

Types of Time:  
Parametrically Defined Materials as Temporally  
Significant in Recent Works

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## Contents

List of Compositions and Audio Examples .....	4
List of Figures .....	5
Copyright Statement .....	6
Abstract .....	7
<b>Introduction</b> .....	<b>8</b>
Background .....	8
Temporality .....	11
Parameters .....	15
Cognition .....	18
<b>Chapter 1: <i>Ovation</i> (2022)</b> .....	<b>23</b>
1.1: Structured Silence .....	23
1.2: Pitch Organisation .....	26
1.3: Memory and Expectation .....	32
<b>Chapter 2: <i>Co[a/u]rsing</i> (2023)</b> .....	<b>36</b>
2.1: Types of Material .....	36
2.2: Layers and Time .....	39
2.3: Aesthetic Considerations of Perception .....	44
<b>Chapter 3: <i>Shades of Same</i> (2023)</b> .....	<b>48</b>
3.1: Timbre-Pitch Profile .....	48
3.2: Duration and Repetition .....	53
3.3: Recognition .....	57

<b>Chapter 4: <i>Emphases</i> (2023)</b> .....	61
4.1: Repetitive Aggregates .....	61
4.2: Dynamic Displacement and Time .....	65
4.3: Density and Fragmentation .....	68
<b>Further Considerations</b> .....	73
<b>Bibliography</b> .....	79
Texts: .....	79
Musical Works: .....	89

## List of Compositions and Audio Examples

### *Overation* (2022)

Instrumentation: String Quartet

Duration: 14 minutes

Score submitted: Yes

Audio submitted: No

### *Co[a/u]rsing* (2023)

Instrumentation: Piano and Percussion

Duration: 10 minutes

Score submitted: Yes

Audio submitted: Yes (Workshop Recording, GBSR Duo - George Barton and Siwan Rhys)

### *Shades of Same* (2023)

Instrumentation: Flute Solo

Duration: 17-22 minutes

Score submitted: Yes

Audio submitted: No

### *Emphases* (2023)

Instrumentation: Two Pianos

Duration: 9 minutes

Score submitted: Yes

Audio submitted: Yes (MIDI Representation)

## List of Figures

Figure 1.1: Initial consistencies of gestural contour and rhythm in <i>Overation</i> .....	25
Figure 1.2: Representation of element boundaries in <i>Overation</i> .....	26
Figure 1.3: Expanding boundaries of pitch-range used in <i>Overation</i> .....	27
Figure 1.4: Pitch content of first 15 ‘object’ chords in <i>Overation</i> .....	29
Figure 2.1: Pitch content of piano cluster and scraping in <i>Co[a/u]rsing</i> .....	38
Figure 2.2: Basic rhythmic unit of higher-attentional layer in <i>Co[a/u]rsing</i> .....	39
Figure 2.3: Temporal inconsistencies of piano materials in <i>Co[a/u]rsing</i> .....	41
Figure 2.4: Temporal development of basic rhythmic unit in <i>Co[a/u]rsing</i> .....	42
Figure 3.1: Active and non-sounding pitch boundaries in <i>Shades of Same</i> .....	49
Figure 3.2: Distribution of sounds within active pitch boundaries in <i>Shades of Same</i> .....	51
Figure 3.3: Proportional scheme used for all materials in <i>Shades of Same</i> .....	54
Figure 3.4: Complete repeat structure used throughout <i>Shades of Same</i> .....	56
Figure 4.1: Continuous expansion of pitch content in <i>Emphases</i> .....	62
Figure 4.2: Dynamic scheme as related to changes of tempo throughout <i>Emphases</i> .....	68
Figure 4.3: Differences in approaches to fragmentation and continuation in <i>Emphases</i> .....	70

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## Abstract

This thesis and accompanying portfolio explore the perceptual capabilities of parametrically defined musical materials as potentially significant mediators of temporal perception. The methods involved concern the use of materials on the basis of their relative parametric attributes and attentional qualities in their relative contexts. Through the use of various structures in addressing matters of repetition and resemblance, the presented works pursue an engagement with cognitive memory in ways which emphasise both subjective and ambiguous temporalities. Across discussion of the portfolio as a whole, I explore the use of materials created through assessments surrounding the parameters of pitch, dynamic, timbre, and duration, alongside considerations of silence as musical material. Each work employs different approaches to one or more of these elements, with reflections on their inherent qualities and interrelationships prompting discussions which encompass varied phenomenological viewpoints. The music is contextualised within the contemporary landscape by means of contrast and comparison with established repertoire - addressing the distinctive features, influences, and approaches of the submitted works to offer a nuanced reflection of how they situate in the field. Furthermore, inquiries surrounding the perception of time through music are examined from diverse perspectives, incorporating related philosophical views with more empirical contributions from the cognitive sciences.

## Introduction

Every facet of human experience is contingent upon time. My fascination centres around musical experiences which have the ability to highlight the inherent subjectivity of our perceptual relationship with duration. This thesis and accompanying portfolio represent two compositional concerns which have become fundamental to my music: temporal perception, and a parametric approach to sound organisation. Each of the submitted works are discussed in detail, outlining their construction and the thought processes involved. I also contextualise each piece by referring not only to existing repertoire, but also through consultation of work done in both the cognitive sciences, and relevant philosophical literature.

## Background

I attribute much of my interest in musical time to the music of Harrison Birtwistle. My concern with Birtwistle's use of time and the ways in which he defines certain moments via durational and metric irregularities is something I became particularly intrigued by as an undergraduate; being notably drawn to the music's ability to hold one's attention through matters of expectation and unpredictability. I must acknowledge that Birtwistle's music has certainly influenced how I engage with music - an approach predominantly inclined towards the temporal aspect. Even with works spanning various phases of the composer's career, such as *The Triumph of Time* (1971-72)<sup>1</sup> and *Harrison's Clocks* (1997-98),<sup>2</sup> I have often found myself at an experiential crossroads; between anticipating the potential resurfacing of a particular emphasis, and an immersion within musical time which is less preoccupied with compositional processes. I find there is a capacity in this music to strongly undermine one's sense of conventional 'measured' time, resultantly accentuating perspectives of temporal

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<sup>1</sup> Harrison Birtwistle, *The Triumph of Time*, for orchestra (London: Universal Edition, 1971-72).

<sup>2</sup> Harrison Birtwistle, *Harrison's Clocks*, for piano solo (London: Boosey & Hawkes, 1997-98).



subjectivity; Jonathan Cross states *The Mask of Orpheus* (1973-83)<sup>3</sup> as significant in constructing 'a very different kind of temporality...with its many time shifts and reversals, its attempts to allow past and future to exist simultaneously in the present'.<sup>4</sup> There is a certain level of abstraction in Birtwistle with which I find myself resonating, as in my view it encourages one to seek diverse approaches to listening in uncovering particular connections. Although not used as a direct means of contrast or contextualisation with the works submitted alongside this thesis, I find it useful to ground this written work with such perspectives.

The late works of Morton Feldman have also significantly influenced my compositional perspective regarding the experience of time through music. This impact is clearest with regard to two specific areas: the perceptual qualities of musical textures in relation to the experience of time, and the temporal experience over extended durations. Although more concerned with intuitive approaches to temporal organisation,<sup>5</sup> I find profound temporal experiences are to be gained through such works as *Crippled Symmetry* (1983)<sup>6</sup> and *Piano and String Quartet* (1985),<sup>7</sup> reflective of Feldman's unique textural ability in maintaining one's attention *within* the experience from moment-to-moment. In my own practice, there is a considerably elevated degree of process at work, indicative of the particular conditions of experience I am interested in attaining. In other words, my music could be said to be of a more clearly-defined intentionality. Concerning Feldman's use of extended durations, this is yet to be an aspect I have considered as part of my own practice, although I find its inclusion relevant here in the sense that it has affected me in such ways that have offered new

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<sup>3</sup> Harrison Birtwistle, *The Mask of Orpheus* (London: Universal Edition, 1973-83).

<sup>4</sup> Jonathan Cross, *Harrison Birtwistle: Man, Mind, Music* (London: Faber and Faber, 2000), 202.

<sup>5</sup> 'Feldman, ... was able to escape from the reliance on any methodology whatsoever, and to compose with a reliance on instinct'. Louis Goldstein, 'Morton Feldman and the Shape of Time', in *Perspectives on American Music since 1950*, ed. James R. Heintze (New York: Garland Publishing, 1999), 68.

<sup>6</sup> Morton Feldman, *Crippled Symmetry*, for flute, percussion, and piano (London: Universal Edition, 1983).

<sup>7</sup> Morton Feldman, *Piano and String Quartet* (London: Universal Edition, 1985).

perspectives on the ways in which time may be experienced through music. There is an emphasis on time as the subject through an ability to hold focus *in the moment*, imbuing a more interconnected experience between listener and sound in affecting one's sense of scale; as Feldman stated: 'I wanted time felt, a more subjective feeling for time'.<sup>8</sup>

The clearest influence for the ideas behind this thesis, however, comes from the music of Bryn Harrison. Mutual interests surrounding temporality through music led me to pursue this research with the composer's guidance; an exploration which has proven both valuable and captivating. From my own experiences, Harrison's music has an unparalleled ability to shape one's perception of time, bringing attention to our relationship with its inherently ambiguous and contradictory nature. And it wasn't until Harrison's work that I began to take an interest in matters more rooted in perception, in the *types* of experiences of time. This music interacts with perceptual attention in ways which encourage the listener to make associations through time, whilst simultaneously undermining one's expectancies of perceived temporal consistencies. James Saunders states that Harrison's 'primary interest is in our experience of time as listeners, and in particular the way we ascribe it with directionality'.<sup>9</sup> In contrast to Harrison's work, I became interested in exploring the possibilities of comparable temporal experiences through the use of more microtonal pitch-structures; aligning with my own approaches to pitch, which are often concerned with more extended divisions of the octave. What grew from this was an emergence of interest not only in the attentional capacities of such approaches to pitch, but also in the broader parameters of sound (discussed further shortly).

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<sup>8</sup> Morton Feldman, 'The Future of Local Music', in *Give My Regards to Eighth Street: Collected Writings of Morton Feldman*, ed. B. H. Friedman (Cambridge, Massachusetts: Exact Change, 2000), 177.

<sup>9</sup> James Saunders, 'Fourteen Musicians', in *The Ashgate Research Companion to Experimental Music*, ed. James Saunders (Farnham, England: Ashgate, 2009) 223.

## Temporality

My use of the term 'temporality' pertains to the perception of time through conscious experience, resonating with David Couzens Hoy in how 'the character of temporality...appears to be dependent on the mind and would thus be said to be subjective'.<sup>10</sup>

As a key part of both the practical and written work of this research, I find it necessary to preface the upcoming commentaries with my own perspectives surrounding notions of time - or more specifically, the subjective implications of this fundamental state of being. My own takes on this will not attempt to offer any clear definition of what time 'is', but will instead focus more on the types of temporal relationships we seem capable of experiencing as dependent on the information we receive/have previously received.

Although I find myself largely in agreeance with the Cartesian rationality surrounding 'clear and distinct ideas'<sup>11</sup> as being key to how we apply truth to that which is experienced, I do not agree with such notions of time as being aligned with motion (or, more specifically, speed).<sup>12</sup> Diverging from this more objective view regarding the nature of time, my own thinking further aligns with a phenomenological perspective akin to the work of Edmund Husserl - time as the subjective experience of duration from the perspective of the individual. I am in general agreement with the broad notion that 'there is only now', insomuch as it being the only perspective we have - everything else is memory or anticipation (two factors critical to the thinking behind the temporal organisation of my music). Jonathan Martineau expands on this with regards to Husserl:

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<sup>10</sup> David Couzens Hoy, introduction to *The Time of Our Lives: A Critical History of Temporality* (Cambridge, Massachusetts: The MIT Press, 2009), xv.

<sup>11</sup> René Descartes, *Principles of Philosophy*, trans. Valentine Rodger Miller and Reese P. Miller (Dordrecht, Netherlands: Kluwer Academic, 1982), 20.

<sup>12</sup> See Geoffrey Gorham, 'Descartes on Time and Duration', *Early Science and Medicine* 12, no. 1 (2007): 28-54.

In true Augustinian fashion, the Husserlian 'now' *qua* present is furthermore made of three parts: the present-present, the present-past, and the present-future. This means that each present is the source-point of its own separation of temporal dimensions: the past is past and the future is future only in relation to a definite present.<sup>13</sup>

What the compositional concerns of this thesis centre around are the contradictory experiences of difference between how time is measured and organised, and how time is lived through conscious experience; the incompatibilities of the two are a central theme of my interest in temporal perception. The field of music psychology often refers to such temporal ambiguity as psychological time: 'Psychological time is a subjective feeling which is related to the temporal experiences. Nevertheless, psychological time differs from "time," because it is non-linear and because it is dependent on the nature of events occurring within a time period'.<sup>14</sup> A useful way of thinking about my own approach to temporal organisation is with regards to the recognition of 'objects', and their relative impressions on memory through that which is perceived as linear time. I also find correlation with Maurice Merleau-Ponty in this regard with his terminology of 'the perceptual "something"'.<sup>15</sup> Given that the mind does not experience temporal events in isolation, we must attempt to establish relationships between stimuli through our continuity (or 'flow') of time; particularly with regards to their perceived durations and reappearances. Husserl is again relevant here with his views on temporal succession: 'There is, accordingly, a perception of unities that succeed one another in time...and since that is the case, there is also a direct apprehension of identity, equality, similarity, and difference'.<sup>16</sup> It is then through various approaches to durational inconsistency

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<sup>13</sup> Jonathan Martineau, 'Edmund Husserl's Internal Time Consciousness and Modern Times, a Socio-Historical Interpretation', *Journal of the Philosophy of History* 13, no. 2 (2019): 218.

<sup>14</sup> Dan Zakay, 'Psychological Time', in *Philosophy and Psychology of Time*, ed. Bruno Mölder, Valterri Arstila, and Peter Øhrstrøm (Cham: Springer International Publishing, 2016), 53.

<sup>15</sup> Maurice Merleau-Ponty, *Phenomenology of Perception*, trans. Colin Smith (London: Routledge, 2002), 4.

<sup>16</sup> Edmund Husserl, *On the Phenomenology of the Consciousness of Internal Time (1893-1917)*, trans. John Barnett Brough (Dordrecht: Springer Science+Business Media, 1991), 23.

and recontextualisation with surrounding materials that I am aiming to compromise the temporal stability of the perceived elements within the listener's experience. As David M. Eagleman has stated, 'perceived durations can be distorted...by an oddball in a sequence, or by stimulus complexity or magnitude'.<sup>17</sup>

An aspect which has emerged as temporally significant throughout this research, particularly when considerations were made as to what may be perceived as more abstract musical materials, is pattern recognition. As one of the core human responses when attempting to understand complex sensory input,<sup>18</sup> this aspect has, at various stages, developed as an increasingly valuable component of my compositional methodology. Particularly relevant in this regard are the works *Overation* (chapter 1) and *Co[a/u]rsing* (chapter 2), which have greatly contributed to my position that pattern recognition can prove a crucial factor in facilitating our experience of psychological time, even with distinctly obscure or complex materials. By questioning how temporal experience is affected when the materials themselves become less 'graspable', it raises the issue of how the attentive mind may attempt to decipher such experiences. W. Jay Dowling has highlighted the temporal significance of pattern recognition in music, stating how 'we are able to resolve separate events in sequences presented at rates of up to 10–12 per second, and we have difficulty linking events into a coherent pattern when they proceed much slower than one every 2 seconds'.<sup>19</sup> Even if we perceive the musical experience to offer little in the way of more 'established' musical syntax,

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<sup>17</sup> David M. Eagleman, 'Human Time Perception and Its Illusions', *Current Opinion in Neurobiology* 18, no. 2 (2008): 131.

<sup>18</sup> 'Pattern recognition requires the consistent generation of identical responses to different complex input constellations which bear a certain invariant spatial or temporal feature (the pattern that is being recognized), independently of the particular place, scale-size, orientation, or order in which that feature appears among all other components of the input signal'. J. G. Roederer, 'Neuropsychological Processes Relevant to the Perception of Music — an Introduction', in *Music in Medicine: Neurophysiological Basis, Clinical Applications, Aspects in the Humanities*, ed. Ralph Spintge and Roland Droh (Berlin: Springer-Verlag, 1987), 83.

<sup>19</sup> W. Jay Dowling, 'Perception of Music', in *Blackwell Handbook of Sensation and Perception*, ed. E. Bruce Goldstein, (Oxford: Blackwell Publishing, 2005), 470.

then the intended temporality of the work may, I believe, still function effectively through the recognition of how contrasts between parametric values have been specifically patterned through time.

Also under this heading of temporality, I find it necessary to clarify my use of the term repetition - the phenomenon itself being a potent basis of discussion regarding its substantive reality. I approach the idea of repetition as dependent upon the perception of particular attributes - the recognition of an identity. As David Hume wrote:

There is nothing in any object, considered in itself, which can afford us a reason for drawing a conclusion beyond it; ... even after the observation of the frequent or constant conjunction of objects, we have no reason to draw any inference concerning any object beyond those of which we have had experience.<sup>20</sup>

And in this sense, I use the term repetition to describe the *experience* of having perceived the same thing again which has previously been experienced - in contrast to whether or not the same has in fact taken place. Nonetheless, I find it important to state (albeit from a considerably metaphysical viewpoint) that I tend to agree that repetition cannot fundamentally exist; which is not to say that we do not perceive it as happening as such. Elizabeth Hellmuth Margulis outlines this view excellently: 'Since two iterations are never precisely repetitions in their deepest essence—they're composed of different atoms or occur at different time points—it is perception that abstracts both a relationship of shared identity and a relationship of difference'.<sup>21</sup>

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<sup>20</sup> David Hume, *A Treatise of Human Nature* (Oxford: Clarendon Press, 1960), 139.

<sup>21</sup> Elizabeth Hellmuth Margulis, *On Repeat: How Music Plays the Mind* (New York: Oxford University Press, 2014), 35.

Although repetition is a common feature of the ways in which my music is temporally organised, it is not solely employed on the recognition of exactitudes; at times it is intentionally employed to function on higher perceptual levels, further to the materials being attended to at any particular moment. I find it useful to use the term *resemblance* in such instances, indicating not the verbatim repetition of an occurrence, but instead an awareness that the same *type* of material is being re-presented.

## Parameters

As outlined above, my interests in the applications of musical materials in affecting temporal perception began with a rather rigid focus on the role of pitch. What my research has expanded to, however, is a parametric approach to musical materials using the broad terms of pitch, dynamic, timbre, duration, and silence.<sup>22</sup> Much of this development comes from time spent with James Tenney's *Meta+Hodos*,<sup>23</sup> itself greatly driven by the principles of Gestalt psychology. The input on my work through this has emphasised the ways in which I qualitatively assess my materials - a relationship of getting closer to the sounds, to be more phenomenologically concerned with what they are *like*. And it is through such assessments that the materials presented in the discussed works have been considered; rather than subcategorising each of these core attributes of sound, they have instead been approached on their relative qualities in the given contexts. By seeking distinct sonic identities within the frame of a given parameter (or combinations thereof), I have attempted to place such occurrences within a clear perceptual focus, to the end that they may potentially emerge as significant regarding the perception of time.

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<sup>22</sup> Although not a parameter of *sound*, the use of silence as musical material is explored in chapter 1.

<sup>23</sup> James Tenney, *Meta+Hodos: A Phenomenology of 20th Century Musical Materials and an Approach to the Study of Form and Meta Meta+Hodos* (Oakland, California: Frog Peak Music, 1986).

The parametric contexts explored in this research may be better thought of as relationships between perceptual qualities, and there are fundamental Gestalt principles which support the cognitive organisation of these relationships. As Stefan Koelsch has outlined, 'Grouping of acoustic events follows Gestalt principles such as similarity, proximity, and continuity'.<sup>24</sup> I would posit that the most relevant to the perception of parametrically defined musical materials here is the aspect of similarity. Tenney applies Wertheimer's factor of similarity<sup>25</sup> directly to musical experience, stating that 'sounds played on the same instrument or in the same pitch-register tend to seem "connected" and to form groups more easily than sounds that are relatively dissimilar in these respects'.<sup>26</sup> It is with consideration of such a psychological framework that I have attempted to encourage the conditions whereby a listener may assign value judgements to elements deemed similar/dissimilar in a given parameter, that organisational associations may be made across various durational spans. Such attempts made towards this form of perceptual recognition, however, strive to remain subjectively mindful of what Mark Reybrouck terms 'the tension between actuality and virtuality in the construction of musical Gestalts'.<sup>27</sup>

If a Gestalt framework may guide the perceptual organisation of musical materials, then the broader field of music psychology is equally valuable in illustrating potential responses to the sounds themselves. I have found that engaging with research examining how individuals perceive, process, and emotionally respond to specific aspects of musical experience has been compositionally significant within the scope of this thesis. It is by considering the affective

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<sup>24</sup> Stefan Koelsch, 'Toward a Neural Basis of Music Perception – a Review and Updated Model', *Frontiers in Psychology* vol. 2 (2011): 4.

<sup>25</sup> Willis D. Ellis, *A Source Book of Gestalt Psychology* (London: Routledge & Kegan Paul, 1967), 75.

<sup>26</sup> Tenney, *Meta+Hodos*, 29.

<sup>27</sup> Mark Reybrouck, 'Gestalt Concepts and Music: Limitations and Possibilities', in *Music, Gestalt, and Computing: Studies in Cognitive and Systematic Musicology*, ed. Marc Leman (Berlin: Springer-Verlag, 1997), 57.



tendencies initiated by certain parametric attributes that I have attempted to underscore the dynamic interrelationship between auditory perception and temporal subjectivity. For instance, how Sophie Donnadiou considers the role of timbral familiarity,<sup>28</sup> or Diana Deutsch's proposition that 'memory for the pitch of a tone is laid down simultaneously both on a pitch continuum and also on a temporal continuum'.<sup>29</sup> It is work such as this which has informed the temporal organisation of the parametrically defined materials explored in this research, insomuch that it has illuminated to me the relative degrees of attentional resources required when encountering particular types of auditory stimuli. To further clarify my stance on musical parameters from this perspective of music psychology, it is perhaps useful to state that this research has not been undertaken on the basis of primary and secondary parameters as forwarded by Meyer,<sup>30</sup> and Snyder.<sup>31</sup> Rather, each of the parameters outlined above have been approached with the view of being equally capable of directing the temporal organisation of their relative structures.

What has surfaced throughout this research, however, has been the involvement at times of a deeper qualitative focus within the scope of the aforementioned broad parameters of pitch, dynamic, timbre, and duration. Although these wider terms are indeed the most relevant to the intentions of this research, I must acknowledge that each of these parameters could certainly be explored to an increasingly significant degree; that is, with respect to individual parametric intensities. My use of this term relates to Tenney's definition: 'Parametric intensity is thus to be understood as an approximate measure - in one "dimension" - of the more

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<sup>28</sup> Sophie Donnadiou, 'Mental Representation of the Timbre of Complex Sounds', in *Analysis, Synthesis, and Perception of Musical Sounds: The Sound of Music*, ed. James. W Beauchamp (New York: Springer, 2007), 272-319.

<sup>29</sup> Diana Deutsch, 'Effect of Repetition of Standard and of Comparison Tones on Recognition Memory for Pitch', *Journal of Experimental Psychology* 93, no. 1 (1972): 159.

<sup>30</sup> Leonard B. Meyer, *Style and Music: Theory, History, and Ideology* (Philadelphia: University of Pennsylvania Press, 1989), 14-16.

<sup>31</sup> Bob Snyder, *Music and Memory: An Introduction* (Cambridge, Massachusetts: The MIT Press, 2000), 193-205.

inclusive musical or subjective intensity of a perceived sound'.<sup>32</sup> Deviating slightly from this, I do not use the term in precisely this manner; that is, I do not use it to denote that the parameter in question is making the music *feel* intense. Rather, I apply it to illustrate the relative 'dominance' of a parameter (or 'subparameter') currently perceived as the most salient aspect at a given moment within the musical experience. This approach aligns more with the graphic representations Tenney gives in *Meta+Hodos*,<sup>33</sup> wherein each vertical axis is only loosely assigned parametric values by 'any distinctive attribute of sound, in terms of which such an ordinal scale might be constructed'.<sup>34</sup> The material assessments undertaken for *Co[a/u]rsing* (chapter 2) do approach such considerations, yet it is *Shades of Same* (chapter 3) which arose as most relevant in this regard. When addressing the distribution of timbral characteristics for the piece, what was essentially my phenomenological assessment of the selected sound qualities could certainly be viewed as values to be plotted along the vertical axis in Tenney's examples. Although not presented as one of the fundamental aspects underpinning this inquiry, the idea of parametric intensities does, at times, surface as a meaningful aspect of my compositional thought within this thesis.

## Cognition

Also required here is some context regarding how the following commentaries consult with the more empirically-driven pursuits of the cognitive sciences. Although there does exist rather specific perceptual intentions for the music presented, it is ultimately a subjective exploration of the interests stated. That said, I do find it pertinent at times to draw from scientific work done in such areas as memory, attention, perception, and reasoning. This is not approached from a perspective concerned with evidencing any particular claims, rather it

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<sup>32</sup> Tenney, *Meta+Hodos*, 36.

<sup>33</sup> See figs. 3, 4, and 5. Tenney, *Meta+Hodos*, 34.

<sup>34</sup> Tenney, *Meta+Hodos*, 35.

is done to contextualise the ways in which the psychological functions of the mind generally operate. I find it useful to imbue the discussions with such contrasting viewpoints of these objective and quantitative findings, with perspectives of a more theoretical and philosophical nature. Here I will identify the most relevant terms from this field from my own compositional perspective, addressing the importance of how each relates to the cognition of both sound and time. Although there is a great deal of overlap in the application of these terms, most relevant to this thesis are the role of attention on the cognition of sound, and that of memory with respect to the cognition of time.

Attention is a highly dynamic factor in the cognition of sound, serving as one of the most definitive aspects of subjectivity in how each individual processes auditory information. How I have attempted to align with our cognitive tendencies in this regard is by acknowledging what is referred to as a 'selective filter' which prioritises certain auditory stimuli over others.<sup>35</sup> By anticipating how inclined we may be to allocate attentional resources in this manner, the music composed throughout this research attempts to engage with these levels of attention through organisational principles of parametric contrast. And although I have attempted to mediate the relative levels of material prominence, one cannot escape the facts of varying listening preferences, abilities, and experiences. As Botteldooren et al. state, 'attention can be drawn by saliency elements such as changes in time and frequency, but it can also be outward oriented and voluntary'.<sup>36</sup> Another important consideration of auditory attention concerns familiarity, and how prior exposure to sounds naturally elevates their attentional significance. I have attempted to sympathise with cognitive limitations in this regard by considering the

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<sup>35</sup> See Marie-Helene Giard et al., 'Neurophysiological Mechanisms of Auditory Selective Attention in Humans', *Frontiers in Bioscience* 5 (2000): 84-94; Peter Lakatos et al., 'The Spectrotemporal Filter Mechanism of Auditory Selective Attention', *Neuron* 77, no. 4 (2013): 750-61.

<sup>36</sup> Dick Botteldooren et al., 'The Role of Paying Attention to Sounds in Soundscape Perception', *paper presented at the Proceedings of the Acoustics 2012 Hong Kong Conference* (2012): 1.

perceived distinctions between familiar and unfamiliar materials (again, from my own limited perspective) as inherent qualities of the materials themselves. This principle is articulated by Albert S. Bregman:

As we increase the difference in familiarity between two sound patterns that are mixed together by making ourselves more and more familiar with just one of them, although we may become increasingly more skillful at pulling the familiar one out of the mixture, this does not, in itself make it easier to hear the unfamiliar one as a coherent sequence.<sup>37</sup>

Concerning my approach to the multiple layers of memory, a clarification of terms and their use in the cognitive sciences is necessary here. The fundamentally temporal nature of memory is crucial to the compositional processes of this research, and there are three specific concepts to be engaged with: short-term memory, working memory, and *chunking*. Short-term memory is the term used when referring to ‘a number of memory systems with limited capacity, concerned with the temporary (in the range of seconds) retention of a variety of materials’.<sup>38</sup> Working memory is defined as ‘the ability to hold things “in mind.” It lies at the core of cognition, a mental sketch pad on which thoughts are held, transformed, and then used to guide actions’.<sup>39</sup> To use a more interdisciplinary example, Bob Snyder outlines chunking as ‘the consolidation of small groups of associated memory elements’, going on to further describe how we may then be able to group chunked elements into chunks themselves: ‘Any time we can combine things in this way to make higher-level units (chunk them), we can reduce the number of elements and save memory space’.<sup>40</sup> Such aspects,

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<sup>37</sup> Albert S. Bregman, *Auditory Scene Analysis: The Perceptual Organization of Sound* (Cambridge, Massachusetts: The MIT Press, 1994), 407.

<sup>38</sup> Giuseppe Vallar, ‘Short-Term Memory’, in *Encyclopedia of the Human Brain*, Vol. 4, ed. V. S. Ramachandran (San Diego: Academic Press, 2002), 367.

<sup>39</sup> Timothy J. Buschman and Earl K. Miller, ‘How Working Memory Works’, in *The Cognitive Neurosciences*, 6<sup>th</sup> edition, ed. David Poeppel, George R. Mangun, and Michael S. Gazzaniga (Cambridge, Massachusetts: The MIT Press, 2020), 357.

<sup>40</sup> Snyder, *Music and Memory*, 54.

particularly in relation to the subjective experience of time, will form a crucial part of my compositional thinking at various points throughout this thesis.

One further aspect of cognition that has come to light during this study concerns the temporal implications of material density. Given the significance of James Tenney's *Meta+Hodos* in this thesis, it is important to briefly clarify my use of the term density in relation to the perception of time, as it does not align with Tenney's description of temporal density; it instead having a closer resemblance to Tenney's idea of vertical density.<sup>41</sup> It is with respect to the amount of sensory information being received at a given moment that I refer to density, yet with a broader view of the cognition of music and what this might contribute to our perception of time. It is generally accepted that the extent to which a given duration is 'filled' with information can disrupt our temporal experience relative to its objectively measured (clock) time.<sup>42</sup> As Mari Riess Jones has stated, 'Time cannot be evaluated independently of the events used to signal durations'.<sup>43</sup> Moreover, if one may also consider how the dynamic nature of individual listening preferences and prior musical experience can affect how information density is perceived and processed, then I would argue that this could be a highly fertile area of contemplation regarding temporal ambiguity. I also believe that the principles of Cognitive Load Theory (CLT) would prove advantageous in this regard. James L. Alty has written on the significance of CLT in relation to musical processing abilities:

Rich schemas are what probably distinguish an expert listener from a novice, since an expert will have more higher level schema to trigger. Novices, in

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<sup>41</sup> Tenney describes temporal density as 'a measure of the relative speed of parametric alteration in a clang (or sequence), or the number of successive elements distinguishable per unit time', and vertical density as 'the number of simultaneous elements perceptible at a given moment in a clang'. Tenney, *Meta+Hodos*, 87.

<sup>42</sup> See Jonathan D. Kramer, *The Time of Music: New Meanings, New Temporalities, New Listening Strategies* (New York: Schirmer, 1988), 330-33; William J. Matthews and Warren H. Meck, 'Temporal Cognition: Connecting Subjective Time to Perception, Attention, and Memory', *Psychological Bulletin* 142, no. 8 (2016): 870.

<sup>43</sup> Mari Riess Jones, 'Time, Our Lost Dimension: Toward a New Theory of Perception, Attention, and Memory', *Psychological Review* 83, no. 5 (1976): 334.

contrast, have to process the unfamiliar schemas using their working memory with a resultant high cognitive load. Unfamiliar music, which is constructed using schemas which we do not recognize is likely to rapidly overload our working memory.<sup>44</sup>

Whilst these aspects of density have not been explicitly employed as a distinct compositional mechanism within the works discussed, it has been intriguing to consider their perceptual significances. Specifically, how a listener's level of engagement can shift when the 'workload' of the materials being experienced at a particular moment may be deemed too great to process effectively. Although it is advantageous to further understand how we tend to process the sensory information we receive, especially within the realm of music (and one so experimental), I must again acknowledge the ultimate arrival point of individual subjectivity. As the Canadian philosopher Paul Thagard articulates, 'Whenever science operates at the edge of what is known, it runs into general issues about the nature of knowledge and reality'.<sup>45</sup>

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<sup>44</sup> James L. Alty, 'Engineering for the Mind: Cognitive Science and Musical Composition', *Journal of New Music Research* 31, no. 3 (2002): 251.

<sup>45</sup> Paul Thagard, 'Why Cognitive Science Needs Philosophy and Vice Versa', *Topics in Cognitive Science* 1, no. 2 (2009): 239.

## Chapter 1: *Overation* (2022)

### 1.1: Structured Silence

*Overation* is a work for string quartet with a duration of approximately 14 minutes. With this piece I was interested in how silence may serve as structurally significant in presenting the gradual expanse of an object's duration, alongside ongoing and increasingly microtonal transformations of pitch. The object in question is a resurfacing four-note chord, with every iteration being unique in pitch content and duration. It is important to note here how I am defining the use of this chord as *object*: the intention is to present this chord as being effectively perceived on the primary basis of a simultaneous realisation of four different notes. By defining this element as a whole, rather than through associations of its constituent tones, a potential space unfolds whereby the relationships of pitch presented are not dependent upon any previous realisations of the chord, nor do they rely upon any form of directionality. Silent measures precede and follow each instance, effectively framing each object to such a degree that they become temporally detached from the third element of *gesture* (discussed below). Therefore, by isolating this object, it encourages the conditions to which it may be perceived as such; i.e., to be experienced on a more fundamentally phenomenological basis.

Framing the materials through these silent measures was, for me, a way of presenting these objects in such clear isolation that the way in which they are perceived defines a rather unambiguous segmentation of time; my approach to what Pearce, Müllensiefen, and Wiggins term 'the identification of boundaries between the final element of one segment and the first

element of the subsequent one'<sup>46</sup> when discussing the role of expectation in musical experience. That said, it is important to draw a line between silence as an *idea*,<sup>47</sup> and the representation of silence through silent measures of musical notation. When instances of a lack of action are experienced *within* a piece of music, these are of course not events completely devoid of sound, yet they may be accepted as essentially functioning as such within the context of sounds heard before and after these points. Di Liberto, Marion, and Shamma describe the role of silence as 'an essential component of our auditory experience, which serves important communicative functions by contributing to expectation, emphasis, and emotional expression.'<sup>48</sup> These 'empty' measures thus function perceptually in this context as representational of *not sound*.

Another point of consideration concerns how these descriptions of inaction may emerge as temporally significant. Taken as such, the 'silences' being used here effectively take on the role of material through the contrast of 'sound versus not sound'. In the performance notes of Bryn Harrison's *Four Parts to Centre* (2002) the composer outlines that: 'Each short section is followed by a pause. The length of pauses may vary slightly but should generally be short'.<sup>49</sup> The revolving nature of this work invites us on the uppermost levels of musical experience to be expectant of such a duality, even when the silences carry no specific durational scheme. Thus, through the use of *not sound* as material in its own right, it may take on structural significance once established as a repetitive element. I find it useful to turn to John Cage regarding this seemingly paradoxical notion:

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<sup>46</sup> Marcus T. Pearce, Daniel Müllensiefen, and Geraint A. Wiggins, 'The role of expectation and probabilistic learning in auditory boundary perception: A model comparison', *Perception* 39, no. 10 (2010): 1367.

<sup>47</sup> This being, in my opinion, the most fundamental definition the term can attain.

<sup>48</sup> Giovanni M. Di Liberto, Guilhem Marion, and Shihab A. Shamma, 'The Music of Silence: Part II: Music Listening Induces Imagery Responses', *The Journal of Neuroscience* 41, no. 35 (2021): 7449.

<sup>49</sup> Bryn Harrison, *Four Parts to Centre*, for B $\flat$  Clarinet, Electric Guitar, Viola, and Cello (self-published score, 2002).



If one is making something which is to be nothing, the one making must love and be patient with the material he chooses. Otherwise he calls attention to the material, which is precisely something, whereas it was nothing that was being made; or he calls attention to himself, whereas nothing is anonymous. The technique of handling materials is, on the sense level what structure as a discipline is on the rational level: a means of experiencing nothing.<sup>50</sup>

Having outlined the two elements of *object* and *silence*, it is useful to introduce the third element; the short parametrically differentiated events which I labelled *gesture*. The gesture commences with recurring consistencies of pitch contour and rhythm; being the only instances of the piece which involve the use of pizzicato, which themselves frame fleeting realisations of a bowed dyad (of which a third part occasionally doubles one of these notes). Figure 1.1 shows a condensed representation of these initial consistencies.

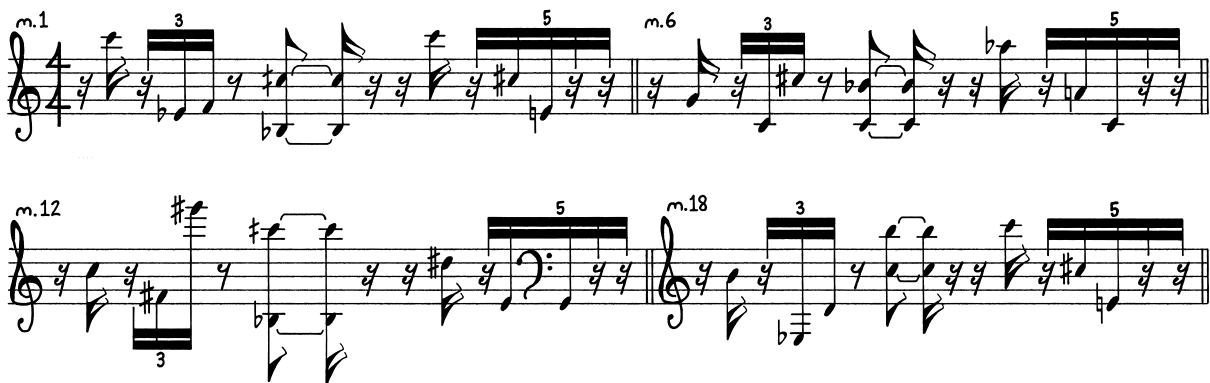


Figure 1.1: Initial consistencies of gestural contour and rhythm in *Overation*

These punctuated events stand in contrast to the sustained nature of the *object*, as they permeate the durations through which they exist. Figure 1.2 demonstrates how the silent measures are used as the determinants of boundaries between both these elements. As can be seen, the gestures and silences themselves become subject to durational variabilities; the

<sup>50</sup> John Cage, *Silence: Lectures and Writings* (50th Anniversary Edition) (Middletown, Connecticut: Wesleyan University Press, 2013), 114.

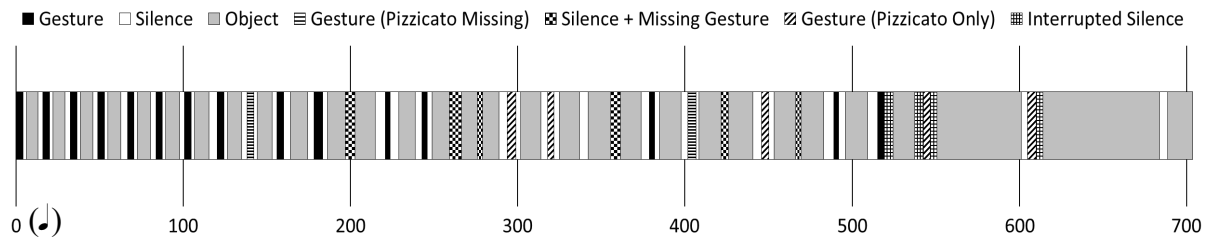


Figure 1.2: Representation of element boundaries in Overation

gesture also begins to surface with missing elements and manipulations of its contour and rhythm. The nature of this construction, as with the use of the empty measures, is to place down distinct temporal 'markers' with high degrees of expectation; that these events may be consistently relied upon to continue occurring as such. The perceptual response I am interested in concerns when any established reliability begins to be undermined. The potential outcomes of such an experience are discussed further in 1.3.

## 1.2: Pitch Organisation

The role of pitch, and particularly perceived tonal relationships having to do with specific temporal experiences, is an issue which was certainly a foundation for what has become the wider parametric focus of this research. It interests me to what extents our perception of time through music may be informed through pitch when more 'established' intervallic relationships are not the significant points of focus, but instead make way for microtonal contexts which remove such a solid grounding. As shown above, the *object* (chord) continues to resurface in isolation, making this the area for increasingly intricate pitch complexes. This was approached in two ways, the first of which concerns a structural approach to range boundaries of the ensemble as whole. As can be seen in Figure 1.3, there is an expansion of tessitura occurring over seven approximately equal divisions of the whole piece.

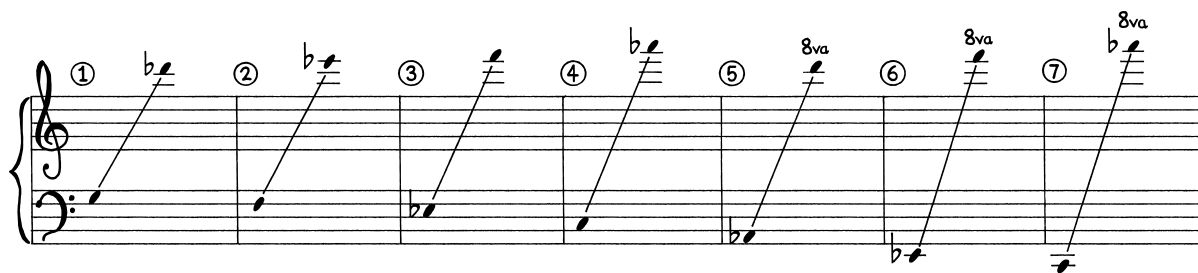


Figure 1.3: Expanding boundaries of pitch-range used in *Overation*

This aspect is again to do with my interests in how the distances which define pitch relationships may continue to change, further affecting perceptions of coherence regarding one's focus of the temporal experience. As my research has to do with the parameters of sound, it seemed appropriate that such ongoing and expanding boundaries would serve the aims of this perceptual enquiry. Russo et al.<sup>51</sup> have documented how tonal responses become much less consistent at both the upper and lower regions of the pitch spectrum; which when coupled with the progressively increasing microtonal factors used in *Overation*, suggests an effective combination which contributes to the growing demands upon cognition.

Considering the limits of range placed on the chord during particular moments, I decided from an early stage that there would be a single yet strong intervallic relationship between successive chords, separated in time though they may be. This is an ongoing alternation of a perfect 5th between A $\flat$  & E $\flat$ , something which persists with no microtonal variation until the very end of the piece; within all realisations of the chord up until this point, one of the parts will feature one of these pitches. Alongside these notes I worked around a simple triadic sequence, whereby a difference of a quarter-tone was applied in an almost 'rotational' fashion upon one note (then eventually two) of the triad in question at each realisation, with the aim of never really allowing any stable relationships of pitch to take hold from the outset. This

<sup>51</sup> Frank A. Russo et al., 'Sensitivity to tonality across the pitch range', *Perception* 36, no. 5 (2007): 781-90.

aspect is further pursued with the eventual introduction of eighth-tones to the proceedings, beginning at around the last quarter of the piece. All these processes of pitch unfold under the aforementioned limits of range.

It's important to address the use of a triadic basis, as harmonically arranged thirds have, in my opinion, very little to offer regarding perceptual challenges in contexts such as this.<sup>52</sup> That said, it seemed an appropriate point of departure in this piece, given the transformative nature of pitch; through their isolated reappearances, any perceived triadic relationship is heard only in comparison to itself. Related to this is Diana Deutsch's view on perceptual differences of simultaneous pitches upon memory over time:

The system that subserves memory for pitch relationships must be capable of retaining information over very long periods of time, whereas this is not true of the system that retains absolute pitch values. Similarly, the system that retains temporal patterns must preserve information for considerably longer than the system that retains absolute values of duration. Based on such considerations, we can assume that when memory for a musical pattern is tested after various time periods have elapsed, differences in its form of encoding would emerge.<sup>53</sup>

And as such, the fundamental triads of this piece cannot be judged to have any definitive tonal footing, even when the microtonal alterations are not considered; my intentions do not concern the recognition of absolute pitch values, but the phenomenological differences in *quality*. Figure 1.4 shows the first 15 chords used, which also go on to repeat in this sequence, but with the introduction of the further transformations discussed above. The triadic bases involved also undergo large-scale rotations as they unfold; yet as previously

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<sup>52</sup> Inasmuch that tonally-functional associations would undermine the nature of identifiability I am seeking with these chords.

<sup>53</sup> Diana Deutsch, 'The Processing of Pitch Combinations', in *The Psychology of Music*, 3<sup>rd</sup> edition, ed. Diana Deutsch (San Diego: Academic Press, 2013), 283.



Figure 1.4: Pitch content of first 15 'object' chords in *Overation*

stated, each realisation is unique in its pitch content. This again draws upon my fascination with our perceptual abilities, and by recurring the use of these triadic sequences, there does fundamentally exist a coherent basis/reference from which to continually and microtonally branch out from. The content of each chord is designed to become increasingly difficult to comprehend; my interest lies on where the limits of our perceptual capabilities may begin to emerge.

When working microtonally with pitch, I have seldom found the need to diverge from equally-tempered systems. For me, the available palette of say, 48-tone equal temperament provides a rich network of navigable possibilities, and it is from this basis which the later stages of this piece are derived. Considered from the viewpoint of my perceptual intentions, this microtonal framework certainly aligns with the concept of tonal 'roughness' in relation to critical bandwidth.<sup>54</sup> That said, it is important to note exactly how I approach such divisions of the octave; as when using this system of 25-cent steps, it is not due to my wanting to achieve perfectly intonated frequencies at such an incremental level. Instead, it becomes for me a matter of *quality*, a matter of difference in relation to what may be considered the more

<sup>54</sup> See Reinier Plomp, and Willem J. M. Levelt, 'Tonal Consonance and Critical Bandwidth', *The Journal of the Acoustical Society of America* 38, no. 4 (1965): 548-60.

stable divisions of quarter-tones and semitones. For example, the sonorities achieved by Gérard Grisey in *Périodes* (1974),<sup>55</sup> certainly reflect the type of experiential aggregates of tones being used by myself here; whereas Grisey had the natural properties of the harmonic series at the forefront of his work, I myself prefer to anticipate where experience may lead by lessening such specificities. And as such, is why the performance notes of *Overation* outline that quarter-tones should be as performed as accurately as possible; eighth-tones however, may be approximated between these points.

Despite the incremental introductions of semiquaver rests among each of the parts, the static nature of the chord has been fairly established as an object by the time these 15 realisations have taken place. It is from this point when (again, incrementally) the instruments begin to expand beyond their single-tone origins. As with the revolving nature of the basic triadic elements discussed above, the nature of these divergences correlates directly, and sequentially, with what the part in question has already visited previously in the piece; being derived from the ordering of tones first established by the instrument at the beginning of the work. The pitch class information already sounded is now reintroduced with an eighth-tone variation, and is not bound to remain in the original octave. This expanding movement of lines naturally results in a progressively meandering texture, as further departures from stasis unfold. This progresses in such a way as to perhaps indicate when it is that one's ability to determine a basis of relational coherence begins to be called into question. As Tom Johnson has commented on types of listening: 'It's difficult to talk about perception: no-one knows exactly how they listen and even fewer how others do'.<sup>56</sup> Mindful of such views, it was my

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<sup>55</sup> Gérard Grisey, *Périodes*, for seven musicians (Milan: Ricordi, 1974).

<sup>56</sup> Bernard Girard and Christine Lucia, 'Conversations with Tom Johnson', *Contemporary Music Review* 39, no. 4 (2020): 418.

aim to present these growing intricacies in such a clearly compartmentalised fashion that the listener may be able to distinguish *how* they are unfolding.

I find it appropriate to relate a more specific cognitive aspect to my methodology here, as my approach to the ongoing transformations of pitch in this piece strongly reflects principles associated with Cognitive Load Theory (CLT).<sup>57</sup> Although most commonly employed in the construction of effective learning contexts, I do find CLT a useful concept to consider regarding relative degrees of experiential comprehension; that is, in contrast to intentions being specifically geared towards long-term retention. Unlike the correlation with material density mentioned in the introduction, my consideration of CLT here is centred on the coherence of pitch.

If pitch complexity may be perceived to be increasing in this piece, then limits of comprehension are likely to be exceeded when attempts are made to continually monitor these evolving relationships. Instead of expanding the quantity of concurrent sounds to present a more challenging outcome, I wanted to explore whether making the relationships between the same number of pitches progressively difficult to parse could have a similar cognitive effect. By attempting to increasingly obscure more 'established' syntactical relationships between notes, I aimed to use this compositionally to elevate the levels of cognitive demand being presented at these points. I certainly find Sweller, Ayres, and Kalyuga relevant in this regard: 'Information is difficult to understand when it consists of more interacting elements than can readily be processed in working memory'.<sup>58</sup> This approach

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<sup>57</sup> 'The objective of CLT is to predict learning outcomes by taking into consideration the capabilities and limitations of the human cognitive architecture'. Jan L. Plass, Roxana Moreno, and Roland Brünken, eds., introduction to *Cognitive Load Theory* (Cambridge: Cambridge University Press, 2010), 1.

<sup>58</sup> John Sweller, Paul Ayres, and Slava Kalyuga, *Cognitive Load Theory* (New York: Springer, 2011), 62.

is specifically designed to direct the listener's immediate focus away from the continuously unfolding and inherently unstable nature of duration at these points. Such a challenge, I find, is also further compounded by the temporal separation between events, and the intervening contrasts of the *gestures*.

### 1.3: Memory and Expectation

Earlier it was discussed how the ‘segments’ of this piece are realised sequentially, and it is through this unambiguous ordering that the listener is invited to accept a certain level of expectation; that this is how the piece will continue to unfold. And as the piece continues, relating this back to the ‘sketchpad’ of working memory (a concept developed in 1986 by Alan D. Baddeley<sup>59</sup>), this assumption does (for at least the opening five minutes or so) continue to hold true. With every re-establishment of this sequence, further ‘imprints’ may be embedded in the working memory of the listener. Whereas smaller recognisable units of stimuli would be more readily comprehended in short-term memory, *Overation* could be said to be interacting with working memory in a fundamentally structural fashion, owing to the longer duration of the elements. And as such, time-ordered *chunks* may be conceptualised through the recognition of difference among the elements of gesture - silence - object - silence etc.; potentially emerging as a consolidated ‘higher-level chunk’ themselves. Through recognition of this pattern and its preliminarily consistent reiteration, a solid foundation upon which questions of the reliability of memory and what has already been heard may be expanded upon.

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<sup>59</sup> Alan D. Baddeley, *Working Memory* (Oxford: Oxford University Press, 1986).



The recurring nature of the structure also gives rise to matters of cognition, specifically in relation to pattern recognition. This is also relevant to how perception of this reiterative form is intended to be led by the distinctive parametric identities of each of the structural elements. A natural function of the human brain,<sup>60</sup> the ability to detect patterns within various stimuli is how I am seeking to engage the listener with this structure. Through the perception of parametric contrast between gesture - silence - object - silence etc., it encourages this pattern to be comprehended most unambiguously; that it may be accepted as the primary method of communication the piece wants to use. Diana Deutsch has outlined that 'when presented with a complex signal, the auditory system may group elements according to some rule based on frequency, on amplitude, on temporal or spatial position, or on some multidimensional attribute such as timbre'.<sup>61</sup> Taking this further, the qualitative differences between structural elements (object/pitch, gesture/punctuated, silence/not sound) also reflect the similarity principle posited by Gestalt psychology: 'If aggregation is caused by similarity, then the degree of cohesion must be a direct function of the similarity'.<sup>62</sup> Thus, when perception is confident in its recognition of a sequence (pattern) of a particular regularity, we are more inclined to accept the pattern *as it is happening*; that is, to engage with the experience on its own terms.

Having outlined my intentions regarding memory and pattern recognition, it is now necessary to assess how these may factor into the experience of time through *Overation*. By bringing together these fundamental perceptual processes, I find it conceivable that the durational

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<sup>60</sup> Mark P. Mattson, 'Superior pattern processing is the essence of the evolved human brain', *Frontiers in Neuroscience* vol. 8 (August 2014): Article 265.

<sup>61</sup> Diana Deutsch, 'Auditory pattern recognition', in *Handbook of Perception and Human Performance*, Vol. 2, *Cognitive Processes and Performance*, ed. Kenneth R. Boff, Lloyd Kaufman, and James P. Thomas (New York: John Wiley & Sons, 1986), 32:2.

<sup>62</sup> Kurt Koffka, *Principles of Gestalt Psychology* (New York: Harcourt, Brace and Company, 1936), 488.

scheme employed may enable temporally ambiguous experiences. Intending to establish a certain level of structural expectation, my temporal concerns have the purpose of transformations taking place on a cognitive level not at the forefront of *now*. What I mean by this is that if the initial regularity of form is perceived as such, it follows that perception is more likely to comprehend this into working memory, thereby outlining a particular landscape which requires less and less attention with every realisation. Therefore, attention becomes increasingly directed to the substance of each element, and not on matters of duration (which have never been passing consistently). Considering the lack of emphasis on the incremental transformations of duration, I find James Tenney's words on attention and accentuation applicable:

In a collection of sound-elements, the temporal distribution of perceptual attention - from moment to moment - will be such that, if the differences in the parametric intensity of the elements are considerable, successive clangs will tend to be formed which are initiated by the more intense, accented elements.<sup>63</sup>

By intentionally directing attention away from matters of timescale, it invites certain circumstances which engender sporadic questionings of how time is unfolding through this work. At least until the extended chord passages towards the end of the piece, there are no clearly evident patterns of time capable of being cognised with any definitive attentional significance - either in short-term or working memory. Mari Riess Jones and Marilyn Boltz have described how characteristic signifiers are a means through which anticipations of time yet to be experienced may be formed:

Often there is distinctiveness as natural time patterns, including special beginnings and endings, characteristic tempi, and rhythms. All of this

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<sup>63</sup> Tenney, *Meta+Hodos*, 41.

contributes to temporal predictability. And predictability allows perceivers to anticipate an event's future course, including when in time it should end.<sup>64</sup>

This correlates with the ways I have withheld (via insufficient temporal distinctions) clear opportunities of directly perceiving the temporal scheme. If such conditions may be established through this experience, I believe what should arise is a temporal relationship between listener and work which is fundamentally rooted in uncertainty. Moreover, it is sought through ways of qualitative *resemblances*, as opposed to direct repetitions. I find such thinking aligns with Harrison Birtwistle in this regard: 'I'm interested in all sorts of things to do with time and repetition within it – repetition that you don't know you're hearing'.<sup>65</sup> In this piece I have intended to affect such a response, to encounter time differently; through such an incremental way that it principally remains out of the direct grasp of current perceptual focus.

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<sup>64</sup> Mari Riess Jones and Marilyn Boltz, 'Dynamic Attending and Responses to Time', *Psychological Review* 96, no. 3 (1989): 461.

<sup>65</sup> Andrew Palmer, 'Harrison Birtwistle', in *Encounters with British Composers* (Woodbridge, Suffolk: Boydell Press, 2015), 84.

## Chapter 2: *Co[a/u]rsing* (2023)

### 2.1: Types of Material

With a duration of approximately 10 minutes, *Co[a/u]rsing* is a duet for piano and percussion, and is the first representation of my parametric interests which disregards pitch in defining the experience. The way in which I was seeking to guide the temporal events in this piece was one of primarily timbral means. When formulating the materials for this piece, one of my first considerations concerned the percussion part; more specifically, how I could approach unpitched sounds which were not from instruments one would conventionally strike. There are two pieces involving percussive scraping which particularly engaged me: James Saunders' *imperfections on the surface are occasionally apparent* (2009),<sup>66</sup> from the multipart series *divisions that could be autonomous but that comprise the whole* (2009-11); and Jürg Frey's *Ephemeral Constructions* (2015-16).<sup>67</sup> I find the James Saunders piece particularly immersive, with the performers using upturned coffee cups on a variety of surfaces. However, in both these works I found the scraping had a particular attentional quality, which I attribute to the nature of these sounds being somewhat 'novel' in relation to wider musical contexts.

I understand this is a highly subjective evaluation of timbral experience; nevertheless, Stephen McAdams, when discussing the psychophysics of timbre, states that 'one of the main approaches to timbre perception attempts to characterize quantitatively the ways in which sounds are perceived to differ'.<sup>68</sup> In a similar line of thought, I became interested in how I

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<sup>66</sup> James Saunders, *imperfections on the surface are occasionally apparent*, for 10 players (self-published score, 2009).

<sup>67</sup> Jürg Frey, *Ephemeral Constructions*, for Violin, Percussion, and Ensemble (Düsseldorf: Edition Wandelweiser, 2015-16).

<sup>68</sup> Stephen McAdams, 'Musical Timbre Perception', in *The Psychology of Music*, 3<sup>rd</sup> edition, ed. Diana Deutsch (San Diego: Academic Press, 2013), 36.

could potentially work with different *types* of scraping through the use of different physical materials. After some experimentation, I decided to use the three materials of wood, stone, and metal - originally alongside three pairs of scrapers of the same material types. I eventually excluded the metal scrapers due to their incredibly invasive quality in relation to each of the other sounds. With this basic range of six individual scraping sounds and timbre as my guiding principle, it gave me the conditions to explore further characteristics (or *qualia*, as termed by Lindsey Reymore and David Huron<sup>69</sup>) through various approaches to scraping-specific articulation.

When making decisions regarding the piano materials, I was confronted with a curious challenge as I questioned the approaches I might take with such an inherently pitched instrument. Intending to guide the experience without reliance on pitch, potential materials were assessed on the basis of their sonic identities; i.e., the parameter of timbre was the central criterion. Wanting the piano to 'reflect' the various scraping sounds from the percussion part, my initial decision was to include the use of a plectrum inside the piano - the performer is given direction-specific notation to scrape between two low strings. Next, I sought a relatively consistent resonance which was to be defined (experientially) not by its contents of pitch, but on the basis of its quality, its fundamental *type*. I shaped a cluster around the two adjacent notes used in the plectrum scraping (figure 2.1), with the aim of further undermining any potential comprehension of tonal relationships; especially when considering the pedal is held down throughout. The third component of this basic layout of piano materials is a swift glissando movement played on the strings with a finger. As for the previous elements, the intent is for this to be perceived on the basis of 'what it is', not the

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<sup>69</sup> Lindsey Reymore and David Huron, 'Identifying the Perceptual Dimensions of Musical Instrument Timbre', in *Proceedings of ICMPC15/ESCOM10*, ed. Richard Parncutt and Sabrina Sattmann (Graz, Austria: Centre for Systematic Musicology, University of Graz, 2018), 372-77.

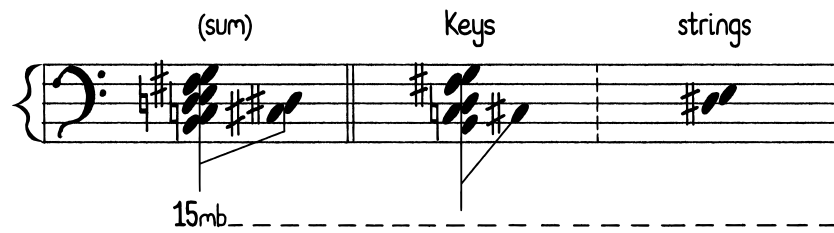


Figure 2.1: Pitch content of piano cluster and scraping in *Co[a/u]rsing*

pitches which constitute it. However, due to the clearer register in which the glissando is placed (C5-G6 is given as a guide in the score), an exception to this action was made which differentiates it from the others: whereas the scraping and cluster are unchanging, the glissando notation indicates that the exact pitch content is to be approached with an approximated range through every realisation. With this set of three timbrally-assessed sound-objects, I find the function of pitch in defining their identities has been made fundamentally redundant.

With this rudimentary fabric established, I then wanted some sounds of a particular salience with which to engage working memory on a more immediate/moment-to-moment basis. These elements were again appraised by their timbral characteristics, the aim being to provide a clear contrast against the events already occurring. With the percussion, differing approaches to articulation were explored; my decisions resulting in 'knocks' on the surfaces, and dynamically differentiated 'swipes'. These 'types' of sounds were complemented in the piano part through the use of vocal sounds: a 'knocking' sound made through a click of the tongue (resembling the struck percussion sounds), and a 'shushing' sound which aims to sympathise with both the scraping and swiping. These are the basis of my 'upper-level' perceptual events - where I intended to direct the temporal experience through instilling expectations in the listener which become increasingly unpredictable.

On the subject of certain elements being perceived as related, Diana Deutsch writes: "When different types of instrument play together, we tend to form linkages between tones that are similar in timbre. We also invoke other principles, such as good continuation and common fate, in making grouping decisions".<sup>70</sup> Working with this disparate collection of sounds, I bound them as a basic rhythmic unit (figure 2.2) which was to continue to resurface - both with manipulations of its inner proximities, and of durational distance between events. In relation to the underlying percussion/scraping and piano/punctuating context of these 'base' layers, these aspects may certainly be defined as having not only contrasting parametric qualities, but considerable variance in parametric *intensities*. That is not to say that these sounds are intrusive or overbearing, but when layered over the established context, they may readily become the vehicle for perceptual attention.

Figure 2.2: Basic rhythmic unit of higher-attentional layer in *Co[a/u]rsing*

## 2.2: Layers and Time

With the materials employed in this piece already laid-out, it will be useful here to illustrate how each of these elements are temporally defined, and to outline the layered approach of the form they take. The scraping undergoes a simple contraction and expansion scheme within

<sup>70</sup> Diana Deutsch, 'Grouping Mechanisms in Music', in *The Psychology of Music*, 3<sup>rd</sup> edition, ed. Diana Deutsch (San Diego: Academic Press, 2013), 196.

the structural confines of the current tempo; initial longer durations become constricted then proceed to relax again. In defining what constitutes an individual duration, a single unit is identified as each unique combination of scraping materials - effectively, each time there is a shift in timbral quality. I like to think of the scraping as the work defining its own context, as this first layer of temporal irregularity is established. Such an approach to 'timbral layers' is something previously explored in John Cage's *Ryoanji* (1983-85);<sup>71</sup> a work which has been comprehensively analysed by John Latartara.<sup>72</sup> Whereas in my experience of this piece there is a definitive expectational quality which persists at each timbral level, it is my intention in *Co[a/u]rsing*, however, to establish a qualitative reference point upon which more immediate matters of attention may be imposed.

It is important to reinforce the aim of this first layer not being the crux of the experience - its ongoing instability is something which *may* be attended to. I suspect further significances may be perceived regarding these timbral differences, throughout differing approaches to the experience among different listeners. However, from my own perspective, I like to think of the establishment of this layer that the scraping simply *is*; it is happening and continues to do so. Whether or not its role changes as the piece goes on to contain further events is something which greatly interests me, yet unfortunately may only be speculated on at this time.

The following layer was constructed with the primary piano elements of the low cluster/string scraping, with intermittent appearances of the glissando. Here I will outline how this scheme is durationally defined, and consider how this layer interacts with the previous; effectively resulting in a single contextual layer. As seen in figure 2.3, the temporal scheme taken by

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<sup>71</sup> John Cage, *Ryoanji*, for variable instrumentation (Leipzig: Edition Peters, 1983-85).

<sup>72</sup> John Latartara, 'Cage and Time: Temporality in Early and Late Works', *College Music Symposium* 47 (2007): 100-16.



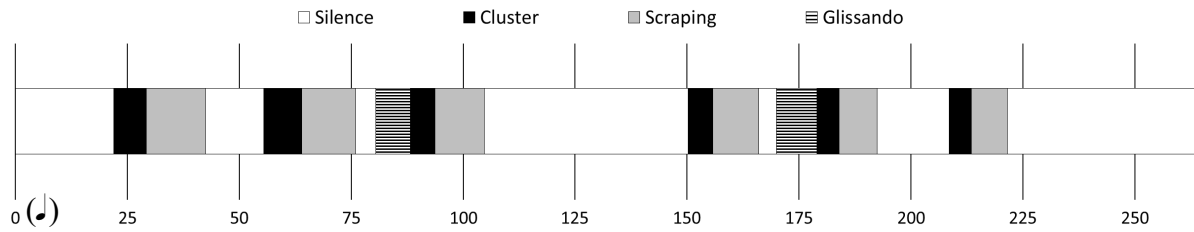


Figure 2.3: Temporal inconsistencies of piano materials in Co[a/u]rsing

these materials is one concerned with inconsistency. Once clearly established over several minutes, such combinations are likely to be perceived as ongoing systematic processes with very little regularity. However, it is important to consider the length of time these changes are occurring over; they unfold over such extended periods to reduce their ability of being the primary attentional focus. Regarding the manner of temporal distribution used here, I again turn to Diana Deutsch: 'The division of a sequence of elements into subsequences is readily achieved by increasing the size of temporal gap following the last element of each subsequence'.<sup>73</sup> The materials are clearly (yet irregularly) segregated through time to essentially render them as unreliable timekeepers.

Considering also the percussion layer, each aspect follows its own individual course, yet both are made to exist together - separate timelines grating against one another. I consider these two layers as having the role of directing the structural track of the work; yet in contrast to *Overation* (chapter 1), they take place on a perceptual level upon which they *may* be attended to. Although not functioning on the same temporal basis, the changes these layers are undergoing are not out of grasp - at practically any moment in the piece they may become the current focus. I also find it interesting to consider how much agency a listener may have in attending to these processes, particularly when the 'upper-level layer' of 'punctuation' increasingly imposes itself on the experience.

<sup>73</sup> Diana Deutsch, 'Auditory pattern recognition', 32:38.

Examining this salient 'punctuated' layer itself, (or 'thing', to use Dora Hanninen's<sup>74</sup> terminology), these 'upper-level' events (figure 2.4) continue to develop new points of articulation with unreliable temporal consistencies (as progressed from figure 2.2). Due to the parametrically differentiated qualities of timbre found in this element when compared to its underlying context, cognition is invited to interact with these units by way of their initial regularity - laying the foundations for expectation. This aims to become a key perceptual element which working memory may readily comprehend; by having one's attention, matters of predictability may commence directing the experience. I could then attempt to interact with this conscious unfolding by manipulating expectations of what - for many - would likely be deemed 'logical' conclusions. Bryn Harrison's 2010 work *M.C.E.*<sup>75</sup> for solo guitar effects a comparable temporal response, although via means of pitch relationships and distinctions of register. Thus, by exploiting such expectations, (both *within* the elements themselves and the space between individual events), it allows the conditions for the 'regularity' of passing (clock) time to be brought into question. If perception is led to believe a particular rate at which an experience is repeating, then differences in the ways this re-presents itself lend credence to ideas of temporal disruption.

(mm. 65-67)

Figure 2.4: Temporal development of basic rhythmic unit in *Co[a/u]rsing*

<sup>74</sup> Dora A. Hanninen, 'A Theory of Recontextualization in Music: Analyzing Phenomenal Transformations of Repetition', *Music Theory Spectrum* 25, no. 1 (2003): 59-97.

<sup>75</sup> Bryn Harrison, *M.C.E.*, for Guitar solo (self-published score, 2010).

What is also relevant in this regard is how I have considered the role of attention; or, more specifically, how I attempted to engage with attention as a compositional principle. Instead of taking a more measured and quantifiable approach to the expansion and contraction of this upper layer, the way in which I ultimately determined the temporal distances between events was by anticipating how attention would most likely be functioning at these points. From a psychological perspective, I would relate this to Michael I. Posner's orienting of attention, described as 'the aligning of attention with a source of sensory input or an internal semantic structure stored in memory'.<sup>76</sup> It is then by considering the contrast between timbral qualities that I have tried to realise this attentive dynamic; as Nelson Cowan states, 'Although many stimulus conditions may cause orienting, they appear to reduce to two situations: stimulus novelty, and stimulus significance'.<sup>77</sup> By determining this upper layer as the most prominent (or *novel*) focus of attention (when present), I could attempt to undermine its durational predictability. The significance I found by engaging with such a principle was a distinctly more flexible approach to the temporal organisation of these materials.

One further consideration I find relevant here concerns the amount of information being presented within a particular timeframe. An idea introduced by Robert Ornstein in 1969, the storage size hypothesis<sup>78</sup> posits that the more time one has to cognise an element, the more likely we are to comprehend what has been presented. This idea argues that memory has a working capacity; a threshold at which certain elements decrease in perceptual significance. Such an approach was intentionally used in *Co[a/u]rsing*, whereby the rate at which the elements resurface continues to increase, with the amount of time traversed between events

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<sup>76</sup> Michael I. Posner, 'Orienting of Attention', *Quarterly Journal of Experimental Psychology* 32, no. 1 (1980): 4.

<sup>77</sup> Nelson Cowan, *Attention and Memory: An Integrated Framework*. (New York: Oxford University Press, 1997), 140.

<sup>78</sup> Robert E. Ornstein, 'The "Storage Size" Metaphor', in *On the Experience of Time* (Middlesex: Penguin, 1969), 37-52.

becoming increasingly narrower. As the amount of information presented grows *per-moment*, concerns of memory may then surface regarding which stimuli may persist as 'placeholders', (referring back to the 'sketchpad' idea from chapter 1), and what linkages may fall from consideration having been deemed no longer pertinent. I understand how diverse any potential responses to such a subjective experience may be - yet, for myself, it is more about attempting to institute the types of environments in which these perceptual quandaries may surface in the first place.

### 2.3: Aesthetic Considerations of Perception

I'd like to address here the rather 'unconventional' materials used in this work, and consider how they may proceed to function from an aesthetic perspective. In what is a fundamentally perceptual inquiry, I find it curious why I have chosen such 'unusual' sounds - and, moreover, what are the aspects a listener could be potentially inclined to engage with. What I have tried to establish in this work is a temporal experience capable of being conceptualised through comprehension of the patterned forms the sounds are moving through; essentially, encouraging interaction with the materials through their *function*, as opposed to aesthetic judgments of *substance*. I find that through the use of such atypical materials, this music may be described as largely having only itself as a point of reference, (a notion which has been previously addressed by Bryn Harrison<sup>79</sup>). Irène Deliège, in addition to empirical studies, has drawn from various creative approaches in discussing the perception of similarity/difference relations in the experience of music; those of particular relevance here being *internal similarity relations*, which are experienced 'in the same work or part of a work, and in the

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<sup>79</sup> 'I began to understand how music might be understood without any affective connotations, without any reference to things other than itself'. Bryn Harrison, 'Cyclical Structures and the Organisation of Time' (doctoral thesis, University of Huddersfield, 2007), 3.

same interpretation'.<sup>80</sup> Thus, if the materials being used are predominantly without external context(s) of previous experience/knowledge, it then follows that the receptive mind requires more specific strategies of attempting to understand.

Auditory scene analysis (the 'distinction of auditory events or objects in the broader auditory environment'<sup>81</sup>) is particularly relevant to *Co[a/u]rsing* when considered as its own 'auditory environment'. When we encounter stimuli which is not readily comprehended or is deemed to be of a certain level of abstraction, a natural function of the human mind is to attempt to find understanding through the perception of patterns and their interrelationships. Chakrabarty and Elhilali illustrate this as such:

The ability of humans...to parse the mixture of cues impinging on our senses, organize them into meaningful groups and map them onto relevant foreground and background objects. Our brain relies on innate dispositions that aid this process and help guide the organization of patterns into perceived objects.<sup>82</sup>

Therefore, by inviting engagement through such an inherent cognitive function, it greatly interests me to consider this idea of 'process-as-aesthetic' as being incredibly pertinent to the temporal experience of the work.

One further point of consideration concerns the function of repetition. Not only relevant to the workings of pattern recognition, but I would also like to reflect on repetition as aesthetically relevant on its own terms. Regarding pattern recognition, Massimiliano Viel provides a comprehensive elucidation: 'A pattern is related to practices involving a reiterated

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<sup>80</sup> Irène Deliège, 'Similarity relations in listening to music: How do they come into play?', *Musicae Scientiae* 11, issue 1 (2007): 9.

<sup>81</sup> Jeremy M. Wolfe et al., *Sensation & Perception*, 5<sup>th</sup> edition (New York: Sinauer Associates, 2018), 309.

<sup>82</sup>Debmalya Chakrabarty and Mounya Elhilali, 'A Gestalt inference model for auditory scene segregation', *PLoS Computational Biology* 15, no. 1: e1006711 (2019): 2.

connection to a reference based on resemblance: there is no pattern without an event of its recognition and the possibility of its new occurrences'.<sup>83</sup> Thus, in determining what defines a pattern as such, it is necessary to experience particular elements as happening again. Yet I find that repetition itself, however, stands as an even more elementary mode of engagement - regardless of any would-be patterning. When considering the distinctive sounds used in this piece, repetition becomes one of the core ways through which we may attempt to comprehend abstract information. Margulis has undertaken studies which demonstrate how 'the simple introduction of repetition, independent of musical aims or principles, elevated people's enjoyment, interest, and judgments of artistry. This suggests that repetition is a powerful and often underacknowledged aesthetic operative'.<sup>84</sup>

This is not to state that repetition alone will ultimately result in aesthetically positive experiences; yet when considered as a primary method of engaging with recondite stimuli, I find it acquires an elevated role of substantial importance. Furthermore, when memory is able to construct representations of a work's structure through the use of repetition, it signifies an incredibly fertile compositional resource when dealing with the experience of time. Margulis has also spoken to the significance of repetition in relation to temporal perception:

When temporal ordering is fixed, repetition welds the distinct component occurrences together into inseparable chunks, such that perceivers "listen ahead," with the expectation for forthcoming events literally alive in the present moment—expectations that are felt and experienced rather than cognized or articulated. Repetition effects this temporal welding—and this temporal connectedness, in turn, whets an appetite for further repetition.<sup>85</sup>

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<sup>83</sup> Massimiliano Viel, *Listening Patterns: From Music to Perception and Cognition* (Saarbrücken: LAP LAMBERT Academic Publishing, 2019), 201.

<sup>84</sup> Margulis, *On Repeat*, 16.

<sup>85</sup> Margulis, *On Repeat*, 72.

And as such, through the durational conflicts used on several temporal scales throughout *Co[a/u]rsing*, repetition serves as a basis which enables comparisons to be made against events already perceived; and, furthermore, to influence anticipations of what may yet reappear.

It was stated in the introduction to this thesis that I do not speak of repetition as being of a universally verbatim nature, but as the perception that an element is once again taking place. One interesting idea that arises from this is the extent to which something may progressively change until it is no longer recognised as what it once was. It is intriguing to contemplate how such identities could be judged to have diverged significantly from their original points of reference, and how varying perceptual responses may converge on such judgments. In this work, however, my focus was to maintain relatively consistent parametric profiles, with any crucial discrepancies between recurring elements primarily centred around duration.

## Chapter 3: *Shades of Same* (2023)

### 3.1: Timbre-Pitch Profile

The only solo work submitted in this thesis, *Shades of Same* is a piece for flute with a variable duration of between approximately 17 and 22 minutes. Much like the work explored in chapter 2, this piece again takes the parameter of timbre as its primary communicative basis. However, it's important to note that pitch, or more precisely, considerations regarding register, now play a significant role in evaluating different sound-types. It is also necessary to acknowledge that various approaches to the study of timbre exist, each differing in their considerations of other sound elements as being relevant to sound-qualities. This work finds consistency with Reymore and Huron inasmuch that this particular study considers the effects of pitch in the classification of timbres - a factor not universal throughout similar research. Furthermore, my own approach to the creation of this work was indeed concerned with 'the phenomenological experience of sound that may extend beyond acoustical correlates and include cultural, affective, or other types of factors'.<sup>86</sup>

Working to create a diverse palette of timbral qualities, I assessed the types of sounds produced by various approaches to articulation and technique; subsequently appraising the resultant qualities when considered with register. This led to an awareness that individual timbral qualities could achieve a heightened perceptual effectiveness through the use of limited pitch-boundaries in maintaining timbral consistency. For example: in classifying an 'ordinary' pitched sound as articulated by the flute, it is misleading to classify sounds of the same articulation as 'of the same type' - even if they happen to be two octaves apart. Which is

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<sup>86</sup> Reymore and Huron, 'Identifying the Perceptual Dimensions', 372.



why pitch had to be considered in assessing timbre; there are levels of difference in timbral qualities which correlate to distances of pitch.

Seeking to establish such clearly-defined materials, evaluated via pitch and timbre, I took a very 'clinical' approach to the range of the flute. Beginning with a standard three-octave range (C4-C7), it was my original intention to apportion this scope of 72 quarter-tones equally among the selected sounds. However, two important considerations affected this outcome: the reduction of bandwidth relative to increases in pitch frequency, and the potential of perceived encroachment on adjacent pitch regions.

The first concern was addressed by assigning wider boundaries to sound-types relative to their pitch heights; the lowest elements receiving the narrowest spaces due to their relatively increased bandwidth. On the matter of neighbouring pitch-spaces, I segregated the sounds further by disregarding equal areas of the pitch-space. Figure 3.1 outlines this division of sounding and non-sounding areas. By using 'empty' space between the sounding-areas, it encourages an increased level of perceptual clarity whereby individual qualia are less likely to be experienced as tonally interdependent.

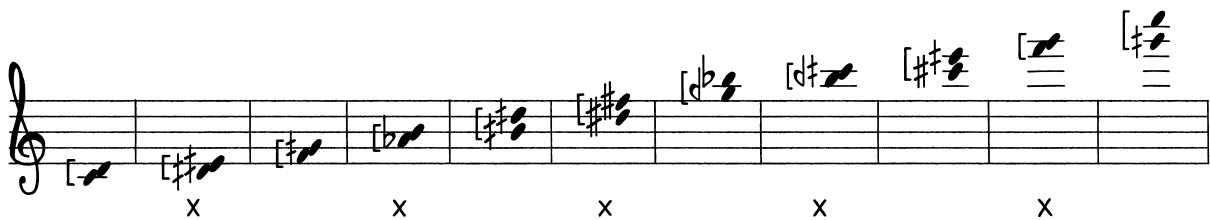


Figure 3.1: Active and non-sounding pitch boundaries in *Shades of Same*

I then chose six articulation-specific sound qualities, narrowed down from wider considerations:

Standard articulation 'ordinary' sounds

Sung tones

Lip pizzicati

Flutter-tonguing

Microtonally-inflected trills

Bisbigliando

Five of these establish the wider fabric of this work, with the sixth being employed as a resurfacing 'reference point'. Commencing with this diverse collection of sounds, it provided the conditions for them to be employed on a functional basis of recognition - that change is to be an ongoing expectancy. I'm interested in how the same fundamental materials may be able to undergo such recontextualisation through recognition of the absence or presence of particular qualities. I find Lawrence Zbikowski's thoughts on perceptual categorisation very apt in this regard:

Because categorization is an active response to the environment, it always has a temporal dimension... With music the temporal aspect is slightly more prominent, since musical entities are thoroughly ephemeral: not only must we evaluate each musical entity in turn, but also this evaluation is practically the only evidence that the entities ever existed at all.<sup>87</sup>

Having established both the range of sounds and divisions of pitch-space, I was then able to assess the outcomes of their qualities relative to pitch placement; the first step in experimenting with the phenomenological effects of the stimuli. Considering the segregation of sounds through the use of non-active pitch-regions, I took another step towards the aim of unit clarity - an approach certainly less methodical and of a considerably subjective nature. I applied descriptive terms to the qualities of each sound-type and sought out potential overlaps

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<sup>87</sup> Lawrence M. Zbikowski, *Conceptualizing Music: Cognitive Structure, Theory, and Analysis* (New York: Oxford University Press, 2002), 51.

in perceptual values. For example, I attributed ‘airy’ to both the ordinary and sung tones, and ‘vibrant’ to the bisbigliando and flutter-tonguing; the outcome of this is that attributes I deemed too similar in qualitative nature were to be further separated throughout the spectrum. The final distribution of sounds is outlined in figure 3.2. This descriptive approach brought to attention my experiential response to a particular solo work for a wind instrument, Rebecca Saunders' *Caerulean* (2010-11) for bass clarinet.<sup>88</sup> My perception meets this music on the basis of its contrasting sound-types and their relative intensities; which I find is the vehicle perpetually influencing a sense of expectancy, inviting contemplation upon its myriad of qualities. Although of a considerably different intentionality, *Shades of Same* certainly strives to express such perceptual contrasts of timbre.



Figure 3.2: Distribution of sounds within active pitch boundaries in *Shades of Same*

It is also important to acknowledge the relevance of parametric intensities regarding my distribution of these materials. Although my assessment of these sounds was concerned with distancing what I perceived as some degree of shared characteristics, this led me to question the extent to which the timbral quality of each individual sound was crucial in defining the identity of that sound. What I mean by this concerns how we may engage with each individual sound; what is essential in each of the perceived sounds, that defines the identities with which we understand them?

<sup>88</sup> Rebecca Saunders, *Caerulean*, for Bass Clarinet solo (Leipzig: Edition Peters, 2010-11).

For example, an 'ordinary' note is, I would argue, much more likely to be experientially defined on the basis of pitch; whereas a flutter-tongued note has an elevated degree of interest regarding its mode of sound production. Therefore, speaking strictly within the broad context of *timbre*, the nature of the flutter-tongue has a stronger parametric intensity than an 'ordinary' sound when we consider the degree to which timbre defines the identity of the material.

James Tenney spoke of such a dynamic treatment of parameters in Schoenberg's *Five Pieces for Orchestra*, Op. 16, stating how 'timbre does become the most effective shaping factor, and the degree of articulation of all the other parameters is correspondingly reduced to a minimum'.<sup>89</sup> Given the dynamic nature of perceptive interaction with such contrasting parametric intensities, it interests me to consider the effect this has on the temporal essence of each individual sound. What my approach has intended in this regard, given the diverse cognitive significances of each sound-type, is to offer a greater level of depth to the materials in terms of how they are temporally processed.

I find it necessary to emphasise that my approach to the organisation of materials may only be described as being perceptually significant on a primarily subjective basis; my own interactions with the materials are not a reliable basis with which to make experiential predictions. Nonetheless, I find Michael Maierhof's words firmly align with my own thought processes: 'The problem is to organize the sounds: to create composed audible spaces that make sense, which are not arbitrary... I listen to the sounds over and over again to find out what makes sense in an audible way'.<sup>90</sup> Yet the result of my own 'finding out' was one of considerable difficulty, when attempting to discern the types of experiences other listeners

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<sup>89</sup> James Tenney, 'On the Development of the Structural Potentialities of Rhythm, Dynamics, and Timbre in the Early Nontonal Music of Arnold Schoenberg (1959)', in *From Scratch: Writings in Music Theory*, ed. Larry Polansky et al. (Urbana: University of Illinois Press, 2015), 10.

<sup>90</sup> Sebastian Berweck, 'Beyond Pitch Organization: an interview with Michael Maierhof', in *Noise in and as Music*, ed. Aaron Cassidy and Aaron Einbond (Huddersfield: University of Huddersfield Press, 2013), 137-38.

may encounter. In confronting this challenge, I sought to promote a qualitative independence in the materials; imposing these further conditions upon them with the aim of enhancing their perceptual clarity.

### **3.2: Duration and Repetition**

As my interests are directly concerned with temporal perception, I now went about constructing a malleable form capable of hosting these sounds. An approach I have observed myself leaning towards in much of my compositional work surrounds a method of deriving particular musical elements (usually duration) from a single basis. Two conditions preface my approach with respect to duration: the length of time of a primary unit, and how many further divisions of time should constitute this unit. In assigning the duration of a 'prime' unit, generation can arise from of multitude of influences. It could be some mathematically significant value, or it could be arbitrary. For this piece, having spent time assessing the sounds, I attempted to envision the minimum time necessary (in seconds) for each of the five sounds to exist in some meaningful way (excluding the bisbigliando 'reference point'). I arrived at the duration of 27 seconds, which I translated into notation using 65 crotchet beats per minute; a figure arrived at through the tapping of a digital metronome during this 'thought experiment'.

I then went about applying some form of proportional scheme on this basic duration - it is unnecessary to expand upon the origin of the basis I employed. As before, these could be entirely random in nature, or referencing some particular numerical constant; what interests me is what is actually *done* with a certain scheme. My perspective identifies closely with Brian Ferneyhough here: 'Partitioning of given rhythmic patterns forms part of the composer's arsenal of tools for apportioning contextual meaning to the "raw facts" of the

initial structure'.<sup>91</sup> The proportional scheme used is illustrated in figure 3.3, whereby the smaller divisions generated go on to inform the durational values of the materials themselves. I hesitate to label this a 'fractal' approach, despite its potential resemblance - my concerns relate to the use of certain methods as a starting point, rather than adhering to a particular rigidity. That is, I prefer responding to a system's suggestions and anticipating unforeseen potential, rather than a strict preservation of values.

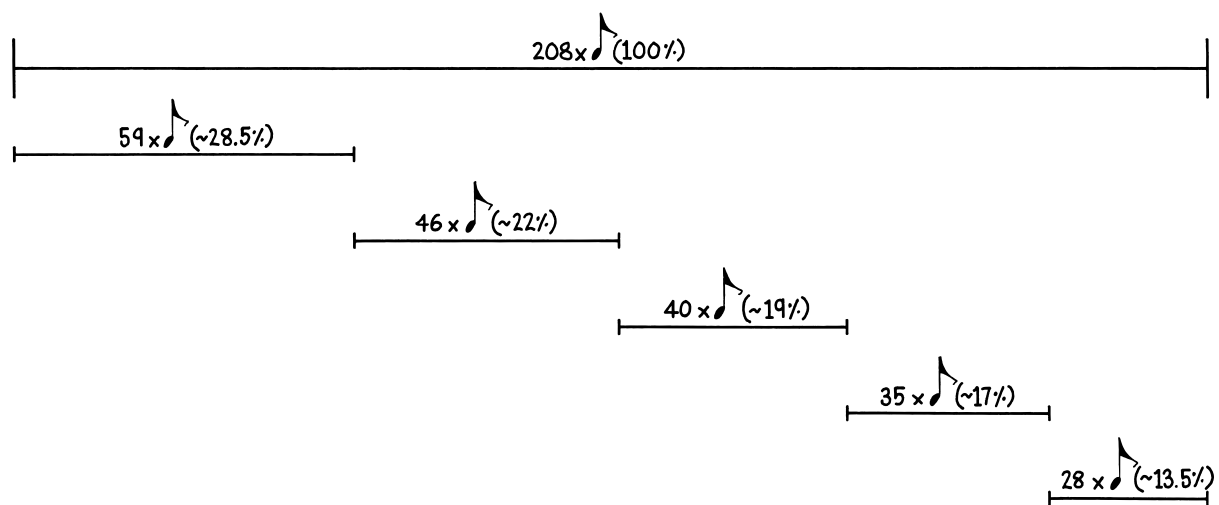


Figure 3.3: Proportional scheme used for all materials in *Shades of Same*

Having both the sounds and the durational scheme with which to express them, I explored possible ways of assembling these materials to exist together, to assess the ways in which they might interact. I devised another simple system whereby every type of material combination could be expressed. With a set of five values there are 31 possible combinations in which to realise the materials; only one of these did I not include, giving the total of 30 elements which comprise the piece. The five substantive qualities were each assigned a duration, which can be seen as the final five numbered elements in the score (Nos. 26-30). Rather than a standard layering process of superimposition, I assembled combinations of

<sup>91</sup> Brian Ferneyhough, 'Duration and Rhythm as Compositional Resources', in *Brian Ferneyhough: Collected Writings*, ed. James Boros and Richard Toop (Amsterdam: Harwood Academic Publishers, 1995), 58.

materials by various degrees when exploring the resultant properties. I certainly find my thinking at this stage resonating once more with Ferneyhough:

The challenge, of course, is to specify objects which suggest such a high degree of internal coherence that the listening ear is necessarily twisted at an angle towards a structured awareness of the insufficiency built into the dimensions of the time-space within which the object is located.<sup>92</sup>

It was useful for me to have these five solidified units as a working basis, allowing the assumption of a certain coherence in the 'true' representation underlying each type. Further, this also enabled the conditions whereby I could react intuitively towards my temporal aims, by experimenting with the staggered outcomes of these 'moveable types'. An important work I think useful to mention here is James Saunders' *511 possible mosaics* (1999).<sup>93</sup> This work uses nine individual instrument characters of c.18 seconds in duration, which led Saunders to consider 'the possibility of any combination of the nine instrumental parts being performable, but with an exact synchronisation'.<sup>94</sup> I find parallels with my work in this piece, with both expressing well-defined components. However, *Shades of Same* involves the experience of material fragmentation throughout the majority of its duration; whereas contrastingly, *511 possible mosaics* employs a complete presence or absence of material in establishing combinatorial contexts.

I'd like to now address the matter of variable duration this piece uses. Looking at the works discussed in the previous two chapters, one thing that was common to both (and indeed, most of my previous compositional work) is the idea of durational rigidity. Until *Shades of Same*, I

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<sup>92</sup> Brian Ferneyhough, 'The Tactility of Time', in *Brian Ferneyhough: Collected Writings*, ed. James Boros and Richard Toop (Amsterdam: Harwood Academic Publishers, 1995), 44.

<sup>93</sup> James Saunders, *511 possible mosaics*, for ensemble (self-published score, 1999).

<sup>94</sup> James Saunders, *511 possible mosaics (1999)* (web page), accessed September 8<sup>th</sup> 2023, <https://www.james-saunders.com/511-possible-mosaics>

have always tended to establish a relatively fixed amount of time for a work to exist within. I can acknowledge that there is not a substantial difference between the extremes of 17 and 22 minutes, but that this is ultimately an outcome beyond my control is an issue that interests me. Figure 3.4 shows the complete repeat structure used. Despite such a structured (yet variable) ordering of time, it fascinates me to reflect on how we attempt to 'manage' time through our organisation of it - something which fundamentally relates to individual matters of perspective. Maurice Merleau-Ponty highlights such a distinction from objectivity:

Constituted time, the series of possible relations in terms of before and after, is not time itself, but the ultimate recording of time, the result of its *passage*, which objective thinking always presupposes yet never manages to fasten on to.<sup>95</sup>

① x 2	⑥ x 2	⑪ x 2	⑯ x 3	⑳ x 2/3	㉖ x 2
② x 2	⑦ x 3/4	⑫ x 3	⑰ x 3-5	㉑ x 2	㉗ x 2
③ x 2/3	⑧ x 2	⑬ x 2-4	⑱ x 2/3	㉒ x 2-4	㉘ x 2
④ x 2	⑨ x 2-4	⑭ x 2	⑲ x 3-6	㉓ x 2	㉙ x 2
⑤ x 2/3	⑩ x 3	⑮ x 2-4	⑳ x 3	㉔ x 2-5	㉚ x 4

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Figure 3.4: Complete repeat structure used throughout *Shades of Same*

Such thinking is the most likely candidate which led me to loosen control of duration in this piece, to increase the unpredictability from my own perspective. The idea of such unbalanced durational subtleties across different performances is something which intrigues me greatly. By emphasising the unique essence of the time in which it was experienced, this work may more genuinely align with what I perceive as the inherently natural state which fundamentally is *time*.

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<sup>95</sup> Merleau-Ponty, *Phenomenology of Perception*, 482.



### 3.3: Recognition

With each of the materials created around a basis of timbral independence, I am eager to uncover the ways in which particular qualities may invite a listener to make connections *through* time; that is, on a foundation of recall from that which has already been heard. This concerns my original inquiries surrounding temporality, and I find this piece offers a useful contrast to the intents of the previously discussed works. I often have a preoccupation with the capabilities of a musical experience in enabling prominence of temporal ambiguity and subjectivity; yet I am not sure such an intent can be demonstrated here. Rather than establishing a given duration within which particular perceptual units may exist, and then attempting to engage with memory through durational disruptions, I have attempted with this work to guide the ear towards a process of what is and isn't present - to be mindful of new contexts through different combinations of the same things. Once again, I find correlation with the thinking of Harrison Birtwistle:

I'm very intrigued by how pieces are completely different when you hear them several times...about what your mind, particularly in a complex piece of music, is deciding to listen to at a particular time; and that you take a path through it.<sup>96</sup>

One could perhaps approach this work as somewhat of a 'puzzle', as potential qualities of a particular salience find their appearances segregated through time. Morton Feldman, when discussing his particularly intuitive approach to repetition in *Triadic Memories* (1981),<sup>97</sup> described his intentions as 'a conscious attempt at "formalizing" a disorientation of memory'.<sup>98</sup> Thus, if a specific sound consistently emerges as prominent in several consecutive

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<sup>96</sup> Harrison Birtwistle and Ross Lorraine, 'Territorial Rites 2', *The Musical Times* 138, no. 1857 (1997): 14.

<sup>97</sup> Morton Feldman, *Triadic Memories*, for piano solo (London: Universal Edition, 1981).

<sup>98</sup> Morton Feldman, 'Crippled Symmetry', in *Give My Regards to Eighth Street: Collected Writings of Morton Feldman*, ed. B. H. Friedman (Cambridge, Massachusetts: Exact Change, 2000), 137.

contexts, how might this impact the perception of time when the element considered significant suddenly fails to surface for an extended period? To clarify, my interests concern enabling the conditions that such questions may be posed, rather than obtaining objective results. Nevertheless, I find the temporal approaches taken in this piece, driven by such a highly inquisitive nature, may be more accurately defined as having a reduced compositional intentionality; that is, an experience fundamentally dependent upon individual perspectives.

A view I find useful is in framing this work as a potential entity, seeking to be understood. However, comprehending its complete form necessitates self-deconstruction, reliant upon the listener's recognition of its progressively reductive contexts. Furthermore, the multitude of ways in which the same fundamental elements interact and establish new contexts was, for me, a very useful approach in allowing individual combinations to inform their own temporal relationships. An intriguing parallel can be made with Stockhausen's 1986 flute version of *Xi*,<sup>99</sup> (derived from the opening of the composer's opera *Montag aus Licht*). Although of a more microtonally-contoured nature, there are interjections of timbral contrast which I certainly perceive as having significant attentional qualities within the larger context. Structurally differentiated as this work may be in relation to *Shades of Same*, I do find, through its approach to parametric intensities, it brings to the surface the relationship between recognition and expectation.

It interests me to contemplate just how strongly a factor of recognition regarding sound-qualities may affect the similar cognisance of the repeat structure; if the ear may be inclined to place significances on the interaction between particular sonic identities, what then of

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<sup>99</sup> Karlheinz Stockhausen, *Xi*, for a melody instrument with microtones, version for alto flute or flute (Kürten, Germany: Stockhausen-Verlag, 1986).

attention to the larger time-structures? Margulis highlights how 'some of the effects of repetition, including an emergent sense of inevitability or rightness, can depend on a lack of awareness that repetition itself is mediating the experience'.<sup>100</sup> Thus, if attention may be primarily concerned with the ongoing recontextualisations of qualities, matters of duration may unfold at a perceptual level below that which is being attended to. If this can indeed be the case, it then follows that one's perception of the passage of time may be affected in ways which emphasise its intrinsically subjective and ambiguous nature.

As the only element featuring each sound-type occurs at the opening of the piece, I find it worth considering the temporal implications of this unfolding approach to its structure. Setting out with the largest degree of density at the beginning of the work, one's first encounter involves all of its components. At this point, it is likely that matters of duration do not factor significantly; perception being more readily preoccupied with the interaction of individual qualities. Relating this again to perceptual categorisation, Zbikowski speaks of 'the fact that we must process musical materials in time and that it is often the case that significance accrues to the first events in any psychological process'.<sup>101</sup> But as the texture gradually thins to lessening constituent parts, I am interested in observing whether potential contradictions exist within the temporal experience.

This idea concerns the amount of *types* of information present in each element in relation to the progression of the temporal scheme; with the repetitive units become increasingly shorter as relative to the number of qualities present. Where the potential contradiction arises is that by having a reduced number of aspects to attend to, we may perceive the current sounds as

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<sup>100</sup> Margulis, *On Repeat*, 113.

<sup>101</sup> Zbikowski, *Conceptualizing Music*, 47.

existing through a larger expanse of time - when actually the opposite is true. There is a conflict between the prescribed amount of time within which the sounds are realised, and the perception of a greater durational expanse due to the reduction in textural density. And because the attentive mind has less qualitative connections to make *in the moment*, there is potential for the perception of materials passing over longer durations - something which does not align with the metric framework being used. Taking care to remain mindful of the subjectivity surrounding such potential, I find the words of Morton Feldman particularly apt: 'Time does untangle complexity. We are eventually left with the one-dimensional — with the face of the clock rather than the workings of its inner parts'.<sup>102</sup>

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<sup>102</sup> Morton Feldman, 'Vertical Thoughts', in *Give My Regards to Eighth Street: Collected Writings of Morton Feldman*, ed. B. H. Friedman (Cambridge, Massachusetts: Exact Change, 2000), 12-13.

## Chapter 4: *Emphases* (2023)

### 4.1: Repetitive Aggregates

The final piece presented in this thesis is an approximately nine-minute work for two pianos. This work explores the perceptual implications of dynamic intensities, when this parameter is approached from a foundation concerned with contrast. Before specific discussion regarding such variances, however, it will be useful to first outline the extensive use of repetition in establishing a consistent structure against which clear dynamic contrasts may be placed. My interest here concerns the use of a type of 'hyper-repetition', but one that has little ability of being singularly perceived. I used two related but individually repetitive elements to exist against each other, aiming to promote an inherent level of clarity through such ongoing consistencies. By metrically misaligning these units, together with the difference in quantity of notes each element contains, individual cycles of repetition can seldom be discerned with any definitive clarity.

By instilling such a high degree of familiarity within the representation of these materials, I find it interesting to consider how their simultaneity may be perceived - and what our cognition may or may not lean towards in attempting to establish start and end points of potential 'chunks'. The aim is that attention may be primed to attend to more emergent properties other than those repeating, something Bryn Harrison has spoken to regarding Feldman:

As Feldman's late music exemplifies, our perception of high-level repetition changes the experience of what we hear: the sequence of unchanging (or only slightly differencing events) begins to take on a life of its own, becoming almost larger than the sum of its parts.<sup>103</sup>

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<sup>103</sup> Harrison, 'Cyclical Structures and the Organisation of Time', 5.

Each piano has its own set of descending pitches (both sharing the same intervallic properties) which cycle repeatedly (shown in figure 4.1). Also useful to note here are the further levels of repetition within each of these units, as the same four-note collection continually repeats in the octaves below. While such commonalities between the two contribute to a fundamental sense of familiarity, there are two factors supporting their resultant asynchronous essence: their constant temporal relationship (a perpetual metric ratio of 5:4), and the number of pitches comprising each element.

The image shows a musical score for two pianos, Piano 1 and Piano 2. Piano 1's part is written on a grand staff (treble and bass clefs) and begins with a sequence of 14 notes, indicated by '(14)'. Piano 2's part also uses a grand staff and begins with a sequence of 11 notes, indicated by '(11)'. The notes are descending in pitch. Vertical dashed lines mark specific points in time, labeled with asterisks and numbers: Piano 1 at notes 15, 16, 17, 18, 19, 20, 21; and Piano 2 at notes 12, 13, 14, 15, 16, 17, 18. A legend at the bottom states: '\* Added pitches correlate with tempo changes'.

Figure 4.1: Continuous expansion of pitch content in Emphases

Speaking to the latter first, this in itself would be a significant factor in establishing a sense of misalignment. For example, the initial number of pitches are 14 for piano 1 and 11 for piano 2; if these were performed with the same temporal values, they would not realign until 154 notes have passed (11 repetitions for the 14 notes and 14 for the 11 notes). Therefore, considering the actual temporal relationship of 5:4, I find the result to be practically inconceivable to monitor accurately, whilst simultaneously retaining a great amount of

internal coherence due to its self-referential nature. Iannis Xenakis spoke to the importance of familiarity in relation to time through music:

What is time for a musician? What is the flux of time which passes invisible and impalpable? In truth, we seize it only with the help of perceptive reference events, thus indirectly, and on condition that these reference-events be inscribed somewhere, do not disappear without leaving a trace.<sup>104</sup>

Speaking further to the 5:4 relationship, I think it is important to acknowledge how this construction is not intended to be a deliberate feature of recognition. Rather, it is an outcome arrived at by seeking metric consistency within each part, yet persisting as combinatorially abstruse. As a result of this, there is a high degree of simultaneous articulation (the beginning and middle of every measure); however, what I find is that due to the relationship shared by each line (same intervallic content and repetitively cascading), coupled with the fact that both these parts are being performed by a piano (that is, of the same sonic *quality*), this recurring synchronicity becomes much less of a defining factor of the experience, and instead lends itself more to practical considerations on behalf of the performers. In lieu of a more elaborately constructed temporal scheme, aimed at further reductions in synchronicity, I believe the perpetual use of 5 against 4 serves my intentions effectively here in the context of the materials and instrumentation used.

One further point here concerns the perceptual significance of the instrumentation. In contrast to previously discussed works, considerations of timbre were not one directly concerned with a more defined temporal role. I do not think it overly presumptuous in assuming the sounds of a piano as readily distinguishable; and contrary to more elaborate practices of instrumental

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<sup>104</sup> Iannis Xenakis, 'Concerning Time', trans. Roberta Brown, *Perspectives of New Music* 27, no. 1 (1989): 87.

technique, this work seeks no other properties of sound than those of keys pressed on a piano. I mention this not as any type of 'statement', but simply to acknowledge that I have been mindful of the ways in which people tend to respond to both familiar and unaccustomed sounds; studies surrounding such concerns have been comprehensively assessed by Sophie Donnadiou.<sup>105</sup> In listening to *Emphases*, one aspect which fundamentally needs no attention is how these sounds are being produced from these instruments.

I find a correlation here with an earlier piece of Feldman, *Piece for Four Pianos*<sup>106</sup> from 1957. Each performer defines their own pace in this work, despite each reading the exact same music; yet of almost no perceptual concern is how the resultant aggregation of sound is being achieved. For instance, referring back to the string quartet of chapter 1; although we can be aware that the sounds are coming from such a familiar ensemble, the subtle changes in bowing positions and overlapping regions of pitch taken by the instruments become a distinct feature of the experience, which implores perception to allocate more attentional resources. My point is that the sounds coming from the two pianos in *Emphases*, unadorned and without manipulation as they are, have been intentionally employed with consideration to the levels of interaction one may commit to the experience. Put another way, this could be said to concern material functionality - with little effort required in assessing the qualitative nature of these sounds, perception is invited to instead assess their intentions: a case less involved with 'what are these sounds *like*?', and more attuned to 'what are these sounds *doing*'.

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<sup>105</sup> 'In fact, the piano is probably one of the most familiar instruments to the primarily European listeners who participated in these studies'. Sophie Donnadiou, 'Mental Representation of the Timbre of Complex Sounds', 286.

<sup>106</sup> Morton Feldman, *Piece for Four Pianos* (Leipzig: Edition Peters, 1957).



## 4.2: Dynamic Displacement and Time

As stated above, the temporal focus of this work is intended to be one directed through the contrasting of dynamic intensities. What I find useful to discuss is how the use of irregularly surfacing points of accentuation can only manifest as temporally significant with consideration to the relative consistency through which they emerge. Rather than any gradual changes of dynamic level, the approach I decided to use was one of *emphasis*. In doing so, it was important to establish an underlying dynamic constancy; one decided upon as persistently quiet and unobtrusive from which accented aspects may be most clearly perceived. Every note in this work belonging to this underlying fabric (i.e. unemphasised) is notated at a level of *pianissimo*; even when the loudest points of contrast have reached the level of *fortissimo*, this elemental balance holds true.

With such a level of familiarity, the receptive mind is able to increasingly rely on this baseline as a comparative reference against potential divergences. As Martin Heidegger stated: 'Even in expecting, one leaps away from the possible and gets a footing in the real. It is for its reality that what is expected is expected'.<sup>107</sup> What interests me is how the temporal displacement of these punctuating dynamic contrasts may factor as determinant in one's perception of the rates at which time is happening. With a great deal of regularity and familiarity already established within various other aspects, it was my aim to enable suggestions of temporal incompatibilities through the irregular emergences of accentuated differences.

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<sup>107</sup> Martin Heidegger, *Being and Time*, trans. Joan Stambaugh (New York: State University of New York Press, 2010), 251.

What intrigues me about the outcome of this work relates to how one might be inclined to engage with the experience of its dynamic scheme. As the piece establishes its self-resemblant nature during the opening 3-4 minutes, contrasts are considerably subtler than those which have yet to surface - leading to considerations of a closer listening experience involved with the perception of more tenuous and unintentional emphases. I find James Weeks' 2007 solo cello work *Tide*<sup>108</sup> effects a similar response in this regard, whereby a certain level of uniformity pervades with such an elevated degree of reliability, priming attention to become highly receptive to more nuanced deviations from the established nature. Although more specifically concerned with interpersonal relations, Wang et al. suggest that, 'beyond concrete functions such as navigation and distance judgment, individuals sometimes rely on loudness cues to make additional inferences that are previously unrecognized'.<sup>109</sup> I find it curious to consider such a psychological trait as persisting through the relationship between individual and the music being perceived. Furthermore, if the irregularity of the articulative contrasts can itself become an aspect of anticipation, it is intriguing to consider the attending mind during the spans of regularity between such pronounced areas. To reiterate once again, my goal is not to obtain clear and quantitative answers to such questions, but to create experiences conducive to exploring such notions.

Another way of contextualising my approach to this work concerns the relationship between memory and the rates at which the dynamic levels increase. More specifically, I was interested in exploring whether the progressively louder dynamics take on more perceptual significance and therefore become more readily available in working memory. If these increasingly prominent aspects correlate with a heightened perception of importance in the

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<sup>108</sup> James Weeks, *Tide*, for Cello solo (York: University of York Music Press, 2007).

<sup>109</sup> Deming Wang et al., 'Loudness Perceptions Influence Feelings of Interpersonal Closeness and Protect Against Detrimental Psychological Effects of Social Exclusion', *Personality and Social Psychology Bulletin* 48, no. 4 (2022): 566.

experience, it follows that less cognitive effort is required to keep these features 'in mind'. Assuming this to be the case, I worked with the premise that this more immediate allocation of significance would allow me to 'push' the capacities of working memory by increasing the rates at which these elements were realised. Emmanuel Bigand's remarks on the *perceived present* are greatly relevant to my organisational thinking here:

It means that the musical surface is apprehended through a series of "perceptual centrations" within a window sliding along a string of sound events... The processes of segmenting the musical surface are processes that help define the position and size of this sliding window.<sup>110</sup>

As there is less time in which the stronger articulations may be processed, (that is, before the *fortissimo* introductions commence the reversal of this increased pace), it interested me to consider if their significance lessens due to this reduction. And, furthermore, what impact this may have on the temporal experience in the sense of Bigand's 'sliding window'. My intention was to find a compositional approach which permitted an attempt at balancing concerns of working memory, in a manner which encourages the experience of durational uncertainty.

One further consideration here concerns the progressive levels of loudness in the work as something potentially contributing to a sense of formal directionality. Taking a step back and viewing the structure as a whole (figure 4.2), there is a rather clear dynamic curve spanning the overall duration; and it interests me to consider the perception of such gradations as developmentally relevant in the mind of the listener. This point relates more to the individual types of listening experiences one may bring to the work, as opposed to relations made in comparison to the piece itself. Once the intensity of dynamic is perceived as continuing to

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<sup>110</sup> Emmanuel Bigand, 'Contributions of Music to Research on Human Auditory Cognition', in *Thinking in Sound: The Cognitive Psychology of Human Audition*, ed. Stephen McAdams and Emmanuel Bigand (Oxford: Clarendon Press, 1993), 247-49.

No. of Measures:	36*	36*	36*	28	27	14	11	8
Piano 1 (♩)	♩=66	♩=82.5	♩=c.103	♩=c.129	♩=c.103	♩=82.5	♩=66	♩=c.53
Piano 2 (♩)	♩=82.5	♩=c.103	♩=c.129	♩=c.161	♩=c.129	♩=c.103	♩=82.5	♩=66
Dynamics Used:	<i>pp/MP</i>	<i>pp/MP</i>	<i>pp/mf</i>	<i>pp/f</i>	<i>pp/ff</i>	<i>pp/f</i>	<i>pp/mf</i>	<i>pp/MP/mf/f</i>

\*18 measures played twice

Figure 4.2: Dynamic scheme as related to changes of tempo throughout *Emphases*

change, there then exists the possibility of memory making associations with pre-existing knowledge of more standardised musical forms: 'In rich nervous systems, memory is the specific enhancement of a previously established ability to categorize'.<sup>111</sup> I raise such an idea in a similar manner to the aforementioned point on the recognisability of the sound of a piano; certain intrinsic perspectives (specifically Western) may, I believe it reasonable to consider, interpret the dynamic structure of this work with respect to matters of formal significance. To clarify, this is not to state that a listener may be right or wrong about such perceptions, but rather to demonstrate my intrigue at the types of attention this particular assemblage of sound may invoke.

### 4.3: Density and Fragmentation

An aspect I have found interesting in this work concerns the amount of information one is presented with from the outset, insomuch that little is offered by way of introduction to the piece. And from this, potential listening strategies may emerge which involve approaches concerned with deconstructing that which is perceived, as opposed to clearer forms in which a listener may be invited to piece together the outline of a work through certain processes and temporal relationships. I also view such an experience of material density as relevant to

<sup>111</sup> Gerald M. Edelman, *The Remembered Present: A Biological Theory of Consciousness*, (New York: Basic Books, 1989), 109-10.

temporal subjectivity when referring back to Ornstein's storage size hypothesis (see chapter 2.2): 'If duration is considered solely as a dimension of experience it is then unnecessary to determine whether this experience is 'accurate' or not with respect to the clock'.<sup>112</sup> By initially presenting such a considerable level of information, I find that cognition will place a certain degree of 'acceptance' on such degrees of density; which potentially redirects attentional resources to more pertinent compositional intentions with which I have herein concerned myself. Richard Glover has written on the relationship between both attention and temporality as relative to density in the music of Chiyoko Szlavnic: 'Lighter density prompts closer, more focused listening, there is more detail in the sound to be explored...A higher density creates added forward motion'.<sup>113</sup>

The view I form of the pervasive density inherent to this piece is one which resonates with the idea that what is being perceived is simply *happening*; and due to its highly repetitive nature, it can be somewhat reliably presumed to continue occurring as such. This is not to say that *any* particular level of musical density through a given duration can ultimately result in such acceptance; however, given the characteristics already discussed which abound in this work, the relative 'busy-ness' present demands little active attention due to the strength with which its re-familiarity persists.

There are two ways in which this density has been used in an attempt to stimulate inherently temporal responses: the first was discussed above in relation to the broad parameter of 'dynamic'; the second, examined here, was an originally unplanned aspect which potentially effects a further increased sense of time-disruption. Although the manipulations used for the

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<sup>112</sup> Ornstein, *On the Experience of Time*, 40.

<sup>113</sup> Richard Glover, Jennie Gottschalk, and Bryn Harrison, *Being Time: Case Studies in Musical Temporality* (London: Bloomsbury Academic, 2018), 69.

material of each piano do differ, I have labelled this broader process as one of fragmentation. Related numbers of rests are consecutively introduced between the parts, aiming to provide a shared intention of temporal discontinuity. However, there are crucial differences in their respective continuations. The progression of pitches realised by piano 1 always remains intervallically consistent: where rests are introduced in this part, piano 1 resumes from where it departed. This of course more clearly affects the temporal scale of the initial repetitive units of piano 1 where such differences occur. Piano 2, however, remains temporally consistent through such introductions, therefore 'losing' certain pitches throughout these deviations. The processes involved can be seen in figure 4.3.

(mm. 130–132)

The image shows a musical score for two pianos, Pno 1 and Pno 2, spanning measures 130 to 132. Pno 1 is in 4/4 time and Pno 2 is in 5/5 time. The score is divided into three measures. Pno 1 has rests marked with arrows, and Pno 2 has rests marked with 'x'. The score shows a 5:4 relationship between the two parts. Pno 1 has rests marked with arrows, and Pno 2 has rests marked with 'x'. The score is divided into three measures.

Piano 1 becomes temporally inconsistent whilst remaining intervallically consistent

Piano 2 remains temporally consistent whilst becoming intervallically inconsistent

Figure 4.3: Differences in approaches to fragmentation and continuation in Emphases

It was stated earlier how the ongoing 5:4 relationship was a meeting point of persistence and 'misalignment'; and by introducing these rests in distinct but temporally related ways, there is not only a further abstraction of this established relationship (even though performatively it never changes), there is also a drastic sense of slowing as these 'emptinesses' become more

evermore pervasive throughout each part. Without prescribing the metric rate to be decreased in any way, there is a distinct sense of misshapen time at these points, owing to the amount of information one has been experiencing and (potentially) accepting for several minutes by this stage.

I will conclude this chapter with a final consideration regarding the differences within the perceived stimuli, following the changes in density from the processes of fragmentation. The amount of 'literal' repetition present in this work has already been discussed, however the effect of these disruptions not only agitates the temporal flow established by the two parts, but in my view redefines repetition as functioning on the basis of perceiving the same *essence* of that which has already been cognised - repetition of *types* by way of resemblance. To put it differently, even when verbatim repetition begins to fall apart through these fragmentary means, I find that having already been exposed to such a considerable level of similar material, one's inclination is to continue accepting the same units as effectively continuing to exist. I believe this idea can be further supported by once more considering the qualitative familiarity of the instruments, insomuch that a greater depth of attention may be more easily achieved. This resonates with Craik and Lockhart's influential 1972 paper regarding the processes of memory: 'Analysis proceeds through a series of sensory stages to levels associated with matching or pattern recognition and finally to semantic-associative stages of stimulus enrichment'.<sup>114</sup>

What intrigues me here is if this can predominantly be the case (I suspect this eventually fails when the introduction of rests becomes ever more pervasive), then how may cognition

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<sup>114</sup> Fergus I. M. Craik and Robert S. Lockhart, 'Levels of Processing: A Framework for Memory Research', *Journal of Verbal Learning and Verbal Behavior* 11, no. 6 (1972): 675.

attempt to reconcile the disruptions in time as removed from the experience of the material? I understand that these are interdependent aspects of this experience, yet I am drawn to the idea that these two concerns may present themselves as clashing in the moment, each vying for attention and potentially instigating an increasingly salient experience of temporal subjectivity. In other words, I believe this exhibits potential for multiple perspectives of experienced time to be considered (in addition to the intentionally disruptive compositional processes). Furthermore, I find it compelling to consider where sensitivities meet and deviate on such impressions, in determining which factors may persist as more perceptually affective.



## Further Considerations

Many avenues of thought have emerged through the course of this research, each resonating with me as having the potential to be comprehensively explored on their own terms. Such areas include: the modes of interaction with unfamiliar sonic qualities; studies surrounding perceptions of time as relative to the amount of information experienced within defined durations; inquiries into competing dominances emergent through highly-specified parametric values; matters of recognition of type as being explored in comparison to direct repetition. Here, I present some considerations derived from the ideas of this thesis, and discuss how each might serve as an encouraging line of inquiry.

The idea of selective parametric intensities as a compositional asset is something which I find particularly appealing, even without deliberate consideration of certain temporal aims. Furthermore, the work presented here was prefaced with approaches using very broad parametric terms, each of which may be further subcategorised into more nuanced specificities. James Tenney acknowledged such potential in writing which he directly relates to the parametric concerns of *Meta+Hodos*:<sup>115</sup> 'Each one of these parameters involves at least two subordinate factors that define relatively independent (or at least partially independent) attributes of musical sound relating to separately distinguishable aspects of perception'.<sup>116</sup> I find it interesting to consider how the combinations of multiple parametric (or 'subparametric') aspects employed with a particular emphasis on attentional qualities (i.e., what is effectively determining the experience) may alter perceptual functionalities if

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<sup>115</sup> 'The following pages must have been written at about the same time as parts of *Meta+Hodos* (1961) and may have originally been intended to be a part of that book...Although I evidently decided not to include it in the book, I see now that it contained at least the seeds of several important ideas that were not developed fully until some years later'. James Tenney, 'On Musical Parameters (Ca. 1960–1961)', in *From Scratch: Writings in Music Theory*, ed. Larry Polansky et al. (Urbana: University of Illinois Press, 2015), 408, Appendix 2.

<sup>116</sup> Tenney, 'On Musical Parameters', 410.

variables within both combinations and intensities become significant. A curiosity of mine is to explore the attentional extremes of such materials; much like the approach taken with pitch in *Overation* (chapter 1), where the aim was to increasingly obfuscate one's ability to determine with relative certainty the intervallic relationships through each progressive object. Such an approach need not apply solely to the realm of pitch, however; for instance, how many *types* of timbre may be introduced to articulate similar materials until a certain perceptual threshold is exceeded, and the fundamental identity of that which was originally perceived can be no longer said to have enough in common with the current representation?

Aaron Cassidy has written on the assignation of parametric values to matters of technique and performer-instrument physicalities, for what are described as 'multi-parametric compositional and performance techniques...with highly specific, prescriptive, choreographic actions stratified across multiple, physiological aspects of sound production'.<sup>117</sup> Whereas Cassidy's focus here concerns matters of notation and performativity, my own approaches to the interrelationships of parametric distinctions would be more involved with sonic qualities and experiential outcomes. While I am particularly fascinated by the concept of perceptual thresholds in relation to temporality, I find it relevant to consider, perhaps primarily, the limits of attentional focus in retaining changes within the same fundamental materials; when alterations occur across various parametric aspects, there ultimately reaches a point where the current state and the preceding one are no longer so phenomenologically alike.

Another curiosity comes from the development of *Co[a/u]rsing* (chapter 2), regarding considerations of perceptual responses to the types of sounds intended to inform temporal

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<sup>117</sup> Aaron Cassidy, 'Constraint Schemata, Multi-Axis Movement Modeling, and Unified, Multi-Parametric Notation for Strings and Voices', *Search: Journal for New Music and Culture* 10 (2013): 1.

experiences. As I developed the presentation of materials unlikely to be already established in the previous experiences of the listener, it became of interest to consider potential modes of interaction with abstract sonic qualities which may increase aspects of active comprehension. Such explorations might involve the types of listening strategies perceived as useful (or indeed required) when the present mode of interaction is perceived as being of too extreme a level of abstraction. This is something I see as encouraging ideas that more precise aspects present in a complex spectrum may be perceptually strengthened or lessened within a given moment, as relative to compositional intentions. However, this again presents to me matters of pattern recognition; whereby from the perspective of the composer, it becomes a case of balance involving just how clear the intended process is desired to be. The development of such concerns was noted in the introduction to this research, and although its relevance has been acknowledged within the thinking behind the composed works, it has led me to consider just how potent a compositional aspect this may be when examined as fundamental in the perception of obscure materials. Furthermore, while an ideal listener has never been assumed throughout this thesis, there are reasons to further the case that a highly generalised way of deconstructing abstract information is through the functions of pattern recognition:

Cognitive psychologists think of schemas as descriptions of regular properties of the environment. It is natural, therefore, to ask whether regular auditory patterns form more coherent streams than irregular ones do. If the process that is responsible for the formation of streams is one that makes predictions about the properties of the next sound, regular patterns should afford better prediction, and therefore better integration.<sup>118</sup>

A further notion which has undoubtedly been encouraged throughout the course of this work surrounds the idea of material density as having the perceptual capacity to operate on multiple temporal levels, potentially resulting in new concepts of engagement through the

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<sup>118</sup> Bregman, *Auditory Scene Analysis*, 411.

cognition of qualitative differences. I find it conceivable that such an idea could be temporally relevant on two structural levels: a larger-scale formal 'rhythm' using multiple degrees of material density, and a more detail-level awareness of the materials as they are being experienced. In this prediction, there again surfaces this quandary of attentional divergence; between the level of information being attended to at any particular moment, and the higher-level structural progressions of density-types being experienced over longer durational spans. An exploration of such perceptual boundaries could, I believe, be greatly enhanced by an engagement with the philosophical foundations proposed in the work of Gilles Deleuze. The influence of Deleuze is evident in many diverse fields, and I feel there is much to be gained by drawing from such considerations as the identity of difference:

It seems indeed, on the other hand, that specific difference meets all the requirements of a harmonious concept and an organic representation. It is pure because it is formal, intrinsic because it applies to the essence. It is qualitative, and to the extent that the genus designates the essence, difference is even a very special quality "according to the essence", a quality of the essence itself.<sup>119</sup>

Given my own creative perspective as intricately tied to delineating phenomenological qualities through distinctions between experiential identities, I envisage such an endeavour as potentially enabling contexts whereby the recognition of difference can itself be utilised as a potent compositional asset. Pursuing such ideas greatly intrigues me, not to concerns of establishing empirical data as a matter of primacy, but instead towards definitions of such concepts capable of expressing the types of distinctions inherent at such perceptive junctures. At the very least, I see such an undertaking as having the capacity to more comprehensively enrich vocabularies concerned with experiences of time through music.

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<sup>119</sup> Gilles Deleuze, *Difference and Repetition*, trans. Paul Patton (London: Continuum, 2001), 31.

One significant aspect which needs to be addressed in concluding this thesis is the divergence between the abstract principles which have guided the creation of the music discussed, and the subjective realities of how it may be perceived and interpreted by audiences. From my own perspective, I consider the composition of experimental music as attempting to bridge the gap between theoretical frameworks of perception and the lived experiences of listeners. However, rooted in such cognitive processes such as attention, memory, and pattern recognition, the theoretical underpinnings posited may not always align with the sensory and emotional experiences of listeners. Even with my intentions of effectively contemplating each significant concept from all relevant perspectives, this does not guarantee that the experiential conditions I am exploring will necessarily occur; further strengthening such theories on potential responses would require, at a minimum, examination of sociological, emotional, cultural, and aesthetic factors, which are beyond the scope of this research. What I do find crucial to keep in mind, however, is that any forwarded ideas surrounding the composition of a piece are distinctly external to the experience of the piece itself. I find Philip Tagg's thinking highly relevant in this regard:

If, as I've argued several times, music could be described in words, it would be unnecessary. But since no human society of which we have any knowledge has ever been without music...we will have to find words indicating at least something of its *perceived meanings*, however inadequate those indications may be.<sup>120</sup>

Attempting to operate between this duality of theoretical and actual is something I would posit as fundamental to myself as a composer of experimental music. In essence, I find an important aspect of my practice is in maintaining a certain degree of 'not yet knowing'; that is, in constructing a musical environment as a basis for discovery, as opposed to a more 'rigid'

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<sup>120</sup> Philip Tagg, *Music's Meanings: A Modern Musicology for Non-Musos* (New York: The Mass Media Music Scholars' Press, 2012), 78.

communication of ideas. Moreover, I believe a correlation can be made here from the perspective of musical experience. That the experience of music itself involves a complex synthesis of perceptual immediacy and conceptual abstraction is, I would argue, highly reflective of my compositional methodology in this thesis. Mark Reybrouck speaks of the generation of a 'conceptual map' in the experience of music, offering three approaches to the question of internal or external semantics; the most relevant here being the second stated idea of 'the percept/concept dichotomy':

The “percept/concept dichotomy” is related to the way human listeners structure the acoustic flow. Listening embraces both perceptual immediacy and conceptual abstraction...This is basically the tension between the “bottom-up” and “top-down” approach with sensory information being presented to the senses in a continuous way and the mind applying discrete labels to chunks of information...As such, listening is both an “experiential” and “conceptual” affair.<sup>121</sup>

It is my hope to have illustrated through the work presented here how musical materials developed with consideration to particular parametric attributes have been employed to mediate matters of temporal perception in my music. Engaging with the assessment of sounds in such a manner has proven to be a very revealing endeavour, significantly affecting my interaction with the materials. Furthermore, in addition to the grounding phenomenological aspects that underpin a substantial portion of my compositional thinking, I am inherently drawn to the more abstract concepts related to the organisational framework of temporal experiences; insomuch that it has underscored for me the often profound contrast between our conceptualisation of what we may think of as 'time' and how our experience situates within its subjective nature.

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<sup>121</sup> Mark Reybrouck, 'Musical Sense-Making between Experience and Conceptualisation: The Legacy of Peirce, Dewey and James', *Interdisciplinary Studies in Musicology* 14 (2015): 198.

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