Y graph of interruptions/impacts over time in the introduction of *to facilitate friction* in the style of Grisey's statistical acceleration archetype

The placement of these impact/gestures throughout this opening section was done intuitively, with principles from Grisey's discussion of the skeleton of time in mind, however, after returning to this sequence and charting the exact position of each hit in time, I believe the similarity to Grisey's statistical acceleration archetype is striking (see pg. 14). It should be noted that the last dot in this sequence is the attack/initiation of section 2 at rehearsal letter A, which I see as a fluid continuation of this progression, as section 2 develops out of this accelerating, increasingly present, discontinuous, aggressive, nasty gesture that eventually overwhelms the smooth, connected contours of the opening completely.

Notice that cue 26 subverts this progression, smoothly transforming into a bow "hair" gesture rather than immediately crashing down again into the expected hard stop/aggressive cutoff of the next "interrupting" impact, before transforming into the series of successive impacts that launch the listener into the next section. As Grisey and Rust emphasize in their discussion of the perception of time and stimulus ramps respectively, predictable, continuous movement towards goals isn't nearly as interesting as a jagged approach full of unexpected contrasts and detours. I do consider this sequence to be a series of five aggressive impacts that were interrupted by the gradual transformation into an unexpected, elongated bow hair gesture rather than immediately proceeding to the next impact gesture.

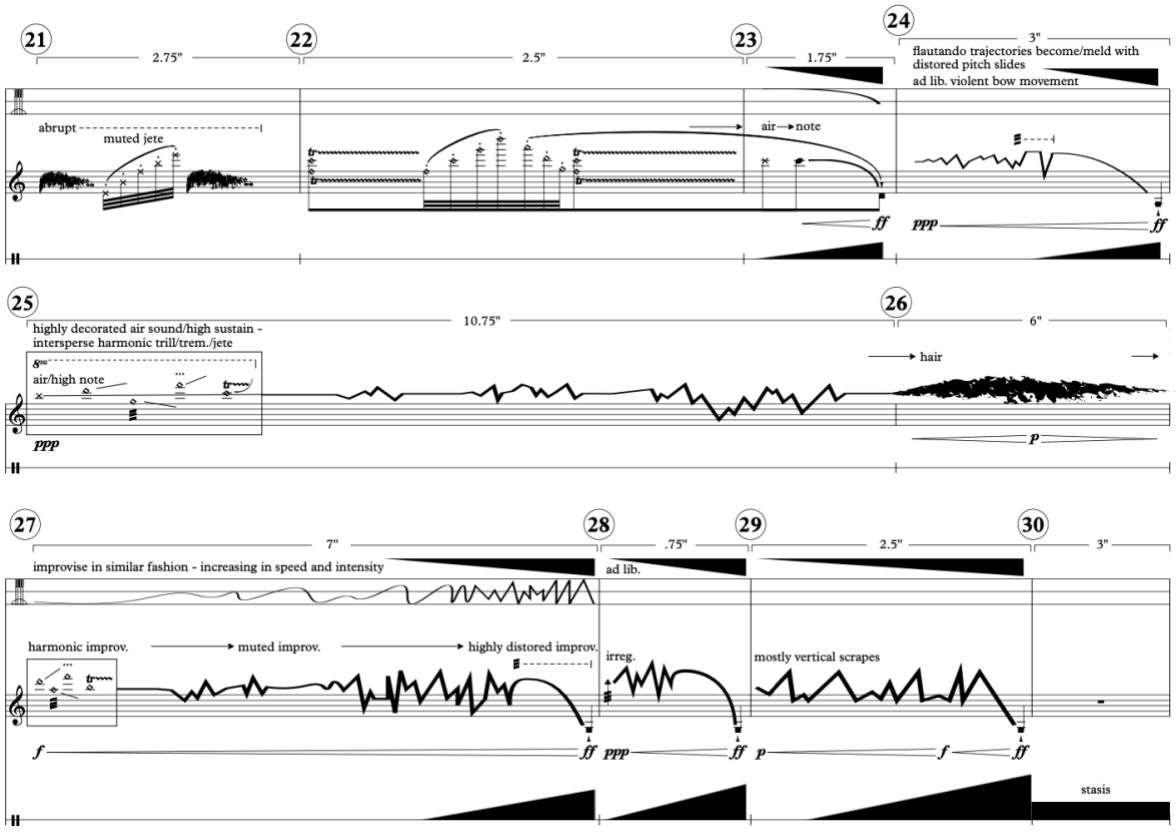


Figure 11 a score excerpt of *to facilitate friction* featuring cues 21 through 30

As stated previously, these interruptions/impacts are often marked by aggressive cutoffs where the violin player is asked to stop the bow hard on the string, producing a distorted, definitive, screeching halt to the gesture. This stemmed from my work on *Spate,* for oboe, trumpet, and percussion, and *Spate II,* for amplified chamber ensemble and electronics, where I became engrossed with how a note and/or gesture ended, feeling that this was far too often left ambiguous, especially in writing for brass. Through this work, especially in the introduction, whether a gesture fades away into nothing or is brought to an abrupt end and rapidly silenced is of critical importance to my understanding of the piece's construction. This obsession is reflected in all of the pieces discussed in this paper. This was certainly also influenced by Smalley's concept of energy-motion trajectories composed of varying onset, continuant, and termination morphologies,[58] which will be discussed in further detail in relation to *Spate III.*

2.4 **Section 2 - Intercutting Materials – Multiply-Directed Linear Time and Filmic Montage**

Looking back at my original notes and sketches from 2019, in the sea of scrawling squiggles, I clearly identified a set of seven core types of materials that the work is constructed from: Hair, AFAP Aggressive Improv, Stasis, Overpressure/Vertical Scrapes, Harmonic Play/Sparklies, Air Sounds, and Pizz./Grind. The work is built around rapid cuts between these improvisatory sonic, gestural, and embodied physical archetypes, each requiring their own attitude, persona, and approach to their performance. Each cut is accentuated by the electronics, which primarily function as a natural, hyper-real extension of the timbre, texture, gesture, and behavior of each material. These materials develop throughout the work, but not necessarily in order. The listener is often only provided brief, disjunct glimpses of them; each new appearance

[58] Smalley, 112-113.

of a slice, fragment, or window into the material may or may not represent the next step in its development, the window could instead open to reveal an evolutionary state from much earlier or later in this imagined progression. These continuums/progressions are also multiply-directed and can branch towards many outcomes and goals simultaneously. With this, the goals towards which each material is developing may or may not be realized within the temporal confines of the work. This approach was directly inspired by Kramer's concept of multiply-directed linear time as well as Eisenstein's filmic montage and intercutting of scenes and perspectives.

As stated above, in addition to reading like a love letter to Kramer's concept of multiply-directed linear time, my explanation of the nature of this jarring, cutting between materials across multiple, simultaneously evolving continuums, in retrospect, shares tremendous amounts of overlap with Eisenstein's description of his concept of "vertical" (based off of how a musical score is read) or "polyphonic" montage in his silent films, saying that "shot is linked to shot not merely through one indication – movement, or light values, or stage in the exposition of the plot, or the like – but through a simultaneous advance of a multiple series of lines, each maintaining an independent compositional course and each contributing to the total compositional course of the sequence."[59]

To further elucidate his concept of polyphonic montage, Eisenstein provides an analogy comparing the interdependent lines of such a vertical montage to "a ball of varicolored yarn, with the lines running through and binding together the entire sequence of shots."[60] I believe that this imagery could be directly applicable to the understanding of my work, as long as this analogy is expanded to feature multiple, tangled strands of yarn amalgamated into one, complex ball, with each strand evolving in color, quality, roughness, and more metaphorical parameters at its own

[59] Bernard, 664.
[60] Bernard, 667.

rate throughout its undefined length, at times even unraveling and fusing with or splitting from other strands in the snarl.

Despite there being a number of nonlinear and multiple qualities to the time and form of this piece, the actual sequence of events as they are in time is extremely important to me. I do not believe the piece would function just as well if reordered. As Bernard and Eisenstein said, "while it was true that 'two film pieces of any kind, placed together, inevitably combine into a new concept, a new quality,' one obviously would not have much control over what that quality turned out to be if the collisions were not rather exactingly engineered."[61] Or, as Kramer says, "more significant than this music being heard as a series of interlocking reordered continuities is *how* they are reordered."[62]

[61] Bernard, 662.
[62] Kramer, 157.

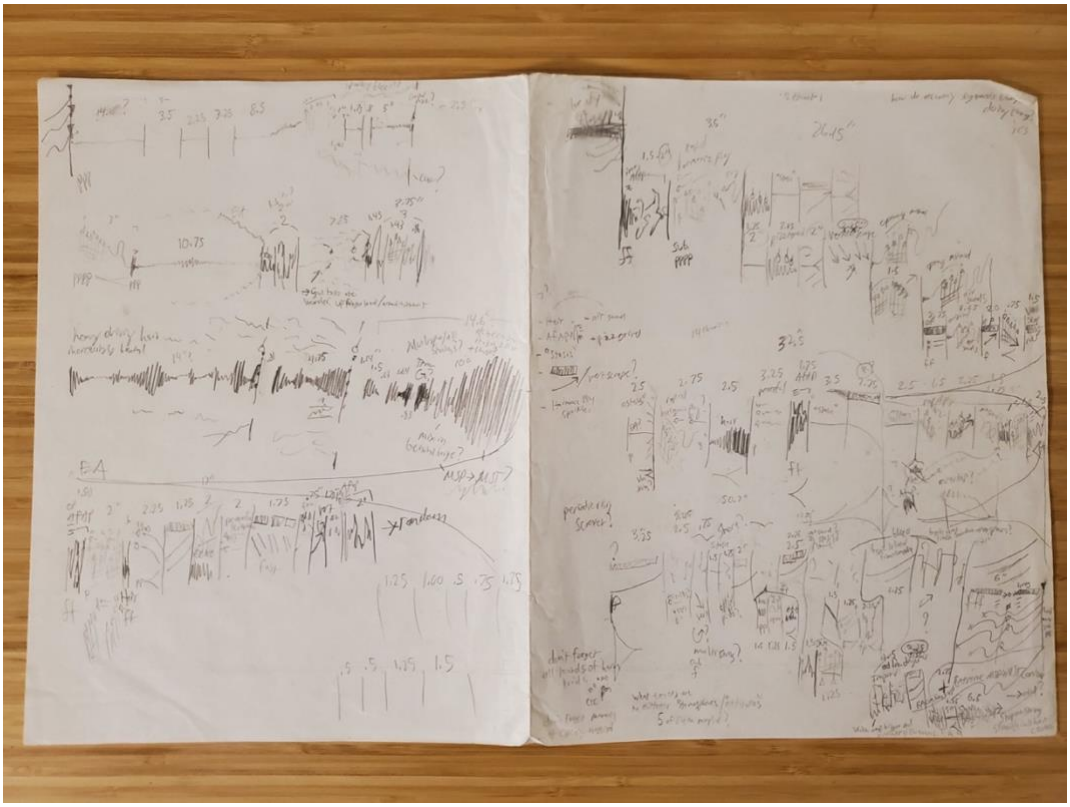


Figure 12 This image is a picture of one of the original sketches for the first "intercutting" sections/section 2 (on the right) as well as the "hair time" section/section 3 transitioning into the second, intercutting' section/section 4 (on the left) – This displays how the irregular cutting between many abrupt chunks of material/personas forms composite phrases/pushes towards larger arrivals. Notice that each instance/chunk of material appears in a developed state, but not necessarily in order! In the center is the list of the seven primary intercutting materials.

In reference to Kramer's definition of multiply-directed linear time, in which materials can develop towards multiple goals that may or may not appear within the temporal confines of the piece, I would argue that the ultimate goals of the "hair" material and "sparklies" are, in fact, achieved within the time frame that the piece is audible. The conclusion of the third section, which will be discussed shortly, represents the ultimate form of the bow-hair material, and section 5, the calm before the storm or the respite which transforms violently into the climax material in section 6, represents the ultimate form of the "sparklies/harmonic play" materials. In the score, this moment is marked as "sparklies – purest, grandest sustain," suggesting that it is

also simultaneously one of the goals of the stasis material. For that matter, cue 78, which features extreme overpressure across all four strings (and is interrupted by a brief transformation into a gentle, harmonic material, lest anything be allowed to predictably advance in a straight line towards anything!) could certainly represent an ultimate form for the "overpressure/vertical scrape" materials. These are, of course, only some incarnations of a few of the possible goals that these materials illude to and could reasonably become.

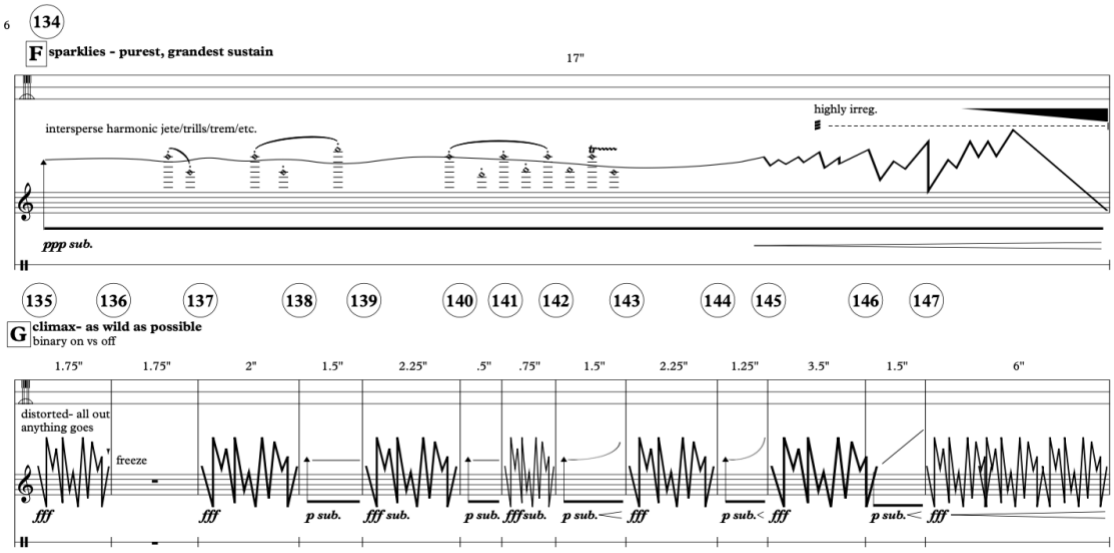


Figure 13 a score excerpt from *to facilitate friction* featuring rehearsal letters F and G, the purest, grandest sustain and the climax respectively

Related to this, I would argue that the climax is the ultimate form of intercutting. All of the conflict from the juxtaposition of "shots" and montage pieces throughout the work are distilled into a "binary – on vs. off" conclusion where complete frozen stasis and unmitigated chaos are placed in direct opposition. Certainly, the chaotic, "distorted – all out – anything goes" improv. also represents the ultimate, fully developed presentation of the distorted "AFAP improv." materials. I would argue, however, that it is also an amalgamation and distillation of the qualities and vectors of many of the seven core materials melding into each other towards this climactic gesture.

Kramer often speaks about the possibility of materials developing towards multiple goals simultaneously. I will, at this moment, posit the idea that multiple materials could also be working towards the same goals. I would argue that all of the core materials of this piece are trending both towards the binary, on vs. off materials of the climax as well as the desperate, flickering gestures, the "fading tries," at the end of the piece. One is birthed out of the juxtaposition and contrast of aggressive chaos and stasis established throughout the work, the other evolves from the flickering, granular, decaying properties inherent and implied in the initial, opening gesture and in each crackle of the bow hair as well as in many, if not all, of the other intercutting, ad lib. materials. Interestingly, as the final, "desperate, choking, erratic, staggering out" materials of the concluding "tries" fade away, they become closer and closer to the qualities of the "air sounds" from the opening as well. I believe this is crucial to conceptualizing how these materials interact, morph, conflict, congeal, and evolve to form the shape of this work.

2.5 **Intercutting Continued – Acceleration, Stimulus Ramps, and Perceptions of Time**

Although some of the intercutting blocks of material may have a static, unchanging set of ad lib./improvisatory instructions for the violin player, the electronics are almost always crescendoing, decrescendoing, accelerating, decelerating, ascending, descending, and becoming more or less dense in terms of both activity and spectrum overtime, creating potent gestures towards or away from the borders of each segment. These exponentially morphing gestures have the dual advantage of allowing ample space for the acoustic performer to shine through (particularly the exponentially curved amplitude envelopes), rather than being perpetually covered by the electronics, and the interaction of these dramatic pushing and pulling/driving and

receding gestures as well as brief interjections of stasis, create an experience where pre-audibility is tenuous and the listener's sense of time is constantly expanding and contracting, their "arrow of time"[63] is repeatedly being redirected and reoriented. This changing sense of time is treated as a structural parameter in these sections. In terms of Pasoulas's "haste to languor continuum," each chunk of material would have a markedly different, contrasting score on this scale of the contraction and expansion of time. Composite crescendos towards higher-level goals are created when the rate and intensity of this expansion/dilation and contraction of one's time sense accelerate towards these larger formal markers and impacts.

Relating back to Rust's writings about the "ramp archetype" and its application in describing irregular changes in textural intricacy in the work of Lutosławski, each of these gestures could certainly be considered as combinations of textural intricacy/density ramps and loudness ramps working together to create particularly engaging series of stimuli, each with similarly curved shapes that are often, but not always, reinforcing one another. As typical of a ramp archetype, they feature "a gradual increase in density followed by a more dramatic drop."[64] This applies both to smaller-scale intercutting gestures as well as the larger, composite crescendos that grow out of the interactions of these discontinuous montages.

In fact, the concept of stimulus ramps and the ramp archetype, as discussed by Rust, is most interesting to me when applied to larger formal structures. In this case, the three composite, intercutting crescendos that combine to form section 2 and together create one even grander composite gesture into section 3 that spans the entirety of the section, are an excellent example. Although these disjunct, highly contrasting materials and their durations were arranged and determined intuitively, I am confident that if a quantifiable measure of perceived textural

[63] Grisey, 249.
[64] Rust 2004, 196.

intricacy, density, loudness/intensity, activity over time, purity vs. distortion of spectrum, haste vs. languor, expansion vs. contraction of time, etc. could be assigned to each intercutting block of material, and were then averaged and weighted by their duration relative to the entire gesture/section and by their degree of contrast with their neighboring materials, as Rust does in his analysis of Lutosławski's work, the result would be three irregular ramp shapes, with increasingly sharp slopes, driving towards the peaks of each composite crescendo, dropping rapidly and then building again. These three ramps would also be subsumed in one all-encompassing ramp from the beginning to the end of the entire section as all of these parameters increase, overall, over time via a jagged, exceptionally chaotic journey towards these goals and structural markers.

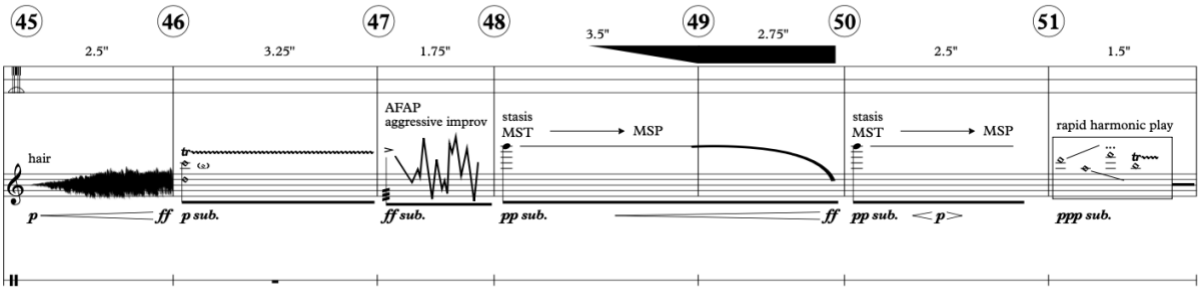


Figure 14 Cue 45 to 51 is part of "composite push 2 of 3" and presents some especially strong contrasts, as well as one of the few instances where materials reach out and connect with one another, breaking through their discontinuous boundaries, from cue 48 to 49, where the high sustain becomes an overpressure gesture gradually, rather than being conflictingly juxtaposed with it. When everything is disjunct, and abrupt juxtapositions and harsh discontinuities dominate the section, continuities become subversive. A piece with only discontinuities and surprise is just as predictable as one without any, after all!

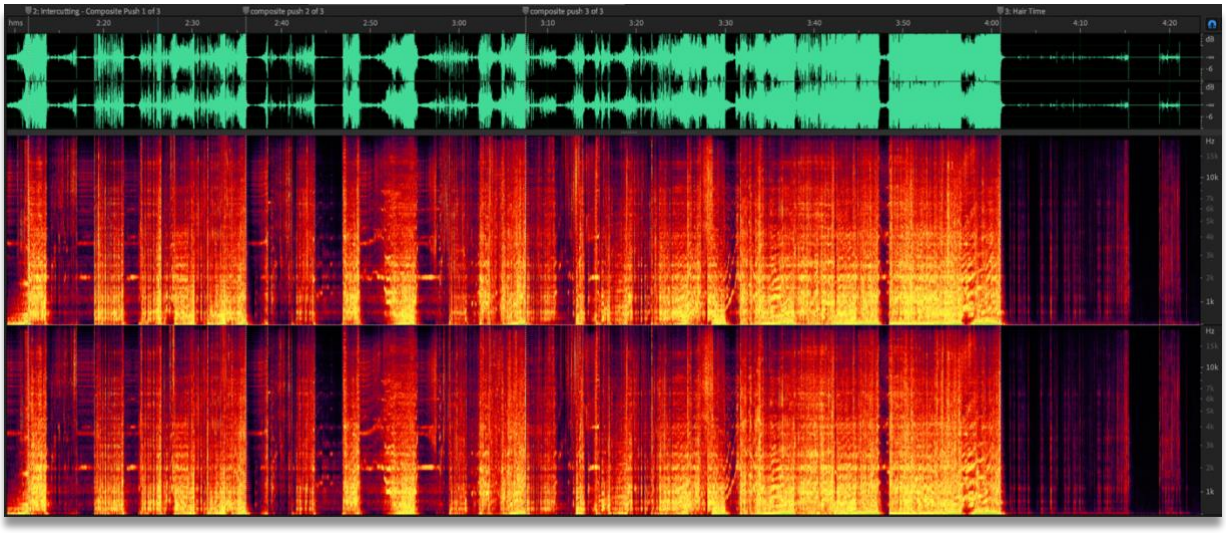


Figure 15 The picture above is a spectrogram (displaying frequency over time with brightness representing the amplitude of each frequency component) and the amplitude over time or waveform view of Section 2, including markers for all three composite crescendos/pushes as well as the jarring transition to section 3. This clearly demonstrates the frequency domain results of intercutting blocks of materials, spacing of composite crescendos in time, and the stark contrast between section 2 and 3.

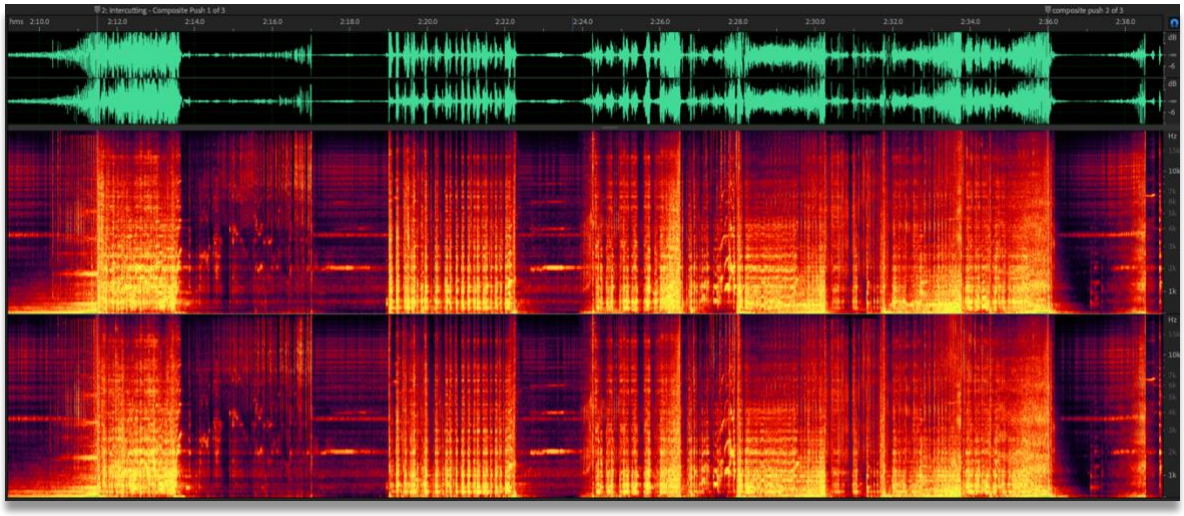


Figure 16 Zoomed in view of the spectrogram for the first of three composite, intercutting crescendos/pushes

2.6 **Intercutting Continued - Shaping of Physical Exertion Over Time**

Sudden, jarring changes in musical material also denote frenetic changes in the physicality, behavior, and personality embodied by the performer - fragile, intimate, faltering sustains requiring a vastly different persona, physical presentation, and quality of movement from the more grotesque, erratic materials. This rapid juxtaposition of extreme virtuosity and sincere vulnerability evolves into its own kind of choreography or even its own kind of theater. In addition to some explicit theatrical indications throughout the score like "freeze!" (featured during the "hair time" section and the climax), the movement and exertion required for each gesture and the resulting visuals throughout the performance are very much factored in from the nascent stages of the piece's development. These nonlinear juxtapositions and developments of physical, visual, and theatrical material also contribute to forming the larger composite/meta phrases throughout the work that are reinforced by or often in counterpoint with the electronic sound worlds and behaviors.

In other words, the intercutting of these seven materials could also be viewed as a shaping of the degree of physical exertion over time. Moments of stasis can provide a listener the opportunity to zoom into the interior details and nuances of a sound, becoming more concerned with its interior textural changes rather than larger, formal concerns that dense, rapidly changing materials point to,[65] altering one's sense of time, however, they also require less physical energy and exertion on the part of the performer to execute. Certainly, there is still a great deal of skill and tension involved in the execution of these "stasis" materials, particularly in being able to leap abruptly to them and immediately "lock in" despite the fact that the material that proceeded

[65] Grisey, 259.

it was extremely physically demanding and erratic, however, when watching the performance, the contrast in the movement, pressure, friction, and strength required to perform a high, faltering sustain, vs. an instance of "AFAP Aggressive Improv." is abundantly, arrestingly clear. Auditory stasis mandates a visual and physical "freeze," or at least a moment of relative stillness and peace in comparison to the chaos surrounding it. Other cells request a playful, desperate, or scathing approach/performance of their materials. This intercutting of jarring changes in "persona/attitude" and the visual, theatrical result of this is also a core component of this work.

Aaron Cassidy emphasizes the importance of the physical and visual components of gestures, writing that:

> The primary morphological unit – not only in my music but also in music in general – is not merely the *aural* gesture, but far more importantly, the *physical* gesture. I would assert that the shapes and local forms that we hear and process as listeners are at their core the byproducts of physical, visceral activities and energies, and, further, that the physical motion required to create a particular sound or set of sounds is the most important component of a gesture's morphological identity. The gesture is, then, a composite of a variety of individual physical activities linked to separate though interdependent parameters. Figuration, articulation, rhythm, contour, register, and amplitude all combine to create a single, amalgamated gestural unit. What is most crucial to this argument, however, is that these parametric components are inherently linked (both aurally and as units of morphological material) to the physical action required to create them.[66]

It is not the visual results of these gestures alone, however, that contribute to the power of these composite, intercutting crescendos. Cassidy goes on to state that:

> More direct gestural languages have aural fields which seem to carry a certain sense of the physical activity or energy employed to create those sounds. As the central building blocks of shape and form in music, aural gestures seem to convey particular physical gestures as well. Likewise, in my own work I often find that the physical element of performance – even in the most extreme circumstances – can be transmitted purely sonically in recording.[67]

[66] Cassidy, 34.
[67] Cassidy, 40.

Directly reinforcing this concept, Denis Smalley states in his discussion of Source-bonding and Gestural Surrogacy that humans are able to understand and subconsciously react to the physical energy required to produce a certain sound, as if they were performing the action themselves, based off of the sound/spectromorphology alone.[68] These sequences, then, are not just manipulating one's sense of time; they are eliciting and evoking rapid changes in one's sympathetic, cognitive/physical response. In essence, they are creating a multiply-directed, disjunct, nonlinear counterpoint of dramatically contrasting physical states and responses. Admittedly, this is greatly aided by viewing a live performance or video of the work, as if a listener is entirely unfamiliar with how a particularly strange sound is produced on a violin, it is almost certainly beneficial to see the physical gesture occurring in order to more readily connect that exertion with the resulting spectromorphologies. Or, in the words of Lutosławski, "of course, music is not only sound. Music is also a collection of psychological reactions, and they are not extramusical."[69]

2.7 **Stasis:**

I feel it is necessary to briefly highlight the "stasis" or "high sustain" material here as well, as its function, justification, and necessity is manifold. Informed by Kramer's writings and perspective, I consider these moments to be glimpses of an infinite, vertical time continuum, in which, if allowed to exist or be audible to the listener for longer, time would dilate to the point of freezing or stopping entirely, taking on a sculptural, non-teleological quality.[70] Based off of Grisey's discussion of the "flesh of time," I view this moment of stasis as allowing the listener to

[68] Smalley, 111.
[69] Rust 1995, 210.
[70] Kramer, 55.

zoom into the interior, microphonic properties of the sound due to its (relative to the other, chaotic, macrophonic gestures and materials that surround it) unchanging qualities facilitating a high level of predictability/preaudibility, resulting in a substantial expansion of time, or a "moment of suspension," thanks to this change in the "degree of proximity" or structural change in one's "type" of perception.[71] On Pasoulas's Haste to Languor Continuum, this segment would antonymously rank exceptionally far towards the Languor extreme of the spectrum. According to Rust's discussion of stimuli ramps, I consider this a necessary foil and disruption through which contrasting increases in stimuli are elevated and made even more potent, resulting in a more powerful overall "ramp" effect as the sequence progresses. Finally, I believe these moments represent what Bernard and Eisenstein describe as a "caesurae in the action" of the material in a montage, essentially moments of relative stasis and respite, which are "effectively a way of superimposing a dilation of time."[72] In other words, I believe the importance of these tense, fragile, vulnerable moments of respite to the function of this work cannot be overstated.

[71] Grisey, 268.
[72] Bernard, 669.

2.8 **Section 3 – "hair time – nuanced crackling respite"**

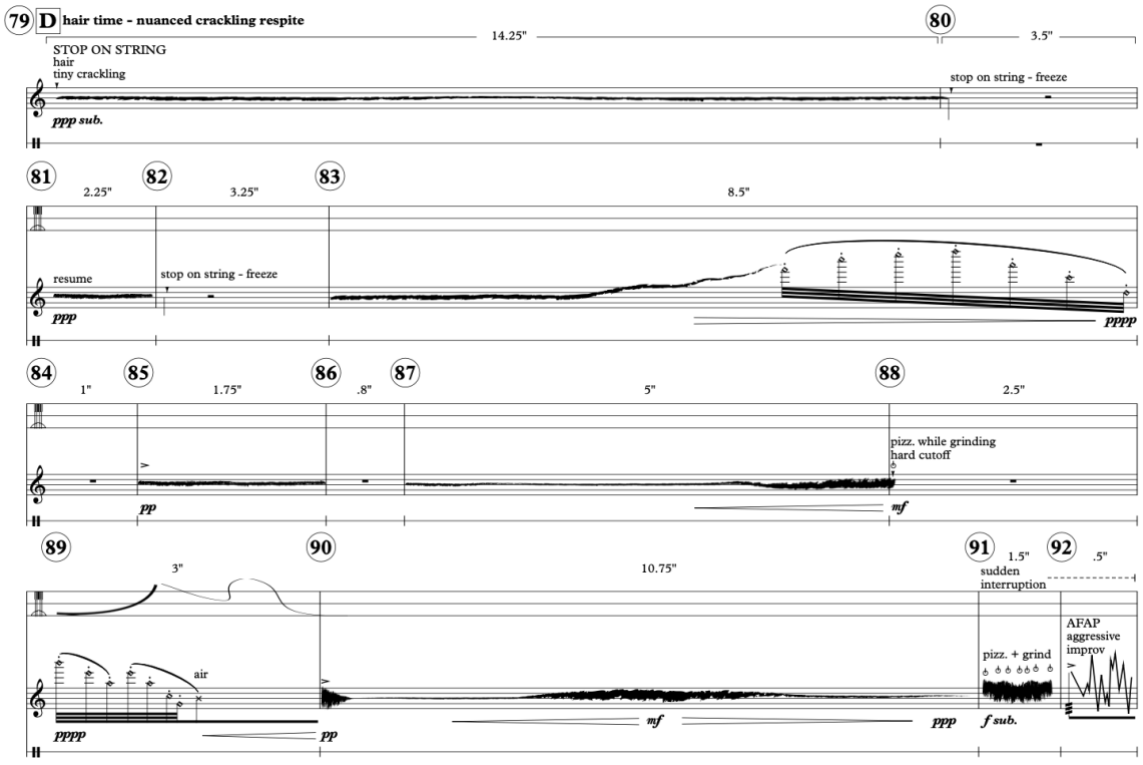


Figure 17 score excerpt from *to facilitate friction* featuring rehearsal letter D, labeled section 3, "Hair Time" in this analysis

As the longest, and one of the only instances in which the piece explores one kind of material for an extended period of time, I consider the "hair time" section to be its own kind of respite. Here, the "hair" materials from the opening "bow choreography" gestures finally have their moment to shine and are foregrounded, while the behaviors and discourse of the previous section now function as the interruptions/interjections. By allowing just enough time, consistency, and preaudibility for the listener to begin to investigate the interior details and structures of the crackling bow hair, rather than the interactions of intercutting materials or other, more active formal, macro concerns, this contributes to an expansion of time. As mentioned previously, although sections 2 and 3 have nearly the same chronometric/clock time duration, I

believe the experience of these sections results in a markedly different psychological perception of the passage of time, as the "hair" section is much more static in comparison to the rapid intercutting of section 2. The jarring interjections of previous (or future) materials, in addition to the "freezes" and silences, which produce their own sense of unpredictability and unease, do provide "acoustic jolts" that disrupt this relative stasis and leave a "violent impression in our memories,"[73] drastically influence the listener's perception of the section, contract time with a reminder that an impact could occur at any instant, even in this more peaceful moment, and recall previous explosive gestures, still just under the surface, while foreshadowing the increasingly intense intercutting exchanges still to come. This interjection of previous materials into new sections with substantially different discourses and contexts could also be likened to Bernard's discussion of James Joyce's *Ulysses*, in which the same event is witnessed by multiple different characters from different perspectives with very different personal perceptions of time and memory.[74]

As mentioned previously, this expansion and contraction of time, or "play of the zoom lens" is used as a structural parameter and is carefully controlled both within this section and across the piece as a whole. This section is one of the few where the expansion of time dominates and arrives after an exceptionally chaotic build, providing a much-needed, although uneasy, respite. This entire section, which breaks up the two "intercutting" sections, could, of course, itself be considered an interruption and represent an intercut or montage piece of a much larger scale.

The differentiation of this section is also aided by it being one of the only areas of the piece that I would describe as primarily "textural" in nature, or *texture-carried*. In this section,

[73] Grisey, 259.
[74] Bernard, 652.

gestures are elongated to the point that they lose some of their directional energy, and listeners become more able to attend to internal activity. Over time, this section becomes less *texture-carried* and more *gesture-carried,* since the frequency of abrupt halts and dynamic gestures increase over time. Towards the end of this section, it may be more accurate to describe it as an instance of *gesture-framing*. Smalley provides an example of this, stating that "individual gestures can have textured interiors, in which case gestural motion frames the texture – we are conscious of both gesture and texture, although the gestural contour dominates…."[75] I have also already stated that I do consider the conclusion of the "hair time" section at cue 106 to be one of the ultimate goals/incarnations of the bow hair material.

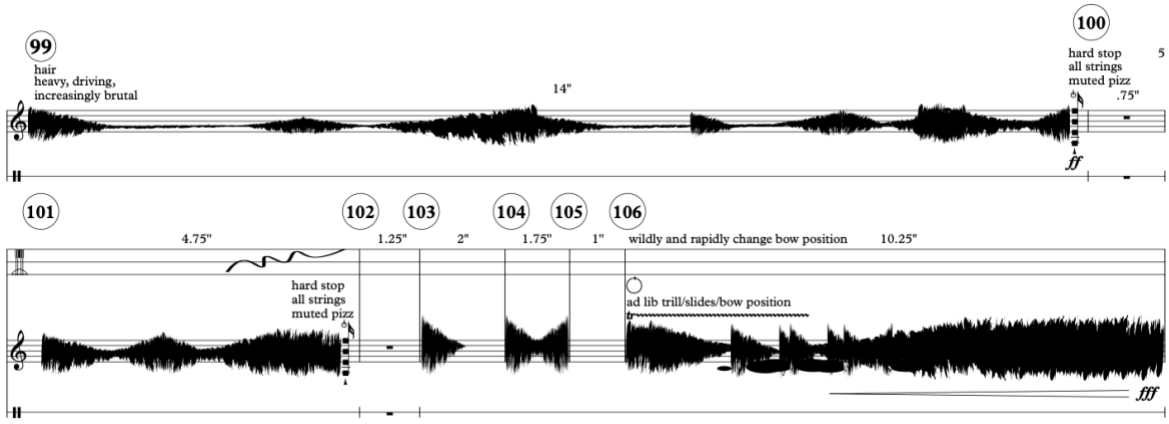


Figure 18 score excerpt from *to facilitate friction* featuring measures 99 to 106, the climax of the "Hair Time" section

2.9 **Montage is Conflict – From Metaphorical to Actual Simultaneity**

During most of the piece, the materials are treated like scenes and shots from a filmic montage; only one event is allowed to happen at a time, as if there is only one screen and one perspective, one shot that can be viewed at any given moment. It was necessary for Eisenstein's

[75] Smalley, 114.

polyphonic film montages to feature only a metaphoric or figurative simultaneity, rather than a literally simultaneous presentation of different materials, however, it goes without saying that music can easily present multiple auditory streams simultaneously, in fact humans are quite good at perceiving and differentiating them under certain circumstances. It was an intentional choice, then, to treat the materials this way throughout the majority of the work. This choice allowed the later breaking of this extremely tight connection, and the eventual independence of materials to be even more significant, as even a slight deviation between violin and electronics, which have otherwise been entirely locked together, and any hint of real polyphony or counterpoint, becomes a substantial contrast, especially compared with the direct tethering of acoustic and electronic sounds throughout the introduction.

The decision to approach the work in this way arose and developed organically from a combination of factors, including the initial goal of trying to create a system of electronics that would react directly, in real-time, to the improvisatory expression of a performer in a 1 to 1 fashion, a desire to expand on some of my favorite sections of *Spate II* which featured sequences that abruptly cut between different, contrasting "kinds" of improvisations, and being directly inspired by Bernard's discussion of Eisenstein's cinematographic work. This approach is not uncommon for a solo instrument, especially those that are typically considered "monophonic." For example, Evan Parker's saxophone improvisations often achieve a metaphoric "polyphony" through rapid alternation between multiple polyphonic lines and techniques.[76] The odd part is that the electronics are so directly tethered to the violin as to convey a homophonic, almost monophonic texture.

[76] David Borgo, *Sync or Swarm: Improvising Music in a Complex Age* (New York: Continuum International, 2005), 39.

It is almost unsettling how directly the violin and electronic components are coupled. I would go as far as to argue that it is expected that a piece for instrument and electronics would feature substantial independence between these two elements, as well as elements of foreground, middle-ground, background, etc. The delayed fulfillment of this nonlinear expectation is invaluable to the function of the piece, and the gradual shift from metaphoric to actual polyphony between the violin and electronics, and the evolution of the behavioral interactions between them, is a core parameter of the work. As Smalley articulates, in a piece for performer and electronics, "perceived behavioural relationships between the visible, gesture-bearing performer and the surrounding acousmatic context will be crucial to the work's understanding."[77] By cue 18, the fixed media has become fully audible and is no longer directly tethered to the amplitude of the violin, but the electronic and acoustic materials are still directly matched, and the onsets and terminations of each gesture are almost always in complete synchrony, suggesting a single, unified sound percept. I would argue that true polyphony does not begin to emerge until cue 107, or section 5, a vast majority of the way through the work.

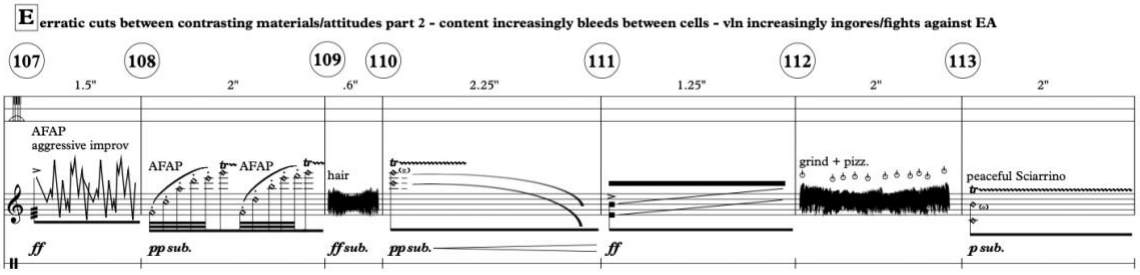


Figure 19 score excerpt of *to facilitate friction* featuring cues 107 to 113 at rehearsal letter E

[77] Smalley, 118.

The score for the section that I have labeled “intercutting prime” for this analysis, beginning at rehearsal letter E, opens with a description reading, “erratic cuts between contrasting materials/attitudes part 2 – content increasingly bleeds between cells – vln increasingly ignores/fights against EA.” This directly conveys that the interaction between violin and electronics, and their increasing level of disagreement, is treated as an evolving parameter and continuum within this section. This “disagreement” progresses from a continuation of section 2 with increasing bleed and overlap between intercutting materials, to a series of “misaligned hits” where the violin and electronics are increasingly out of phase/alignment with each other, to a sequence where the violin “soars” over the electronics’ chaotic and increasingly intense intercutting, ignoring it almost entirely, and concluding with the violin and electronics in explicit conflict. Here, the performer is directly fighting against the electronics as they are asked to “push back the electronics,” countering/refuting each of the electronic gestures with their own.

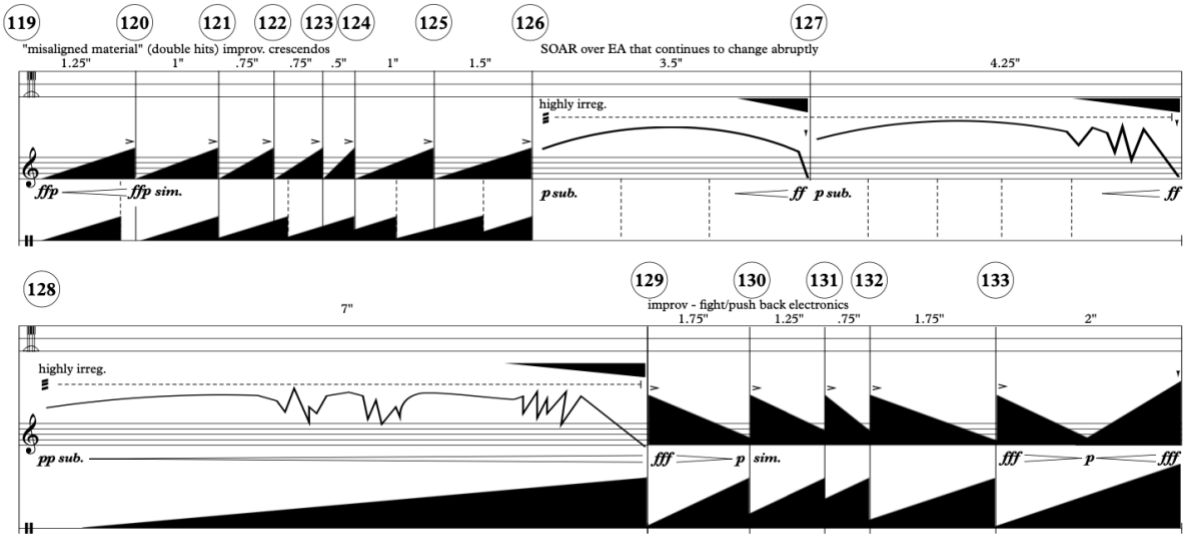


Figure 20 score excerpt of *to facilitate friction* featuring the conclusion of rehearsal letter E, cues 119 through 133

Suddenly, at the onset of section 5, the ultimate sparkling respite, the electronics cut completely, and the violin enters a reverberant space, this is one of the only moments in the work where this occurs. Gradually, they re-emerge, completely unified again with the violin to produce an exceedingly jarring and definitive climax. From here on, the electronics and violin act in complete synchrony, coexisting once again, amplifying the impact and futility of each of the conclusion's "final tries."

2.10 **Section 7 – Conclusion – "Final Tries" – staggering, halting, desperate, weeping, still trying**

For what it is worth, the final section of this work is one of my absolutely favorite parts of this piece. I believe it is extremely powerful and represents a true blend of "extreme virtuosity" and "genuine vulnerability," which I often profess as something that I strive to achieve as a goal of my works. This ending sequence was born partially out of defiance of Grisey's assertion that listeners can handle long, stretched-out crescendos and accelerations better than they can tolerate extended decrescendos and decelerations, clarifying that listeners prefer long builds and accelerations followed by short decelerations and decrescendos. In making these final gestures, I set out to enact a series of decrescendos and decelerations, each longer than the last, and becoming less and less dense and active over time, to test the limits of how long this decaying gesture could hold the listener's attention. I was so enamored with the result of this sequence that it has been integrated, in modified forms, into the conclusions of the remaining two works to be discussed in this paper as well. I believe that careful control and consideration of this balance of "explosion" and "respite" will be increasingly important as I continue to develop works of longer durations.

2.11 **Electronic Interactions**

Some of the earliest forms that this piece took were improv. sessions where I had attempted to create an interactive real-time electronic instrument/performance system that would react meaningfully to Ilana's performance and that she could, in turn, investigate and musically respond to, creating a kind of cybernetic feedback loop. Early recordings of Ilana from these meetings are integrated into the fixed media throughout the piece in addition to the sounds of bowed desert cactus, giant pinecones being rolled and crushed, Styrofoam, cardboard, tree branches being whipped through the air, and live processing of the real-time performance. Ilana was pivotal in the formation of the score and the electronics from the very beginning and her impact and expression is forever sonically ingrained in the electronics even as the work travels the world, finding new meaning with each new performer's interpretation.

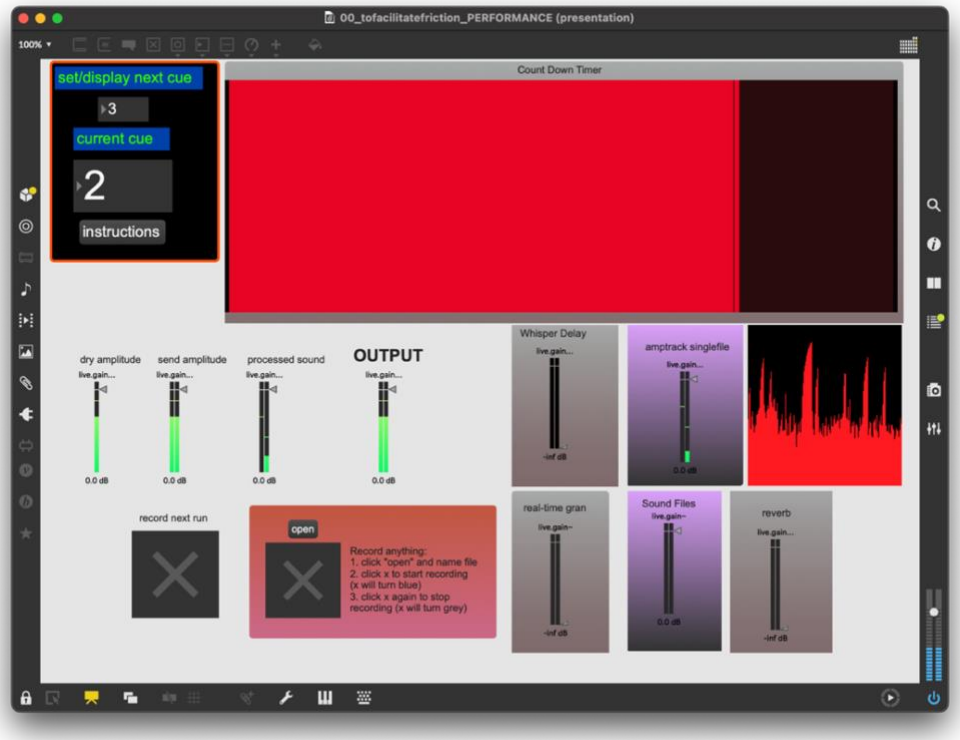


Figure 21 a picture of the Max patch from *to facilitate friction* showing the graphic user interface that the performer sees on stage while performing the piece

Like a majority of my works for instruments and/or voice and live electronics, I would describe the electronics as a 50/50 blend of live and fixed elements, providing an engaging mix of real-time integration of the performer's sound and expression in the moment through live processing, and potent points of arrival thanks to the fixed elements. The max patch functions by displaying an "arrival slider," providing a great deal of freedom and agency in between strict, unforgiving arrival points.

As stated at the outset of this analysis, one of the goals of this piece was to devise a system of interactive electronics that would provide the greater sense of agency and temporal flexibility that I was striving for. I made many attempts at creating this "instrument" and, through collaboration and many experimental testing and prototyping sessions with Ilana, came up with a few interesting systems, but I was not satisfied with the results.

I was aiming to create a system where Ilana's real-time input was analyzed and not just paired with a sample or grain with the nearest timbral match, but instead the morphology and context of Ilana's incredible performative gestures, interpretation, and improvisation were fully considered and reflected in the playback of sounds that didn't just follow her lead but also exerted their own agency and fought back vigorously where compositionally appropriate. In the end, as I lacked the technical facility to achieve this, I instead created a fixed media track that replicated all of the nuanced sounds and their complex interactions and associations with the violin score and performance that I was pursuing and, using an envelope follower, made it so that this track was only audible when Ilana was playing, making it seem as if the fixed media was fused with and being generated by her performance – in essence, I 'faked' the material and interactions that I wished I was able to generate live.

The result of this is actually quite wonderful and varies delightfully with each performance, as slight changes in interpretation and temporal alignment bring forth different aspects, moments, and qualities of the underlying audio track – ensuring a different but identifiable iteration with each performance. To accomplish this, however, below the apparent freedom, there are hundreds of strict time points/alignments that Ilana must adhere to. Beneath the illusion of freedom and free improvisation, timing is actually strictly controlled. This works well in many ways, however, often in performance, there will be a delicate, intimate, moment that I wish Ilana could choose to extend for as long as she deemed appropriate in the current context, but with the current fixed media setup, this is impossible - the piece would simply progress without her.

Since then, I have discovered machine learning. Through the use of tools from FluCoMa, I was able to get much closer to this goal, although certainly I still have much to learn and a long way to go. The results of this interactive, machine learning based exploration will be discussed further in relation to the final piece analyzed in this paper, *untitled.*

In terms of Denis Smalley's *Gestural Surrogacy*, all of the pre-recorded elements featured in the fixed media, as well as the amplitude-tracked/envelope following audio that is only revealed when the violinist plays, feature essentially the same, or similar methods of initiation, excitation, or "cause," but involve different resonating bodies, or "sources."[78] The desert cacti and Styrofoam are both bowed, the crushing and twisting of plastic water bottles, I would argue, is not so far removed from crushing the bow hair into the strings with immense pressure to produce similar, unpredictable crackles, pops, and grains, and the variety of sounds

[78] Smalley, 111-112.

emanating from “giant pinecones” were achieved by dragging, scraping, and bouncing large, sharp, wooden objects against rough concrete surfaces, not unlike the extreme friction of overpressure and vertical scrapes causing the body of the violin to vibrate and the forceful, bouncing, jete impacts resulting from throwing the bow and allowing gravity to continue the work/gesture.

I would argue that even if the source, cause, and “energy-motion-trajectory” involved become obscured through intense processing and distortion, the electronic gestures in my work still maintain effective proprioceptive connections and elicit strong, psychological reactions. Smalley coins this state as remote surrogacy, and describes it in detail:

> Source and cause become unknown and unknowable as any human action behind the sound disappears. …But some vestiges of gesture might still remain. To find them we must refer to tensile, proprioceptive properties, to those characteristics of effort and resistance perceived in the trajectory of gesture. Thus, remote surrogacy, while distanced from the basic, musical first order, can yet remain linked to the psychology of primal gesture. But in order for such a gesture to be felt, there has to be sufficient directed, propagating or reinjected energy in the spectromorphology.[79]

For example, at the climax of *to facilitate friction*, I doubt that anyone, even with the knowledge that many of the sounds were initially generated from recordings of bowed desert cacti, could identify any of the sound sources or causes during this section; they are distorted beyond recognition. Despite this, I would argue that these gestures are sufficiently directed and energized as to maintain, if not enhance, their primal, human impact and induce physical responses in the listener.

The “amplitude-tracked” fixed media is meant to create a sense of “augmented reality” in which the electronics act as a natural, although at times surreal, extension of the violin player’s expression. This is achieved by a careful pairing of acoustic, live materials and

[79] Smalley, 112.

spectromorphologically related recordings and electronically processed sounds. The energy-motion-trajectories of these sounds, their behavior, and their shaping in spectral space is then sculpted over time to match or exceed the trajectories of the instrumental part. Large, bowed Ferocactus samples, for example, especially when substantially pitched down, become gargantuan, unidentifiable resonant bodies that, through their shared mode of activation, still feel as though they are connected to, or in the same family as the violin, greatly extending the possible sound world of the instrument as well as its traditional limits of frequency range, timbral variation, noise saturation, and power.

Since the timing is secretly quite strict, and the score dictates that certain techniques will be evolving in certain ways at certain times, I can, to some extent, ensure that if the performer is executing a bow-hair gesture which smoothly transitions to a flautando sweep and then into a sparkling jete, that this will coincide with crunching plastic and pinecones smoothly morphing into air/wind sounds and eventually granulated, bowed Styrofoam in the fixed media track. This illusion is completed via the direct application of the, barely smoothed, amplitude envelope of the violin to the accompanying fixed media track, ensuring that their onsets and amplitudes are unified, completing the perception of absolute synchrony, and contributing to the idea that the piece may plausibly be reacting and generating these sounds in real-time based off of Ilana's expression and interpretation.

2.12 **Conclusion:**

to facilitate friction uses aspects of multiply-directed linear time, bow-choreography-based morphological hyper-units, potential montage, polyphonic/vertical montage, geometric and statistical accelerations and decelerations on micro, meso, and macro structural levels, and erratic contrasts in the level of stimuli of multiple parameters, including textural density,

amplitude, and dilation or contraction of psychological time/sound proximity/kind of temporal perception over time, overall trending and developing towards larger goals in line with Rust's discussion of the ramp archetype to create a compelling form full of direction and meaning despite, or arguably because of, its erratic, chaotic, conflicting surface. The moments of vertical montage include not just auditory events but also juxtapositions of physical, emotional, and visual states. Multiple materials develop towards multiple goals but also simultaneously coalesce towards the same goals, as represented in the climax and final, desperate "tries." Because the electronics are so closely tethered to the expression and interpretation of the violin performer, through amplitude tracking and careful pairings of extended violin techniques with samples that share similar "causes" or methods of activation and related spectromorphologies, as if only metaphorical, montage based simultaneity were possible, the delayed fulfillment of the nonlinear expectation that the electronics and violin will act in actually simultaneous counterpoint becomes a structural force and elevates the significance of the eventual conflict between the violin performer and electronics. The conclusion of the piece, attempting to refute claims from Grisey, tests exactly how long a decrescendo and deceleration can hold a listener's attention, stretching a fading gesture to its limits. This work is, in many ways, an exploration of the manipulation and perception of time, timbre, texture, and physical gesture, and its formation and presentation revealed a number of provocative questions, challenges, and goals that led to the creation of the next work to be analyzed, *Spate III.*

Chapter 3 *Spate III* – Large Chamber Ensemble

> Like the visual perception of stripedness in shirts or intricacy in tile, such auditory impressions of musical texture become available to the brain in an instant.[80]
>
> Sound masses are analogous to the spraying shower or the flowing hair in vision. Though individual lines are not perceived, the granularity is, and the granularity of one piece can be quite unlike that of another.[81]
>
> The ear cannot hear all of this information while listening to the piece any more than the eye can number the strands of flowing hair in Bregman's visual analogy. Nevertheless, the more dissimilar contours obtained between strands of hair, the more likely we are to judge that hair as tangled. Our eyes need not count strands to distinguish between straight, wavy, tangled and very tangled hair; neither do our ears need to count voices to recognize varying degrees of intricacy in musical texture.[82]

Spate III was commissioned as part of the 2020 LA Philharmonic National Composers Intensive and was written for the new music ensemble, Wild Up. It was premiered in Walt Disney Concert Hall on the main stage during the annual Noon to Midnight festival. This work was meant to directly follow *to facilitate friction,* however, due to the pandemic, its completion and premiere were delayed until 2022. This piece received a repeat performance shortly after at UC San Diego by the Palimpsest Ensemble, primarily featuring UC San Diego doctoral students, conducted by Steven Schick. The UC San Diego performance will be the recording referenced throughout this analysis.[83]

This piece is for large chamber ensemble and is entirely acoustic (unless one counts an electric guitar with a distortion pedal as the presence of "electronics," which I do not) but many

[80] Rust 2005, 194.
[81] Rust, 17.
[82] Rust, 197.
[83] Interestingly, I discovered that a concert hall designed perfectly for an orchestra, intended to reduce the interference of any extraneous clicks, pops, or bow noises, instead amplifying and focusing on the pure, warm resonances and tones of the instruments and eliminating any sonic indication or evidence of exertion or struggle and toning down the sounds of noise, accidents, and "mistakes," means that almost all of the materials of my piece are eliminated and absorbed by the hall. In this kind of space, amplification is certainly required to revive these omitted qualities.

of the techniques, approaches, and priorities common in electronic or acousmatic music permeate this work, from the smallest instrumental grains and micro-sounds to the evolution and design of the macro-structure or form of the work. For this reason, the writings of Curtis Roads and Denis Smalley will be prominently featured to reinforce my analysis of how this piece functions. In addition to this, essentially all of the concepts discussed in the analysis of *to facilitate friction* are still at play in this work, often surfacing through even more extreme presentations and explorations of these ideas.

In reflecting upon the completion of *to facilitate friction* and looking forward to the creation of this new ensemble work, I had three priorities in mind for how this piece would build upon, extrapolate from, and expand beyond my previous work:

1. I wanted to further refine, enhance, and expand on the ad lib. and improvisatory materials presented in *to facilitate friction* and *Spate II,* focusing more on their internal growth and development in time rather than primarily on the conflict and contrasts between them. This also rose out of a desire to quickly communicate and request the absurdly complex gestures and textures I was interested in creating so that they could be achievable given a limited rehearsal schedule.
2. I wanted to give these materials more time to exist, evolve, and interact with each other over longer durations, increasing the effect of the "zoom lens" and allowing a greater dilation of time, as well as actually allowing the opportunity for interior details and their nuances to be perceived and appreciated, rather than being cut off almost as soon as they began.

3. I wanted the work to feature a higher degree of actual, rather than metaphorical, polyphony and counterpoint compared to that of *Spate II* and *to facilitate friction,* allowing multiple streams of granular, ad lib. materials to overlap, interact, reinforce, and conflict with one another simultaneously.

Two other overarching concepts that are present throughout the piece are also worth briefly mentioning here. First, everything in the piece is irregular. This is very much inspired by Grisey's concept of *fuzzy periodicity,* the idea of including slight irregularities in an overall consistent material to maintain some aspects of uncertainty and retain listener interest and attention,[84] as well as Trevor Wishart's discussion of "the lattice" in his book, *On Sonic Art.*[85] Wishart discusses the idea that the languages we use directly influence how we think and the ideas that we are likely to consider possible, targeting classical conceptions of pitch and rhythm as particularly problematic. He states that pitch, rhythm, and traditional concepts of orchestration exist on a discrete grid and encourage composers to think in terms of metric rhythms, equal-tempered or even microtonal pitches, and instrumental timbres. Instead, Wishart posits that every aspect of a piece can evolve smoothly through a multi-dimensional space along multiple, interrelated continuums, including smooth evolutions of duration, frequency, timbre, and more, defying any sense of an underlying grid and instead morphing freely in time. As a result of the combination of these ideas, my work consciously attempts to avoid any sense of regularity, exact repetition, perfect periodicity, or any perception of an underlying rhythmic, pitch, or timbre lattice. Even trills and tremolos are marked "irregular" to maintain some tension, suspense, and unpredictable variation within sustains, and exact pitches and rhythms are almost never

[84] Grisey, 245.
[85] Wishart, 23.

specified. Instead, timings, frequency content, and ranges of extended techniques are often left up to the volition of each performer within carefully sculpted constraints.

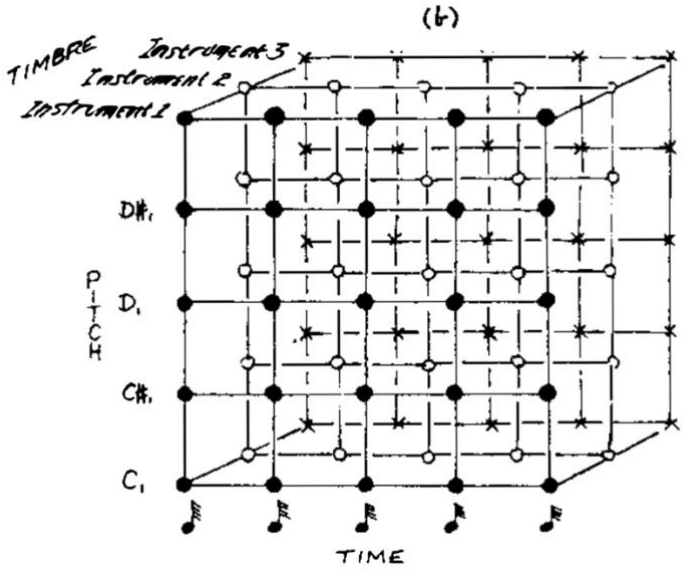


Figure 22 Trevor Wishart's illustration of a three-dimensional lattice of pitch, time, and instrumental timbre from *On Sonic Art* (Wishart, 26)

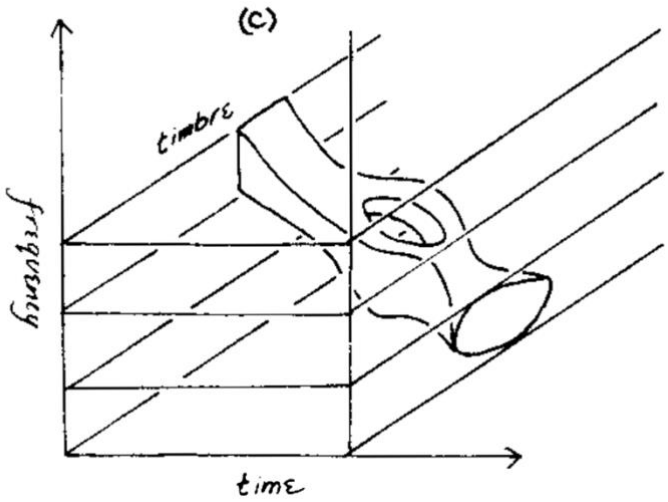


Figure 23 Wishart's illustration of "a complex sound-object moving in the continuum", rather than being beholden to an underlying grid or “lattice,” from *On Sonic Art* (Wishart, 26)

Related to this, it was essential to me from the inception of this work that any instrument should be able to play any role and contribute to any texture in this piece. The contrabassoon, for example, is not typically considered an agile instrument. It was exceptionally important to me, however, that it be able to contribute to the fastest, active textures and gestures of the work just as potently as any other instrument in the ensemble, rather than being relegated exclusively to low sustains. The contrabassoon, and all other instruments, contribute equally to the rapid, airy improvisations, the raucous eruptions, and the grotesque sustains of this work, presenting their own perspectives and unique takes on the material thanks to the idiosyncratic properties, construction, and extended performance practice of each instrument. I view this as an updated perspective on "orchestration," in which I explore how each instrument, through extended techniques, can participate in each kind of material of the work in its own way.

Before continuing, it is worth sharing the program notes for this work here:

> While seeking to expand on the concepts and material found in the original iteration of Spate, I was immersed in its erratic, panicked atmosphere. I became obsessed with the idea of frantic, futile solos lashing out violently from silence with such constant intensity and fervor that they resulted in a kind of horrified stasis, a unit of grotesque and vicious sustain, striving endlessly but going nowhere, grasping desperately at nothing in the pursuit of a distant unseen hope. *Spate III* furthers this obsession and explores the coalescing of individual "popping" grains, collectively evolving and progressing from individual, ultra-sparse grains/"pops," to sporadic clusters, and eventually uniting into powerful composite crescendos and undulating masses while celebrating their unpredictable and unstable nature. Often resulting from high-pressure friction, these grains evoke a sense of extreme tension, tremendous pressure, and the tempting of a vulnerable threshold, as if an immense force is on the brink of erupting forth.

The word "Spate" means "a large number of similar things or events appearing or occurring in quick succession" or "overflowing due to a sudden flood" or "a large number or amount" or "a sudden or strong outburst."

Below is a spectrogram and waveform view of the entire work separated into two parts, each approximately 3:30 in duration, so that the details of the evolution and spectromorphology of the work can be seen at a reasonable scale. These graphics are marked with rehearsal numbers and descriptions of the kinds of events and materials present in each section. In many ways, this acts as a representation of the overall form of the piece and is meant to be referenced in tandem with the score and audio recording of this work to aid in the following discussion.

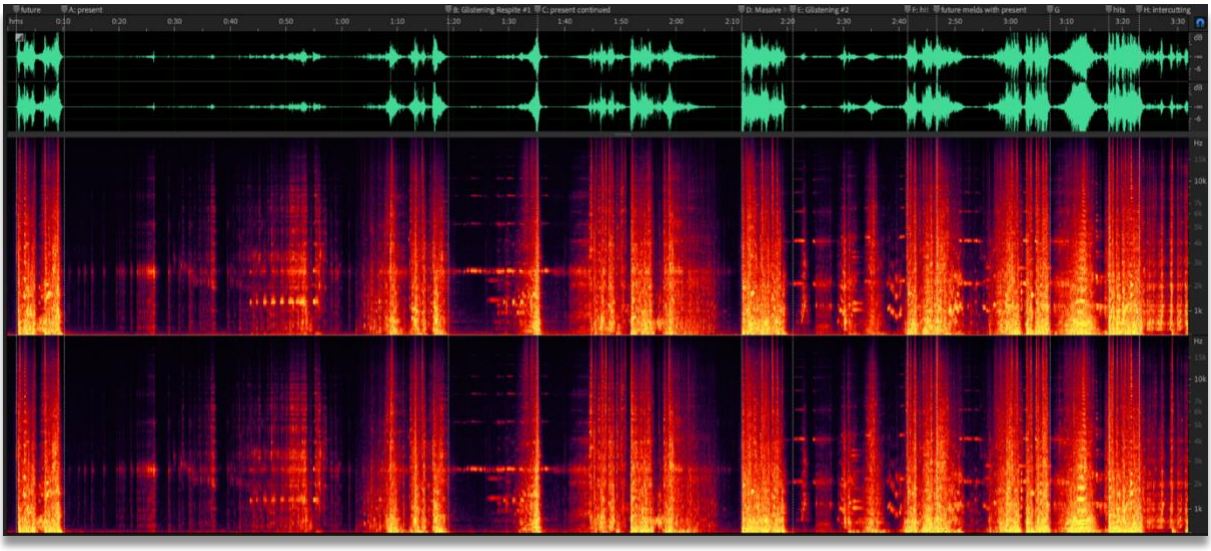


Figure 24 Spectrogram and waveform view of first 3:30 of *Spate III* with structural markers

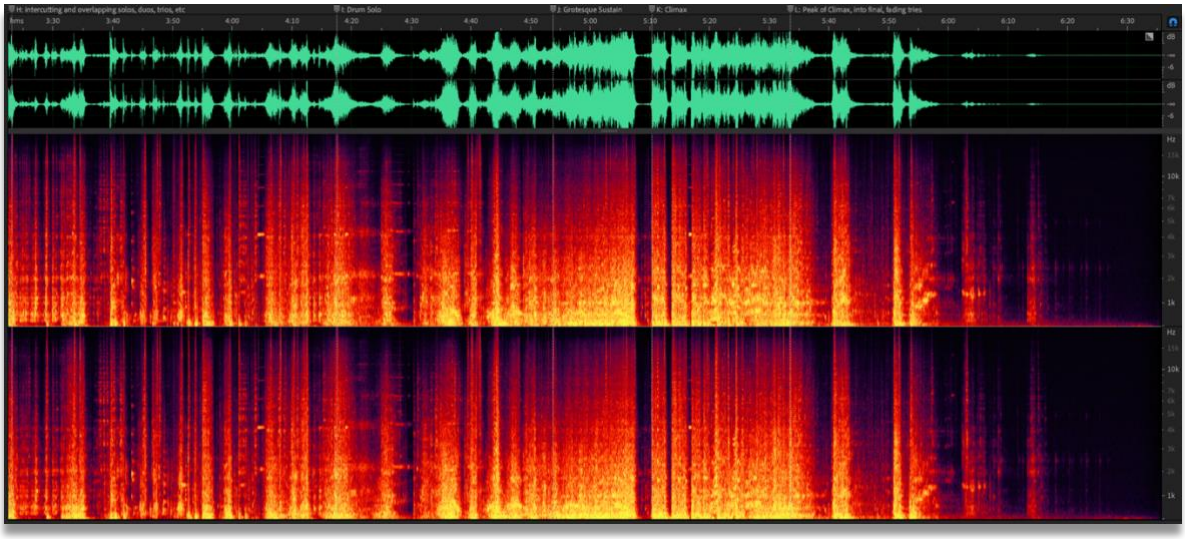


Figure 25 Spectrogram and waveform view of second half of *Spate III* with structural markers

3.1 **The Time of the Piece:**

In many ways, I believe that this piece represents an even more extreme presentation of Kramer's multiply-directed linear time. The opening of the work, as stated in the score, is meant to be a "jarring, frenetic eruption - a glimpse of the distant, raucous future." Although these gestures are the first sounds heard in the piece, they are not representative of "the beginning" material. It is reasonable to be skeptical of this conceptual claim. How could the opening of the piece not be the "beginning?" Kramer, within his discussion of multiply-directed linear time, directly addresses this dilemma by stating that **"**to be presented with an ending gesture at the very outset of a piece can be disorienting. We are faced with the incongruity of a gesture that seems nonbeginning in function yet is heard first. The development and possible resolution of such a disorientation can become a major force in the work."[86]

Kramer states that this is possible due to the differentiation between "absolute" and "gestural time," comparing "absolute," "Newtonian," or measurable clock time to gestural time, which "depends on our recognizing the shapes and hence understanding the implied meaning of gestures. Gestural time depends on qualities inherent in entire gestures but not in the individual notes and durations that make up those gestures. Thus gestural time is more holistic than syntactical." He clarifies that "we can perceive both gestural and absolute time at once" and suggests that many of the tensions we feel in music compositions come from "the apparent contradictions between their two kinds of time."[87] In other words, reaffirming the multiple, and multiply-directed, time-sense in question.

He goes on to suggest that this is achieved by connecting gestures with similar qualities and meanings, despite their separation or exact placement in absolute time, by means of

[86] Kramer, 150.
[87] Kramer, 151.

cumulative listening, where these connections are understood and unified after the fact in memory. Kramer reinforces this further by saying that the "earlier-simultaneous-later qualities of events can, in music, be separated from their past-present-future qualities. The latter may be determined by gestural shape while the former depend on the order in which the events are heard (in absolute time)."[88]

Essentially, much of *Spate III's* rhetoric functions through the gradual reveal of how the true "beginning" material, the individual, high-pressure clicks and pops, became the raucous material that appeared as a "flash forward" at the onset of the work. It is important to clarify that these "massive hits" from "the future" are not glimpses of the climax itself, but selections of imagined, developed, chaotic, pre-climax materials, still with room to escalate even further. Once the future and present merge, the piece does just this, irregularly trending overall towards greater levels of intensity, complexity, density, intricacy, distortion, and all other parameters, with many respites, interruptions, stimulus ramp archetypes, and developments in discourse and behaviors along the way, towards the peak of the actual climax of the work on the second beat of measure 103, or rehearsal letter L.

This burst of intensity, textural intricacy, distortion, and rapid, intercutting changes in material, also has the added benefit of, as Rust says about similar opening "explosions" in the work of Lutosławski, setting up expectations of extremes to come. Rust writes that "a convincing, powerful climax at the end of a work requires that substantial expectations be instilled near the beginning."[89] I would argue that this also aids in hopefully holding the listener's attention more effectively during the prolonged, slowly building materials that follow, as they have seen the promise of what's to come and a vision of what the piece is slowly,

[88] Kramer, 154.
[89] Rust, 213.

exponentially, building towards. These blasts from the future become more and more frequent, along a similar exponential, statistical acceleration curve as is present via the interruptions/impacts in the opening of *to facilitate friction,* until future and present merge at, specifically, *exactly* the fourth 16th note of measure 49 (In retrospect, this is an atrocious decision in terms of ensemble coordination and absolutely should have been placed on a downbeat). At this point, the future and present materials meld, and for the first time, one of the "massive impact" gestures morphs into a clicking, popping, granular gesture rather than being juxtaposed in contrast against it.

Since humans are able to compare levels and changes of textural intricacy in a work much faster than they can memorize exact sequences of notes, relying on primal rather than schematic listening and perception,[90] and since my work is largely based in disrupting, subverting, reordering, and fulfilling Smalley's powerful motion and growth processes, I believe my piece is particularly well positioned to effectively call upon these *gestural time* connections, even more so than the music steeped in tonal harmony that Kramer lauds. I would argue that despite a substantial chronometric or absolute time gap between the opening eruption and the next "massive hit," let alone the eventual climax, these gestures are indisputably connected and can be understood as clear returns, continuations, or developments of these materials.

Notably, Kramer further explicates this idea of absolute and gestural time interacting by saying that "gesture and its temporal placement may be separable, but they do not function in isolation. Our memory of gestures at odds with their absolute-time placement influences our subsequent understanding of these same gestures when they recur in new contexts."[91] This is, in

[90] "The ear can compare different sound sequences much faster than it can memorize and recall a single sequence." Rust, 197.
[91] Kramer, 152.

many ways, the intent in the construction of the opening of this work. Each time an impact from the "future" is heard, the listener has more information about how the "present" material has evolved in its journey to become one with the it, until they inevitably meet and meld. In relation to this, Kramer also suggests that, even if an "upbeat" occurred well before the climax, thanks to gestural time and cumulative listening, this gesture could still be considered to be "leading directly to the climax."[92] This is very much how I see the "hits" throughout this work; though separated in time, they are all building together towards the climax, though, just like *to facilitate friction,* not necessarily in perfect, predictable, linear order or sequence.

Certainly, the same expansions and contractions of time discussed in the analysis of *to facilitate friction* are also invaluable to this analysis as well. "Glistening Respites" and extended periods of time spent focused on one texture still cause dilations of one's sense of psychological time in comparison to the rapid-fire changes of material present in the "eruptions" throughout the work. These perceptual facts are very much taken into consideration in the positioning and proportioning of materials throughout this piece.

3.2 **The "Present" - The Piano as Catalyst, Model, and Impetus Towards Multiple Transformations**

As already established, the "present" initially consists of the accretion and coalescing of grains, moving from individual clicks and pops to sporadic clusters, and eventually into dense, composite crescendos and unified gestures. Later, it is revealed that, in the spirit of both Kramer's multiply-directed linear time and Smalley's concept of motion and growth processes, this initially piano-based gesture and technique can also evolve towards multiple, different goals.

[92] Kramer, 154.

The individual clicks and pops emanating from the piano require an immense amount of pressure, the grinding slightly less so, and on the other extreme of this pressure continuum, a delicate touch allows the bicycle inner tube to act as a kind of "bow," causing the string to emanate, in the case of the medium to upper strings, a haunting, piercing, pure tone. When the lower strings are "bowed" which requires much more effort, the effect is gritty, visceral, and absolutely nasty. In many ways, the multiple possible evolutions and incarnations of this bicycle-innertube-inside-piano-based technique give rise to the goals, development, and structure of the entire work. The entire ensemble joins the popping and clicking "density gesture" to become the "present" material, the bowed, pure, sinusoidal tones become the "glistening respites" as labeled in the spectrogram and formal overview of the piece, and the grotesque excitation of the lower strings produce irregular, undulating, multiphonic, overpressure, and split-tone-esque sounds that, when reinforced by similar techniques and sounds from the rest of the ensemble, become the "undulating noise wall/grotesque sustain" materials throughout the work. All of these materials can be quickly accessed and cut between, or, much more enticingly, can be connected through continuous, gradual transformation and morphing achieved through the exploration of pressure, speed, and position continuums inside of the piano. The properties and possibilities inherent in this piano and bicycle inner tube technique are the model, catalyst, and impetus from which this entire work is constructed.

A notable example of the piano clearly guiding and facilitating a transformation of the entire ensemble as a kind of meta-instrument occurs at rehearsal letter G. This is also one of the only instances of a unified, uninterrupted graduated-continuant morphology in which the materials emerge from near silence and return to near silence over a smooth, continuous curve, and is, as such, easy to spot in the waveform of the recording. The piano initiates the

transformation from pure sustain, to grotesque, distorted, noisy, undulating overpressure, and back again, with all the instruments of the ensemble joining in and exiting this gesture in their own time. In this way, the "glistening respites" directly become the extended, distorted sustain material (which receives its ultimate presentation at rehearsal letter J), the trajectory of which is metaphorically and literally tethered to the increase in pressure on the strings of the piano.

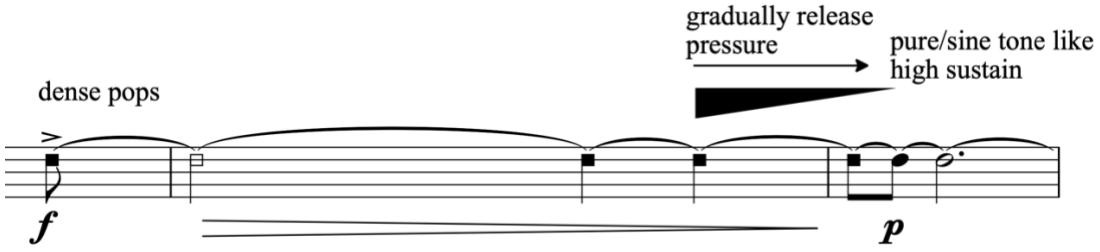


Figure 26 score excerpt from *Spate III* featuring the piano gesture and material transforming via a change in the pressure being applied by the performer with a piece of bicycle innertube

These transformations of the piano gesture from noisy, gritty grinding to ethereal, bowed sustains were very much inspired by Smalley's "note to noise" continuum as well as Rebecca Leydon's *Disembodied to Embodied* continuum, or, in other words, her *transparent, non-corporeal, asomatic, sinusoidal purity* to *turbid, corporeal, somatic, inharmonic noise* continuum.[93] Smalley's concept simply conveys that pitch and noise are extremes of a spectral continuum that contains many intermediate states and can be smoothly traversed, while acknowledging that a wide array of noise variations are achievable and worth exploring. Leydon's *sinusoidal purity to inharmonic noise* continuum provides much more tantalizing detail. In describing the pure, sinusoidal end of this spectrum, she writes that:

> Inasmuch as isolated harmonics resemble pure sine waves, they all sound essentially *the same*. …Extracted from its contributing role within the timbral percept, an isolated harmonic becomes quite literally *disembodied*. It is a sound that no longer bears any evidence of the physicality of its origins, since that evidence—resonances, formants,

[93] Rebecca Leydon, "Clean as a Whistle: Timbral Trajectories and the Modern Musical Sublime," *Music Theory Online* 18/2 (2012).

> impedances—is only audible as a *spectral* feature, across a span of frequencies. Naturally, an isolated harmonic is still propagating through a medium (air, for example), but in a quite palpable sense it breaks free of a material source. In casting off physical encumbrances, isolated harmonics reach us as evidence of non-corporeality.[94]

She goes on to contrast this with the embodied qualities of noise, stating that:

> By the same logic, a musical sound characterized by inharmonic noise—respiratory and ingestatory sounds, buzzing, tapping, hissing—is absorbed back into its corporeal essence. When inharmonic noise crosses the tolerance threshold set by our perceptualizing impulses, a sound becomes incorrigibly fleshy, entangled in the sheer materiality of matter. We can therefore envision a range of different timbral effects implying varying degrees of corporeal presence: at one extreme, the emancipated harmonic; at the other, the quaggy materiality of inharmonic noise; and in the middle, pitch, melody, and polyphony, as we ordinarily understand them, poised between states of somatic turbidity and asomatic transparency. Note, however, the basic asymmetry of this scheme: there are myriad timbral configurations expressing bodies through many kinds of noise, but only one way for sound to come clean: the sine wave. The diversity and uniqueness of material bodies evaporates in the homogeneity of their constituent fragments.[95]

I find the discussion of how this continuum and spectral trajectories between its extremes can be used to elicit a sense of an unattainable sublime in regard to pure, sinusoidal tones, or material bodies and corporeality in the case of distorted noise, fascinating.

The influence of this continuum is evident in all of the works being discussed in this paper, but especially so in *Spate III.* Many of my works explore juxtapositions and transitions between noisy, spectrally dense, and pure, sine-tone-like states, but notably, the score excerpt above explicitly calls for a "pure/sine tone like high sustain," directly referencing Leydon's conception of spectral purity and frequency component isolation as idealized goals for timbral trajectories. In this state, the high piano sustain can easily be joined by other voices also producing high, isolated harmonics on their instruments through their own extended techniques, as they often do in sections dominated by "glistening respites." The inverse of this gesture, the

[94] Leydon, Chapter IV. Evidence of Bodies.
[95] Leydon, Chapter IV. Evidence of Bodies.

increasing of pressure to transform the pure sinusoid into a grotesque sustain, gradually returns the sonic, audible evidence of the physical materials and properties of the massive resonant body of the piano and its taught, metallic strings, as well as, for that matter, the sound of the bicycle rubber itself, as the gesture descends into embodied, sporadic noise. At moments like rehearsal letter G, the other instruments of the ensemble join in this timbral trajectory from spectral purity to abject noise as well, playing their grittiest, most distorted, low material and techniques, calling for maximum embodiment and turbidity, exuding, as Leydon says, "the sense of sheer bulk projected by noisy timbres."[96]

Within his discussion of the note-to-noise continuum, Smalley identifies one particular kind of noise that is especially relevant to this gesture. He expounds that "extrinsically we associate *granular noise* with sea, water textures, wind, static interference, granular friction between rubbed and scraped materials, fracturing materials (e.g. stone), unvoiced vocal consonants, and certain types of breathing and fluid congestion."[97] Since the gesture in question is generated through the application of granular friction between a piece of rubber scraped across metal, *granular noise* is certainly the quality of noise at play in these morphing trajectories. Related to the discussion of the formal implications of this gesture, Curtis Roads states that "in traditional composition, transitions function on the mesostructural level through the interplay of notes. In electroacoustic music, the morphology of an individual sound may play a structural role, and transitions can occur within an individual sound object. This ubiquity of mutation means that every sonic event is itself a potential transformation,"[98] again emphasizing how

[96] Leydon, footnote 6.
[97] Smalley, 120.
[98] Roads, 20.

philosophies and conceptions of materials typically attached to acousmatic compositions are critical to my approach to writing for acoustic instruments.

As mentioned already, the "present" features gradual morphing between noise and a high, pure sustain but also between grains and noise, and between grains and a high sustain. All of these materials evolve together but are also at times treated as separate materials to be juxtaposed in conflict, much like the components of the opening gestural-morphological-hyper-unit of *to facilitate friction,* but with much greater control and contrast in the amount of time dedicated to gradual, morphing transformations vs. exceptionally quick bursts of intercutting materials, which take up a proportionally smaller fraction of the work. "Present" gestures also feature their own, weaker reversed attack-decay morphologies built out of coalescing grains and pointing towards the, much rarer, fulfillment of these curved crescendos, often separated substantially in time, through abrupt attack decay envelopes. These gestures intensify until they merge with the "future" materials. This convergence or merging is itself proceeded by an acceleration of the rate and quantity of overpressure and other methods of distortion, smoothly transforming the second "glistening respite" into the material of the next "massive hit."

3.3 **"Massive hits" and "Eruptions"**

It is worth mentioning that, just like *to facilitate friction*, the "massive hit" eruptions do feature sets of intercutting materials and are divided into multiple chunks or "hits." The quantity of chunks and material within them was carefully selected for each "massive hit" as the piece progresses (the sketches are intricate and beautiful in many ways and fascinating to return to). For example, the first explosion at the onset of the piece is composed of five hits, each containing different materials and behaviors. Each hit is almost always marked by the kick drum.

Seven, rather than five, kick drum hits exist in this "future" gesture as three are dedicated to driving into the aggressive cutoff of the eruption.

Not all instruments align with each hit, some have longer trajectories and might skip one or two hits to converge with other instruments at the next one. Some instruments are logarithmically moving away from a hit point while others are exponentially crescendoing into the next, or abruptly joining in with, or misaligning and smattering against, the kick drum, forming a web of tendrils and trajectories in chaotic counterpoint. Notably, the string material inside of the first hit features the request to include "all future techniques" – this same material will later be presented as "all previous techniques" during the climax.

The trumpet, trombone, and guitar also shared an exposed, contrastingly still and quiet moment where an electric guitar multiphonic is crossfaded, thanks to the volume pedal, with delicate, muted brass notes intensifying by morphing into split tones, exponentially removing their mutes, and adding double tonguing and trills to further distort the gesture, before reversing its dynamic shape and joining them again to crescendo into the next hit. Each of these "hit" materials, like the AFAP raucous improv, airy improv, and grotesque sustain in the guitar and brass, are meant to represent developed states of materials that will be expounded on later in the piece (or earlier depending on how one construes the relationship between future and present), in some ways introducing and foreshadowing their presence and evolution. Simultaneously, it is also important that these events, even with their highly detailed interiors, be perceived as an explosive whole, initially contrasting with the surrounding "present" material.

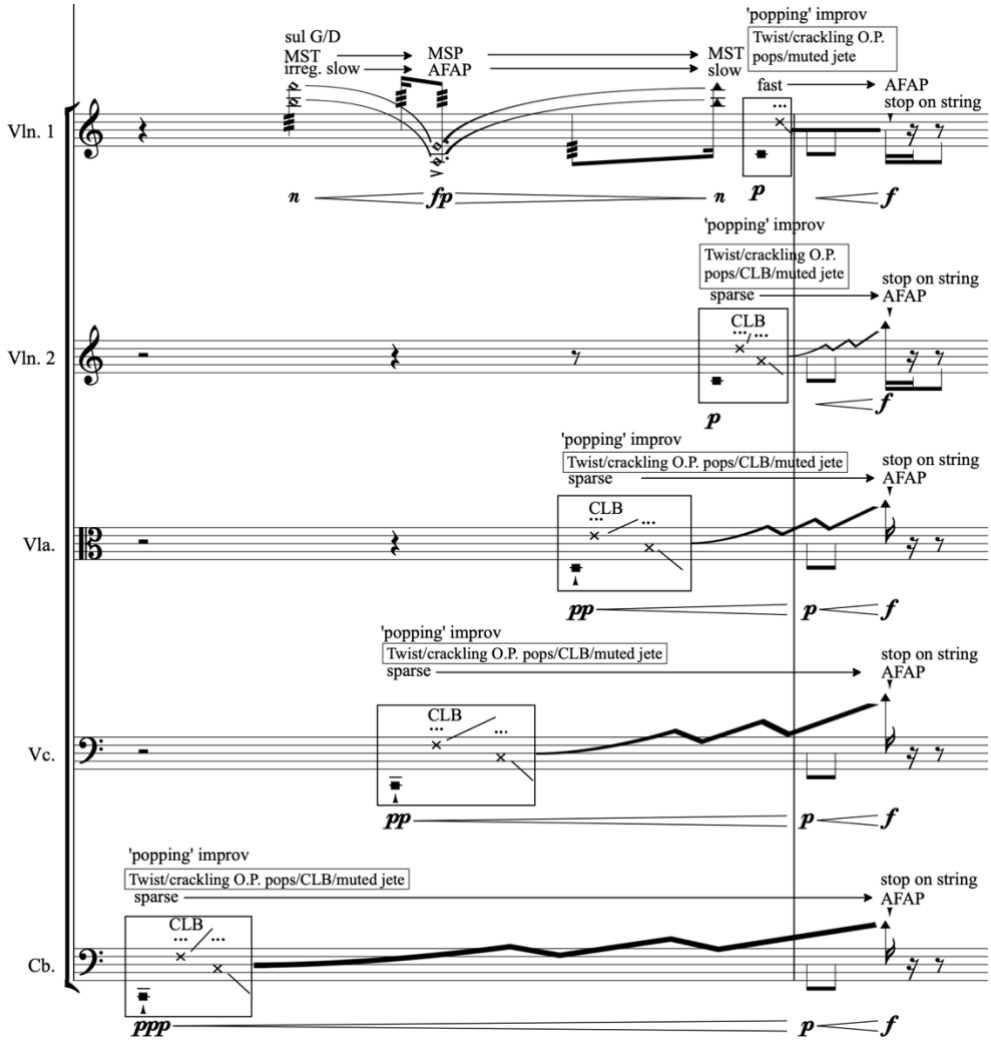


Figure 27 score excerpt from *Spate III* featuring the string section at measure 20

3.4 **As Always, Everything is Curved:**

Pictured above is a literal geometric acceleration of the entrances of the string section; this is a frequent occurrence throughout this work and is essential to its underlying structure. Each instrument joins the texture and gesture with exactly half the delay compared to the previous initiation in the sequence. The cello takes two beats to start after the contrabass, then the violin takes only one beat, violin 2 takes half a beat, and violin 1 joins the gesture just a 16th

note later. This acceleration is not only a direct reflection of Grisey's geometric acceleration archetype, but is also related to Conlon Nancarrow's tempo cannons, in which the same material enters at different points in time, but with different tempos, causing all instances of the canon to accelerate independently towards a powerful convergence point, at which they all perfectly align with dramatic formal implications.[99] In this example from the score, each performer has a shorter amount of time to transition from "sparse" to "as fast as possible," essentially creating a tempo cannon-esque acceleration towards a convergence point, but with no underlying tempo grid present.

This gesture is, like many gestures throughout the work, artificially cut off, creating a reversed attack-decay morphology that is intensifying across many parameters and driving towards the next attack, but is instead met with silence. The gesture points towards the possibility of a future, reciprocal inversion of this gesture, which does not arrive… yet. Together, all of these reverse-envelope gestures, artificially cut off as their energy is still growing, build anticipation towards their inevitable fulfillment, which must, eventually, arrive. These accelerations, crescendos, and increases in density and textural intricacy as well as all changes in pitch and frequency throughout the work are, of course, all exponential curved, since, as Smalley says, "perfect linearity is normally less acceptable to the ear as it can sound too mechanical or artificial; absolute linearity is therefore more often synthetic than natural."[100]

[99] Kyle Gann, *The Music of Conlon Nancarrow* (Cambridge University Press, 2006), 20.
[100] Denis Smalley, "Spectro-morphology and Structuring Processes," in *The Language of Electroacoustic Music*, ed. Simon Emmerson, 61-93. (London: Macmillan, 1986), 70.

3.5 **Priority 1 – Development of Improv./Ad Lib. Materials:**

It is worth investigating the use of "Improv./Ad lib. Box Notation" within this work in detail. For the first time, instructions for how these materials should be approached and interpreted are codified in the performance notes for this piece:

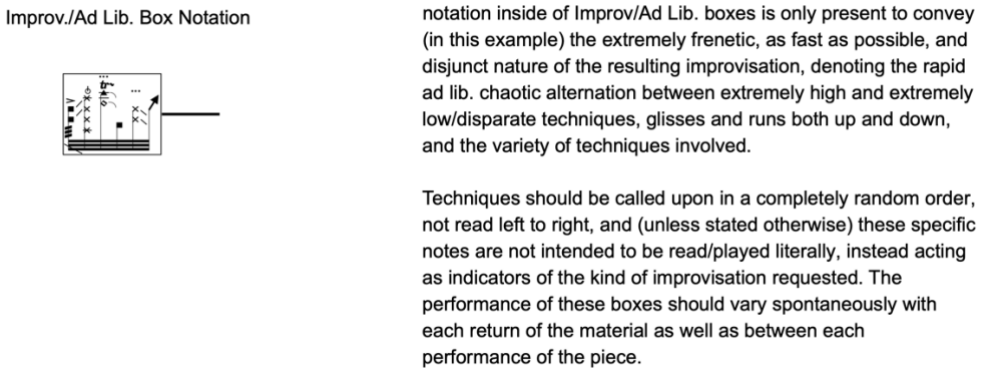


Figure 28 an excerpt from the score of *Spate III* featuring the performance notes explanation of "Improv./Ad Lib. Box Notation"

The extensive use of these materials developed from a desire to convey the explosive, writhing, complex, chaotic masses and morphing densities that I wanted to present at Walt Disney Concert Hall in a way that could be understood and performable with just a few rehearsals. I believe it would be monstrous to attempt to notate every single fragment, grain, chaotic, ametric rhythm, figure, and gesture required to produce the piece that I envisioned. Not only would this not be technically feasible for me as the composer or for the performers to present without years of dedicated rehearsal, but I also believe that even if this could be achieved, doing so would not generate the desired performance or sonic, perceptual result that is invaluable to the success of this piece.

It is incredibly important to me that these materials vary erratically with each presentation and that performer agency, artistry, choice, and expression is in some way represented and projected. The instrumental grains that comprise these materials are often

"unpredictable" in that they could happen at any time in any sequence within loose, ever-evolving constraints, and are generally impossible to perfectly, exactly control. I believe both of these approaches combine to have a tangible, sonic and visual impact on the resulting performance and piece that could not be achieved through more strict, traditional notation.

The question of why these boxes are notated the way they are arises often. The answer is because the disjunct, abrupt, improvisatory leaping between different kinds of techniques and materials is critical to their resulting timbral percept. I know from experience that simply requesting "aggressive, disjunct improvisation" would not elicit the variety of disparate techniques and gestures required to produce the intended erratic, transmogrifying barrage of materials. My assertion that leaping between very different techniques across very different ranges of each instrument is critical to the resulting sound is echoed in the writings of Aaron Cassidy:

> It is crucial to emphasize that the choreographic element does not exist simply to create additional (and otherwise unnecessary) difficulty for the performer. Rather, the various energies, intensities, attack types, and composite visual/gestural shapes are the central foundation for phrase shapes… the gestural morphemes are combined, stratified, augmented, and deconstructed to create larger shapes and forms… the performative challenges change the very nature of the gesture fundamentally *because* the gesture is now altered both physically *and* aurally.[101]

This is further reinforced by Smalley, who emphasizes that "from the viewpoint of both agent and watching listener, the musical gesture-process is tactile and visual as well as aural. Moreover, it is proprioceptive: that is, it is concerned with the tension and relaxation of muscles, with effort and resistance. In this way sound-making is linked to more comprehensive sensorimotor and psychological experience."[102] Rather than having this same array of techniques

[101] Cassidy, 42.
[102] Smalley 1997, 111.

distributed across the ensemble in a way that could facilitate an "easier" performance, it is absolutely critical to the aural result of this piece that these conflicting amalgamations of materials emerge from within each individual performer and part.

When looking at measure 49 of the score for *Spate III*, it may appear that the strings are all playing the exact same thing in complete unison. Thankfully, this is not at all the case. In addition to being asked to present the techniques in any, irregular order, and in fact, to not necessarily present the exact notes in the cells at all, but instead adopt the "idea" of the material they represent, each technique takes different amounts of time to get to, set up, and execute. It may take longer, for example, to execute a double harmonic trill high on the fingerboard immediately after a low, overpressure gesture or a burst of quasi-guitara pizzicato. Some materials may also require more time to "speak" than others, although the possibility of "half-speaking" qualities arising in the turbulent, frantic milieu is actually desirable. Because of this, the indication of "as fast as possible" or "AFAP" should result in an irregular smattering of materials in time. Notably, one can't always fit all techniques into each time frame. Ideally, each string player will choose their own contrasting assortment and contour.

Stockhausen directly addresses this phenomenon in his 1957 publication "How Time Passes," stating that these differences in the amount of time that it takes for a performer to react to, prepare, approach, or execute various techniques, modes of attack, and movements results, especially if asked to perform "as fast as possible," in a wide variety of different "time-fields" and "field-sizes."[103]

Earlier within this same article, Stockhausen also proposes that the complexity of notation effects the accuracy of a performance, also resulting in "time fields" with various "field

[103] Karlheinz Stockhausen, "How Time Passes By" *Die Reihe* 3, (1959), 34.

sizes," the range or span of these variations and inaccuracies in timing generally increasing with more complicated notation. He goes on, however, to suggest that, instead of relying on inaccuracies to produce and control these fields of possibilities, "it would be more reasonable to *describe such field-sizes directly,* by choosing a suitable notation. This is possible neither for duration nor for pitch, if one uses the signs used hitherto, because we have only discrete values in discontinuous scales."[104] In relation to the discussion of Kramer's various time senses throughout this paper, he also states that "if a series of field-sizes served to present a time-structure in which the composed fields mediated between the pointillist and statistical extremes, then we should really be dealing with a new musical time continuum: time as a discontinuum – and time as a continuum would then merge in a supra-ordered concept of serial *field-time.*"[105]

This idea eventually develops into the concept of notating "degrees of freedom" as a structural parameter of a work. He clarifies that, when a work takes advantage of greater degrees of freedom, "instead of mechanically quantifying durations that conflict with the regularity of metronomic time, [the performer] now measures sensory quanta; he feels, discovers the time of the sounds; he lets them take their time."[106]

This is directly in line with what I would argue I am achieving through the use of improv/ad lib. boxes in combination with more traditional notation throughout *Spate III*. Moving between the composing of field-sizes or time-fields of varying degrees of flexibility and freedom, and strict, points of unison and alignment, dictated through traditional, rhythmic notation, is invaluable to the structure of the piece and the evolution of its form, just as Stockhausen astutely prophesized in 1957. While discussing this notation and shaping of this

[104] Stockhausen, 33.
[105] Stockhausen, 34.
[106] Stockhausen, 37-38.

kind of "freedom," he even states that a composer could include "the restriction that no periodicity may occur,"[107] which, although I read this article after completing these works, is an indication that I include in my works constantly.

In my experience, performers have expressed that they greatly prefer this kind of notation to the alternative of writing out every single, multifaceted detail, getting directly to the heart of the kind of material needed for each moment of the piece rather than trying to elicit a similar performance through a hail of nested tuplets and microtones meant to subvert the ubiquitous, tyrannical lattices of classical pitch and rhythm. I am explicitly requesting that these underlying grids be ignored entirely, except for when the time comes for a moment of strict alignment. This, I acknowledge, is its own unique challenge. This sentiment is echoed by Stockhausen while referring to pieces that function through higher degrees of "freedom," as he seems to have experienced a similar reception of these kinds of materials, asking, "for how is it that the instrumentalists who have played the first compositions of this kind feel much freer than hitherto, although they are more engaged?"[108]

Finally, in regard to these ad lib. materials, I must invoke the writings of Curtis Roads. Since this piece makes use of the word "grain" so often, it makes sense to connect these materials to Roads's book on *Microsound.* Roads, drawing on the work of Xenakis and Wishart, puts forth the "sound mass" as an organizing principle. Within this, he discusses the possibility of forming "statistical clouds of microevents" and identifies two primary properties of these cloud textures. One, the "set of elements used in the texture, which may be constant or

[107] Stockhausen, 35.
[108] Stockhausen, 38.

evolving," and second, their "density, which stipulates the number of events within a given time period, from sparse scatterings to dense scintillations."[109] He goes on to say that:

> Cloud textures suggest a different approach to musical organization. In contrast to the combinatorial sequences of traditional meso structure, clouds encourage a process of statistical evolution. Within this evolution the composer can impose specific morphologies. Cloud evolutions can take place in the domain of amplitude (crescendi/decrescendi), internal tempo (accelerando/rallentando), density (increasing/decreasing), harmonicity (pitch/chord/cluster/noise, etc.) and spectrum (high/mid/low, etc.).[110]

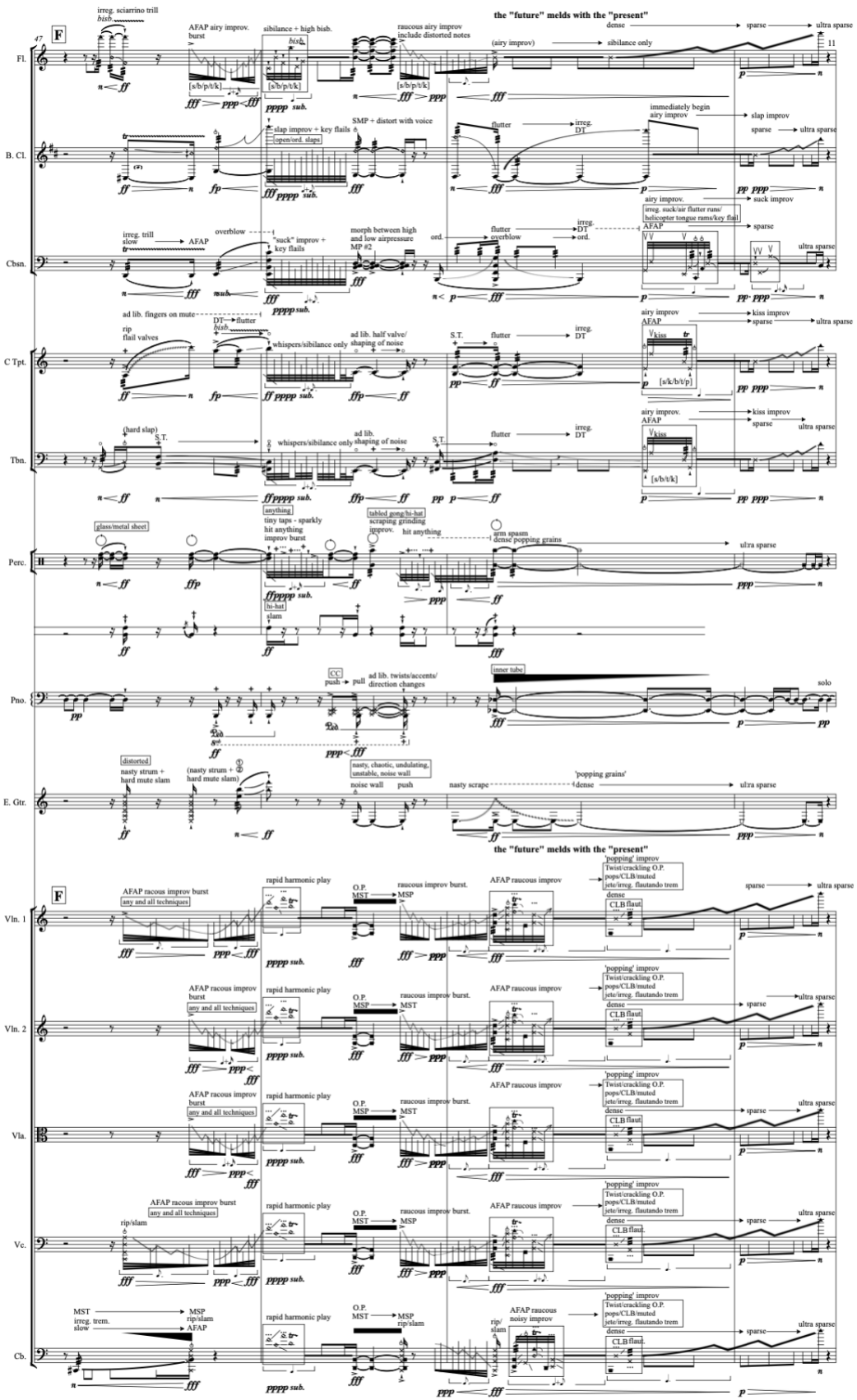
This is, in essence, exactly how *Spate III* is constructed. The materials and "grains" that together form mutating clouds are often evolving through various states, through different ad lib./improv. boxes, in combination with the smooth transformation of many parameters simultaneously via text instructions and arrows, as elaborated in the next section of this paper. It is important to mention at this point that Roads also clarifies that it is certainly possible to "create grains that were short glissandi" among a myriad of other archetypes.[111] Glissandi, tremolo, jete, and other techniques are critical in the structuring and shaping of the kinds of morphing, cloud-based entities I am trying to create.

It is essential that the gestures and crescendos throughout this work be composed of these kinds of ad lib./improv boxes not just because of the unique spectromorphologies they produce that can only be achieved this way or the remarkably complex textures they allow, but because I believe that having material that seems to be completely free, largely improvised, emerging from individual agency, expression, volition, and often inner ferocity, and does not appear to share any underlying rhythmic grid or lattice at all, suddenly, spontaneously unify and abruptly cease together, has a ridiculously powerful, perceptual effect. Extreme, absolute control exerted on

[109] Roads, 15.
[110] Roads, 15.
[111] Roads, 66.

onset, termination, convergence, and divergence of “free” materials is something that I find abjectly fascinating. We are all, always, inextricably connected.

Figure 29 an excerpt, on the next page, of page 11 of the score for *Spate III*, featuring the moment that “future” materials meld with “present” materials


47
F
Fl.
B. Cl.
Cbsn.
C Tpt.
Tbn.
Perc.
Pno.
E. Gtr.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
the "future" melds with the "present"
irreg. sciarrino trill
bisb.
AFAP airy improv.
burst
sibilance + high bisb.
raucous airy improv
include distorted notes
(airy improv)
sibilance only
dense
sparse
ultra sparse
[s/b/p/t/k]
slap improv + key flails
[open/ord. slaps]
SMP + distort with voice
flutter
irreg. DT
immediately begin
airy improv
slap improv
suck improv
irreg. suck/air flutter runs/
helicopter tongue rams/key flail
irreg. trill
slow
AFAP
overblow
"suck" improv +
key flails
morph between high
and low airpressure
MP #2
ord.
ad lib. fingers on mute
DT
flutter
rip
flail valves
whispers/sibilance only
ad lib. half valve/
shaping of noise
S.T.
airy improv
kiss improv
[s/k/h/t/p]
(hard slap)
anything
tiny taps - sparkly
hit anything
improv burst
tabled gong/hi-hat
scraping grinding
improv.
hit anything
arm spasm
dense popping grains
glass/metal sheet
hi-hat
slam
CC
push → pull
ad lib. twists/accents/
direction changes
inner tube
solo
distorted
nasty strum +
hard mute slam
(nasty strum + hard mute slam)
nasty, chaotic, undulating,
unstable, noise wall
noise wall
push
nasty scrape
'popping grains'
AFAP racous improv burst
any and all techniques
rapid harmonic play
O.P.
MST
MSP
raucous improv burst.
AFAP raucous improv
'popping' improv
Twist/crackling O.P.
pops/CLB/muted
jete/irreg. flautando trem
CLB flaut.
rip/slam
MST → MSP
irreg. trem.
slow → AFAP
AFAP raucous
noisy improv

3.6 **Intermediate, Transforming Stages in Box Materials – Sculpting Statistical Clouds of Instrumental Grains**

Since ad lib./improvisatory cells are given more time to develop, the evolution *within* each material becomes much more critical, rather than the focus on evolution between discontinuous chunks of material seen in *to facilitate friction. Spate III* features three solutions to achieving this gradual evolution of materials and parameters: first, an onslaught of text instructions and arrows denotation the gradual change in various parameters over time (to the chagrin of some of the premiere performers), second, sequences of improv./ad lib. boxes that include slight changes in material and represent intermediate stages in the material's development, and third, the use of a "density gesture" graphic to visually, proportionally display changes in the level of activity and attacks or density over time (as well as movement through Smalley's *attack - effluvium* continuum[112]). All these approaches come together to facilitate the manipulation and morphing of statistical cloud sound masses, as described above by Roads, through purely acoustic, instrumental means.

Pictured below is an excerpt from the score featuring the winds moving through multiple ad lib. boxes acting as stages in one, continuous progression or evolution of the material. The changes marked by these intermediate cells are not meant to be obvious, discrete events, in this case, they indicate the time at which a wider array of techniques, materials, and gestures should be called upon and can begin to be interjected into the morphing sequence, or, similarly in the case of the trumpet, a smooth, gradual, morphing transition between related materials ("kiss improv" evolving into "rapid airy improv" over the indicated duration).

[112] Smalley 1986, 72.

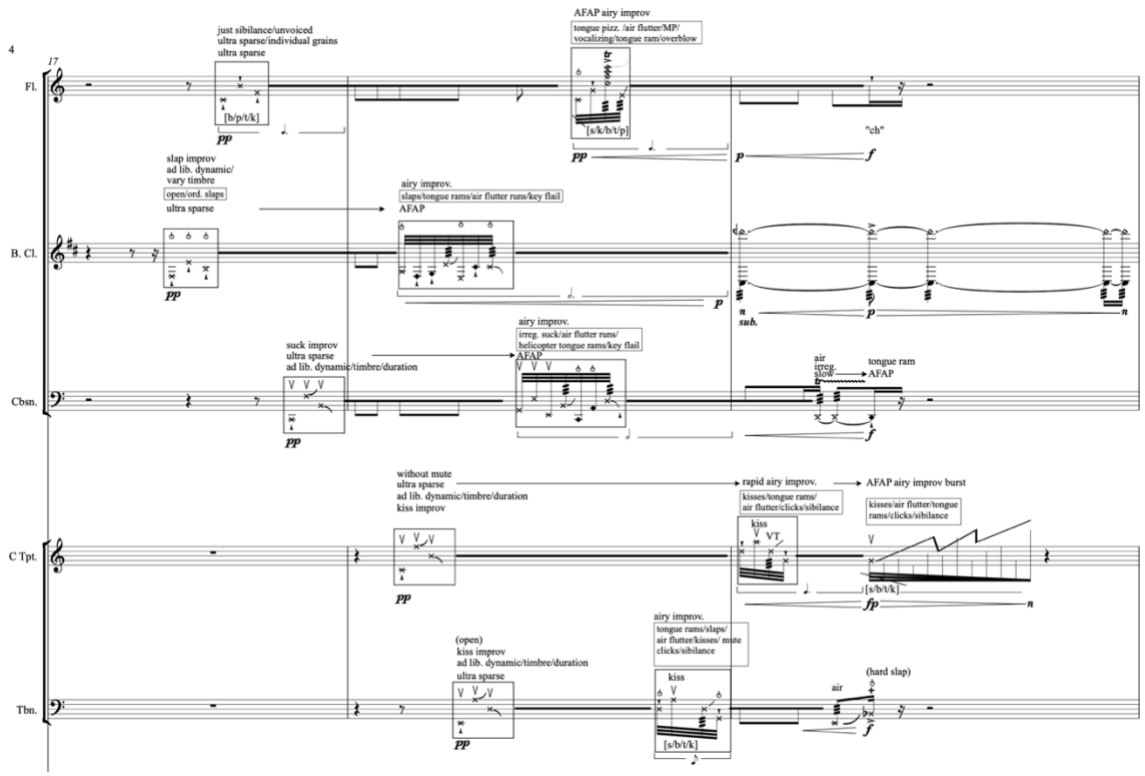


Figure 30 score excerpt of *Spate III* featuring the gradual transformation of ad lib. materials in the winds from measure 17 to 19

Later in the work, these boxes are no longer shown, the ad lib. materials they represent are instead called for by name alone. Often, smooth morphing transformations between “popping improv” and “AFAP raucous improv” are evoked through an arrow connecting these two performance indications, accompanied by dynamics, graphics, and other arrows to provide further shaping of the amplitude, frequency range, and density of the gestures.

A limited set of these materials are introduced throughout the piece. The recalling of a select few "types" of ad lib./improv materials was meant to address the complaint that there was “too much text” in the parts, as the full list of techniques called for in each kind of ad lib. material was no longer displayed in these instances, and had the added benefit of increasing the

variance, agency, distortion, and morphing of these materials over time based on experience and the desirable blurring that inevitably comes from the performers having to recall their impression and understanding of the character of the materials and the kinds of techniques each box entailed from memory while applying moment to moment shaping and sculpting transformations within the current, unfolding context of the work. This is desirable to me. Optimally the piece is never exactly the same twice and evolves based off of the interactions and interpretations of the performers spontaneously in the moment.

3.7 **Density Gesture – Testing the Threshold of Rhythm and Pitch Perception:**

The "density gesture" graphic arose as a means of visually conveying the change of density over time and continuous shaping of ad lib. improvisatory materials throughout the work. It also simultaneously represents the most critical, structural, fundamental gesture in the piece, from which all others emerge, and the entire composition is constructed. In the performance notes for the piece, this is how this gesture and symbol are described:

individual grains coalescing - this symbol conveys a recurring gesture that moves from individual ultra sparse grains/"pops", to sporadic clusters, and eventually coalesces into powerful composite crescendos - the duration of these density gestures is shown through traditional notation and should be stretched/compressed accordingly - these gestures should celebrate the unpredictable and unstable nature of these pops, often resulting from high pressure friction, and will naturally vary with each instance, however, the weighting should be exponential/towards the 2/3s mark, the crescendo being relatively rapid compared to the extended period of sparse grains dramatically gathering/collecting (or decrescendo when the gesture is reversed)

Figure 31 an excerpt of the score from *Spate III's* performance notes describing the purpose of the "density gesture" graphic

This gesture was directly inspired by Smalley's *attack - effluvium* continuum, which describes our changing perception of attack-impulses as they become increasingly compressed in

time. It develops from "separated attack-impulses" where each event is perceived individually, to "iteration" where "linked attack-impulses are perceived as a unified object, to "grain" where "once individual impulses have lost any vestiges of sperate identity," and finally an "effluvial state," which he describes as a "final compressive act" that will "squeeze out any granular characteristics." In essence, this continuum conveys the fact that eventually our ear "fails to resolve the once separate components, and must therefore turn its attention to the morphologies which shape the broader stretches of structural motion."[113] In the opening of *Spate III*, the piano density gesture is described as moving from "individual grains" collecting into "sporadic clusters" and eventually coalescing into a "dense crescendo," which could manifest more specifically as "grain" or at its most extreme, an effluvial state.

This is, however, how Smalley described this continuum in his 1986 article on Spectromorphology. His more recent 1997 article encapsulates the details of this phenomenon quite beautifully:

> Texture motion may vary in internal consistency. *Continuous motion* is sustained while *discontinuous motion* may be more or less fragmented. The *continuity–discontinuity continuum* runs from sustained motion at one extreme to iterative motion at the other. If iterative repetitions become too widely spaced then separate objects will be heard. This tendency is possible with some of the multidirectional growth processes if the internal texture becomes sparser during fragmentation in the growth process. Granularity occupies an ambiguous mid-point since it could be considered either (roughly) sustained or iterative depending on how closely packed the grains are. …Continuous-discontinuous texture motion may need to be considered as a totality, or may follow grouping patterns if contours, fluctuations or discontinuities are subject to repetitions, cycles or pauses which imply higher-level groupings.[114]

This continuum, however, is in actuality just the "rhythmic" side of the "note to noise" continuum discussed earlier, as rhythm and pitch are just two sides of the same frequency continuum, separated only by the particularities of human perception. As Roads clarifies,

[113] Smalley 1986, 72.
[114] Smalley 1997, 117.

> The sensation of tone happens when human perception reaches attentional limits where microevents occur too quickly in succession to be heard as discrete events. The auditory system, which is nonlinear, reorganizes these events into a group. For example, a series of impulsions at about 20 Hz fuse into a continuous tone. When a fast sequence of pitched tones merges into a continuous "ripple," the auditory system is unable to successfully track its rhythm. Instead, it simplifies the situation by interpreting the sound as a continuous texture. The opposite effect, *tone fission*, occurs when the fundamental frequency of a tone descends into the infrasonic frequencies.[115]

The phenomena of *tone fusion*, is the auditory equivalent of *persistence of vision* in sight, which was invaluable to the function of Eisenstein's filmic montages earlier in this paper.[116] Roads also goes on to allude to a similar phenomenon as Smalley's effluvial state, explicating that "between the sensation of a continuous tone and the sensation of metered rhythm stands a zone of ambiguity, an infrasonic frequency domain that is too slow to form a continuous tone but too fast for rhythmic definition."[117] In essence, I am arguing that these density gestures directly explore and test the limits of this phenomenon and that this entire piece could be viewed as an exploration of this threshold and transformations between rhythm and pitch and vice versa via traditional instruments.

Roads specifically states that "it is hard to imagine how certain acoustic instruments could be made to cross between the infrasonic and audio frequencies, where, for example, rhythm turns into pitch and timbre."[118] I would argue, however, that this piece explores and achieves a number of ways to successfully navigate this threshold within the instrumental domain. These piano density gestures move from individual attacks and iterations into effluvial states as well as, eventually, clear tones. Roads clarifies that "tones can be considered as a succession of discrete units of acoustic energy," or, in other words, "any sound can be

[115] Roads, 23.
[116] Roads, 56.
[117] Roads, 17.
[118] Roads, 79.

decomposed into an appropriate combination of thousands of elementary grains,"[119] as well as the idea that "any sound perceived as continuous is a tone. This can for example include noise,"[120] so I would consider both the "grotesque sustains" and "glistening respites" to constitute goals of transformations from discrete rhythms, attacks, or grains into tones.

In addition to this, thanks to immense bow pressure, the strings are able to smoothly move between infrasonic materials into audio rate sustains, and the winds follow a similar trajectory from clicks, pops, tongue rams, etc. into airy, flutter tongue gestures, into sustained split tones and multiphonics. If not convincingly represented in the literal traversal of this threshold, this concept is certainly metaphorically critical to this work, as many gestures begin as individual, short attacks and accelerate until they converge into undulating tones. The inverse also frequently occurs, as tones dissolve by descending through this threshold and become individual rhythmic, attack impulses once more. In this way, the acceleration of the frequency of large events or "hits" in time could be considered movement along this continuum but on a much grander scale, eventually contracting to move from formal marker to individual attack, to continuous tone. These coalescing and disintegrating events, even when not marked by the presence of a "density graphic," are what I refer to here as "density gestures."

These density gestures eventually expand to include not just clicks and pops but an increasingly wide array of techniques and intensities. These composite, reverse attack-decay shaped crescendos and attack-decay shaped reciprocal decrescendos, still increasing and decreasing in density towards or away from structural markers, are building in terms of the total number of instruments, range and variety of techniques, overall density and opacity, frequency range, and increasing amounts of sustained vs. attack-only materials or distorted pitch vs. non-

[119] Roads, 57.
[120] Roads, 17.

pitched content. These gestures comprise the core material of the work, and bring life to the evolving, unitary mass. Eventually, the climax marks the maximum variety and range of techniques, calling for "absolutely wild/grotesque AFAP Climactic Improv – all previous techniques – anything goes!"

In this way, the *degree of freedom* as well as the *ataxy*[121] within these ad lib. materials reaches its absolute peak at the climax of this work. Where limited selections of techniques, ranges, and materials are presented elsewhere in the piece, by the time we reach the climax "…anything goes," and the performers are encouraged to leap dramatically throughout the feasible extremes of their instrument. This is, of course, still meant to be kept within the realm of reasonable materials for the piece. I would not be pleased if someone played a Sousa march, although, it could be argued that the chaos is substantial enough here as to subsume even this into the writhing mass.

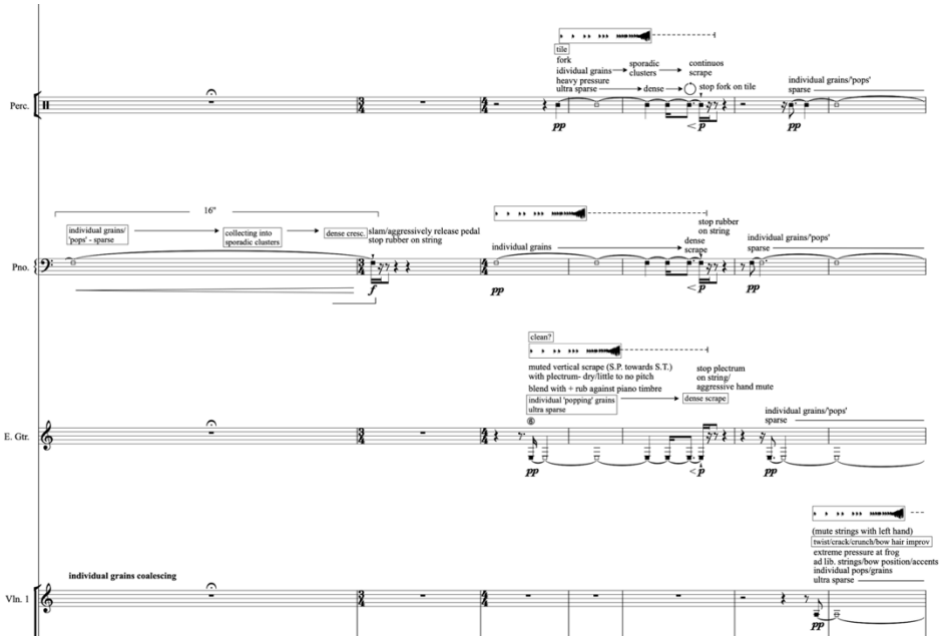


Figure 32 score excerpt from measures 5 through 11 of *Spate III* featuring density gestures in the piano, electric guitar, percussion, and first violin

[121] Roads, 66. Xenakis – degree of chaos or disorder

3.8 **Priority 3 – Increased Actual Polyphony and Counterpoint:**

The idea for this piece came to me in a dream at the height of the pandemic. I woke up at around 3:00am to write an idea for the opening of the work into the Notes app on my iPad. The resulting sketch, pictured below, bears striking similarity to the beginning of the piece as it premiered at Walt Disney Concert Hall years later.

The sketch represents the idea that the piano, initially producing extremely sparse, individual, popping, clicking, grains, could present a continuous, independent line that coalesced and dispersed, crescendoed and decrescendoed as a coherent, gestural stream throughout the work. Other instruments could then stagger in to join and reinforce these piano gestures or instead defy, oppose, and subvert them, carving out their own "intricate, multiple trajectories" producing an "increasingly layered/complex interaction." The piano would often have moments where it would emerge soloistically above the other materials, and others where it would be completely subsumed, but remain present, until the other instruments gave way to reveal that its trajectory had continued, on its own, elongated time frame, presenting a continuous throughline around which the work is structured. It is also clearly indicated in the sketch that these piano gestures would initially be joined by high-pressure, pops from the electric guitar and violin, and that the piano gestures would gradually accelerate, becoming more frequent over time in addition to the fact that they would eventually transform into "pure, shimmering, bicycle rubber tone moments."

In this way, the piece would present multiple, actually, rather than metaphorically, simultaneous streams of grains existing in counterpoint. Where *Spate II* and *to facilitate friction* would have, in most instances, only allowed one trajectory to be presented at a time, this work would instead allow multiple streams of materials to be layered, unfolding and evolving at their

own rates, and coinciding, misaligning, or conflicting as necessary for the progression of the piece. The question arises, however, as to if this conception is truly represented in the resulting, perceptual reality of the work.

I would argue that, fascinatingly, despite its countless, intricate complexities, this piece is not perceived as a series of streams in counterpoint and instead comes across as almost entirely "homophonic." It would appear that the gestures are so strong throughout that the directionality of the gesture overpowers the intricacies and nuance of the textures, instead becoming one dynamic spectromorphology, pushing towards or away from large points of cohesion and arrival.

Figure 33 The original iPad sketch from 3:00am of idea for LA Phil Composers Intensive Piece

possible LA Phil thoughts:

boldly piano chromatic pressure individual popping focused?

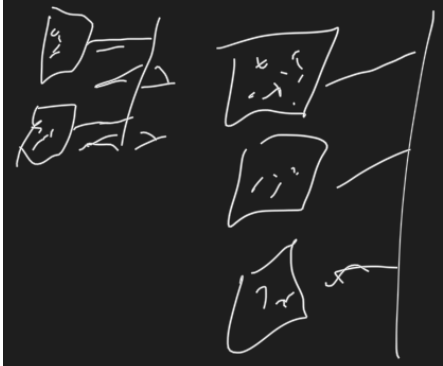
bowed cardboard + styro?

bb clarinet flutter?

transition into pure shimmering bicycle rubber tone moments?

more intricate multiple trajectories increasingly layer/complex interaction

festive/tense piano crisis?



multiple overlapping aggressive improv duets? trios? more? (tutti)?

more time given/ dedication to extending stasis/ crackling moments than before?

- bow E- guitar strings with bicycle rosin

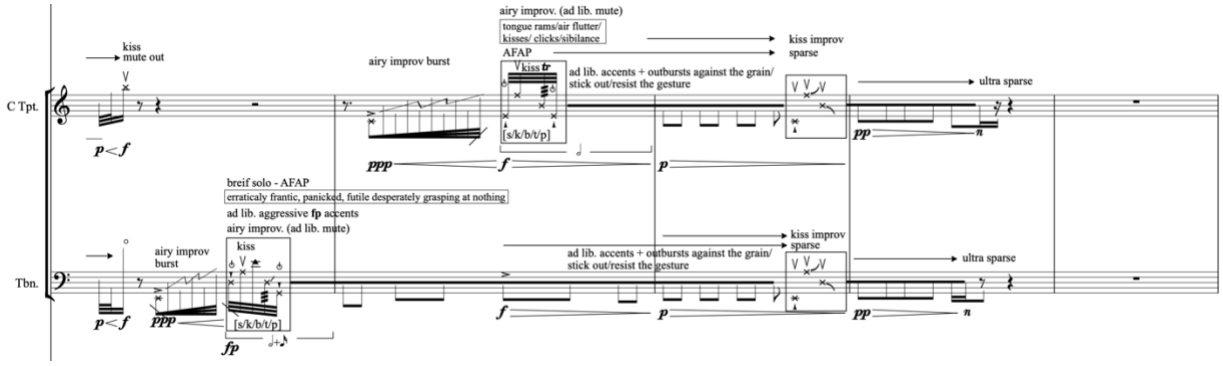


Figure 34 excerpt from measures 33 through 37 of the score of *Spate III* featuring brief solo in the trombone part

As stated, some solo moments do exist, like in the trombone line pictured above, and prominently multiple times in the violin part (played again by Ilana Waniuk in this recording), and some critical alignments, like between the flute and violin 1 in measure 20, are intended to elevate and highlight duos and other instrumental subsets, bringing them out against the gesture and/or texture, often through frequency contours, dynamics, and densities that are opposed to other gestures developing simultaneously. I would, however, defy anyone to actually perceive these as independent gestures (especially the flute and violin connection), as in the perceptual reality of the piece, these miniature moments of counterpoint are completely, overwhelmingly subsumed by the amalgamated, massive gesture unfolding on a larger scale. There are also, for example, an incredible amount of detailed points of alignment and lower-level connections and counterpoint throughout and within each of the "massive hit" gestures, but I believe the resulting impression is that "a detailed explosion happened." To some extent, this is the point and fulfills the formal function of these sections. Simultaneously, this could be described as *gesture framing*, which Smalley explicates by saying that "individual gestures can have textured interiors, in

which case gestural motion frames the texture – we are conscious of both gesture and texture, although the gestural contour dominates."[122]

Throughout the work, extreme care has been put into how materials emerge, accelerate, decelerate, agglomerate, disperse, and terminate. The careful placement of entrances (usually along exponential/geometrically accelerating or decelerating curves), as well as the intentional misalignment and staggering of the peaks and troughs of gestures and the rate and eventual termination of their decay, are all critical to the design of the work. Particularly from rehearsal letter H to K, many solos, duos, trios, and other ensemble groupings overlap, intercut, conflict, and unify at critical moments, with extreme care and concern for how, why, and where these simultaneous streams overlap and interact or ignore one another. It is fascinating to me, then, that the end result, rather than being perceived as complex sequences of counterpoint between the various streams, appears to instead be perceived as one, ever-evolving, undulating, essentially homophonic, gestural mass. Measures 74 – 75, for example, do not come across as two gestures or streams in counterpoint, they come across as a cloud of grains evolving in quality over time.

Despite, or possibly because of, a myriad of microlevel transformations and details, the overall percept seems to be an intricate, writhing, texturally evolving monstrosity of a gesture, with the overall directed energy of the large-scale gestures towards or away from critical, structural, arrival or impact points throughout the work seeming to have taken precedent. It should be clarified that this is a beautiful thing in itself and should not be received negatively. I believe it is an incredible feat to have a collection of grains and materials so honed, coherent, and vectorially sculpted that they are subsumed into a single, grotesque entity. I am truly grateful for the resulting piece and feel that it is amazing in many ways. I would, however, be interested in

[122] Smalley, 114.

pursuing a true, simultaneous counterpoint of these kinds of materials, as well as the presentation of multiple simultaneous time-senses, in the near future.

I believe I have pinpointed a few reasons behind this perceptual phenomenon. The first connects directly to Roads:

> Varese spoke of the interpenetration of sound masses. The diaphanous nature of cloud structures makes this possible. A crossfade between two clouds results in a smooth mutation. Mesostructural processes such as disintegration and coalescence can be realized through the manipulations of particle density. Density determines the transparency of the material. An increase in density lifts a cloud into the foreground, while a decrease causes evaporation, dissolving a continuous sound band into a pointillistic rhythm or vaporous back-ground texture.[123]

I would argue that the counterintuitive foregrounding of astoundingly sparse grains throughout *Spate III*, which would normally be relegated to the background or processes of evaporation in Road's description, holds a tremendous amount of tension and power, especially when it has already been established that large hits could arrive at any moment, in stark contrast to the current, pointillistic, barely existent cloud.

Roads goes as far as to connect this concept of statical cloud sound masses to the taxonomy of real clouds and their shapes and properties in the atmosphere.[124] Since many of the textures presented in *Spate III*, particularly the more chaotic, writhing, climactic materials, are so densely packed, I would argue that they could be considered opaque, *Nimbostratus*, or at best, translucent, *Status* clouds, at least in terms of their penetrability, it would perhaps not be surprising then that miniature moments of counterpoint are not perceived. Smalley, within his explanation of the note to noise continuum, similarly discusses the idea that certain processes can build towards noise, saying that *Saturate noise "*can occur when spectral space becomes filled by the active contours of convoluted and turbulent motions. Thus there are certain accumulative

[123] Roads, 15.
[124] Roads, 16.

processes which tend towards noise and can be used to create noise,"[125] which could also block some of the more subtle details throughout.

Even in far more sparse areas of the work, however, the materials still tend to cohere into one, mutating sound mass, so this is not, necessarily an issue of masking, but rather a consequence of working with statistically evolving, malleable grains. As Roads very plainly states, "a texture might contain a statistical distribution of micro events that are perceived as a unitary yet time varying sound."[126] It seems that much greater contrasts between collections of grains would be required to break this cohesive percept into separate streams, if, of course, that is actually what is needed for the work. It is always worth remembering, however, that even "barely perceptible variation in the properties of a collection of microevents – their onset time, duration, frequency, waveform, envelope, spatial position, and amplitude – lead to different aesthetic perceptions,"[127] as small details are still critical to the perception of the whole.

3.9 **Ending**

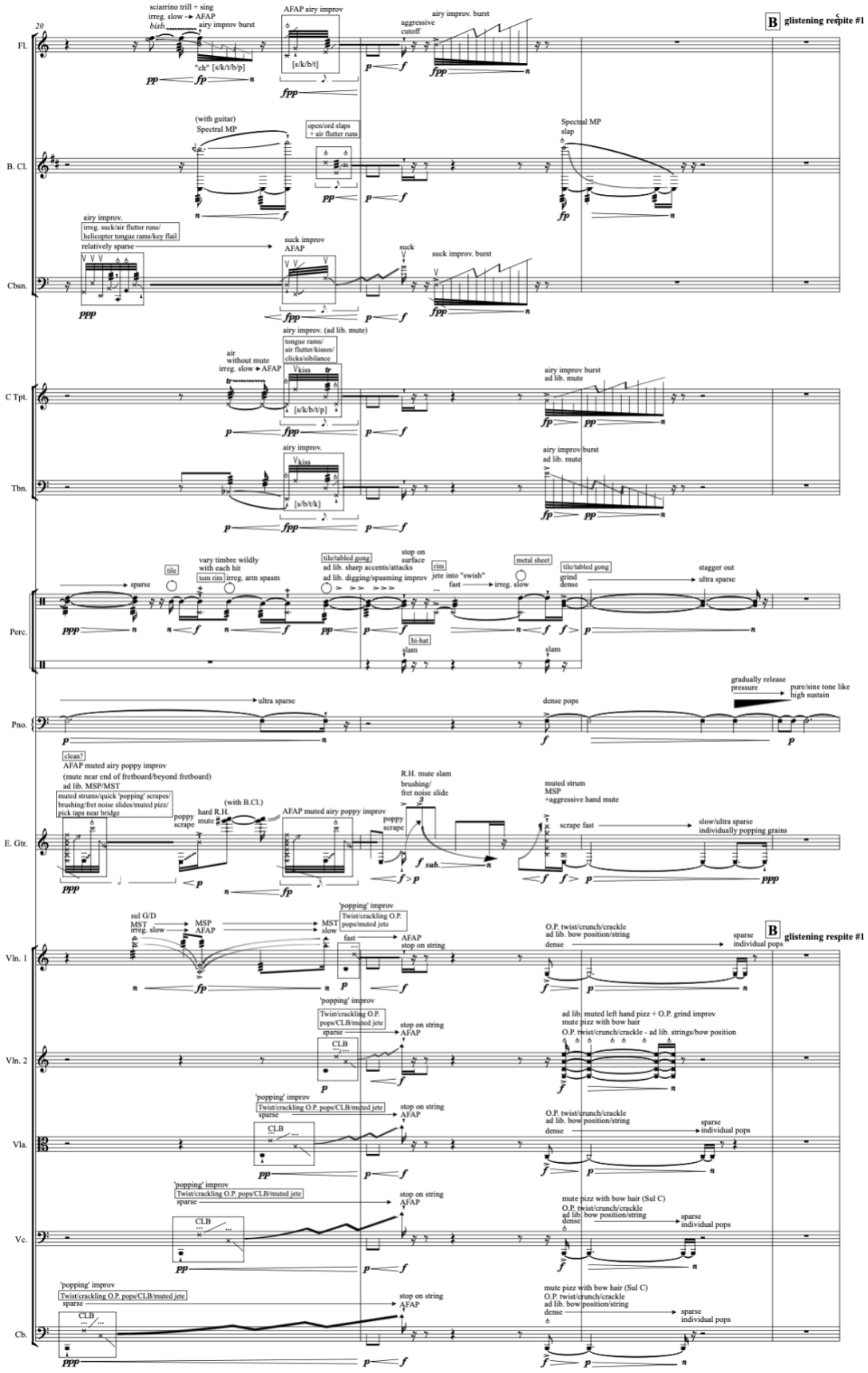
The ending of the piece, and the entire final section, is, as mentioned, essentially an exact re-orchestration of the conclusion of *to facilitate friction.* The timings are identical. With each "try," fewer and fewer instruments join in, contributing to each re-injection of energy being weaker and weaker, until only the piano is left, presenting the inverse of its "beginning" extended, density gesture. It is worth noting that I found it extremely difficult to get the ensemble to play as sparse as I believed was required for these gestures to work. This challenge will be addressed in the discussion of *untitled.*

[125] Smalley, 120.
[126] Roads, 6.
[127] Roads, 26.

3.10 **Conclusion**

In the creation of *Spate III*, I sought to further refine and develop the ad lib./improvisatory materials that were introduced in my previous works, especially their gradual evolution in time, to give these materials more time to exist and interact, and to present more moments of actual, rather than metaphorical, polyphony, simultaneity, and counterpoint. Although I intentionally tried to structure these materials over longer durations than ever before, giving them more time to morph, coalesce, and disintegrate, it became clear after the first performance that even longer spans of time were needed for these higher degrees of freedom to truly be felt. While my intention was to have multiple streams of evolving, statistical clouds of instrumental grains and layers of materials acting in counterpoint, through reflection and analysis, it was revealed that greater differentiation of materials will be required in the future in order to present multiple, granular streams as individual, perceivable, entities in a polyphonic texture rather than having these detailed layers be subsumed into a single, writhing, homophonic sound mass as occurs in *Spate III. untitled*, the next piece to be analyzed in this paper, attempts to address many of these concerns, however, it was not until after the completion of both *Spate III* and *untitled* that I realized that I will have to create even more pronounced contrasts of timbre, spectromorphological behavior, time sense, and physical/visual gesture between concurrent streams of materials if I want them to retain their identity in the resulting, undulating composite of the work.

Figure 35 score excerpt of measures 20 through 23 of *Spate III*, displaying the connection between flute and violin 1 highlighted in section 3.8


20
Fl.
B. Cl.
Cbsn.
C Tpt.
Tbn.
Perc.
Pno.
E. Gtr.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
B
glistening respite #1
sciarrino trill + sing
irreg, slow → AFAP
bish
airy improv burst
"ch" [s/k/t/b/p]
AFAP airy improv
[s/k/b/t]
aggressive cutoff
airy improv. burst
(with guitar)
Spectral MP
open/ord slaps
+ air flutter runs
Spectral MP
slap
airy improv.
irreg. suck/air flutter runs/
helicopter tongue rams/key flail
relatively sparse
suck improv
AFAP
suck
suck improv. burst
airy improv. (ad lib. mute)
tongue rams/
air flutter/kisses/
clicks/sibilance
air
without mute
irreg. slow → AFAP
[s/k/b/t/p]
airy improv burst
ad lib. mute
airy improv.
[s/b/t/k]
tile
vary timbre wildly
with each hit
tom rim
irreg, arm spasm
tile/tabled gong
ad lib. sharp accents/attacks
ad lib. digging/spasming improv
stop on surface
rim
jete into "swish"
fast → irreg, slow
metal sheet
tile/tabled gong
grind
dense
stagger out
ultra sparse
sparse
hi-hat
slam
ultra sparse
dense pops
gradually release pressure
pure/sine tone like high sustain
clean?
AFAP muted airy poppy improv
(mute near end of fretboard/beyond fretboard)
ad lib. MSP/MST
muted strums/quick 'popping' scrapes/
brushing/fret noise slides/muted pizz/
pick taps near bridge
poppy scrape
hard R.H. mute
(with B.Cl.)
AFAP muted airy poppy improv
poppy scrape
R.H. mute slam
brushing/
fret noise slide
muted strum
MSP
+aggressive hand mute
scrape fast
slow/ultra sparse
individually popping grains
sul G/D
MST
irreg, slow
MSP
AFAP
MST
slow
'popping' improv
Twist/crackling O.P. pops/muted jete
fast
AFAP
stop on string
O.P. twist/crunch/crackle
ad lib. bow position/string
dense
sparse
individual pops
'popping' improv
Twist/crackling O.P. pops/CLB/muted jete
sparse
CLB
stop on string
AFAP
ad lib. muted left hand pizz + O.P. grind improv
mute pizz with bow hair
O.P. twist/crunch/crackle - ad lib. strings/bow position
mute pizz with bow hair (Sul C)

Chapter 4 *untitled* – Amplified Septet and Live Electronics

> Microsound is ubiquitous in the natural world. Transient events unfold all around in the wild: a bird chirps, a twig breaks, a leaf crinkles. We may not take notice of microacoustical events until they occur en masse, triggering a global statistical percept. We experience the interactions of microsounds in the sound of a spray of water droplets on a rocky shore, the gurgling of a brook, the pitter-patter of rain, the crunching of gravel being walked upon, the snapping of burning embers, the humming of a swarm of bees, the hissing of rice grains poured into a bowl, and the crackling of ice melting.[128]
>
> Molecular materials alter the terrain of composition. Pliant globules can be molded into arbitrary object morphologies. The presence of mutating sound objects suggests a fluid approach to compositional mesostructure, spawning rivulets, streams, and clouds as well as discrete events.[129]
>
> In matter, such as water, waves move on a macro scale, but water is composed of molecules moving on a micro scale. Sound can be seen in a similar way, either wavelike or particle-like, depending upon the scale of measurement, the density of particles, and the type of operation that we apply to it.[130]

untitled is a work for amplified septet and live electronics commissioned by the 79th Composers Conference as part of being awarded a Fromm Foundation Fellowship and was written for the Composers Conference Ensemble. The work was premiered during the conference at Avaloch Farm Music Institute in their Concert Barn in Boscawen, New Hampshire in July of 2023. The instrumentation is an odd collection of seven instruments, featuring bass clarinet, contrabassoon, horn, trumpet in C, trombone, soprano voice, contrabass and live, interactive electronics. All instruments are close-miked, and their signals are processed to some extent, but the trombone, contrabass, and especially the voice receive special, elevated attention in terms of live processing. Remarkably, this is the first piece I have ever written for ensemble and live electronics, rather than for fixed media made to sound like live processing, as featured in *Spate II*. All of my previous works for instruments or voice and live electronics have been solos.

[128] Roads, 21.
[129] Roads, 40.
[130] Roads, 55.

The original program notes for the work are presented here:

> *untitled* is a work for amplified chamber ensemble and live electronics and represents the first time I have ever felt that "untitled" was a compelling and fitting name for one of my works. This piece involves a number of new approaches that I have not yet been able to name, label, or identify, and I am excited for listeners to engage with the work as it unfolds without the preconceptions imparted by a programmatic title. I am genuinely looking forward to the premiere of this piece and am eternally grateful to the Composers Conference Ensemble for bringing this work to life!

These program notes are not particularly evocative, but they do allude to the fact that I perceive this work as strange and intangible, although also beautiful in many ways. I would no longer describe this piece as involving a number of new approaches, I would instead explicate it as pushing previously explored approaches to their extremes. As conveyed in the program notes, I am genuinely interested in how the experience of this work is perceived by each audience member, as I feel it takes a number of formal risks and is meant to manipulate psychological time in more drastic ways over more potent, extended, contrasting, chronometric durations than my previous works dared to.

I had three main priorities when writing this piece, each building off of lessons learned through creating *to facilitate friction* and *Spate III*. First, to allow even more time for improvisatory, ad lib. materials to exist, develop, interact, and flourish, second, to create juxtapositions of material that were truly jarring, rather than directly foreshadowed, prepared, or telegraphed, and finally, to implement the machine-learning-based interactive performance system I originally dreamed of when writing *to facilitate friction.*

As many of the techniques and concepts explored in the analysis of *to facilitate friction* and *Spate III* are still integral to the function of *untitled*, although often manifested in more extreme forms, the following analysis will primarily focus on the differences between this piece

and the proceeding works, rather than recounting the presence of previously mentioned approaches and priorities.

4.1 **Overview:**

Below, I have provided a spectrogram and waveform view of the premiere recording of this work, marked with the most perceptually relevant cues as structural markers, to aid in the discussion of the piece in tandem with the score and audio recording. The spectrogram is split into two parts, each containing five minutes of the recording, so that it is possible to see critical details in the spectromorphology of the work.

The spectrogram for this work displays the gestures and evolution of this piece particularly vividly, so I will provide a brief overview of the form of the piece in reference to this graphic to better contextualize the following analysis.

untitled is built primarily from the conflict and eventual fusion of granular clicking and popping materials, often accompanied by the sounds of melting glaciers, and screeching, metallic materials that combine split tones and multiphonics with recordings of metal, cattle corrals as well as bowed, scraped, and struck metallic sculptures.[131] The intermediate state between these two materials is simply described as "noisy/distorted improv" which exists to allow smooth transitions from clicking and popping gestures to metallic, undulating noise walls, as demonstrated in the transformation from cue 13 to 15. This material is often integrated with heavily distorted samples of the clicking, popping, grating, and scraping of giant pinecones. Whether materials are intercutting and interrupting one another in conflicting montage, smoothly morphing between each other, or actually being presented simultaneously in layers is actually quite clear in the resultant shapes of the spectrogram. Metallic gestures produce strong,

[131] Thank you to Thomas Rex Beverly for the amazing sound libraries https://thomasrexbeverly.com

inharmonic overtones which produce bright, horizontal lines in the spectrogram and the clicks are represented through fleeting impulses and transients which register as thin, tall strips in both the amplitude over time and frequency over time representations. The opening minutes, for example, display an accretion of clicking, popping grains, interrupted by a relatively stable, intensifying inharmonic gesture, before resuming again.

Despite the intricacies of these transformations, sequences of intercutting, and interactions of simultaneously presented materials, this piece is, without a doubt, the most "homophonic" piece I have ever written. Every instrument, voice, live process, and fixed media element of the work join together to create a meta-instrument, driving towards and away from the same goals, and moving though identical evolutions. This does, however, have the benefit of highlighting the extremely rare moments where a member of the ensemble is not conforming to this gestalt and makes the contrast this provides exceptionally important to the form of the work. The few instances in which this occurs will be discussed momentarily.

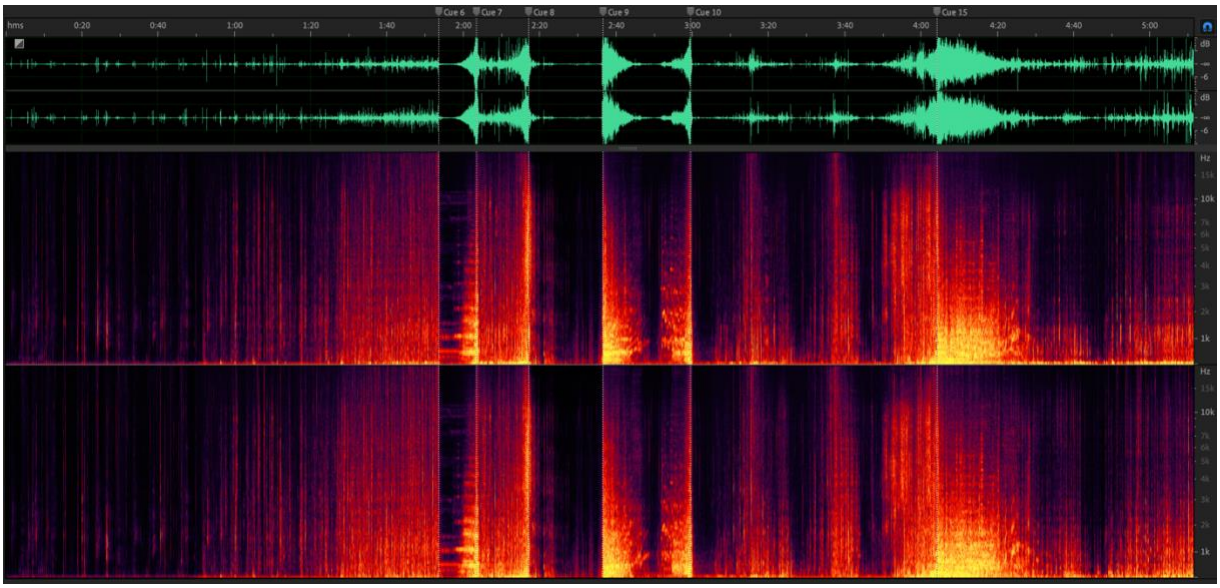


Figure 36 spectrogram and waveform view of first half of *untitled* with structural markers

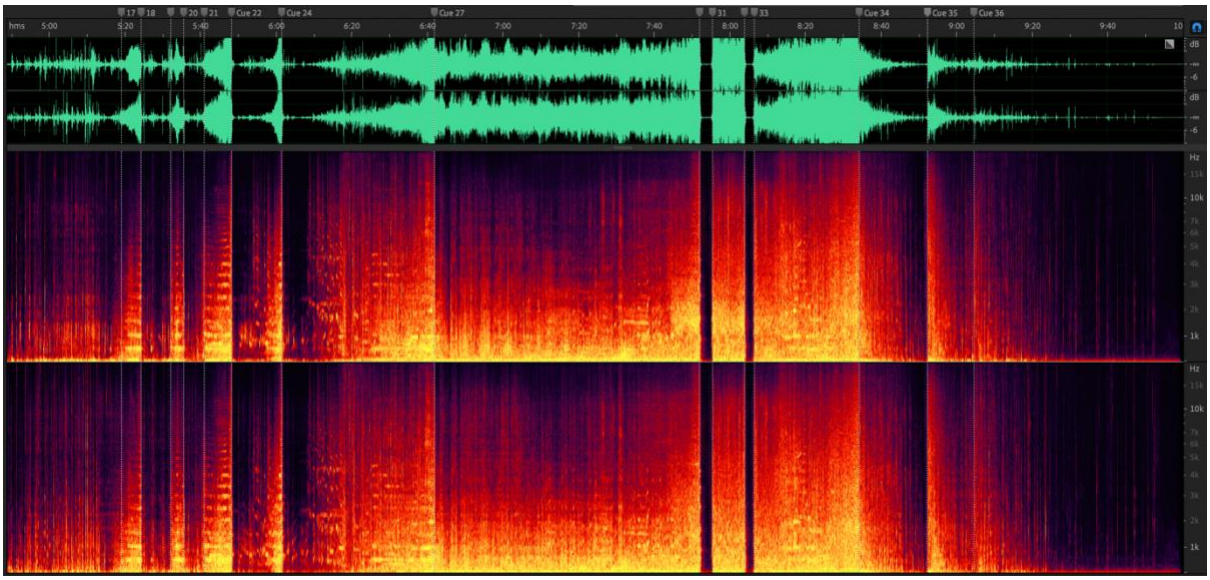


Figure 37 spectrogram and waveform view of second half of *untitled* with structural markers

This piece features improv/ad lib. boxes to an even greater extent than *Spate III.* Extremely few moments of "traditional" notation exist in this work and the piece instead focuses intensely on the sculpting of ad lib. clouds over extended periods of time. In feedback I received from performers after the premiere of *Spate III,* there seemed to be consensus that more density graphics would have been exceptionally beneficial, with some going as far as to advocate that the inclusion of more of these graphics would be necessary for the success of future performances. In response to this, as the agglomeration[132] and refined sculpting of grains is, essentially, the entire material of *untitled,* graphic representations of collecting and dissipating grains and density graphics are used much more consistently in this work, frequently receiving their own dedicated staff as necessary for each part in the score.

---

[132] Smalley, 116. Denis Smalley defines the textural processes of *agglomeration* as "accumulating into a mass" and *dissipation* as "dispersing or disintegrating."

4.2 **Priority 1: More Time**

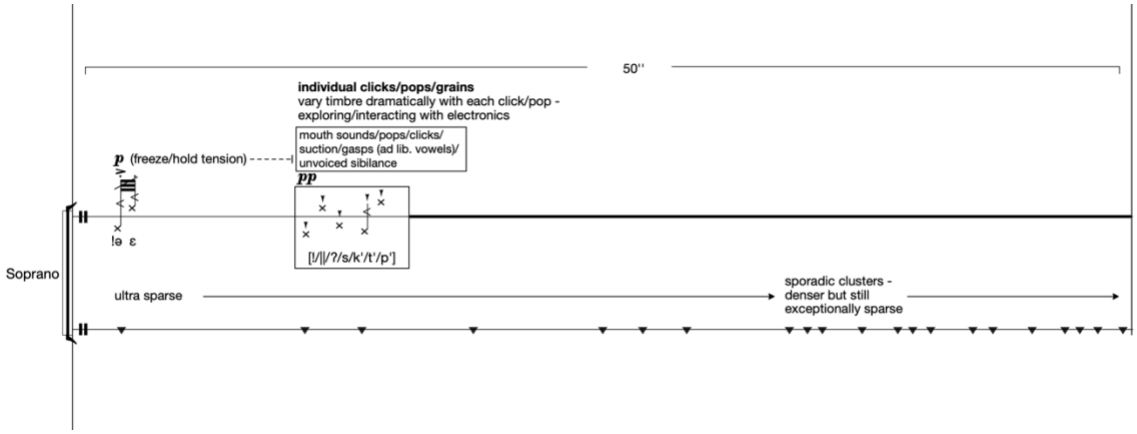


Figure 38 score excerpt from opening of *untitled* featuring voice in extended isolation

After *Spate III*, it became clear that even longer periods of time were required for the improvisatory, granular materials to flourish. Despite being intentionally crafted to allow materials more time to exist and develop, the first "density gesture" in the piano in *Spate III*, meant to represent an exceptionally long time to focus on one, sparse, aggregating activity (relative to my previous work), still only takes approximately twenty seconds. The opening of *untitled*, designed specifically to address this, features the voice, on its own, with uncomfortably sparse material and a markedly gradual accretion of grains, for a full fifty seconds. After fifty seconds, the other instruments of the ensemble slowly join the vocalist, exploring the same coalescing grain trajectory over exponentially tighter time frames. The entire opening is essentially one elongated gesture (with only one brief interruption) stretched out over two minutes and 15.5 seconds. This is a substantial difference when compared with the rest of my work to date. Notably, the climax of the work is also one continuously evolving, raucous gesture that spans a full minute and twelve seconds, with only two, very brief interruptions. This is,

again, a big deal for me, and certainly the longest period of time I have ever allowed or trusted an improvisatory mass to exist and progress without intervention.

This extension and stretching out of a gesture over greater amounts of time, in the case of the opening of this work, over two minutes, results in a change in the perceptual focus and priorities of the listener. Kramer, Grisey, Smalley, Roads and others have all affirmed this, but I will quote Smalley here:

> If gestures are weak, if they become too stretched out in time, or if they become too slowly evolving, we lose the human physicality. We seem to cross a blurred border between events on a human scale and events on a more worldly, environmental scale. At the same time there is a change of listening focus - the slower the directed, gestural impetus, the more the ear seeks to concentrate on inner details (insofar as they exist). A music which is primarily textural, then, concentrates on internal activity at the expense of forward impetus.[133]

Smalley goes on to discuss, within this, the possibility of *texture-setting,* a phenomenon that I believe aptly describes the situation of this gesture and many others throughout this work. Smalley states that "texture-carried structures are not always environments with democratic interiors where every (micro-) event is equal and individuals are subsumed in collective activity. Gestures can stand out in foreground relief from the texture. This is an example of *texture-setting* – texture provides a basic framework within which individual gestures act."[134]

Throughout this opening, extended gesture, the statistical cloud materials evolve in a similar but more detailed fashion than they did in *Spate III,* including many more intermediate stages and featuring more intricate interior gestures. Fluttering gestures emerging from silence and crescendoing into sudden stops are, for example, a critical aspect of the development of these opening, granular textures. This miniature reverse-envelope gesture is integrated into the composite cloud for the first time at cue 3 in the voice but gradually appears in the form of

[133] Smalley, 113-114.
[134] Smalley, 114.

similar dynamic contours and techniques in each instrument over time. In this way, the peaks of louder gestures do jut forth and briefly highlight individuals in the ensemble, in other words, the interior of the texture is not always democratic, but as the accretion continues and the texture becomes increasingly dense, the mini-gestures are completely subsumed again by the effluvial mass. In this way, the movement between *texture-setting* and *gesture-setting* is treated as a core parameter throughout the work.

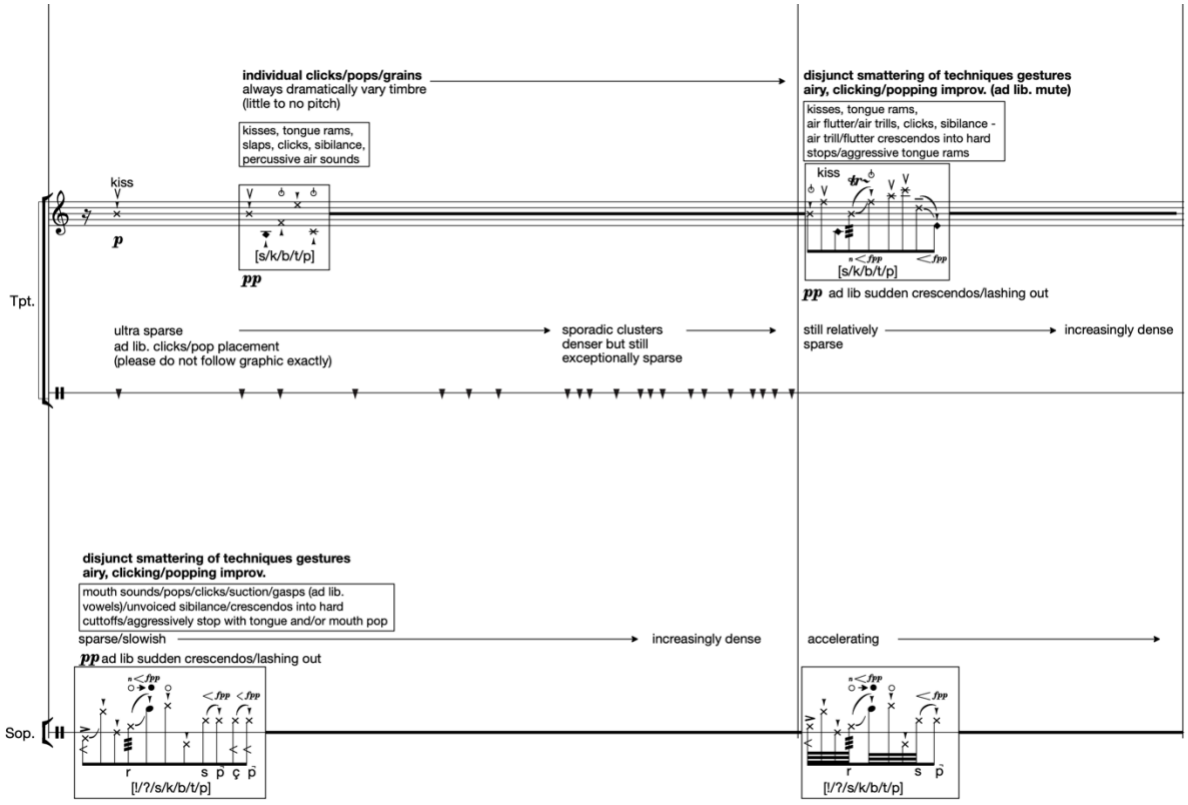


Figure 39 score excerpt of cues 3 and 4 in the trumpet and soprano part, showcasing the increased level of gestural detail inside of ad lib. boxes

I consider the granular gestures in cues 12 and 13 to be a success story in relation to this priority. By allowing these materials more time to exist, develop, and interact, and placing their peaks much further apart in time, I believe these gestures can actually be perceived as three separate clouds or streams of grains in (almost) counterpoint. In addition to the grouping or

flocking[135] of grains by instrumentation (brass with brass, wood instruments with wood instruments, and voice creating its own, unchanging texture), this is possible thanks to the reduced overall density of each gesture and therefore increased translucency of the resulting, overlapping "clouds."

More time also means more room for variation and agency within each improv./ad lib. cell. This was again pinpointed by Stockhausen back in 1957, as he proclaimed that "the fewer durations per part-field, the more possible it is for the player to distribute the durations in various ways; the more durations per part-field, the narrower the scatter of the field-size of each single duration." He further clarifies that, in this scenario, "single durations are not notated at all, only the number of durations to be distributed over each part-field,"[136] which I would describe as eerily similar to my use of density graphics throughout this work.

Stockhausen's assertion is directly affirmed by my experience with this piece. The exceptionally sparse opening where the voice is alone for fifty seconds, feels much "freer" and includes far more possibilities and opportunities for agency and expression than the densely packed conclusion of this same gesture. In sparse moments, stretched across large amounts of time, the degree of possible variation in rhythmic placement is immense, but by the time it has condensed to become AFAP, very little perceptible opportunities for choice and variation remain, especially when all members of the ensemble join in.

Since, in the opening of this piece, the performer is asks to ad lib. the technique, placement in time, ingressive vs egressive phonation, frequency range, vowels, consonants, sibilance, suction, gasps, and eventually clustered sequences of these wide-ranging options over

[135] Smalley, 117. "*Flocking* describes the loose but collective motion of micro- or small object elements whose activity and changes in density need to be considered as a whole, as if moving in a flock."
[136] Stockhausen, 35.

an extended amount of time, I believe this moment of the piece is much closer to being able to be considered actually improvisational than any moment in my previous works. I noticed, in these beautiful opening moments, that performers were able to interact and respond to one another as I originally imagined, however, as the material became denser, and the "durations per part-field" increased, the performers could no longer interact and instead focused on executing their AFAP materials independently.

This move from elongated, sparse moments, where individual choices matter tremendously, to densely packed textures where agency is subsumed and made almost irrelevant, represents a gradual morphing of the degree of freedom as a structural parameter throughout the work. This exploration of degrees of freedom as a core, evolving parameter can be engaged more fruitfully in this work than was possible in the more constrained time frames of *to facilitate friction* and *Spate III.* Within *untitled,* many sparse moments occur where actual interaction is possible. Cues 12 and 13, in addition to the opening, have already been mentioned. Cues 15, 16, and 18 feature an extended, improvised duet between the trombone and contrabass, bolstered by live electronics, where only the general clicking, popping material and overall density, as well as the slightest dynamic trajectory, are indicated. This is again something I would not have ordinarily trusted to unfold without intervention if I were not intentionally pushing myself to do so.

4.3 **Priority 2: Less Preparation**

Another reasonable critique of *Spate III,* echoed by multiple people, was that if the disjunct "massive hits" were truly meant to be spontaneous, surprising, and in direct conflict with the materials surrounding them, then they were far too "well prepared." The second priority in creating *untitled* was to attempt to create moments and gestures that truly felt out of place, as if

they were from a future point in the piece that was so far developed that it seemed almost entirely unrelated to the current materials, and that was not proceeded, setup, or foreshadowed by a decrease in dynamic, textural intricacy, and/or density like often occurs in *Spate III*. The intent in creating this piece was for the "eruptions" to truly be jarring. This attempt to not telegraph what is going to happen next resulted in what I would describe as a very strange form and a bizarre listening experience.

Although I would argue that *Spate III* established the possibility that the instrumental grains could, after reaching peak sparsity, simply begin to gradually collect again, it is true that the arrival of many of the interruptions was prepared by the whole ensemble staggering, ominously away, laying a contrasting, near-silent foundation for the impending sonic jolt to invade. *untitled,* instead features bursts and explosions that I would argue are not portended at all, and in many ways, go against my usual inclinations, often arriving "too soon."

Kramer, in discussing the concept of multiply-directed linear time and gestural time, states that "Too-soon-ness" arises from the disagreement of gesture with the seeming dictates of absolute time."[137] Certainly, this applies to many gestures throughout *untitled.* As with *Spate III,* the raucous material is intended to be from the future. The difference is that the first presentation of this screeching metallic material at cue 6 acts as a real interruption to the progress of the extended opening gesture. This gesture, as stated, is already very weak and has limited directional implications. There is almost no change or build-up to cue 6 at all. The screeching gesture is, hopefully, actually interrupting what would have otherwise been the natural development of the clicking, popping gesture. The material it interrupts then resumes almost as if nothing of consequence happened at cue 7. Except for a brief ***ffp*** impact and the continuation of

[137] Kramer, 154.

the contrabass's interrupting "future" material continuing and leaking out of its montage shot into the cue 7 material, there's very little to indicate that a louder event built of contrasting, metallic material just interjected.

There is an extended period in the piece where, despite monumental gestures in the rest of the instruments, the voice doesn't change at all. The importance of these independent moments in the voice is, as stated, highlighted and emphasized by the otherwise overwhelmingly homophonic, meta nature of the work. The vocalist is instructed to completely ignore the rest of the ensemble and continues to create "tiny lip/mouth sounds" with no regard for the micro or macro-scale forces interacting around them. This sets up a situation where anything could happen next. Grains could begin to agglomerate out of this texture, or huge impacts could erupt, seemingly out of nowhere. Both options do occur, and I believe it is genuinely unpredictable which will be called upon next. For example, Cue 9, I would argue, arrives far "too soon" after the conclusion of the opening gesture at cue 8, and has essentially nothing to do with the tiny mouth sounds. A reasonable person would not have placed this impact here, and it receives zero immediate preparation. The hope is that this is truly jarring and is actually perceived as displaced in time and a representation of future materials.

The climactic build of metallic sustains and increasingly distorted improv. materials from cue 27 to 34 is also interrupted by the return of the original, uncaring, tiny mouth sounds twice. This is arguably the clearest moment of intercutting in the entire spectrogram. These moments are also intentionally ill-prepared and are meant to represent a genuine interruption of the progress of the climactic material by a readily identifiable texture from the distant past. This is aided by the contrast in duration of the at least two-minute build (it could be argued that the build

towards this climax started long before cue 27) and the tiny 2.5 and 3.5 second interjections of the solo voice.

4.4 **Priority 3: Electronics - Application of Machine Learning-based Corpus Manipulation**

This work uses machine learning to partially achieve the dream of having electronics react in real time to the performers' interpretation, expression, and a wide variety of possible techniques, timbres, timings, gestures, etc., initially presented as a goal in the creation of *to facilitate friction.*

Throughout the piece, the voice is the center of attention. Most of the live processing is applied to the vocalist and, through the opening section, each instrument joins the voice as if they were emanating from her and expanding to fill the imagined stereo space, or literal space between the speakers. In this way, they are acting like acoustic "live processing" of the voice, with even the spatial position of their instrumental grains being controlled, just as I would have shaped this gesture if increasing the "width" of a granular delay over time. Notably, the initial entrances of each instrument joining this texture are again positioned almost exactly geometrically or exponentially in time, but over much larger timeframes than in *Spate III.* This use of both electronics and acoustic instrumental forces as extensions of the voice contributes greatly to the largely homophonic, meta-instrument nature of the resulting work.

Although the sounds of underwater melting glaciers and the vocal utterances, sibilance, and gasps of the soprano may not share as direct a connection in terms of "cause" as the violin and bowed desert cacti of *to facilitate friction* did, they still share a tremendous amount of similarities in their spectromorphologies. In the terms presented by Simon Emmerson in his book, *The Language of Electroacoustic Music*, I would argue that the vocal part is timbrally and syntactically mimetic of the clicking, popping, sizzling samples of melting icebergs featured

throughout this work.[138] In other words, the voice part is intentionally designed to mimic the timbre and morphological behaviors inherent to the natural, irregular processes involved in the slow death of a glacier, as heard propagating through the medium of the water it is becoming and returning to.

These samples are not processed in any way, other than a variety of smooth, curved amplitude envelopes to avoid any unintentional clicks and pops at their onset or termination, they are simply selected by a machine-learning-based timbre matching and corpus mining algorithm. This algorithm uses a combination of real-time MFCC analysis, k-nearest neighbor (kNN) and K-D Tree operations, trained on the MFCC data of all of the numerous glacier samples in the corpus. These samples were pre-cut from their lengthy, original audio files based off of an out-of-time, spectrum-based onset detection analysis. This is again, made possible thanks to the University of Huddersfield's Fluid Corpus Manipulation (FluCoMa) package for Max.

This process was initially developed for an electric guitar and live electronics work that I wrote for guitarist Dan Lippel. In this work, titled *CREVASSE,* the guitarist was specifically asked to mimic the sound of a clicking, popping, melting glacier by pressing the pick aggressively into the low E string of the guitar and irregularly producing a click as the pick staggered from rung to rung, moving up and down the wound metal structure. Each click from the guitar pick traversing the strings was analyzed and matched with a glacial sample. This worked well, however, the timbral variation of this guitar technique was extremely limited and nuanced, the range of timbral possibilities presented by the voice in *untitled* creates much more engaging results when run through this process.

[138] Simon Emmerson, *The Language of Electroacoustic Music* (London: Macmillan, 1986), 18.

The result of this timbre matching is a sample that is so closely aligned with the timbre and expression of the vocalist in each moment, that it is often almost impossible to differentiate between the two. Combined with the almost exact alignment of their onsets, the vocal performance and electronics fuse into one unified percept, often creating scenarios where the glacier clicks could plausibly be emanating from the vocalist. This is especially true when watching the performance and seeing the vocalist's mouth movements directly coincide with the initiation of these samples of gargantuan structures, recorded thousands of miles away from any performance venue. This results in a strange fusion and a presentation of human scale performance and environmental scale phenomena as indistinguishable.

A similar effect is achieved during the duet between the trombone and contrabass from cue 15 to cue 19. In this case, both instruments contribute to this texture in their own way, mimicking the glacial clicks and pops through their own unique techniques and methods. Each performer's signal is analyzed separately and matched with its own, timbrally similar glacier sample. This does, excitingly, bring forth lower, richer, more abrasive, more resonant clicks and pops as the MFCC analysis of these larger, vibrating bodies connects with a different subset of the sample corpus than the soprano vocalist is able to evoke.

Through their selection, the sounds are certainly, in a way, being performed. Despite not being processed or altered in any substantial way, they are also not being presented in their original, environmental context, so again in the terms presented by Emmerson, I would place these electronic materials somewhere in the middle of the abstract to abstracted continuum. In this case, abstract materials are further removed from their original, abstracted environments and sources.[139]

[139] Emmerson, 20.

Mimesis, as well as source bounding and gestural surrogacy, is also very much a factor in the integration of recordings of large, metal cattle corrals and metallic sculptures with brass split tones and woodwind multiphonics. My favorite quality of brass instruments is their ability to sound like tearing metal. Thomas Rex Beverly's samples of cattle corrals and bowed, scraped metal sculptures were intended to enhance this timbral quality through huge, close-miked, larger-than-life, brutal versions of these metallic, brass-like resonances. The cattle gate sounds also draw shockingly close resemblance to both brass split tones and woodwind multiphonics. Many of the beating patterns and tone clusters within the unaltered corral recordings were almost identical to the sound of many, standard instrumental multiphonics. I could have easily been convinced that a metal fence was a stereotypical bassoon or saxophone multiphonic if I was not aware of the context and origin of the file I was listening to.

All of the objects involved in these gestures are metal (or wood, in the case of the bass clarinet, contrabassoon and contrabass) resonant objects being aggressively excited by some vibrating source, whether it be human lips, wooden reeds, hair on metal strings, or the friction between multiple metal components of a swinging corral gate, in a way that specifically evokes multiple, clashing, distorted, inharmonic overtones. The instrumental and electronic materials were also intentionally shaped to mimic the natural trajectories produced by pushing a swinging gate. For example, at cue 9, the gestures progress from initial fast movements and intense, raucous, full spectrum, clashing resonances and eventually slow down, isolating just a few disembodied partials, squeaking feebly at the highest point of the parabolic gesture. Afterward, without interruption, the inverse of this gesture is presented: as partials collect, noise increases, and the metaphorical and literal gate slams shut. This again ties directly to Leydon’s sinusoidal

purity to inharmonic noise continuum,[140] but also demonstrates that vestiges of human agency are still directly represented in these somewhat alien sounds and that Smalley's *energy-motion-trajectories* are still at the heart of these gestures.

Unlike the glaciers, whose stochastic processes unfolded naturally on a textural, environmental scale, the recordings of metal were directly performed by Beverly and are imbued with human-scale action and gesture. Fascinatingly, on a scale almost beyond our comprehension, the clicking and popping of the melting glaciers could be considered to be initiated and shaped by human intervention as well, since human activity is directly responsible for climate change.

It is worth noting that, within the metallic, screeching sections, a secondary goal in creating this piece was to develop more nuanced control and understanding of split tones. This is the first piece I have written where the split tones are actually properly notated, thanks to Mattie Barbier,[141] and specific combinations of partials, pitches, and fingerings are requested, rather than simply calling for a distorted, clashing split-tone effect to occur within a vague frequency range. I paid close attention to the theoretical pitches that would be present in each split tone and multiphonic, and tried to create interesting, often clashing harmonies and orchestration. I also recognized, however, that those specific pitches would likely not be exactly what was actually perceived or produced by each instrumentalist, as many of these techniques vary based on instrumental model and individual ability, so the shaping of these techniques, timbres, and spectromorphologies in time was generally more important to me than the exact pitch structures.

Split tones also notoriously take a moment to attack and initiate. An additional benefit of working with fixed media electronics is that if I wanted a sudden onset of metallic screeching, an

[140] Leydon, entire article.
[141] Mattie Barbier, *Face|Resection* (Rage Thormbones Publication, 2016), entire book.

abrupt discontinuity, or an immediate change in material, I could have the electronics consistently erupt forth right away to cover any gaps in the performers' initiation of an often unreliable technique. I love the sound of these unstable techniques faltering, but ideally, that should be saved for moments where the gesture is sustaining or dying away, not at the moment of arrival or impact.

Also, during the creation of this work, the vocalist's rider stated that it was recommended to avoid vocal fry, one of my all-time favorite techniques. I believe vocal fry would have fit exceptionally well with many of the distorted sustain materials. As a solution, I convolved their voice with the impulse response of a gong to better blend the timbre of their sustained pitches with the aggressive, metallic materials.

Just like *to facilitate friction* and *Spate III*, this piece involves large degrees of freedom in between extremely strict moments of alignment that are completely locked in time. In this way, strict timing on higher hierarchal levels of the form is maintained. The crafting of instrumental materials is again identical to how I would shape live processes, with overall trajectories trending towards or away from goals, but never appearing exactly the same twice, while still presenting coherent, identifiable gestures and materials, with fixed media positioned to clarify crucial formal markers, structural points of alignment, and impacts.

In terms of transcontextual suggestions and extrinsic connections,[142] the sounds of melting glaciers and man-made, grating, metal, cattle corrals undoubtedly invoke their own real-world, semiotic associations throughout the work. Certainly, the combination and conflict of these two sounds conjurors heavy climate change implications. I will not, however, falsely claim here that this was intentional, or that I consciously designed the work to have a hidden

[142] Smalley, 110.

programmatic meaning based in the ongoing climate crisis. Since, however, this world-ending climate threat is ever-present and exponentially escalating, I would argue that it is not unreasonable to believe that this narrative was subconsciously present in the construction of the work. In retrospect, to anyone listening to the work and seeking intrinsic-extrinsic or transcontextual suggestions and connections, I believe this is an exceptionally powerful association to make in combination with the sculpting of spectromorphologies and perceptions of time that I tend to prioritize over programmatic elements and often preoccupy myself with. The slow build, harsh interjections and juxtapositions, and exponential descent into chaos, ending with the faltering, staggering away, almost drowning return to the clicks and pops of the melting icebergs, is certainly evocative in this context.

4.5 **Conclusion**

untitled functions through even more extreme manipulations of the perception of time and contrasts of timbre, texture, and physicality than its predecessors. It trusts and allows materials to evolve over much longer durations, resulting in much higher degrees of freedom and expanded room for interaction and expression. This piece also represents the first steps towards developing and integrating a machine-learning-based interactive performance system and has already produced promising, nascent results. As the most unified, homophonic, ensemble piece I have ever created, I believe this work presents many acoustic and electronic materials, interactions, and behaviors that could be interrogated, explored, and extrapolated as materials to be presented in actual, simultaneous counterpoint and polyphony in the near future.

Chapter 5 Conclusion

In conclusion, the manipulation and perception of time, timbre, texture, and physical gesture is critical to the function, form, and understanding of my recent works. Multiply-directed linear time, accelerations and decelerations, stimulus ramps comprised of multiple parameters, morphing evolutions and contrasts of texture and timbre, montage, choreography, and the physical and visual aspects of performance unite, interact, and conflict to create shape, direction, expectation, and meaning in my pieces. Whether working with acoustic instruments, electronically produced sounds, or both, philosophies, approaches, and priorities typically associated with acousmatic music permeate my work and act as a challenge and catalyst for further development of my instrumental writing. The three works presented in this paper illustrate a trajectory of increasing obsession with all of these priorities, manifesting through progressively more radical incarnations of these ideas throughout my time at UC San Diego. I anticipate that the perception and manipulation of nonlinear and multiple time senses, timbre, texture, growth processes, and degrees of freedom, all evolving across a myriad of interrelated continuums, will continue to be a driving force for me in future compositions as I seek to develop new approaches and solutions to the challenges, especially the presentation of simultaneous streams in perceivable counterpoint, illuminated through these analyses. My research into audiovisual synergy, spatial audio, and machine learning, although not addressed directly in this paper, is also ongoing, and I am elated to have the opportunity to combine these interests with the priorities elucidated in this document in the near future.

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