Hybrid Approaches to Tensile Discourse in Post-Acousmatic Composition

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Declaration

This is to certify that, to the best of my knowledge, the content of this thesis is my own work. This thesis has not been submitted for any degree or other purposes.

I certify that the intellectual content of this thesis is the product of my own work and that all the assistance received in preparing this thesis and sources have been acknowledged.

Patrick Carroll,

November 12, 2021.

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Abstract

The commonalities of technology focussed creative practices of acousmatic music and popular electronic music (PEM) genres has led composers of these genres to share an interest in using timbre as a tool for creating dramatic expressions. In recent years, scholarly discussion has grown around unintentional similarities between, and intentional attempts to fuse, the compositional languages of PEM and acousmatic music. However, an area that remains unexplored is the nature of dramatic tension and resolution, a phenomenon Dennis Smalley refers to as “tensile discourse”, within works that leverage the expressive musical discourses of the two styles. In this thesis, I carry out an exploration into the compositional effects of overlaying and combining the discourses of acousmatic music and PEM with an aim of uncovering new approaches to tensile expression. I first provide an overview of the current scholarly literature surrounding the timbral dramatic devices inherent in the processes of acousmatic music and PEM. Following this, I discuss how these devices were used and combined in creative ways in the development of an original 13-work compositional portfolio which charts an informed process of fusion of the two styles. Through my discussion of the processes undertaken to create the compositional portfolio, as well as the analysis of the works themselves, I outline various methods for portraying timbral dramatic gestures within works of PEM and acousmatic music fusion, as well as the key methods for combining and overlaying these in creative approaches to generate hybrid forms of tensile discourse. This discussion explores how the discourses of the two styles might work together towards the same artistic function of generating tensile discourse to contribute to a cohesive gestalt expression of musical drama.

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Introduction

The long history of utilising electronic technology in music composition, from the manipulation of tape recordings in musique concrète to the innovative deployment of digital signals in acousmatic music, has resulted in an array of compositional practices in which timbral variation is called upon to drive musical drama. Different electronic music genres tend to embrace different core practices in their approach to timbre-driven drama, yet a flurry of recent activity undertaken by artists seeking to fuse popular electronic music (PEM) and electronic acousmatic music has opened up a new set of compositional possibilities related to the overlaying of different timbre-driven dramatic gestures.

This thesis seeks to articulate the compositional effects of this integration and extend knowledge of how the timbre-driven dramatic devices in PEM and acousmatic music might be brought into productive dialogue through the development of new musical works presented in my composition portfolio. At the Sydney Conservatorium of Music, the term "thesis" refers to both the body of creative work composition students produce and the text-based document that situates and illuminates the knowledge embedded within the creative portfolio.

Works by electronic music artists Jon Hopkins, Max Cooper and Martin Stimming provided the initial stimulus for this research project. Hopkins, Cooper and Stimming have each fused the compositional techniques of an acousmatic approach with the formal and rhythmic structures germane to dance music and electronica. Their work explores the timbral

characteristics of recorded sounds, processes of sound transformation, and the grooves and harmonies of modern PEM. Monty Adkins, Richard Scott and Pierre Alexandre Tremblay have described such cross-pollinations as "post-acousmatic" practices yet situate these practices as a natural extension of the legacy of Pierre Schaeffer, the pioneer of acousmatic theory.[1] As this thesis explores different traditions of electronic music-making, it highlights the importance of viewing PEM as a unique intellectual space with a particular set of dramatic concerns. In its blending of timbre-driven dramatic devices from the realms of PEM and acousmatic music, this research project focuses on the potential for musical fusions to produce new, sophisticated compositional languages that 'add up to more than the sum of their parts'.

Research Overview

This project utilised a practice-based research methodology. Scholarly theorisation of dramatic discourses in acousmatic music and PEM were consulted and used to inform the development of a creative portfolio. The parsing of scholarly literature and the development of my creative works were tied together in a feedback mechanism. Scholarly theoretical texts provided creative lines of inquiry into practical tasks and, in turn, practical tasks exposed new ways of bringing theoretical ideas together. This feedback mechanism closely resembled Hazel Smith and Roger Dean's notion of practice-based research as an "iterative cyclic web"

[1] Monty Adkins, Richard Scott, and Pierre Alexandre Tremblay, "Post-Acousmatic Practice: Re-evaluating Schaeffer's Heritage," *Organised Sound* 21, no. 2 (August 2016), https://doi.org/10.1017/S1355771816000030.

connecting traditional and creative forms of research.[2] As this process was iterated, the research questions, aims and methodology evolved, ultimately refining the research project.

The primary research contributions of this project include a theoretical framework for understanding the drama at play in fused compositions and a 13-work composition portfolio infused with new dramatic gestures. The knowledge gained and presented in the dissertation component and creative portfolio component furthers understanding of compositional practice and the possibilities of electroacoustic composition—especially in the field of post-acousmatic practice.

This project centres on the concept of tensile discourse in post-acousmatic works. "Tensile discourse" refers to the ebb and flow of musical tension and resolution in a work, and, according to Denis Smalley, it is the cumulative product of dramatic gestures in the range of a work's modes of discourse.[3] For example, in acousmatic music, dramatic gestures can be expressed through processes of sound transformation, changing relations between sounds in terms of coexistence, dominance and subordination or timbral motions. On the other hand, in popular instrumental electronic music, dramatic gestures are produced by a different range of primary discourses–commonly tonal, metric or textural discourses. A work's tensile discourse is not produced by any one of these discourses *on its own*, rather it emerges through the combination of these discourses and their dramatic gestures. Thus, in the context of post-acousmatic music compositions, tensile discourse can be considered as the result of a

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[2] Hazel Smith and Roger Dean, *Practice-Led Research, Research-Led Practice in the Creative Arts* (Edinburgh University Press, 2009). https://www.jstor.org/stable/10.3366/j.ctt1g0b594.

[3] Denis Smalley, "Defining Timbre—Refining Timbre," *Contemporary Music Review* 10, no. 2 (1994): 46.

combination of acousmatic music discourses and those of other styles. This project explores this concept in terms of acousmatic music and PEM compositional techniques, investigating how the discourses of the two styles can contribute to a cohesive gestalt expression of musical drama by working together towards the same artistic function of generating tensile discourse.

Firstly, chapter one delineates current scholarly discussion surrounding the primary types of musical discourses in acousmatic music and PEM, as well as research into how artists fuse these musical worlds. This chapter outlines a potential area of research into the ability for tensile discourse to be generated through creative techniques of overlaying and combining the discourses and dramatic gestures frequently used in the styles.

Chapter two describes the theoretical framework developed over the course of this project and outlines the structure of the practice-based research undertaken. Denis Smalley's "six interactive types of electroacoustic discourse" form the backbone of the practice-based inquiry, along with six functions of drama through which my compositions express tension and resolution, using the discourses of both acousmatic music and PEM.[4] I discuss how my project uses the above framework in a research format which relates closely to Smith and Dean's "iterative cyclic web" format of practice-based research; of oscillating between traditional and practice-based research of consulting past scholarly written work and composition tasks, as means of exploring the aforementioned gap in the literature.[5]

[4] Smalley, "Defining Timbre—Refining Timbre," 46.

[5] Smith and Dean, *Practice-Led Research, Research-Led Practice in the Creative Arts*.

Chapter three describes the artistic goals, compositional process and structural overview of each of the thirteen works in the portfolio, as well as providing a discussion of the main artistic approaches taken to generate and resolve musical tension. The discussions of the works illuminate how the designs of these works have been informed by the historical use of different sorts of timbre related dramatic devices from different kinds of electronic music practice.

Chapter four summarises my uses of the functions of drama and the main methods of creatively overlaying and combining them to generate tensile discourse in the composition portfolio. I was able to approach this by using the discourses of PEM and acousmatic music alongside each other to reinforce the dramatic trajectories that each afford, as well as modulating the foreground and background relationships of the discourses, in an effort to 'juggle' the roles of creating drama between the discourses of the two styles. I also discuss the notion of considering PEM elements as source material, while treating these with audio processing techniques common to acousmatic music. I describe the ability for this strategy to divert the role of carrying drama from the tonal and metric PEM discourses native to the elements to timbral discourses based on trajectories of transformation and processes of motion and growth.

The concluding chapter reviews how my project has addressed the research aims, and discusses how this may help in understanding the relationships between the musical languages of PEM and acousmatic music in post-acousmatic contexts.

Chapter One: Literature Review

My compositional language fuses the timbre driven dramatic gestures of acousmatic music with PEM to synergistically create new kinds of tensile expression within works of fusion. This chapter outlines the relevant literature on timbre and musical drama in acousmatic music and PEM to contextualise my compositional aims and approach.

Acousmatic Music

The use of electronic technology in music composition is capable of triggering a variety of associations between sound materials heard in a given musical context. This is especially true in the case of acousmatic music, which focuses listeners' attention on the relationships between sound timbres.

Since Pierre Schaeffer's mapping of unexpected similarities between sound objects in musique concrète (a product of the process Schaeffer referred to as "reduced listening"), a body of literature has developed around how perceived characteristics and behaviours of sounds in acousmatic composition might inform an acousmatic musical taxonomy of infused meaning.[1] One view, developed by Denis Smalley, calls attention to how sounds in acousmatic composition can conjure either real or imagined energy transfer processes. First presented in a chapter for Simon Emmerson's *The Language of Electroacoustic Music* and then explored in greater depth in a 1997 paper for *Organised Sound*, Smalley's discussion of spectromorphology and structuring processes identifies how various "motion and growth processes" in music have analogues in natural phenomena, like "ascents/descents,

[1] Pierre Schaeffer, *Traité des Objets Musicaux* (Paris, France: Editions du Seuil, 1966).

parabola/undulation, rotation/spiral/spin, agglomeration/dissipation, [and] dilation/contraction".[2] Smalley states that associations with these natural processes are important for "composer–listener communication", as they allow listeners to "make sense" of the musical events they are experiencing in relation to a known set of audio phenomena.[3] Similarly, Emmerson's 1986 essay, *The Relation of Language to Materials*, explores the "mimetic" mode of musical discourse used by composers of electroacoustic music.[4] "Mimetic discourse" relates to the purposeful invocation of mental imagery through sound, such as synthesised imitations of wind, animal noises or industrial sounds. Francesco Giomi and Marco Ligabue interrogate a more abstract kind of referencing in their paper, *Analysis of Narrative Strategies in Six Early Compositions*. Through a discussion of Evangelisti's electroacoustic work, *Incontri di fasce sonore*, Giomi and Ligabue argue that audio processing creates "metaphorical associations" between sounds.[5] As material in the central section of the work is heard again with reverberation applied to it, Giomi and Ligabue hold that "there is a symbolic transposition of the axis of time with the axis of space, in order to give further weight to the mnemonic component of the narrative situation".[6] Reverberation creates a perceived sonic distance that serves as a metaphor for temporal distance. Thus,

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[2] Denis Smalley, "Spectro-morphology and Structuring Processes," in *The Language of Electroacoustic Music*, ed. Simon Emmerson (London, England: Palgrave Macmillan UK, 1986); Denis Smalley, "Spectromorphology: Explaining Sound-Shapes," *Organised Sound* 2, no. 2 (1997): 116.

[3] Smalley, "Spectromorphology: Explaining Sound-Shapes," 125.

[4] Simon Emmerson, "The Relation of Language to Materials," in *The Language of Electroacoustic Music*, ed. Simon Emmerson (London, England: Macmillan, 1986).

[5] Francesco Giomi and Marco Ligabue, "Understanding Electroacoustic Music: Analysis of Narrative Strategies in Six Early Compositions," *Organised Sound* 3, no. 1 (April 1998): 48, https://doi.org/10.1017/S1355771898009169.

[6] Giomi and Ligabue, 48.

drawing attention to timbral relationships between sounds and referencing extramusical objects and processes serve as two central modes of discourse in acousmatic music.

A parallel body of research has sought to illuminate how transforming from one sound to another in acousmatic music functions as a driver of drama in the genre. British composer Trevor Wishart's book, *Audible Design* (1994), dives into this idea by mapping out three kinds of sounding narratives in acousmatic composition. First, he states that processes of "mediation in sound between distinct sound types" can create narrative drive, citing the transformation in Stockhausen's *Gesang Der Junglinge* of a boy's voice into a sine wave as an expression of "religious conception[s] of "unity" in the cosmos".[7] Another narrative unfolds through transformations that stress "the ambiguous implications of the sounds thus created".[8] This narrative arc is rooted in ongoing questions listeners might ask over the course of unfolding transformations about a sound's origin—is this sound still the base identity, the destination or a blend of the two? Finally, Wishart notes that "focus[ing] upon the process of change itself" can result in a simpler kind of narrative, where a clear interpolation from a recognisable base sound to another is carried out with no ambiguities or suggestions of other sounds.[9] Here, the aim is to emphasise the unexpected similarities between two seemingly unrelated sounds. Accordingly, sonic transformation functions as another carrier of narrative in acousmatic music.

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[7] Trevor Wishart, *Audible Design: A Plain and Easy Introduction to Practical Sound Composition* (York, England: Orpheus the Pantomime, 1994), 97. http://www.trevorwishart.co.uk/audible_design.pdf.

[8] Wishart, 97.

[9] Wishart, 98.

Smalley's 1993 essay, "Defining Transformation", makes a similar point about transformations and narratives in acousmatic music but argues that they are particularly compelling if they begin with familiar, recognisable sounds. This home territory might be left behind for other recognisable sonic destinations or for abstract destinations linked to the starting sound through spectral characteristics. Yet, in both cases, the starting point serves as a reference point that scaffolds a work's dramatic arc. Smalley refers to the two most familiar transformations used in acousmatic music as "source-bonded transformations" and "spectromorphological transformations".[10] "Source-bonded transformations" are transformations between two sounds that the listener can link to a possible known sound source. "Spectromorphological transformations" are transformations that draw the listener's attention to the more intrinsic qualities of sound objects, as their relation to familiar sound sources is less direct.

Smalley also brings together a taxonomy of sound objects and transformations with the notion of narrative gestures. He states, "where the composer conceives of materials in categories or parameters which can be mediated, it is linked to the notion of the 'continuum': movement along a continuum or a leap to another position on a continuum is a transformation".[11] The use of these transformations in a composition is described as one of the expressive capabilities of electroacoustic composers that extends beyond traditional music writing, made possible by the computer's ability to manipulate audio and construct sound transformation sequences. As Smalley explains, the ambiguity permitted by spectromorphological transformations can express dreams and "fantasy", while reference to

[10] Denis Smalley, "Defining Transformations," *Interface* 22, no. 4 (1993): 282, https://doi.org/10.1080/09298219308570638.

[11] Smalley, 279.

extrinsic objects through source-bonded transformations can act in a more "utilitarian" role, "help[ing] depict and illustrate, to represent ideas and ideologies, to make cultural and political statements".[12] Smalley's work positions transformation as the "latest manifestation" of the play of "identities and their relations" that is crucial for constructing narratives in Western art music.[13]

The methods of creating narrative and meaning in acousmatic music discussed so far are brought together in Smalley's proposed "six interactive types of electroacoustic discourse".[14] In his 1994 paper, "Defining Timbre—Refining Timbre", Smalley labelled the three aforementioned modes of discourse "typological discourse" (emphasises timbral similarities of sounds from separate sources), "source-cause discourse" (extramusical referencing) and "transformational discourse" (narrative created through sonic transformation).[15] Smalley also mapped out two further discourses: "behavioural discourse", the relationships of "cohabitation/coexistence" and "dominance/subordination" between sound textures; and "motion discourse", the "motion and growth processes" carried out by sonic identities.[16] Finally, Smalley conceptualises the accumulative drama produced by overlaying these five modes of discourse as "tensile discourse", the unfolding ebb and flow of the summative tensions and relaxations within a work.[17]

[12] Smalley, 295-96.

[13] Smalley, 295.

[14] Smalley, 45.

[15] Smalley, 45-46.

[16] Smalley, 46.

[17] Smalley, 46.

Popular Electronic Music

PEM relies on its own set of techniques for expressing dramatic shape. For instance, Rick Snoman asserts that dance music artists frequently use harmonic/motivic development, changes in orchestration and, more commonly, rhythmic development to give their works structural trajectories. In *The Dance Music Manual* (2004), Snoman demonstrates how these components of a musical work constellate to form different grooves, arguing that although "dance music is heavily based on repetition, it retains interest by building and releasing the groove".[18] Mark J. Butler explores similar territory in his 2006 book, *Unlocking the Groove: Rhythm, Meter, and Musical Design in Electronic Dance Music*. One of Butler's key examples of musical drama involves the various percussive looping "sequences" that dominate the orchestration of most styles of electronic dance music (EDM) and the ways artists introduce and withdraw these sequences 'into the mix' in the development of a track's form.[19]

Robert Ratcliffe describes this approach to structure as "directly related to the functionality and idiomatic performance characteristics of the tools of production, which promote rhythmic-oriented programming, pattern-based design and a layered approach to texture and materials".[20] In his 2013 analysis of "Chime" by British duo Orbital, Ratcliffe explores the

[18] Rick Snoman, *The Dance Music Manual: Tools, Toys, and Techniques*, 2nd ed. (Oxford, England: Focal, 2009), 224. https://books.google.com.au/books?id=NzfaPAjipe8C.
[19] Mark Jonathan Butler, *Unlocking the Groove: Rhythm, Meter, and Musical Design in Electronic Dance Music* (Indiana, USA: Indiana University Press, 2006) , 206-08.
[20] Robert Ratcliffe, "Analytical Précis of Chime by Orbital: Towards an Analysis of Electronic Dance Music," *OREMA*, 2013, http://orema.dmu.ac.uk/eorema/analytical-pre%CC%81cis-chime-orbital-towards-analysis-electronic-dance-music.

way the work unfolds through the introduction, withdrawal and variation of short loops of harmonic and percussive materials.[21] Orbital's application of loop-based structures echoes American minimalist styles of composition in the way they draw attention to emergent textures and subtle variations in assemblage. This heavy use of repetition occurs in both EDM and some works in the early electroacoustic repertoire. For example, Schaeffer's *Etude aux Chemins de fer* (1948) focuses listeners' attention on the timbral characteristics of short, looped material, while Steve Reich's *Come Out* (1968) draws focus to emergent pitch and rhythmic relationships that arise from two short identical vocal phrases gradually falling out of phase with one another. Thus, Ratcliffe's work highlights the effectiveness of textural density modulations in creating dramatic shapes in PEM works.

The use of recorded 'found sound' material in works of PEM has subsequently led PEM composers to think differently about timbre and structure. For instance, Brian Speise's online article in *Dancecult* describes parallels between the use of 'found sounds' in PEM and Schaefferian practices of musique concrète, even though compositional outputs in PEM share little resemblance to Schaeffer's work.[22] As Speise argues, "experiments with musique concrète that are presently occurring within the world of EDM and other musical genres are quite different from Schaeffer's original work. Artists like Matthew Herbert and Matmos are proving that composers can make music out of nearly any recorded sound—accessible music nonetheless."[23] Ratcliffe discusses similarly influenced compositional processes in his proposed system for categorising sampled audio material in EDM. He identifies similarities

[21] Ratcliffe.

[22] Brian Daniel Speise, "From Grapefruit to Plastic Surgery: Experiments in Contemporary Musique Concrète," *Dancecult: Journal of Electronic Dance Music Culture* 6, no. 1 (2014), https://dj.dancecult.net/index.php/dancecult/article/view/455/461.

[23] Speise.

between British artist Norman Cook's (Fatboy Slim) process of gathering and cataloguing source material and the methods of "electroacoustic composers who often collect and catalogue different sound sources along with extensive variations, according to different processes applied to the original (for example, reverb and delay)".[24] Justin Morey and Phillip McIntyre explain that sampling practices such as these often lead composers to be drawn to the timbre of material rather "than identifiable riffs or melodies" as they go about structuring their work.[25]

Subsequently, a growing relationship between PEM and acousmatic approaches to composition can be found in the increasing use of timbre-focused sounds and musical structures common to electroacoustic art music in the works of experimental PEM. In 2002, Ben Neill wrote about the growing incorporation of "conceptual and process-oriented composition" in PEM styles, pointing out that "the extensive use of experimental software and hardware can be seen turning up in clubs and on dance records around the world".[26] Neill points to various artists working outside the electronic high-art sphere who "prove that it is possible for rhythmic electronic music composers to work with the most abstract sound processes, experimental textures and techniques, as well as rhythmic materials that make references to, but do not fit within, specific pre-existing dance music genres".[27] He describes

[24] Robert Ratcliffe, "A Proposed Typology of Sampled Material within Electronic Dance Music," *Dancecult: Journal of Electronic Dance Music Culture* 6, no. 1 (2014): 100.
[25] Justin Morey and Phillip McIntrye, "The Creative Studio Practice of Contemporary Dance Music Sampling Composers," *Dancecult: Journal of Electronic Dance Music Culture* 6, no. 1 (2014): 46.
[26] Ben Neill, "Pleasure Beats: Rhythm and the Aesthetics of Current Electronic Music," *Leonardo Music Journal* 12 (2002): 4, https://doi.org/10.1162/096112102762295052.
[27] Neill, 5.

a wave of composers bridging the disconnect between popular music and art music by mixing the programmed rhythmic structures of dance music with complex timbres, even proposing that these practices create a "new art music".[28] In arguing this point, Neill links a performance by British artist Squarepusher to Varese's first presentation of *Poème Électronique* in the Philips pavilion half a century prior. He mentions the use of "highly processed digital noise and textures that would rival any art-music composer's sonic palette", noting that at this performance, no "longer was this type of music relegated to a rarefied, unique performance situation. Experimentation had fully made its way to popular culture and a mass audience".[29] The same use of electronic technology in the creative practices of both experimental PEM and acousmatic music has led both groups of composers to common employment of timbre in the delivery of musical drama in their respective styles.

Ben Ramsay's analysis of the Monolake piece "Internal Clock" highlights the compatibility of acousmatic approaches to musical drama in 'intelligent dance music'.[30] Specifically, Ramsay describes two narrative streams within the work in terms of sonic transformation. The first narrative unfolds through spatial modulation: "space is treated as a primary compositional tool in "Internal Clock" which results in sonic morphologies from the dry and close to reverberant and distant which generates tension and discourse within the work".[31] The second narrative stream unfolds through the dynamic relationship between the synthetic and organic materials in the work and the obscuring of the listener's ability to distinguish between the two. Monolake's emphasis on the intrinsic, spectral characteristics of sound

[28] Neill, 4.

[29] Neill, 4.

[30] Ben Ramsay, "Analysis of 'Internal Clock' by Monolake," *OREMA*, 2012, http://www.orema.dmu.ac.uk/analyses/ben-ramsays-analysis-%E2%80%98internal-clock%E2%80%99-monolake.

[31] Ramsay.

material, and the blurring of synthetic and organic materials, corresponds to Smalley's typological and source-cause modes of discourse.

The work of Jon Hopkins demonstrates similar applications of acousmatic expressive tools in the context of PEM. The British artist's 2013 record, *Immunity*, features extensive use of processed recordings in a fashion that echoes the practices of many acousmatic composers. The first piece from the album, "We Disappear", begins with a field recording of a city street before keys are heard, opening a door into a space that has music playing in a distant room. After being led into this room, certain sounds from the piece emerge alongside the recording, giving the listener the sense of transitioning from listening to the piece through speakers in a room to being in the space of the piece itself. As Brian Howe described in his review of the album, Hopkins "is ushering us into the tactile space that suffuses the record".[32] This use of the sound of doors to signal entry into different spaces can be heard in the acousmatic works of Gilles Gobeil's *Le Vertige Inconnu* and Robert Normandeau's *Rumeurs (Place de Ransbeck)*. Throughout *Immunity*, heavily processed field recordings are heard alongside many PEM elements and often appropriate the roles of traditional instruments: "He drums on desks, plays saltshakers, slows down serendipitous recordings of nearby fireworks, boosts the kick-drummed rattle of a window. … Hopkins processes beats and melodies right out of the piano, tapping the pedals and striking the strings."[33] Hopkins thus centres processes of transformation in his works. In reference to his 2018 record *Singularity*, Hopkins stated that

[32] Brian Howe, "Jon Hopkins - Immunity," *Pitchfork*, June 6, 2013, https://pitchfork.com/reviews/albums/18090-jon-hopkins-immunity/.
[33] Howe.

"one of the main ideas … was to have sounds that morph into things you don't expect".[34] Indeed, his piece "Feel First Life" unfolds through a gradual, seamless transformation from a synthesised pad sound to a 16-part choir. The coupling of these techniques with harmonic and rhythmic elements of EDM reflects a growing trend towards hybrid approaches to discourse within popular music.

In a 2016 article, Adkins, Scott and Tremblay label these types of hybrid narrative strategies as "post-acousmatic" compositional practices.[35] The authors, who use these strategies in their own compositions, describe the interactions between PEM artists and the acousmatic tradition as "evidence of continuous flux and hybridisation engendered by acousmatic aesthetic listening and common approaches in the use of technology".[36] They argue that such commonalities between acousmatic music and certain practices within PEM genres "have facilitated a more sophisticated dialogue between [the two traditions] rather than a shallow reciprocal plundering".[37] Thus, these authors depict the appearance of acousmatic narrative techniques in other genres as a natural development of acousmatic practice.

Ben Ramsay's doctoral research highlights the importance of focusing on the dialogic potential of works that engage both PEM and acousmatic narrative strategies. In a composition portfolio and accompanying exegesis, Ramsay's research exposes links between

[34] David Smyth, "Jon Hopkins Interview: My New Album is a Psychedelic Experience," *Evening Standard*, April 27, 2018, https://www.standard.co.uk/go/london/music/jon-hopkins-interview-my-new-album-is-a-psychedelic-experience-a3825251.html.

[35] Adkins, Scott, and Tremblay, "Post-Acousmatic Practice: Re-evaluating Schaeffer's Heritage," 112.

[36] Adkins, Scott, and Tremblay, 112.

[37] Adkins, Scott, and Tremblay, 112.

"materials of composition, the use and appreciation of space [expressed in compositions] and spaces [of performance], as well as the social and cultural influences associated with" acousmatic music and electronica.[38] His comparison of the compositional materials of acousmatic music and electronica is carried out by exploring electronica through the lens of certain acousmatic music concepts and analytical tools. Ramsay also highlights PEM composers' application of "structuring methods that are more akin to art music, such as the use of space as a compositional narrative and exploring timbral density and sparsity as central structures".[39] The subsequent discussion of the "listened" spaces and cultures of the two styles compares the genres' sociological aspects.

Exploring possible methods of fusing electronica and acousmatic music is the focal point of Ramsay's creative portfolio. The first part of the portfolio focuses primarily on acousmatic techniques, while the second part increasingly presents works of fusion. Within the works of fusion, Ramsay develops a particularly interesting technique of "flipping" the musical discourse between being carried by metric time and being carried by energy-motion.[40] Metric time refers to beat-based sections of electronica, while energy-motion references extramusical objects and processes—a fundamental mode of discourse in acousmatic music.

An example of this occurs in his work "Flinch–Rest", which initially focuses on expressing acousmatic music energy-motion trajectories before "flipping" to being carried by metric

[38] Ben Ramsay, "Exploring Compositional Relationships Between Acousmatic Music and Electronica" (PhD diss., De Montfort University Leicester, 2014), 102, https://dora.dmu.ac.uk/handle/2086/10524.

[39] Ramsay, 105.

[40] Ramsay, "Exploring Compositional Relationships Between Acousmatic Music and Electronica," 103; Emmerson, "The Relation of Language to Materials," 24.

time articulated by percussive electronica beats. Ramsay maps this transition using Emmerson's language grid to highlight how movement from the zone of "mimetic discourse" of acousmatic music to the "aural discourse" of electronica occurs.[41] The gestures that articulate the acousmatic energy-motions are constructed from the source material of common electronica sounds and structures. In doing so, the piece retains a sense of cohesion despite a shift in the fundamental type of discourse that carries the work. Ramsay's techniques in "Flinch–Rest" demonstrates one possible method for allowing the compositional languages of acousmatic music and PEM to sound within a single work.

In this thesis, I develop this line of inquiry further in two particular ways. First, given the lengthy discussion in the literature surrounding different types of sounding discourses in acousmatic and PEM music surveyed in this chapter, I have developed compositions that 'flip' between a wide range of acousmatic and PEM approaches. Energy-motion and metric time are two common modes of discourse in acousmatic music and PEM, but not the only ones. Smalley's six modes of discourse and others commonly featured in PEM are frequently alternated in my portfolio to give my compositions their dramatic arcs. Second, this thesis explores the effect of these modes of discourse as they operate *simultaneously* in my compositions, offering insight into how acousmatic and PEM elements can be brought together in ways that add up to more than the sum of their parts. This exploration of what Smalley refers to as "tensile discourse" opens up a discussion of how tropes from one electronic music tradition might be energised and/or transformed by tropes from another electronic music tradition when called upon to deliver a united musical narrative.[42]

[41] Emmerson, "The Relation of Language to Materials," 24.

[42] Smalley, "Defining Timbre—Refining Timbre," 46.

The new insight from this research offers pedagogical avenues into the fusion of musical languages which utilise discourses of separate styles to generate tensile discourse in compositions. It does so by offering new ways to analyse existing compositions and to consider compositional approaches to new works. As more composers of popular genres of electronic music have access to the same tools as traditional acousmatic composers, this research offers ways to make informed aesthetic decisions when approaching musical drama through techniques of audio processing and the creative arrangements of generated materials. It offers news ways for composers of popular genres of electronic music to consider engaging with timbre as a dramatic device, in methods informed by the acousmatic tradition.

Chapter Two: Methodology

Smalley's "six interactive types of electroacoustic discourse" form the backbone of the intervention into my compositional practice detailed in this thesis. As discussed in Chapter One, timbral shifts play an important structural role in acousmatic music and are increasingly being incorporated into the PEM compositional landscape. Smalley's "six interactive types of electroacoustic discourse" provided a creative prompt for me as I set out to foreground timbre in my own creative practice. In turn, I was struck by the utility of Smalley's concept of "tensile discourse" as a way of shifting our gaze from how particular types of discourse are deployed in a musical work to the way simultaneous modes of discourse *collide* in a musical work.

Thus, Smalley's modes of discourse seemed particularly relevant to my compositional aims, as they are conceived broadly under the term "electroacoustic" music; that is, Smalley does not exclusively pin them to the acousmatic electroacoustic music tradition. Transformational, behavioural, motion and tensile discourse are clearly tools capable of interpreting the structural functioning of timbre events in PEM. For example, the phenomenon of cohabitation and conflict of behavioural discourse is apparent during shifts between various layers of percussion when creating a central groove in EDM.

Smalley's six proposed modes of discourse are:

1. **Source-cause discourse** involves the listener's attempts to relate the heard material to "specific or inferred" objects.
2. **Transformational discourse** refers to the unfolding transformations of material.

3. **Typological discourse** draws timbral relationships between sounds or groups of sounds.
4. **Behavioural discourse** involves the relationships of "cohabitation/conflict and dominance/subordination" between sound objects.
5. **Motion discourse** regards the perceived "motion and growth processes" of sounds.
6. **Tensile discourse** refers to the ebb and flow of tension and relaxation caused by the previous five discourses. [1]

Listed below are the dramatic gestures explored in the literature review that I have sought to bring together and overlay in my composition portfolio:

- **Familiarity–Remoteness:** the moving towards or away from sonic identities or characteristics that have been established in the context of the immediate work (internal) or in the world (external).
- **Expectation Fulfilment–Denial:** the compositional play of the listener's anticipation of future events caused by specific aural and mimetic sonic processes.
- **Stability–Instability/Organisation–Chaos:** states that can be reflected in many ways, such as harmonic structures, spectra and rhythmic material.
- **Sensory Dissonance**: caused by harsh or abrasive sounds. Perhaps a simpler concept to grasp, the sense of tension caused by this is resolved through the attenuation of the harsh material, either through filtering or changing amplitude.
- **Energy Accumulation–Dispersal/Modulation of Densities:** represented through a range of different sonic elements. Dynamics might be the most obvious of this category, but specific motion types are also effective, including accelerando and

[1] Smalley, "Defining Timbre—Refining Timbre," 46.

portamento, and processes of granular 'scattering' to sparsity. Modulating the densities of reverberant space (or "external space"), the sonic spectrum, texture and temporal divisions effectively portray these processes of building and releasing energy.[2]

- **Relational Contrasts and Conflicts:** corresponding with Smalley's behavioural discourse, this involves the relations between different sounds or sound groups. It directly relates to the structural narrative of a work as new, contrasting sounds conflict with what has been established as the work's core elements or thematic features. How the sounds contrast with each other varies, such as in terms of timbre, space, register and morphology. This method of creating drama plays with the dominance, subordination, and coexistence between different sounds, and directly influences the sense of stability of the musical context.

In the initial stages of the project, I devised broad questions to allow the act of composition to take place, which included:

- How can an analytical approach to sound materials contribute to new ways of building musical form and narrative in works of PEM?
- How can acousmatic techniques for expressing drama be used in PEM musical contexts?
- How can acousmatic music studio techniques be used and/or adapted for composing PEM works?
- What is the result of combining a top-down compositional strategy with acousmatic studio practices?

[2] Iannis Xenakis' stochastic compositions–"Pithoprakta" especially–demonstrate an undeniable mastery of this particular dramatic function.

- How can acousmatic spectromorphologies cohesively relate to, and interact with, tonal and metric PEM elements?

This method of using practice to "dive in" and "see what emerges" aligns with Brad Haseman's notion of "performative research".[3] In his 2006 paper, *A Manifesto for Performative Research,* he states that the strategy stems from the fact that many practice-led research projects "eschew the constraints of narrow problem-setting and rigid methodological requirements at the outset of a project."[4]

Using the above lists as ways into a new compositional practice, the compositional act itself functioned as a form of research that was critical for this project. I was able to explore the development of an acousmatic music skillset and build works that prompted further engagement with the scholarly literature. This feedback loop between compositional practice and engagement with the literature continuously yielded new knowledge on the ground, corresponding with what Smith and Dean describe as an "iterative cyclic web" of practice-led research and research-led practice.[5] In their 2009 text *Practice-Led Research, Research-Led Practice in the Creative Arts*, they explain their model as one that "combines the cycle (alternations between practice and research), the web (numerous points of entry, exit, cross-referencing and cross-transit within the practice-research cycle), and iteration (many sub-cycles in which creative practice or research processes are repeated with variation)."[6]

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[3] Brad Haseman, "A Manifesto for Performative Research," *Media International Australia Incorporating Culture & Policy* 118, no. 1 (February 2006): 100, https://doi.org/10.1177/1329878X0611800113.

[4] Haseman, 100.

[5] Smith and Dean, *Practice-Led Research, Research-Led Practice in the Creative Arts*, 2.

[6] Smith and Dean, 8.

For example, I began the first work in my portfolio, “On Objects”, with the aim of exploring Smalley’s transformational modes of discourse. Primarily, I was interested in working with the notion of familiarity–remoteness as I laid the foundation for this work’s dramatic arc. Yet enacting this approach required a return to the literature. Specifically, I needed strategic methods for transforming audio to accomplish my goal, and I found these methods in the work of Trevor Wishart. The insights I developed while working on “On Objects” were then developed further in later works presented in my portfolio.

The knowledge generated through this project is presented in both the traditional written format and through the creative artefact. Seeing that the creative artefact is the “basis of the contribution to knowledge”, my project aligns with the conventions of practice-*based* research, delineated from practice-*led* research by Linda Candy and Ernest Edmonds.[7] The researchers differentiate between these two forms of research by stating that “for practice-based researchers, making an artifact is pivotal, and the insights from making, reflecting and evaluating may be fed back directly into the artifact itself. Practice-led research, on the other hand, does not depend upon the creation of an artifact but is nevertheless founded in practice.”[8] Hence, the supplementary compositional folio demonstrates novelty in both the artistic method that explores the research aims and the product that demonstrates the final outcomes of this exploration.

[7] Linda Candy and Ernest Edmonds, "Practice-Based Research in the Creative Arts: Foundations and Futures from the Front Line," *Leonardo* 51 (February 2018): 64, https://doi.org/10.1162/LEON_a_01471.

[8] Candy and Edmonds, 65.

Portfolio Overview

In the next chapter, I will discuss the compositional portfolio in terms of my investigation into how the aforementioned discourses and functions of drama were used to generate and resolve tension. Thirteen electroacoustic works were composed over the course of the research project. The works composed during the project's initial stages explored the fundamental modes of discourse of acousmatic music and developed the compositional skills necessary for their articulation. The discussion of these works focuses on how these modes of discourse overlap and interact with each other to create tensile discourse. Several works were then composed, introducing certain elements of PEM and exploring how the acousmatic modes of discourse interacted or interfered with each other and those of PEM. Certain techniques were developed during this stage of the project to better manage the relationships between the acousmatic and PEM elements, contributing to a greater sense of cohesion in the works. As will be discussed, these included shifting the background and foreground relationships between primary discourses being used to create drama or moving between them in different sections of works. During the later stages of composing the creative portfolio, I addressed techniques of balancing the acousmatic types of discourse with those of PEM styles, allowing them to equally contribute to tensile discourse.

The structural strategies used in these works can best be articulated using the terminology used by Curtis Roads' discussions of form, especially in his 2015 text, *Composing Electronic Music: A New Aesthetic*.[9] While Roads outlines nine timescales regarding music and sound, only the middle four of the set were applied in the discussion of the compositions. Moving

[9] Curtis Roads, *Composing Electronic Music: A New Aesthetic* (New York, USA: Oxford University Press, 2015).

from larger to smaller timescales, these are “macro”, “meso”, “sound object”, and “micro”.[10] The “macroform” refers to the entire structure of a composed work. This consists of “mesostructures”, which Roads describes as “groupings of sound objects into hierarchies of phrase structures of various sizes”.[11] Roads identifies that “local rhythmic patterns, as well as melodic, harmonic, and contrapuntal relations transpire at the meso layer, as do processes such as theme and variations, development, progression, and juxtaposition”.[12] “Sound objects” refers to “a basic unit of musical structure, generalizing the traditional concept of note to include complex and mutating sound events on a timescale ranging from a fraction of a second to several seconds”.[13] Roads points out that they “can vary in time (they can mutate) and … are very heterogeneous”.[14] Finally, these are constructed by “sound particles” such as “grains and wavelets” on the “micro” level of time.[15]

Considerations of the mesostructural timescale were particularly useful for my composition and analysis. While mesostructures in my works were commonly identified when they focussed on new timbral, tonal, or metric material, processes which built and released tension also commonly occurred on this timescale, regardless of the primary modes of discourse used in the section. According to this, my discussion of the compositions, and the diagrams outlining structural overviews of the work, mostly refer to the works in sections of mesostructure.

[10] Roads, 50.

[11] Roads, 50.

[12] Roads, 50.

[13] Roads, 50.

[14] Roads, 50.

[15] Roads, 50.

Composition took place in my home studio in Coogee, Sydney. The equipment used included a pair of Yamaha HS-5 monitors, a pair of Focal Twin 6be monitors, a pair of Ultrasone pro900 open-back monitoring headphones, a Focusrite Saffire Pro 14 audio interface and a 15-inch Apple MacBook Pro. Recordings were made using a Zoom H4n handy recorder and the recent H5 model. The works were composed using Ableton Live as the host digital audio workstation (DAW), with many different third-party plugins. Specifically, software tools developed by GRM, soundHack and Robert Henke were used extensively due to their spectral and granular processing capabilities. Audioease's Altiverb and the Max for Live Convolution Reverb plugins were used for convolution processing.

Chapter Three: Discussion of Composition Portfolio

"On Objects"

Artistic Goals

The key objective for "On Objects" was to compose with a diverse range of 'found sound' materials. From this approach, I set out to explore the typological discourse of acousmatic music, blending the timbres of found sounds with instrumental sources to draw focus to the musical potentials produced by regular household objects. The second goal was to develop my skillset in composing works with a strong transformational discourse. This tended to be articulated by "*spectromorphological* transformations", whereby sounds transform to sonic destinations to be appreciated solely for their interesting timbral characteristics.[1] However, I also explored Smalley's notion of the stronger composer–listener communication created when transformations occur from recognisable, "source-bonded" sonic objects.[2] By using different levels of recognisability in this way, the work utilises the familiarity–remoteness variable to create drama. These techniques highlighted the points of overlap between the modes of discourse, as source-bonded transformations engage both the transformational and source-cause modes of discourse.

[1] Smalley, "Defining Transformations," 282.

[2] Smalley, "Defining Transformations," 282; Smalley, "Spectromorphology: Explaining Sound-Shapes," 125.

Compositional Method

I composed “On Objects” from a set of short recordings of household objects that each contained unique timbral characteristics. These included windchimes and coat hangers, a sliding door being opened, a stack of chairs being rattled, and a pot and frying pan being struck with a wooden spoon. After capturing these sounds, I recorded a kalimba and xylophone as the instrumental sounds to mix with the household sounds.

With these, work began on creating the low-level material, carried out by processing the original recordings to create a pool of sonic material with which to compose. The key methods for transforming the materials were time stretching with Paulstretch and the native algorithms within Ableton Live, granulation with the Granulator II plugin developed by Robert Henke and GRM’s Freeze and Space Grain plugins, convolution with the Max for Live Convolution Reverb plugin, and distortion and granular processing with various plugins by Glitchmachines (especially Cryogen, Fracture and Hysteresis).

After analysing the generated materials, I decided on a macrostructural shape for the work, expressed through the longer resonant materials. The initial sections explored resonances from the household objects, followed by a section incorporating harmonic instrumental resonances, then a final stage mixing the two, blurring the ability to distinguish between the two streams and drawing attention to the timbral similarities between them. To realise this structure, I placed certain longer pieces of audio in positions to create the foundation for each mesostructure of the work. The first section included time-stretched audio of a sliding door being opened, followed by a second section with time-stretched pots and pans. The instrumental section featured stretched recordings of a kalimba, followed by a section with granulated kalimba and pots and pans recordings.

Next, I placed longer unfolding transformations and shorter gestural materials, created by splicing together recordings of granular and time-stretched processing, onto these mesostructural foundations. The foundations were then edited to emphasise the focal texture of each section and balance the background/foreground relationships between the materials. For example, the resonant background material was lowered in volume at 01:27” to emphasise the heavily processed windchime material in the foreground—necessary due to the similarities of their spectral occupancies.

I then processed entire mesostructures by passing them through extensive processing chains, generating material spread throughout the work. By using these materials at points in the work earlier from where they were generated, I could foreshadow and hint at sounds to come later in the work. Or, by mixing the materials with the original mesostructures, I created sudden timbral variations. This technique of treating the musical material as new concrete source material for further processing became a useful tool for almost all other works in the portfolio, both sound-based and those with PEM elements.

Structural Overview

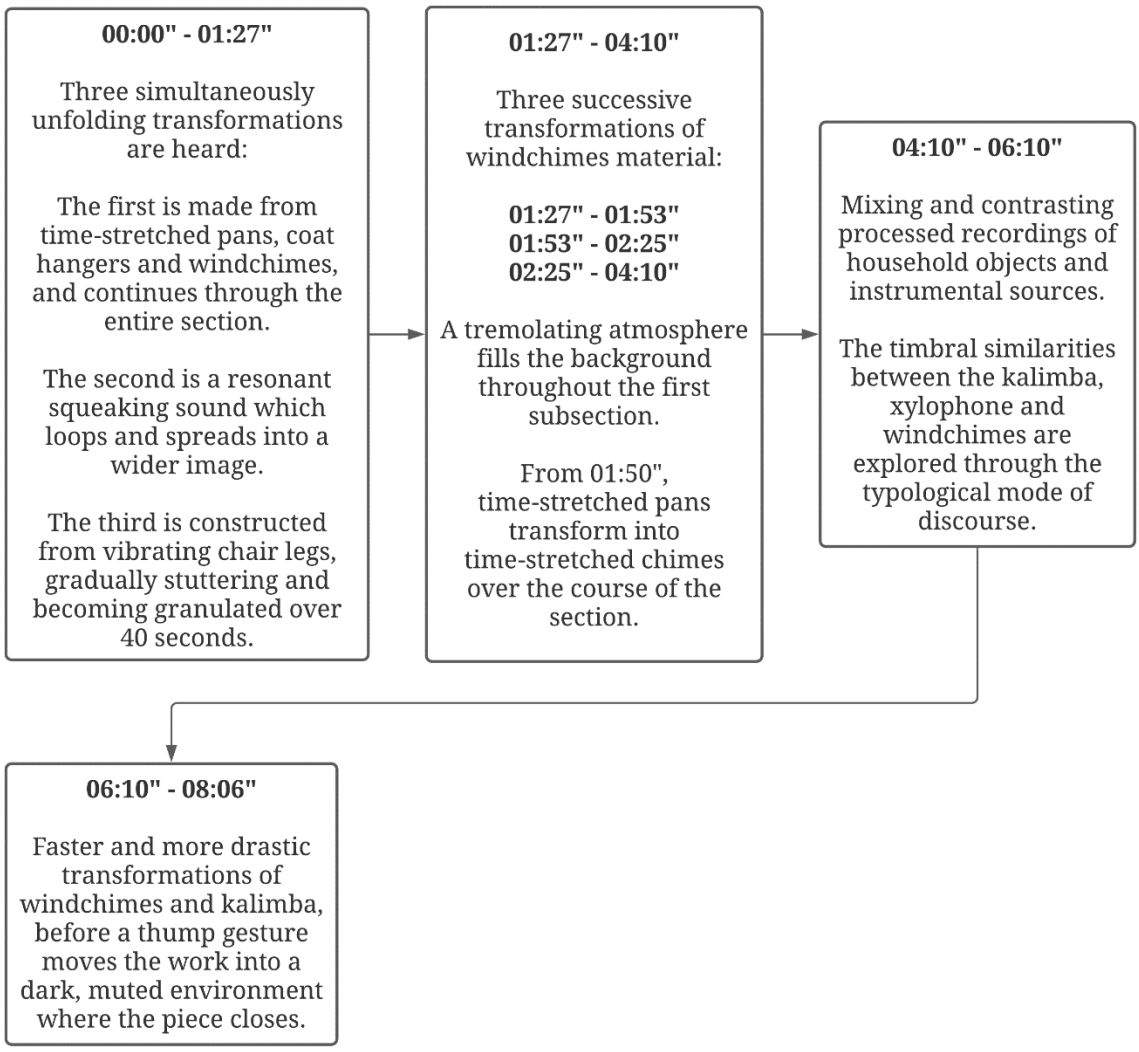

Figure 1: Structural overview of "On Objects"

The work begins with three separate streams of unfolding transformations. The first is constructed from time-stretched pans, coat hangers and windchimes, which lasts for the entire first section. The change of the resonant material's spectral characteristics was achieved by mixing different layers of recordings—each with its own processing techniques, and therefore unique timbral characteristics. While this is occurring, two additional streams of material also transform in different ways. First, a resonant squeaking sound appears in the centre of the stereo image and loops continuously in a locked groove. This sound spreads

wider, filling the stereo space and revealing a second squeaking sound that acts in a call and response relationship with the first. The other stream of transformation occurs from the sound of vibrating chair legs. This is a four-second looped recording of chairs being shaken and rattled against each other that gradually transitions into a stuttering and granular version of the same material over the course of 40 seconds. This trajectory was designed to blur the listener's perception of clear, recognisable sound by gradually incorporating more unnatural behaviours and timbres. I used this transition to more unrecognisable and "remote" sounds to build a sense of tension, reinforced by the increasing dynamics.[3] The sound crescendos until the recording of the now swirling processed chairs suddenly terminates, moving into a new timbral focus at 01:27".

The section from 01:27"–04:10" focuses on three consecutive subsections, each of which is carried by transformations of windchime recordings. Like the vibrating chairs, the trajectories of the materials in each of the three transformation processes move from being recognisable to becoming more abstract and distant from their original source. The chimes material is first presented unprocessed, before (either gradually or abruptly) changing into more remote, glitch-like and unrecognisable material. As with the transformation with the rattling chairs, this is an example of using recognisability and Smalley's scale of gestural surrogacy for dramatic effect.

The first of these subsections is from 01:27"–01:53". The transformation in this subsection begins very abruptly at 01:32", with the onset provided by an artefact from the processed windchimes recording (created with Glitchmachines software), opening into very different timbres from the original recording. At 01:35", this section terminates, with dual

[3] Smalley, "Defining Transformations," 282.

functionality as the onset for the following gestures. Here, a wide array of transformation types occur simultaneously before the stuttering sound type prevails. The stuttering ends with a low thud at 01:53”, terminating this subsection.

Throughout this subsection, a tremolo sound accompanies and contrasts the metallic sounds of the chimes. This was designed from a recording of a sliding door squeaking, which was stretched and pushed back into a deep reverberant space before a tremolo effect was applied using the native Ableton Live ‘autopan’ plugin. Although the chimes material is changing at a fast rate, including a sound that stays relatively consistent throughout this longer timeframe binds the section together as a more cohesive unit.

The second subsection (01:53”–02:25”) introduces more granular processing of the windchime material. This section is slightly calmer than the introduction of the work and first chimes subsection. Similar to the first chimes subsection, a recognisable recording of the windchimes is presented at the beginning; however, here it has been transposed down three semitones. The granular recordings were made using both the GRM Freeze plugin and Robert Henke’s Granulator II. In this context, they act more as an accompaniment to the dry recording instead of acting as transformational targets.

After the calmness of the previous section, the final chimes section (02:25”–04:10”) explores a heavily manipulated recording of the chimes. This was achieved with Granulator II, as this plugin allows for key-tracking (the pitch of notes received from a MIDI controller) to manipulate the playback speed, and therefore the pitch of the sample being used for the granular synthesis. The sample is transposed down to resonate at approximately 900hz from 2:35”–3:09”, before returning at 3:14” transposed down another octave.

On a much longer timescale, another transformation occurs during this section. The resonances of pots and pans being struck were stretched using Paulstretch to create long resonant material. These were overlayed throughout the entire section, becoming audible at 01:50” before evolving into the stretched chimes sound that has been processed in the same way.

The following section (04:10” – 06:10”) is carried by a typological discourse, mixing and contrasting the sounds of household objects with instrumental sounds to extract a sense of musicality to seemingly non-musical sources. This was achieved by grouping together the sounds of a kalimba, xylophone and windchimes to explore their timbral similarities, allowing them to be potentially interpreted as emanating from a single metallic instrumental source.

In the final stages of the work (06:10” – 08:06”), tension is created by the faster pacing and more drastic transformation, especially of the kalimba materials. The piece concludes with a final dark, muted texture created by transposed and distorted chimes and kalimba materials.

Familiarity–Remoteness as a Function of Drama in “On Objects”

The discourse of “On Objects” is primarily carried by sequences of “spectromorphological” and “source-bonded transformations”.[4] By beginning these transformations from recognisable material, as in the chimes transformations at 01:27”–4:10”, a clearer sense of the transformation’s trajectory is expressed to the listener. As mentioned, the use of recognisable

[4] Smalley, "Defining Transformations," 282.

materials in this way employs both the transformational and source-cause modes of discourse.

"On Objects" particularly uses the familiarity–remoteness function in source-cause and transformational discourse. Notably, it does so mostly in terms of extramusical contexts. In other words, remote and unfamiliar materials are remote from *any* known source-causes, not just those established as important to the work. This exposes two possible types of the function: external and internal familiarity–remoteness. In source-cause discourse, the play with presenting clearly recognisable materials or more remote sounds functions as a useful tool for creating drama. Extremely remote musical contexts can cause a sense of displacement, while using more familiar sounds provides a sense of grounding in the listening experience. The section involving clearly recognisable kalimba material offers more familiarity than the final closing section at 07:43", with its remote and heavily distorted textures. In transformational discourse, sounds may originate from or transform into more recognisable identities. For example, the windchimes transformations subsections each use various types of processing to explore different levels of familiarity or remoteness during their transformations.

The climactic section from 06:30" is dramatic for a range of reasons. These include the pace of introductions of new materials, the range of remote and unfamiliar timbres, the inclusion of abrasive materials, and the filling of external and spectral spaces. The combination and growth of these throughout the section create a sense of tension that is almost entirely resolved in the final closing texture described above. This resolution comes from switching to a slower soundscape with a timbre that mostly occupies the lower areas of the spectrum, and omitting the abrasive materials. The only aspect of the previous drama not resolved is the

familiarity–remoteness function. Indeed, if the piece closed with a return to purely familiar materials, all tensions would be resolved. In this way, these functions were used artistically to determine the work's narrative shape.

"Volca"

Artistic Goals

"Volca" was composed as I experimented with methods of processing PEM materials. In the case of "Volca", I used the creative limitations of the Korg Volca Beats analog drum machine as the sole source material for the work. This was treated in the same manner as recorded material in traditional compositional methods for acousmatic music.

The inherent percussive nature of the source material led me to build a work featuring more gestural material than in "On Objects". The material was designed by piecing together small fragments of the original recordings and/or processed versions of them in ways that aimed to create sound objects that mimicked natural sonic behaviours. The source-cause mode of discourse carries the work's expression and engagement, as the sounds suggest realistic sounding bodies.

During the composition of this work, I also began developing the 'artefaktor' and 'chaosMacro' instrument and effects chains.[5] In "Volca", these were formed by randomising many parameters of a sampler into which each of the recordings was loaded. Using a sampler in an artefaktor aligned closely to basic musique concrète processing, as the main parameters being modulated were playback speed and direction, similar to the manipulation of tape. By

[5] The 'artefaktor' and 'chaosMacro' instrument and effects chains were a suite of tools I built for sound generation or processing. They feature extensive use of randomisation of many parameters of software instrument and effects plugins, aiming to increase the chance of creating and capturing 'happy accidents' from experimentation. These randomisations were either synced to the project's tempo, or operated in free time, measured in Hertz.

recording the output of these and picking out the best sounds, I generated a large set of percussive material that retained recognisable links to the original unprocessed recordings.

"Volca" was presented at the 2020 Australasian Computer Music Conference (ACMC).

Compositional Process

First, I created long recordings of each of the analog voices of the 'Volca Beats' drum machine, with their parameters modulated by hand. These included the kick drum, tom drum, snare, and open and closed hi-hats, along with the machine noise from the unit itself. The nature of the sounds produced by the drum machine meant a sense of gesture was already embedded within the source material. Due to this, the sound design process also involved generating textural material to balance the pool of materials in terms of gestural and textural typologies. I created most of the textural material by freezing a reverb effect just after kick drums, toms and hi-hats had played through it and capturing the 'frozen' reverberation.

As mentioned, I carried out a process of loading each of the long recordings into a sampler, triggering the sounds while randomising many parameters of the sampler. The sampler used was the 'impulse' instrument that is native to Ableton Live. I picked out the most useful sections from these long-generated audio pieces and carried out further processing, especially granulation using Henke's Granulator ii plugin. A technique I used with this instrument was to make recordings of expressively 'scrubbing' around a percussive event within the audio file. From this, I generated sequences of audio that contained a sense of structure embedded into them. These recordings were then used as structural frameworks for building certain sections. This involved building other sounds around the major events of the scrubbing recording to effectively translate the tensile ebb and flow of the scrubbing recordings into

musical sequences. The section from 01:10” was composed in this way, although the original scrubbing recording was removed, leaving only the elements built around it.

I created what would become the first mesostructure of the work by outlining a plan for referencing the most common ‘four-to-the-floor’ dance music structure. This consists of a looped kick drum rhythm accentuating the crotchet pulse, with an open hi-hat just before the loop begins again. I positioned a set of elongated kick drum sounds with long, descending tails across a 50-second timespan with stretched hi-hats swelling up into every second kick drum.

I created a piece of drone material through the work, which resulted from an unexpected artefact created during the sound design process. This was created by sending a sample of the tom drum into the Native Instruments’ Replika delay plugin and modulating the delay time. As the plugin was set to ‘modern’ mode—meaning no pitch modulation occurred as the delay time was changed—the sound was stretched in a semi-granular process, which produced a pitched artefact. This process can be heard from 4:50” to 5:13” in the wider stereo field. The artefact was resampled and processed by Dillon Bastan’s Max for Live device, Iota, which creates loops of small selected areas of spectral space within a spectrogram of an inputted sample (similar to iZotope’s Iris plugin). I created a recording of a long drone created by looping multiple areas of the spectrum, duplicated the recording, and transposed and layered several duplicates in a process that created a sense of slow evolution. I also threaded the material through different areas of the work before the section in which it is the focal point, foreshadowing it and using it to bind the composition and provide a sense of tonal gravity. The sound usefully offered an interesting contrast to the work due to the typological

differences between it and the other more gestural materials which commonly lacked any clear sense of tonality.

When the core sections were constructed, I intentionally had not yet considered them in the work's overall structure. This was deliberate, as I wanted to explore the bottom-up compositional strategy that is most common in acousmatic music. According to this, the high-level structural elements of the work materialise purely through the process of grouping and combining the low-level materials in artistic ways. This is opposed to the top-down strategy that is common in PEM composition, which begins with a consideration of the high-level structures of a work (the macro- and mesostructures) which may be relevant to the genre of the work, before building the low-level material to accommodate those structures. This fundamental difference between acousmatic music and PEM compositional strategies plays an important role in exploring the nature of compositional methods for composing the fused works of the portfolio.

I rendered each of the mesostructural sections into new audio files and moved these into a new Ableton Live project. From here, I considered how the sections could be ordered to form a desirably unfolding macrostructure. I placed the audio files across the timeline in a structure which oscillated between sections with tense gestural activity, and slower sections with less or slower movement and pacing. This preliminary form functioned as another structural framework. With this in place, I generated smaller transitioning sections by processing the entire mesostructural 'chunks' and spreading the resulting audio throughout the arrangement.

In much the same way as working on the mesostructural level, although operating at a level above, the goal of this process was to accentuate the structural features of the macroform. A

good example of this was working on the section focusing on the textural resonant material. This section needed more gestural material to provide forward momentum, so I processed the entire opening section and applied reverb to push it back into a deeper space, so it did not interfere with the resonant focal material.

Structural Overview

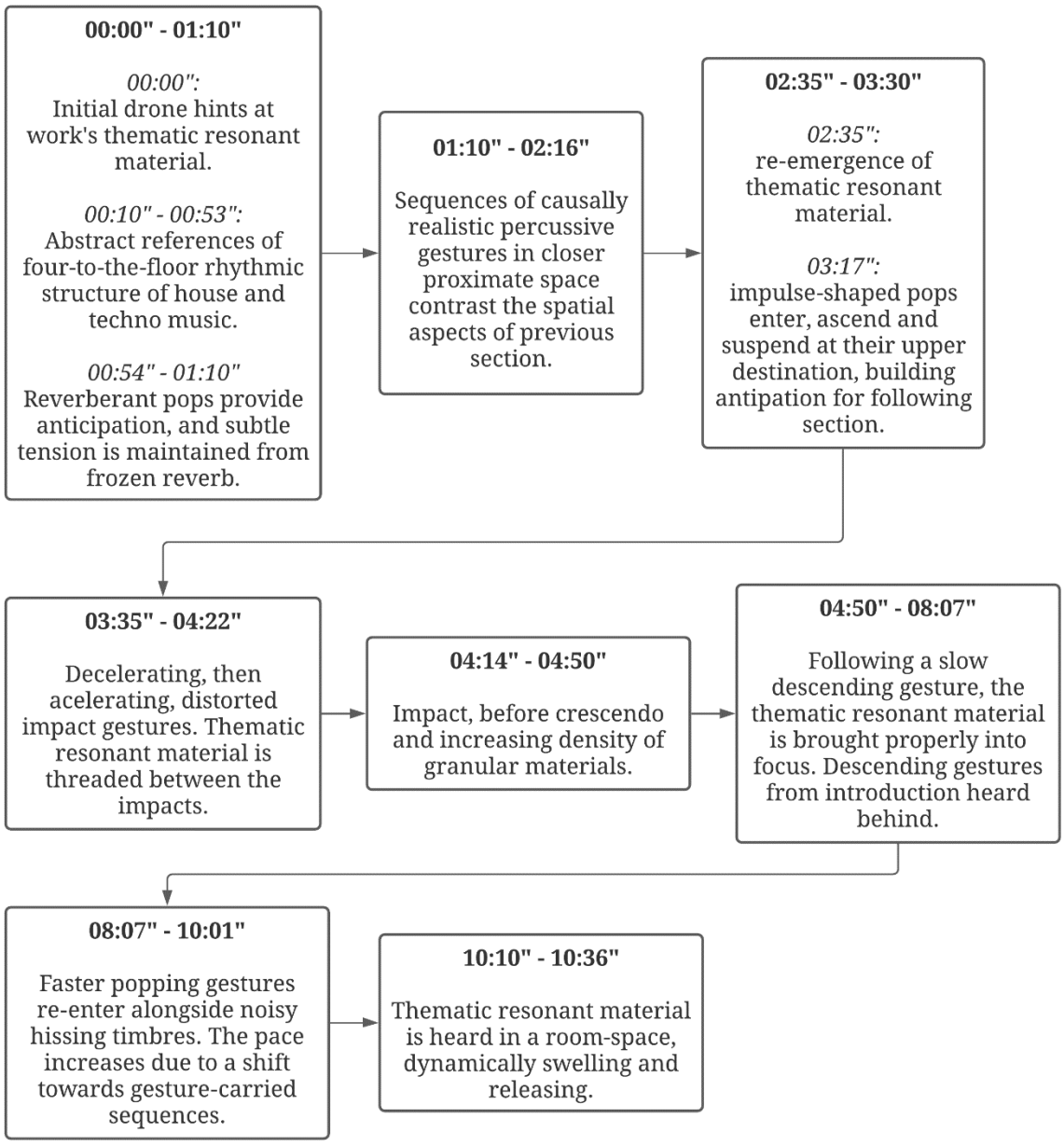

Figure 2: Structural overview of "Volca"

The opening section of the work abstractly references the four-to-the-floor structure common to house and techno music. This begins with a slowly emerging drone that hints at the thematic resonant material in the work. Spectrally framing this material is a layer of deep sub-bass rumble and a layer of highpass-filtered machine hiss. At 00:10”, a submerged impact reverberates with a tail descending in pitch before rising back up into the following impact. This process takes place from 00:10” to 00:17” and repeats throughout the opening section until 00:53”, with each impact becoming louder and more overdriven than the last. Reversed open hi-hat sounds swell into the descending kick drums at 00:24”, 00:38” and 00:53”. Throughout this section, small transient grains pop around the stereo field, and along with the hissing machine noise, provide a foreground against the distant descending kick drums. From 00:54” to 01:10”, a series of reverberant pops prolong the spatial aspects of the opening section, although the change in texture creates a sense of anticipation. Beneath these pops is a layer of frozen reverb of the opening section to provide both a sense of timbral continuity and yet an almost subliminal sense of tension caused by prolonging, or not entirely dispersing, the energy from the previous section. The release of this comes in the form of a termination by a set of close knocking gestures at 01:10”.

From 01:10” to 2:16”, the material focuses on causally realistic percussive gestures in closer proximity to the listener. These were created by methodically stitching together long recordings of the tom drums of the Volca Beats, heavily processed by a ‘chaosMacro’ chain using FabFilter’s Saturn distortion and Pro-R reverb plugins to create sequences that mimic natural sound behaviours.

After a series of hissing and granular material, the resonant material emerges again at 2:35”, providing contrast to the gestures and smaller resonances heard so far which have not conformed to any harmonic system so far. The shuddering sounds accompany this bed of resonance, before impulse-shaped popping sounds enter at 3:17”, increasing the textural density before gradually ascending as the resonance disappears. There is a suspension at the top of their ascent at 3:30”, which aims to sustain the tension and create expectation for the following section.

The design of the following section revolves around distorted kick drums that initially occur shortly after one another, before gradually being spaced further apart and finally becoming closer to each other as the section builds to a climax. This shape can be seen in figure 1. This design aims to use rhythm to heighten tension, influenced by the percussive and distorted timbres of the source material. At 3:35”, a sudden set of clicking gestures breaks the silence before a distorted kick drum enters, beginning a section that lasts until around 4:14”. The resonance heard in the previous section and at the beginning of the piece is weaved between the kicks.

Figure 3: Decelerating then accelerating impact gestures in “Volca”

Following an impact at 04:14”, granular crackling crescendos and provides momentum into a final descending gesture which begins the following section at 04:50”. This is carried by a slow convergence of tonal materials that form the thematic resonance hinted at throughout the work so far. There is a clear focus on this from 05:12” to 07:26”. At 05:03”, the

descending kicks from the beginning sequence are heard in a deep distal space, with the resonant material in close proximate space. Granular pops enter at around 05:47” but are convolved with an impulse response of a small room to smear the initial transient. At 06:30”, these pops create percussive thumps with resonant frequencies similar to the drone material, created using a resonator plugin. This provides a sense of coexistence between the granular and tonal materials by linking their spectral characteristics.

Throughout the final stages of the work, the pace of the gestural material increases, drawing the piece towards a climax until 10:01”, when the tonal material finally returns and releases the tension built by the quick rhythms and unpredictability of the more noisy gestural material.

Stability–Instability and Accumulation–Dispersal of Energy as Primary Functions of Drama in “Volca”

Central to this work is the relationship between the tonal drone and gestural material. The shifting balance between these two sets of elements builds drama through behavioural discourse. The tonal gravity of the drone provides a stability that contrasts with the instability of the fast-changing and diverse gestural material. Hence, the expression of stability–instability and the play of relational contrasts that unfold throughout the work are functions of behavioural discourse. Further, by threading the drone material throughout the work before the section where it is the focal point, the texture is established as important, creating internal familiarity. An example of the play balancing these two contrasting elements occurs in the section at 05:12”–07:26”, where the drone carries the work. Here, the gestural material is pushed to the back of the mix, leaving the foreground focus on the tonal drone. Doing so balances the tension without losing the interest provided by the submerged gestures provides.

Here, interference is minimised by separating sounds in both composed space and spectral space. Moreover, the resonance created by applying a resonator to the gestural material allows the two elements to coexist.

The accumulation and dispersal of energy is another key tool for creating drama in the work. This plays an important role in source-cause discourse, as it mimics natural sonic behaviours. These are heard in the opening submerged kick drums, which impact and descend (dispersing energy) before ascending and swelling into the following impacts (accumulating energy). Evidently, these spectral ascents and descents also relate to motion discourse. The oscillating dispersal and accumulation of energy provide a level of expectation as the sequences repeat on the sound object level. However, the growth of dynamics and increasing distortion make the structure unstable, expressing an overarching accumulation of energy throughout the mesostructure. This exemplifies how certain dramatic functions occurring on smaller timeframes can be 'nested' within others occurring over longer periods.

There are several other key uses of energy accumulation and dispersal as a dramatic function in motion discourse. The ascending motion at 03:17"–03:30" expresses this and sets up expectation for an event when it reaches its destination. However, this expectation is denied in this case, providing anticipation for the following section. Similarly, the section from 03:35" features deceleration, then acceleration, in the sound's kick drums. This rhythmic play, paired with the kick drums' distorted and abrasive timbres, creates the tensile flow of this section, resolved by the short break in these sounds at the end of the section. Also, the convergence of tonal materials from 04:50" provides an element of expectation and dispersal of energy, as the sounds become closer to their destination.

Finally, the return to the resonant material at the work's end provides resolution, with the resumption of familiar material after the diverse timbres of the previous section and relief from its fast rhythmic pace. This final return to familiarity and stability determines the narrative trajectory of the work. Where "On Objects" ended in a remote and ambiguous environment, "Volca" ends with greater senses of closure and stability.

“Ash and Copper”

Artistic Goals

Like “On Objects”, the goal was to develop skills working with a small set of source materials, although the set was much smaller for this work. In “Ash and Copper”, the materials came from a singing bowl and a piece of driftwood. The work’s form was designed around different transformations of this material instead of focusing on different sources of material in each section, as in “On Objects". The dramatic scheme of the work revolves around the recognisability of the material, expressed through the source-cause mode of discourse. This meant the sound materials are more diverse in regard to Smalley’s levels of “gestural surrogacy”.[6] The listener should be able to identify the sounds in terms of their original source-cause at certain points in the work, but at other times these may be suggested, ambiguous or entirely “unknowable”.[7] Therefore, the predominant modes of discourse are transformational and source-cause discourses. Dramatic shape is articulated by sounds transforming to remote destinations from knowable source-causes traversing the scale of familiarity–remoteness.

The practices explored during the composition of “Volca” in building sound objects that contain a sense of causality were developed further in this work. The source materials in “Ash and Copper” were often more recognisable and less percussive than those of “Volca”. Consequently, this required more effort in the ‘hands-on’ shaping of spectromorphologies of gestural units. As described in the following chapter, in most cases, structural aspects and

[6] Smalley, "Spectromorphology: Explaining Sound-Shapes," 112.

[7] Smalley, 112.

designs of the gestural units were somewhat planned before their construction rather than following an improvised and experimental approach. Smalley's ideas of "structural functions" proved useful when building gestural units in this way. I was able to plan the spectromorphologies by deciding on the desired sounds for the onsets, continuants and terminations, as well as any textural elements to layer upon the unfolding gesture and/or any spectral or spatial movements that would occur throughout each sound object.

Compositional Process

I began composing "Ash and Copper" by recording a small singing bowl being tapped by a wooden striker and a piece of driftwood being struck on the ground, knocked with my knuckles and tapped and rubbed with a metal rod.

The work was composed through a bottom-up strategy, beginning with first building low-level material: the individual gestural units and their components which later are organised into higher-level phrases. A wide range of processing techniques was utilised, including distortion and granulation using Glitchmachines' plugins and GRM tools. I paid attention to creating a balanced amount of different sound types and behaviours in the pool of generated material. These included short granular materials, longer resonances, noisy textures and portions of the unprocessed recordings that would be useful for building gestural units. As shown in Figure 2, I collected all the generated material, named the audio clips and organised them into six groups: transient-based, transients, resonance, granular, texture, and onsets and terminations ('ons and terms').

Figure 4: Organising produced materials for "Ash and Copper" in Ableton Live's 'Session View'

I created a set of gestural units by stitching small sections of these audio clips together, then organised these units to create 10 discrete mesostructures. Using Ableton Live's Clip View and Arrangement View together streamlined this process, as I had access to the labelled clips in Clip View that I could simply drag into the arrangement window to construct gestural units.

As mentioned, I carefully considered how these events unfolded with the aim of evoking imagined source-causes. This required choosing sounds to play specific structural roles within the gestural units, being the onset, continuant or termination. Within the continuant stage of the gestures, I created spectral or spatial motions to give a sense of trajectory for the unit. These decisions depended on the material before and after the unit being worked on, as the tension generated from an event representing a building of energy (e.g., a rising pitch) could be resolved by a following gesture dispersing this energy (e.g., a decelerating rhythm). As these events express through the motion mode of discourse, Smalley's "motion and growth" word set was a useful collection of terms for inspiring the decisions in creating them.[8]

[8] Smalley, "Spectromorphology: Explaining Sound-Shapes," 116.

The first small phrase at the opening of the work (00:00” – 00:04”) demonstrates this technique. I used two knocks from the driftwood recording, panned hard left and right, as the onset of the unit. These served to commence a section of the ‘crackling grains’ recording, which becomes increasingly surrounded by randomly pitched granular material and distorted versions of the singing bowl recording. This unfolds seemingly as a single transforming layer due to their corresponding crescendo, acting as the continuant of the unit. At the end of this crescendo, I used a thump from a transposed recording of the driftwood knock and a reversed duplicate of the knock used for the onset to create the termination of the unit. This unit gives the sense of a sonic process being switched on before growing in dynamics and chaotic spectral behaviour, suddenly being switched off again. This unit is separated from the following unit by a short section with a very quiet textural layer. However, other units were constructed as gestural strings that were joined by dual functioning onsets and terminations. The termination of one gestural unit was used as the onset for the following unit, contributing a sense of ongoing causality in the sequences.

In one particular unit (04:02”–05:20”), I created a form of structural guide that low-level materials were then used to reinforce, similar to the ‘scrubbing’ process used in “Volca”. I created a recording of granulating a small portion of the singing bowl recording while modulating the starting point of the granular sampler. By moving the starting point through the recording by hand, I captured an organic and human sense of evolution, expressed through amplitude and spectral complexity. This recording was then used as a framework from the mesostructure. I automated processing parameters such as building in stereo width and slight distortion to accentuate key points of growth and decay in the improvised recording. I then used small transient materials to onset or terminate these trajectories.

Finally, I convolved the recording with an impulse response of the singing bowl being struck and automated a gradual transformation from a dry sound to a more resonant one.

Similar to “Volca”, I recorded each of the 10 discrete mesostructures into new audio files and created a new project file to arrange the piece, working with these as the core materials. I outlined a structural plan by ordering the audio files in an appropriate format, paying attention to the dramatic pace, dynamics of each section and level of ‘remoteness’ of the sounds from any recognisable source.

Structural Overview

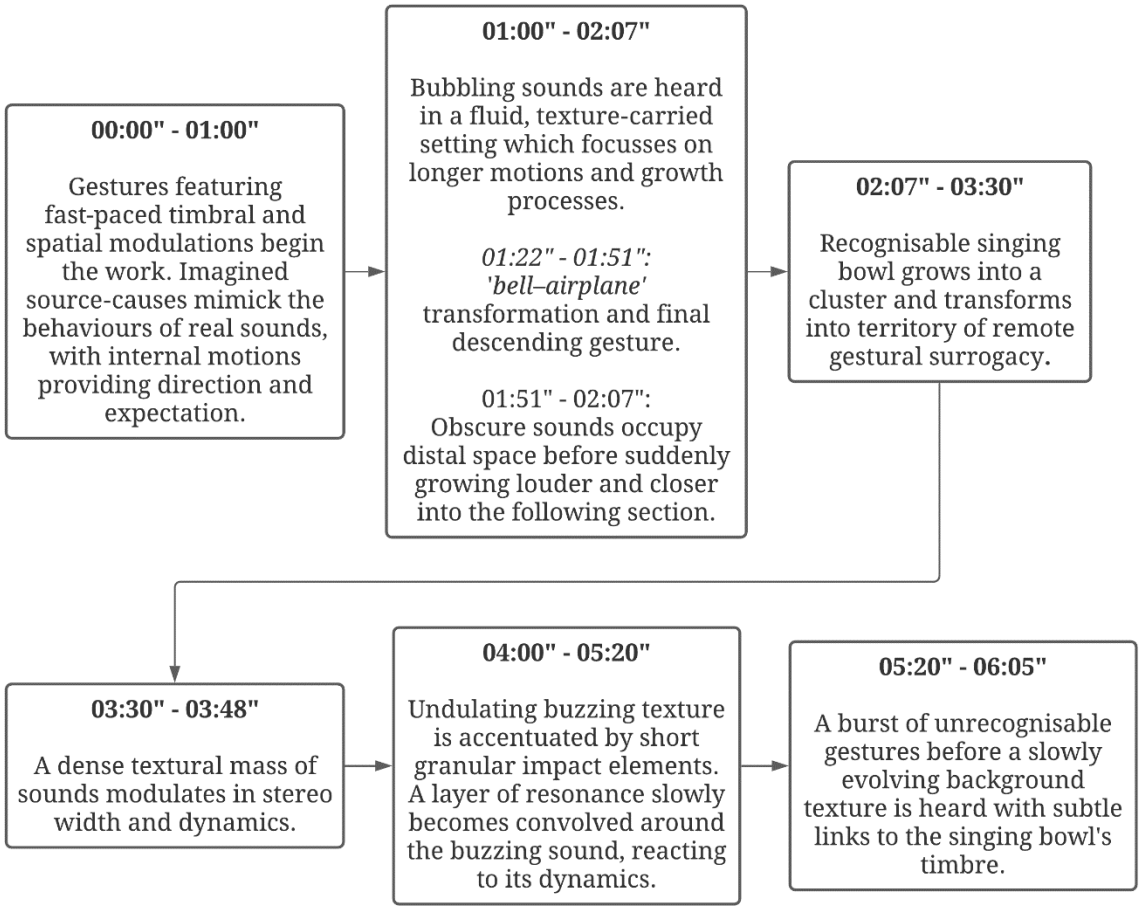

Figure 5: Structural overview of "Ash and Copper"

The opening section of the work (00:00”–01:00”) focuses on providing a frantic pace by the speed of timbral and spatial modulations. The gestures here aim to evoke imagined source-causes due to their construction mimicking real sound-shapes. I paid attention to the internal motions of the sound objects, which provide direction and expectation.

The following section has a similar focus on motion and growth but in a mostly texture-carried context. The sounds here appear more fluid in nature, following slower contours and transformations. This is especially true for the sonic process I labelled as the ‘*bell–airplane* transformation’ due to its mimetic links, heard from 01:22” to 01:51”, which terminates the section with a slow descent into rumble.

The third section (02:07” – 03:30”) focuses on the more recognisable material of the singing bowl being struck. However, the section aims to express a transformation from recognisable to unnatural sound material, building tension through this trajectory. This unfolds as various layers of the singing bowl recording are mixed at different transpositions before they become drastically processed and obscure. As the cluster grows, the link between the sound and a singing bowl becomes compromised before being unimaginable by the end of the section.

The short following section focuses on a mass of textural sounds that modulate in stereo width and dynamics, terminated by a heavy thump at 03:48”.

The section from 04:00” is carried by an undulating buzzing sound with short gestures built around its trajectory. Short glitch sounds seem to interact with the modulating buzzing sounds, with the resonance of the singing bowl interweaved throughout the section.

The piece closes with a section focusing on unrecognisable gestures (05:20” – 06:05”), remote from any known source-causes. Behind these is an evolving background texture that only retains subtle links to the original singing bowl recording.

Accumulations–Dispersals of Energy as a Function of Drama in “Ash and Copper”

A key consideration of this work was the construction of realistic acousmatic gestures that evoke drama through the expressions of accumulating, dispersing and transferring energy. Using low-level sounds materials, I pieced together impacts and longer transforming sounds with particular attention to creating a sense of causality. This required sounds to be organised to present accumulations and dispersals of energy, which is particularly evident in the opening sequence of the work. The continuant stages of the objects become increasingly unstable through modulations of their granular densities and dynamics, which both effectively express an accumulation of energy. These particular accumulations build until a dispersal of the energy terminates them. However, the ‘gestural strings’ in this section use the dual functionality of one sound object’s terminations as the onset for the following objects to transfer built-up energy across multiple gestures. This ongoing causality prolongs the sequence’s drama and makes for a greater sense of resolution as the gestural string is eventually terminated.

The processes of accumulation and dispersal of energy occur over different timespans, directly influencing the pace of the music. As Smalley discusses, sections that are carried by gestures have a stronger sense of forward momentum than texture-carried sections (which

draw focus to internal spectral behaviours).[9] The texture-carried sections of "Ash and Copper" have slower dramatic motion and growth processes unfolding. For example, the bell–airplane transformation from 01:22" accumulates energy slightly before a slower descent, as it disperses energy until all that is left is a very low rumble. The section at 03:36"–03:48" also has slower modulations of energy, with growth through tremolating dynamics, a longer crescendo and an expansion of stereo width. This phrase is terminated in a sudden thump, dispersing the energy that has been accumulated. These particular sounds are rather abrasive, so as they get louder, a greater sense of tension is created due to their spectral shape, only resolved when attenuated at the thump impact. The section from 04:04" is another example of unfolding accumulations and dispersals of energy, although here it is more undulating than building up to a final termination. The drama is expressed through the buzzing sound's spectral, spatial, stereo and dynamic growth and decay. These types of expressions appear to traverse the scale of stability–instability as they slowly expand and contract. By convolving the buzzing sound with a recording of the singing bowl, the spectrum becomes more occupied with metallic resonances. I was able to modulate this element of growth by simply automating the wet/dry mix parameter of the convolution effect. This particular work highlights the ability to overlap sonic processes that contribute to the same function of drama: spectral, spatial and dynamic processes can unfold, which all contribute to the same sense of fluctuating energies.

[9] Smalley, "Spectromorphology: Explaining Sound-Shapes," 113-114.

“Iterations”

Artistic Goals

The thrust of “Iterations” was to explore how acousmatic works could be structured around specific morphological archetypes and their potential to express tension and resolution. Like “On Objects” and “Ash and Copper”, “Iterations” also explores composing with a limited amount of source material and a play with recognisability, although it carries on from “Ash and Copper”s’ line of exploration into the drama produced by certain spectromorphologies and their unfolding motions. Adhering to this, the process of generating materials and constructing low-level sound units was guided towards exploring different iterative, granular and sustained morphologies, inspired by the “continuity–discontinuity continuum” in the “texture motion” descriptors outlined by Smalley (see Figure 3).[10]

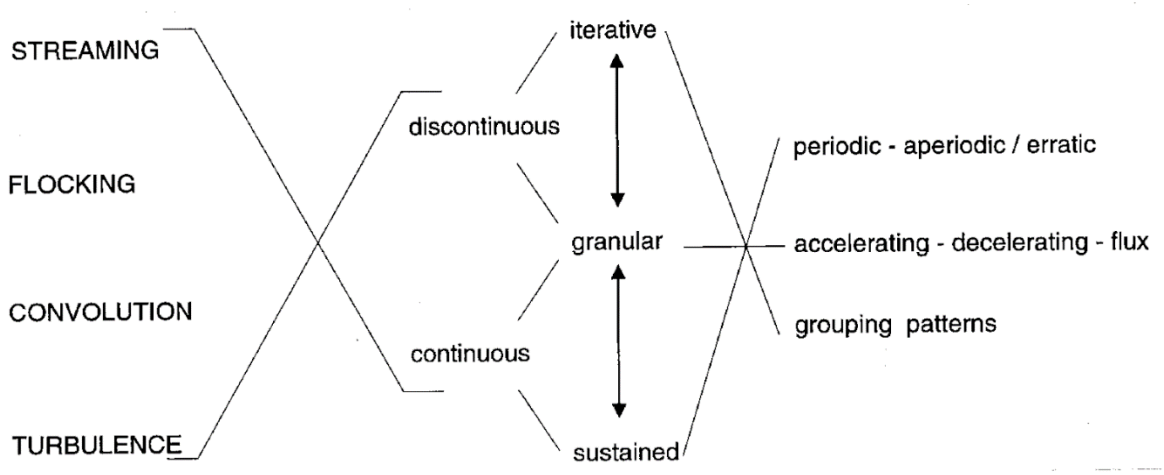

Figure 6: Smalley’s texture motion descriptors in ‘Spectromorphology: Explaining Sound-Shapes’

[10] Smalley, "Spectromorphology: Explaining Sound-Shapes," 118.

However, instead of exploring all of these sound types equally, I was drawn towards the iterative end of the continuum. I chose this because of the rich number of possibilities to investigate, which would create many creative avenues while composing with a small set of source material, and the diversity of structural functions iterative sound types can provide. I set out with this in mind to create materials that featured stuttering, zipping and humming characteristics, as well as decelerations and accelerations. Describing the relevant section of his word set, Smalley states that "texture motion may vary in internal consistency. Continuous motion is sustained while discontinuous motion may be more or less fragmented. The continuity–discontinuity continuum runs from sustained motion at one extreme to iterative motion at the other. If iterative repetitions become too widely spaced then separate objects will be heard."[11] Similar themes can be seen in Curtis Roads' *Point Line Cloud* (2005) and Blinkhorn's *The Gossima Collective*, where a specific morphology is the motif of the work.

Compositional Method

I decided to use a small recording of a set of cutlery being tapped and shuffled and a drawer being opened and closed. Using the sounds of closing objects like draws and doors appealed to me due to their dual functions as impactful percussive sounds and reference to something opening or starting and closing or ending. The metallic sounds of the cutlery ringing after being struck within the recording seemed ripe for producing resonant material of the work. However, the recording also unintentionally contained the hum of a fridge that was in the

[11] Smalley, "Spectromorphology: Explaining Sound-Shapes," 117.

same room, which was processed and used alongside the metallic resonances for contrast and variation.

I carried out the sound design exercises for this work within Bitwig Studio due to its modulation capabilities. Bitwig Studio is a DAW that allows extensive modulation of native and third-party plugins in a similar workflow to my use of the artefaktor and chaosMacro patches. This process separated the sound design and arrangement stages of composition, adhering to a traditional acousmatic music workflow.

I created a granular synthesis patch within Bitwig Studio that allowed control over the type of iteration produced. The design of this patch was based on Henke's 'Granulator ii' plugin for Max for Live. The cutlery recording was loaded into the native sampler plugin of Bitwig Studio. Using the 'textures' mode and freezing the playback, the play head position is set, looping a small portion of the recording (the length of which is controlled by the 'grain' parameter), with a certain amount of random movement of the play head position (controlled by the 'motion' parameter). Through these parameters, I created long recordings of material that involved experimenting with the parameters to create sonic processes of all descriptors of the continuity–discontinuity continuum. For example, looping a short portion of material (low 'grain' values) with 'motion' set to 0% produced sustained sounds. By raising the amount of 'motion', the sound became more granular. If the 'grain' size was very short in these cases, the sound had a noisy timbre; if it was longer, the sound became more iterative. With 0% motion and a longer 'grain' value, the sound would clearly be a short iterative loop. These long recordings were treated as the core material of the work.

As mentioned, both the metallic resonances and fridge hum recordings were used as the resonant material of the work. I created these by processing the recordings using GRM's Evolution and a patch created with the audio processing engine of Native Instruments' Alchemy plugin. This material was later used to provide the background for closer granular material and to separate and bridge between mesostructures.

I imported the material into Ableton Live and carried out a bottom-up strategy for building the work. The first stage was to build gestural objects that explored the continuity–discontinuity continuum.[12] These included 'zipping' accelerating and decelerating sounds, sustained tones generated by very small 'grain' values in the Bitwig sampler, and granular elements produced by modulating the 'grain' and 'motion' values. I contemplated the structural functions of these iterative elements for the construction of gestures. The accelerating sounds, which could be thought of as moving from "iterative" towards "sustained" on the "continuity–discontinuity continuum", were useful at the start of percussive gestures, as they implied a building of energy.[13] The opposite was true for the decelerating sounds, acting successfully as the termination tail of percussive gestures. The sustained tones were more versatile, performing a range of different structural functions for gestural material such as the termination heard at 00:19" carried out by a decrescendo and spatial modulation, or the very short, buzzing onset heard at 00:26". The granular material was not only more versatile but a more diverse body of material due to the vast difference of sounds dependant on source material (the position in the recording being granulated) and values of 'grain' and 'motion'. This was not necessarily surprising, as it is entirely possible to

[12] Smalley, "Spectromorphology: Explaining Sound-Shapes," 118.

[13] Smalley, 118.

construct works using only granular synthesis methods.[14] The granular material was also used as a textural component of other gestures to give them a sense of crackling and as the sole focus of a specific part of the work.

To construct the mesostructures, I began piecing certain gestures together to make ‘strings’, a technique developed while composing “Ash and Copper”. These string phrases were organised in the DAW linearly to create a set of goalposts to aim for and bridge between with other material. The decisions of the order and spacing of these strings contributed to the macrostructure’s ebb and flow. Once these structures were outlined, I then constructed elements of transition and foreshadowing in the structure by processing entire gestural strings and whole mesostructures and using snippets of the resulting audio in earlier sections of the work.

[14] See Curtis Roads, *Microsound* (Cambridge, USA: MIT Press, 2002).

Structural Overview

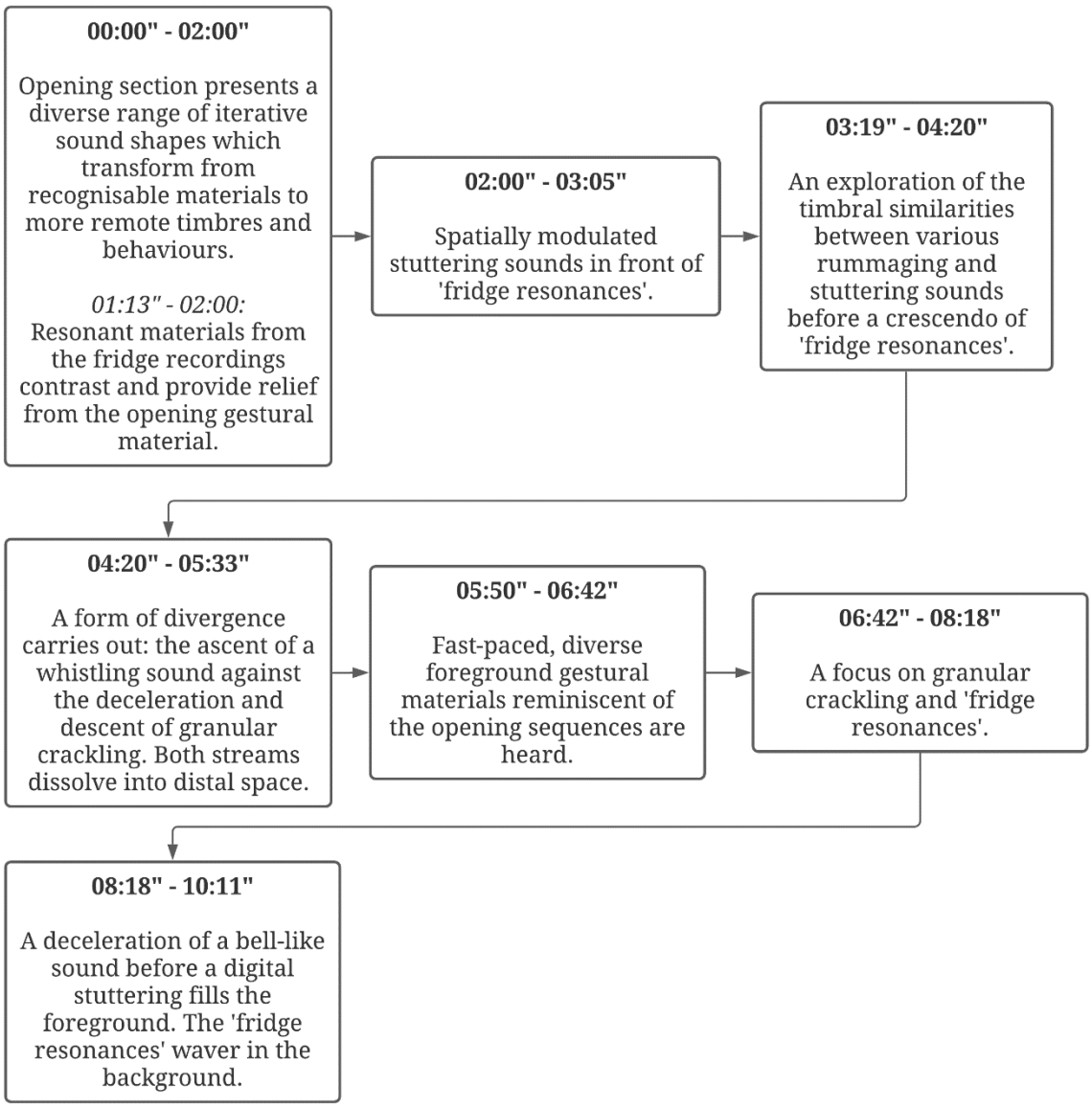

Figure 7: Structural overview of "Iterations"

The piece begins with recognisable cutlery drawer recordings. Over the course of the opening 15 seconds, the sounds begin to act unnaturally, and a more remote sound world is introduced. The opening section (00:00”–02:00”) focuses on gestures built from different iterative sound-shapes, often close to the listener and exhibiting a diverse range of spectromorphologies. The accelerations and decelerations are the key drivers for creating

dramatic movement between and within the gestures. The final stage of the section (01:13” – 02:00”) uses resonant processed fridge recordings to provide relief from the fast pace of the opening.

The following mesostructure (02:00”–03:05”) is carried by a stuttering sound moving through various spaces. The fridge resonances provide an ambiguous background for the trajectories.

The section from 03:19” to 04:20” explores the timbral similarities between various rummaging and stuttering granular sounds, ending in a crescendo of the fridge resonances.

The following section, 04:24”–05:33”, follows two main streams expressing a form of divergence. The whistling sound ascends in pitch, while the granular crackling slows down and descends. These types of motions create a building tension as they evolve. This is suspended as both streams fade into the background, joined by crackling sounds in distant spaces at 05:33”, betraying expectations set up in their trajectories.

The section from 05:50” to 06:42” focuses on more foreground gestures changing at a similarly frantic pace to the beginning section. A similar focus on various forms of iteration is held here, exploring their abilities to express building or releasing energy.

The granular crackling and fridge resonances feature in the following section from 06:42”, with different transpositions altering the spectral occupancy of the two streams. The final section of the work (08:18” – 10:11”) begins with a slowly decelerating bell-like sound before a range of digital stuttering materials occupies the foreground. Over the course of the

section, these foreground gestures enter intermittently against the textural wavering fridge resonances.

Inherent Stabilities and Instabilities in Iterative Sound Types and their Role in the Tensile Discourse of "Iterations"

The use of iterative sound types in "Iterations" led to a greater understanding of the inherent sense of stability within specific sounds. Ultimately, this was expressed through the types of internal motion of certain gestures and textures. Certain sounds proved to create a sense of tension that was resolved by specific changes to the sound's textural motion. The granular synthesis patch in Bitwig Studio provided control over these motions, allowing for recordings to be made of the 'play' of these behaviours or stitching together of different pieces of these recordings to construct gestures with variable senses of stability. For example, the noisy timbres created by using smaller 'grain size' values were stabilised as values for that parameter were raised, and the 'motion' value was lowered, creating sustained tones. It was felt that sustained tones resulted in the greatest sense of stability. The decelerating iterative 'zips' represented a dispersal of energy, while accelerations expressed accumulations. In effect, both of these motions had a greater sense of instability. Thus, smaller and longer phrases had drama expressed by the unfolding accumulations and dispersals of energy, which modulated the overall sense of stability or instability.

It was also felt that accumulations and dispersals of energy expressed through these morphologies created a sense of expectation in the listening experience—although an ambiguous one. Accelerations and decelerations did not always have a clear destination where the listener could predict a future musical event might occur. The ascent and deceleration heard from 04:24" to 05:33" unfold with no sense of prediction for when they

might be complete. The accelerating zips heard in the opening of the work suggest that they are leading *somewhere*, but that destination is difficult to accurately predict. This is comparable to a process of spectral convergence in a later work in the portfolio, “Tor”, where one sound stays at a single frequency while another rises up towards it. In this case, the listener can predict the destination of this unfolding process—the point the two pitches join. This comparison highlights the ambiguity of expectations aroused in the listener when listening to motion discourse and other routes of creating the drama of specific phrases.

The divergence from 04:24” to 05:33, where the whistling sound ascends while the granular crackling slows down, was designed to explore the combined effect of these two processes, which are simultaneously overlaid. Indeed, there was a clear sense of instability to the structure, contributing a large portion of the section’s drama, although the ascending layer—the accumulation of energy—appeared to dominate the discourse. It is reasonable to suggest this is due to the listener being drawn to pitch content more than textual or granular content. On its own, the descending granular crackling has a slow yet clear sense of resolution, even a sense of ending. This demonstrates the dominance that certain elements and their behaviours have in the tensile discourse of a musical context. It was interesting to experiment with these two expressive devices simultaneously, with each attempting to pull the listening experience in the opposite direction.

The use of more recognisable materials also engages the listener in interesting ways. “Iterations” feels more grounded in the real and familiar than, for example, “On Objects”. It was a conscious decision to use more raw recordings (or sections of them) and more minimally processed sounds. In this way, the scale of familiarity–remoteness could be more clearly traversed throughout the work. Music that only contains remote unfamiliar and

‘unknowable’ sounds appears less able to hold interest than music that contains familiar points of reference in terms of extramusical objects or processes. This was used strategically in “Iterations” as a contributor to the work’s drama by modulating the level of the remoteness of timbres in different contexts. Returning to unprocessed recordings of the cutlery, even for brief periods, suddenly engages the listening experience further, as it presents an anchor to tether the work to familiarity. By traversing away from these familiar sounds, as expressed in the opening of the work, a sense of untethering and distance from familiarity was established, generating a layer of drama.

“Tensions”

Artistic Goals

“Tensions” explores Smalley’s note–noise scale as a compositional prompt (see Figure 4). The scale outlines a continuum to identify various spectral typologies that a sound may embody. The two extremes of the scale are “note”, with a single pitch, and “noise”, with an absolute lack of pitch. In between the two extremes, “(notes)” refers to a “note collective” that may create chords or densely packed clusters, which can create a noisy spectrum if expanded throughout the entire spectrum. I drew inspiration for this work specifically from Ligeti’s use of dense note clusters in *Volumina* and how their expansion and contraction carries the work’s form.

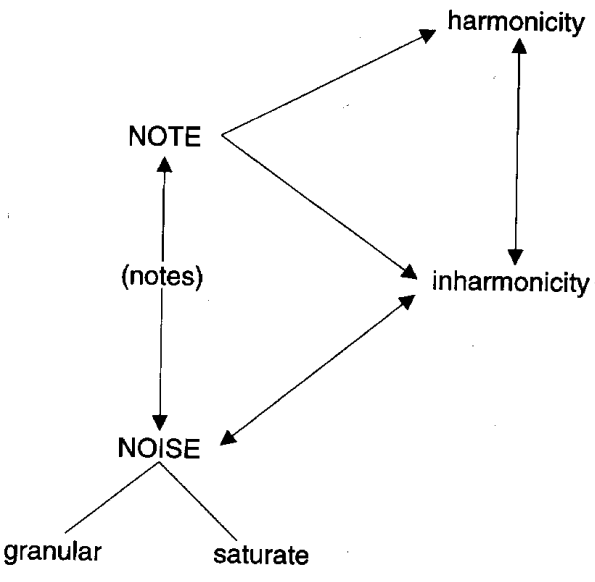

Figure 8: Smalley's note–noise scale in ‘Spectromorphology: Explaining Sound-Shapes’

I found this continuum very inspiring for composition, as it both guided the compositional process and carried the work’s form. The process of creating sonic materials and their

transformations had provided a clear sense of focus by limiting me to exploring note-, noise-, or combinations of note/noise relationships. The sections of the work express different interpretations of sounds moving through the scale.

The note–noise scale was useful for dramatic purposes through its ability to express tension and relaxation. In this way, transformations of sonic characteristics tended to carry the work and contribute to tensile discourse, as loud, noisy spectra created a sense of tension that resolved through their transformations into single notes or clusters.

The fusion of streams to create gestalt textures was also an exploratory aim of the work. This was inspired by Smalley's "integration–disintegration continuum", which describes how unfolding sounds are perceived as a single texture, even if they are constructed by fusing multiple materials together.[15] This tended to involve the fusion of separate tonal and noise-based sounds to form composite sound objects and relates to the behavioural discourse of the work, as form is created in the process of fusing separate elements. The gradual cohesion of the sound image, as achieved through various means of processing, is an additional method of creating dramatic resolution.[16]

I composed this work as mostly "texture-carried" music. Smalley explains that this type of music, which lacks explicit gestural material, "concentrates on internal activity at the expense

[15] Smalley, "Defining Timbre—Refining Timbre," 42.

[16] Albert Bregman's concepts of integration–segregation and fusion in his research of "Auditory Scene Analysis" are also of relevance here. Bregman, Albert S. *Auditory Scene Analysis: The Perceptual Organization of Sound.* (Cambridge, Mass: MIT Press, 1990).

of forward impetus".[17] This internal focus allows the listener to focus on the unfolding transformations across the note–noise scale.

Compositional Process

Composition was carried out in a multiscale approach. Compositional focus tended to move from the low-level textures to the mesostructures they formed when amalgamated before moving on to the low-level objects of another mesostructure. These low-level materials were much longer in timescale than the smaller gestures of the previous acousmatic works in my portfolio. A set of these mesostructures was constructed and then ordered chronologically to construct the macrostructure.

I began composing the work by making long recordings of improvisation on a Dave Smith Instruments Prophet Rev2 analog synthesiser, processed through a Zoom MS-70CDR guitar pedal. The recordings included noisy textures with amplitude modulated to sound like waves and wind, and long growing and contracting note clusters. Another layer was created by convolving a recording of waves at a beach with a recording of a long metal pipe being struck, which contained a set of inharmonic, bell-like overtones. By modulating the wet/dry mix of the convolution plugin, the resulting sound essentially transformed across the [(notes)–noise] section of Smalley's scale. These recordings were used to make the first section by stacking and crossfading them with one another. Automation was also applied to the stereo width of each of the recordings to allow the sounds to be perceptually integrated, as this tends to be easiest when all sounds are occupying the same area of the stereo field.

[17] Smalley, "Spectromorphology: Explaining Sound-Shapes," 114.

Moving onto a new mesostructure (heard at 04:51”), I recorded a dense cluster of tones produced by a Novation Peak synthesiser, which effectively occupies the (notes) section of the note–noise scale. I then made several copies of this recording, with each transposed at different values: +12st, -5st, -6st and -18st. Heard unfolding from 05:11”, these were crossfaded to form a very dense cluster, intensified by a layer at the original pitch smoothly descending an octave. This entire cluster was then processed with two instances of Soundtoys’ Crystallizer granular delay plugin, which transposes and delays an input signal. One instance transposed the cluster down an octave and the other transposed up an octave. Both instances had a high level of feedback that caused the output to cascade up and down the frequency spectrum. This entire process effectively fills the frequency spectrum through what Smalley describes as “inharmonic saturation”.[18] As a result, the music moves linearly from notes to noise. To resolve this dense texture, I reduced it to the original cluster and slowly bandpass-filtered it to focus on a narrow node in its centre. I then ascended and descended the cut-off frequency of the bandpass filter to accentuate specific notes within the cluster.

Next, I set out to create a section with a stronger focus on separating and integrating the noise and note elements of the gestalt sound. To do this, I created a distorted bass sound with the Novation Peak, which swells up and down in amplitude, distorting when it is at higher levels. I then recorded myself scratching a small Irish bodhran with my hands and fingernails using a Zoom H4n recorder. I layered the distorted bass and the bodhran recordings, each in clearly separated stereo spaces. I then mapped the volume of the bodhran audio to be modulated by the amplitude of the fundamental frequency of the distorted bass, using the envelope follower device for Max for Live. By automating this envelope follower to gradually have a greater

[18] Smalley, "Spectromorphology: Explaining Sound-Shapes," 120.

effect throughout the section, the amplitudes of the noise (the bodhran scratches) and note (distorted bass) aspects of the sound became behaviourally linked. Then, I composed a sequence of these two elements integrating into a singular sound by gradually bringing them closer together in stereo space, using the same technique as the first section.

I found that the pitch content of the scratching sound interfered with this integration, as the pitch contours were different to those within the distorted bass sound. So I composed another section following a similar process but used only the recordings where I used the pads of my fingers, which had much less pitch content than recordings where I used my fingernails, resulting in a much clearer integration of the layers.

I arranged each of the sections into an appropriate macrostructure. I began the work with the section focused on the convolving of waves with the metal pipe, which was followed by the distorted bass and bodhran section. I then split this section into two parts (one scraping the drum with fingernails and the other with the pads of the fingers) and inserted the section focused on “inharmonic saturation” in between them.[19]

[19] Smalley, "Spectromorphology: Explaining Sound-Shapes," 120.

Structural Overview

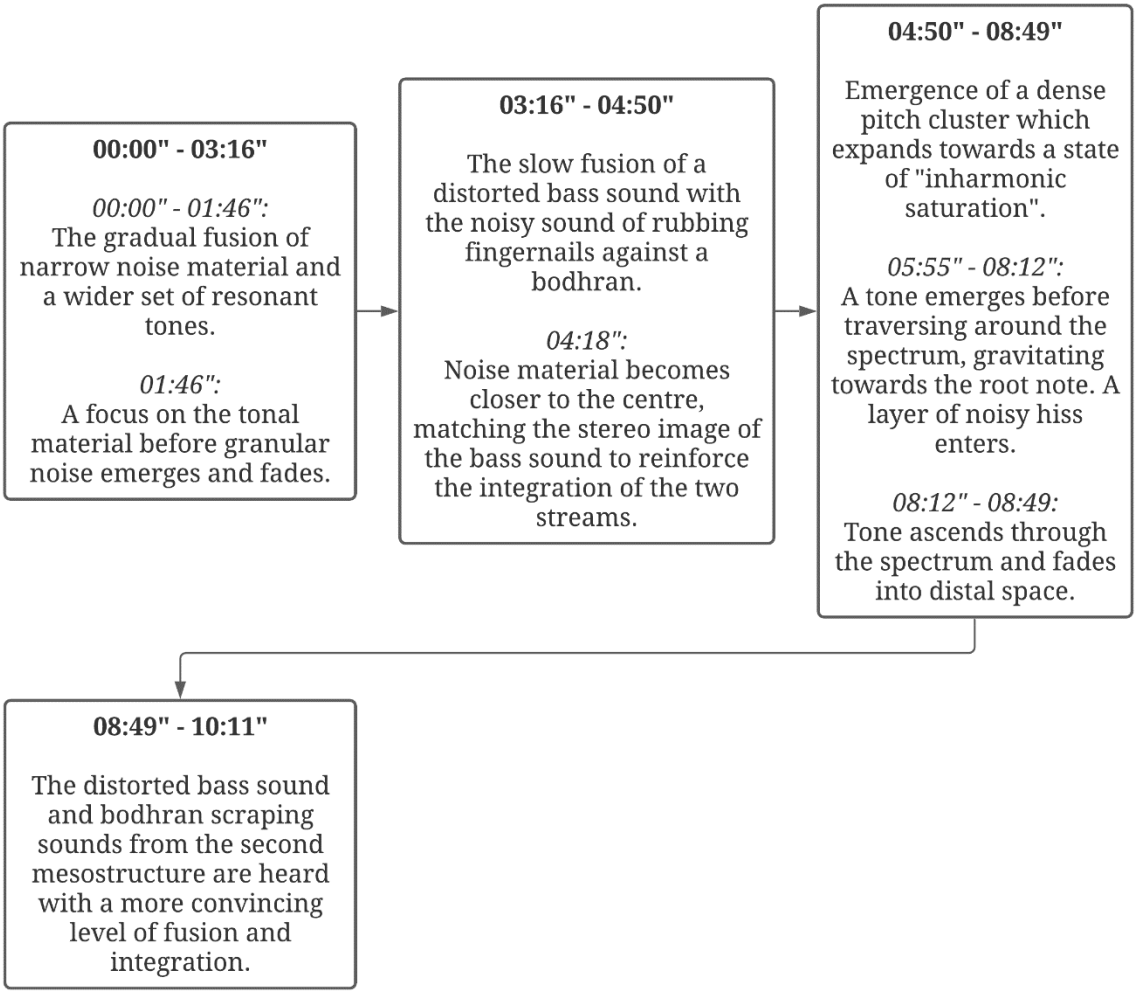

Figure 9: Structural overview of "Tensions"

The piece begins with a very noisy sound that is fairly confined in stereo space. Slowly, a smooth and resonant set of tones emerge, portraying the two extremes of the note–noise scale within the gestalt sound fairly independently of one another. The note and noise layers fuse together throughout this opening section until the noise exits at 01:46”, leaving a clear focus on the resonant “notes” material. Shortly after, the noise returns in a narrow stereo image with a more granular textural characteristic. This fades at around 03:04”, and the resonant material remains until it also fades at 03:16”.

At 03:16”, the second section begins with the distorted bass sound entering under the sounds of the rubbing fingers against the bodhran. Similar to the previous section, these two layers initially exist separatly from one another. As the section unfolds, they become more glued together as their amplitudes are linked through the envelope follower technique mentioned above. As this modulation has a greater effect, the two elements begin to integrate at around 04:00”. This process is similar to when the snares in a snare drum rattle while a bass sound resonates it. Gradually from around 04:18”, the noise material begins to move into the centre of the stereo field, closer to the bass sound, reinforcing the sense of integration of the two sound types.

The third section begins from 04:50” with the emergence of a dense note cluster. Gradually, the cluster expands across the frequency spectrum in a process of “inharmonic saturation”, where the cluster expands to cover the entire spectrum, effectively creating broadband noise.[20] This full spectrum becomes increasingly intense until a tone emerges from around 05:55” through the gradual bandpass filtering of the texture. This tone scans up and down a short area of the middle of the spectrum, before gravitating towards the root note at 07:20”. It carries out another ascent and descent as another high-pitched textural layer emerges and accompanies the tones. From around 08:12”, the tone ascends through the spectrum before fading into a deep reverberant space.

Lastly, the bass sound heard in the second section emerges, at first muted before its high-frequency content is introduced, revealing the scraping bodhran recording to be integrated with the bass sound. This integration results from the use of lowpass filtering to slowly

[20] Smalley, "Spectromorphology: Explaining Sound-Shapes," 120.

introduce the scraping drum recording, the same stereo positioning of the bass and noise element, and the lack of pitch elements of the scraping sounds, achieved by scraping with fingers as opposed to fingernails.

Creating Tensile Discourse in "Tensions" Using Order and Chaos in the Note–Noise Scale

"Tensions" is an example of how a simple concept in spectromorphology can be used effectively as both a compositional prompt and to build dramatic shape in a work. By applying the creative limitation to the composition, I was forced to consider different methods of expressing and exploring the scale and the consequential dramatic effects of certain trajectories within it.

The spectral typologies of noise and note appear to have an inherent sense of chaos and order, respectively, embedded within them. Noise is the chaotic manifestation of the entire spectrum occupied at once, while the note is an organised, mathematically related set of frequencies (unless articulated by a sine wave). This was considered the main form of expression, primarily using typological discourse to create the work's drama. Noisy spectra can also be abrasive to the ear, which is a useful dramatic tool. The third section of the work, which focuses on a process of "inharmonic saturation", utilises this and acts as the dramatic climax of the work. The loud and dissonant spectrum of that section produces tension through sensory dissonance, which is resolved by bandpass filtering the spectrum, leaving only a narrow portion of it audible (a note), and attenuating all other frequencies. However, this is not the only source of drama in this section. There is a sense of accumulating energy expressed through both an increase in dynamics and the filling of the sound spectrum (modulating the density of spectral space). These are resolved through a softening of

dynamics and a ‘thinning’ or focusing of spectral occupancy. This is a prime example of multiple overlapping functions of drama. Moreover, the section that proceeds just after its resolution creates a play with expectation through an almost melodic gesture from 06:34” – 08:35”. This is due to the sustained drone holding a root frequency, from which another tone departs before returning to it. This makes expectation and prediction possible, as the listener can predict where this ‘wandering’ sonority will eventually end. The sense of tension that is created from their divergence is resolved as the two tones converge again.

The process of integrating individual sonic layers into unified, gestalt sound objects was also used as a dramatic device in “Tensions”. This is relevant to both transformational and behavioural discourses, as it is ultimately a matter of changing the relations of the contrasting typologies. The first, second and fourth sections use this. The first section uses stereo width to bring the sounds together, while the second and fourth sections use that and the pairing of the two elements’ amplitudes. Additionally, the riddance of the pitch content in the bodhran recordings in the fourth section contribute to a greater sense of integration of the two elements (by using the finger pads instead of the fingernails when exciting the drum). Thus, what Smalley describes as an “integration–disintegration continuum” is effectively used as a device for creating form and drama.

Two formal aspects of this work also have implications for its drama. First, on the macro-level, the work’s form was organised to provide structural closure. This was achieved by finishing the work on a second iteration of a previous section. By doing so, the work ends with a sense of internal familiarity instead of remoteness, which is a technique similar to “Volca”s’ form and contrary to “On Objects”. This return to internally familiar elements affords the structure a sense of closure and conclusion, as opposed to ending the work in

open, uncharted territory. Additionally, “Tensions” ends with integrated sound objects—another overlapped dramatic device. These two elements of the work create a combined sense of closure to the narrative shape. Second, the work’s pacing was approached differently from the previous works in the portfolio. By being a primarily texture-carried work, there is a slower unfolding of the transformations and integrations. This led to the use of slower dramatic accumulations and dispersals of energy than the previous gesture-heavy compositions. However, that certainly does not compromise the potential to produce a tensile response in the listener in texture-carried works; indeed, the “inharmonic saturation” section is one of the most dramatic moments of the portfolio.

“Purging”

Artistic Goals

I composed “Purging” while I was interested in the different ways that popular music sounds could coexist with acousmatic music processing and structuring techniques in a single work. The goal of the piece was to explore how sonic elements could perform a harmonic role and also be the subject of acousmatic transformations and gestures. Through this, “Purging” was structured in two parts: the tonal mode of discourse mostly carries the first, and the second focuses predominantly on the source-cause and transformational modes of discourse. The aim was to achieve a sense of cohesion in the work, despite switching modes of discourse, by using the tonal sound material in the first section as the source material for creating the objects of the second section. Bell-like sounds proved engaging in exploring this dual functionality, as they could be used as a voice within a chord but also had an interesting spectromorphology. I used a recording of a small handheld bell being rung and an FM synthesiser patch to produce similar bell-like tones.

I paid attention to mimicking a natural sense of accumulation and dispersal of energy through the sonic events—a technique developed while composing the acousmatic works in this portfolio, especially “Iterations”.

Compositional Process

I began composing “Purging” by programming a bell sound in a Dave Smith Instruments Prophet Rev2. From a long recording of different versions of this sound, I picked out a single ‘bell pluck’ and stretched it dramatically using Paulstretch. This served as the foundation of a mesostructure as I layered two versions of the stretched recording together, one of which was

transposed at different values throughout the section to create a two-voiced harmonic sequence. I performed granular processing on another bell pluck to create a set of material with different grain morphologies: some smooth and bell-shaped (faded in and out), some with sharper onsets. This was layered on top of the two harmonic bell tones with different grain morphologies used at each harmonic change.

I composed the following section by recording an improvisation of chords around F Minor and Ab Major. With this main harmonic strip in place, I then inserted percussive 'thumps' to accentuate the beginning of each new chord. This utilised a similar technique to that developed while composing "Volca", where an improvised recording of play was created to act as the structural framework for a mesostructure. Lower-level sound objects were built around this to create the structure.

I inserted snippets of the chords to swell into the harmonic changes of the previous section with the two bell tones. After noticing the effect of these, I carried out a similar process of using different synthesised and handheld bell recordings to swell into the harmonic changes in both of these opening sections, giving the sense of accumulations and transfers of energy.

I then began working on the following section, which would feature acousmatic gestures created from the material in the opening section. As mentioned, I aimed to emulate natural processes of accumulation and dispersal of energy, which could be expressed in many ways, including ascending and descending pitch, accelerating and decelerating rhythm and modulations of dynamics. Percussive impact gestures serve well as a sudden dispersal of energy, so I used these as climaxes that energy would appear to build up to and be released from.

I constructed a mass of ‘pluck’ gestures by stacking them on top of one another at different pitches and at slightly different times. This small cluster of plucks was then resampled with processing, producing a recording that was then overlayed onto the cluster, transposed up an octave. This technique increased the cluster’s density and made it more of a gestalt granular entity than a collection of its individual plucks. The process was repeated to create the main gestural events (the climax of releasing accumulated energy), although each iteration had different processing carried out during the resampling process. This processing included delay with modulation of the delay time to create tape-style pitch descents and ascents, heard at 03:07”; granular time stretching using soundHack’s ++spiralstretch plugin; and filtering using low and bandpass filtering, modulating the resonance and cut-off frequency. To swell into these sections, I added short fading in segments of bass material from the previous section to lead into each gestural cluster.

To fill the background area of this section, I recorded an improvisation on the DSI Rev2 using a synthesiser pad patch. I processed a portion of this recording with reverb, overdrive and filtering. This processed material was used in this section, while the dry recording was used in the following one.

I aimed to have the improvisation as a foreground element in this following section with more textural sounds moving with it, each layer operating on the same level of focus to complement the other. To create the textural material, I recorded all the gestural clusters into a single audio file and performed heavy processing on it. This layer can be heard on its own at around 05:10”.

After analysing the structure of the work so far, I decided that an interesting addition to the work would be a final section that focused on presenting entirely new variants of the previously heard harmonic, textural and gestural materials. This technique was initially instigated by my consideration of ways that the classical music coda can be interpreted into modern electronic music.[21] However, it should be stressed that I was not aiming to strictly abide by the traditional function of a coda: the sense of departure from the previous sections that comes from the introduction of new variants of the material is not in line with this. I wanted to process the previous material of the work enough that while they retained some characteristics of their original form, the section would feel almost as though it is a new chapter of the piece, taking place in a new musical context.

I began building this section by further processing the stretched pluck recording from the first section that modulates pitch to create the two-voice harmony. This processing included pitch shifting, using ++spiralstretch plugin again to create short delay-like iterations, overdrive and reverb to create an atmospheric 'wailing' layer, heard at 05:20". I originally included material from the F Minor and Ab Major chords improvisation but later deleted it, as I felt the ambiguity and eeriness of the wailing sound without other harmonic material fit the function of the coda better. The small bell recording was stretched using Paulstretch, and its low-frequency content filtered to create a hissing layer. I then granulated the consolidated recording of all the gestural clusters and filtered out the high-frequency content to create a rumbling texture in the low frequencies. The distance between these two layers, and the lack of interference between them, contributed to a sense of coexistence of their spectral

[21] My dance music pieces, "Conditions" (2018) and "Plateau" (2019), released under Pat Carroll, each feature a similar section.

occupancies. They both acted to spectrally frame the wailing texture in the middle of the spectrum.

The first section of the work set the gestural material in a background role, with harmonic material in the foreground. To create this relationship, I processed the gestural clusters from the middle of the work with granular and spatial techniques and used quiet segments of the resulting audio throughout the opening section.

Structural Overview

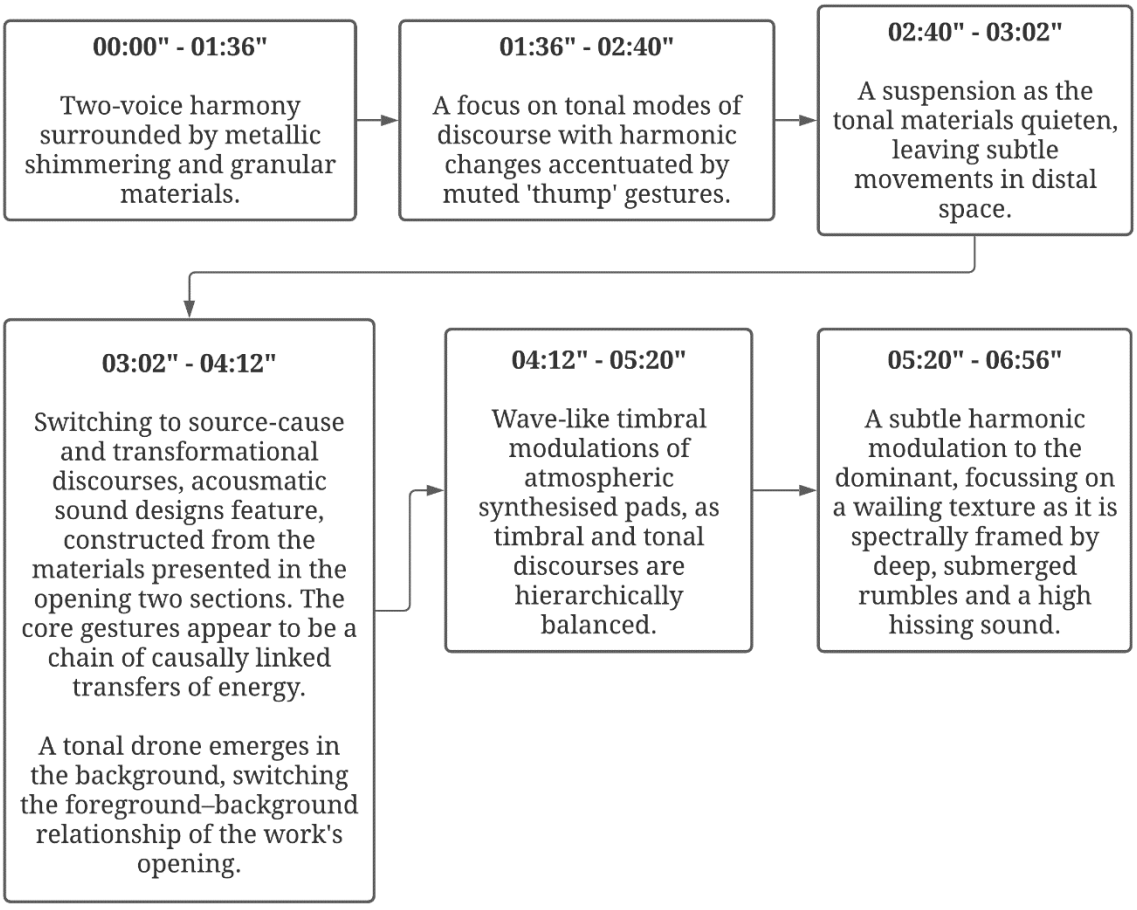

Figure 10: Structural overview of "Purging"

The opening section of the work focuses on the two-voice harmony surrounded by a shimmering, metallic texture and granular materials. Behind these is a layer of dynamic spatial sounds establishing the background relationship. The focus on tonal modes of discourse continues into the second section, with changes of harmony accentuated by low 'thump' gestures.

The following section expresses more strongly through the source-cause and transformational modes of discourse, featuring acousmatic sound designs created from the materials of the first section. The gestures that occupy the foreground appear causally linked, with various motion and growth processes articulating an organic transfer of energy. Behind these gestures, a tonal drone provides the background, switching the relationship between acousmatic gestures and harmonic material from the first half of the work. The section from 04:12" presents the pad materials with sweeping wave-like timbral modulations.

The 'coda' of the work begins at 05:20" with a modulation to the dominant. This final landscape is carried by a wailing texture (created from the two-voice harmony of the opening section), cohesively framed by submerged textures and high hissing.

Shifting Roles of Tonal and Source-Cause Discourses in "Purging"

The relationship and interconnections between tonal and timbral discourses is a key feature of this work. In the first section, the tonal discourse is the primary source of expression, although subtle background sound designs also engage the source-cause mode of discourse. This role is reversed in the middle section, with acousmatic gestures providing primary focus against a bed of synthesiser pads using the tonal discourse in a background role. Here, the acousmatic gestures express drama through the accumulation, dispersal and transfer of

energy in their designs. This was achieved by constructing phrases with terminations that smoothly transition into the onsets of the following gestures, contributing a sense of ongoing causality and prolonged drama. After this, the tonal discourse is balanced against the textural wave-like motions.

The techniques to separate the foreground and background roles of the discourses were modulating dynamics and position in external space of the elements expressing them. For example, the sound designs in the first tonal section involves soft dynamics and is in a range of room and hall reverbs, as is the synthesised pad material behind the acousmatic gestures in the centre section. However, differences in morphology also played a role in establishing this relational dynamic. The harmonic material's form was long, graduated pad sounds or a short pluck followed by a longer continuant stage. Meanwhile, the gestural materials were mostly short plucks and percussive clusters. These differences allowed for a greater separation of the elements, ensuring that they do not conflict. Moreover, when the morphologies of tonal and timbral-centric materials are similar, a sense of closer integration is heard (at 04:12") between the synthesiser pads and noisy textural motions.

The combination of these discourses contributes to a single unified expression of drama in the work. This is particularly evident in the larger gestural section in the centre of the work, which creates a euphoric atmosphere by featuring dramatic acousmatic gestures alongside softer, emotive synthesiser pads. It was felt that these two elements created a gestalt expression through their own individual musical functions and sonic characteristics. This type of relationship works well as the relation of the elements, and their respective discourses are clearly established: the gestures fully occupy the foreground with their activity, while the harmonic material functions to establish the mood of the musical scene.

The use of familiarity–remoteness is also an important feature of "Purging". By creating the acousmatic gestures from the tonal material, there is a greater sense of cohesion and familiarity with the work's timbres. Yet, the final coda section functions to introduce more remoteness into the form. Ending the work in this remote sound world creates a slight sense of tension in the work's narrative shape. The remoteness is accentuated by the lack of the previous 'euphoric' or uplifting harmonic material. As previously mentioned, this technique created the sense that the final section was a new chapter of the work – featuring elements of the previous sections, but in a new, remote musical environment.

“Proximity Plays”

Artistic Goals

“Proximity Plays” explores the ability to express drama through modulating the densities of spectral, stereo and “external” space. “External” space is the term assigned by Smalley to reference the perceived spaces that sounds occupy in music, caused either by reflections naturally present in a recording or artificially imposed through audio processing.[22] The inspiration for this approach came from considering how to use certain mixing techniques for compositional use. Good audio mixing technique requires the ability to localise sounds in their own areas of stereo, external and spectral spaces, avoiding conflicts between sounds. The mix is clearer when sounds are localised to their own region, creating balance and stability of the overall image coexisting between the elements. However, as some sounds clash and interfere with others in stereo, external and spectral spaces, a sense of instability and conflict can emerge. I speculated about how to capitalise on this phenomenon by using movements of sonic objects in and out of stereo, external and spectral spaces occupied by other sounds to create dramatic tension and resolution.

I explored this technique in a musical context that involved PEM elements, including harmonic and rhythmic material, and textural and timbre-centric material. Additionally, I carried out extensive audio processing on each of these core elements, treating them in a similar concrete manner to that used in composing “Purging”. In this way, the materials would be used as new material sources for timbral and spatial variation.

[22] Smalley, "Spectromorphology: Explaining Sound-Shapes," 122-23.

The nature of rhythmic material becomes interesting when composing with acousmatic gestures and textures alongside PEM elements. Acousmatic music tends to include unquantised free rhythms, whereas PEM relies strongly on a quantised rhythmic grid. I wanted to explore how to utilise both approaches to rhythm while retaining a sense of cohesion and avoiding rhythmic conflicts between materials. This conflict can occur between sounds if both approaches to rhythm are used simultaneously at equal intensity. Through my composition work, I found that this sense of conflict appears to be dependent on the sounds' proximity to each other in spectral space. For example, if a low sound is adhering to a quantised grid while higher-pitched material follows a free unquantised rhythm, there is less of a clash than when two sounds occupy the same area of the frequency spectrum. This phenomenon was a consideration for composing the work, although it was not necessarily a goal for exploration. "Datumplane" and "Tor" focus specifically on the relationship between free and quantised rhythms in hybrid compositional settings.

Compositional Process

I began composing by recording the sound of a piano pedal being knocked and tapped. This produced an appealing wooden knock as the strike reverberated through the body of the piano. This recording was then processed by granulating with GRM's Freeze plugin and layered with a second reversed version of this recording overlayed.

I used Ableton Live's Session View to create a core loop to build up to throughout the work. Session View allows for the creation of patterns and loops of material, similar to looping a period of time in the traditional arrangement window. A benefit of Session View is the ability to create a collection of sounds and patterns without having to consider arrangement. This approach is very useful, as it separates the sound design and pattern building stage of

composition from the structuring process, as explored in “Iterations” by carrying out sound design in Bitwig Studio then arranging the material in Ableton Live. To begin constructing the percussion elements, I created a synthesiser patch using Ableton Live’s native FM synthesiser, Operator, to create quick glitch-like percussion. Among other parameters, the filter and amplitude envelopes were randomised at a semiquaver rate, allowing the output to have a great deal of variation for each small gesture.

I created a simple kick drum sound by applying a resonant bandpass filter to one of the piano pedal knocks, with the cut-off frequency quickly sweeping down the frequency spectrum to create a thump similar to the Roland TR909 bass drum sound. This kick was looped, providing a consistent crotchet pulse. I created a percussive line of shakers made from recordings of knives and forks being struck together, using six strikes and triggering them to create a core groove. I added a snare to the groove by transposing another knock of the piano pedal up two octaves and applied a swing to all the elements to create a shuffling and less rigid groove.

Then, I created a short loop of harmonic material using a Native Instruments Kontakt library of German pianist and composer Nils Frahms’ piano, which has a distinct sound due to its one string per note construction and use of different materials inserted between the hammers and strings. The chords were G#m, C#Maj, D#m and F#Maj, along with a bassline following the chords using a synthesised sine wave with slight overdrive.

Once I had created these materials, I moved into Arrangement View to begin creating the form of the work. As mentioned, I wanted to express musical drama through modulations of densities and conflicts of stereo, spectral and external space. I recorded the core loop pattern

into Arrangement View (from 3:22”), which I used as a structural goal post to build up to throughout the work. Hence, creating the sections before this climax was a matter of unpacking this core phrase in the beginning of the work and building it back up gradually throughout the structure.

I began by creating the atmospheric introduction of the work. I used the processed recording of the piano pedals and applied a deep reverb using the Max for Live Convolution Reverb. Then, I processed a recording of the piano chords, widening its stereo image and transposing it down an octave, allowing it to create a dense texture as it mixed with the layers of ‘pedal rumbles’. I used the percussive glitches to establish the foreground position and centre stereo space.

I created the first main section with all three elements in their respective spaces. The piano pedal and chords occupied the distant space with a wide stereo image, and the percussive sounds occupied the intimate area close to the listener, in mono. The frequency spectrum is also clearly divided by the elements. The kick drum and bass occupy the lower and sub-frequencies, the piano chords and atmospheric pedal sound occupy the lower-mid frequencies, and the percussive ‘zaps’ occupy the upper-mid and high frequencies. This balance of external, stereo and spectral space was designed to resolve any tension established by the obscure textures of the introduction. I used the first two beats of each note in the bassline to allow it to unfold further throughout the work.

The percussive glitches were generated using the artefaktor instrument. However, as the resulting sounds were somewhat unpredictable (sometimes generating overly loud or harsh

sounds), I recorded a long clip of them and worked in a subtractive manner by selecting its best sections while deleting any undesirable sounds.

Next, I duplicated this 16-bar section of the arrangement twice and gradually filled the frequency spectrum to build tension, especially in the upper ranges. I did this by adding the knives and forks percussion to occupy the higher frequencies and expanded the spectral range of the piano chords. I duplicated a recording of the chords, transposed up an octave and delayed the signal using Soundtoys' Crystalliser. This was then rendered into an audio clip that was gradually faded in throughout the section. I also added the higher snare, made from the piano pedal knocks, to add to the groove, and extended the bass at bar 61 to play for two bars per note.

On the last half of the third repeat of the phrase (beginning at 02:20"), I returned the chords to their lower register one octave below the original recording to create spectral space in the upper frequencies, resolving the tension produced throughout the previous section. Now the upper area of the spectrum was only occupied by the percussive glitches, which I kept in the centre of the stereo field.

I deleted all the percussion from the core loop at 02:36" to create a 'break' before the second half of the work. To lead into this eight-bar section, I processed the kick through a delay plugin and gradually reduced the delay time, creating a tape-style pitch descent, producing a resolving dispersal of energy. Accentuating this resolution, I automated the cutlery percussion to gradually move back into a distant space with a mono stereo image.

Over the following 24-bar section, which builds into the core loop, I created a gradual sense of expansion by automating short bursts of the percussive glitches out into a wider stereo image. This meant that the percussive glitches would sometimes occupy the same stereo space as the chords and textural piano pedal material. Also, I introduced more external spatial processing to the percussive glitches in these sections by automating quick modulations of the dry/wet mix of a convolution reverb effect. I automated these sudden stereo and external space changes more frequently throughout this and the following section—the original core loop. In this way, the pace of the stereo and external spatial characteristic changes increases and builds tension throughout the final sections into the climax. Tension is built here through the instabilities and inconsistencies of the elements' spatial positions.

To add to the energy of this final section, I expanded the spectral occupancy of the chords material through a spatially processed version of the chords transposed up an octave, similar to the layer that enters towards the end of the first main section.

I created an almost palindromic structure of the work by withdrawing elements in the final section in the reverse order to their introduction in the beginning. Accordingly, the percussive glitches are focused at 04:25" before being silenced and leaving the atmospheric chords and piano pedal material. These low chords were processed using Audiothing's Filterjam plugin to create a slight sweeping motion through its spectrum. After the chords ended their phrase, I included a final eight bars to draw sole attention to the ambiguous pedal material.

Structural Overview

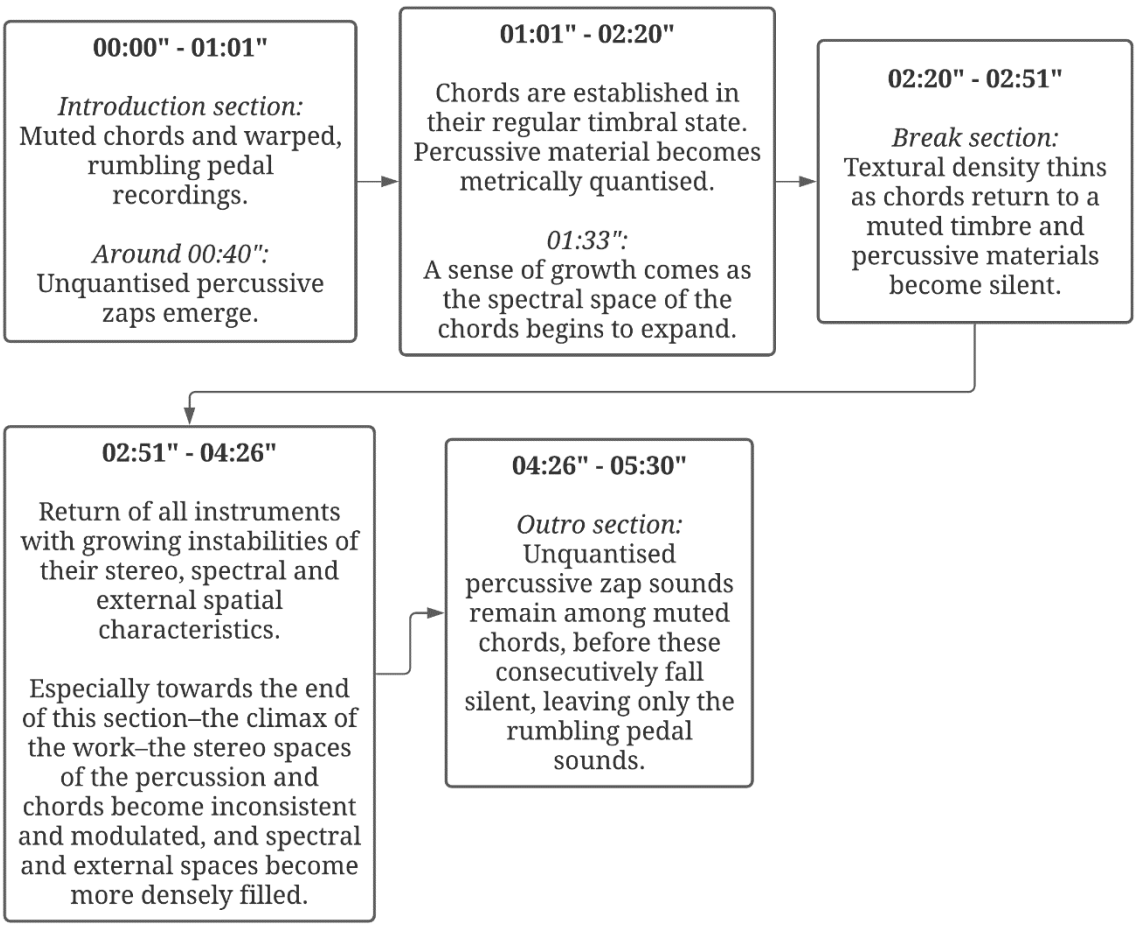

Figure 11: Structural overview of "Proximity Plays"

The introduction of the work (00:00”–01:01”) presents the chords in a processed state, mixing with the warped pedal recording. The glitching percussion sounds surface at around 00:40” and appear free of any quantised rhythms. The chords and pedal occupy the wider stereo space, while the glitch zaps are centred in the stereo image.

The second section focuses on introducing percussive material and establishing the chords in their regular timbral state. The glitched percussion becomes quantised here. From around

01:33”, the spectral space of the chords begins to expand into the following phrase. This builds tension, along with the gradual instability of spatial characteristics.

The break section from 02:20” to 02:51” brings resolution by returning the chords to a muted tone and reduced spectral occupancy, thinning out the textural density.

The final section (02:51" - 04:26") sees the return of all instruments, although with an instability of the spatial characteristics of certain sounds. The percussive glitches sporadically move out of their centred space into the wider stereo spaces, and the chords’ spatial characteristics are similarly modulated. Towards the end of this climax section, the stereo space is increasingly unstable and inconsistent, and the spectral and external spaces become fully occupied, creating the climactic sense of drama.

Finally, the outro section (04:26" - 05:30") sees a slow return to the pedal rumbling.

Modulating Spectral, Stereo and External Spatial Densities to Create Tensile Discourse in “Proximity Plays”

Modulating the densities of spectral, stereo and external space creates two functions of drama. First, they represent an accumulation or dispersal of energy as each space fills or empties. Second, as the spaces of one element interfere with those of others, tension is created through relational conflicts, resolved again as sounds return to their localised zones. The modulations engage the transformational and motion discourses, while the resulting interactions simultaneously engage the behavioural discourse.

These discourses operate alongside those of tonal and rhythmic structures that carry the work's narrative shape in a combined effort. Indeed, in the first percussive section, all elements are in their respective areas of spectral, stereo and external space, minimising conflict and contributing to a sense of coexistence. However, in the final climactic section of the work, these boundaries are breached, causing a sense of tension as the 'mix' contains conflicts. If this occurred over the entire work, the mix would be deemed 'bad' from an audio engineering standpoint. Yet, this work demonstrates a way to capitalise on the conflicts and use them as a dramatic device. Moreover, the functions of drama are used for PEM elements through modulating their timbre. This is why they can be discussed in terms of Smalley's six discourses, as the modulations that result in gestures of drama befall the elements' timbral characteristics. The metric discourse of the work unfolds alongside these functions, modulating in complexity, as the timbral characteristics of the percussion additionally modulate conjunctively. This is exemplified in the work's 'break', as the groove is stripped back in complexity while the spatial occupancies of the elements return to their local areas. Additionally, a dispersal of energy occurs at the break section's beginning through the decelerating material from tape-style modulations of the delay time of the kick drum. In this way, tension is resolved simultaneously by the dispersal of energy, simplification of rhythmic groove, reduction of clashes in the three modes of space and softening dynamics.

"Tor"

Artistic Goals

In March of 2017, I was offered a one-month residency at Bondi Beach Radio, hosting a weekly two-hour show.[23] While I used a large amount of dance music in the sets, the residency also allowed me to explore mixing different styles of music that would not be appropriate in a usual dance music mix. Focusing on each set's introductions and bridging sections, I mixed acousmatic music and pieces of other electroacoustic music styles with ambient and electronica works. Since this residency, I have approached all live and DJ sets performed outside a club environment in the same way. I found that as acousmatic music commonly lacks tonality, works of ambient music can mix seamlessly with acousmatic music. The harmonic material of ambient music has nothing to conflict with in many acousmatic music works. The gestures and interesting acousmatic sound designs also have nothing to conflict with in ambient music pieces. In most cases, there is a coexistence between the elements of the two styles, affording a cohesive piece of music.

These considerations were front-of-mind when I set out to compose "Tor". I wanted to explore how to incorporate acousmatic sound objects with the drone and harmonic elements of ambient music in a way that seemed as though they were reacting and working in synergy with one another.

[23] These shows are accessible at https://soundcloud.com/patcarrollmusic/sets/bondi-beach-radio-residency.

Additionally, I wanted to take certain ideas I explored in “Purging” and develop them in a musical context with percussive and rhythmic material. A core idea in “Purging” was repositioning the tonal synthesised bell material into the role of portraying acousmatic gestures. However, in “Tor”, I wanted to use the percussion sounds of one section as the source material for creating textural and granular layers that would accompany the harmonic material in another section. A key difference between the approaches to this technique in “Tor” and “Purging” was the formal structure. “Purging” presents the unprocessed harmonic materials *before* they are presented in a processed manner. Conversely, “Tor” features the unprocessed versions of the materials *after* the processed material is heard. In this way, the work unfolds as a process of uncovering the materials in their original form. The work initially applies these materials within source-cause and transformational modes of discourse before switching to rhythmic modes of discourse using the same materials.

From the perspective of rhythm in this structure, there is a switch from free, unquantised rhythms to a quantised rhythmic grid. I wanted to explore how to express a sense of stabilisation through this transformation. British electronic music artist Max Cooper uses a similar technique in “Order from Chaos”. The work begins with a recording of rain hitting a rooftop, which gradually aligns with a quantised rhythm over the course of the first three minutes. From this idea, I wanted to set up a dramatic function of tension and resolution from the movement of the percussion materials on and off the quantised grid.

Compositional Process

Creating the structural plan of the work was the first stage in its composition. I created a macrostructural plan for the work, with the first part mixing ambient and acousmatic music elements and the second part focusing on rhythmic percussive structures. I aimed to have

continuity in the work by repurposing the percussive sounds as acousmatic textures (although this would seem like the acousmatic textures were repurposed as percussive sounds due to the order of the sections) and threading a consistent harmonic line throughout.

As in “Proximity Plays”, I constructed the core loop for the second part to which the work would build. The percussive materials for this section would also serve as the source material for the acousmatic granular sound designs. I created all percussive sounds using artefaktor instruments to produce small glitch-like zapping sounds. I recorded a chord sequence using the DSI Prophet Rev2, which I doubled using the Una Corda piano Kontakt library and a slow harmonic rhythm for the chords to contrast the quick rhythms and modulations of the percussive glitches: [Amin7/9, Dmin7/9, A#maj7/9, Emin7, Amin9, Dmin7, A#maj7/9, Emin7]. The percussive glitches were positioned in a very dry space, while the chords were placed wide in stereo space, with their reverberance occupying a deep external space.

Then, I used the recordings of the percussive glitches and kick drum as the source material for creating new granular textures. The main plugins used for this were GRM SpaceGrain, Henke’s Granulator ii, and Glitchmachines’ Fracture. I created other forms of granular stuttering by time stretching recordings using Ableton Live’s ‘texture’ algorithm and modulating the ‘grain’ size.

Using these materials, I composed the first part of the work in reverse. First, I created a sequence of percussive gestures to serve as a bridge from the free rhythmic section into the

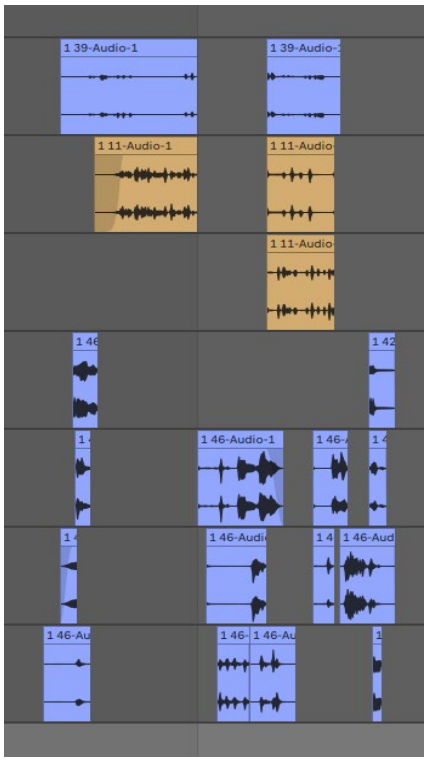

Figure 12: Organising and layering granular materials to give the impression that they are reacting to the harmonic sequence

quantised percussion section. Then, I carried out another session of processing this phrase to create a small pool of extra textures to use in the section before. Here, I overlayed the chords to create a mesostructural framework for the section. Then, the granular sounds were organised according to harmony changes to give the effect of a reaction between the two layers (see Figure 5). This was expressed through the modulation of dynamics and stereo and external spatial movements that occurred with chord changes. As previously mentioned, due to the lack of pitch information in the granular recordings and granular elements in the chord material, the two layers did not interfere with one another. I filtered out the high frequencies in the chords in this section to create a sense of spectral space between them and the granular material. I then created a new prior section, which focused solely on the chord material.

Following this, I created the intro and outro sections of the work by processing the original percussive and harmonic elements. I returned to expressing predominantly through source-cause discourse by creating causally realistic sound objects and a final transformational trajectory to close the work.

Finally, I introduced the granular versions of the percussive glitches into different areas of the rhythmic part to produce moments of instability as the granular sounds interfered with the quantised grid. These aimed to provide interest and dramatic momentum to the climax of the

work. This was reinforced by adding a melody, a faster kick pulse and new percussive elements introduced throughout the structure.

Structural Overview

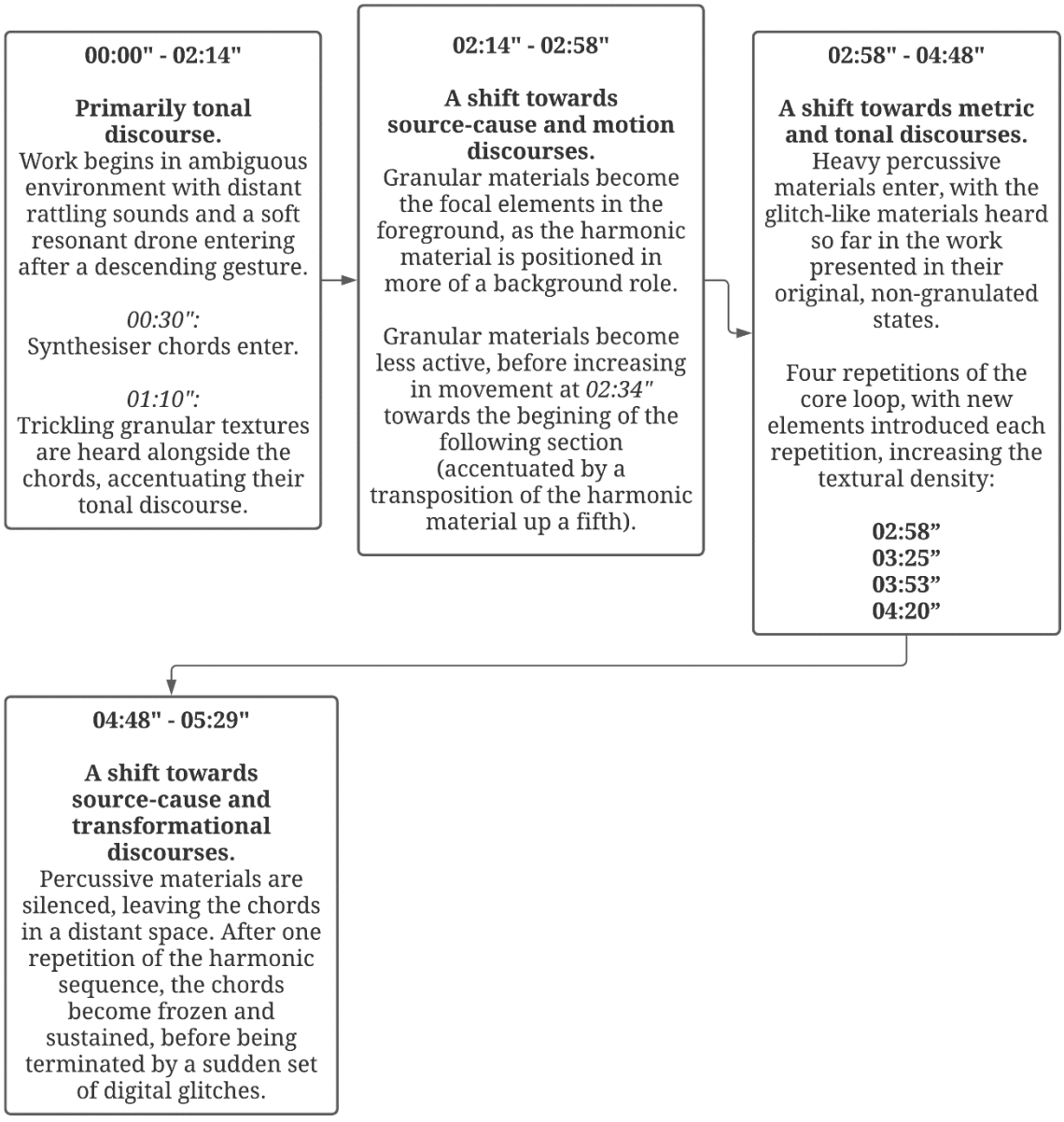

Figure 13: Structural overview of "Tor"

The work begins in an ambiguous space with a soft resonant drone behind an initial descending gesture, followed by distant rattling sounds. The synthesiser chords enter at

00:30”, and trickling granular sounds enter at 01:10”. These chords carry the following section with the addition of a bass voice, and the granular materials work to accentuate the changes in harmony.

From 02:14”, the focus suddenly shifts towards the granular material, away from the harmonic material. As the digital glitches move fluidly across the stereo field, a distant, resonant drone with a very narrow spectral space remains. The glitches become less frequent at around 02:30”, leaving a more organic overall texture of the scraping object and resonant drone with softer dynamics. The section from 02:34” features more active granular material and the chords transposed up a fifth, which together build into the following section.

At 02:58”, the work shifts to a focus on rhythmic and percussive structures, revealing the original form of the granular materials, accompanied by the chord sequence. This part features four repeats of the core loop, each with new elements added to build the textural density. They begin at 02:58”, 03:25”, 03:53” and 04:20”. The granulated versions of the percussive material are heard at times throughout this part, creating tension by interfering with the quantised rhythmic grid.

The outro begins at 04:48”, removing all rhythmic material to return focus to source-cause and transformational modes of discourse. The chords are heard here, although they are deeper in the background. After one repeat of the sequence, they become frozen on the final chord. This frozen sound remains and transforms from a semi-realistic reverberation to digital, artificial reflections. To close the work, the sounds stutter and a harsh set of glitches terminate the chords.

Coexistence and Synergy Between Tonal, Metric and Motion Discourses in "Tor"

A primary driver of "Tor"s' drama is the interaction between the tonal synthesised chords and the motions of granular glitch material. The two elements were organised to set up an element of synergy, working together to emphasise each of their dramatic trajectories. The clearest example of this technique is when the granular materials appear to accumulate and disperse energy to accentuate harmonic changes (heard at 01:21" – 01:34", 01:52", 02:01"). This was achieved by modulating the granular materials' dynamics and stereo and external spatial characteristics. Here, the elements relate to each other, not by competing or conflicting to create drama, but by complementing one of their unfolding sequences. Consequently, there is a hierarchy between the two: the chord material (and hence tonal discourse) takes the foreground, while the granular materials accentuate it. However, the granular materials do not occupy the background space, nor would they be considered as taking a background role. Rather, their motions fulfil more of a 'serving' role. Indeed, the granular materials might be considered in a foreground position, as they seem closer to the listener than the chord material. This positioning was designed to avoid any conflicts between the two elements; to contribute to their coexistence. The elements' ability to coexist is made possible by their differences in spectromorphology, and positioning in external and spectral space (achieved by applying a soft reverb to the chords and filtering out their high-frequency content). In summary, while the two elements coexist, the accumulations of energy of the granular materials—relating to transformational and motion discourses—build the drama that surrounds the expressions of tonal discourse.

The interaction between quantised and unquantised rhythmic grids is another key feature contributing to the drama of the work. Similar to Ramsay's technique of flipping between discourses, the work initially focuses on the traditional tonal discourse and the acousmatic

transformational, source-cause and motion discourses before shifting to a strong focus on metric discourse. This means the granular materials are unquantised in the initial half of the work and present free-flowing expressions of accumulations and dispersals of energy. Following this, the metric section, which focuses on percussive beats, aligns the same granular materials to the metric grid. However, in this quantised structure, accumulations and dispersals of energy still fulfil a dramatic role, as smaller rhythmic subdivisions are occupied in the percussive groove throughout the section. Moreover, the unquantised materials are reintroduced at certain points throughout the section to accentuate the drama created by the increased textural density that builds throughout and the quickening pulse of the metre. The interference between the quantised and granular materials creates a sense of instability, as the ordered structure that quantised rhythms represent becomes compromised.

The work also takes the 'reversed' compositional process of "Proximity Plays" further. As described earlier, the 'core loop' was composed first and then unpacked and gradually rebuilt throughout the work, providing a sense of progression. "Tor" develops this technique by first creating the climactic section and unpacking it by processing and transforming the materials into entirely new textures. The combination of the 'reversed' method from "Proximity Plays" and the repurposing of materials to create new textures from "Purging" represents a new compositional method synthesised from the two works. Importantly, these textures retain a sense of their original glitch-based forms, meaning there is a sense of familiarity and cohesion to the materials, even when their rhythmic behaviours are entirely different. They begin obscure and distorted before transforming into much cleaner sounds in the rhythmic section. Essentially, by composing in reverse, their narrative is in the revelation of their original form throughout the work.

“Datumplane”

Artistic Goals

A central aspect of “Datumplane” is expressing and resolving tension using the degree of vertical synchronisation of gestures. Smalley proposed the scale of vertical synchronisation to describe the relationships of spectromorphologies in terms of temporal simultaneity. He proposes a “loose–tight continuum” to allow for the articulation of this relationship in musical contexts.[24] Smalley points out that “today there is an extreme distance between a very tight, perhaps rigidly controlled, punctual, homorhythmic, minimal music, and the very relaxed malleable associations found in some electroacoustic music”.[25] This concept is extremely relevant in PEM, which is mostly rhythmic-focused and can be described as having a “tight” vertical synchronisation of gestures. This is the product of the nature of the technologies at the centre of PEM composition. However, this creates an opportunity to explore how movement within the loose–tight continuum affects the listening experience. Tight synchronisation can be interpreted as the quantised rhythms of much PEM, while granular material and unquantised gestural events are considered loose synchronisation. Moving from loose to tight vertical synchronisation was employed to affect the tensile discourse of the work.

I also wanted to explore the dramatic effects of building and reducing spatial density in a quicker musical context than “Proximity Plays”. As I composed “Datumplane”, I found the technique of building tension through modulating the characteristics of external space needed

[24] Smalley, "Spectromorphology: Explaining Sound-Shapes," 118.

[25] Smalley, 118.

to match the nature of the other materials. In particular, the frantic percussion could be matched by sudden changes in the spatial dimensions of the sounds. This contrasts with the slowly evolving structures of “Proximity Plays”, which explores similar uses of space, as sudden changes do not fit into the musical context of that work with its slow harmonic rhythm and warm atmospheric soundstage.

I composed “Datumplane” after creating a collection of artefaktor and chaosMacro instrument and effects patches. These patches created a diverse range of sounds very quickly through the randomisation of many parameters at once, either in synchronisation with a tempo or at a rate regulated by a macro controller, which itself could be assigned to a MIDI controller to incorporate an element of human improvisation and gesture.

The signal flow of the artefaktor generating most of the sounds is outlined in Figure 6.

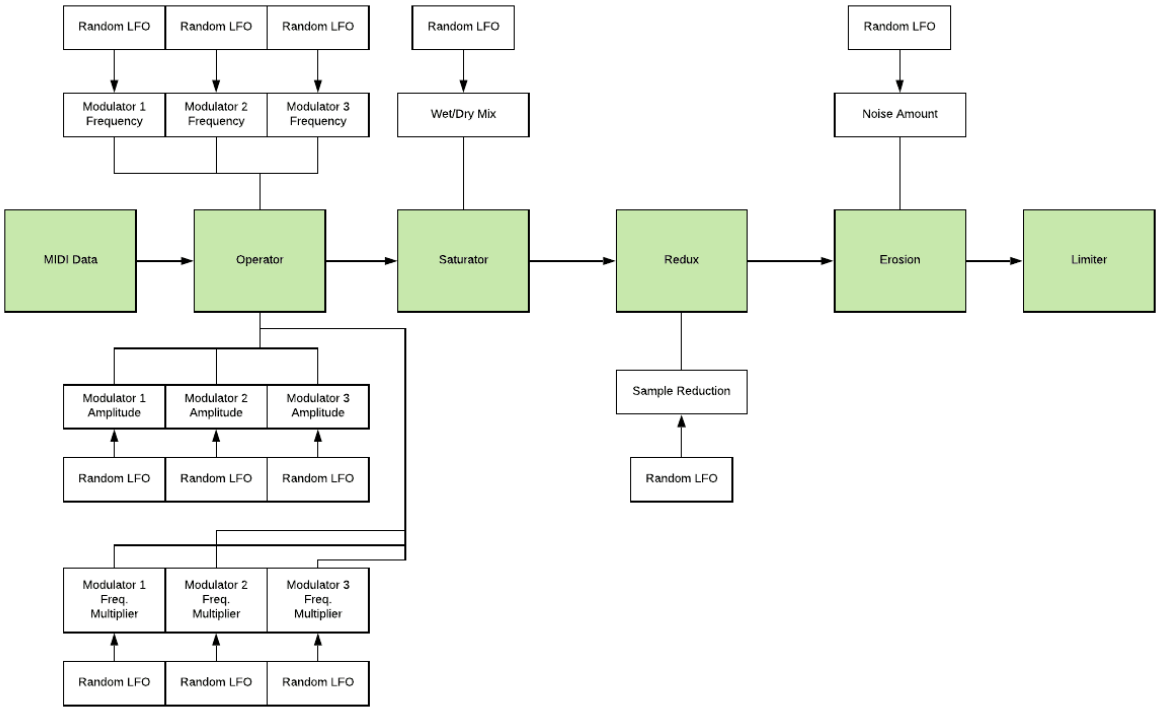

Figure 14: Diagram of the ‘artefaktor’ instrument that created most of the sounds in “Datumplane”

Using these patches creates a subtractive approach to composition, similar to the traditional processes of acousmatic composition. A large amount of material was created and analysed before being reduced to a pool of usable and interesting moments in the recordings. This process required thinking about which materials fit well with others, which offered a sense of contrast and variation to the rest of the pool, and which did not fit in the musical context and could be discarded.

By only synthesising materials using a specific set of software instruments, I embraced the overall sense of the digital and synthetic nature of the materials. The process of generating so much material from nothing was inspiring in itself. For me, it represented the acceleration of productivity that technology has allowed, thus increasing the sense of urgency in modern technological life. Due to this inspiration, I decided to use sounds and structures that evoke aggression, franticness and abruptness.

Compositional Process

I composed “Datumplane” by establishing a macrostructure of the entire piece early in the compositional process, prior to creating musical drama by modulating the vertical synchronisation of gestures and spatial density at the necessary moments in the structure.

I began composing “Datumplane” by creating the kick drum using an artefaktor. The artefaktor design was based on the synthesis technique for the Roland TR808 bass drum, using a sine wave to sweep down from very high frequencies into the sub-bass range, causing a click transient and bass thump. The signal then passed through processing effects that again were being randomised every crotchet beat.

This main artefaktor was used to create all the percussion sounds, although certain parameters were adjusted to suit the desired sound. I created semiquaver-paced short zaps, which I automated to move from left to right in the stereo field. A bass sound was also created using an adjusted version of the percussion artefaktor.

I created a noisy drone using another artefaktor, which filled the mid frequencies at certain points in the work and contrasts with the frantic nature of the percussion. The frequencies of the modulators, their waveforms, and the FM configuration were all randomised, although not rhythmically. Instead, I controlled a macro that stopped the randomisation, essentially locking the parameters in place until I engaged the macro again. This allowed me to pause the modulation and record certain produced drones for as long as I needed.

With these materials, I developed a macrostructural sketch by creating two main sections: the first with seven duplicates of the core eight-bar loop and the second with five. In between these two main sections, I created an eight-bar section that focused on the drone material only. From here, I subtracted elements in the two main sections and, at times, replaced and manipulated individual percussive sounds to create variation.

At this point, I was able to consider the areas that needed a sense of burgeoning drama. These areas ranged in size from single beats at the end of two-bar phrases or the last phrase in a section. As mentioned, I created this tension and resolution by loosening the vertical synchronisation of gestures and modulating external spatial density.

To loosen the vertical synchronisation of percussive sounds, I granulated some rendered material from the percussion and layered these on top of the original, non-granulated version.

The granulated sounds were entirely unquantised and then sidechain-gated to the non-granulated version. I then reintroduced the granulated material by adjusting the gate's 'floor' (the amplitude the gate would output when closed). In other words, when the floor is at -0dB, vertical synchronisation of the percussive sounds is very loose, but as the 'floor' is lowered, the granulated percussion is only heard when the original non-granulated percussion is played, effectively tightening the vertical synchronisation.

For the introduction, I expressed a process of tightening the vertical synchronisation of the percussion material. I modulated the vertical synchronisation in the section leading up to 01:08" several times to give a sense of instability. By locking into a tight vertical synchronisation at 01:08", this instability is resolved as the rhythms become quantised. The percussive material is in two-bar phrases, each consisting of two one-bar call and response structures. I reinforced this phrasing by automating the percussion to be *tight* for a bar, *loose* for the next. As seen in Figure 7, the end of the second main section involves more changes in the scale and a bias towards being loose, as this is the climax of the work.

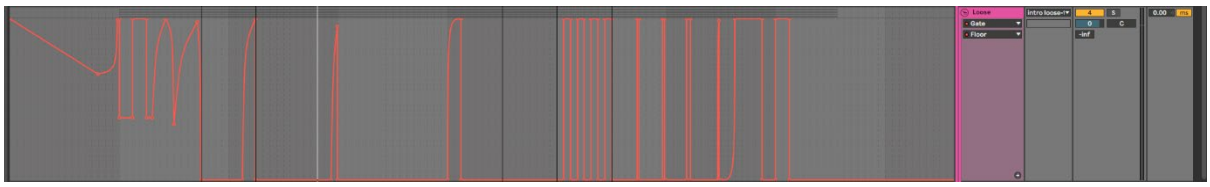

Figure 15: Automating the loosening and tightening of vertical synchronisation of gestures in "Datumplane"

While I composed with the vertical synchronisation in mind, I also used quick modulations of external space to add to the sense of drama. External space was also used more sparingly to add interest in the music, where sounds change from being close to the listener to suddenly having a sense of depth for a very short amount of time. Instead of simply automating the wet/dry mix of a reverb effect to do this, I used chaosMacros to create fast-changing spaces. I

used FabFilter's Pro-R reverb and Timeless delay to do this by assigning random low-frequency oscillations to many parameters of the plugins at once (except the wet/dry mix, which remained set to wet), rhythmically changing to the tempo of the piece. By using this patch on an auxiliary channel within Ableton Live, I was able to send certain sounds into it and record the output of the channel. I carried out another subtractive method of assessing the resulting recordings and deleting unusable sections. Then, I shaped the recordings to fade in and cut out when interest or drama was needed. By not moving the recordings from their original positions, they are linked to the dry sounds at that point in the work, giving the sense that these sounds suddenly change in spatial characteristics. These fast changes to the spatial characteristics felt appropriate to the frantic musical context. An example of effective use of this technique and its combination with the loose–tight continuum is at 01:08". In the bars leading into this point, the percussive materials are very loose, and the spatial characteristics are fairly deep. However, the sudden change to tight vertical synchronisation and close proximate space effectively resolves the tension.

Structural Overview

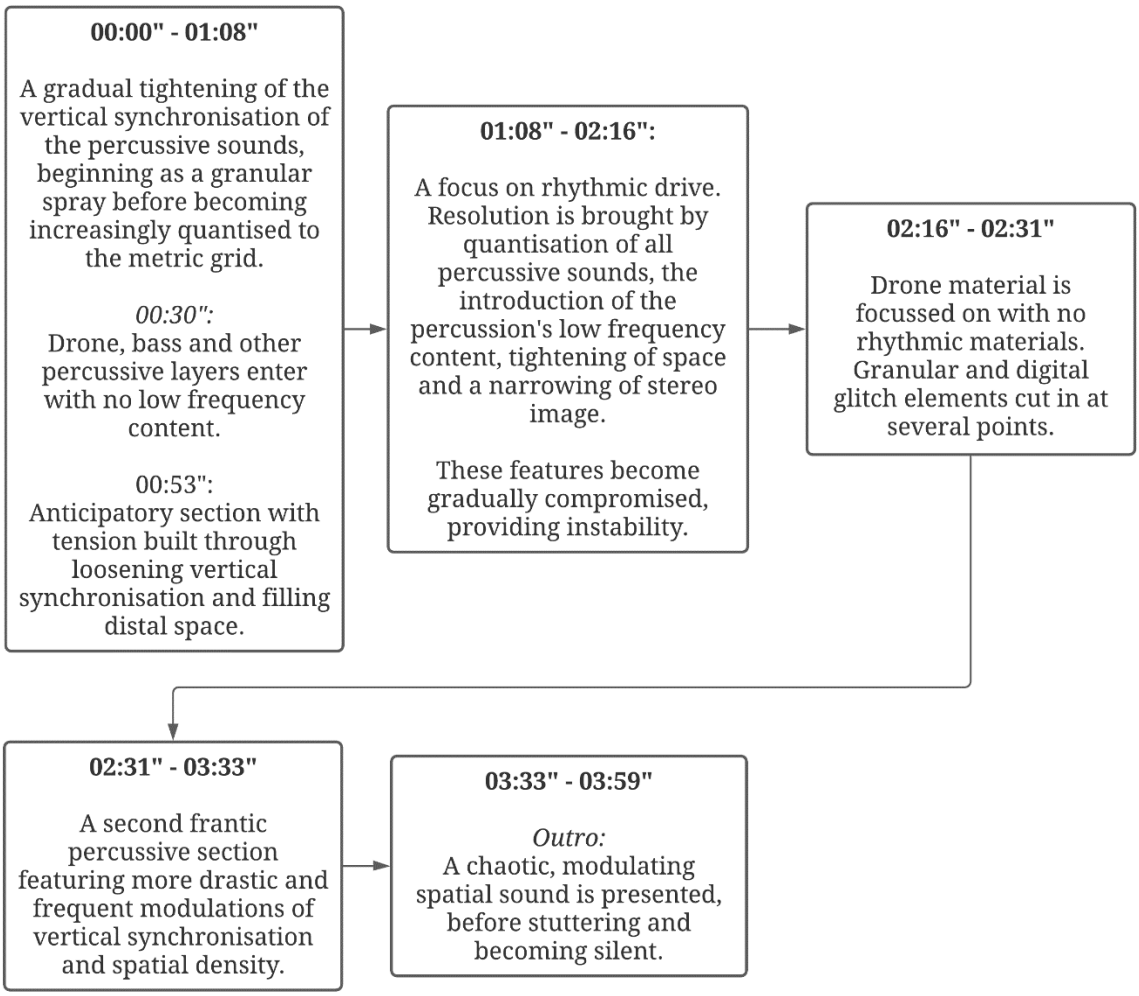

Figure 16: Structural overview of "Datumplane"

The introduction features a process of tightening the vertical synchronisation of the percussive sounds. The drone, bass and percussive layers enter the mix at 00:30”, although with the low frequencies attenuated. An anticipatory section unfolds from 00:53”, with a busy soundscape, loose vertical synchronisation and occupied distal space building tension.

The first main section begins at 01:08”, focusing on a rhythmic drive from the aggressive percussion sounds. The percussive glitches are locked on the quantised rhythmic grid, the

spatial aspects of the sounds are suddenly tightened, and the stereo image also narrows considerably, resolving the tension from the previous section. The shape of this image is altered throughout this section as wider sounds cut in—at first sparsely but becoming more frequent.

The following section from 02:16” suddenly focuses on the drone material presented in the introduction, stripping away all rhythmic material.

The percussive material returns at 02:31”, moving into another frantic rhythmic section. The modulations of vertical synchronisation and spatial density become more frequent and drastic in this final climactic section. This builds until the final outro section at 03:33”, which presents a modulating spatial sound that eventually stutters to close the work.

Generating Tension Using Order and Chaos in Rhythmic Quantisation in “Datumplane”

The use of vertical synchronisation for creating drama in “Datumplane” is a development of the strategies used in “Tor”. Ultimately, the ‘de-quantisation’ of the metric grid—or at least interference with it—is proven to be an effective means of expressing instability in works containing an element of metric discourse. The rate of loosening vertical synchronisation of gestures increases towards the climax of the work, highlighting the effect of pace in creating tension and resolution. In other words, the increasing rate at which functions of drama occur compounds the drama they produce. Notably, vertical synchronisation is relevant for a range of timescales, from single discreet gestures to the repetitive homorhythmic structures of PEM.

A faster pace was also applied to the modulations of external spatial characteristics. This was designed to match the frantic pace of the percussion materials. The base spatial characteristic of the work is very dry, with only close ambiences applied to the percussive sounds. This means that when the modulations to large spatial characteristics suddenly enter, they have a greater effect due to the starkness of the contrast. These transformations operate alongside the metric discourse and destabilisation caused by the modulations of vertical synchronisations.

The introduction provides an example of the modulations of spatial characteristics and vertical synchronisation of gestures simultaneously carrying the drama. The unfolding granular 'spray' begins wide in stereo space, gradually external space and with very loose vertical synchronisation. Gradually, it becomes tighter as a metre emerges. Then suddenly, as the percussion sounds fully enter, it completely tightens as the stereo space stabilises in the centre and the external spatial characteristics shift from occupying the far "distal space" to mostly occupying the more intimate "proximate space"—a *tightening* of space.[26] Tension is generated here by moving between ordered and chaotic structures. The vertical synchronisation scale interacts with the metric discourse, as the percussive sounds express both that discourse and the vertical synchronisation.

It is worth considering the nature of the percussive glitches themselves. Their spectromorphologies are aggressive and may cause tension through sensory dissonance. This creates an ongoing layer of drama that is only resolved when they are absent from the orchestration—in the centre 'break' section and at the work's end. The consistency of this

[26] Denis Smalley, " Space-Form and the Acousmatic Image," *Organised Sound* 12, no. 1 (April 2007): 36, https://doi.org/ 10.1017/S1355771807001665.

tension makes the work tense overall and ultimately dramatic compared to others in the portfolio.

“Contour of Mountains”

Artistic Goals

I composed “Contour of Mountains” using the unidirectional motion and growth processes (ascent, plane, descent) as an organising principle for the work. I decided to use these descriptors as the central theme to structure the work’s form. Through this approach to the structure, the form of motion ties the musical elements together as they express it in different ways.

Ascents and descents can have a strong reference to processes of accumulation and dispersal of energy, which is useful for building a sense of drama. PEM artists commonly refer to these motions when used for building or releasing tension as ‘risers’ and ‘downlifters’, respectively. These are essentially portamento slides designed to build tension before a climactic musical event. While I wanted to capitalise on this phenomenon, I also wanted to approach using the motions like a theme being fragmented and shared throughout the orchestration. I explored how ascents can be expressed through a range of instruments in both foreground and background roles, from lead synthesiser voices, background textures and sub-bass voices.

Central to composing this work was the necessity for other PEM elements to coexist with and embellish the narrative expressed through the motion and growth processes. Because these processes involve elements of chromatic pitch movement, I decided the rhythmic material could have more freedom to develop and be complex without interfering with the spectral motions. However, the nature of ascents, planes and descents allowed them to work well in a tonal context with sparse harmonic movement: the chromatic nature of the spectral motions

meant they would be troublesome when paired with any leading harmonic development. Accordingly, I wanted any harmonic chordal material to play an important role by providing tonal gravity, although ultimately in the background with minimal movement.

Compositional Process

"Contour of Mountains" demonstrates a possible application of spectromorphology as a compositional prompt. Moreover, it is used in a top-down strategy by establishing a clear macrostructural plan based on a specific set of motion and growth processes. Choosing these early in the compositional process meant the sound design process was guided, with clear requirements to fulfil the structure. Indeed, the sound design process consisted of thinking about different ways to express these particular spectral motions, which was a more orderly approach than the experimental strategies taken in composing "On Objects", "Ash and Copper" and other works not guided by a thematic sonic behaviour.

The top-down strategy of the work involved outlining the higher structural levels before building any low-level material. For this, I decided on a structure following the trajectory of plane–ascent–plane–descent–plane, hence the title of the work. In each of these sections, the material should express different versions of the respective motion. The shape of this structure reflected a realistic and natural trajectory of objects in flight, meaning the overall structure had a sense of resolution. Specifically, the material ascending away from the initial plane would later be resolved through its descent and landing back on the lower plane. This 'return' narrative shape was especially appealing. I then began to fill the sections within this framework with appropriate material and ideas as they were created.

After synthesising a kick drum and percussion sounds, I created the plane material. These materials were characterised by a lack of movement within the frequency spectrum. First, I generated a drone using iZotope's Iris plugin by improvising with F, Bb and C, leaving the mode of the key (major or minor), ambiguous, as I knew there would be unquantised pitch content in the ascent and descent sections. I recorded the improvisation and loaded the audio into a sampler, and then looped a small section. I created a sub-bass sound with Ableton Live's Wavetable synthesiser using a simple sine wave patch that played an F by fading in and out relatively slowly.

Then, I created the ascent section. The core of this section is the leading synthesiser plucks. I first created a simple loop of playing an F every second beat of each bar. I duplicated this loop for the entire 48 bars and automated a gradual increase of the pitch, causing the synthesiser plucks to ascend an octave gradually throughout the section. I carried out a similar process as the pluck sound for the bass by automating a slight ascent in the pitch of the bass over the course of each note, although always beginning on the F.

The ascent section clearly produced a sense of tension as the pluck gradually ascended and approached the upper octave. To accentuate this, I gradually built the textural density of the percussive material and spatial effects on the ascending pluck material. For the percussive material, I created more loops from the initial percussive clicks material and introduced these at different points throughout the ascent section, accumulating into a full and complex texture. I recorded the main ascending plucks being processed through an artefaktor that focuses on spatial processing and automated this to crescendo gradually over the course of the entire 48 bars. I also doubled the ascending pitch material, transposed the recording up an octave, and placed this into a slightly distant room reverb. This sound was automated to

crescendo through the final 16 bars of the section. I also recorded the master channel being processed using GRM's Evolution plugin to create a deeper spatial texture that increased in volume throughout the section. The filter of the droning plane material was also gradually opened to increase the spectral density as the section builds.

I interpreted the following plane section as a resolution of the ascending material, as though it had reached its target. To accentuate this, I reduced the texture by thinning out the percussion line and bass. I also created a transformation of the pluck material to become a central plane for the section, along with the droning material. This was achieved by first sending it into a distant room reverb before granulating this sound with GRM's Freeze plugin. This recording was then smeared using reverb and looped for a single beat, becoming a frozen spectral plane. I duplicated most of the material from the first plane section, although without the kick drum, which was placed in a muted room reverb. To provide momentum before the following descent section, I reintroduced the percussion material and bass. I also moved the starting point of the kick drum rhythm forward half a beat, altering the core groove and accentuating the downbeat more than the original rhythm.[27]

Next, I recorded the descent section by first recording the descending plucks on the Prophet Rev2 using the same technique as the ascents but automating the pitch *down* an octave. I then carried out the same process on the Novation Peak synthesiser and panned the two pluck recordings hard left and right. This created a sense of expansion from the size of the plucks in the ascent section. I also created a dipping contour in the pitch of the sub-bass over the course of its tone. A similar tension builds as the plucks descend and approach the lower F, so I built a comparable texture throughout the section.

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With these major sections sketched, I was able to build more elements and embellishments around the core trajectory. While the plucks are simple chromatic ascents and descents, I developed some material to contextualise them within the harmonic context of the work. I recorded a short sequence of Fmin(6/3), Fmaj(6/3) and Dbmaj(6/4) and used the Una Chorda piano Kontakt library. I placed the chords material in the first plane section of the work to establish it as a point of gravity, and in the second plane section after the ascent section. I also placed it in the descent section as the pluck reaches the dominant C, emphasising the moment of convergence of the pluck and drone material.

I created a similar moment as the plucks approach the A-natural in the descent section. Here, I thinned out the texture and pushed the percussion and kick drum back into a distant room, creating a short moment of suspension before the rest of the descent. After this section through to the end of the descent, I increased the pulse by accentuating every second beat with a kick drum.

I also resampled the master channel in the ascent section and applied GRM's Fusion plugin. Within Fusion, I drew ascending lines, which created spectral gliding and sweeping ascents as the audio passed through it. As I modulated these lines towards the end of the section, the ascents became quicker, adding to the building tension caused by the growing textual density. This can be heard from 02:25" to 02:57".

I then worked on the final section. Initially, I planned on having a final plane section close the work. However, I decided to include a section that explored mixing ascents, planes and descents simultaneously. I wanted this section to be a climax created by the spectral motions

and timbral changes instead of being carried by rhythmic development. I started with a plane section with a very thin texture, focusing on sparse percussion and the piano chords before drifting into a more atmospheric plane created by the drone. To break up this section and begin introducing more movement, I created bell-shaped ascent-descent shapes in the sub-bass area using a resonant bandpass filter on the drone material.

The ‘mixed motions’ section was constructed using piano tones bending upwards and downwards. By placing these against each other simultaneously, I created short spectral convergences and divergences. I granulated the percussion material from the previous parts, using GRM SpaceGrain to create a hissing texture that was spread throughout the section.

I enjoyed the ambiguity of this final section, and decided to use a small part of it to introduce the work before the first plane section. I copied two piano descents and a spatial synthesised descent into the first eight bars of the work, along with two bell-shaped bass motions and a highpass-filtered version of the bass drone.

To add a subtle sense of movement within the harmonic material, I recorded an improvisation of an atmospheric piano and effect patch. Like the drone material, this mostly revolved around F, Bb and C to avoid suggesting either minor or major modes. However, at the suspension before the descent section, I decided to provide a resolution with an EMaj–FMaj (VII → I) harmonic sequence using the same patch.

Structural Overview

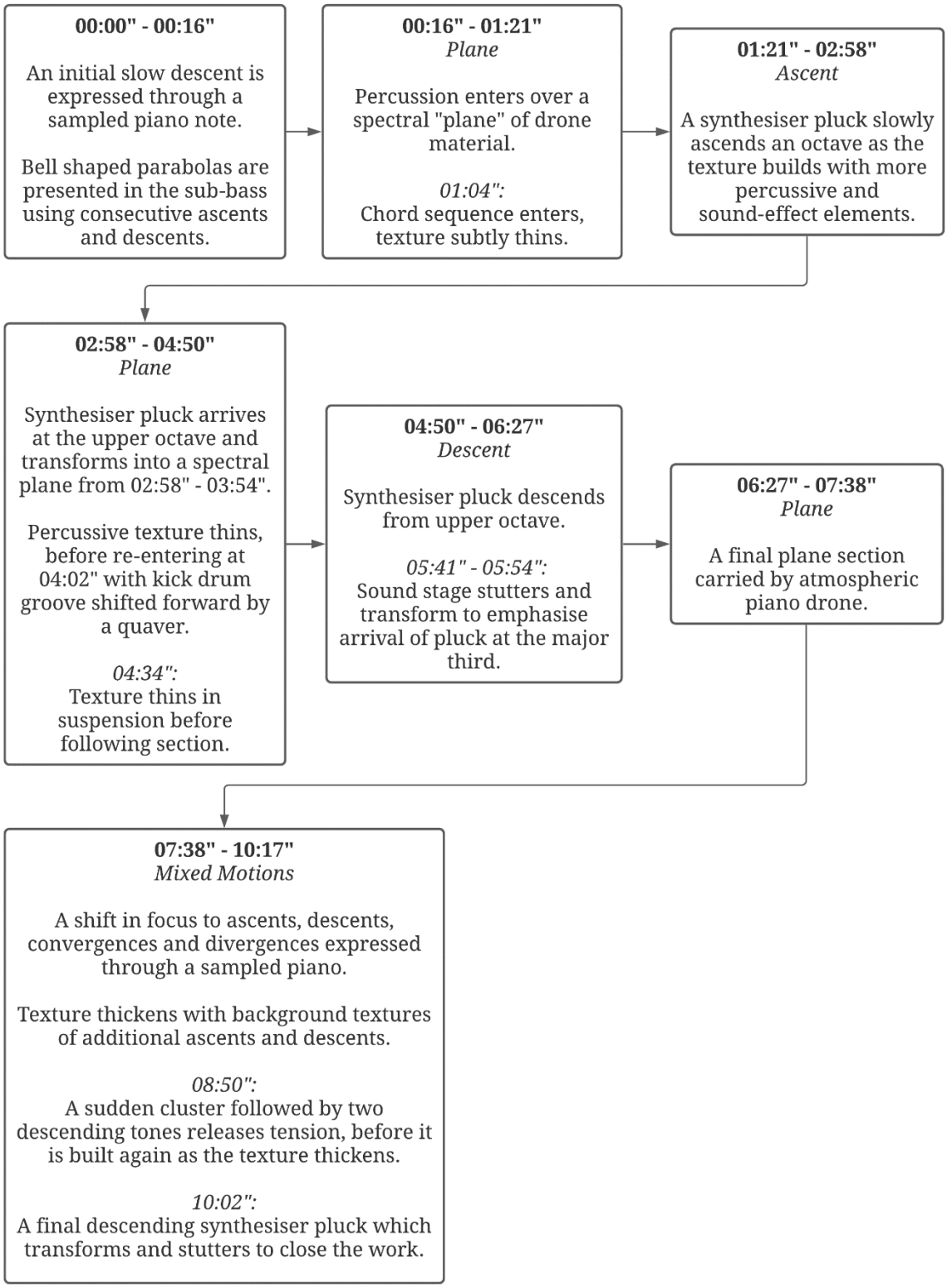

Figure 17: Structural overview of "Contour of Mountains"

The piece begins with a short introduction from 0:00” to 00:16”, presenting ascents and descents in the sub-bass combined serially to form bell-shaped parabolas against a slow descending sampled piano. Percussion enters at 00:16”, beginning the initial plane section. This establishes the core sounds while providing a sense of anticipation caused by the lack of direction in the planing material. The chord sequence enters towards the end of the section at 01:04” as the texture thins.

The ascent section begins at 01:21”, led by the synthesiser pluck, which ascends an octave throughout the section (01:21”–02:58”). During this time, the texture builds as more percussive and background elements enter.

At 02:58”, the plucks reach the upper octave, where they begin the following plane section. At 02:58”–03:54” the pluck transforms into a sustained spectral plane. The percussion texture reduces over this section to reinforce the resolution provided by the plane. The kick drum groove shifts forward by half a beat at 04:02” as the percussion re-enters. At 04:34”, the texture thins again in a suspension before the following descent section.

This begins at 04:50” with the return of the synthesiser plucks, although with a much wider stereo spatial characteristic. The plucks diverge from the planing drone sound present throughout this section and converge again at its end, causing an added sense of drama through the expectation in the pluck’s trajectory. A transformed sound stage emphasises the arrival of the plucks at the major third (A-natural).

The third plane section begins at 06:27”, carried by the atmospheric processed piano drone. The ‘mixed motions’ section begins at 07:38” and focuses on various spectral ascents,

descents, convergences and divergences, expressed through a sampled piano. The texture thickens throughout this section due to busy background textures expressing ascents and descents. The piano cluster at 08:50” acts as a sudden release of built tension, as two piano tones slowly descend. The dense background texture returns and builds until 09:45”, where it reaches the end of its ascending and descending trajectories. A final synthesised pluck descends in the distance at 10:02”, before transforming into a distorted stuttering sound to close the work.

Ascents, Planes and Descents as Dramatic and Structural Tools in “Contour of Mountains”

The expression of ascents, planes and descents relates directly to motion discourse. In musical contexts, these processes represent accumulations of energy and set up expectations in the listener—especially in processes of spectral convergence. These techniques for creating drama are heard in works of PEM in certain tension-building sections. However, “Contour of Mountains” centralises it as the fundamental dramatic device and thematic element expressed by a range of instruments. The sections focusing on processes of ascension and descension provide a sense of instability created by the focal element—the synthesiser plucks—leaving its stable plane position and tonic pitch and moving to a destination it reaches at the end of the section. Additionally, the gradual rise in pitch in the ascent section references accumulating energy. As this meets its destination—the upper octave, which it sustains to establish the spectral plane—a sense of stability is created. The same can be said of the plane at the end of the descent section. Curiously, the descending sound creates a similar building of tension to the ascending sound. It is safe to assume that descents use the same element of expectation that is created through convergences. In that sense, processes of ascension and descension create tension by forcing the listener to ask the same question:

where and when will the process end? Especially in this type of musical content which contains metric and harmonic structures, as the temporal and spectral destinations are suggested to the listener, expectation is established, creating tensile discourse. The final destination of the tone is not the only important position of the synthesiser plucks' ascents and descents. The convergences on important notes in the work's tonal scale also build a sense of drama. In the descent section, this is especially true for the fifth and major third. In this sense, these points when the plucks land on important scale degrees represent a short shift towards tonal discourse before they move away from the tone and are appreciated as elements of motion discourse.

The work's final section, which mixes ascents, planes and descents, has a greater sense of instability than the previous ascent and descent sections. Here, tension is built by the disorder and lack of repetition of the materials, creating remoteness from the work's previous material.

The other elements and their respective discourses are used to reinforce the trajectories of the motion elements. The discourses of metre and textural modulation play this role in the work. Harmonic discourse is mostly used in a background role, to minimise interference between the quantised tonal system and the unquantised ascending and descending sounds. In the descending sections, the accented pulse of the groove increases, articulated by the additions of kick drums as the plucks converge on their destination. The addition of more percussive elements to adjust the groove is also composed according to the trajectories of the plucks. The background atmosphere becomes denser, produced by the spatial layer of modulated reverbs that becomes louder throughout the section. Resolution is reinforced by thinning the texture and simplifying the percussive groove as the plucks reach the upper and lower plane

destinations. The chord sequence is used at the arrival at the upper octave to release tension built throughout the ascent; it is similarly used at the arrival at the fifth in the descent section. The final plane section's resolution is also reinforced by the major tonality that is finally presented. The nature of the work's tonality is intentionally ambiguous throughout, as notes common to both scales are predominantly used. This creates a greater sense of resolution at the arrival of the major I chord when it is heard in the final stable plane section. However, the major key is suggested in the descending section, which emphasises the major third by the drastic timbral transformation of the percussive elements and synthesiser plucks.

A consideration of the work was the differences between motivic and dramatic roles. For example, within each section, the bass sounds express small contours that reflect the sections' thematic motion type (ascents, planes or descents). However, I felt that while they created logic in the structure and narrative, their motions played a very minor dramatic role, if any at all. This suggests that not all applications of these motion types will create a sense of drama in a musical context. They must be accentuated and produced in a way that clearly represents accumulating energy and/or sets up expectations from processes of convergence. The background ascents in that section only begin to properly add to the growing tension when they become louder and ascend faster, presenting another form of accumulating energy: acceleration.

“Order Affray”

Artistic Goals

“Order Affray” demonstrates the use of a popular music form to organise a work containing expressions through PEM and acousmatic music modes of discourse. The compositional process for the work entailed understanding the requirements for the form and creating acousmatic elements, or using the techniques of the style to fulfil these requirements. A typical song structure consists of a ABABCB format, or ‘verse, chorus, verse, chorus, bridge, chorus’. The C ‘bridge’ section traditionally consists of new contrasting material to gravitate the music back to the familiar subsequent B section. To fulfil the requirements of the bridge in the context of “Order Affray”—a work with a stronger focus on timbre and texture than tonal development—I used a progression from quantised to unquantised rhythms, a change of the spatial characteristics and a transformation from granular clicking sounds to swirling, organic sonic characteristics.

To articulate the A and B sections, I used different textural densities and an unfolding trajectory of the relations between two sets of resonant materials— ‘sinister’ and ‘pleasant’ resonances. Throughout the work, these move between conflicting and coexisting—expressed through the behavioural mode of discourse—to enforce the drama provided by the other PEM strategies.

Compositional Process

Like “Iterations”, I began composing “Order Affray” within Bitwig Studio by carrying out a lengthy sound design process. I used a recording of driftwood to create short percussive sounds by loading the recording into a sampler and applying various modulations to its

parameters. In particular, the ‘play position’, filter type, cut-off frequency and resonance, the attack, decay, and sustain of the amplitude envelope. For the effects, the parameters of an overdrive processor were also modulated, then passed through bit-reduction and a ring modulator. The chain had some elements of randomness to it, although it also consisted of looping step sequencers to add repetition. This way, the sounds are diverse and complex, but with an element of familiarity that can build expectation. Similar chains were created for a kick drum generator, two hi-hat generators and a shaker generator.

Unlike “Iterations”, I also used Bitwig Studio to create an early macrostructural plan for the work. I placed clips within the arrangement to outline the pop music ABABCB song structure. With this in place, I began creating the resonances that would ‘battle’ throughout the work. First, I created the ‘pleasant’ resonant texture by processing a recording of a piano improvisation and another of a kalimba together. I created the ‘sinister’ resonant texture by combining and processing a recording of a synthesiser improvisation with vinyl crackle. I then planned out a trajectory for the coexistence of these two resonant materials. Figure 8 depicts this trajectory in the final work.

The ‘pleasant’ and ‘sinister’ labels were used solely to name the two elements, based on my own perceptions of them and their differences. I heard the ‘sinister’ texture as an ominous and disturbing sound, while the ‘pleasant’ texture expressed a more euphoric and blissful mood. Due to the subjectivity of this perception, it would be difficult for me to design a narrative specifically around what is ‘sinister’ and ‘pleasant’. Instead, I designed the work around a sense of dissonance I observed as the two layers were played alongside each other.

This dissonance was particularly used in the areas labelled in red in figure 8, where all or most of the component recordings which made up the ‘sinister’ and ‘pleasant’ layers were used simultaneously. As the ‘pleasant’ layer consisted of several component recordings, I was able to introduce it subtly by using only one of these which, on its own, did not cause a sense of dissonance with the ‘sinister’ layer. After the component was embedded within the texture, I introduced the rest of the components which did have the dissonant effect. This allowed for smoother transitions between the sections which focussed on the ‘sinister’ and ‘pleasant’ resonances.

Upon experimenting with the materials, I was able to resolve this conflict by filtering out the high frequencies of the sinister layer, and the low frequencies of the pleasant layer, to merge the two sounds into a single texture. This process of resolution is heard at the end of the work from 05:03”.

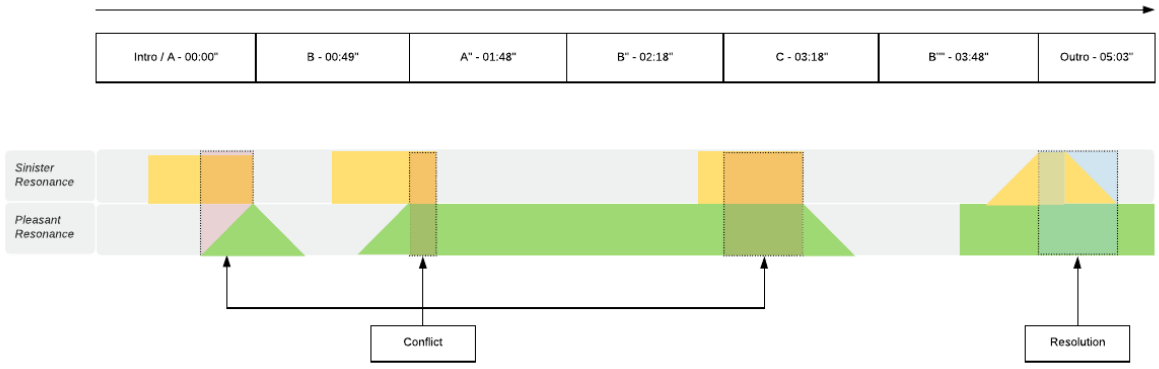

Figure 18: Resonance conflicts and resolution in “Order Affray”

At this point, I rendered all audio channels into discrete files and brought these into Ableton Live to refine the structure. I constructed the A sections to focus on a slower pulse with less percussion, emphasising textural changes and a sense of instability that drove the piece

towards the B sections. These had a stronger sense of stability and focused strongly on rhythmic development.

However, the C 'bridge' section required contrasting material in some way. As mentioned, I decided to express this through a movement away from quantised rhythm to free rhythm, a change in the focal sound's spatial characteristics and how the sound behaves in terms of morphology and motion. With these properties, the contrast of the bridge would come from the music's stylistic change from electronica to acousmatic. To create this section, I processed the original driftwood recording using GRM's Freeze, Bitwig Studio's Delay 4 and Comb Filter plugins to create a sound with an organic nature that aligns closer to acousmatic material than the percussion sounds generated using the sampler. I created a long recording of this material, modulating certain parameters to enhance the organic motions of the sound. Then, I brought this recording back into Ableton Live and inserted it into the bridge section of the arrangement. I automated the sound to move from a distant room space to become closer to the listener, building tension by making the obscure sound more intimate and louder. This sets up an element of expectation as it signals the approaching next section, and represents an accumulation of energy through its crescendo and increased movement towards the end of its trajectory.

By having this structural template in place, I inserted the clips of the resonant materials into the work according to the planned trajectory. This trajectory was designed to create a dramatic drive that worked in tandem with the rhythmic development and complexity of the percussion sounds. I created a four-bar loop of the sinister resonance and inserted these throughout the opening A section, the second half of the B section, the bridge and the eight bars leading into it, and the final outro section of the work. The pleasant resonances were

inserted at the end of the first A section, colliding with the sinister resonances; towards the end of the B section and into the second A section, through the second B section and into the bridge, again colliding with the sinister resonances, and at the end of the final B section and into the outro, as per figure 8. I designed the outro to express a sense of coexistence between the two resonances, achieved by filtering out the high frequencies of the sinister resonances and doing the same with the low frequencies of the pleasant resonances. Using this technique and balancing their dynamics, the two sounds sit together within the frequency spectrum with little spectral conflict and merge into a single unified texture.

The following stage of composition involved synergising the two streams of narrative work. By employing more of a top-down strategy, I was able to work with the materials with the entire macrostructure in view, providing the context of any section within the work. This allowed me to see which areas of the work needed the strongest dramatic energy, provided by the conflict of the resonances or complexity within the percussive materials.

Structural Overview

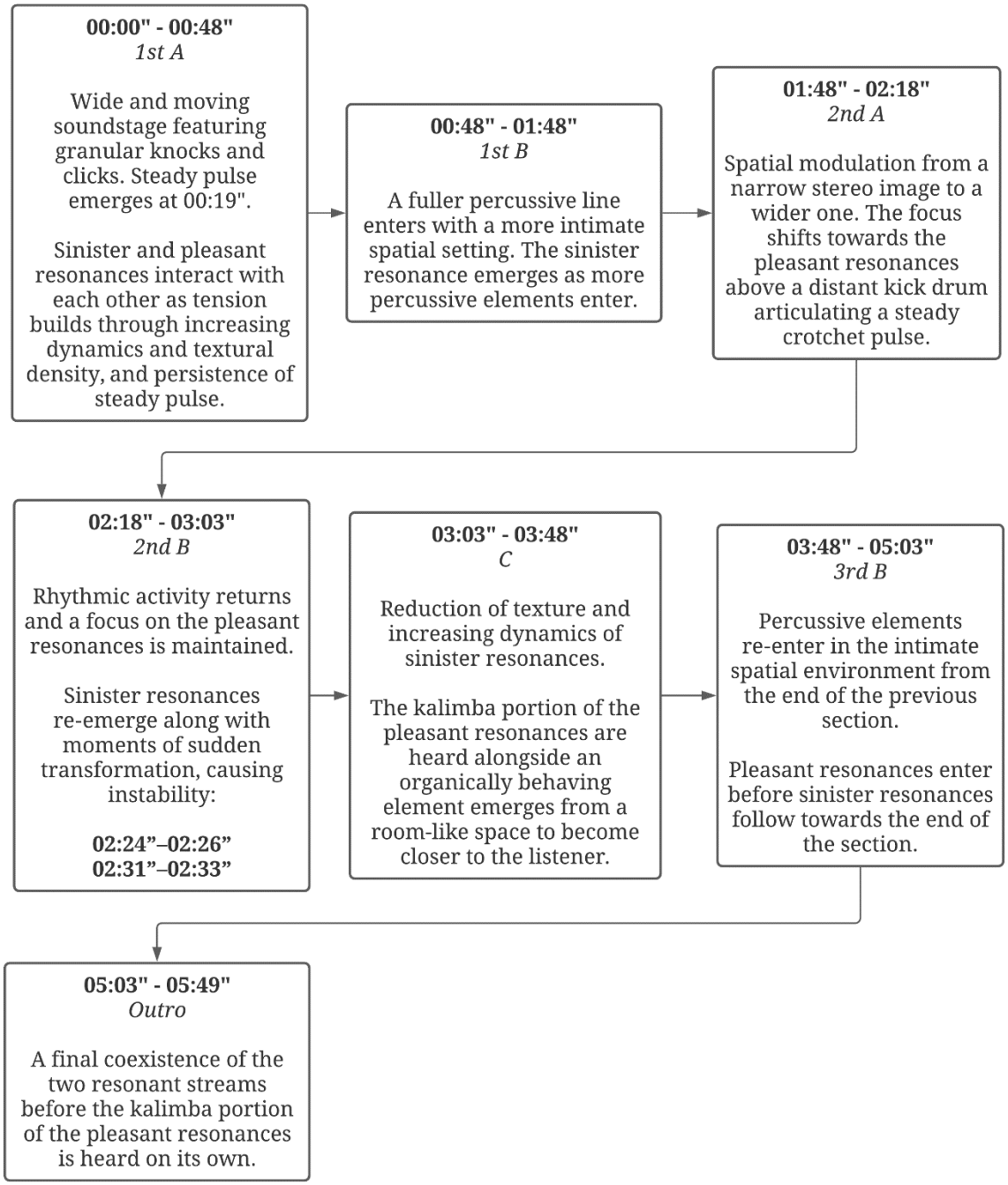

Figure 19: Structural overview of "Order Affray"

The first A section opens in a wide and moving sound stage of granulated percussive knocks and clicks. The steady pulse emerges at 00:19” from an unquantised beginning of the work. The sinister resonance is the first to be presented, then the pleasant layer enters and interacts

with it. Tension builds in the following section primarily through increasing dynamics and textural density and the emergence of the steady pulse.

The following B section is carried by the fuller percussive line. The sudden intimacy of the sounds resolves the tension from the A section. The sinister resonance re-emerges as more percussive layers are added to the percussion instrument group.

In the second A section (01:48”–02:18”), a spatial modulation occurs where the sounds begin very narrowly in the stereo image and gradually widen throughout the section. The sudden narrowing of the stereo image going into this section, coupled with the reduction of high frequencies, resolves the tension accumulated as the previous section comes to an end. The pleasant resonances are featured here, along with a steady crotchet pulse articulated by a distant kick drum.

After the sounds widen again, the following B section features more rhythmic activity and focuses on the pleasant resonances. However, the sinister resonances return along with processed variants of the master channel to create moments of instability (at 02:24”–02:26” and 02:31”–02:33”).

The following C section unfolds from 03:03”, with a reduction of texture and increasing dynamics of the sinister resonances. The pleasant resonances enter again at 03:16” as the bass of the sinister layer suddenly vanishes. The kalimba element of the pleasant resonances is heard on its own as a new contrasting, organic element appears to emerge from a distant room before moving close to the listener.

The final B section begins in an intimate space, contrasting the deeper and denser stage of the previous section. The pleasant resonances enter first before the sinister layer is introduced towards the end of the section. As these two strands move into the outro section of the work (05:03”), the dynamics of the sinister resonance soften, suggesting coexistence and stability in their relationship, which resolves the tension and, indeed, the narrative of the entire work. As the piece closes, the sinister resonance fades, leaving only the pleasant kalimba resonance heard without conflict.

Conflicts and Coexistences as Functions of Drama in “Order Affray”, and Considerations of Song Form

Central to this work’s form is the unfolding relationship between the two streams of resonance—the sinister and the pleasant—relating to the behavioural mode of discourse. The dissonance caused by these two streams’ interactions creates tension that is resolved at the end of the work by filtering the streams so they merge into a cohesive spectromorphology. However, in this work, I considered how this simple dramatic device could be used in synergy with the unfolding discourses of the PEM elements and the popular music form that structures the piece. I used the entry of the sinister resonance at 01:18” to accentuate the textural change caused by the introduction of the noisy centre texture. I processed the entire percussion texture using convolution to produce a strong timbral shift from 01:48” to 02:18” to complement the change in resonances from sinister to pleasant. The evolving nature of the pleasant resonances at 02:18”–03:03” was accompanied by a growing percussion line, with the addition of hi-hats and a kick drum that accentuates the crotchet pulse, in a room-like space. The effect of the transition from pleasant to sinister resonances at 03:03”–03:18” was accentuated by transposing the hi-hats down an octave, removing a layer of the kick drum transients, changing the pulse to a minim and removing the ‘Clix’ percussion. I used a new

section of the pleasant resonance recording in the bridge section to reinforce the novelty of the focal granular sound that enters there, adding to the sense of contrast expected in a bridge section of a pop music structure. As the resonant material grows in complexity and dynamics at 04:30", I granulated the percussion line and layered this recording throughout the transition from mostly percussion-focused to a balance of the resonant material and percussion. Finally, I thinned out the percussion texture in the outro to reinforce the sense of resolution as the two resonant materials finally coexist with each other.

However, I felt the resonant material's trajectory operates more in the background behind the PEM elements. While they come forward in the bridge section and outro, at most other points, the resonant materials serve to accentuate the drama of the discourses of metre and textural density of the percussive elements.

The popular music form provided an interesting framework for exploring the fusion of acousmatic and PEM discourses. The acousmatic A sections feature a sense of instability caused by ambiguous sounds, lack of repetition or familiar elements, fluid granular gestures representing transfers of energy, and the dark mood of the sinister resonance. The B sections feature more stability through metric and timbral repetition of the percussive elements, representing a sense of order to the music. As is common of the bridge of popular music, the C section provides drama by introducing contrasting materials that build anticipation of the return of the previously established, familiar elements of the work. In "Order Affray", this was articulated by the switch from quantised to unquantised rhythms, a focus on spatial and timbral modulations, and the new organically behaving texture that emerges towards the end of the section. The bridge's tension is resolved by the return of familiar elements and quantised rhythms heard throughout the work.

This work represents a clear merging of the PEM and acousmatic compositional traditions. In composing this work, PEM approaches were ultimately used for the creation and organisation of the percussive material within the work. Acousmatic considerations were employed to arrange the resonant material throughout the work, express that material's development through sonic processing rather than harmonic development, and articulate development and variation through timbral modulations of existing materials in the work.

“Dashboard Exam”

Artistic Goals

Like “Order Affray”, “Dashboard Exam” uses the popular music form to structure work that uses both PEM and acousmatic modes of musical discourse. However, this work employs source-cause and transformational modes of discourse to articulate the structure. This is achieved by retaining the links between the sound objects and the original source recordings, which were taken from inside a car—turning on the ignition and manipulating the dashboard’s switches, dials and buttons. These materials primarily appropriate the percussion section of the work and create the background elements and a central ‘chirping’ sound described below.

The work was presented at the 2020 ACMC, where I described my use of a multiscale compositional strategy in the context of a fused work. A multiscale strategy moves back and forth between considerations of high-level structure, and the creation of low-level sound materials. I created these low-level materials in an acousmatic approach by making many variations and permutations of the original recordings through to extensive processing. These materials were then analysed and organised into the high-level structure of the popular music form. Further low-level materials were created by processing the original recordings and the produced material to create further interest in the looping structures. This process of moving between work with low-level materials and high-level structures demonstrates the multiscale strategy’s ability to help fuse acousmatic and PEM compositional strategies.

Compositional Process

After making the recordings of the car interior, I processed these within Ableton Live to create a set of permutations. As mentioned, I paid attention to creating sounds that mainly retained a sense of their original sources and did not become too remote and unrecognisable. These processes included stretching the recordings with soundHack's ++spiralstretch plugin using the phase vocoder algorithm to create atmospheric textures. Key material generated from this process was the 'handleRes' sound, a long resonance created from stretching a small, high-pitched tone produced when I opened the handle to the car door. This produced an F-sharp at 740hz, which I chose as the tonal centre of the work. I then processed this stretched recording with Arturia's Delay Eternity plugin, using a resonant bandpass filter with random modulation applied to both delay time and feedback. This created random bursts of 'chirping' sounds, which worked nicely against the more stagnant resonant material. I recorded the output of this channel for six minutes and planned to use it throughout the entire work, acting as a consistent layer to bind the work as a cohesive unit.

Working in Clip View, I began chopping out small transients from the recording and loaded these into Ableton Live's native 'drum rack' plugin. I programmed a set of rhythms in 5/4 and used different parts of the recordings to articulate the central groove. For the kick drum, I used a recording of the car door shutting, processed by a fast-sweeping resonant lowpass filter. I used similar synthesis techniques to create tom drums and snares. Other percussive sounds were left almost entirely unprocessed and were used to double the processed percussion sounds to help them retain their original forms. I granulated the transient material using GRM Tools' SpaceGrain, while modulating the output pitch, creating sections of ascending and descending spectral trajectories. For contrast, I also created granular material that moved across the stereo field but stayed constant in pitch. I used a resonant bandpass

filter and swept the very low frequencies of a portion of the recording with the car engine running. By modulating the filter's cut-off frequency, I created recordings of moving sub-bass tones with a nodal spectral typology. I then created several short loops of this material and used these to fulfil the role of a bassline.

With this low-level material generated, I next considered the macrostructure of the work. I plotted out the ABABCB structural guide using empty MIDI clips and colour-coding these to represent each section. Then, I filled the structural plan with the elements created so far but left the bridge C section sparsely populated, as I knew that section needed new contrasting material. I decided the A sections should focus on the percussion and different non-harmonic elements, while the B sections should introduce harmonic material which interact with the drone 'handleRes' material. To create this, I recorded a simple two-chord repeating sequence (DMaj, EMaj9). To integrate these synthesised sounds into the organic sound palette of the rest of the material, I applied tape saturation and wobble and a low-fidelity reverb using an emulation of a guitar pedal reverb. In the second B section, I used a second layer of the chords transposed up an octave and with different voicing. I used sections of the constant-pitch granular material throughout the A sections, with more animated timbral motions in the second.

Next, I created the bridge section (03:46"), which required a new contrasting element. To appropriate the role of a harmonic modulation, I used the recording of the car engine turning on and processed this using GRM's Evolution to freeze and constantly reproduce the timbre of the sound. This produced a set of resonant tones from the car's engine that I then looped throughout the section. I wanted this transformation to be explicit to the listener, so I used the beginning of the recording of this process to reveal the sound's origin. The car is heard

turning on before the engine's hum becomes frozen and transforms into a still, atmospheric layer. I created another 16-bar section from 03:01" to act as a transition from the second B section into the recording of the car turning on. I used different sets of granular materials to contrast these two sections, with bubbling and popping sounds in the post-chorus and more animated ascending and descending motions in the bridge. To transition from the bridge into the third B section, I used a portion of the granular recording that focused on the metallic sounds of car keys and crossfaded these with the ascending and descending material. Finally, I used a new loop from the sub-bass recording to create further contrast in the bridge section.

I designed the introduction to display a trajectory from raw field recordings and semi-realistic acousmatic gestures into the rhythmically organised structures of the percussive groove. To articulate this, I layered three differently transposed versions of the original recording. These created an atmospheric bed upon which I layered portions of the granular material, crossfaded to gradually incorporate more unnaturally behaving material as the introduction proceeds towards the first A section. Then, I faded in the percussive material, which enters almost unnoticed due to the similarities of the percussive materials and the raw recordings and granular sounds.

Structural Overview

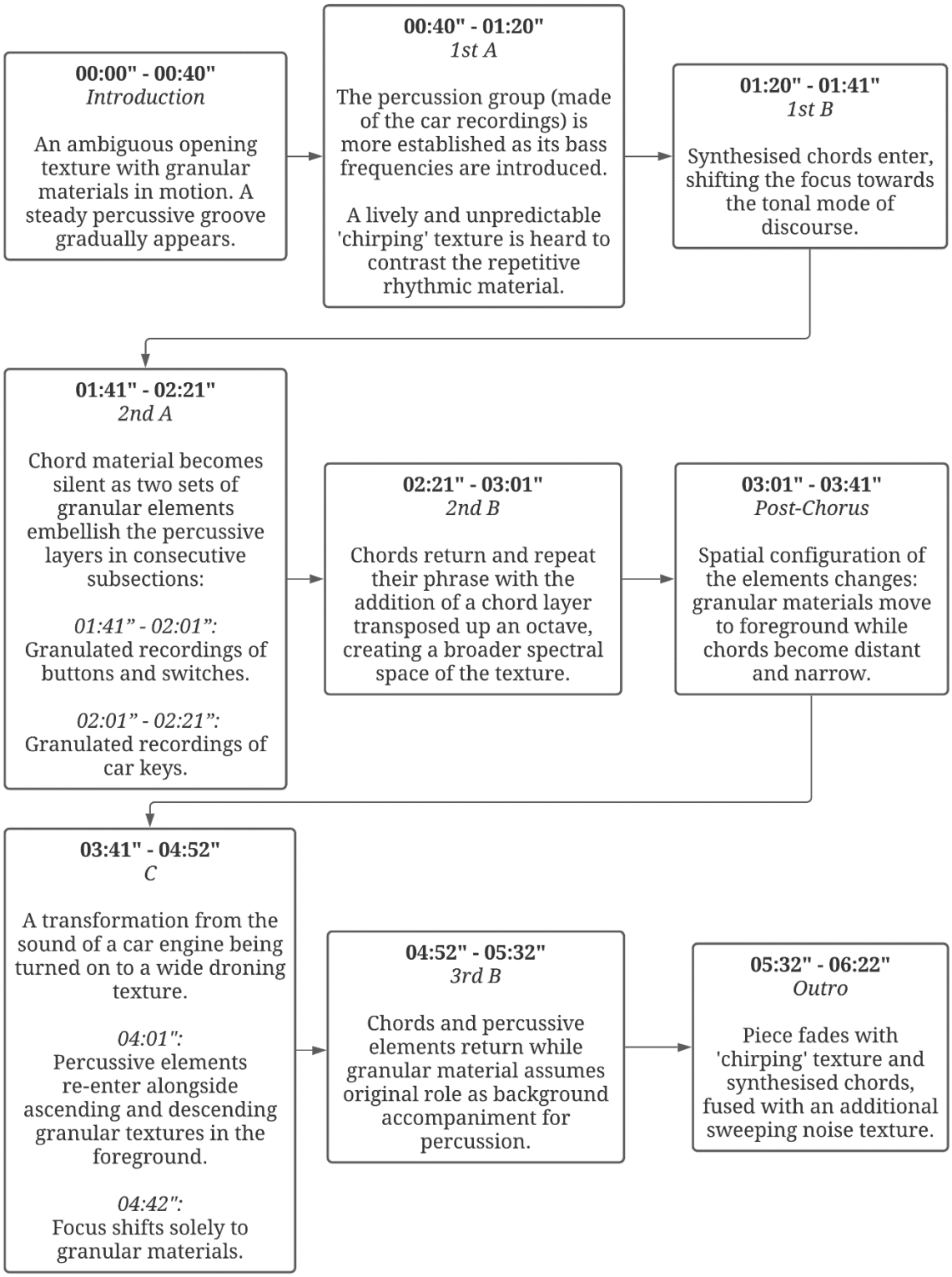

Figure 20: Structural overview of "Dashboard Exam"

As mentioned, the introduction begins with an ambiguous texture before the percussive material slowly emerges. The first A section from 00:40” – 01:20” establishes the foundation percussive groove, articulated by the various sounds of the car interior. The chirping sounds from the processed door handle provides a liveliness that contrasts the repetitive rhythmic phrases. The B section from 01:20” focuses on the tonal mode of discourse, with expressive synthesised chords.

The second A section features more granular materials to embellish the percussive elements. The mid-frequency granular material at 01:41”–02:01” is from the recordings of buttons and switches, while at 02:01”–02:21” it is from rattling the car keys.

The chords return in the second B section, which is twice as long as the previous one. The additional chord layer, transposed up an octave, creates a broader spectral space of the texture, contributing to the added excitement of the repeated section.

The post-chorus section begins at 03:01”, where the spatial configuration of the work’s materials so far modulates. More granular material comes to the forefront while the chords move into the centre of the stereo field and to the rear of a distant space. The C section begins at 03:41”, which initially follows the transformation of the car’s engine into a droning texture. New ascending and descending granular textures occupy the foreground and contrast the previous sections of the work. The focus shifts to granular material from 04:42”, providing anticipation for the following section.

The final B section, from 04:52”, sees the return of the chords and percussion, and the granular material assumes its original role as background accompaniment for the percussion.

The piece closes with the chirping sounds and synthesised chords, which are fused with an added sweeping texture to compensate for the movement that is lost without the percussion.

Familiarity and Remoteness in the Source-Cause Discourse and Form of "Dashboard Exam"

The function of drama most relevant to "Dashboard Exam" is the use of the familiarity–remoteness scale. There are two elements to the use of familiarity in the work: identities that become familiar internally within the work, and identities that are familiar due to external, cultural exposure. The former is seen in the contrast between the bridge and the previous and subsequent A and B sections. In popular music, this is usually created through the discourses of harmony and rhythm; however, I fulfil the same roles in "Dashboard Exam" through timbre and spectromorphological motions. The A and B sections establish the core timbres in the percussion and resonant materials, which contrast with the 'engine drone' that emerges through a process of transformation in the bridge section. In this sense, the new engine drone—which fulfils the role of a harmonic modulation—moves away from the established base of internally familiar identities in the previous section, furthered by the focus on ascents and descents of the granular material that also emerges here. Then, the tension the bridge causes is resolved by the established harmonic sequences of the chorus returning. On a smaller scale, familiarity is also established in the spatial configuration of the sound stage by fixing the main elements in positions for the first and second A and B sections (from 00:40" – 03:01"). This is then compromised by changes in the stereo and external spatial configurations of the chords and granular materials heard at 03:01" in the transition section before the bridge. This shift establishes the initial tensions of the bridge before the engine drone transformation.

Cultural exposure to cars and the sounds they make engages external familiarity to the work's sonic components. I saw this as a useful artistic tool, which led me to choose processing techniques that preserve links to the original materials. Similarly, while the chirping sound does not immediately link to any recognisable car sounds, it does have an organic nature, similar to a birdcall. From this, the overall sound world of the work might remain familiar to the listener. This is used as a dramatic tool at the beginning of the work, which starts in a somewhat ambiguous environment featuring the most remote sounds of the work. The immediate drama of the introduction aims to capture the listener's interest and curiosity through the section, as familiar elements are gradually introduced, including the timbres of less-processed recorded materials and the steady rhythm of the percussion. In other words, the work begins by traversing from the remote to the familiar as an initial dramatic gesture. The gradual incorporation of quantised materials also begins to establish a sense of order to the music, contrasting with the ambiguous and disorderly (although not necessarily chaotic) nature of the sounds heard in the introduction.

The central discourses of the sections change throughout the work. The A sections are mostly carried by metric and source-cause discourses, while the B sections suddenly shift to tonal discourse through synthesised chords. The C section is carried by transformational and motion discourses. These shifts in discourses enable diversity in musical expression, although they also have the potential to cause a breakdown in continuity and cohesion. This is why it is necessary to continue elements of the discourses heard, for example, in the A section through to the B section. The percussion continues to carry the work forward as the chords take the foreground role. After the chords finish and the next A section begins, the ear is drawn to the timbres of the percussion and granular materials, engaging source-cause discourse once again.

The engine drone transformation that leads into the bridge was also composed to capitalise on the listener's external familiarity with car noises. I intentionally made the transformation begin at a very recognisable location (the sound of a car engine starting) and explicitly transform into a drone in the foreground without overly interfering sounds. Through this, the listener can engage with the transformation more than if it began from one remote location and transformed into another. Interestingly, the engine drone transformation in Dashboard Exam was externally familiar yet internally remote: a common sound in the external environment, yet unheard in the work so far. This was an attempt to explore how externally familiar material could be used to engage the listener, while its internal remoteness might cause a sense of drama to emerge from its sudden novelty in the musical context (resolved with the reintroduction of previously established elements).

"Dashboard Exam" represents another method of merging the popular music form with acousmatic sensibilities. There is a clear influence from PEM styles in the rhythmic structures, elements of harmony and macrostructure of the work. However, the articulation of this structure, the sound processing and design techniques and sound material limitations, are all imported from the acousmatic tradition.

Interestingly, in "Dashboard Exam", the structure's request for materials opposes that of most other works in the portfolio. Commonly, the PEM elements in my works are subjected to acousmatic music treatments and materials. However, in "Dashboard Exam" (and also in "Order Affray"), the acousmatic techniques were subject to the requirements of the PEM structure. The difference between these two strategies can be summarised in two general questions that act as exploratory probes for my compositional process:

1. How can PEM elements be manipulated to function in an acousmatic musical context?
2. What acousmatic techniques and materials could be used to fulfil this PEM music structure?

“Navy”

Artistic Goals

“Navy” was composed using a set of recordings from the Brooklyn Navy Yard, created by Ryan Majoris and Liam Fox. Similar to “Dashboard Exam”, I wanted to create a work using sounds with a clear sense of recognition of their source environment. The navy base recordings featured water and metal piping, making a diverse range of liquid textures and resonant strikes. Using these timbres as the source material for sound design gave the pool of generated material a sense of cohesion, unified by the maritime environment they invoked.

These sounds inspired me to compose with a rough scene in mind of being inside a large ship as it was sinking. This scene played a role in the tensile discourse of the work by influencing decisions made during the creation and collection of low-level sound materials, the construction of short ‘claustrophobic’ loops, and the decision to focus on expressions of submersion throughout the work. Though, I preferred to keep the structure of the work open to interpretation and did not base it on any specific linear narrative. Using James Andean’s proposed “narrative modes” to articulate this, the hypothetical scene influenced the “material narrative” of the work much more than its “formal narrative”.[28]

Ultimately, such a scene is inherently tense and dramatic, which led me to consider a musical context for portraying it. I decided to create a work using minimal PEM elements, letting the timbres from the recording and the modulation of textural densities carry the work. At the

[28] James Andean, "Narrative Modes in Acousmatic Music," *Organised Sound* 21, no. 3 (December 2016): 194-95, https://doi.org/10.1017/S1355771816000157.

same time, I wanted the acousmatic material to be treated in the same manner as certain PEM elements, with strong repetition throughout the structures.

The work expresses through the source-cause mode of discourse, referencing water and metallic resonant sounding bodies.

Compositional Process

I performed the sound design process for “Navy” using the Make Noise Morphagene Eurorack synthesiser module. The design of this instrument is inspired by the workflows of musique concrète—manipulating tape to create new material from existing recordings. I used it to generated a large body of granular, transposed and time-stretched material utilising the water and resonant pipe recordings.

I created a bass drone and a kick drum with recordings I had made using the modular synthesiser system. With these elements looping repetitively, I created short loops of a quarter, half and whole bar length in the same way I use sampled material in a PEM work. I developed stacks of these looping materials in Ableton Live, which I built up over the course of mesostructures to build tension.

In one portion of the recordings, an abrasive tone was created when I modulated the ‘grain size’ of the Morphagene to a very small amount of time. This caused the module to loop such a small frame of audio that a tone was produced. I used this resulting sound as a theme of the work due to its similarities to an alarm sound—a relevant sound for the scene of a sinking

ship that inspired the work. I used this in several sections of the work, either in its original register (heard at 02:13”) or transposed down an octave (heard at 00:47”).

To give the piece a sense of tonal gravity, I processed a recording of the pipe being struck, using GRM Tools’ Evolution to capture and re-synthesise the sound’s timbre. As in “Volca”, this resonant material provided continuity through the work, appropriating the role of a harmonic drone.

I created four core mesostructures for the work using the same techniques and materials, though with different methods of processing applied to the core sounds. The object of this was to manipulate the sounds in different ways while retaining their links to the original source material—their relations to water and piping. I also resampled and processed entire groups of audio to create new, yet familiar, material. For example, the section from 03:54” consists of sounds exclusively from the previous section (from 02:28”), processed by Plugin Alliance’s SpecOps.

Structural Overview

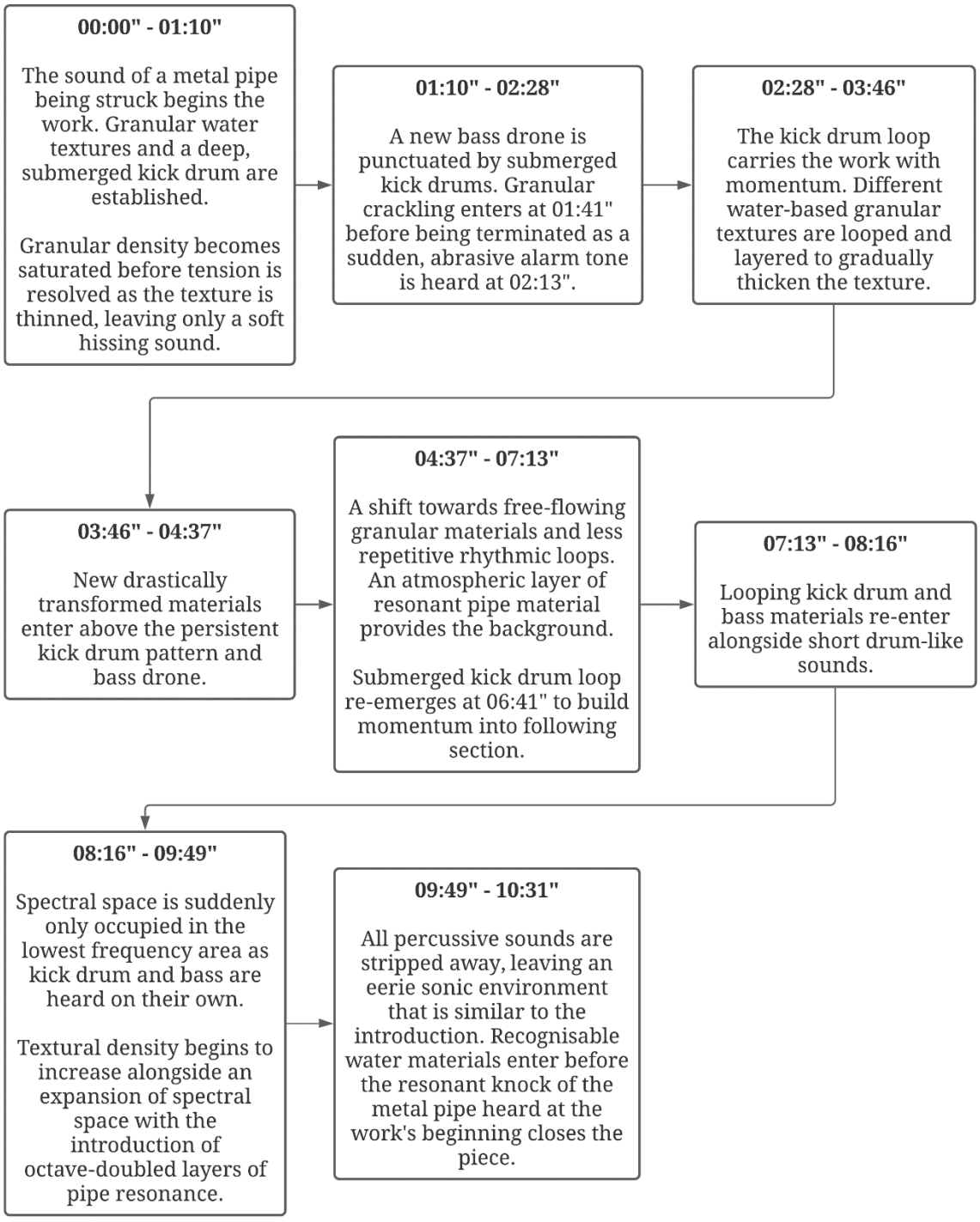

Figure 21: Structural overview of "Navy"

From 00:00” to 01:10”, the work begins with a resonant knock of a metal pipe being struck before its core elements are introduced: the muted, submerged kick drum filtered of any high-

frequency content and granular water textures. The dissonant alarm sound at 00:47” creates an ominous mood for the work’s opening. The density of granular textures becomes saturated, causing a claustrophobic sense of tension that is resolved towards the end of the section, as only a soft hissing sound remains, representing a dispersal of energy in the texture.

The section from 01:10” to 04:37” presents the new bass drone punctuated by the submerged kick drums. Crackling granular sounds fill the spectrum at 01:41” before being cut off by the abrasive alarm sound at 02:13” in its original register. The work is then carried on a repeated kick drum loop instead of the singular thumps at the start of phrases heard so far, increasing the pulse. The texture becomes increasingly dense as more granular water materials are added to the set of looping materials. A section follows from 03:46” that presents material more remote in gestural surrogacy than the previous sections, but retains the looping kick drum pattern and bass drone.

The section at 04:37”–07:13” focusses the texture towards a more obscure soundstage which features less repetitive rhythmic loops. Both free-flowing and looped streams of granular materials are heard against an atmospheric layer of the resonant pipe material. At 06:41”, after the texture has thinned, the kick drum loop re-emerges to draw towards the following section.

The section from 07:13” is carried by the looping kick drums and shorter drum-like sounds created from the water material. From 08:16”, the spectral space becomes occupied only in its lowest regions by the kick drum and sub-bass. Gradually the piece increases again in textural density and spectral space, as pipe resonances become louder and overlayed with different octave doublings with each phrase. From 09:49”, percussive sounds are silenced,

and the work focuses on an eerie soundstage that is similar to the introduction of the work. More recognisable water material enters before the work ends with a final, resonant knock of the metal pipe heard at the beginning of the work.

Modulating Textural Density as a Dramatic Device in "Navy"

The key device of dramatic tension in this work is the approach to repetitive looping structures. Specifically, they merge source-cause and metric discourses to generate an ongoing sense of tension in the music. Like traditional PEM techniques, I used repetitive percussive structures to build momentum and created tension by modulating the loops' textural density. However, instead of choosing percussive or harmonic elements to add to the loops, I used acousmatic textures and processed recordings to fill the role. In doing so, the structures do not become more rhythmically or harmonically complex, but they express an accumulation in energy as the spectral space becomes fuller and more active with each new textural addition. This is particularly evident towards the end of the work as the spectral space becomes occupied only in the bass and sub-bass areas, releasing tension that has built throughout the previous section by greater high-frequency activity. Tension is then built back up throughout the final percussive section as more sounds are introduced to the looping structure, and the spectral space gradually becomes more fully occupied again.

Additionally, the recognisable timbres of the looping elements—of various water and metallic pipe sounds—engage the source-cause mode of discourse, referencing the sounds of the recorded environment. I chose these unrelentingly repetitive structures because they provide a sense of claustrophobia, which felt appropriate to the use of sounds relating to boats and the narrative of being within a sinking ship.

While providing mostly metric discourse, the kick drum also plays a role in the source-cause discourse of the work. The primary role of the kick drum is to provide the submerged pulse that carries the loops forward. However, it also initiates strong timbral shifts, heard throughout the introduction and section from 04:37", as the kick drum acts as the onset of the free-flowing granular materials, imitating the causal behaviours of natural sonic events. This demonstrates the use of the kick drum as a structural function of acousmatic objects rather than a simple articulator of rhythm. The former is possible due to the morphological similarities between the kick drum and common acousmatic impact gestures.

The abrasive alarm tone initially provides a sense of tension due to the sensory dissonance it creates. However, as the sound is later introduced after being processed, the abrasiveness is reduced. Yet, it remains recognisable due to the impact of its initial introduction and its contrast with the work's other sounds. Indeed, its almost tonal nature separates it from the noisy water timbres that mostly occupy the foreground of the soundstage. Interestingly, I felt that the sound's return in the later sections did not provide a release of tension, even though it was a return of familiar elements. While it provided the work with a level of cohesion, the sound being so close to an alarm meant its sinister nature sustained the general sense of eeriness in the already tense music.

Chapter Four: Functions of Drama and Tensile Discourse

This chapter summarises my approach to generating tensile discourse in the portfolio of post-acousmatic works. Firstly, I will discuss the key functions used to express dramatic gestures in the works through both acousmatic and PEM discourses, before taking a macro perspective in examining how these dramatic gestures were combined, overlayed and switched between to create gestalt tensile expressions.

Familiarity–Remoteness

This dramatic gesture is commonly manifested through source-cause discourse in the sound's ability to be linked to other recognisable sounds—either external (sounds or behaviours in the real world) or internal (sound objects heard elsewhere in the work). However, the same function was expressed using harmonic and metric discourses, by re-presenting previously established material to create familiarity, or create remoteness by introducing new foreign material, as in the bridge sections of "Order Affray" and "Dashboard Exam". Although not used in my portfolio, referencing recognisable elements of other works through sampling also establishes external familiarity of melodies or rhythms. Interestingly, the engine drone transformation in "Dashboard Exam" was externally familiar yet internally remote. This was an exploration of how externally familiar material could be used to engage the listener, while its internal remoteness might cause a sense of drama to emerge from its sudden novelty in the musical context (resolved with the reintroduction of previously established elements).

This function was also expressed through transformational discourse by altering a recognisable, familiar element so much that it becomes remote. I employed this displacement

to create tension, which I resolved by returning to either the original material or establishing a new ‘base’.

The lack of repetition and recycling of material was also explored to generate tension through remoteness. This is especially true in “Contour of Mountains”, as the end of the work shifts to almost no direct repetition after several sections that are explicitly built around repetitive rhythms and timbres. Recycling materials played a fundamental role in retaining familiarity in works that shifted in primary discourses. This is evident in recycling the bell tones of the harmonic discourse in “Purging”, which was used later as the source material for acousmatic gestures. Similarly, the granular glitch-like sounds of the early sections of “Tor” were later used to articulate quantised rhythms of metric discourse. This recycling and repurposing of material maintains a level of cohesion despite shifts in the fundamental discourses carrying the works.

Expectation Fulfilment–Denial

In the composition portfolio, this function was primarily produced alongside other functions, particularly energy accumulation–dispersal. Spectral convergences proved an effective method of generating expectation, especially during the ascent and descent sections in “Contour of Mountains”. In this work, I generated expectation by bringing the ascending plucking sounds’ frequencies closer to the sustained upper octave pad (especially heard from 02:55” – 02:59”) . The meeting point of the two sounds was used to resolve the tensions built through the process of convergence. In “Volca”, I also explored methods of prolonging tension, setting up and denying expectation by silencing the sounds before they meet, as heard in the ascent at 03:17”–03:30”, which carries anticipation into the following section. I also use accumulations of energy, through spectral motions or increasing densities of spaces,

to suggest a forthcoming musical event, especially in the accelerations in the opening section of “Iterations”.

Stability–Instability/Organisation–Chaos

After exploring the dramatic gestures in the portfolio, I found this function was related to most of the others and can be expressed through most musical discourses. Certain sounds and processes were used due to their intrinsic portrayals of stability and instability, especially those previously mentioned which were used to provide an element of expectation. I created instabilities using ascending, accelerating, descending and decelerating sounds and portrayed stabilities using planes and static spectra. While this formed the foundation of “Contour of Mountains”, the tonal drone in “Volca” provided relief from the constantly changing and diverse gestural material in surrounding sections of the work by returning to stable, unchanging spectra.

I also used the relationship between unquantised and quantised materials to portray chaos and organisation, which operate hand-in-hand with stability–instability. The gradual imposition of the regular semiquaver rhythms that emerge from a chaotic granular texture at the beginning of “Datumplane” resolved tension by introducing order into an unsystematic context. Conversely, in “Tor” and “Order Affray”, the subtle introduction of granular materials to interfere with quantised materials in those works was used to compromise stability and build drama.

The modulation of timbral and spatial characteristics of a sound was also used to create a sense of instability. This is most clearly evident in the fast and non-repetitive spatial modulations in “Datumplane”, where sounds appear to shift quickly between rooms, halls

and cavernous spaces. In this case, I resolved tensions by stripping reverberation back to a very intimate spatial environment. The diverse timbral shifts at the end of "Contour of Mountains" and final sections of "On Objects" are further examples of this method of creating instability, as I avoided repetition or offering elements for the listener to latch onto and build familiarity with.

Sensory Dissonance

The main method I explored to resolve tension built through dissonant sounds was simply by attenuating the amplitude of either the abrasive frequencies or the entire sound. As abrasive sounds have a more tensile effect at louder dynamics or in brighter spectra, they can be closely linked with processes of accumulating energy. The inharmonic saturation section within "Tensions" provides an example, as the frequency spectrum becomes entirely filled and the texture becomes increasingly loud—one of the most dramatic sections of the portfolio. It is then resolved by thinning the spectrum to a smaller nodal area through bandpass filtering, reducing its abrasiveness. Similarly, the sharpness of the morphologies of the percussive clicks in "Datumplane" and their spectral harshness is only resolved in the middle break section and end of the work when the sounds are silenced altogether. The use of abrasive sounds like this throughout the entire work creates a sustained level of drama that led to several shortenings of the structure to avoid the listening experience being altogether too unpleasant. Similarly, the alarm tone that suddenly emerges in the early sections of "Navy" is another example of these types of abrasive materials producing a sense of heightened tension. In this case, it is resolved as the materials are silenced and the sound world shifts to more muted timbres.

Energy Accumulation–Dispersal/Modulation of Densities

I found the building up and releasing of energy to be almost synonymous with musical tension and resolution. The primary processes expressing these in the compositional portfolio were spectral ascents/descents, accelerations/decelerations, modulations of dynamics and distortion, and modulations of stereo, spectral and external spatial characteristics. These generate the tensile ebb and flow of "Proximity Plays". Additionally, the creation of 'gestural strings' in "Ash and Copper" allowed the built-up drama to be prolonged by transferring energy from one gesture into the next, using the dual functionalities of terminations as onsets. Evidently, this is commonly expressed through motion discourse. However, as accumulations and dispersals of energy directly reflect natural sonic events and behaviours—many of which have a sense of drama embedded within them—they are directly relevant to source-cause discourse.

These processes were particularly relevant within the fused musical contexts of the portfolio that used PEM and acousmatic structures and techniques. Along with providing instability, I generated drama in "Tor", "Datumplane" and "Order Affray" through increasing rhythmic and granular densities by incorporating granular material against quantised structures. As mentioned in Chapter One, modulating textural density is a primary tool for driving works of PEM. Throughout "Navy", I explored this technique of building drama but used found sound materials in the looping structures, which expanded dynamics and spectral, stereo and external space.

Relational Contrasts and Conflicts

This function strongly aligns with Smalley's behavioural discourse, which references the conflicts and coexistences between elements. Coexistence was a particular consideration during the second and fourth sections of "Tensions", where 'note' and 'noise' layers are presented independently of one another before they gradually become integrated into a single texture through various means of processing. In turn, I found Smalley's integration–disintegration continuum a useful tool for generating drama through these types of processes.

Coexistence was also a consideration of the discourses operating in each work in terms of how certain elements and their primary discourses could be balanced with others or shifted into foreground or background roles. The relationship between the gestural and drone material in "Volca" reflects this. The work is structured around the drone material initially operating in the background, peaking through at times, although establishing a sense of tonal gravity to the work. Then in the centre, the drone is fully explored and operates in the foreground before gestural material returns and the relationship becomes more dynamic again in the final third of the work.

Coexistence played a role in maintaining the sense of cohesion in "Purging" despite the shifts between tonal and source-cause discourses throughout the work. In this work, I was forced to consider how the separate discourses and elements that articulate them could coexist and maintain cohesion. Recycling materials played a crucial role in this.

Considerations of structural contrasts were important for the popular music structures in the portfolio and were approached creatively in these fused works. For example, the bridge

sections of “Order Affray” and “Dashboard Exam” required an element of contrast against the rest of the materials of the work. Instead of using harmonic, textural or metric variations, I provided contrast through timbral, spatial and motion variations and shifts away from quantised rhythmic structures towards granular elements. With these shifts, I approximated the structural tension provided by traditional variations in the bridge section of popular music, resolving it with the same reintroduction of previously established materials.

I also explored the use of conflicts between simultaneous sounds as a dramatic device. “Order Affray” was built around creating conflicts in spectral, stereo and external spaces, which I resolved by returning the elements to their localised zones in each of these spaces. The dissonance caused when mixing the two resonant materials in “Order Affray” was also exploited through building and releasing drama by colliding and separating them throughout the work. The final resonant texture was designed to display this sense of closure at their final coexistence by filtering the two resonances to reduce the conflicting frequencies and merge them into a single texture.

Separating elements in terms of morphology also allowed a greater sense of coexistence. The ambient pad sounds in “Purging” operate alongside the gestural materials with a sense of coexistence. However, if these chords were articulated by plucking sounds, they would be more difficult to perceptually separate from the gestural materials due to morphological similarities and may conflict with their articulation. In the section at 04:12”, I creatively exploited this phenomenon by playing the synthesiser pads against sweeping wave-like textures. While these two elements are very similar in morphology, I used the differences in their spectral typology to allow them to coexist: the wave-like sounds feature noisy spectra, while the pad sounds contain clearer notes.

Tensile Discourse

In my portfolio, I approached producing tensile discourse by overlaying and interweaving the dramatic gestures produced by the range of discourses of acousmatic music and PEM. In this thesis, I have explored the nature of tensile discourse in post-acousmatic works of fusion to demonstrate that combining discourses and their dramatic gestures produces a tensile discourse that is greater than the sum of its parts. I have included these discourses and functions of drama simultaneously in musical contexts and combined them to produce new and interesting forms of tensile expression. Tensile discourse was explored throughout the portfolio within the context of self-contained acousmatic music languages and those borrowing from acousmatic music and PEM compositional approaches. In the acousmatic contexts, tensile discourse was generated by discourses of timbre, while in the fused works, these were overlayed with and switched between the tonal, metric and textural discourses common to PEM approaches.

Tensile discourse acted as a foundation and articulator of musical form for my works. As might be considered common in most music, the ebb and flow of tension and resolution was used to plan out and materialise the shape of the work on a macrostructural level, and a sense of progress and momentum at the micro-, sound object and mesostructural levels. I used a bottom-up compositional strategy to structure the acousmatic works of the portfolio, which required generating the lower-level materials early in the composition, and then later planning and building the higher-level structures by piecing the low-level materials together. This meant that the process of higher-level structuring necessitated the consideration of the tensile shape of the works, which in turn came from an understanding of the tensile effects embedded within the lower-level materials. Conversely, the later works which used the

popular music structures were constructed by considering the tensile requirements of those culturally familiar music forms. Hence, tensile discourse was considered from two angles: not only *how* tensile discourse might be articulated, but also what the formal, tensile shape of the work would be as a consequence of arrangement of materials, discourses and gestures.

"On Objects", "Ash and Copper", and "Iterations" mostly use timbral discourses to portray dramatic gestures, in line with an acousmatic approach to tensile discourse. In these works, drama was built by transforming sounds into remote timbres, accumulating and dispersing energy through various motion and growth processes, and introducing and withdrawing abrasive sounds. These each exploit the capabilities of tensile expression of the mimetic acousmatic discourses. Notably, in these works, there were still both shifts in the discourses expressing drama, and simultaneous balancing of multiple timbral discourses carrying this task. For example, in "Ash and Copper", an ascent begins at around 02:50" and sustains at its top, where a crescendo of noise-like sounds enters and further accumulates energy, before this energy is dispersed as a diverse set of new sounds explode onto the sound stage. In these meso-structural processes, several dramatic gestures are used in tandem to create a cumulative crescendo into the following section. That is, instead of a single spectral ascent, several gestures were pieced together to create a dramatic 'string'. In this particular example, the gestures occur one after the other, though at other times, gestures were overlayed to have a similar cumulative effect. The climactic section of On Objects, beginning at 06:34", is generated by multiple simultaneous representations of growth, pacing and introduction of remote textures. This method of layering gestures aims to produce a stronger tensile effect than a single focal gesture, as it simultaneously engages multiple methods of dramatic expression, and organises them all towards the same compositional goal in the given musical context.

In the later works, I explored ways of combining, overlaying and switching between these discourses and those of PEM. I observed two main strategies of overlaying PEM and acousmatic approaches to generate tensile discourse in the compositional portfolio. These were not mutually exclusive per work. Both strategies aimed to capitalise on the expressive potentials of combining dramatic gestures expressed through *both* mimetic and aural discourses. That is:

1. through the use of both PEM and acousmatic sonic *elements* in a work
2. through acousmatic *treatments* of PEM elements.

In the first approach, I considered how the dramatic arc of one sonic element/identity might be further reinforced by another's. This paired the timbral acousmatic music discourses alongside the traditional discourses of PEM. This required considering a hierarchy in the elements and their respective discourses and then organising other elements and their dramatic gestures to emphasise the most important element. The introduction of "Purging" reflects this process, as the spatial and timbral transformations and motions of the granulated bell recordings help articulate the dramatic moments of the tonal discourse. Similarly, in the first half of "Tor", I designed the granular materials to transform, move and grow to strengthen the drama around the beginnings of phrases and harmony changes. In the same work's percussive section, I used the granular materials to create tension by interfering with the quantised grid after prioritising the metric discourse as the prime carrier of drama in the section. I used a similar approach in "Datumplane", along with expanding spatial characteristics to emphasise points of drama.

At other times, the hierarchical 'distance' between the foreground and background discourses was greater and resulted in more obvious changing of the focal discourse. Indeed, modulating these roles in various ways throughout compositions was an effective tool for providing diversity in the expression of tensile discourse. While this method is reminiscent of Ramsey's "flipping" technique—which shifts focus between "energy-motion (trajectories)" of acousmatic music and electronica "beats"—my works demonstrate that it is equally effective within other discourses of PEM and acousmatic music.[1] Rather than considering the method as moving exclusively between new discourses, I approached it by shifting one type of discourse to the foreground and accentuating it with others in the background. This positioned the discourses to retain the effect of reinforcing each other, although with one discourse brought to the foreground, handling a greater role in carrying a work's drama. This was especially evident in the shifting relationships between the foreground and background roles of the tonal and source-cause discourses in "Volca" and "Purging". This approach was also explored by providing contrast in the bridge sections of "Order Affray" and "Dashboard Exam". In both of these examples, the contrast was provided by bringing the source-cause and transformational discourses to the foreground and moving the tonal and metric discourses into background roles.

In the second strategy, I capitalised on the dramatic effects of certain acousmatic methods of sound processing, using PEM materials as source materials. This strategy effectively shifted the role of generating drama away from the discourse originally inherent in the PEM source material, towards the timbral discourses of acousmatic composition. This was made possible through the mutual use of computer technology in the compositional process of both styles

[1] Ramsay, "Exploring Compositional Relationships Between Acousmatic Music and Electronica," 103.

and my tendency to use concrete, rendered audio (as opposed to abstract scored or MIDI data). This strategy commonly introduced transformational and motion timbral discourses to work alongside the PEM discourses. Building the percussive material's external and stereo spatial characteristics to provide growth in "Proximity Plays" is an example of this. Similarly, building tension through the sudden filling and emptying of external space in "Datumplane" using percussive materials is another example. Transformation discourse and metric discourse work alongside each other in "Order Affray", where I overlayed granular versions of the percussive materials onto the unprocessed sounds to loosen the vertical synchronisation of gestures, creating drama by destabilising the quantisation of the metric discourse.

I also aimed to engage source-cause discourse by processing PEM elements in specific ways to generate materials which aim to invoke references to external objects. The granulating and distorting of the car interior recordings in "Dashboard Exam" engages source-cause and motion discourse in the work's introduction before the sounds are repurposed as percussive materials when the percussive groove enters. In this example, and in the similar technique used in the introduction of Order Affray, this transition aligns with the strategy of shifting the foreground and background roles of discourses mentioned above. In other words, the introduction focuses on source-cause and motion discourses before the same sounds are used later in their unprocessed states to articulate metric discourse, shifting that discourse to the foreground. It should be noted that using obscure sounds for rhythmic roles uses source-cause discourse to engage the listening experience. The use of raw car recordings in Dashboard Exam aims to encourage the listener to question the origins of these sounds, even while they are being used to articulate metric discourse. The difference here is that source-cause discourse is not being used to generate the drama of the musical context (as metric discourse

is). This can be compared to the bridge section of these two works, where source-cause discourse is brought to the foreground once more, and the use of new contrasting materials aims to take on the role of generating drama.

Ultimately, this hybrid approach required developing an understanding of how the discourses of acousmatic music and PEM can each express the functions of drama. Once these techniques were understood, they were brought into the same musical context in ways that made artistic sense. In doing so, dramatic trajectories were constructed by overlaying multiple discourses and/or shifting the role of carrying drama among a set of discourses. For example, the ascent section of "Contour of Mountains" builds tensile expression by the accumulating energy expressed by simultaneous spectral ascents, filling external space, increasing dynamics and growing texture. Similarly, in the final section of the percussive part of "Tor", the accumulation phase is expressed simultaneously by the increasing densities of texture, spectrum and external space before the dispersal phase is expressed by a spectral descent and decelerating shuddering sounds. I sought to investigate how these types of combinations of dramatic gestures might produce a tensile effect that is greater than the sum of its parts. I have done so by capitalising on the possible responses to both the aural discourses developed by cultural exposure and the mimetic discourses developed by environmental exposure—the processes that mimic natural events and behaviours.

Conclusion

In this thesis, I have explored the potential effects of fusing expressions of tensile discourse of acousmatic music and PEM. The aim of doing so was to develop a greater understanding of the nature of tensile discourse in the broader context of post-acousmatic compositional practice and demonstrate the benefits of this understanding in developing my own musical language. Chapter One explored the scholarly discussion about the central modes of discourse of acousmatic music and popular styles of electronic music that function to provide a work's tensile narrative, as well as past research into post-acousmatic practice. This exposed a gap in the literature around how the modes of discourse of acousmatic music and PEM can be combined and overlayed in creative ways to produce a work's unfolding tension and release. Importantly, this approach offers insight into how the mimetic discourses of acousmatic music and the aural discourses of PEM can be united under a mutual artistic role, emphasising the *cooperation* of the discourses in fused languages, which ultimately contributes to the cohesion of produced works.

In Chapter Two I developed an analytical framework that enabled the articulation of dramatic gestures in my composition portfolio produced by both acousmatic and PEM discourses. These dramatic gestures were expressed using the following functions of drama:

- familiarity–remoteness
- expectation fulfilment–denial
- stability–instability/organisation–chaos
- sensory dissonance
- energy accumulation–dispersal/modulation of densities
- relational contrasts and conflicts.

In Chapter Three, I outlined the artistic goals, compositional process and structural overview of each work, and discussed the fundamental approaches to drama within each of the 13 compositions. I demonstrated that the functions of drama offered in the previous chapter could be expressed by both acousmatic and PEM techniques. For example, familiarity and remoteness can be expressed through the reintroduction of established timbres and melodic or rhythmic structures. Equally, sensory dissonance can be expressed using elements common to both acousmatic music and PEM. These functions of drama allowed me to bond the languages of acousmatic music and PEM under the common artistic goal of generating tensile discourse by combining them, through effective arrangements, in musical contexts.

In Chapter Four, I discussed these strategies of creatively overlaying and switching between the discourses of acousmatic music and PEM to construct hybrid tensile discourses. In the first of these strategies, I used the discourses simultaneously in a balanced relationship to emphasise one element's dramatic trajectory. I also modulated the foreground and background roles of these discourses to depict shifts between the range of PEM and acousmatic discourses as the primary carriers of drama at different points throughout the works. I also applied acousmatic music techniques of processing audio and organising the resulting materials using PEM elements as source materials. Developing these techniques throughout this research project has allowed me to bridge the gap between the technical skillsets and aesthetic considerations of acousmatic music and PEM. Through this fusion, I sought to capitalise on both the mimetic discourse of acousmatic music, acquired through exposure to natural environments and behaviours, and the aural discourses of PEM, acquired through Western cultural exposure, within single post-acousmatic works.

This research could be extended in several potential directions. Firstly, the set of functions of drama could be expanded upon to encompass more compositional styles. Secondly, they could also be further applied as both an analytical and compositional tool: composers could describe its intentional application in their compositional processes, and analysts could use it as a lens for exploring past works. In particular, research into the functions' use in instrumental composition would explore their relevance outside of the electroacoustic music sphere, and in mixed electroacoustic compositions (works which combine traditional instruments with electroacoustic elements and processing techniques). Thirdly, the functions could be explored in their use in fusing timbral discourses with those of programme music and/or works which feature lyrical content to depict a literal narrative. Finally, the research has the potential for development into an educational resource for new composers wanting to explore techniques in depicting tensile discourse in timbre-driven works, or those interested in fusing compositional discourses of different genres.

The theory of acousmatic music is full of ideas that are extremely valuable to the PEM composer. As past research has shown, composers of electronic music are commonly engaging with studio techniques that align to an acousmatic musician's skillset. My research has identified a rationalised method for applying acousmatic music theory within PEM contexts in order to create a broader kind of tensile discourse. In doing this research, I hope to encourage further informed developments of Pierre Schaeffer's legacy and new applications of the theory initiated by his work. This line of research potentiates the exposure of new listeners and composers to the rich sound worlds, concepts and techniques of the acousmatic tradition.

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