



Noise, Music and Perception:

Towards a Functional Understanding of Noise Composition

A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy (Art)

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September 2011

Declaration

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis/project is the result of work which has been carried out since the official commencement date of the approved research program; any editorial work, paid or unpaid, carried out by a third party is acknowledged; and, ethics procedures and guidelines have been followed.

Darrin Sean Verhagen
15th October, 2015

CONTENTS

CHAPTER 1. INTRODUCTION

- 1.1 Introduction
- 1.2 Research focus and methodology
- 1.3 Noise and Music – Four preliminary arguments
- 1.4 Outline of the exegesis

CHAPTER 2. THE COMPOSITIONAL MECHANICS OF NOISE

- 2.1 Introduction
- 2.2 Flow and the perception of meaning
- 2.3 The mechanics of musical flow
- 2.4 Zen and the Art of Giving up
- 2.5 What is Music?
- 2.6 Imagination and Dissociation
- 2.7 From Noise to Music

CHAPTER 3. PROJECT 1: TRIPTYCH 1

- 3.1 Introduction
- 3.2 Audio: DSV Atonal Kraanerg
 - 3.3.1 Audiokinetic: Fast ride on a fast machine
 - 3.3.2 Pitch vs Roll
 - 3.3.3 One Direction
 - 3.3.4 Something rich and strange

3.3.5 Vibration

3.3.6 Vision

3.4 Audiovisual: Music of the Spheres

3.5 Conclusion

CHAPTER 4. PROJECT 2: TRIPTYCH 2

4.1 Introduction

4.2.1 Improvisation: Longflow

4.2.2 Principles of Uncertainty

4.3.1 Composition – Sound Design

4.3.2 Composition – Opera

4.4 Remix – Drums

4.5 Conclusion

CHAPTER 5. PROJECT 3

5.1 Introduction

5.2 *Object 2*

5.3 Conclusion

CHAPTER 6. CONCLUSIONS & FUTURE WORK

6.1 Introduction

6.2 Key Findings

6.3 Research questions revisited

6.4 Future work and applications

REFERENCES

APPENDIX A: AUDIENCE SURVEYS

APPENDIX B: CHAPTER - WHAT'S WRONG? THE SOUNDS OF DANGER VERSUS HEARING DANGEROUSLY

LIST OF FIGURES

- 40. *FIGURE 1* – Circumplex model of emotion
- 46. *FIGURE 2* – CKAS Thruxim Motion Simulator
- 48. *FIGURE 3* – Laban's Shaping Notation
- 52. *FIGURE 4* – Body Planes
- 62. *FIGURE 6* – Fast Ride on a Fast machine (early documentation)
- 66. *FIGURE 7* – Music of the Spheres
- 82. *FIGURE 8* – Laban Effort Graph
- 100. *FIGURE 9* – Plinth (Object 2)

LIST OF WORKS

1. Atonal Kraanerg (*audio*)
2. Fast ride in a Fast Machine
(*multisensory installation; early documentation provided here*)
3. Music of the Spheres (*audiovisual*)
4. Longflow 121010 (*improvised audio*)
5. Longflow - composition (*composed audio*)
6. Longflow - drums (*remixed audio*)
7. A series of small wire objects (many of them uninteresting): Object 2
(*documentation of multisensory installation*)

EXTRA WORKS

1. Berg Noise (*audio*)
2. Bloodshed: reshod (*remixed audio*)
3. Delete/re_sound (*audiovisual*)

SUMMARY OF THE RESEARCH

This research explores the compositional mechanics of Noise Music. It seeks to understand both the grammars of Noise when compared with traditional musical styles, as well as the types of experiences it elicits from its audiences. It acknowledges the academic work undertaken to date in relation to the genre, but identifies that extant academic analysis has been strongly informed by sociopolitical analysis, cultural context, or philosophical claims (whether for or against the genre). With that in mind, this research bypasses such approaches and instead uses systematic musicology to gain a better understanding of the genre's compositional mechanics. Acknowledging the fact that Noise hit a brick wall of maximum intensity almost immediately, it then asks the question how arousal levels in response to contemporary Noise practice might be heightened. Experiments in attempting to maximize the experience has pushed sound into light, vibration and physical movement. In so doing, a number of the deeper questions that usually lie latent in musical experience have assumed greater presence and demanded answers.

Given the experimental nature of the experiences being designed as part of this practice-based research, it was important to interrogate this project from a variety of multidisciplinary angles. Inquiries included research into Laban movement analysis, appetitive and aversive directionality, the emotional correlates of sagittal and coronal planes, the perception of meaning, the question of audience identity and perspective within a soundfield, the devices which can be used to shift it, the principles of the *umwelt*, *apophenia*, and the ubiquity effect, the question of Noise as an ostensibly environmental rather than a 'musical' stimulus, principles of idiomaticism, the effect of collapsing figure, ground and field relationships, and the subjectivity of valence versus the objectivity of arousal in two dimensional models of emotion.

Ultimately, the issues at the core of understanding Noise's functional mechanics have moved well beyond a simple musicological study into deeper questions of perception, cognition, emotion and meaning-making.

CHAPTER 1. INTRODUCTION

1.1 INTRODUCTION

This practice-based research explores the compositional mechanics of Noise Music. It seeks to understand both the grammar of Noise when compared with traditional musical styles, as well as the types of experiences it elicits from its audiences.

For the purpose of this study ‘Noise’ will be used to refer to the more specific sub-genre, Power Electronics. This style exists at the furthestmost extreme of the musical cannon. Compositionally, it is unconcerned with tonality and rhythm and instead pursues texture with maximum instability, volume, bandwidth and force.¹ As such, it occupies a unique position to question the limits of how music may be formally defined, as well as how it may be processed neurobiologically at the point of consumption.

Such questions are not merely abstract, conceptual or historical. Central to understanding the extremity and operational mechanics of Noise is the listening experience itself. Whilst my research will include musicological contextualisation and discussion of compositional techniques and devices, the main focus is driven by a curiosity as to how a Noise work *feels*, either as a monomodal or multisensory experience. The starting questions therefore, perhaps more than any other genre, need to be as psychophysiological as they are musicologically informed. At their most simple, they are: What is Noise? In relation to the experiences it elicits, how does it work? Why does it work?

¹ Artists working in this genre include Bastard Noise, Genocide Organ, Grey Wolves, Grunt, Merzbow, Massona, Maurizio Bianchi, Namanax, Prurient, Ramleh, Sutcliffe Jugend, Whitehouse, Richard Ramirez, Macronympha, The Haters, Daniel Menche, Incapacitants, MSBR and Taint.

It is important to note from the outset the number of things this work is not. As a compositional study of the Power Electronics genre and not a cultural study of noise principles, it eschews many of the larger debates about both the definition of terms², as well as any perceived, professed or projected sociopolitical agendas of the form. By so doing, my starting point, which rebuts the introductory assertion in Paul Hegarty's (2007) *Noise, Music: A History*, is that Noise, as a genre, actually *is* "an objective fact" (p. x). By limiting my focus to the music of Power Electronics specifically, I can focus on the mechanics of a style rather than engaging in an ontological debate about a word. The resulting focus then, involves a systematic musicological exploration to concentrate on the compositional processes and practices of the form, as well as the audience's experiences in its consumption. Social and political history, cultural context, claims and assertions (for or against its status) as well as any alleged motivations, expressions or intentions have been well covered in the existing literature. A summary overview of the traditional Noise ideas I will not be covering can be found in Hegarty's *Noise Music* editorial in the 2006 *Semiotic Review of Books*. It provides a useful outline of the conceptual cannon, covering authors such as Adorno, Attali, Bataille, Deleuze and Guattari as well as ideas such as excess, ecstasy, failure, authenticity and anti-intellectual radicality. A "political, poetical and ecological" overview of Noise in Sound Art can be found in *Noise Water Meat* (Kahn, 1999, p. 4). For those interested in a "relational and expressive" ontology there is Greg Hainge's recent *Noise Matters* (2013, p. 146). Such texts give the form its cultural and philosophical context. What is currently missing from an academic

² Sangild (2004) concisely summarizes the etymological basis for the term in different Western languages. Noise "(støj, bruit, Geräusch, larm etc.) refers to states of aggression, alarm and tension, and to powerful sound phenomena in nature such as storm, thunder and the roaring sea. The English word "noise" comes from latin "nausea", meaning seasickness and disgust (as the English "nausea"). The German Geräusch is derived from rauschen (the rushing of the wind), related to Rausch (ecstasy, intoxication), thus pointing towards some of the aesthetic, bodily effects of noise in music."

analysis of this style is:

- a musicological understanding of how it works in relation to established compositional principles.
- a psychophysiological understanding of the *experience* of Noise
- and, at the core of a PhD by Project, an exploration of the creative potential of Power Electronics as a style. If its defining quality of power and force has it reached the limits of its own extremity, is further listener arousal is possible, and how might this be achieved?

Such questions outline the equal interests I have in understanding the genre and its possibilities as a composer, as well as the effects it has on experience as a listener.

1.2 RESEARCH FOCUS AND METHODOLOGY

This project is practice-based research and has evolved through a range of methodologies. Some approaches to composition have been intuitive, designed to explore sonic technologies, musical techniques or experiential effects through the process of creating and assessing works. Others have involved specific agendas where the testing of theories and interrogation of ideas through studies would guide future musical creation. Then, when I started exploring a new sensory language by augmenting the sonic with physical and visual gesture, the unique nature of the immersion being explored meant that it became important to understand the listener experience. This was explored through public presentations, interviews and surveys.

When I began writing new Noise³ pieces, the whole process was a fluid

³ Noise, when capitalized in this text, refers to the genre.

dynamic between composition, questions, research and answers — effectively, a closed, personal loop. Drawing on my understanding of experimental music, I would create the works and then judge the outcomes. Such a model, whilst a legitimate artistic process, felt incomplete once I moved into experiments in multi-sensory composition. The types of audiovisual and audiokinetic⁴ discoveries I was making and the claims for perception and cognition I started prosecuting were growing within an innovative territory. Importantly, I found that there were significant increases in subjective involvement when listeners were responding to multimodal works compared with monomodal composition. To understand which responses might be considered innate (and consistent across subjects) and which were strongly personal required the collection of feedback from a range of participants.⁵

Significantly, the augmentation of sonic construction with other modalities was not only about exploring potential amplification of arousal. The ways in which Noise interacts with vision, with vibration, and with movement provide useful crucibles for exploring how the sound-only stimulus might be operating with the listener's imagination. In other words, to understand what it might be in one sense, it was important to explore what it seemed to be when combined with others. The virtual, the metaphoric, the implied, and the projected: sound's domain is rich, personal and highly suggestive. To gain a better understanding of how Noise works both compositionally and experientially it becomes important to explore how a listener makes meaning from Noise in sound-only environments, and how these may compare to its integration within audiovisual or audiokinetic domains.

⁴ "Audiokinetic" is a term I shall use to refer to compositions which have been extended into motion (as well as vibration).

⁵ This can be found in Appendix A.

AIMS

The aims for this project can be broken into three different areas — understanding Noise’s compositional characteristics and workings, exploring particular technical methodologies associated with its production, and developing a contextualisation of the form within a range of relevant research disciplines.

I aim to -

1. Explore the characteristics, behaviours and musical devices of Noise composition.
2. Consider the relationship between improvisation and composition in Noise performance and studio practice.
3. Understand the positive and ecstatic responses of adherents to Noise composition, and the relationship between these responses and the compositional devices that engender them.
4. Investigate, through psychological and neurobiological research, how the brain copes with the perception of threat, violence, overwhelming dataflows or dangerous instability and then explore the potential to incorporate this knowledge compositionally.
5. Apply knowledge from a range of fields (including musicology, psychology and neurobiology) to Noise composition. These disciplines will be used to better understand and predict audience responses, and more effectively shape compositions to elicit desired outcomes.

RESEARCH QUESTIONS

The research questions guiding this study are as follows:

- i. How does composing Noise differ from forms of harmonically organized sound?
- ii. How can the fields of musicology, psychology and neurobiology assist in the understanding of the Noise genre?
- iii. How might these perspectives inform compositional decisions?

1.3 NOISE AND MUSIC – FOUR PRELIMINARY ARGUMENTS

When examining the writings on Noise, as well as the musical history from which the form arises, there are two contrasting perspectives — and their disagreement centres around conflicting opinions about the relationship between ‘music’ and ‘Noise’. One is philosophical, framed by politics, and crafts a clear dichotomy between the two. The other is historical, deals with more compositional interests, and unites Noise and music by charting the development of Power Electronics as a direct outcome of music history. In this chapter I will outline each position, then augment them with two further alternatives.

NOISE-AGAINST-MUSIC

This first argument suggests that Noise is not music and centres around the definition of ‘music’ itself. Philosophers such as Andy Hamilton (2008) and Roger Scruton (1997) delimit the classification of music by the extent to which a composition may use pitch (melody and harmony) and rhythm to organise sound. According to such definitions, genres that lack overt harmonic or melodic content cannot be classified as ‘music’. Hamilton uses this argument as a practical method to distinguish Sound Art from Music; Scruton’s perspective is underpinned by assumed hierarchies of value and correlates of moral decline. And if Scruton was already citing

the moral turpitude arising from the way Michael Stipe writes a melody (compared to Paul McCartney) one can only imagine the scale of cultural apocalypse he might imply by Merzbow's backcatalog.

Whilst Hamilton and Scruton examine general principles of musicality, Paul Hegarty is a central theorist on Noise, specifically. He pursues a distinction between music and non-music even further by concentrating on the Noise genre's alleged behaviour as much as its properties. In exploring artists such as Incapacitants, Masonna, CCCC and Merzbow, Hegarty suggests that Noise is not only a "negativity: defined in opposition to something else" (2008, p. 1) but that its very existence is positioned as a deliberate affront to the musical canon, a resistance to "institutional practices, musical conventions" and "society as a whole" (2007, p. ix). "It does not exist independently, as it exists only in relation to what it is not" (2008, p. 5). As a result, its production and consumption is therefore viewed as an inherently political act. Positioning Noise as an illegitimate challenge to the musical pedigree crafts an intractable Noise-Music binary. 'Noise', by its very nature, cannot be 'music'. By extension, the point at which it may be accepted as music, by this definition, it must cease to be noise. Hamilton takes the form's characteristics and denies it musical status. Hegarty cites its alleged agendas (intended or subconscious) and does the same.

Referring to the principles of noise more broadly, Hillel Schwartz identifies the inevitable cultural contextualisation of such a binary, but also the mutability which can be seen to feed into the second perspective.

As a register of the intensity of relationships, noise has a fourfold history.

First, the chronicle of changing soundscapes: how each era and culture lives within its own ambience of sounds. Next, the annuals of sound earmarked as

pleasant or obnoxious: how each era, culture and rank hears (or does not hear) and welcomes or disdains the sound around it. Next, the career of noise itself as variously apprehended: how each era, culture, occupation or discipline reconstitutes the notion and nature of noise. Contingent upon these, finally, are narratives of noisemaking and noise-breaking: how noise in each era, culture and class have been denounced or defended, defiantly produced or determinedly deadened. (2011, p. 21)

The process Schwartz identifies as the cultural context of noise and its capacity to be absorbed into a system it may have previously been outside, leads us to the next perspective.

NOISE-IN-MUSIC

In the face of any noise/not-noise dichotomy there is a contradictory position to be argued that is neither philosophical nor interested in the aforementioned music-Noise binary. Rather, the claim can be mounted that the growth of Noise is simply the technologically accelerated extension of a variety of developments consistent throughout the history of music. Leading composers have always been interested in taking an established compositional framework and introducing certain challenges to its existing principles. Whilst it does not extend to the Noise genre, Andrew Ford outlines this process in various forms of 20th Century music across the focus of *Illegal Harmonies: Music in the Modern Age* (1997), as did Alex Ross in *The Rest is Noise* (2007), an overview of developments in 19th and 20th century Classical music. Noise in the creative process can be tonal/harmonic, rhythmic, structural, timbral or conceptual — with composers exploiting the opportunity to deliver increasing levels of complexity, ambiguity or instability as an engagement tool. In an attempt to

stimulate their own interest as they habituate to extant conventions, composers help to ensure that musical forms continue to develop. It could be argued that in much the same way that an addict's chemical high diminishes through prolonged drug abuse, the same neurochemical hit that composers are addicted to in their practice weakens when constantly stimulated by the same musical means. In these instances, levels of novelty and innovation within a known system are the means to effectively stimulate the brain's mesolimbic reward circuitry (Salimpoor et al, 2013; Menon & Levitin 2005). Traditionally, this involves a dynamic between experimentation and the compositional system within which it operates.

If the compositional methodology and emotional impact of Noise can be seen to have broken through the containment lines provided by musical tradition, it is possible that these transgressions are actually less political and more easily comprehensible in the light of composers' creative imperatives. These inventive urges (as evidence of underlying neurobiological drives designed to overcome this habituation) need not be labeled as philosophical or activist positions in order to be understood. Rather, it can be argued that Noise, as an example of this principle, is simply selfish experimental exhilaration as opposed to political action. This is not to deny that instances of contestatory or transgressive agendas may have existed in the genre's history, but rather establish that anger and activism may not be the only motivators behind the compositional excesses of the form.

The history of music can be charted as a history of compositional extensions. These include complexity, ambiguity and destabilisations effecting tonality, timbrality, rhythm, and structure. Even movements viewed as radical breaks in the ears of the public were logical developments in the eyes of the composers. In Classical music, for example, atonality was not a challenge born in negativity to the

established tonal system. Rather, pantonality, as Schoenberg preferred it to be known, was viewed by such composers as the reasonable extension (indeed the most sublime structural endpoint) of developments in the tonal system. (Admittedly, Webern claiming that the serialists took tonality and “broke its neck” (1963, p. 47) did not assist in the perception of any creatively altruistic incrementalism.) Effectively, pantonality simply accepted as ‘legal’ the greater levels of dissonance which had been underway for centuries. The dominant 7th, for example, took a century to shift from a distressing experimentation to a pleasantly sublime tonal stepping-stone. Throughout history, as audience ears acclimatised, generation after generation were better able to ‘cope’ with dissonant recreation previously unacceptable or, at best, unpleasant. Whatever the audience reaction, its proponents and adherents viewed pantonality as the “emancipation of dissonance” (Schoenberg, 1975, p. 258-64). An approach, ultimately beyond what the general public would accept, was for the artists viewed as a liberation not a confrontation. The same can be said for Indeterminacy (as an alternative to Serialism) as a principle for compositional organization. The involvement of chance operations provides deliverance from the strictures of music’s history. This was also a symptomatic example of a desire to find a new compositional and aesthetic paradigm. Detractors may charge that aleatoric processes represented a revolutionary attack on compositional order, however composers engaged in its application, however, may simply be beguiled by the innovative options such processes offer for musical consideration. The attraction of composers to the creative possibilities of unpredictable systems will be further considered when I explore idiomaticism in Noise instruments.

Further Classical precursors to the timbral primacy of Noise can be found in the use of extended technique in orchestration. Such devices were employed initially

as a controlled expansion to the sound palette on offer and not as a challenge to the established order. Even in the most well-established traditional musical practices, developments in the 19th Century were adding breadth to the sound sources on offer. As timbral complexity became legitimate territory for musical exploration, there was a commensurate shift in focus from tonality as the primary organisational mechanism for composition. At its most basic, simply the burgeoning size of the percussion sections of Romantic orchestras indicated a move to augment the tonal groupings with a more sophisticated array of instruments capable of delivering greater harmonic complexity. This shifted compositional options into non-pitched or less-pitched realms. It also foregrounded louder instruments capable of eliciting both surprise as well as heightened emotion through immediate physiological impact, rather than affect being mediated by a more musically ‘descriptive’ tonal approach over time. Before the confrontation of Antheil’s *Ballet Mechanique* in 1920 where traditional orchestral instruments were augmented by noise makers, airplane propellers and electric bells, the clashing sound of sword battles on stage had already been incorporated into Wagnerian opera. Further timbral extensions could be found in violin sections clacking and scraping, playing Col Legno⁶ to dramatic effect (such as in Holst’s *Mars*, Berlioz’s *Witches Sabbath* and Mahler’s *Second Symphony*). But this was just the starting point for a general interest in pushing beyond the delimited safety of traditional instrumental timbres. Extended techniques (such as the multiphonics, prepared instruments, and half-valving of 20th Century Classical music as well as experimental jazz) were all distorting the tonal into the timbral. The devices employed resulted in both greater harmonic complexity in the sounds, as well as a push away from pitch stability (or at least clarity). The effect of unknown sources,

⁶ This involves scraping the strings with the backs of their bows.

alien-sounding textures and weakened tonality was intriguing, disorienting, disturbing and dramatic. Composers had discovered the emotional potential in the materiality of sound — noise in music.⁷ This move towards timbral experimentation and tonal ambiguity was well underway in the concert halls and provides evidence of a trend that did not need the philosophy of the Futurists or Dada to crystalize. The introduction of electronics by Edgar Varese and Karlheinz Stockhausen, manipulated records by Darius Milhaud (1922) and Edgar Varese (1936), as well as the use of film to edit sound by Walter Ruttmann (1930) further expanded timbral language beyond even the extended established orchestral palette into new and unfamiliar territories. Rather than Power Electronics existing as an outsider force in musical history — a contestation or transgression — it can actually be seen as the inevitable conclusion to a range of the 20th Century's most important compositional trends. This is a principle already well established by Varese.

...as far back as the twenties, I decided to call my music 'organised sound' and myself, not a musician, but a 'worker in rhythms, frequencies, and intensities'. Indeed, to stubbornly conditioned ears, anything new in music has always been called noise. But after all what is music but organized noises?

And a composer, like all artists, is an organizer of disparate elements.

Subjectively, *noise* is any sound one doesn't like. (1966, p.18)

I would add that *objectively* — and importantly, *culturally* — noise as an element subsumed into Noise is still music, whether one likes it or not.

MUSIC-IN-NOISE

⁷ For a comprehensive comparison of compositional devices by Merzbow and Ligeti, see Gillies honours thesis (2012).

If the first position is “Noise-*against*-music” and the second is “noise-*in*-music”, a further position should be presented — that of “*music*-in-Noise”. This represents a shift in focus, looking less at a proposed historical lineage of the genre and more at the established compositional devices it employs. For a form that eschews clear tonality and rhythm, how many musical techniques are actually operational in Noise composition? Ultimately, are there any grounds on which its ‘otherness’ can be successfully justified?

Leonard Bernstein’s claim for musical universality based on the harmonic series (outlined in his 1973 *The Unanswered Question* Harvard lecture series) may have been an interesting (albeit controversial) starting point for discussion on pitch-based musics. But is it possible that there is a musical equivalent akin to the 17th Century principle of linguistic monogenesis that is encompassing enough to include a form as extreme as Noise? If one disregards tonality and concentrates instead on the most blunt characteristics of music, namely how composition dynamically manipulates attention, arousal and/or emotion through structure over time, a summary suite of rules can be explored to unite material across genre, geography and time. The methods Noise employs and the pace with which it unfolds, may confound musical perception in some listeners. But whilst extreme in their intensity, such methods may draw from the same fundamental principles as all other forms that use time to organise sound. I suggest that this elemental musicality may be no surprise, and, again, may be contextualized neurobiologically.

The psychologist Stephen Pinker, controversially claimed that “music is auditory cheesecake” (1997, p. 534), suggesting that our susceptibility to and passion for music is merely a byproduct of an evolutionary adaptive process that serves no

real purpose in and of itself.⁸ This is not to diminish the prevalence of musical drive or appetite but simply to suggest that musical consumption merely accesses neurological processes of audition designed for other ends.

The chorus of dissent arguing for music's adaptive function was swift (and at times, shrill). There are a number of researchers such as Levitin (2006), Mithen (2007), Tooby and Cosimides (2001) whose positions challenge Pinker's point of view mounting persuasive arguments for the adaptive nature of music for neurobiological as well as social ends. Irrespective of whether music is an evolutionary adaption or a byproduct, there appear to be a number of universal constants that underpin the mind's concentration and response to a flow of sonic information. As outlined in Huron's ITPRA⁹ theory (2006), these provide a foundation which informs all composers when modulating attention and affect over time, regardless of the genre. But notwithstanding the strength of such a base, importantly, there are also culturally acquired competencies listeners develop in relation to particular styles — a nurturing of expertise atop the auditory instincts of our nature. I will examine the similarities between Power Electronics and other types of music at a deep, underlying level as well as the suite of particular devices Noise practitioners may have established which appear peculiar to *its* culture, and that may be defined more by their amusical characteristics and effects than their aesthetic accordance with musical traditions.

NOISE-IN-NATURE

⁸ Pinker (1997, p. 534-538) lists five areas of human thought that may have contributed to our musical ability – language, auditory scene analysis, emotional calls, habitat selection and motor control (for rhythm). He also cautions that people should not mistake a scientific hypothesis as a moral declaration of value. (*personal email correspondence*)

⁹ imagination, tension, prediction, reaction, appraisal.

The argument that Noise might be a simple extension of the creative dynamic operating in traditional forms does not, however, account for the dramatic difference in feeling between Noise and tonal music. Can the consumption of Noise be viewed as qualitatively different from more conservative, pitch-based musical genres? The final position I shall outline speculatively agrees with the conclusion of the first — “Noise is not music” — but is based on a neurobiological rather than philosophical rationale. It ignores cultural history, lineage, musicology and philosophy and, instead, examines the *experience* of the genre. In so doing, it suggests that there may be a cognitive distinction worthy of exploration in how we actually process different streams of sonic data. In reference to traditional music, Scruton claims that “the musical experience ... is founded in metaphor, arising when unreal movement is heard in imaginary space” (1997, p. 239). The notes of a melody don’t actually move; the territory a composition inhabits doesn’t actually exist. But is it possible that such metaphoric (Kemler, 2001) interpretations of pitch-based music, with its clear links to prosody (the musicality which underpins language), may involve a significantly different process from the listener’s decoding of Noise? If so, one can take Mithen’s suggested tripartite cognitive separation of speech, music and environment (2007, p.39) as a starting point and argue that the Noise experience may be read more literally – as a setting or situation – than either as a traditional musical metaphor, or a flow related to the paralinguistic codes of speech.

Whilst Noise may access deep underlying musical structures to modulate expectation and curiosity,¹⁰ I would suggest that the level of assault it offers by being complex, non-pitched, confronting, loud and structurally unstable may increase the

¹⁰ Notwithstanding such deep structures, it’s unlikely to be processed in the language centre of the brain – given that it lacks the grammatical logic to be found in most other forms of music. See Levitin and Menon (2003, p. 2142).

probability of it being read within this ‘environmental’ rather than ‘prosodic’ or ‘musical’ mental schemas.¹¹ Its violations of the tonal arcs of music, many of which are grounded in the pitch flows of speech as guided by the energy trace of respiration, are simply the first step in separating it from musics that have been linked to language.¹²

It could be argued that Noise’s sonic similarities to loud and dangerous events in the real world (earthquakes, storms, electrical catastrophe, violent destruction) cognitively tether it more directly to an experience of drama than the more descriptive dramatic devices found in the Romantic Classical tradition, for example. Furthermore, as Farbood suggests, ...”responses to features such as loudness are biologically wired due to extra-musical necessity... rooted in basic, innate responses to the environment” (2008, p. 695). Noise, as this loud environment, lacks the protective, ordered, musical veneer of other high arousal genres that contain emotional intensity within a clear musical frame. Whilst Noise may be classifiable as music culturally, it is potentially far more environmental, experientially.

Importantly however, it is the degree to which Noise falls short of complete literality that generates a soundscape that can open imagination, rather than closing it through clear referentialism. Kenji Siratori’s *Destruction Code* (2009) for example, combines elements suggestive of train brakes, falling earth and grinding machinery, without ever allowing such elements to assume definition to the point of recognizable focus. If real elements are employed in Noise these generally service the creation of a new environment, unreal and unknown.

If some kind of distinction between environmental and musical positions is

¹¹ The distinction Voegelin might make between ‘listening in’ rather than ‘listening to’ (2010, p. 29).

¹² See research by Patel (2007), Koelsch et al. (2004), McMullen & Saffran (2004), Deutsch (1998, 2004), Levitin (2003), Peretz (2003), Aiello (1994) and Lewman (1992).

tenable in relation to this genre, it may be possible to observe the basis of a fundamentally innate biological response to Noise music rather than any acculturated grammatical competence. Whilst the listener may need to acclimatize to the genre to enjoy it as ‘music’, they do not need to be literate in the form to be aroused and emotionally affected by its sound. (They just may not enjoy it very much.) If this is actually the case, this positions Noise in a different territory from music as defined by Aiello and Sloboda (1994). In their analysis of the philosophical theories about music’s relationship to meaning and emotion (absolutism, referentialism, expressionism, emotional designation) they conclude with Myer’s assertion that ultimately, “musical stimuli, and hence musical affective experience, are non-referential” (Myer, 1954 p. 20.) Ultimately, Noise complicates such a neat assertion. When an artist such as Randy Yau screams, distorted, into a microphone, the primal wail could be argued to link to the perception of psychotic assault, or the angered flailing of a cornered, vicious animal. When we listen to a Noise piece constructed from sounds of stressed metal buckling and glass smashing, it is difficult to hear such stimuli without feeling like there is some kind of reference to the actual source, at either a conscious or emotional level. (The creative potential of the gap will be explored further in chapter 4.) And the next step — electronics that share characteristics with either of the aforementioned examples of distress — simply involves further abstraction whilst still maintaining the residual energy from such overt references. There is still a referential suggestion to which these timbres and envelopes relate. A specific understanding may be out of reach, but an inference can be made about the signal as an important indicator of a huge, dangerously failing system or violent entity.

In Power Electronics, if there is meaning in the sonic flow, it is derived from the

associations which are instinctively triggered by high volume, unstable, timbrally aggressive audio, unleashed from the constraints of overt musical formats. These potential points of reference are further compounded by both macro and micro-structural compositional devices, none of which effectively lead to any sense of resolution. At the macro level, the sonic stream points towards a real-world dangerous stimuli. Whilst at the micro level, the potential absence of resolved tension directly amplifies an already activated affective state in the listener. This leads to an experience where whatever is potentially dangerous, or feeling out of control, is neither resolving successfully or getting any better. Aielleo and Sloboda again:

... It should be noted that uncertainty and lack of clarity may be products not only of conflicting tendencies but also of a situation which itself is structurally confused and ambiguous. This is of capital importance because it indicates that a situation which is structurally weak and doubtful in organisation may directly create tendencies towards clarification. Delay in such a generalised tendency toward clarification may also give rise to affect. (1994, p. 17)

The constant of Power Electronics is the utter *denial* of clarification. Compared with music's capacity to provide anchorage against the "terror of uncertain signs" (Barthes, 1977, p.39). Noise champions uncertainty and impenetrability. As a musical device this is not new. Examples of uncertain focus, structural ambiguity, and lack of musical clarity are clearly evident in genres before Power Electronics. What has changed, and has led to the characteristic visceral experience in Noise, is the sheer level of force. Free Jazz or atonal Classical music, notwithstanding a potentially uncertain internal logic, still felt like *musical* experiments. Their consumption can still occur at a purely cognitive level without necessarily stimulating affect. Confusion in the consumption of these genres can still exist at a disinterested level. By comparison,

the impact of Noise makes a low arousal response such as disinterest unlikely.

The importance of how this genre is framed and experienced should not be underestimated. The first five adjectives of Kahn's (1999) perspective on Noise, "...tetchy, abusive, transgressive, resistive, hyperbolic..." suggest intentionality if not agenda; whereas his final three open up a far more interesting frame of reference. For if the kinds of noise fields under consideration are actually "...scientific, generative and cosmological" the experience has the capacity to enter a far richer and more mysterious domain. Within this framework, the flailing sheets of sound are potentially all the more interesting for being removed, either perceptually or conceptually, as the disruptive instruments of a petulant composer. In other words, rather than existing merely culturally as "an affront to existing discourses and paradigms", Noise instead can "evoke or bring into being the mysterious and unknown" (Hainge, 2013, p. 51). As Russolo suggests, it is "never totally revealed to us and it keeps in store innumerable surprises" (Art of Noises, 1913, p. 9). It is the mechanics and flavours of these invocations and experiences that this research will be exploring.

1.4 OUTLINE OF THE EXEGESIS

Chapter one has outlined the starting motivation for this research project. It identifies my aims, research questions and objectives in undertaking a study of Power Electronics. It delimited the research by summarizing many of the existing academic perspectives on Noise music, and the possibilities presented by an understanding of the form that adopts a more open, psychophysiological examination of the form, without the cultural and political histories that have shaped much of the academic discourse to date.

Chapter Two provides a systematic musicological overview of some of the key

methods listeners employ when decoding streams of sonic data. By so doing, it outlines some of the similarities between the listening experience of music, language and environmental sound, identifying some of the micro and macrostructural correlations between Power Electronics and other styles of music. It builds on the positions outlined in chapter one, exploring the ideas about the genre's musicality and its status as music from a cognitive musicological standpoint. It identifies a number of key theorists who, whilst not discussing Noise specifically, have outlined relevant ideas about how music is processed as a psychophysiological phenomena.

Chapter Three is an overview of the first of the series of major works that form the basis of this research. *Triptych One*, as an iterative project, explores the experiential differences between Noise as a sound-only stimulus, as a viscerally embodied installation, and as a soundtrack to a video image. It begins with a premise that the invocation of more senses would inevitably lead to higher arousal responses to Noise stimuli. It identifies the differences in the qualia or subjective experience of these compositions — the comparison when Noise is consumed mono versus multimodally. Importantly, the audiokinetic and audiovisual versions of the composition are used as a method to explore some of the possible perceptual and cognitive implications in Noise music — ideas that move beyond simple musicological and cultural analysis.

Chapter Four outlines the second suite of works. The Longflow Triptych presents compositions designed to explore the effect of idiomaticism in Noise practice and the creative relationships and experiential differences between improvisation and composition, music and environmental sound, and the effects of combining Noise practice with more traditional genres. Within a purely sonic realm it again examines the principle of “more equals more” – to explore whether Noise's impact can be

amplified through the augmentation of the soundscape with concrete sounds and the emotional shorthand of vocal melody. It identifies that whilst part of Noise's impact is delivered through levels of structural uncertainty, it is actually degrees of *contextual* uncertainty that have the potential to create the emotionally powerful experiences Noise can generate.

Chapter Five presents the final composition – *Object Two* - an installation that extends Noise music into a clear relationship with light. It draws on some of the initial research into synchresis from *Triptych One*, but in this instance, outlines the diminishing returns that can accompany tight audiovisual parity. In so doing it explores the mechanics behind the perception of audiovisual events that feel decorative as opposed to meaningful. In this example, the amplification of power in the Noise experience is about establishing a tight audiovisual relationship, which is then inverted, with sound mutating into ambience whilst vision still articulates the frenzied activity of the composition as it had started.

Chapter Six presents the key findings of the project. It directly addresses the original research questions, summarizing the conclusions of the work. It then outlines the variety of creative and scientific research possibilities that have been generated during the course of this study and noted as future areas of interest.

The first Appendix is a summary of the survey responses, designed to explore the kinds of experiences the audiences reported when using the *Fast Ride in a Fast Machine* motion simulator. Given the subjectivity of each individual's immersive journey, it provides a useful insight into the variety of ways in which it is perceived and interpreted. It also collates responses in order to explore the points of convergence and divergence across the participants.

The second Appendix is a book chapter (in print). It has been included as it

explores many of the key ideas of this doctorate — how sound drives issues of perception, identity and perspective. Whilst it focuses on science fiction film, it stands as a comprehensive overview of principle of the umwelt (an organism's subjective experience of its environment), and how it can be manipulated through sound. As such, it goes into greater depth and allows a more comprehensive study of such ideas, as germane to the experience of Noise Music as they are to science fiction cinema.

CHAPTER 2. THE COMPOSITIONAL MECHANICS OF NOISE

2.1 INTRODUCTION

The principle of “shifting sounds, musical flow”, the title of a popular music conference I attended in 2012, could not apply more aptly to the *modus operandi* of Noise music. As identified previously, Noise is a genre defined by its extremity. Unlike a style such as Heavy Metal, where the energy at its core acts as a fuel to drive a strong, clearly musical engine, the *unbounded* energy of Noise is different. There may be furious activity, but it is not clearly at the service of a focused agenda or any considered structural propulsion. Sounds are erratic and constantly shift, but despite the structural volatility, something arguably ‘musical’ flows. The experiential precedents for these flows, and the perceptual and cognitive processing involved for the listener are the foci of this chapter.

This is a genre that eschews melody, harmony and rhythm to produce an aggressive, unwieldy soundscape characterized by high volume, chaotic structure, timbral density and distortion. The fact that it lacks any overt rhythmic or tonal organization separates its internal logic from genres which abide by generative theories of musical grammar (Lerdahl & Jackendoff, 1996, p. 298-301). Ultimately, without patterns, hierarchies and standard markers of orientation, Noise music must find other means to successfully manipulate attention, arousal and emotion over time. I contend that the methods it employs, whilst crafting this sense of intrinsic logic, actually generate a coherence more closely allied to our environmental experience of sound, and not necessarily the traditions and contrivance of musical metaphor. The flow in a Noise composition may well be musical, but it’s the prosody of sputtering electricity, the song of a raging tornado, or the score of a multi car pile-up on a Formula One racetrack. If Wagner might be said to *describe* a dramatic environment,

I would suggest Noise potentially *is* one.

Timpanies, cymbals and brass within a programmatic style of music can be seen to be forming a descriptive point of reference. These are examples of a metaphoric language that is interpreted for meaning and significance, suggestive of an environment, a narrative or an emotional state. Whilst this musical language is well known to the listening public, it still involves interpretation - and with this subjectivity, the potential for a gap between *felt* emotion (audience experience) and *perceived* emotion (of compositional intention) is ever present (see Kallinen & Ravaja, 2006). One may hear the bluster and force in the overture of *The Flying Dutchman* but there is no guarantee that the audience will do anything more than register the emotional state that Wagner is suggesting. Noise, by comparison, has the potential to be a stimulus that goads, bullies and bludgeons its way into an immediate response. It may feel like a violent environmental encounter, but it's not using the polite language of music, interpretively removed, in order to describe it.

One of the questions that initially interested me when proposing this research: If Noise is more absolute than referential, and it *absolutely* feels like a threat, how can the consumption of such an assault become an enjoyable aesthetic experience? Listener acclimatization felt like the first step - the idea that ongoing exposure could contribute to a greater perception of musicality; the perception of danger diminishing through habituation. Developing this sense of a musicality in a Noise soundscape then, felt like a necessary pre-requisite to becoming a fan.

This chapter will outline the cognitive mechanics of how we intuitively follow flows in sound - whether functional or aesthetic - into a path or template of least resistance. It explores how we process environmental noise and read the musicality of speech. In presenting the Noise idiom as a musical extreme, it then asks how a genre

so fractured, violent and unstable could generate *any* sense of music in a data flow historically viewed as a disruption to, rather than a creator of, meaning.

Given that the difference between *musicality* and *music* has a significant bearing in this discussion, it is important to firstly define terms. For the purpose of this argument I shall interpret ‘musicality’ as a flow of sound that demonstrates particular musical properties - semblances of rhythm, pitch, tempo, cadence, or inferred relationships between the components of a soundfield. By comparison, I broadly define ‘music’ as an attempt to manipulate attention, arousal and emotion through sound. The former looks at the characteristics of a sonic dataflow; the latter, compositional intentionality. Any of the conservative prerequisites for musical definition, such as beauty, pleasantness or aesthetics have been left in the centuries they were first mounted, and can be viewed as historical footnotes to the broader view of music that contemporary theory and practice currently defines.

2.2 FLOW AND THE PERCEPTION OF MEANING

Life involves constant exposure to flows of sound. Whether consciously processed, unconsciously absorbed or deliberately unattended, we are submerged in shifting streams of sonic data. To conserve cognitive energy, we have become masterful at chunking (grouping together) tiny units into rivers of meaning. With language, we parse a torrent of phonemes, fused fragments of microtonal textures, into words and sentences. With environments, we use past experience to group arrays of sounds to confer a proximal and contextual logic in the absence of direct timbral or obvious causal relationships. And in music, we gorge on repetition and pattern. We chunk. (McAdams, 1989, 2009; Bregman 1990) Thousands of individual notes are read as a symphony; a skittering compound of phonemes falls into the Lord’s Prayer;

the scattered sounds of 13 chickens, 2 ducks and a goat becomes a farmyard ambience.

Irrespective of the frame — music, speech, environment — we are skilled at knitting disparate or discrete elements into fabrics of significance, whether contextual, syntactic or semantic. Whatever the stimulus, we will stream, segregate, filter and edit until a flow of sound works with the least cognitive resistance. So primed for this process, if needs be, we will even project an internal logic, aberrant salience or causal inference where none may actually exist — such is the framework of apophenia.¹³ “We take what we can where we may; we make up what we need where we must” (Verhagen, 2012). This process is a direct byproduct of the limited resources we can allocate to conscious attention. Tor Norretranders suggests that compared to the collection of sensory data (estimated to be 1.4 meg per second) the spotlight of conscious attention is merely 16-40 bits (1991/1999). With such narrow mental bandwidth the more we can intuitively know and relegate to subconscious processing the detail in any sonic flow, the more efficiently we can train our attentional resources on events of importance. Feeling and hence trusting the structural and contextual logic of the noisescap is an important step in this preservation of cognitive energy.

But it is one thing to find meaning and flow in sound. It is another to find musical characteristics or relationships - let alone *music*. There are two key questions in this chapter which explore this. Firstly: What is musical flow and how can cognitive musicology help us to understand it? Secondly: When does allegedly musical *flow* in environmental sound become *music*? I shall begin small and specific to answer the first question, and then look at some broader fundamentals to explore

¹³ *Apophenia* - the spontaneous perception of connections & meaningfulness in unrelated phenomena. This is a bastardised term extended from Klaus Conrad's word “Apophanie”, coined in his 1958 monograph *Die beginnende schizophrenie versuch einer Gestaltanalyse des Wahns*.

the second.

2.3 THE MECHANICS OF MUSICAL FLOW

Data chunking

Traditional styles of music form partnerships with audiences, providing an orienting musicality through a range of structural devices. This confers confidence, manages expectation and curiosity, stimulates imagination, and positions the listener within a particular compositional experience. As outlined by systematic musicologist David Huron (1999), there exist a number of cognitive tools listeners employ when making sense of traditional forms of music. Two in particular are useful when reading Noise: data chunking and rhetorical listening. Each provides a mechanism that assists the audience in following the perceived internal logic of a composition - or at least the *feeling* that they are following the internal logic of a composition. Data chunking operates at a small scale; rhetorical listening at the large. In turn, through both micro and macrostructural predictions met and/or thwarted, these modulate levels of attention and arousal over time - and hence emotion.

“Auditory grouping processes serve to organize the acoustic surface into musical events (simultaneous grouping), to connect events into musical streams (sequential grouping), and to chunk ‘event streams’ into musical units (segmentational grouping)” (McAdams, 2009, p. 182). Within the context of melody and rhythm, for example, data chunking is a perceptual method used to combine individual notes of information into coherent melodic or rhythmic arcs. The immediate memory of where a phrase has been informs where the listener might expect it to proceed (engaging them to follow whether the composer will satisfy or challenge such an expectation). This process takes place as the existing material

unfolds but also draws on the broader melodic and rhythmic syntax as absorbed through the experience of patterns in other musical, environmental and paralinguistic precedents.

Whilst Noise music, lacking focused, organised pitch information, any overt tactus (pulse) or regular rhythmic data, may appear resistant to such an approach, there is still enough of a timbral flow in Noise's chaos to encourage such chunking. Indeed, with such a dense and overwhelming mass of information being delivered in Noise, grouping into microstructural arcs rather than processing each element individually is actually crucial for an audience to prevent an overwhelming surfeit of information. This sense of timbral flow is given strength by the fundamental idiomaticism of Noise music's construction.

Idiomaticism is where the imprint of an instrument or system shapes or overrides aesthetic choices or the application of innate or enculturated musical grammars. On a small scale it can be found in the timbral instability of multiphonic exploration or more broadly in the serial and aleatoric processes used in composition. It is prevalent in Noise due to the unstable technologies (software or hardware) which form the base of many of the musical systems employed. Improvisation in Noise sees musicians often abrogating a level of control to a series of wild electronic processes that, whilst compositionally influenced, are often still unwieldy and, to varying degrees, performatively unpredictable. Whilst the composer may have diminished agency, there is still a seemingly organic logic in the sound for the listener due to the fundamental flow of the actual system's instability. Whether this logic is apophenic or a legitimately perceived residue of a methodology is immaterial. Whilst the audience may not know what a piece is doing, through a combination of brute force and the order to be found in chaotic systems, the composition can still project a confident

sense of direction – whether predictable or not.

Rhetorical listening

Data chunking of timbral activity can generate (or elicit the sense of) a microstructural flow, but there are also similar musical devices that can be drawn upon to manage expectation and curiosity on a larger scale. There may be chaotic streaming at a level of fine detail, but there is also potential for some imprint to coalesce into a perceptible form over the full arc of a composition. In the context of traditional musics, this broader sense of structural perception involves what Huron (2002) refers to as rhetorical listening.

Rhetorical listening involves the decoding of small musical cues that allow the listener to intuit the likely function, position or structure of a passage within a larger work. Such a skill can craft a sense of pseudo-narrative structural contextualisation of a musical moment within a frame broader than the note-to-note trace of a melody. It includes the feeling of musical sections having expository, developmental, transitional, or closing functionality. The skill to recognize such categories is as prevalent within the general public as it is in expert musicians, and it can generally be applied to most genres. Perhaps surprisingly, rhetorical listening is often just as important in Noise as it is in other musical forms. But rather than nurturing this perception to encourage orientation, Noise composers often simply exploit this listener capacity to actively confound it. Chunks of transitional data may start a composition; expository information may be heard at the end of a piece. So rather than macrostructural flow, instead there are often gear-shifts where the feeling of where a moment *should* be located violates its actual position in the overall framework. Will Soderberg's (2005) *Fuck the Swells (Just Chill)*, for example, opens up with material that actively feels transitional rather than expository. *Incident B* by

R.H.Y. Yau (2000), after a quick exposition, immediately moves into a section which feels transitional but which is revealed to be a second exposition of new material.

Ultimately, such approaches prevent a rhetorical reading correctly aligned with the actual structural behaviour of the material. These devices, which thwart such skills as useful means of decoding the data stream, further strengthen the levels of disorientation that compliment and amplify the standard confrontation of Noise.

2.4 ZEN AND THE ART OF GIVING UP

It could be argued that Noise music's resistance to (or intentional misdirection of) such cognitive tools potentially encourages a more purely sensorial approach to its consumption - a cognitive and physiological surrender to the moment. In the absence of effective predictive coding - hanging on at any given point to infer the next - there is simply the glee of basking in the visceral excess of full bandwidth, high volume, unpredictable sound. This is what critical theorist Csaba Toth has termed an "anti-teleological *jouissance*" (2009, p. 28).

Whilst not citing this genre specifically, this *type* of immersive listening strategy has been outlined by Lerdahl and Jackendoff (1996, p. 298-301) when examining exceptions to their theory of generative tonal grammar. In compositions where a fractal relationship between a given moment and a larger musical picture is absent, where scale may have been uncommonly exaggerated, where predictive coding is consistently thwarted, and where the emphasis may be instead on timbre and dynamics, 'giving over' to the experience of the moment is often the only way to successfully engage with the flow of data. In such instances, and given the lack of these structured musical patterns and hierarchies, traditional listening tools may consistently fail - potentially leading to a frustrating experience for the audience. If a

composition is nothing more than a series of unpredictable gestures (albeit delivered in a running stream), sensorial immersion may become the most useful strategy for its consumption. Similar effects have been noted in other forms of 20th Century composition, where there are “blocks of sound of such density and complexity that individual elements, such as pitch and rhythm, are meaningless as individual elements and are subordinate to the total aural effect” (Hoogewind, 2000, p. 34). Within this total aural effect, the inherent logic within the idiomatic system may lead to some sense of causal determinism. Where one element leads to the next there may arguably be a perceptible *musicality* in the flow of elements used to guide attention, but some listeners will find the experience itself differs from what they may normally define as *music*.

In much the same way that the word ‘game’ may not speak successfully to the *experience* of American gridiron, Bolivian canasta and Russian roulette, could it be that we also need to consider more carefully the usefulness of the word music as applied to such a broad array of experiences? To ponder that question, let’s re-examine an old one now.

2.5 WHAT IS MUSIC?

Cognitive evolutionists Penn, Holyoak and Povinelli’s Relational Reinterpretation Hypothesis (2008) positions humans as the only species able to understand their world in terms of unobservable agents. Similarly, from Artificial Intelligence theory, the Physical Symbol System hypothesis (Newell, 1980) identifies the unique human capacity to craft fully abstract, second-order representations of underlying causes. Whilst these ideas are not normally applied to music, they provide useful perspectives when theorizing about the meaningful feelings music engenders.

Furthermore, they also go some way to explaining our susceptibility to apophenia.

Ultimately, whether innate or acculturated, conscious or subconscious, the cognitive experience of music can be argued as an extension of a domain-general principle as usually practiced and applied to other sonic data flows. Listening studies, as identified by Dibben, “showed that while listeners pay attention to the acoustic properties of sounds they are also sensitive to what sounds specify (physical source, physical space and proximity, genre, musical function, performance skill, emotional attributes and social context). The results highlight the way in which listeners privilege particular kinds of specifications” (2001, p. 161-194). Dibben with Coutinho also suggests that “a significant part of the listeners’ second-by-second reported emotions to music and speech prosody can be predicted from a set of seven psychoacoustic features: loudness, tempo/speech rate, melody/ prosody contour, spectral centroid, spectral flux, sharpness, and roughness” (2013, p. 658) as each feature carries with it a set of potentially salient inferences.

So we infer meaning, or at least perceive significance, through a series of characteristics, relationships and indicators to be found in sound — all of which either authenticate action or intention, or can be imaginatively interpreted to do so. Both of the lists above provide examples of a principle (sound-indicates-something) and an interpretative skill set that, by extension, we draw upon, whether as a motor mechanic listening to an engine, or a concert-goer decoding music. Reducing sound to such characteristics identifies the useful points of crossover between the drama of traditional music and the sounding drama of environmental catastrophe — as both share and are decrypted through the same set of psychoacoustic features. If the perception of energy flows from a raging tornado is not the same as a musical experience, what are the cognitive prerequisites to enforce a musical perception from

a dataflow never so intended?

The famous statement attributed to Marcel Duchamp (and reaffirmed by Cage) was that the only thing that was not art was inattention (Retallack, 2003). Such a position suggests that the state of anything can be shifted into the realm of the aesthetic simply through a sheer force of focus. A similar process was outlined by Brian Eno (Kelly, 1993) where he described how a recording of traffic could be turned into music. He claimed that merely through the repeated listening of a short field recording, a sense of perceived compositional logic would inevitably accrue across the series of otherwise random events. The frame of reference for the listener gradually shifts from a functional representation of an environment to a soundscape with an increasingly strengthening sense of musicality in its microstructural relationships.

Once the sound of a car horn stops identifying a car and simply becomes a structural setup for another sound — one sound object ‘resulting’ in another — the sense of underlying causes or the identity of “unobservable agents” shifts from a real world into an imaginative, abstract world. Inevitably, a perceived sense of causal determinism starts to develop - but it is a sonic choreography that actually floats free from reality. This demonstrates that if “music is organized sound” (Varese, 1966, p. 18), non-musical material can *become* music, as much through the perceptual organisation of the *listener* as any intention of the composer.

Psychologist Diana Deutsch and musician Steve Reich demonstrated this principle by shifting speech into music through repetition. In both Reich’s *It’s gonna rain* (1965) and Deutsch’s *But they sometimes behave so strangely* (2003) attention finds musical significance in the stimulus once functional meaning has been expunged through repetition. Seams of music - rhythmic, melodic, timbral — are sequentially

revealed through the inherent musicality of paralinguistic codes, but only through repetition coaxing them into relief once any functional linguistic meaning has been annulled.

Power Electronics, however, actively resists moving aggressive sound into a comfort zone of musicality through simple repetition. Such an approach (where pitch and rhythmic registration are brought into focus) is instead more common in the Industrial Music genre (Esplendor Geometrico, for example). The cognitive move from salient, functional sonic stimulus (whether it be speech or environment) to aesthetic sonic stimulus, if achieved in Noise, needs a different approach. If blatant repetition rests outside Noise's musical vocabulary, how then can Noise become music?

2.6 IMAGINATION AND DISSOCIATION

Philosopher Roger Scruton (1997) suggests that the experience of *music* involves imaginative perception where we imagine sounds as falling under particular concepts (such as space, weight, effort, motion, and emotion). Functional environmental sounds, by comparison, traditionally require no such abstraction or imagination, given that they are organically bound to actions and events in everyday experience. Those sounds don't represent such concepts as metaphors, as they actually embody them.

Emery Schubert (2011) makes a similar distinction. He has argued that a dissociative state of listening may be an enabling mechanism for enjoying music as an aesthetic experience. The state of mind when listening to the sound of a train as an environment, for example, does feel quite different from the state where, through reduced listening we have divorced it from context, and instead hear it musically as

what Shaeffer would refer to as a series of timbral or rhythmic “sound objects”, rather than “sound events”. When the agenda has been removed from a sonic data flow to provide important information and it can simply be appreciated for the luxury of its aesthetic properties (either through Duchamp’s focus or Eno, Deutsch and Reich’s repetition), the resonance of such an experience can be likened in feeling to the shift from functional prose to poetry. In language, once the functional tethers which bind words clearly to explicit meaning are loosened, there opens an imaginative space for the reader to inhabit and explore - which features a commensurate resonant shift into an experience which feels more aesthetic than practical. Similarly, in audition, when sound no longer means something functional, it can suggest something imaginative. And this shift can move non-musical sound into the realm of music.

If, through recontextualisation, we can get art out of a urinal, music out of traffic and speech, where and what is the aesthetic experience to be found in the chaos of Noise? In the absence of traditional markers of musicality, combined with such a brutal tenor, does Noise make more difficult the process of Emery Schubert’s dissociation? The inherent sense of danger to be found in allegedly a-musical, loud, chaotic, full bandwidth, unstable sound raises the stakes of the listening experience to a point where a dissociative state — an apparently catatonic response to an aggressive provocation - could be viewed as pathologically inappropriate reaction.

If then, the stimulus demands a reaction, perhaps Scruton’s imagination is a better framework - as it has the capacity to make richer an aesthetic response. Whilst we may not be able to identify the unobservable agent in a violent Noise piece, through imagination, we can be certain that the organism or environment is neither happy nor safe. But it is one thing to have a very strong sense that the shifting sounds which coalesce into a violent figure or a dangerous landscape are likely to kill you.

And it is quite another to call that experience music, even with a cognitive musicological understanding of the sound stream's essential musicality. Do we have to enjoy it before we're prepared to so name it? Can it feel like music if it still sounds like a power station exploding? These questions will be explored in greater detail in *Triptych I*, but my exploration of physical movement certainly supports the importance of framing devices when it comes to engineering specific types of reactions.

How something is contextualized, such as the track name, album cover, listening environment, video clip, is a principle commonly understood by musicians and record labels alike. All these factors can have a major bearing on both the reading of the experience, as a piece of art/music/entertainment, as well as the likely levels and flavours of enjoyment they may engender. The idea that top-down (contextualized, volitional) processing can successfully manage a data flow from a perceptibly dangerous threat to a joyous thrill then is hardly a radical notion. Compared to how long this process may take in musical consumption (e.g., acclimatizing to Noise could take a significant number of listens), my research has raised some interesting findings about instantaneous valence shifts through the extension of sound into movement. These are explored in Chapter Three.

2.7 FROM NOISE TO MUSIC

If art can purify the soul through pity and fear (Aristotle, 350 B.C.E., trans. 1997), how does one turn such terror into gleeful excitement and this Noise into music?

The following diagram may help.

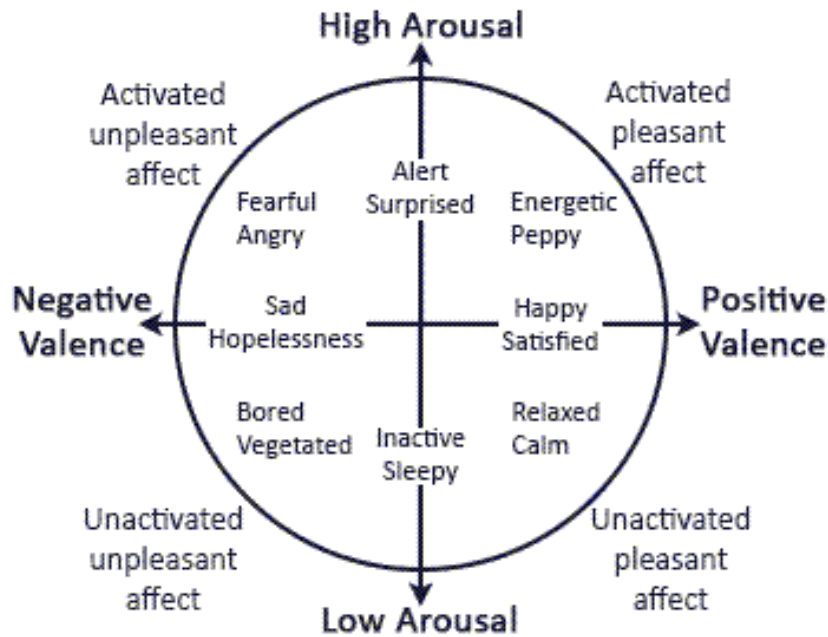


FIGURE 1 The circumplex model of emotion

The circumplex model of emotion (Russell, 1980) locates specific emotional states in particular quadrants through the use of an x-y axis of valence and arousal.¹⁴ Even musicians unfamiliar with the model will certainly be aware of the principles that lie at its core. Certain musical devices are likely to elicit particular physiological (high arousal-low arousal) and judgmental (appetitive or aversive) responses. Whilst focused on the mechanics of harmony as the catalyst, The Theory of Musical Equilibration suggests that listeners identify with volitional processes in music, which are then coloured by emotions (Willimek, 1998). The physiological reaction to loud, fast chaos, for example is likely to be an objective one and high arousal (with accompanying accelerated cardiovascular and respiratory responses). The valence of that heightened response however will subjectively draw on the listener's own personal experience. Adherents of the genre will be excited, newcomers potentially terrified.

¹⁴ The addition of another metric 'dominance' - in surveys such as the International Affective Picture System/International Affective Digitized Sound system - is discussed in 4.3.2.

The limitations of the circumplex model will be discussed further in 3.3.6 and 4.3.2, but for now it has useful application in relation to Noise to question the point at which fear and loathing might become exhilaration and joy, or when the sonic flow moves from being an indication of a physical threat to an awesome composition. I am suggesting that these are not unrelated. Noise, given the superficial a-musicality of its character, and amplified by its brutality, perhaps requires a certain level of acclimatization in order to be read as something more (or less) than mere environmental danger. I would argue that only once the listener is familiar enough to feel a relative safety might they engage in the recreation of musical perception. Registering the musical flow amidst the shifting sounds, let alone enjoying the music can only work once the composition has been decoupled from any potentially functionally informative purpose.

There is, however, a fast track — and I found it in kinetic embodiment, Triptych One.

CHAPTER 3. PROJECT ONE

3.1 INTRODUCTION: TRIPTYCH ONE

One of my methodologies in order to understand how Noise is experienced as music has been on the exploration of compositions in different contexts and augmented by different modalities. Through an iterative approach to recontextualising a central composition I have been able to explore whether arousal levels and valence readings may change across audio-only, audiokinetic and audiovisual versions of the same piece. The *Atonal Kraanerg / Fast ride on a fast machine / Music of the Spheres* suite was the first example of this approach. It exists in three forms – a musical composition, an audiokinetic installation and a video art soundtrack. Each involves different sensorial relationships and modes of engagement, designed to generate divergent types of experiences. Voegelin's assessment of sound art is particularly apt in this instance. "It is the engagement with the world rather than in its perception that the world and myself within it are constituted, and it is the sensorial mode of that engagement that determines my constitution and that of the world" (2010, p. 3). On the subjectivity of experience, Merleau-Ponty similarly moves from identifying perspective to engagement when he says that "All my knowledge...is gained from my own particular point-of-view, or from some experience of the world" (1945, p. ix). As the survey results in Appendix A for *Fast Ride* suggest, each participant uses their own experience to frame the piece in a way that is meaningful to them.

This triptych began with solo audio. It was then augmented by abstract stimuli designed to trigger somatosensory, proprioceptive and vestibular sensations to generate these heightened sensory experiences. The sound was then finally 'clarified' by visual context. Each iteration raised its own set of research questions.

3.2 AUDIO: *DSV ATONAL KRAANERG*

The composition began as an exercise in exploring rail-based composition using the tracker software, Renoise (2.8.0, 2012). Such systems, given the level of control possible on every point in the grid, have proven to be excellent frameworks for artists wishing to craft hyper-detailed microrhythmic works.¹⁵ I was curious to see the effect a step-time, vertical dropdown sequencer may have on my Noise music construction – which to date had either been crafted as Reaktor (5.9.2, 2014) or Max (6.0.8, 2011) patch improvisations and usually followed by horizontal assemblies of the raw noise material in Protools (10.3.2, 2012).

The design of Renoise is similar to early versions of Logic Audio – a vertical dropdown path, microstructurally scrolling through columns of data, which is then ordered, macrostructurally, into patterns. These patterns can be repeated with different lanes, muted or unmuted for variation. This structural architecture led to more of a theme and variation approach in *DSV Atonal Kraanerg* than I would have previously employed in Protools – even though such a methodology may not be entirely self-evident to the listener. The idea was to inject a degree of ‘noise’ into my compositional process, where the ordered constraints of the system would have a bearing on compositional decisions.

By its nature, the noise palette is usually crafted within an idiomatic paradigm¹⁶. The output is generally the result of a system that has a degree of chaos or

¹⁵ These include the drill and bass of artists such as Venetian Snares or the fractured complex beats of Enduser.

¹⁶ Most Noise works, whether live or recorded are driven by an improvisational approach where the artist is exploring a timbral territory through the use of a complex, unpredictable or unstable system.

unpredictability built in to its methodology. The idea for *DSV Atonal Kraanerg* was to explore the opposite. I sourced raw footage, processed it as sustained textures, and then imported the audio files into the tracker to organize the flows of sound. The elements were stripped back and simple, the methodology, neat and controlled.

The main sample used in this composition continues the excavatory idea explored in the study *Berg Noise*¹⁷ – where residual musicality from the original source material is faintly present within the noisescap. The approach to restrictive practices in the tools chosen was extended from the sequencing software through to raw sonic material itself. For this composition, the sound palette was limited to an ostinato sustain, a kick drum, and a single timbral extrapolation sourced from Xenakis's *Kraanerg*, processed and distorted through the shaper function in the audio processing software Metasynth (5.1 2008-2009). I regarded this as a simple suite of raw material to feed into the tracker, rather than over-weighting the timbral options at my disposal. In so doing, I was keen to strike a balance between unwieldy, sustained energy unfolding microstructurally from the sample and the more recognizable macrostructural material, arranged in a pattern which offers up familiar elements and points of repetition alongside the more chaotic momentum. Overloading the materials and compositional options would have had the potential to overplay the messiness and would have undermined the idea of balance I was keen to explore.

The choice to sample Xenakis was simply opportunistic rather than meaningful. When distorted, the process resulted in one long sample that I felt would be aesthetically useful due to its interesting timbral properties and residual sense of musical flow. Once created, this sample was then imported into Renoise. The extended nature of this sound file allowed for a dynamic between a noise stream

¹⁷ See Extras in the support material.

which possessed an inherent flowing logic, contrasted against the other more defined, gridded microstructural points of focus (such as using components like the kick drum). One element then would flow across the dropdown menu as it ratcheted across its 16th beat matrix, whilst contrasting with other percussive elements that took advantage of this gridded architecture.

The work itself establishes a ground using a grumbling sustain. Figures are provided by the Xenakis sample, with their introduction (and subsequent repeats) signaled with a kick drum spike. The compositional definition of these percussive elements does two things. They break up what would otherwise be an unwieldy noisescape – punctuating it with dramatic hits. Importantly, they also provide a sense of intentionality. It is this sense of focus within the chaos that I suggest contributes to the track’s drama.

3.3.1 AUDIOKINETIC: *FAST RIDE ON A FAST MACHINE*



FIGURE 2 “Thruxim” 2DOF motion simulator

CKAS Mechatronics

The 2015 “Energy and the Arts” conference call for papers suggested that “Energy ... serves as a word-when-lost-for-words to describe situations of great

intensity.”¹⁸ In my thinking, two key statements lead to one important question. For if “energy is always in excess” (Bataille, 1991, p. 23) and “the musical experience ... is founded in metaphor, arising when unreal movement is heard in imaginary space” (Scruton, 1997, p. 239) then *where* is such a monstrous space and *what* is the metaphoric activity from which such frenzied sheets of Noise might be the residual power? To explore this idea I decided to augment sound-only Noise with other modalities. The extension of Noise into multisensory experience involved the pursuit of two main outcomes. Firstly, through the use of additional stimuli such as video, light and motion I was attempting to design experiences that would clarify and focus the perceived reason for the noisescape. Unreal movement could become bound to ‘real’ movement; imaginary soundspace could be articulated and authenticated through vision and/or proprioception. Secondly, my expectation was that the combination of this clarification and the simple multiplication of the senses would serve to amplify the intensity of the Noise music experience.

The positions Zuckerkandl summarises in his overview of music as motion (1987, pp. 682, 683) provide insight into the historical importance of movement as a principle in musicology. “Though the idea of motion appears to us as a most far reaching and important one it has hitherto been conspicuously disregarded in all enquiries into the nature and action of music” (Eduard Hanslick, 1854). “All musical phenomena rest upon kinetic processes and their inner dynamics” (Ernst Kurth, 1922). “Basically music is not so much sound as motion” (Roger Sessions, 1950). “The unity of music and motion is primordial, not artificial, not contrived and not learned” (Erwin Strauss, 1956).

¹⁸ UNSW presented by National Institute for Experimental Arts in partnership with Museum of Contemporary Art, Australia, 13-15 August 2015.

Armed with a body of clear assertions from the literature about the relationship between music and motion, I became interested in the potential for music to be extended into movement and vibration. I started experimenting with motion simulators – kinetic platforms on which the listener would sit whilst listening to Noise compositions. Notwithstanding the declarations above, the idea of moving music from abstract and implied motion to physical movement¹⁹ raised questions about how the experience would be perceived. Given the unnatural nature of physicalizing music's metaphors in agency free movement, I needed to better understand the mechanics of embodied motion.

Laban's language of choreography (1975; 1980) provided some preliminary movement analysis in consideration of this shift from the sonically metaphoric to the kinetically literal.



FIGURE 3 Laban's shaping notation for procedural movements on the vertical, horizontal and sagittal axes of space (Broughton, M & Stevens, C. 2012, p. 354)

The theory was that immersing the listener in a physically embodied experience of the music would mechanistically amplify arousal levels. Music 'rising' and 'advancing', for example, could be articulated in physical as much as sound-space.

¹⁹ Gibson's research "The Visual Perception of Objective Motion and Subjective Movement" (1954) presented a visual corollary of the implied (sonic) versus the actual (kinetic) I was about to explore.

Notwithstanding this starting premise, a larger question started to materialize once I began testing the work on participants – namely, how is music experienced in the unnatural environment of agency free kinesis? How might the perceived internal logic of a composition change once it's embodied? And what might the design choices be in relation to these physicalisations which could influence perceived audience identity – who or what they feel they might actually be when immersed in the world created.

Atonal Kraanerg was adapted for a physically-embodied Noise experience using the Thruxim 2DOF motion simulator²⁰ and renamed *Fast ride in a fast machine*. It was the third piece designed for this multisensory equipment. Previous compositions had matched the musical intensity and detail of the sound with a requisite level of activity in the movement. In that instance, chaotic, microstructurally unpredictable sonic activity was given physical form in the frenetic motion design. Others, by comparison, subverted such parity. Some compositions for example, inverted the audiokinetic relationship, with slow movements conferring an additional sense of scale on the intensely chaotic Noise audio. *Fast Ride* explored a middle territory – where violent micromovements were laid alongside longer form physical gestures to provide the perception of immediate force and stress within a broader context of large-scale grace.

As was the case with all of the experiments extending sound into movement, the conceptual questions focus on an audient finding an overarching logic based on their own personal experience to justify why they are moving to the sound. The

²⁰ 2DOF refers to “two degrees of freedom” indicating the pitch (forward and back) and roll (side to side) planes on which the chair can tilt.

related compositional issues involve the structural questions about the relationship between sonic and physical gesture. How the compositional decisions in these relationships might influence the audience experience became the key enquiry. The survey results in Appendix A provide support for the findings outlined in this chapter, whilst also pointing towards future research potential in better understanding some of the convergent themes preliminary tests have suggested .

It is important to note that nothing about the immersive experience I am creating with this technology is designed to be interactive. As an extension of the compositional process, the audience has no agency. As with music, the experience is carefully designed by an artist, which the audience then ‘passively’ ‘receives’. This process is one of careful design. From the outset, when discussing controller systems with programmers, I was clear about two aspects. Firstly, nothing about the movement would be audio-reactive; secondly, nothing on the machine would be controllable in any way by the participant. The first was to maintain complete compositional control and to ensure the series of the audiokinetic relationships across a composition was to remain as a sequence of design decisions – able to be manipulated into new, as well as potentially counter-intuitive experiences at will. The second was to ensure that control remained invested in the composer. This was to be a designed experience, not an opportunity for interactive play for the participant. To that end, this positions installations such as the *Audiokinetic Jukebox* as distinct from other similar artwork (such as those by Char Davies) that employ sound, vision, proprioception and vestibular navigation to immerse the participant in an interactive world. Whether using movement or light, I view these extramusical components as extensions to the musical palette. This has emerged as an important point across all of the multisensory projects. I don’t consider *Fast Ride* a ride. Nor do I consider *A*

series of small wire objects (many of them uninteresting): object 2 as a fine art work.

These additional senses are simply part of the composition, designed to deepen a listener's affective musical response.²¹

Building on the earlier Thruxim experiments I had undertaken, *Fast Ride in a Fast Machine* foregrounded three important issues associated with vestibular and somatosensory manipulation. The next three sections will explore

- the difference between the experience of gesture on the pitch plane (forward and back) versus the roll plane (side to side)
- the principles of appetitive and aversive directionality
- vibration and its relationship to the perception of weight and mass

All of the above were ideas that had arisen out of previous, open-ended explorations of audiokinetic relationships using the motion simulator. *Fast Ride* was an opportunity to focus and explore this suite of questions within one piece.

3.3.2 PITCH VS ROLL

The first issue arose from preliminary tests when participants suggested that jolts in pitch felt more 'natural' than the same gesture on the roll plane (which had been described variously as 'weird' and 'dangerous'). My initial theory was that the logic of sudden forward/back movements was an enculturated sensation based on our engrained experience of vehicular travel. Acceleration and braking in car drives all occur along the sagittal plane.

²¹ This is also the reason that the control systems for programming both motion and light have been kept in the musical domain of MIDI, programmable from within whatever digital audio workstation the composer feels comfortable.

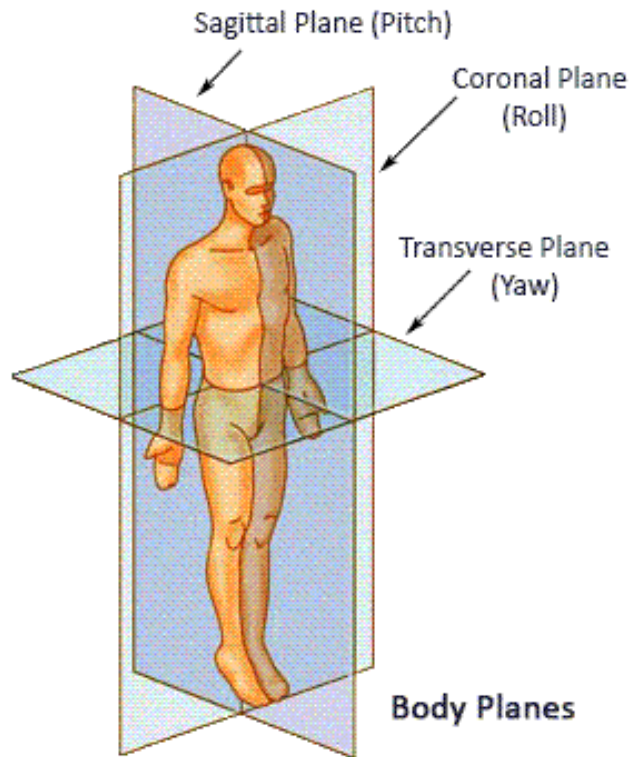


FIGURE 4 Body Planes (public domain image)

Arguably, this would lead to acclimatization to sudden jolts in pitched movement, thus making such gestures feel more ‘natural’ when replicated in a simulated environment. Comparatively, the equivalent jolts on the roll plane would be alien to car travel, which would explain why they might feel more problematic. Beyond the mere unfamiliarity of coronal jolts, hence potentially ‘unnatural’, by inference, such ‘weird’ motions could also be construed to potentially indicate a fundamentally dangerous vehicular movement. So, on one hand, participants are not accustomed to such abrupt coronal shifts; on the other, they can project/imagine the seriousness when they do occur.

Choreographer Antony Hamilton provided perspective on this particular roll sensitivity²². He explained that the body is not made to absorb unexpected coronal impact. (Not surprisingly, ‘rolling’ one’s ankle, for example, won’t occur on the sagittal plane, only the coronal.) Whether the experiences people have with sudden rolls on the Thruxim relate to perception of ‘problematic’ vehicular movement, or tie in to paranoia associated with directional physical danger is a question to be researched further (and beyond the current scope of this immediate project). For me, the important issue in extending composition into the exploration of physical gestures was that the placement of a movement envelope across two different degrees of freedom is not an arbitrary choice, and that there will be different emotional effects depending on the plane chosen. Notwithstanding these considerations, there is a paradox that needs to be addressed. On one hand, we have a susceptibility to trauma from coronal-directed accidents. But, on the other hand, we actually have greater control of our body’s balance on this plane than the sagittal. How can these be reconciled?

This issue became clear to me when exploring the Psychology Department’s balance machines at RMIT’s human research lab. I was initially curious to find that my dynamic responses to sudden balance shifts indicated a superior vestibular acuity on the roll rather than the pitch plane. I could accommodate enforced shifts in balance far faster and effectively side-to-side, than I could front-to-back. On reflection, this makes physiological sense – given that roll has the wide, A-frame arc of the legs to absorb sudden changes, whereas pitch only has the arc of the foot to make requisite corrections. Support for the vestibular strength of side adjustments can similarly be found in martial arts defense positions. Standing side, rather than front-on to an

²² Personal conversation in AkE Lab, 2012.

attacker, gives the body greater stability, and a better capacity to absorb and control the effect of impact.

Initially it appeared that there was a conflict. Firstly, there was the experience of roll in the chair and its potential relationship to dangerous vehicular motion and the requisite physiological vulnerability of the body to side-to-side impact; conversely, there was data to suggest that issues of maintaining balance and stability were actually improved on roll than on pitch. Accounting for such seemingly counterintuitive findings was important and the answer was to be found in position and agency. A defensive Aikido stance is designed to ground the participant with a strong posture in order to actively repel an attack. It is a stance to support *balance* during *active movement*. By comparison, in a passive state – in the case of the *Fast Ride* on the Thruxim, seated rather than standing – there is no capacity to use counteractive measures, no ability to draw on core balance capacities to absorb the directional impact of roll. Unlike a standing position, which gives the participant greater strength to accommodate and control side movement via the legs, when seated in the Thruxim, the body actually has greater protection along the sagittal plane. Backwards movement is supported by the back of the chair; forward pitch is controllable with the listener's feet. If jolts on the pitch plane are reported to be more 'natural' feeling, they are also potentially 'safer' in their emotional affect due to the options for control under these circumstances. But the plane the movement gesture exists on is only part of the question.

3.3.3 ONE DIRECTION

Research by Stins, Roelofs, Villan, Kooijman, Hagenaaers and Beek (2011) demonstrated that appetitive and aversive emotions have requisite directional

corollaries. Approach behaviours are natural in relation to pleasant stimuli, avoidance behaviours, moving backwards, natural in relation to unpleasant stimuli. My interest was whether any emotional residue could be captured in movements in either direction when they were agency free – whether *being moved* forwards resulted in a similar state as *deciding to move* forwards.

Given that the stimulus I was employing was unlikely to be reviewed as ‘pleasant’ however, I was also interested in contextualizing pitch direction in relation to McNaughton and Corr’s two-dimensional physiology of defense (2004, p. 285). This theory suggests that defensive *approach* involves anxiety, whilst defensive *retreat* relates to fear. Finding this distinction was initially exciting for its perceived potential to help identify any underlying spatial metaphors, latent in my relationship to music listening. I reasoned that if I found a Noise piece inducing fear, the metaphor would be that the music was something ‘coming after’ me; if it made me anxious, it might be a dangerous metaphoric environment I was tentatively moving towards or within.

As tempting an idea as this initially was, it proved too simplistic for two reasons. Firstly, when listening to a high arousal, negative valence Noise track, I actually found it impossible to disambiguate whether the emotion I was experiencing was fear or anxiety. Then I realized that even if I could, that the character of that emotion was never likely to remain constant. A loud transient might lead to a defensive retreat reaction (fear), but it would then immediately place the listener on high alert, wary of the possibility that such a shock could return. Such a state would be a defensive approach response (anxiety). More importantly, by its nature, music’s dynamic flow will rarely result in a fixed state emotion. Setups, payoffs, expectations met and thwarted, shifting dynamics, contrastive valence, outcome emotions and

aesthetic emotions will all contribute to a complex and sophisticated experiential journey which plays out over time. If physical gestures were to be designed in relationship to the musical flows of a composition, there is an expectation that these, too, would similarly change rather than remain as triggers for static emotional states.

3.3.4 SOMETHING RICH AND STRANGE

The question of gestures on, and directionality within, the pitch plane were explored in one key moment in *Fast Ride*. The three pulsed swells that occur at 0:55 in the music were given an associated physical shape, pushing the participant forward on the motion simulator. In constructing the movement choreography, a range of options were explored, each with its own perceptual result. Tilts backwards which mapped the sonic shape led to a feeling of vehicular acceleration. Tilts side-to-side similarly felt like vehicular banking. Notwithstanding the name of the track, it felt like such percepts locked down the experience too fully to an easily identifiable concept, thus making the experience less interesting - potentially feeling more 'authentic', but in so doing, ultimately less interesting. The solution – to pitch *forward* at those key points - served to open up dimensionality. No longer could the physical gesture simply feel like the lurch backwards associated with vehicular acceleration. Instead, respondents interviewed variously reported that they felt being 'forced into something' at that moment, or that the chair displayed a sense of 'intentionality', essentially *making* the sound by the direction it was moving. Why these things were happening in the experience became more difficult for them to contextualize, particularly when compared to simple perceptions, such as a car braking.

So whilst such moments were reported to be strong, the audience's ability to articulate what was actually happening had effectively been weakened. If the schema

had previously been vehicular, now such moves were counterintuitive and hence alien/strange. However, even if the action was completely unknown, it was still delivered with enough confidence to sell a fundamental internal logic. Either way, something richer had been opened up at that point than just a simple vehicular narrative. By inverting any expected audiokinetic logic, the composition was no longer imaginatively bound to a daily movement experience. If something strange was happening, any cues about what that might actually be, needed to be considered through suggestions in the composition. The sense produced in such moments is “...Merleau-Ponty’s non-sense, which is neither sense as rational meaning, nor is it its nonsensical opposite” (Voegelin, 2010, p. 20). The structural strength of the multisensory logic holds the authenticity of the experience, whilst simultaneously releasing the participant back into an unknown environment, the physical as again ‘unknowable’ and potentially as metaphoric as the music to which it was bound.

3.3.5 VIBRATION

Integral to the authentication of audiokinetic logic in works such as *Fast Ride* is the role of vibration. Drawn from multisensory experience, whether in nature, industry or vehicular travel, loud sound coupled with kinetic movement in daily life will, by necessity, be interlaced with felt vibration. The capacity for vibration to add levels of authentication to constructed experience and general amplification of arousal levels is well understood in gaming. Vibrating chairs have been integrated into gameplay by Disney, Sony, Renegade, as well as products such as the Aura Interactor Cushion, Thunderseat and X-rocker. And units such as the sub-pac (a transducer available as either a cushion to lean on or backpack to carry,) are examples of current

technology that uses vibration to maximize the experience of music. Understanding how the perception of bass can be manipulated by felt, rather than heard vibration, current headphones from Rosewill and Sony are now also available which employ small, vibrating transducers around the speaker, designed to directly stimulate the skin. Instead of needing to move air to generate low frequencies, the somatic experience of loud bass is fabricated through the vibrations that usually attend the sounds. (ie. Rather than needing sound to move air to create the physical experience of felt vibration, these devices can use direct vibration to accompany low level bass sound to achieve the same effect.) Unlike practical osteophony (bone vibration technology) as developed by the military to allow communication without occluding the audible environment, these other technologies are exploring the perceptual advantages of vibration augmenting headphone or speaker sound to fabricate the sense of mass that loud bass traditionally generates.²³

Moving beyond music, vibration as a component of multisensory experience becomes all the more crucial in events that incorporate motion. Bad encounters in low tech or poorly designed motion simulator rides and old '4D' cinemas²⁴ make this clear. Audiovisual relationships supported by kinetic articulation demonstrate the need for movement that can reach levels of fine vibration. Where the technology lacks that level of resolution, it needs to be augmented with integrated vibration from discrete transducers. This sensory element provides a crucial binding logic for sound and blunt movement. Vibration, like sound, is accompanying energy from action. Its total absence in an audiokinetic experience leaves the movement feeling merely

²³ The exploration of felt vibration as a compositional component was explored by Eliot Palmer in his Masters project, *Surface Resonance* (2010)

²⁴ 4D is a cinematic experience where sound and vision is augmented by choreographed chair movement in relation to the visual action.

descriptive – a correlative experience that ‘pretends’ rather than authenticates whatever is being presented by vision, or suggested by imagination.

Whether the cause is man-made or natural, vibration is not only an integral component in motion’s relationship to sound, but important in the Noise listening experience to the extent that it also speaks to mass. Whether we are hearing or feeling low frequencies, we are evolutionarily primed for the fundamental principle: large events (and entities) make low sounds. Whilst the uncertainty about the specifics of what might be being heard may remain, felt bass at least provides an implication about the expansive scale of the unknown.

Importantly, when combined with movement, vibration not only speaks to size, but can also speak to the perception of weight. *Fast Ride on a Fast Machine* involves a dedicated vibration track – provided by a transducer²⁵ that is bolted into the base of the Thruxim platform on which the chair rests. Whilst it was matching the frenzied activity of the sound and movement for the majority of the composition, at 1:26 there is a specific moment where the jitter is removed from the pitch and roll, and the seat arcs smoothly backwards. At this point, all vibration is also removed. Immersant²⁶ responses during this gesture supported the perception of weightlessness. All the mass and activity associated with the vibration and jagged movement prior to that point suddenly lifts. The feeling is a combination of floating and sinking backwards. As a result, there is a mix of emotions at this point – a calm respite from furious activity, combined with a disconcerting feeling of falling out of control. The amount of movement is minimal, but denied vision in order to corroborate the distance of the fall, participants instead take their lead from the pitch drop in the

²⁵ Clarke Synthesis Gold TST329.

²⁶ A term coined by 3D environmental artist Char Davies.

music.²⁷ The vestibular system, traditionally reliant on visual cues for acuity, searches any other sense for verification and detail about what it is detecting. The ability to use sound to manipulate this perception was of particular interest. But first I needed to address vision.

3.3.6 VISION

The integration of movement into sound works raised a problem early on in my experiments: What to do with the audience's eyes? Early tests on colleagues revealed that in an attempt to maximize the experience there was an equal mix of participants choosing to close their eyes as keep them open. In my opinion, the main benefit of vision was to accentuate the manifestation of musical gestures into a physical representation. Proprioception and balance are blunt tools without additional sensory reinforcement. Visual confirmation of sonic shapes would give a definition to the audio envelopes that were less precisely sculpted when experienced in darkness. The trade-off for such delineation however, was the potential for distraction – visual pollution pulling people away from the richness and purity of the experience, and the capacity for a fixation on the mechanics of the design, rather than their psychophysiological effects. The alternative – blindfolds, visual deprivation – both sacrificed gestural demarcation and encouraged a level of analytical thinking (“Why am I moving? What’s the machine doing now/next?”) which again diminished the aesthetic experience. *Fast Ride* was the opportunity to explore, understand and then finally resolve this fundamental problem.

²⁷ The capacity for one sense to influence the processing of another has been covered by researchers such as Casey O’Callaghan (2008) and will be an ongoing focus of future study – in particular how sonic gestures (pitch and envelope) may be used to influence, rather than corroborate vestibular perception.

Based on conversations with participants, the capacity to listen to music without the experience being diluted/polluted by general visual stimuli was far easier in audio-only tests rather than pieces for integrated sound and motion. At any given point, agency-free audiokinesis can feel like such an unnatural way of experiencing music that vision is invariably invoked in an attempt to better understand it. This can be done either in an attempt to make sense of what is being experienced, or more problematically, as a potential distraction when audiokinetic integration had failed. Either way, it was clear that vision had to be assimilated into the multisensory event in some way. Without a designed incorporation, any richness and power in the music could immediately be undercut by the participant glancing around the room, focusing on the mechanics of the equipment, or feeling self-conscious about their own bodies within the kinetic experience. The question was how to deprive vision without sacrificing audiokinetic definition. The solution came in two steps: firstly, the perception of extrinsic vision; finally the move to intrinsic.

The initial approach was to augment the sonic and kinetic gestures with visual corollaries. This was achieved through the use of a synchronator – an audio to video device that converts three channels of sound into RGB video. Splitting output sends from the composition to drive the three streams of vision, delivered an equivalent intensity and shape in the visual field to the audio. I had seen equivalent syncretic matches in video by artists such as Xenosine (Australia) and Synchronator (Netherlands), and equivalent effects with lasers in the projects such as *Backscatter* by Robin Fox. In the works of all these artists, I was well aware of the synaesthetic hit that can accompany such audiovisual parity. Using this technology would provide a quick way of assessing the effect of vision, closely bound to the audio. It would then provide an opportunity to sculpt more sophisticated relationships between the sound

and light, where control of the synchronator was being driven by new streams of audio in addition to the track being accompanied.

The nature of the *Fast Ride* audio when envelope sculpted and converted to video, resulted in a level of visual activity that, when projected on the walls either side of the motion simulator, resulted in a clear sense of travel and propulsion through a field of energy.



FIGURE 6. VIDEO: Fast Ride on a fast machine
(early documentation, extrinsic vision)

Whilst enjoyable, the potential for sound to manipulate perception in relation to vestibular and somaesthetic signals was still blunted by the audience's visual awareness of the machine they were sitting on. For this composition, the fact that they could use visual cues to fine-tune their perception of balance and proprioception felt like a lost opportunity in my experimentation. Results from my early balance tests (separate to the motion simulator experiments) were clear. Standing on one leg, with eyes closed demonstrated that vestibular acuity is dependent on multisensory support. Fine adjustments to my centre of gravity when losing balance were only successful for extended periods when my eyes were open. Vision provided accurate detail to facilitate appropriate adjustment to my centre of gravity. With eyes closed I could tell my balance was faltering, but without sight, I lacked the accurate detail necessary to address the problem. The next step was to explore whether the brain might take cues from sound to 'confirm' or exaggerate the suggestions received from the vestibular

system. Perhaps I could convince the participant that they were moving further than they actually were.

Carriot, DiZio, and Nougier had already identified areas of controversy in the experiments relating to balance and proprioception. Compared to “....the assumption that vertical perception is global some authors compared results from different axes of rotation, whereas it has been shown that vertical perception is different in pitch, roll and recumbent yaw” and that “visual, haptic and proprioceptive judgments have been treated as equivalent, whereas it has been shown in actual and simulated pitch that these three types of judgments lead to different results” (2008, p. 3). In other words the perception of the participant’s body in space is effected both by the axis of the gesture, as well as the senses involved in manufacturing the positional assessment. As exciting as the synchronised images were in relation to the music, ultimately to explore the influence of sound on proprioception, I firstly had to remove sight.

The question was how this might be achieved without sacrificing gestural definition. The answer was simple. Rather than project onto the walls, I decided to project the video into my closed eyes. The initial surprise was how much colour and definition was perceptible even when occluded through skin. Whilst there were compromises in the linear quantisation of brightness at the lower end of intensity (with perceptible activity dropping off sharply after a particular brightness fade point), gradation within a particular range above this was still usefully defined.

This was the solution to the problem of vision. I had finally discovered a means through which the room and the motion simulator could be expunged from conscious consideration without sacrificing the audiovisual definition which could be used to colour somaesthetic and vestibular perception. But something even more important was happening. Through this approach, I was also fundamentally shifting

my perception of where I felt ‘I’ was. The use of eyelid projection not only eliminated the room, it also had the effect of pushing me back into my own head. The visual experience became far more interior, and by so doing, more successfully anchored with the vibration and movement I was experiencing through my body. This raised the next issue, as a clear disjunct between the senses was starting to materialize.

An alignment between somaesthetic, vestibular and visual sensations had been successfully crafted – forging a highly internalized experience. This now contrasted strongly to the perception of the audio. The feeling of airborne sound from speakers, existing as something *outside* of the body, moved from being invisible and unproblematic, to a recognizable and disruptive discernment. The synaesthetic fusion of gesture across the senses was no longer working with the primary modality that had initially inspired the whole project – hearing. The sound, coming from speakers in front of the participant, had become a problem, as everything else was now ‘emanating from within’.

Of all the issues arising from these experiments, this was the easiest to resolve. Placing the audient in headphones was the final piece of the puzzle. The adjustment, so that sound materialized directly in the participant’s head, rather than activating a room, immediately aligned all the sensory components. Sound, motion, vibration, light were all viscerally embodied, internal experiences. There was no longer anything outside the internal headspace. The room had been eliminated; the resulting sense of the participant’s body in relation to an environment, transformed. The three questions latent and usually unnecessary in traditional musical consumption were now centrally important. Where am I? Who am I? What am I?²⁸

²⁸ Detailed analysis of this can be found in my “What’s Wrong?” chapter. See Appendix B.

The next step was to survey audience experiences with the Audiokinetic jukebox. Whilst public participants had provided open-ended feedback through a comments book when the installation was exhibited in the National Gallery Victoria (White Night, February, 2014), I was interested in assembling a more focused collection of responses, open-ended initially, but then guided by particular questions. The casual responses from earlier public presentations as well as the formal responses to the surveys made the limitations to the circumplex model of emotion clear. The types of emotions captured in those quadrants are typically outcome based – ones that Brown (2009) has termed “everyday emotions”. These don’t account for the ineffable, numinous and/or immersive feelings that are usually associated with powerful states. Whilst the circumplex model of emotion was useful in my research in understanding the general principles of arousal and valence (and how one might be amplified and the other inverted) a more expansive understanding of the emotional experience of Noise was important. Clearly, the encounters audiences were responding to so enthusiastically were deeper and more complex than the simple ‘everyday’ emotions found in the circumplex model. Maslow’s description of peak experiences felt particularly apt when he characterizes these moments as possessing ‘a special flavour of wonder, of awe, of reverence, of humility and surrender before the experience of something great’ (1968, pp. 87–8).²⁹ The first two parts of the triptych focused on the suggestion of this great something; the third part was an experiment in making its definition explicit.

²⁹ Zentner (2010), the author of the Geneva Emotional Music Scale, refers to the French term “*émerveillé*” (“filled with wonder”); Saarinen (2012) explores the range of stimuli which can give rise to what psychoanalysis refers to as “the oceanic state”, “a transient and regressive feeling of oneness with the universe” (2012, p. 939). (The similarities in the relationships between the experience of music and mystical states is explored further in a discussion of d’Aquili & Newberg in Appendix B).

3.4 AUDIOVISUAL: *Music of the Spheres*



FIGURE 7 VIDEO: *Music of the Spheres*

The opportunity for the tertiary iteration of this work was provided when I was asked to create an opening piece for the third ‘episode’ of the Deakin online science fiction journal *Deletion*. The editor, Sean Redmond, had experienced *Fast Ride* as an audiokinetic installation and we had been discussing audience’s experience of the work when he asked me to contribute a piece for the journal. For me, this became a chance to explore the differences between the sound work I had already created, its audiokinetic imagining, and a potential video art contextualisation that, more than the previous incarnations, might guide a reading appropriately science fictional in nature. The idea of something potentially dangerous and otherworldly seemed like an interesting fit for the track I was reimagining. It also drew on particular ideas I was collecting in the audience feedback for the Audiokinetic works – many of which related to science fiction themes. (Appendix A)

In order to explore the emotional effect of this narrative or conceptual justification, I collaborated with video artist Richard Grant. I had seen some preliminary experiments he had been undertaking with a rock on a turntable, illuminated by a single light source (with footage then inverted and sutured back onto itself to form a ‘full’ floating object ‘in space’). Whilst the material looked seductive, it was initially too polite to match the intensity of my composition. That said, I felt

that this visual material could have potential to contribute a sense of both scale and force in relation to the *Fast Ride* music. The context of deep space, combined with a probable confusion about what was actually unfolding in the video felt like useful starting points. It was also an opportunity to compare and contrast how audiences might experience the composition monomodally (sound only), as opposed to audiovisually. Using the existing track as a guide, we collaborated conceptually on the video – me making suggestions, and giving feedback on the visual edits as they were being constructed.

In order to achieve a perception of requisite stress and possible confusion I suggested that our perspective of the rock should be challenged – angles, scale and direction would be unpredictable, and a sense of force in the image created (through visual vibration) to anchor to equivalent moments in the music. Musical gestures would suddenly have justification - ‘reasons’ they exist, either through an intrinsic logic (shuddering coming from within the frame, for example) or an extrinsic logic (where music is guiding edits or movement direction).

Through this iterative process, providing ongoing feedback on the various versions of the video as they were arriving, eventually we had an audiovisual relationship that successfully spoke to the perceptual issues I was interrogating. Whilst the process was intuitive (making suggestions for the vision which simply ‘felt right’), the final result provided me with a multisensory work whose mechanics could then be more rigorously explored. This invitation for online content provided an opportunity to explore ideas about sound as they might relate to a science fiction context (whereas my Noise compositions are always conceptually free, instead simply exploring the materiality of sound). Reflecting on what we had created I remembered the writing of Augoyard and Torgue on the ubiquity effect (2006):

The listener is in search of information. The ubiquity effect is based on the paradoxical perception of a sound that we cannot locate, but we know is actually localized. ... Often it is important to know where a sound comes from; sometimes it is vital information that we need to determine whether to flee, to attack or to remain motionless. The uncertainty produced by a sound about its origin establishes a power relationship between an invisible emitter and the worried receptor. The ubiquity effect is an effect of power.... (p. 131).

Music of the Spheres is designed to play with this effect – with the emitter both visible and invisible; known and unknown. For me, it is the ambiguity and multi-layered contradictions to be found in the audiovisual relationships that give this piece its particular dynamic. Ultimately, the work has been created to establish two competing lines of multisensory logic.

Firstly, there is a possible sense that the sound the listener hears is the force of the object being witnessed. The window onto this world shudders and stresses from the waves of energy pouring from the rock's frenzy or the violent field within which it spins. Simultaneously, the soundscape also offers musical gestures to which the footage has clearly been edited – perspective shifts, a moving camera - video clip tricks which 'explain' sonic moments. The sense of this second audiovisual relationship involves sound operating freely in front of the screen/window, rather than being trapped behind it. An external, controlling (whilst still potentially unfathomable) order runs alongside an internal, dangerous, bewildering chaos.

The paradox, then, is not simply between the localization of sound versus a failure to completely identify its source. In this case, it's also spatio-temporal and taxonomic: the problem of a sound design trapped on one side of the glass (the rock is loud/threatening), whilst a musical score plays with structure on the other (where the

rock is actually mute/harmless). In one, the listener is under attack; in the other, in complete control (or at least in confident hands). Sustaining both is perceptually complicated given that each is being delivered by the same soundtrack. Based on audience responses, it appears that the tension between this intrinsic and extrinsic logic can do one of two things. The confusion and instability has the potential to amplify an active sense of threat, and hence the listener's terror. Alternatively, the failure to reconcile the two may simply turn the experience into one of sheer, gleeful stupidity.

The subjectivity of this audiovisual experience was as variable as the audiokinetic experiments. One audience member explained how *Music of the Spheres* generated a feeling he previously experienced when younger – a simultaneous perception of the enormous and the miniscule. For him, the rock was both a monstrous meteor, as well as a spec of dust – with consequent ramifications about the scale of his own identity as a witness to these two extremes. Additional feedback included an anomalous suggestion from a video artist who felt that his perspective was one of a stationary rock and that he was moving around it, not the rock spinning itself. Whilst clearly there is a high level of subjectivity in such a perceptual encounter, I am keen to pursue postdoctoral research to understand the neurobiological underpinnings of such experiences, and how specific the triggers can be.

3.5 CONCLUSION

Triptych One was a crucial first step in understanding the compositional mechanics of Noise. The issues under consideration, however, were not the low-level musical devices that were discussed in Chapter Two. Rather, these three works

provided some insight into the larger principle of how schematic frameworks can influence the experience of the genre. Through different circumstances, they provided insights into how an audience ‘makes sense’ of a Noise encounter. And importantly, offered an iterative framework to explore the different effects of audio, audiokinetic and audiovisual settings of a work, raising issues of gesture, parity and the context for metaphor and imagination. Ultimately, they are examples of creative possibilities to explore the genre. They used practice-based research to generate questions relating to perception and cognition. They also succeeded in establishing relationships with audiences for whom Noise may otherwise be too intense.

One of the main findings from the triptych was that these works laid bare the simplistic assumption that a multisensory Noise, by its nature, will amplify arousal through the mere addition of extra modalities. The results actually suggested that by moving from audio-only to *audiokinesis*, for example, sound becomes a component of a broader ‘event’. Influenced by “Bayesian priors” (Jolij & Meurs, 2011, p. 1), the experience becomes more personally contextualized, based on any individual schemas at hand. The audience surveys provide an overview of the range of responses obtained. These included birds soaring through cliff rock-scapes, rocket launches/re-entry, wartime bombings, science fiction travel, gaming, roller coasters, theme parks and the womb. Whilst emotional reactions included some reports of anxiety and terror, the majority of respondents found the experience “awesome”, “enjoyable” and (with more than one) — as a further challenge to the circumplex model of emotion — simultaneously “intense” and “relaxing”. (See Appendix A for more details) The informal feedback from the general public in White Night was also characterized by the consistent use of the word “awesome”, and a similar emphasis on science fiction frames of reference.

By the tryptich then moving from audiokinetic to more explicitly *audiovisual*, a more proscriptive understanding of why the music sounds as it does was being suggested. The way in which the audiovisual relationships were constructed, however, supported dual perspectives, hence still encouraging levels of subjective variability.

In both the audiokinetic and audiovisual versions, any overarching logic lacking in the sound-alone version was manufactured by the immersant during its multimodal consumption.³⁰ By comparison — and counterintuitive to my initial assumptions — I suggest that Noise as sound-only music has the capacity to be more confronting. Whilst intensity is felt, “blind hearing”³¹ lacks any clear context for listeners to ‘understand’ what is unfolding. “How better to bring attention to things without bringing things to attention” (Kahn, 1999, p. 21)? With *Fast Ride* (audiokinetic), *Atonal Krannerg* (audio) became an imaginative journey actively mediated through the body, senses beyond hearing. With *Music of the Spheres* (audiovisual) it became a sound design or a soundtrack to the spinning rock. This suggests that part of Noise’s power lies in its ultimately unknowable nature when heard as pure sound. There is a contrast between the feeling of salience generated by its intensity and the listener’s incapacity to ‘act’ in the face of such fury, understanding neither the specifics of its context or what an appropriate reaction might be. Structural and contextual uncertainty related anxiety is the result. (See 4.2.2) Binding to other senses shifts Noise from a “forest of everything” (Kahn, 1999, p. 22) to a forest of something; from an inductive possibility to a known state.

Whilst the objective to consistently amplify arousal through the addition of extra senses appears too simplistic in light of Tryptich One’s results, the surprise

³⁰ This was demonstrated through analytical conversations with peers, discussions with students, observation in public presentation as well as formal surveys on campus.

³¹ Rudolf Arnheim’s term originally used to describe the experience of radio (1936).

finding was how effectively the valence could be inverted (from a negative to a positive experience) through motion, vibration and light. Rather than shifting from terror to exhilaration through ongoing musical exposure (the medium to long-term methodology outlined in Chapter Two), the personalised recontextualisation provided by the motion simulator in *Fast Ride*, for example, facilitated an immediate enjoyment from many members of the general public that was as passionate as it was unexpected.

This relationship between the stimulus and subjective experience is addressed by Voegelin when she states that “Every sensory interaction relates back to us not the object/phenomenon perceived, but that object/phenomenon filtered, shaped and produced by the senses employed in its perception. At the same time, this sense outlines and fills the perceiving body, which in its perception shapes and produces his sensory self” (2010, p. 3). The audiokinetic experiments undertaken here demonstrated how subjectively the different senses could be integrated, and how richly and immersively they could be experienced.

Counter-intuitively, I had isolated the extra power that attends audio-only Noise. Voegelin again:

The ideology of a pragmatic visuality is the desire for the whole: to achieve the convenience of comprehension and knowledge through the distance and stability of the object. Such a visuality provides us with maps, traces, borders and certainties, whose consequence are communication and a sense of objectivity. The auditory engagement, however, when it is not in the service of simply furnishing the pragmatic visual object, pursues a different engagement. Left in the dark, I need to explore what I hear. Listening discovers and generates the heard (2010, p. 4).

To better understand what might be ‘heard’ in the blind listening of Noise, the next step was to examine further the principle of how Noise might relate to non-Noise elements in composition. From the multisensory experiments of Triptych One, I decided to further test these ideas within a music-only context for Triptych Two.

CHAPTER 4. PROJECT TWO

4.1 INTRODUCTION: TRIPTYCH TWO

The *Longflow* suite is a second iterative work. There are three pieces - a noise improvisation, a noise composition (incorporating sound design and opera) and then a heavy metal 'remix' of the Noise composition. Each work builds from its predecessor and all are designed to explore different issues of perception and experience in Noise consumption.

Longflow is the name of a Native Instruments Reaktor patch which was the starting point for this project. It formed part of the *Electronic Instruments* library as a dubdelay effects plug in. As a stand-alone piece of software, it can accept inbuilt microphone input that it then feeds into its selection of delays, equalizers and reverbs. To extend its distortion and to add greater complexity of options in improvisation, I combined Longflow with the Banaan Electrique effects processor (which added additional options of distortion, amp simulation, reverbs and chorus). I then added a recorder to finalize a simple, yet functional live noise patch with capture/documentation capabilities. The benefit of this system was that it could be employed to capitalize on the acoustic environment within which it was being used (with a number of my tests exploiting the beeps, ambient noise and vocal announcements on trains, for example). It could also take finger wiping on the dot-mike as a sonic stimulus for distortion and further manipulation (in instances where greater guidance and control was of interest).

The patch was designed to explore and exploit the aforementioned principle of idiomaticism. A combination of two unstable effects processors, dealing with an audio feed which opportunistically accepted any sound from the surrounding environment would result in a shifting weft of audio that could blindly intersect with elements of compositional command. Decisions about the relationship between

composer-guided elements (for examples finger scratches, effect element mutes and processing decisions) would wrestle with other sonic components over which there was little, no, or unreliable control. Similarly, the complexity of the feedback effects would often result in unpredictable outputs from ostensibly ‘managed’ decisions.

This entire approach deviated fundamentally from my general compositional practice. The methodology employed in my first Noise album (EPA’s *Black Ice*, 2004), for example, did not differ at all from the approach when crafting my lowercase-sound, *p3* release (1998). Each was characterized by carefully sculpted relationships between sonic elements - with an internal logic being built up incrementally from discrete layers of sound. Irrespective of the nature of the starting material, the compositional approach is carefully considered, meticulous and obsessive. By comparison, ‘smashing out’ a live improvisation, using an unstable system to generate a length of audio that matches the time spent in making it was uncharted (and uncomfortable) territory.³²

4.2.1 IMPROVISATION: *LONGFLOW 201010*

121010 was the first piece created on this new Reaktor patch. This particular live performance exhibits typical behaviours and sonic characteristics common to much Noise composition. Interestingly, all of these characteristics have been identified by Huron, in relation to traditional forms of music, as properties likely to generate an acoustic fear response.³³ Namely, rapid increase in volume (the ‘size’ of

³² The discomfort for me relates to the perception of value, with real time improvisation – rightly or wrongly – inherently feeling less ‘worthy’ than a carefully constructed composition, developed over an extended period.

³³ This is a prerequisite to generating frisson (or a ‘chills’ reaction).

the sound, as distinct from loudness), abrupt changes, broadening of frequencies, loud sound, low sound, scream-like sound, and acoustic proximity (Huron, 2006).

In *Longflow 201010*, sounds screech, scream, wail, growl and grumble – timbres that have corollaries with typical expressions of animalistic rage and distress. Importantly, however, these sounds only *share* characteristics with their real-world counterparts. A screaming sound is only a *scream-like* sound, not an actual scream. Similarly, feedback, where used, appears oddly decontextualized from the rock framework and musical structures that usually give it support and functional drive in more traditional musical environments. As a result, all the sonic material inhabits a familiar, whilst still slightly ‘unreal’ territory – the emotion may be clear (due to the associations of such sonic characteristics) but the specifics of the logic and landscape are out of reach. This is an important observation when exploring the depth of audience responses to Noise – and it is an issue that plays out across these three tracks of this triptych.

The key is power - the suggestive power of imagination, rather than the descriptive power of authentication. I suggest that the blunt force of the *201010* improvisation draws a significant amount of its impact from the ambiguity/uncertainty of its context. This is the same principle that was explored in the *Fast Ride* triptych, where it was explored across multisensory versions. I argue that the closer a Noise work approaches ‘knowability’, the potentially less bewildering, confronting or intense the experience. *Longflow* ultimately thwarts two levels of certainty – structural (‘What will happen next?’) and contextual (‘What’s going on?’). A non-Noise adherent, in the face of this, may well feel anxious. Noise’s active violation of the predictive mechanics that drives most musical experience is a

defining characteristic of the form. There is a strong relationship between perceptible force and this structural and contextual uncertainty.

4.2.2 PRINCIPLES OF UNCERTAINTY

This principle of uncertainty-related anxiety can be found in Hirsh, Mar and Peterson's entropy theory (2012, p. 1). There are four major tenets in their model and all are relevant to the Noise listening experience.

1. uncertainty poses a critical adaptive challenge for any organism, so individuals are motivated to keep it at a manageable level

- but such management is not possible as a passive listener in Noise. The audience has no agency to 'manage' the onslaught of uncertainty. One of the participants surveyed, for example, stated "I felt the above emotions (confused, fearful and disturbed) because I didn't have control of what was happening." (Appendix A)

2. uncertainty emerges as a function of the conflict between competing perceptual and behavioral affordances

- but action systems in music consumption are decoupled from emotion systems. The listener may feel assailed, but is not in a position to alter any behavior to take control of the experience. Indeed, early psychological theorists suggested that "when instinctive reactions are stimulated that do not gain expression either in conduct, emotional expression or fantasy that affect is most intense. It is the prevention of the expression of instinct either in behaviour or conscious thought that leads to intense affect. In other words the energy of the organism, activating an instinct process, must be blocked by repression before poignant feeling is excited" (MacCurdy, J.T., 1925, p. 475).

3. adopting clear goals and belief structures helps to constrain the experience of uncertainty by reducing the spread of competing affordances

Again, this is difficult as a passive, uninitiated listener. The primary means by which the experience of uncertainty can be constrained is through exposure to, and familiarity with the form. At that stage, the “clear goals and belief structures” relate to an understanding of musical form, which potentially counterbalance the intuitive biological responses to Huron’s anxiety-inducing musical properties. The corollary is with roller-coaster rides. As long as the ‘This is just a ride frame’ can counterweight the instinctive sense of danger/terror, the ride can induce a positive valence, high arousal response. For Power electronics, through increased exposure, the ‘This is just a piece of music’ frame can be similarly strengthened, hence the experience ‘enjoyed’ instead of endured.

They conclude:

4. uncertainty is experienced subjectively as anxiety and is associated with activity in the anterior cingulate cortex and with heightened noradrenaline release.

So the chaos, volume and extended bandwidth of a track such as *Longflow* is likely to trigger immediate attention (given the adaptive benefit of paying attention to such sounds). But, as suggested, the anxiety response is related to two layers of uncertainty. The effect of the microstructural chaos of the form is well established. As previously discussed, Noise eschews both the hierarchical structures of Lerdahl and Jackendoff’s generative grammar (1996) as well as the experiential mechanisms of Huron’s ITPRA theory (2006). So without inbuilt structures to permit successful

prediction, any dopaminergic reward options (Blood & Zatorre, 2001; Salimpoor et al 2011) traditionally enjoyed and misattributed back onto the music source (Huron, 2006) are thwarted. But the second layer of uncertainty is potentially more interesting and compounds any anxiety associated with structural instability. It is the broader contextual uncertainty ('Where am I?') that amplifies the emotions associated with any finer levels of predictive failure.

For the *Longflow 121010* improvisation, the territory is the abstract world of Power Electronics. Beyond the genre itself, however, it avoids any clear contextual certainty. The sounds are merely suggestive of emotional or perhaps physical states, not quotes or clear abstractions from the real world. The structural organization is a mix of flows and trajectories – where pitch and timbral developments build logically over short arcs; but these alternate with impossibly choppy, disorienting edits – where sounds and/or the spaces they inhabit shift rapidly. This contrasting mix of bleeds and cuts, in both time and space, leads to a sense of microstructural focus, with a sense of small scale intentionality or flow. At this same time it contributes to a level of macrostructural disorientation, as nothing being heard leads to any musical development on a larger scale. Everything might feel urgent or incredibly important, but ultimately nothing matters.

Other genres craft a relationship between individual musical points – horizontally and vertically across a composition. As a result, even apparently inconsequential moments and motifs can feel significant as they feed into broader hierarchies, strengthening a sense of internal logic as they do so. The intensity of Noise, however, and its operation without the protections provided by the traditional characteristics of registered musical construction/confection, set it apart. This has a profound effect on

the listening experience. The rapid shifts in editing lead to potential perspective shifts in the point of audition Voegelin identifies this power when she says that “sound shatters spatial certainty” (2010, p. 127). If there is a ‘Where am I?’ enquiry ambiently underpinning the experience, this is compounded by an ongoing series of ‘where am I now?’ questions. Such a device has the potential to lead to far larger issues associated with identity and the implications of the *umwelt* (an organism’s subjective experience of its environment) being experienced. As we have seen, ‘Where am I?’ can very quickly lead to ‘Who am I?’ and then potentially ‘What am I?’. The visceral power of Noise gives a sense of urgency to the liquid identity Voegelin identifies in the experience of sound art — “an ever passing and evolving subjectivity that drifts in and out of certainty from the doubt and experience that form it continually and contingently as a formless sonic self” (2010, p.93). The stakes in this form of music feel heightened, and these shifts in identity have the capacity to be dynamic, dramatically scaled and, in the case of the operatic experiment we are about to examine (4.3.2), transformative. (A more detailed explanation of the *umwelt* and identity perspectives can be found in Appendix B, *What’s wrong?* Whilst the exploration in that book chapter is at the service of understanding the endangering power of sound in science fiction film, the principles at the core of that hypothesis are central to understanding how Noise music is experienced.)

I suggest that the strength in *Longflow* lies in its paradoxical combination of an intense sense of focus, commensurate with complete structural instability.

Notwithstanding a sense of chaos as it unfolds, every event in the track feels direct, bound, sudden and/or strong. For something that can be read as so structurally free, it’s interesting that when viewed on a Laban effort map (as used in choreography),

everything falls on the ‘fighting’ side of the equation.

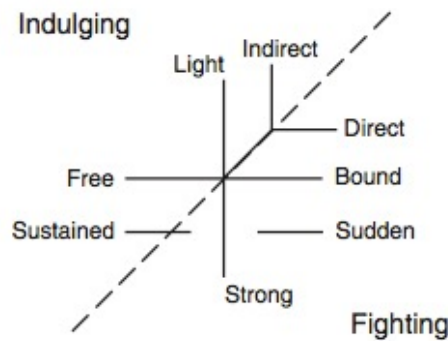


FIGURE 8 Effort elements associated with the motion factors depicted on Laban’s effort graph (Broughton, M & Stevens, C. 2012, p. 354)

Albeit unpredictable, it is still microstructurally focused, whilst simultaneously violating any clear sense of broader rhetorical listening. Sounding furious, intentional yet lacking any clear signposts beyond the genre it sits within, this piece yielded a level of power I was curious to increase. And the failures in the next two iterations were as fascinating as they were spectacular.

4.3.1 COMPOSITION – SOUND DESIGN

In this version, I pursued two distinct approaches in the further development of the composition - sound design (intended to further amplify arousal), then operatic fusion (to manipulate emotion). These were initially explored in the studio, then tested on an audience at the multichannel *Circlejerk* event (as part of the What is Music? Festival, 2012).

The first method was to take the idiomatically generated spine of the original improvisation and use it as a scaffold for further timbral detailing. To that end, the

pre-existing microstructural trajectories and cadences in the track were overlaid at points with ‘real world’ sounds of violent destruction. Field recordings of glass smashing, stressed metal, earth and rock falls were all grafted onto the live noise audio. This was an opportunity to strengthen a sense of internal logic within the piece. What were previously suggestive flows contained within a musical frame, could now be fused with an apparent narrative ‘reality’ of large dramatic events. The approach was influenced by musique concrete at a level of form (adding, as it does, a snappy muscularity to the microstructure) but the experience, given the footage being used, had the potential to push the piece into a more intensely cinematic territory.

In hindsight, I recognize that the initial expectation in this process was the same as the starting presumption in my early experiments with motion simulators: the principle that *more = more*. The assumption was that more senses, and in this case more sounds leads to more intensity. For *Longflow 121010*, I assumed that by drawing the musical suggestion of chaos and destruction found in the improvisation into a violent ‘reality’, articulated through the sound design, the arousal levels of the audience could be further amplified. The field recording would add a layer of focus that the unwieldy improvisation lacked, thus improving attention. It would provide additional timbral detail with sounds scoring high on Chion’s Materialising Sound Indices (1994, p. 99), increasing crisp activity, and, hence, dynamic interest. And it would provide an additional set of real word referents, thus intensifying dramatic context by making events more ‘real’ rather than metaphoric.

Essentially, the plan was to use one compositional methodology to maximize the other. Through its unwieldy form, there would be a sense of chaotic danger in the random structure of the improvisational spine, made all the more confronting/exciting by the sounds of real world destruction being woven into it. This was a compositional

approach I had been considering for a while. It seemed like such a scaffolding method would successfully prevent me from organizing any field recorded material in accordance with my personal tastes in structure – as the placement of any additional detail was beholden to the original form of an idiomatic improvisation (where levels of intent were resisted and balanced by the specific unpredictability of the system). In such a case, any overlays end up being in direct relation to the opportunistic chaos of the live recording. My choices then, in this phase of detailing, are less in relation to *where things go*, as that is already structurally inferred, but rather *what things are* (Huron, 2006). And, in *Longflow 121010*, having signed off on a limited palette of decorative destruction, the latitude for those decisions was similarly contained. On reflection, it is a process that has corollaries with a technique I enjoyed in early primary school – scribbling a line randomly all over a page with grey-lead, then carefully filling in all the resultant positive space with considered colour selections.

Notwithstanding my trust in the *more = more* logic, I was surprised to find that increasing timbral activity through interwoven sound design actually did little to amplify my arousal levels. Indeed, upon comparison, if anything, the piece felt more confronting in its first, more stripped back state – where any ‘violence’ existed in a musical, metaphoric realm rather than with any references to a literal one. This finding accords with the discoveries made in contextualizing the *Fast Ride* music with either motion simulation or video. I would argue that clarifying context in Noise – whether it be directed or suggested – might improve accessibility but it does not necessarily amplify arousal. There is a power to be found in Noise that seems to be a direct result of its abstract activity in the metaphoric realm. With *Longflow*, the audience knows that something dramatic is happening when listening to the improvisation, but they are being given no cues to make more concrete ‘sense’ of any

of that activity. This, then, has the potential to be more distressing or exhilarating than when the activity can be better justified by a perceived context.

This principle is analogous to experiencing Power Electronics acoustically (listening to a CD, for example) as opposed to seeing it performed live. In my experience, the sense of danger to be found in a good Noise composition on playback is a different kind of musical encounter than a live performance. Whilst Randy Yau, for example, has a confident presence on stage, the feeling of being inside the ‘blind’ soundfield of *The Hidden Tongue* (Ground Fault, 2000) is far more disturbing than seeing him growling and screaming into a microphone on stage. I contend this is partly the unknowability of what is actually happening in the acousmatic landscape, amplified by the disorienting ruptures to time and space, which are more likely to be minimized in a live experience (where the perception of time and space is held in check by the visual confirmation of their linearity).

Less performative Noise performances also have the potential to introduce a further dampening dynamic on felt emotion in the audience. My experience of Maldoror (Mike Patton and Merzbow) live was an illustration. As a vocalist, there was a clear parity between Patton’s sound and the intensity of his actions on stage. This alignment resulted in a sense of clear and present danger. By comparison, there was an audio-performative disjunct with Masami Akita. His sounds were no less intense, but I remember thinking at the time that his performance looked like he was carefully carving a small chicken. This control, seeing him so minimally and casually creating such a confronting, monstrous sonic landscape, served to reduce the power of what was being heard.

Again, the metaphoric realm – in this case, the power of sonic gesture – has more suggestive strength than reality. Because of the nature of electronics, the

traditions of gesture shape analysis to be found in acoustic performance (Broughton and Stevens, 2012) are not necessarily equivalent in the performance of electronic Noise. Whilst Patton used his voice, hence delivered parity in physical and musical gesture, neither audiovisual shape, nor audiovisual intensity locked in Akita's performance. This is not a general criticism of laptop or electronic performance, but simply an observation that the perception of scale, intensity and action in the acousmatic experience of Noise – a “sounding form in motion” (Hanslick, 1854, p. 38) is unbounded in a way that a live performance is not. Again, the recurring theme relates to the ‘not knowing’ of Noise and the paranoid power of imagination to feed any propositions that may intuitively frame its experience.

It is this principle of the known (either through watching the aural landscape being crafted before you, or feeling like there are clear contextual referents in the sound world) that has the capacity to diminish the power of Noise. As outlined, there is an anxiety which attends contextual confusion – particularly if the stimulus is loud, full bandwidth and chaotic. There is a freedom when the stimulus is more abstract and unknown to find imaginative feelings (perhaps deeply grounded in subjective paranoia) rather than a tight, objective contextual logic.

In this regard, I would argue that ‘understanding’ the *Longflow* improvisation involves a process of abduction. Unlike deductive reasoning, abduction is an “inference to the best explanation” (Harman, 1965, p. 88). For *Longflow*, as an ambiguous stimulus using abstract sound, and lacking a clear sense of compositional intent, the listener relies on a best-guess understanding as to what is ‘going on’. By comparison, once the clear sounds of destruction were added, there was a greater

likelihood that there would be a more deductive explanation for what people were hearing. (In other words, ‘This is chaotic because things are being smashed...’)

So whilst the sound design elements failed to deliver the additional power I had predicted, there was another phase in the development of this piece that delivered an unexpected revelation.

4.3.2 COMPOSITION – OPERA

The starting premise for my doctoral research was anchored in a paradox. On one hand, I disagreed with any cultural or philosophical dismissal of Power Electronics being classified as music. Rather than some ‘other’ territory, existing outside the musical cannon, on a cultural level, I view Noise as an essential musical form – drawing from and extending, as it does, most of the trends to be found in 20th Century contemporary composition. Neurobiologically however, there is a question to be asked as to whether the initial *experience* of Noise music may not be heard *musically* by the listener at all, and that the encounter with the soundfield, particularly for listeners who lack musical competence in the form, is instead, more likely to be akin to an *environmental* decoding of information.

Armed with this theoretical binary, the next step was to explore the possibilities of fusing Power Electronics with other traditional forms of music. It was an attempt to discover how Noise behaves as a standalone experience, as opposed to a compositional component within other established, musical genres. When might it behave environmentally, and when might it be grounded more musically? Rather than a process of acclimatization leading to musical competence, can listener enjoyment be immediately expedited, not through the process of learning to hear Noise musically,

but through the contextualisation of the Noise within an established musical form? The traditional genre then becomes a Trojan horse to deliver the Power Electronics as a musical experience. But what is that experience?

I had previously undertaken Noise fusions with Heavy Metal when asked to remix a V:28 composition for the Cold Meat Industry label. This resulted in “Solid Structure: undone” (Shinjuku Thief, 2008). I continued this process with another Noise remix for local Metal band Dissymetry (Shinjuku Thief – “Blood shed: reshod”, in print). In each, the strongly musical sense from the starting material provided an opportunity for Noise to amplify the drama of a highly theatrical form. Importantly, the strength of the musical drive of Heavy Metal effectively counterweighted any potentially destabilizing efforts of the Noise elements. The metal was given a ‘bite’ through the inclusion and incursion of Power Electronics textures, but the tracks were never destabilized out of their inherent *musicality* by the Noise.

It is notable that the Noise elements in *Solid Structure: undone*, when used as disruptive spikes, served as a portal into a territory that differed from the standard Metal landscape. They were momentarily disorienting enough to be exciting, without being truly disruptive. Importantly, this disorientation was not just the extension of the sound palette beyond Metal into an alien territory. Alongside the importation of a different sound palette, or a different sense of *place*, is a dramatic overlay of a contrasting sense of *space*. Ruptures in both the Metal remixes cited carry emotional weight not simply for their structural value (as momentary incursions in a rich musical landscape) but also for its disorienting spatial effect. The spikes exist compositionally within, but at times, feel spatially *outside* of the composition. They inhabit their own territory – massive, incursive and distinct from the world they

momentarily interrupt. I suggest that it's this tension between structural *integration* (albeit as an disjunctive device) and spatial *disorientation* that serves to amplify arousal levels. In much the same way the multiplicity (hence 'impossibility') of different reverb types in pop and rock music excites perception as a 'fantastic' imagined space (Doyle, 2005), so too can the spatial continuum be disrupted through the importation of alien landscapes into established musical territories.

The perspective shifts that attend such juxtapositions were an experience I was keen to explore further. Whilst, with Metal, I had used Noise as an incursive and, at other times, propulsive force, I wanted to experiment with inviting other, less related, musical forms back into Power Electronics. The question in *Longflow* became 'How would introducing contemplative cinematic opera into a composition effect the Noise music experience?'

The choice of this genre was grounded in the musical principles of contrastive valence. This is a method used by composers to heighten the emotional impact of a dramatic or poignant moment. The greater the valence shift and associated arousal from one state to the next, the more powerful the emotional reaction (Huron, 2006, p. 317). The device is traditionally a linear one – occurring over time. There is a setup in one quadrant of the circumplex model of emotion, followed by a payoff in a contrasting (usually diagonal) quadrant. The common juxtaposition uses not only valence but also dynamic range (arousal) to generate maximum emotional effect.

If Noise is a high arousal stimulus with (for many) a negative valence, the new experiment in *Longflow* was to add a low arousal, positive valence stimulus into the composition. The idea of doing so horizontally (shifting the noise into a sequence of opera) was less interesting than the idea of layering it vertically. In other words, the contrast wouldn't be made across the timeline, but through integration of both

elements simultaneously. Music of calm inspiration would be folded into a soundscape of chaotic violence.

I selected the introduction of feedback in *Longflow 121010* (at 1:31) as a preparatory moment for the addition of a hymn-like composition. This point represents a change in the noise — a momentary reprieve from a previously unrelenting stream of chaotic textures, consistent in their timbre. As such, this was a useful moment to present the timbral shift as a meaningful event rather than an idiomatic artifact: the interruption to the frenzied activity ‘calling’ the new musical element into being. The work selected for the low arousal, positive valence overlay was a variation on a previously composed piece written for the Chamber Made Opera *Ophelia Doesn’t Live Here Anymore* (2011). Its choral harmonies give the track a calm, liturgical base, whilst, across this foundation, Karen Knowles sings an emotive vocal melody. Initially the tone is contemplative, but as the track develops, the voice becomes more impassioned, soaring into the higher registers. Its smooth organic arcs complement its tonal warmth, both characteristics providing counterpoint to the sharp, dense and unrelenting storm of sonic shrapnel I was now making it float through.

Whilst the principles informing this experiment were clearly logical, the result was unpredicted. On paper, the contrapuntal fit of contrasting frequency, timbre and microstructural envelope between the noise and the opera suggested potential for a complementary balance of elements. Similarly, the space for a focal through-line amidst the chaos made sense. Providing a point of musical centre amongst all the unpredictable activity presented as an opportunity to generate a possible sense of reprieve. Unanticipated was the dramatic shift in perspective when the opera enters. The decision to maintain the previous material and overlay the contrastive valence

rather than cut from one emotional world to another was the key. For me, the result was a fundamental change in the listening experience.

The opening of *Longflow 121010* places the listener at the centre of the maelstrom. Whether experienced as violent danger, or an exhilaratingly brutal event, the sense of the piece is one of large-scale dramatic activity happening *to* the audient. When the opera enters, I found my point of audition was completely transformed. No longer was I, personally, the focus of this sonic ‘attack’. Rather, I (whatever ‘I’ had become) was now looking down on all of this activity as an outsider. This simple musical addition created the perceptual equivalent of a massive crane shot in film. I had been removed from the position of subjective victim, to objective observer.

The cinematic analogy is an informed choice – as the nature of the new musical element abides by two fundamental conventions in film soundtrack. Firstly, the new musical addition’s genre occupies the Classically informed, romantically emotive territory well established by mainstream film. (Soundtrack vocalist, Lisa Gerard was a point of reference for Karen Knowles’ performance.) Just as importantly, however, is the sense of perspective the feeling of soundtrack enforces, due to its acousmatic position beyond the frame of the screen (Chion, 1994). When the new music enters, it assumes the filmic score’s traditional position of non-diegetic commentary on everything else we had been hearing within the frame. By so doing, it relegates all of the continuing Noise activity underneath as the authenticating sound design of narrative drama, and enforces a perspective on that drama from an outside position. This accounts for the feelings of moving from subjective participant to objective witness. ‘We’ are now outside the diegesis, aligned with the world of the vocalist, looking back/down into the action being commented on.

The contrastive valence of the two streams offers a significant shift. Rather than the soundtrack opera being a reprieve on a timeline, instead it provides a more sophisticated perspective that needs to be accounted for. What was previously a subjectively experienced, sonic assault now becomes a witnessed act that we feel encouraged to empathize with. Wherever the likely quadrant in which either emotional state rests in the circumplex model, the shift is transformative. Either the initial noise is exhilarating (high arousal positive) or terrifying (high arousal negative). This is then overlaid with the reflective composition (initially low arousal positive), moving into potentially inspirational (high arousal positive). The obvious limitations of the circumplex model relate to music's methods of eliciting emotions. Compositions change moods and intensities over time. Seldom are they static or singular. But whilst dynamic range and emotional focus are rarely fixed, they are often structurally clear and sequentially unified within a composition's specific modules (a serene, lull leading to a dramatic action moment, for example.) *Longflow* Composition is different.

The development of this piece provided an opportunity to experiment with the emotional effect of simultaneously overlaying emotional extremes. Importantly, it explored the additional emotional measurement of *dominance* (as added by Lang, Bradley and Cuthbert in their International Affective Digitized Sounds scale, 1998).³⁴ In my experience of the track, there was a shift from feeling dominated (positively or negatively) to bearing witness to dominance. At the same time, a warmer, more inclusive dominance (that of the reflective/emotive soundtrack) enters the experience as a secondary feeling.

³⁴ The three metrics now being arousal, valence and dominance.

The introduction of the cinematic frame has a number of effects on the listening experience.

1. The sense of being subjectively immersed in a dramatic environment becomes more of an objective observation of something that feels like cinematic activity. Something which was previously potentially authentic (and personally experienced) moves into a territory which feels more detached and constructed.
2. The potential for a *musical* consumption of the initial Noise is arguably diminished at the point where traditional music enters. By nature of the cinematic frame, the abstract textural material inevitably morphs into a more separated, ‘diegetic-feeling sound design’ in the face of the ‘non-diegetic’ melody and harmony.
3. Attending these shifts is a necessary transformation in the perception of personal identity. The difference in the feeling of the subjective versus the objective experience is significant. But without any clarity from a broader contextualisation, there is no obvious sense as to why our perspective has changed so dramatically. It simply has. Our *umwelt* (the subjective perspective of our environment) has moved from being on the ground, assailed in the centre of a maelstrom, to floating freely above it, untouched, if not unconcerned. The subconscious question at this point: Who do we feel we may *be*, to be hearing and experiencing what we *are*?

Michel Chion’s ideas about the position of the narrator in film are equally applicable in this instance to the behaviour of score. He argues that there are “three powers and one gift” (1994, p. 129) that fiction film bestows on this special voice that is “neither inside or outside the image”. The *acousmetre* is all-seeing, omniscient,

omnipotent and often ubiquitous. Karen Knowles, in this instance is all four. It feels as if the voice has insight, knowledge, power, and a pervasive presence. Importantly, it also has a sense of focus and clarity – something which the ‘music’ to that point had so clearly lacked.

Having explored greater musicality through sound design detailing, tonality and voice, one final contextualisation to explore Noise’s behaviour remained: rhythm.

4.4 REMIX – DRUMS

The third iteration of this composition was an opportunity to explore two principles. Firstly, whether the perspective shift from subjective involvement to objective observation would still occur if the first third of the piece also involved more traditionally musical elements (for example, is the shift described in 4.3.2 a simple pivot between a sense of ‘environmental’ versus ‘musical’ sound?) (Bregman, 1990; Kubovy & van Valkenburg, 2001) and if so, what would the effect of consistent musicality be? Secondly, how might the perception of figure ground and field relationships change through the introduction of rhythm? (Would the Noise composition become something different through its new association with a drum track?) And, in each case, how does the Noise *feel* when recontextualized from its original ‘solo’ state?

Not surprisingly, in the case of *Drums*, the piece started to ‘rock’. The potential for either structural or contextual uncertainty related anxiety was suddenly minimized. At the same time, the context was suddenly clarified – the need for any additional imagination limited by the clearly established frame: ‘This is rock and roll’. The previously chaotic structure of the Noise was immediately held in place by the beat. From previously establishing a dangerously unknowable figure/ground-space,

the furious chaos was now relegated to decorative activity within the safe confines of a comfortable genre. What may have previously been experienced as confronting violence now felt little more than the equivalent of a guitar solo.

The research question that underpins genre mixing, audiokinesis and audiovision ultimately relates to the perception of meaningfulness. The flavour of the failure in crafting such a perspective varies depending on the particular project. For example, in *Fast Ride*, syncretic relationships needed to be managed. Complete parity between light, movement and sonic gestures resulted in an experience that felt ‘locked down’, neat, and quickly became uninteresting. There was no space for imagination, paranoia, or a sense of a larger world beyond what was being parsed by the senses. The relationship becomes known very quickly, and in the absence of change, can potentially lose any sense of salience. For the audiokinetic encounter to feel meaningful, levels of synchresis needed to be varied. Specific moments could lock into multisensory place (with an attendant level of excitement), but they would then need to dissipate back into *relationships* between the senses, as opposed to ones completely unified. This ensured that specific moments would stand out as feeling important, but would then weaken, but without dissolving the relationships, to encourage ongoing engagement. As a result, the more general connection between light, movement, vibration and sound was ‘meaningful’ because it spoke to a larger picture beyond the audience’s comprehension, hence fostering uncertainty related anxiety). The 1:1 moments arising out of these relationships of multisensory elements are meaningful as the alignments feel like points of ‘clarity’, albeit structural rather than semantic.

The dynamic between perceived decoration compared to meaning (as it pertains to light and sound) is explored further in Chapter Five, but it is an equally valid issue in

this triptych. The principle of finding a means of creating a sense of danger or threat from which the audience can then be reprieved lies at the base of the transformation in 4.3. I contend that part of the success of the transition (from feeling like the victim of an assault to the feeling of floating above the action) relates to Noise's capacity to exist experientially outside of a traditionally musical realm. In *Improvisation*, the first 1:30 of the track creates an environment where the listener feels at the centre of violent activity, the specifics of which are unclear, but the psychophysiological response of which is intuitive and strong. This is, in part, because of the unique behaviour of Noise in relation to the musical traditions of figure ground and field relationships.³⁵ The *Longflow* improvisation collapses any such distinction – simultaneously inhabiting all planes, feeling like it is both an environment as well as a protagonist. Its power, therefore is not merely based in its blunt force, but is made all the more confronting through its fundamental violation of gestalt principles. Once *Opera* enters, the listener is afforded the protection of a cinematic frame. The furious energy continues to rail but it is 'seen' through a vapour trail of contemplative musicality. The same principle is found in *Drums*. Again, a known musical genre reframes danger into a territory that feels more theatrical than actual.

4.5 CONCLUSION

The triptych outlined in this chapter provides an important sound-only framework within which to explore the compositional mechanics of Noise. The pieces discussed demonstrate that an investigation into the genre needs to move beyond the simple systematic musicological issues of contrastive valence, dynamic range,

³⁵ For an overview of these relationships across poetry, music and the visual arts, see Tsur's "Metaphor and Figure-Ground Relationship" (2000).

rhetorical listening, and timbral chunking as identified in Chapter Two. It needs to present a larger framework to successfully understand the experience.

The importance of an idiomatic system in the generation of Noise was outlined. Wrangling such an unwieldy software system, by turn only partially controllable, whilst simultaneously presenting an overwhelming suite of other immediate options, is significant in the real-time creation of a sonic landscape that felt dangerously unpredictable. Both the compositional as well as the listening experience of a meticulously crafted sound design overlay provided a less dynamic experience than the improvisation alone.

The timbral properties of Noise and their relationship to real-world environments as well as emotional states was then discussed. I argue that the power of the genre, in part, lies in the extent to which it generates a suggestive rather than literal relationship to reality. Apart from the energy of its construction, the improvisation had additional power when compared to the sound designed composition precisely because of its abstracted, rather than realistic sound palette. The element of the unknown is crucial. The stress associated with this particular confusion is a contextual uncertainty related anxiety that compounds the microstructural and macrostructural uncertainties in the form's compositional mechanics. For the newcomer to Noise, the suite of uncertainty, this incapacity to understand or predict in the face of what feels like an importantly salient stimulus, is magnified by imagination and paranoia. This can then lead to the 'where, who and what am I?' questions. This was the reason adding 'more' – more sound, more context – failed to always elicit any more psychophysiological arousal.³⁶

³⁶ A further study of *Longflow* can be found in Extras. *delete/re_sound* was a rescore for a video clip that allowed me to test the responsibility of the pace in Noise for eliciting high arousal emotional responses. All of the sounds were time-stretched elements of *Longflow* – so the same timbres, only the

The vocal phase in this experiment was to take the relationship between perceived environmental sound and music and use these as elements to influence the listener's identity and its relationship to the sound field. When the Sound Art was augmented by opera, not only was there an emotional shift, but a more interesting metamorphosis of perspective.

The concluding phase in *Triptych Two* involved another emotive convention – rock drums. This addition was less interesting for its affective qualities as the spatial and perceptual issues it raised for understanding Noise. Compared to experiences of metaphoric figure ground and field relationships in traditional musics, Noise confounds and compacts such neat delineations. If opera had placed a known signpost amidst a brutal unknown landscape, heavy rock drums served to further pacify Longflow's initial intensity. Most destructively, it relegated what was a blistering sonic assault into a mere decorative figure. A previously complex, confusing mesh of figure ground and field relationships was minimized with the material now simply occupying the place and behaviour of a guitar solo. This issue of the dismissably decorative over the seemingly meaningful became a crucial point of focus in Project Three.

tempo at which they unfolded had been slowed down. The reduced rate at which the activity unfolds certainly attenuates structural-related anxiety, whilst allowing contextual anxiety and questions of identity to remain.

CHAPTER 5. PROJECT THREE

5.1 INTRODUCTION



FIGURE 9 – Plinth (Object 2)

photo Bronek Kozka

video documentation Rob Harding

This audiovisual work provided a further opportunity to test the premise that arousal was a more consistently controllable than valence in experiences of musical extremity. It also explored the limits of synchresis and the dynamic between decorative versus meaningful chaos. One of the inspirations for the project are two of the questions at the heart of the James Gibson paper *The Visual perception of Subjective Motion and Objective Movement* - namely ‘How do we see the motion of an Object?’ and ‘How do we see the stability of an Environment?’ (1954). Having

identified one of the unique musical properties of Noise where it can collapse clear delineations between figure, ground and field, I became interested in exploring a similar corollary in light. Through independently assignable LEDs, encircling a stationary wire object I wanted to explore whether the shadows cast (traditionally a ‘ground’) could become ‘figures’, whilst the sculptural object (traditionally a ‘figure’), through its stationary status, could become a ‘ground’. This simple starting question then led to a range of other issues, key to my research into the mechanics of Noise, the perception of meaning as well as listener identity.

5.2 OBJECT 2

The idea of establishing a rich audiovisual relationship to influence the perception of scale, meaning and environmental importance formed the basis of the original *A series of small wire objects (many of them uninteresting)* proposal (Arts Victoria funded, 2013). This project, through different iterations, aimed to take a series of innocuous and inherently uninteresting *objects* and, through sound and light, transform them into interesting *experiences*. An intentionally boring *spatial* item (akin to a scrumpled paper clip), through shadow, changing environments and sound design, would become an intriguing *temporal* one. The objective was to explore the structural mechanics behind turning something meaningless into something that felt meaningful.

If the simplistic binary in communication theory of signal versus noise had already been challenged as far back as 1949 (Shannon & Weaver, p. 109), it is certainly untenable with relation to this musical genre. (How can Noise be a disruption to a flow of information when it itself *is* the flow of information?). Indeed,

the intensity of Noise potentially raises rather than diminishes the sense of its meaningfulness. This is not the philosophical issue that Hegarty has identified as “the paradox of nihilism – that the absence of meaning seems to be some sort of meaning” (2006, p. 2). Rather, on a practical level it affirms that “noise in a communication channel need not always destructively interfere with the message, but rather could itself become part of the message” (Krapp, 2011). Or as Douglas Kahn suggests “... noises are too significant to be noises” (1999, p. 21). Indeed, when considered in relation to attention induction from salient stimuli, incursions of noise as bottom up interruptions against an ambient ground can actually appear as an even more ‘meaningful’ piece of information than the dataflow they are interrupting. My composition, *Four Barcodes*, used for *object 1* (the first in the *small wire object* series) explored this idea. Whilst *object 1* itself is not presented as part of my doctoral work, it was the ideas it explored which directly led to *object 2*.

In *object 1*, micro-rhythmic glitch textures in the soundtrack are supported by shadow activity in single-pixel driven blue states. These, together with the composition, establish a dark visual environment, within which shadows are animated. Having established this audiovisual relationship as the world of the piece (or the “flow of meaning”) this state is systematically spiked by an occasional singular audio pulse, aligned with a red flash from lights across the entire light strip. This served as a high contrast, singular incursion into an established environment, burning an afterimage onto the retina.³⁷ Whilst it could be argued as a ‘disruption’ to the data flow, the confidence of its presentation (musically) and the support of a

³⁷ The same principle as used by Ryoji Ikeda in his single participant installation as part of the ACMI *White Noise* exhibition (2005).

commensurately high arousal visual state makes it an assertive moment – making it feel *more* meaningful rather than less. It is a clear example of interruption *as* ‘meaning’ – the spike becoming a salient point of focus precisely *because* it interrupts the constant state.

Technically, I collaborated with programmer and industrial designer Stuart McFarlane on the system. A custom-built Pure Data patch imports an audio file against which a lighting design can be crafted. A circle of LEDs hidden in a lip at the top of a plinth illuminates the object from above. The colour, position and intensity of the LED’s can be triggered directly by the software, whilst other more complex lighting states are built as routines into the Arduino board in the plinth itself.

object 1 premiered at the Spare Room Gallery June 2014 and was then accepted as part of the Globelight Festival (Anita Traverso Gallery) in August of the same year. Whilst this first work in the series involved an intensely cinematic design, in both its sound and light, I recognized the potential in the system to explore, in greater depth, a number of the key ideas of my research. The invitation to present the plinth as part of the *Experimenta:Recharge* biennial (2014) provided an opportunity to push the system into Power Electronics. Through collaboration with Tobias Brodel, the plinth’s functionality was extended. Temporal resolution was increased, the colour palette was augmented, and the capacity to drive the lighting states with sound was introduced.

This last innovation had its risks as well as its rewards. Brodel’s initial experiments in synchresis provided a useful baseline against which questions of the meaningful and the meaningless could be explored. Whilst the principle of audiovisual parity conferring perceptions of additional salience on events is well

established (Murch, 2002, p. 119; Chion, 1994, p.5), an important issue arose from our initial explorations. The question became: How can the preliminary emotional arousal that attends a tightly syncretic audiovisual relationship be sustained over time? For whilst an excitement to be *seeing* what one was *hearing* was an initial result, I found there was a law of diminishing returns in response to this process over the length of the composition. As the piece progressed, the sense of meaningfulness fell away and the experience of sound-driven light, once the system was known, started to feel more ‘decorative’ than ‘important’. I needed to find a way in which the stakes for audience investment could be sustained across the entire length of the two minute track. There were two approaches I adopted to build on and from the audioreactive base Brodel had been developing.

Micro-structurally, I concentrated on extending the dynamic range at points of high sonic contrast. This involved making the dramatic moments more confronting, but it also encouraged greater shape (through volume sculpting) to the more subdued sections. This resulted in both an increased sense of ebb and flow (which aided a perception of intentionality) as well as a greater impact in the sequences of high intensity.

Macro-structurally, I then concentrated on encouraging engagement and the perception of significance by inverting, in the second half of the composition, many of the syncretic relationships established in the first. This approach operates on dual levels. Initially, it can promote attention as it presents a sudden and unexpected violation to an established environmental logic. From an evolutionary point of view, a demonstrated failure to successfully predict one’s environment is a serious problem.³⁸

³⁸ David Huron has identified the importance of surprise as the primary mechanism to generate high arousal, satisfying states in music (for example, the frisson response, Sweet Anticipation, 2006, p.25).

The registration of such failure invariably leads to both a heightened emotional response and an increased level of attention as the new information is quickly parsed. In *object 2*, having established a 1:1 internal logic between the sound and light, the subversion of this relationship (where visual activity, previously fuelled by frenetic sound, is newly counterpointed by fluid, amorphous musical sustains) results in dematerializing the experience of the light – even though they maintain moments of high intensity.³⁹ As with the introduction of Karen Knowles in the previous triptych, the frame of reference to account for the audiovisual inversion invariably feels cinematic. Activity still exists in one plane (in this instance in light) but, through “anempathetic” sound (Chion, 1994, p. 8), the audience feels detached from that drama. Their perspective has changed and something feels ‘not right’. It’s not right given that it’s a sudden shift from a pre-established audiovisual lock, and it’s not right as a counter-intuitively inverted relationship between what is being seen and what is being heard.

The issues I have as a composer with arbitrary audience entrance and exit points in installation works (when compared to the tight structural controls embedded in compositional practice) still stand for *object 2*. As the second half of the work was designed to subvert the established audiovisual logic of the first, this device clearly works best when experienced in sequence. And whilst I seriously tried to entertain the idea that order of entry and exit ‘doesn’t matter’, I still maintain a firm belief in an optimal arc for this particular experience. The solution in the future will be to design a start option in the next iteration of the plinth. An audience member can always retrigger the experience for a second pass, but the piece will always play out and be ready for the next person to trigger afresh.

³⁹ Again, see Chion’s “materializing sound indices” for the emotional flavours such timbral characteristics elicit.

5.3 CONCLUSION

As with the experiments with multimodality in Project One, Project Three continued the objective to provide rich audiovisual contextualisations for Noise without locking the soundscape into an easily understood paradigm. *Music of the Spheres* used vision to contain any rich and strange perspectives within a known scenario – provided by the vision of a spinning meteor. By comparison, *Object 2* offers a more abstract relationship between seeing and hearing. If anything, the gestures and movement of the light, whether operating as homophony or counterpoint to the sound, can be viewed simply an extension of music. An additional sense may be being employed, but the compositional approach continues a clearly musical logic. (In this regard, whilst audiovisual, it is more clearly aligned to the gestural considerations of the audiokinetic experiments.)

For *Object 2*, the force of the Noise and its clear relationship to light and shadow, makes the experience arresting. The metaphoric relationship of sound to something more concrete was simply extended in this instance to another metaphoric stimulus. The sound ‘meant’ the light, but what this fusion, in turn signified was just as obtuse as the sound alone.

The software system, designed to convert sound directly into control for lighting was a further opportunity to test the “more equals more” theory. As with some of the earlier experiments, finding a contextual frame for a multisensory experience of Noise that didn’t diminish the power of the sound into a decorative relationship with something else was the key. To account for the arousal drop-off found as a syncretism continued, and with the objective to make the meaningless feel meaningful, the solution was a complete audiovisual inversion of the established logic

half way through the piece. Just as the mechanics of the piece became ‘known’, they were shifted to something ‘unknown’ again. Through this device, the piece was able to maintain its power. This is a consistent theme throughout my experiments when understanding the compositional mechanics of Noise. Multisensory experiences need to be pulled back from any dangerous levels of certainty for arousal to be heightened.

As previously demonstrated, the valence of the emotion can be viewed as far more subjective than the objectivity of arousal levels. The feedback on *Object 2* established the consistent stimulation of high arousal. Valence, however bifurcated. The influence of trait vs state emotional baselines is an important area for my future research. In this instance, preliminary feedback certainly seems to suggest that familiarity with sound art tended to lead to an experience of amusement (including laughter and gleeful ride-like noises at key moments of intensity. By contrast, an absence of such musical competence resulted in more anxious responses, such as gasps of shock and anxiety. But, as the next chapter outlines, additional work needs to be undertaken to inform a more sophisticated understanding of audience reactions, and more targeted surveys, as well as biophysiological data collection are planned for the future.

Ultimately, *Object 2* was a fitting conclusion to my research, bringing together my key themes – the compositional mechanics of Noise, an investigation into the relationship between arousal and valence and, ultimately, the creative extension of the form.

CHAPTER 6. CONCLUSIONS & FUTURE WORK

6.1 INTRODUCTION

Three seams provided the initial motivation for this project. Firstly, it was fuelled by a desire to discover a research framework for Noise that would not only resonate with my practice but would help me understand how compositional devices in this style may relate to approaches in more traditional musical forms. Secondly, I wanted to better understand the passionate and polar responses Noise tends to elicit from its adherents and detractors and to explore how a high arousal negative response might be transformed into a high arousal positive one. Thirdly, I was intrigued by the claims made by colleagues, both musical and academic, that the form was a creative *cul de sac* – that the genre had ‘maxed out’ almost at inception and there was little room for creative extension. My mission, beyond a systematic musicological understanding of how Noise works, became a quest to explore the possibilities of the form – both to find something artistically and academically inspirational to pursue as well as meeting the challenge to breach the genre’s concrete ceiling of maximum intensity. With hindsight, it should not have been a surprise to find all three seams inextricably linked.

My research has benefitted from a range of disciplinary perspectives. Musicology alone, whilst interesting to apply to Noise, had its limitations. It could explain some low level compositional mechanics, but failed to fully capture the full intensity of the Noise experience. The genre’s very extremity necessitated the move to a broader suite of approaches. By extending the range of analytical tools beyond musicology, I was able to assemble a far richer range of perceptions on this musical form.

6.2 KEY FINDINGS

The key findings of this project can be summarized as follows.

1. There is a distinction to be made between environmental and musical sound.

The intense, unpredictable and a-musical characteristics of Noise align it more intuitively to the former category. Dissociation, enculturation or recontextualisation are necessary to experience it as the latter.

2. The confronting experiences of Noise music are fuelled as much by uncertainty related anxiety about the ungraspable context as much as they are the microstructurally unpredictable content. As a result, a multisensory experience of noise gestures opens up a creative capacity for rich and strange experiences, potentially suggesting immediate and intuitive frames of reference for encounters more enjoyable than when heard as sound alone. Multisensory Noise has the capacity to encourage personalized contextualisation, and hence deliver not simply more intense, but actually more enjoyable experiences.

3. Whilst volume and chaotic unpredictability provide much of Noise's immediate power, it is also the flattening of clear figure, ground and field relationships that contribute to the feel of noise. In the absence of clear traditions of musical stratification into these planes, the experience can be all the more encompassing, more fully immersive – and hence, potentially intense.

4. More elements or senses do not necessarily equate to more psychophysiological arousal, but can equal 'different' – in both monomodal and multimodal contexts. Certain projects support the contention that strict ongoing synchresis between sensory stimuli actually yields diminishing returns. Initial

excitement can be replaced by a sense of the elements feeling ‘merely decorative’. Additionally, heightened arousal can actually be dampened if the sonic gestures are too neatly matched with movement or visual gestures. There is a perceived safety in parity. Even if context is not clarified, the fact that the senses align, can actually relieve *structural* uncertainty related anxiety.

Weakening gestural relationships, therefore, can limit this relief and opens up *contextual* uncertainty related anxiety. Further enrichment of user experience is possible when relationships are established, then weakened or inverted.

Importantly, however, there is a breaking point to the elasticity in the relationships between the senses. Some sense of internal logic uniting the multisensory relationships is crucial for the experience to feel authentic.

6.3 RESEARCH QUESTIONS REVISITED

Three research questions provided the initial focus for this project.

- i. *How does composing Noise differ from forms of harmonically organized sound?*

Through systematic musicology I have demonstrated the essential musicality of Noise, and how structural devices from traditional forms can be found in this extreme genre. At the same time, I have also provided evidence of where expectation, based on musicological tropes is deliberately thwarted. Whilst it was useful to identify, contextualize and provide nomenclature for such approaches, ultimately, I consider these to be low-level findings, however, when compared to other results of my research.

In the absence of pattern, tonality and rhythm, Noise, as an extreme form of sound art, ultimately occupies a more environmental than musical territory. At the

point of consumption, I suggest that this distinction contributes to its power. Unlike other dramatic forms that may feel descriptive or metaphoric, Noise offers no such protection. Overall, it lacks any sense of either detached referentialism or any programmatic agenda. In my opinion, it is precisely the dynamic between its projection of the intensely dangerous, and hence ‘meaningful’, and its utter *meaninglessness* that fuels many of the frustrated responses it can elicit from uninitiated listeners. This contention was confirmed by augmenting Noise with other modalities then exhibiting it in popular locations. The *Audiokinetic Jukebox* in the *White Night* Festival for example, featured *Fast Ride in a Fast Machine* (as well as its more brutal successor *Faster Ride in a Faster Machine (with small shards of glass)*). These public presentations verified that when Noise was a component of a broader experience, audiences would have more of a chance to both personalize and contextualize the encounter – and hence enjoy rather than be confronted by it.

Identifying the principle of idiomaticism was crucial to understanding the process of Noise craft. Previously, my non-Noise composition process tended to be meticulous and obsessive. By comparison, feeling overwhelmed and uncertain about specific outcomes of improvisation due to the idiomaticism of the system, injected a level of compositional uncertainty which can be crucial to the perception of uncontrollable, as opposed to contrived, danger. My compositional voice, then, newly entered into a relationship with elements outside of my control.

The impact of the sense of scale and drama on user experience was a further revelation. The ‘Where am I?’, ‘Who am I?’, ‘*What* am I?’ questions which were made explicit in multisensory applications of Noise fed back into general observations about the form as a musical experience. Issues of identity, framed by the ethological principle of the *umwelt* further clarified the differences between this form, when

compared to traditional musics. Ultimately, these findings moved beyond a simple analysis of contrasting the non-melodic, non-rhythmic elements of Noise with more popular compositional approaches. Rather, they spoke to a far larger context for the form to help explain the mechanics of the power it wields.

ii. How can the fields of musicology, psychology and neurobiology assist in the understanding of the Noise genre?

This question was designed to shift the established academic research frame from one that interrogates Noise from philosophical, cultural and political standpoints, to one privileging an analysis of the musical and experiential. By choosing a systematic musicological examination of the form (rather than either ethnomusicology or traditional musicology), psychology and neurobiology could be successfully integrated into any examination of the experience. As previously identified, there are clear psychological and neurobiological precedents established in relation to loud, chaotic, full bandwidth sound. Historically, any environment (or protagonist) making such a noise would indicate levels of danger that any immersant would be well advised to flee. Understanding the clear evolutionary precedents for such a reaction was the first step. Exploring how these particular fields helped me to contextualize the effects of the form's intensity. Psychological principles of dissociation assisted in understanding the subjective variability in relation to valence. Such analytical tools also provided key insights into how I could create new, interesting, and enjoyable experiences – extending Noise from a form of underground music to a broader, entertaining experience - whether it be in a fine art or ride-implied context

That said, tangential disciplines often supplied more intriguing and inventive

insights into the form's effect on its listeners. Once the genre was extended into multi-modality, in particular, the importance of ethology, neuro-theology⁴⁰, choreography, pharmacology, and ride design⁴¹ cannot be underestimated. It was these perspectives that fed into and out of some of the most innovative aspects of the works created. They are also the seams that will be pursued beyond this project.

iii. How might these perspectives inform compositional decisions?

The works outlined in this exegesis provide a range of examples of how such forms of analysis can lead to works that engage with the core mechanics of Noise music whilst extending the form beyond the boundaries of its existing extremity. *Project One* presents an iterative process. Through an exploration of monomodal then multimodal versions, it progresses from audio to audiokinesis then audiovision. In so doing, it explores the differences between sound-only Noise and Noise as an integrated component of multisensory experience. The compositional decision in this triptych was to incorporate other senses as a part of the overall work. *Project Two* examines the mechanics of Noise through an iterative contrast with other musical forms. In so doing it outlines issues of identity and perspective, as well as figure, ground and field relationships – ultimately exploring the attendant emotional shifts that relate to both. The *compositional* focus here was on the differences between idiomatic improvisation, sound design, then the fusion of musical genres. *Project Three* builds on questions of the decorative versus the meaningful in audiovisual relationships. In so doing, it explored the audience's perception of identity (the 'who, what and where' questions), the overall influence of the edit on temporal perception

⁴⁰ The neurological similarities between mystical states and music are explored in Appendix B.

⁴¹ Applying some of Brendan Walker's ride design research in a musical context will be a future research seam.

(through spatiotemporal rupture), and the theory of the *umwelt* (as covered more extensively in Appendix B). The world is deliberately strange and confronting, but effectively sold through a strong internal audiovisual logic – initially syncretic, then deliberately a-syncretic. Again, rather than considering the use of light as a shift towards a fine art experience, here it is designed simply as an additional compositional element — providing an additional layer of ‘musical’ options in either a homophonic or contrapuntal relationship with the audio.

6.4 FUTURE WORK AND APPLICATIONS

There are a number of research possibilities generated by this project that warrant further exploration. Whilst there is overlap, they broadly divide between creative practice and psychophysiological research opportunities.

A first priority is to access equipment and expertise to further explore the two main hypotheses I forwarded in my research – the experience of Noise being processed neurobiologically more environmentally than musically, and the shift from negative to positive valence when the stimulus shifts from monomodal to multisensory. EEG will augment surveys for the former, and cardiovascular, galvanic skin response and respiratory measurements will augment surveys for the latter.

The recent addition of a 6DOF (Six Degrees of Freedom) motion simulator to the AKE Lab has opened up the potential to craft a more sophisticated range of multisensory experiences than explored with the 2DOF. Six degrees of freedom augments the ‘rotation’ movements of pitch and roll with yaw (twist – *see the ‘transverse’ plane in Fig 4.*). It also adds the ‘translation’ movements of heave (up and down), and forwards and back (without tilting). With the additional degrees of freedom, more complex and fluid gestures can be explored compared to the rather

robotic material from the 2DOF. As a result, there is now potential to develop kinetic sculpture that is interesting enough to be experienced visually (as opposed to the immersive ride-based approach I adopted with the earlier model).

That said, immersive experiences still have clear potential with this new technology. Preliminary tests on vestibular acuity when lying down, vision deprived, on the 6DOF, suggest that there is significant proprioceptive uncertainty that will be useful to explore in a participatory artwork. In experiments to date with translation movements, the participant can tell their body is moving, but there is very little perceptual clarity about direction or speed. I plan to explore how sound and light might be used to potentially influence, or completely remap proprioceptive and vestibular perception. Again, I see potential for both pure psychophysiological research, as well as applied artistic outcomes of such knowledge.

The plinth also has significant potential in the further exploration of audiovisual relationships. I intend to develop a midi controller system so that light position, luminosity and colour can be triggered by note, velocity and cc data from a keyboard. This will permit intuitive exploration of light within a Digital Audio Workstation environment – further supporting the idea of musicians extending music into other modalities, rather than abiding by the traditional demarcations of expertise split into audio or vision.

As with the motion simulators, research using the plinth will be directed towards both pure and applied outcomes. Beyond art, the level of control the plinth affords opens up the possibilities of rigorous psychophysiological tests to explore the dynamic between reactive and volitional attention. One of the shortcomings of the sound on/sound off eyetracking tests we conducted with film (Russell, Redmond,

Robinson, Stadler, Verhagen & Pink, 2015) related to the attentional data being confounded by disengagement when silent. Mute film led to more reactive attention, guided by elements of colour, movement and brightness. Silencing sound appeared to eviscerate narrative. The problem was that missing dialogue as well as all the materializing sound design that authenticates the experience led to an unnatural encounter with the film. Sound on and sound off in these tests provided an authentic compared to an inauthentic experience. The benefit of the plinth is that it has the capacity to present an abstract, non-narrative experience - where a silent version of the aesthetic experience, whilst different, is not an unnatural 'problem' the way a film without sound might be. The anecdotal experiences of amplified emotion and exaggerated perceptions of scale when the plinth lights were experienced audiovisually are useful starting points to unpack the role of sound in visual perception. More scientifically, the capacity for the plinth to allow for highly controlled tests (where attention could be deliberately divided between sonic and visual stimuli) opens up potential to test the mechanics as well as the subjectivity of multisensory perception.

Tests where the wire object was removed and the audience was encouraged to place their hand inside the circle were also auspicious. The additional width of the shadows made for a more dynamic experience and the shifting lighting states generated a gradually encroaching and increasing sense of physical dissociation from the body part being illuminated. A similar version where the immersant looks down into a mirror, with their head encircled by changing light is also being explored.

One pressing objective is to move the plinth series beyond the "small wire objects (many of them uninteresting)" into "meticulously designed objects (a number of them quite fascinating)". Delicately detailed, multi-faceted object construction

would encourage audiovisual designs where the shadows differ greatly depending on the position of the light. I also intend to further explore the idea of multimodal figure and ground fusions by using spoken word to control the LEDs. From past experience using the Audiokinetic jukebox, there is a strange perceptual encounter when the figure the listener hears binds with the environment they are viewing. Exploring the specifics of potential relationships between audible prosody, and visual movement and colour has the potential to challenge the divisions between focused gesture and planar environments. The experience of how the voice is simultaneously interpreted as a landscape presents as a promising seam of research when designing new encounters.

Object 2 is currently being further developed for a new installation. The next iteration will allow the audience to experience the composition as designed, and then choose to replay the work, this time selecting from audio commentary tracks from a panel of experts. The experience will be analyzed and narrated by five academics – explaining the experience as it's happening from the fields of psychology, phenomenology, vision science, programming and sound design.

Many of the findings from my research were developed from explorations within a creative context. The mechanics of multisensory experience were interrogated when particularly interesting moments were discovered from intuitive play. This was done through both personal research in the literature, through conversations with academic specialists, and by conducting and analysing audience surveys. As useful as these points of view have been, there are deeper possibilities to augment such feedback with more rigorous psychophysiological testing. EEG, eye tracking, Galvanic Skin Response, heart rate and respiratory monitoring would all generate physiological data which could usefully feed alongside the surveys to explore issues of emotion,

attention, perception and the psychophysiology of aesthetic experience in a range of contexts. Whilst this project has been practice based research in a fine art framework, a more sophisticated testing regime would provide a more rigorous methodology to further interrogate many of the ideas which lie at the core of this investigation.

Finally, there are two additional fields of future research that may feel counterintuitive to the types of experiences I have been exploring during the duration of my candidature. Firstly, with an understanding of the mechanics necessary to generate extremely high arousal levels in multisensory environments, I am interested in also pursuing the opposite. How might the repurposed and newly developed technologies and systems servicing Noise also be used in the lab to generate extreme states of relaxation rather than anxiety or exhilaration? Secondly, there is potential to apply this research educationally. Again, given the systems developed for this doctorate, there is potential for exploring how our understanding of multimodal experience might contribute to the idea of optimal learning environments. With the increasing popularity of online educational experiences, how might sound, light and an understanding of metaphoric gesture across senses contribute to a richer and more effective approach to education?

Susan Sontag, in outlining her suspicion over interpretation in the arts suggests that '[w]e must learn to *see* more, to *hear* more, to *feel* more, rather than to understand more.' (1966, p.14). This project has been motivated by the first three entreaties in its attempt to get 'more' from Noise. And whilst the design of the audience experience has simply been about the visceral amplification of sensation without the prosecution of meaning, the 'understanding' has arisen after the event, found in the psychophysiological evaluations of the encounters and the mechanics through which they were facilitated. This project has been an exhilarating example of

truly practice-based research – open-ended experimentation in the quest to understand where the psychophysiological *more* may be pursued in the artistic practice of this particular genre. As I have demonstrated, rather than Sontag's oppositional dichotomy, this quest for an experiential more actually becomes the crucible for research into understanding more. As this chapter suggests, there is considerably more to be done.

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APPENDIX A: AUDIENCE SURVEYS

Track: *Fast Ride on a Fast machine*

Format: *Audiokinetic Jukebox (Thruxim 2DOF, Synchronator, transducer, headphone audio)*

After receiving ethics approval, these surveys were conducted with students on the 13th August and the general public (as part of Open Lab, Melbourne) on the 1st December 2013. To date, the data has been used to simply understand the range of participant experiences – from idiosyncratic perspectives to convergent trends. More comprehensive analysis of the data collected, as well as further surveys, augmented by biophysiological data collection are planned for the future.

Part One: Your response to audiokinetic compositions

Composition title: Fast ride in a fast machine

Briefly describe your experience.

Did it trigger any visual or conceptual references? If so, please identify.

Did some parts of the experience work better than others? Please identify such successful and unsuccessful sections. Provide your thoughts on why you think they did or didn't work.

Do you have any other comments about this track?

List any emotions you *perceived* in the music:

- 1.
- 2.
- 3.

List any emotions that the music made you *feel*:

- 1.
- 2.
- 3.

Please choose the answer that best matches your response to the sound track by marking in the box.

	Not at all	Slightly	Moderately	Very	Extremely
Confused	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inspired	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Anxious	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fearful	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bored	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Relaxed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Disturbed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Interested	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Challenged	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Happy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Amused	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Exited	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Annoyed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Euphoric	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Joyous	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Moved	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please explain *why* you think you felt the dominant emotion listed here.

Part Two: About You

Are you: male female (please circle)

What is your age: _____

What is your country of birth: _____

What is your profession / field of study _____

For each sound type please choose one answer that best matches your opinion by marking 'x' in the box.

[illegible]

19. Other _____



Thankyou for your participation

THEMATIC OVERVIEW OF COMMON THEMES

Emotion

- Awesome! Descent into hell? DMT? Crazy Amazon trip?
- Awesome. Nice work!
- Awesome! It was like a 3D experience of a cold meat industry track.
- Awesome. Once I worked out what sense were being engaged I went for the ride. Mechanical noise and jerky movement brought on excitement (rather than a moving seat) was very believable.
- Loved it!!
- Excited by the DIY aesthetic of the chair
- Excited by the internal abstract experience (*which*) embodied virtual experience.
- It was a sensory experience that took away the mundane aspects of reality, as well as the stresses on my mind. It was very beautiful
- Loved the combination of sound, movement and light!
- I was a bit anxious but not to be annoyed. I was trying to keep calm and I let myself to get in the trip or different emotions like ones I described above
- And although the emotions experienced were disturbing my physical reaction was the opposite, to breath deep and stay calm and relax into the environment.
- I felt disorientated and confused
- I found it terrifying. I felt like a character in a video game.
- I kind of feel like the track had its own, very specific emotional response, which does not really conform to any of the (emotions) listed above.
- The experience was moderately intense which made me feel moderately disturbed and challenged.
- I was relaxed but didn't feel particular emotions. I'm a musician and I play experimental music so it was something familiar to me.
- The experience was really intense but at the same time somewhat relaxing.
- It was a mixture of terror and relief – like extreme anxiety followed by extreme calm.
- Violent; not usually a violent or aggressive person but I felt like I had a relationship with violence, felt confident.
- It was equally thrilling and terrifying
- It was traumatizing but great.
- I am now terrified but amazing
- Terror, calm, relief.

Narrative

- At first it was like being in a night club rave. Then it was like being on a roller coaster. Then it was like being in a war zone.

- At times I felt like I was in the woods and others like I was getting shot.
- Because I was seeking out information to make sense of. The lighting had impact which I found curious how I was using that to construct the story. Especially that I come from a visual background. Also interesting because it was a different experience to how I normally experience sound.
- Birds soaring through raw cliff rock-scapes along sunlit coastlines. A sense of nature in a dark, honest, realistic aspect of life.
- The womb (Inside or internal emotion)
- I'm a fan of rocket launches and re-entry so I felt myself thinking of that. The sound/movement/vision all matched my knowledge of being in a capsule.
- It took me back to when I was a little girl during the bombing of Dresden. The images were very vivid. But the strange thing was that I was completely calm. I found it a very relaxing experience. Just incredible.
- Rocket. But then in a car driving off a cliff into the ocean
- Bats, rockets, aliens, apocalypses, The Atomic Bomb

Science Fiction

- Surreal, other-worldly, visceral, attacked?
- 2001, Terminator, Journey through space/time/dimensions
- Drop ship from Aliens?
- Felt like a seed underground ie. Riddick movie or moving forwards through a wormhole passing through suns.
- Gibsonian cyberspace
- Spaceships; war; into oblivion; the end of time

Games/Rides

- I played Call of Duty for the first time last night I don't know if that influenced my interpretation.
- War Zone
- Theme Park
- Story – Victory
- I felt like a video game, in a vehicle or spaceship being driven in a war zone being shot at, like Starship Troopers or Battlefield 3
- I found it terrifying. I felt like a character in a video game.
- At times I felt like I was in the woods and others like I were getting shot.
- Initially I thought of being on the Batman ride at movie world on the Gold Coast. Later the tunnel in Shanghai.
- Rollercoaster simulation at the science museum in Canberra
- CISR haptic motion simulator in Geelong
- It felt like a hellish rollercoaster

Spatial awareness

- I felt a little disorientation while the chair was affecting my spatial awareness; noise accentuated kinetic movements of the chair

- It seems like the noise is all synchronized with my spatial awareness to give me a feeling that I'm in an environment where high gravity gives stimulus on any skin.
- When speed of movement of chair accelerates in an extreme angle, noise became instrumental to guide me where my body is moving.
- I found myself visualizing an environment that didn't exist.
- Dark, it felt apt in the space.
- Sense of being in a much larger room.
- Journey, moving down in a chaotic space.
- Music suggested movement, both full speed and tight corners. I like noise so vibrated nicely.
- There were moments I felt like I was going to fall off the chair... (the flashes of red were also really good).
- I wonder how kinetic experience with noise will change if I listen to the noise without headphones but from large volume coming out of the speakers.

Music vs Audiokinesis

- Normally I miss distinctive rhythm when there is none but in this I did not miss it.
- It didn't really feel like music, it kind of sounded like screaming.

Temporal perception

- The experience seemed a lot shorter than I expected.
- It felt a lot shorter than 2.5 minutes.

Images

- I could almost see a red skull when the red light was projected.
- Yes, I saw defined figures like shiny triangles and prisms
- I think that when the light is linked to the movement it works better. E.g. Red light = fast movement.
- The projection onto closed eyes felt great. A real treat to see the blue.
- ... the flashes of red were (also) really good...

Agency

- I felt the above emotions (confused, fearful and disturbed) because I didn't have control of what was happening.

Movement accentuating sound

The beginning of the piece triggered "climbing" to the top of a rollercoaster hill sensation, the first blast of (I presume) white light made the crescendo of the noise blast jump out.

Familiarity

- I'm interested in sound, timbre, in its communicative strength. When I play I often create music that is pretty similar. It's a familiar sound environment to me.

Surprise

- Not what I had initially expected!
- I was really interested in the experience because I didn't have any idea of what exactly (*it*) was – I took it like a challenge.

Extras

- Track was great. Full *of* energy. Mechanised/interference sounds were listenable rather than annoying.
- The experience shut down thought. It made me look rather than think
- The flashing light seemed familiar but not to anything in particular. The composition was “thematically” familiar as noise “music”. This kind of sound feels “dark” to me.
- Musically I loved it, excellent stereo-imaging and good range of sounds.

APPENDIX B: BOOK CHAPTER
WHAT'S WRONG? DANGEROUS SOUND
VERSUS HEARING DANGEROUSLY

in Redmond, S., & Marvell, L. (eds.). (2015). *Endangering science fiction film*.
Oxford: Routledge.

Science Fiction: What's Wrong? The Sounds of Danger Versus Hearing Dangerously

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Sound provides information about the world in which we live and involves a continuous, 360° summary of surrounding events, ordered, shaped and prioritized by our experience and expectation. In science fiction film aural information can be cautiously divided between two poles. At one, there is the allegedly objective 'exterior' soundscape of the presented environment; and on another, there is the subjective 'interior' sonic fields of our perception. Through the practice of sound design, where audio is woven into the fabric of the film world, a sense of danger can be crafted by presenting the believable threat of the former, whilst sowing seeds of suspicion about the identity, stability or authenticity of the latter. Through spatial and timbral cues, we can be convinced that there might be something 'wrong' with the landscape of the world we are hearing. In these instances, sound's "added value" (Chion, 1994, 5) materializes images, projecting a believable reality into environments and events that are alien, unstable, monstrous, or spectacular. But there is an alternative to this process of audio authentication. Through sonic *dematerialization* (or shifting re-materialization) we can also suspect that there might be something 'wrong' with 'us'. Maybe our point of audition has suddenly moved without cause. We may witness an action that *should* be making a loud noise but is silent. Perhaps there is a ubiquitous sound we are hearing for which there is no apparent justification or point of origin. Materialization can involve hearing dangerous things. Dematerialization and disorientation indicate a different form of

danger, however. They have the capacity to undermine the certainty of our perspective, positioning the audient as other (Redmond, 2011), perhaps a clueless observer, or worse - through diminished or seemingly damaged faculties - a potentially unreliable witness to a particular unhinged moment in space and time. Whilst, at a general level, there may be "...specific systems of expectation and hypothesis which spectators bring with them to the cinema" (Neale, 1990), sound is at its richest when it simultaneously supports such expectation generally, whilst taking advantage of the possibilities of surreptitious subterfuge specifically. The audience may *know* they are in an alien world, but how that world is heard at any given point may be as uncanny and ineffable in its specifics, as it may be confident and convincing overall.

Compared to the 'other' of science fiction *vision* (the alien creature/ landscape/ vehicle/robot), the *sonic* other is often more indirect, sophisticated and deeply experienced. It executes its impact as much through its subtle 'invisibility' as through its perceptible force. Much of its power to endanger comes from the effortless and seemingly 'natural' suturing of certain sounds to particular images; ones which bind without thought. Many of the relationships cited in this chapter are ones that resonate intuitively despite (or often *because of*) potential violations of expected audiovisual logic.

Whilst unfamiliar elements, the puzzling and the potentially dangerous within a narrative dynamic aren't limited to science fiction; this genre, as with horror, provides a license for an exponential exaggeration of their scale and scope. Science fiction's "imagination of disaster" (Sontag, 1966) can threaten the existence of individuals, the planet, even the universe itself. The true hazards, however, are not neatly confined to the perils in plotlines. At its most intriguing, the intensity of such experiences can be achieved through an inversion of the traditional relationship between sound, visual activity and meaning. Roland Barthes, in exploring the general polysemic nature of images, identified a "floating chain of signification" as potentially eliciting a "terror of uncertain signs" (1977, 39). In film, score and sound design have long been used to minimize such terror. This can be achieved through sonic *anchorage* of vision into semiotic clarity (Gorbman, 1987, 55), or through sound *suturing* vision into a perceived flow of structural logic (57-58). When sound is released from such agendas,

the tethers restraining the terror of uncertainty are loosened. When sound actively violates them – obscuring meaning or obstructing narrative flow – fear paranoia and awe can be dramatically amplified.

By drawing on illustrative examples from *Beyond the Black Rainbow* (Cosmatos, 2010), *Tron: Legacy* (Kosinski, 2010), *Sunshine* (Boyle, 2007) and *2001: A Space Odyssey* (Kubrick, 1968), this chapter investigates a range of audiovisual relationships drawing on deep evolutionary precedents which sound designers explore when playing with the audience's perception of safety and identity. Through authentication, sound can lock in the fear of the known; through disorientation, it releases anxiety about the unknown. I suggest that science fiction, at its richest, opens up a sense of dangerously mysterious possibilities – and that sound is not merely attendant, but actively complicit in shaping the form and exaggerating the depth of what these possibilities may be. As Whittington argues, sound in science fiction, far from simply supporting image, is actually an “aggressive, overt and active participant in the production of meaning” (2007, 195).

Importantly, science fiction has the capacity to demonstrate how intuitive and central our point of audition is to our perception of self in a dangerous world.

Where am I?

Sound, as an instantaneous, summary of a surrounding environment, is instrumental in determining a hearing organism's perception of the world. The dangers in “movement, weight, size, solidity, resistance, contact, texture, temperature, impact...” (Sonnenshein, 2001, 27) of proximal, real world objects often resonate earlier and more deeply through sound than sight. Environmental activity is confirmed, an action's force articulated, and threatening emotions understood through the sounds things make. Film takes advantage of our experience of (hence trust in) this established audiovisual contract. Whilst such a bond exists in all genres, in science fiction, the fantastic nature of worlds, characters and situations increases the responsibility of sound for their necessary authentication.

As Spiegel has noted, the “cognitive estrangement” which critic Suvin identifies as a characteristic of the science fiction genre (1979, 369) isn’t usually manifested in its spaceships, aliens and off-world colonies. Rather, “Contrary to Suvin’s definition, these marvelous elements and environments are not presented in an estranged way; rather they are rationalized and made plausible” (371). I suggest that sound is complicit in this “naturalization of the marvelous” (375) on two levels. Firstly, it exploits our innate understanding of broad audiovisual and audiokinetic principles (for example, low sounds indicating the activity of large things). More specifically, it uses our culturally encoded understanding (of engine pitch trajectories and ambient machine thrum, for example) to naturalize imaginatively “marvelous” vehicular systems, not only into believable being but also into drivers of emotional response. Every sound heard in the crashing spaceship in the *Pitch Black* (Twohy, 2000) opening is known to the audience even though the experience of crashing a spaceship into a planet is not. Each noise made by the hull, the engines and the myriad of alarms serves to articulate and authenticate convincing materiality whilst entraining an emotionally amplified response as we empathize with characters within that scenario. But this is not where estrangement is found.

Traditionally, choices made by sonic practitioners when constructing and reinforcing future-set sonic landscapes service a range of objectives. Sounds are used to elicit or exaggerate levels of audience emotion (through both sound design and score), guide viewer focus (where they are hearing what they should be looking at) and aid narrative clarity (through image anchorage). More importantly, complicit in the agenda of plausibility, they inject a material weight into the mise-en-scene, as well as a “sonic velocity equivalent to visual spectacle” (Sobchack, 2005, 4). Whatever the specific agenda, at its core is a craft which, more broadly, engages in an overarching objective to create a seamless, incontrovertible logic which convinces us of the reality of a totally fabricated, alien environment. We are primed for uncritical acceptance by our extant faith in sound’s relationship to action and event in daily life. Our default position, to automatically believe the truth of the world we hear, is a trust sonic practitioners are adept at exploiting, whether to sell or subvert reality (Verhagen, 2008).

Editor and sound designer Walter Murch not merely identifies this audiovisual

contract, but stresses the importance for sound to take advantage of this preset acceptance. He cites the metaphoric gap between the event and its sonic shadow in film as a fertile space within which the audience's imagination can thrive. "(T)he greater the metaphoric distance, or gap, between image and accompanying sound, the greater the value added" (quoted in Chion, xx). The more trusting (or distracted) the audience, the greater the opportunity designers have to stretch the distance between the 'thing' and its 'resultant' sound. Whilst there is a limit to such elasticity, as long as it isn't stretched beyond breaking point, this opportunity to take license in the audiovisual relationship can be exploited to deepen and enrich the audience experience. Schwarzenegger in the *Terminator 2* motorcycle chase sequence (Cameron, 1991), for example, only fires a shotgun *visually*; sonically, it has been stretched to a cannon – now felt as well as heard.

In exploring the psychophysiology of emotion, the value of heightened arousal (in this particular instance, stimulated by louder volume and broader frequency bandwidth) is well established. As Lang, Bradley and Cuthbert confirm "...without the arousal component, affective events are less 'intense'" (1997, 2). Sound Designer Gary Rydstrom, when referring to the idea of the exaggerated approach, similarly frames it as a simple mechanism to maximize arousal levels - using sound to amplify fear or exhilaration through the perception of 'more'. "It's more effective emotionally to realize how hard something is being hit by a bullet than it is to realize there's a gun being shot twenty yards away" (LoBrutto, 1994, 237).

But the issue of exaggeration is not merely about intensity. This creative amplification has the capacity to shift the audience experience from objective observation to subjective immersion. Rather than a *registration* that a gun has been fired it is the *sensation* of firing a gun, or even the perceived physical *reception* of the bullet's impact. There is a residual effect to this experiential transformation that is particularly useful within the science fiction genre, and opens space for subversive exploitation. For if sound has the potential to make us experience cinema more subjectively than objectively, this can potentially lead to a shifting subconscious sense of where, who and what we may actually *be* within the film. Our familiarity with the visual language of film and its editing conventions means that such changes in perspectives are often ones which we take for granted and don't consider consciously.

If the mechanics of the audiovisual contract in manipulating identity and perspective are established and invisible, what is the effect when they are overlaid with an additional contract that is audiokinetic?

The recent developments in cinema's quest to find new ways to amplify arousal through devices such as 4D seats, has made some of these questions of identity more noticeable and pressing. The manufacturer DBox, for example, use principles and technology drawn from flight simulation, theme park and arcade rides to inform an augmented movie experience. In these specialty theatres, viewers watch a mainstream film in a chair that rises, tilts and shudders in relation to the activity being viewed. Not surprisingly, science fiction blockbusters are a popular choice. Unlike our omniscient eyes and ears that seem to float freely through a story in conventional narrative film, however, 4D cinema, through movement and vibration, attempts to place audiences physically within the action, constantly shifting their point of contact and orientation with environment, character and camera. This is not the metaphoric abstraction or synesthetic extension that film phenomenologists such as Sobchack might cite as absorbing the inert body into the cinematic activity on screen. Imagining movement through the concentration on filmic action is different from being physically moved at the discretion of a motion designer. Through enforced kinetic embodiment, latent questions - ones which have ceased to be triggered by camera angles, camera tracking, edits and points of view - now become explicit and demand consideration in order to explain movement. This is because the motion is not subjectively abstracted, personally synesthetic, individually cross-modally assimilated - rather it is literal and imposed. A previously unnoticed camera movement or an instantaneous shift through time and space now can have a physically kinetic corollary. As a result, questions become more pressing. *Where am I? Who am I? What am I?* Motion aside, more than other genres, science fiction, irrespective of whether in 4, 3 or 2D, extends the possible answers to such questions to include expansive possibilities - whether concrete and materialized or merely suspected or paranoid.

By contrast, consider the original 2D release of David Fincher's *Panic Room* (2002) when the intruders are rattling the front door handle. When we momentarily disappear into the keyhole the moment reads as a creative piece of camerawork, and not an individual's perspective - simply because the film (and the genre) provide no options

for this sequence to be anything other than a cinematic device. Whilst the experience might be mildly unsettling, there is no possibility for perceiving any shape-shifting entity to justify such a change in form and scale, and thus legitimize this type of morph as a meaningfully subjective point of view. This is made all the more unsettling as our perspective on the score changes, feeling like our ears enter the keyhole along with our eyes. But whilst everything in the design of the moment makes the journey feel like a personal perspective, our perceived identity remains uncompromised, constrained by the limited possibilities offered by the genre. Ultimately, we're nothing more than a camera. Science fiction, by comparison, carries a far richer and more dangerous suite of possible answers when addressing such cinematic perception. The same devices which may simply register as part of a cinematic language in other genres, possess greater creative potential to fuel more imaginative options about possible challenges to traditional "timespace" (Wood, 2007, 55), and hence suggestions of personal identity within an expanded universe. Either the frame becomes explicitly extended to encompass broader perspectives, thus guiding interpretation ('Am I the alien?'), or there is enough inference to encourage imagination and suspicion, thus fuelling paranoia ('Something's wrong').

Even simple shifts in camera angles, designed for cinematographic interest, raise suspicions about identity when the sound we hear aligns with the spatial location of the camera. Such an example can be found in *Tron: Legacy* (Kosinski, 2010), when Quorra hands Sam the sector map for Zeus. During this scene, there's a moment when both our point of view and point of audition shift to within the wall, looking back into the room. As a result, subconscious questions are raised. These are not just about a justification for the shift but perhaps whom we might be to have done so (even though there is no option clearly available). Without the commensurate change in sonic perspective, such shots wouldn't effect our perception in the same way. The expected continuity of sound, irrespective of the image's position was a significant early development in 1930's cinema (Altman, 1992, 59). This was a deliberate violation of the audiovisual "reality code" preferred by early sonic practitioners and theorists (a principle which suggests that the volume and character of sound matches the position of its emitter). There was a realization that such a transgression could significantly contribute to the early agenda of hiding the cinematic apparatus – with continuous, stable sound smoothing over the spatiotemporal brutality of the visual edit. Sarkar

acknowledges this history and the subsequent weakening of this convention. Now, when “we do have changes in sound volume and reverberation levels in classical cinema, they are motivated not by considerations of auditory perspective (match between image size and sound volume), but by the need to place the spectator in the position of a particular character” (1997, 23). In the *Tron: Legacy* scene, however, the latent consideration relates to which particular character’s ears the audience is now hearing the scene through. A change in perspective through vision rests comfortably as a cinematic device. With sound accompanying such shifts, the resultant sense of embodiment can lead to the perception of unexplainable sentience, thus weakening clear borders of identity. We feel strangely voyeuristic when the audiovisual reality code is suddenly honored without clear justification.

Ultimately, when compared to other genres, and aligned with horror, the alien environment in science fiction opens up greater possibilities about whose eyes and ears we may have suddenly become. Even if the narrative doesn’t explicitly guide this “logic of sensation beyond bodily integrity” (Redmond, 2011, 42), this style, more than others, fuels imaginative options. These range from taking uncertainty-related anxiety (Hirsh, Mar and Peterson, 2012) in order to generate feelings of paranoia, through to more expansive potentials for transcendence (Sobchack, 2008). And whilst 4D cinema may serve to make the aforementioned considerations of identity more conscious (in the need to justify the reasons for physical movement), traditional 2D films, through sound rather than kinesis, still encourage intuitive rumination: Why does that sound like this? Ultimately, just *what* is processing *where* we are? It is here that I suggest the principle of the *umwelt* may help....

Who am I?

1_a trusting organism

The *Umwelt* is a term used in ethology and developed by biologist Jacob von Uexkull in 1909 to describe an organism’s subjective experience of an environment. It is an idea which had already been considered by psychologists such as William James in the previous century. “My world is but one in a million alike embedded, alike real to those who may abstract them. How different must be the worlds in the consciousness of ant, cuttlefish, or crab!” (James, 1890, 288). Whilst differences in the biology of

the senses across species will play an important part in shaping an individual *umwelt*, the subjective parameters of the world are not merely bordered and molded by the limits of personal perception. They are also influenced by past experiences, feeding into current assessments and, for humans in particular, projected potential futures.

Our *umwelt* then, “the small subset of the world” that we are able to detect (Eagleman, 2012, 143), is subconsciously coloured as much by the imagination, memory, and projection as any perceptual stream from the body’s sensors. This is a principle which has been long understood by psychologists and neurophysiologists. “The senses do not give us a picture of the world directly; rather they provide evidence for the checking of hypotheses about what lies before us” (Gregory, 1977, 13-4). Cognitive psychologist, Harwood confirms, “Humans go beyond the information given in understanding their world; we are active participators...drawing as much on hypothesis and conjecture as on data which impinge on our sensory systems” (1976, 531) - or from cinema studies, what Lefebvre would term a “variable conceptual construction” (2006, 21). This process is part of what Norretranders has called *simulation*. It is the connection, executed subconsciously, between *sensation* and *experience* (1991, 289). This crucial link in the construction of an *umwelt* is active whether the senses are providing data from familiar or unknown environments, real or virtual.

Even perspectives which challenge our sense of reality can often be subconsciously accounted for and assimilated without registration. Primatologists, Vonk and Povinelli, have suggested that human beings are the only animal that can understand the world within a context of “unobservable entities and processes” (2004, 5), and that we possess an underlying “abstractive depth” (2011, 5) that makes intuitive reasoning about such unobservable agents possible. We take new information, and we assemble it into a workable frame, subconsciously accessing any schemas, or placing faith in any unknown internal logics necessary for the experience to effortlessly ‘succeed’.

In Norretranders’ simulation phase then, we imagine, we project, and we trust. Sound in science fiction feeds the imagination - making things richer. It can manipulate the projection - making things stranger. And it can violate the trust - potentially feeding awe, paranoia or fear. And the effectiveness of this sonic maneuvering is, in part,

ensured by the audience's concentration on other elements in the narrative whilst the soundscape unfolds. Although hearing can provide a content rich, surround summary of an environment, it collects far more data for the simulator than can be actively considered. Rather, this extra information is absorbed and assimilated intuitively. These subroutines, which run, unnoticed, in the background are what neuroscientists Koch and Crick have termed "zombie agents" (2001).

This process is a direct byproduct of the limited resources the human brain can allocate to focused attention. Norretranders, summarizing the work of Hick, Pierce, Kupfmüller and Frank suggests that, compared with the collection of sensory data, estimated to be around eleven million bits per second, conscious attention can focus on only 16-40 (1991, 137, 143, 145, 150). With such restricted capacity, the more we can intuitively know or assume - and hence relegate to heuristic processing - the more efficiently we can train our attentional resources on events that require focus. So primed for this process, if needs be, we will even project an internal logic, aberrant salience or causal inference where none may actually exist. As a species addicted to meaning, we have a demonstrably feeble susceptibility to such apophenia (a spontaneous perception of connections and meaningfulness in unrelated phenomena). But even when we are not active participants in the fabrication of meaning, we are still primed by a predilection to assume/presume internal logic with as little resistance as possible. At its most passive, it sees us, as Christof, *The Truman Show*'s producer says, simply accepting "the reality of the world with which we're presented" (Weir, 1998 quoted in Eagleman, 2012, 143). This trust in the parameters of our *umwelt* can give us a capacity for a calm acceptance and deep understanding of our environment. But this same baseline belief in unknown forces can easily feed a sense of danger, uncertainty, anxiety or awe – distorted or enhanced perspectives on things which may or may not actually be there.

That impossible things - whether figures or grounds - can be made real through sound is well understood. Whittington (2007) provides ample evidence of this principle. Figures: terminators, transformers, spaceships and aliens are granted mass, scale and believability - transformed from flat CGI into dangerous, dimensional matter through the noises they make. Grounds: planetary surfaces, future cities, spaceship interiors all mutate from stages, sets and code into authentic environments within which stories

can unfold whilst sound supports narrative verisimilitude. Uninterested in the plot of *Tron: Legacy*? “Change the scheme. Alter the mood. Electrify the boys and girls if you’d be so kind.” (Kosinski, 2010) Simply add Daft Punk, turn on the subwoofer and play everything twice as loud. First, ‘see’ what happens; then, consider how that works.

Through arousal, hypothesis and conjecture a flavour of the world is felt and understood. Abstractive depth, subconscious processing, apophenia and our faith in unseen entities further support this intuitive construction. When a film is working well, all of these preset susceptibilities and sense-making methodologies lead to an unquestioning, passionate, trusting (or trustingly suspicious) experience of the new and original worlds science fiction presents. When driven by sound, everything can resonate more deeply than the sum of any of their registered visual elements. Ultimately, we do not know the mechanics of our simulator, or how it assembles data into meaning. We are usually unaware that it is even running. Sonic practitioners understand that if we notice anything at all, it is often only the feelings of the experience that is being generated. There is a trust they take advantage of, as we are led into territories which may challenge the stability of our *umwelt* as we know it.

2_a different organism

In cinema, suddenly shifting points of audition and view point enable one to experience the *umwelt*, or “invisible bubble” (Deeley, 2001, 131) of a robotic gunfighter (*Westworld*, Crichton, 1973), terminator (*Terminator*, Cameron, 1984), predator (*AVP*, Anderson, 2004), or droid (*Oblivion*, Kosinski, 2013) are well established devices; “ulterior embodied alignments (Redmond 2011, 47) which are effortlessly absorbed by audiences. Traditionally, such “illegitimate possibilities” (Bennett, 1997, 20) feature an audiovisual lock and foreground an instantly accessible internal logic: the audience momentarily becomes the eyes and ears of the entity. *Gravity* (Cuaron, 2013) is slightly different. Here the purely *aural* morphs from omniscient to personal points of audition in and out of Sandra Bullock’s helmet are more subtle. And they cause the audience no distress - even though logic, if engaged, would suggest a series of biologically monstrous, transformative shifts, well beyond

the aliens and robots listed above. Our eyes see one thing, whilst our ears hear another. Without visual confirmation we don't become Sandra Bullock in the way we temporarily become the military robot from *Hardware* (Stanley, 1990). In *Gravity*, our perspective remains that of a viewing audience. We just start to adopt radical powers well beyond our daily *umwelt* without even noticing.

The fact that we move in and out of objective and subjective perspectives only with our ears and not our eyes in sequences of *Gravity* is interesting. Compared to similar moments in *Sunshine* (2007), where any sonic shifts into Capa's helmet are accompanied by commensurate visual shifts, traditional points of view in *Gravity* are rare, but alterations to points of audition are common. What we *see* doesn't change even when what we *hear* does. This results in perspective morphs which are probably only ever experienced by an audience as a feeling rather than an observation. But there is an accompanying question which neither the zombie agents or focused attention ever process. What kind of a complex, monstrous perspective involves ears being cleft from eyes to deliver the kind of shifting *umwelt* we are experiencing? What sort of omniscient "unobservable entity or process" would explain or normalize such an experience? Granted, these questions are only dangerous if asked. The bigger surprise perhaps, is that for the most part, they are not. Despite such a radical line of enquiry, the experience of the sound in *Gravity* (with one exception I shall return to) is actually effortless. For an audiovisual contract which doesn't "respect borders, positions, rules" (to use Kristeva's definition of the abject) how counterintuitive then that there is actually no disturbance to "identity, system, order" (1992, 4). In this instance, far from abjection, the audience experience, instead, is one of flowing sophistication. (Nothing to see here.)

3_a lost organism

Perhaps the opening few minutes of *2001: A Space Odyssey* may read more 'dangerously'. In this sequence, the screen is completely dark, and all we hear are the orchestral tonal clusters of Ligeti's *Atmospheres*. How are we expected to make sense of this reality? *Where are we?* If we have already suspended disbelief, our *umwelt* is within the film, and not in a cinema. So *who are we?* Within the presented diegesis, and for no apparent reason, we are deprived of sight. Just *what are we?* Redmond suggests that "Hearing (without seeing) is a carnal activity: the viewer undergoes

physiological changes, and draws on affective memory to ground, to make safe, the sound and/or to confirm (and take perverse enjoyment) in its awe and terror” (2001, 44). But in this instance, whilst the music articulates time and space, as the opening scene to a movie, and without clear sense of musical intention/direction, the detail and exact context of this experience is completely unknown. The resultant suspicion, driven by the confidence of sound, is that something important is unfolding, but we can access neither immediate information, historical precedent or additional senses to effectively clarify what that actually is. We are witnessing something we’re unable to see. Whilst there may be some cognitive assessment as we contemplate the experience, ultimately such an approach fails to help. The overarching result of this audio visual device is a suspicion about the existence or activities of an unobservable agent, combined with a complete lack of understanding about what that agent might be.

Unlike moods, which are “objectless affective states” (Brown, 2014, 4), the appraisal theory suggests that emotions are situational and based on an evaluation (Schachter & Singer, 1962, 379). But the ‘situation’ in the *2001: A Space Odyssey* opening is only suggested, abstractly, through score, with no confirmation data from vision. We are blind. “Where there may be confusion, imperfect knowledge or multiple, conflicting goals” (Mithen, 2007, 87) emotions traditionally replace reason to guide immediate responses and actions. The sound for this sequence then, certainly sets a mood. It potentially leads to an emotion, but one informed by abductive reasoning, conjecture, and suspicion. Neither the mood nor the possible emotion are clearly articulated or even cleanly valenced. And even were the feeling comprehensible, it is unlikely to be identifiable as an ‘everyday’ emotion. The sense Philip Brophy discusses (albeit in reference to Koyannisqatsi-style time lapse cloudscapes) feels particularly apt in this instance of sounding blackness. There is “a feeling of imminence, of the suspense of something on the verge of happening...” (1994, 85). In Kubrick’s opening, without a visual cue to anchor what we hear into concrete meaning, all we are left with is music in the dark, and a feeling that can be experienced without a clear understanding of the event it represents. If this is processed negatively, it might be unnerving; neutrally as potentially mysterious; positively, perhaps even mystical.

It’s important to note, however, that simulation’s range of intuitive frames of

reference to answer (or provide suspicions about) the where, who and what questions posed above, will be clearly effected by the subjective experience, history and perspectives of the individual audience members. These reactions will be varied and not necessarily ‘accurate’. Inductive knowledge, by its nature “is necessarily contingent and fallible... (it) is vague and adaptive, rather than precise and certain” (Huron, 2006, 60). (Abductive knowledge is even more so.) This can be valuable when using sound to give rise to ambient suspicions, intuitions, or more generally, to moods. But it can also cause problems. And when the frame of reference, registered instinctively, delivers a feeling that is too problematic, this issue will be offered up by the zombie agents and scrutinized in the full glare of conscious attention.

This occurred to me whilst watching *Gravity* in a VMax (supersize) cinema, and involves an experience I’ve been unable to replicate on DVD. There was a point towards the beginning of the film where the choices made by the sound designer, Glenn Freemantle, made me feel as if I was directly inside Sandra Bullock’s helmet. The fact that I could hear George Clooney pass behind me from one side of the cinema to the other, wasn’t a problem because it defied realistic logic (the fact that transmitted audio wouldn’t be spatially modulated). Instead, the issue arose when, to make the experience work, my simulator, having already anchored me inside Bullock’s helmet, took the spatial cue of Clooney’s pass-by as a physical articulation of my cranial dimension. Suddenly, not only did I feel like I was inside Sandra Bullock’s head, but the mass of that head filled the entire volume of the huge cinema space. The strange experience which accompanied this effortless realization was as overwhelming and enormous as it was completely useless. Ultimately, it was a perspective I immediately registered as unhelpful and shut down. For all the radical shifts in points of audition in science fiction film, it is surprising that such faulty artifacts of abductive and inductive reasoning actually occur as infrequently as they do.

So sound’s capacity to convince us of the alien, the futuristic is well established. That it authenticates impossible landscapes by supporting the perception of a rich umwelt is now understood. But the depth of our engagement goes beyond Chion’s claim for simply “added value” (1994, 5). How can we be so completely absorbed in the threats and excitement of a genre grounded in fabrication, the fantastic, and the improbable?

It turns out that sound designers have susceptible audiences from the outset.

4_ a spiritual organism

Neurobiologically, the suppression of the posterior superior parietal lobe during the suspension of disbelief in a cinema (Holland, 2003) may help explain why the diegesis of an effective film could easily become our *umwelt* for 90 minutes. “1. We no longer perceive our bodies; 2. We no longer perceive our environment; 3. We no longer judge probability or reality-test; 4. We respond emotionally to the fiction as though it were real.” (Holland, 2003, 397) Within this context, there are two issues to explore - one is our passion for fiction that can lead to the list of conditions above, the other is the relationship between these conditions and our capacity for generating ‘mystical’ states.

Cinema aligns with verbal storytelling and written literature in its ability to replace a literal environment with a virtual one, no matter how implausible or impossible. Our capacity, then, to be effortlessly absorbed into the fantastical world of *Star Trek* in 2000AD involves fundamental processes no different from listening to *The Odyssey* being read in 700BC. The ubiquity of narrative is significant. The form and time may vary, but “Involvement in fictional, imagined worlds is a cross-culturally universal, species-typical phenomenon” (Tooby & Cosmides, 2001, 7). Just why such stories would engage us throughout history and across culture with these levels of emotional intensity is an interesting question.

Functionally, the evolutionary argument applying to our addiction to story telling is that it provides an opportunity for participants to engage with interpersonal and environmental scenarios from which they can learn and apply lessons in their own experience. “Since prehistoric times literature has been serving two complementary functions: to expand the cognitive, emotive, and volitional horizons of human awareness and to integrate our beliefs, feelings, and desires within the fluid mentality required for survival in the complex social environments of human organisms” (Hernadi, 2002, 21). Additionally, and, importantly for science fiction, there is a “motivating impact of fictive stories about imagined characters on the will of actual people to change themselves and their worlds” (21-22). Drawing us into this adaptive benefit are clear neurochemical rewards to provide payoffs for following

such stories.

But the cinematic experience is more than just narrative. The psychophysiological mechanics of musical experience are important to understand given the importance of the score in heightening emotional engagement in cinema. Of note is a potential relationship between how we engage with stories and how we consume music. Firstly, it is notable that “Fictional worlds engage emotion systems while disengaging action systems (just as dreams do)” (Tooby & Cosmides, 2001, 8-9). With the exception of reflexes such as the startle response, the consumption of film is a largely motionless activity. Secondly, musicologists Aiello and Sloboda relate the intensity of experience in the consumption of music to *the law of affect*, where “Emotion...is aroused when a tendency to respond is arrested or inhibited” (1994, 15). Whilst such a point of view has been explored in the ongoing debate about understanding the power of music, it can be equally applied to the strength of narrative. Monsters give chase, spaceships explode around us and we just sit there, physically motionless. We are not just fascinated. In theory, the depths of our visceral, emotional engagement are arguably, in fact, amplified by our inertia.

But Science fiction does more than coax everyday emotions from its ‘viewers’. Emotional depth is also prevalent with this form in the heightened experiences of the sublime and the mystical. Vivian Sobchack identifies the parallels between religious and cinematic encounters of transcendence to be found in immanence. In each, there are instances “in which ex-static transcendence is not only purposefully solicited but also formally shaped and experientially heightened” (2008). The subject matter of much science fiction is perfectly suited to the generation of these types of experiences. Danny Boyle, quotes *Sunshine*’s scientific consultant, Dr Brian Cox, who suggests “that you can’t really speak about these things (such as Higgs boson) without allowing for what some people would call a ‘spiritual dimension’” (Boyle cited in Kermode, 2007). And whether it be the abstract flavour of the metaphysical to be found in *2001: A Space Odyssey*, *Sunshine*, *Solaris*, *Contact*, or the “dichotomized good and evil” (Bukatman, 1997, 34) of *Star Wars*, or *Star Trek V: The Final Frontier*, the narrative material of the genre provides fertile opportunity to explore ‘spiritual’ issues narratively and/or generate ‘spiritual’ states, phenomenologically.

We have previously explored the process by which trust in unobservable agents can

lead to a sense of something outside of our understanding. We know, too, that if there is nothing we can do about it, there is the potential for a stronger emotional response. To explain such heightened, almost mystical states in film however, and the complicity of sound in their generation, we may need to turn directly to religious experience for further insight.

In their book *The Mystical Mind*, research psychiatrist D'Aquili and neuroscientist Newberg attribute four main phenomenological features to mystical states. "The first is a breakdown in the usual sense of the passage of time; the second is a breakdown in the usual sense of the extension of space; the third is a breakdown in the differentiation between objects in the external world; and the fourth is a breakdown in the differentiation between the self and the external world" (1999, 188). The role of the score in film therefore is significant, as all of these features can be found the experience of musical consumption. In music: One: Temporal perception is mutable. Two: The perception of space and scale can be manipulated. Three: The relationship between sounds in music and how they relate to objects in the real world is ambiguous, amorphous and often uncertain. And four: The capacity to diminish the perception of the self, particularly in relation to a sense of physical reality, is part of the reason music has been a global instrument of spirituality for centuries. The opening and closing sequences in *2001: A Space Odyssey* both offer good examples of sound's role in serving this agenda, whether integrated with vision, or as music heard in the dark.

Whilst D'Aquili and Newberg's research explores the neurological effects of meditation and ritual, there are psychophysiological characteristics of such experiences which could be seen to correlate with particular moments in science fiction film. The neurology involves the hyper-activation of the prefrontal cortex and subsequent activation of the hippocampus, leading to deafferentation - where functions of the posterior superior parietal lobes are inhibited. "The PSPLs are believed to be responsible for maintaining certain aspects of the usual sense of the self, and when the neural input to them is cut off, the usual sense of the self alters...It is this inhibition of neural signals into the PSPLs that causes some of the characteristic phenomenological features of mystical experiences." (Miller, 2009, 40) Whilst D'Aquili and Newberg's research methodologies are not without their critics,

Miller amongst them, the reported experiences of the sublime reported in science fiction (Csicsery-Ronay Jr, 2008, 146), and their similarities to both religious states and responses to music, encourage contemplation of their potential neurobiological similarities. Is this is the “porous experience” that Sobcheck suggests “transcends not only any single sense perception but also traditional subject-object, here-there, inside-outside dichotomies” (2008, 198).

It could be argued that the links between the “metaphysical encounter...religious ecstasy and unearthly transcendence” (Kermode, 2007) of the surreal final act of *2001: A Space Odyssey* and the denouement in *Sunshine* go beyond any likely deafferentation simply through hyperactivation of the prefrontal cortex that the audience may experience in each. Underworld’s Karl Hyde admits to Ligeti’s “Lux Aeterna” (1966) being a inspiration for his approach to scoring *Sunshine*, and the influence of sound on the emotional response to the concluding scenes of each cannot be underestimated. This moment in Boyle’s film has been variously described (by the public reviews on forums such as imdb) as “religious”, “sublime”, and “awe-inspiring”. It also tends to make people cry - but not necessarily because it is sad. As an intersection of a number of plotlines, the narrative primes the audience. But the role of their ears is to mainline emotion, ultimately fusing them with Capa’s umwelt. To do this, sound has two operational agendas. Firstly, through the design of the ambiances and sound effects, it confirms the scale and drama of what we are witnessing. Events on the deck of the spaceship are materialized; the sense of force and power of the sun is authenticated. Whilst vision during this time is descriptive and the use of light quite beautiful, weight, mass and danger are only really called into perceptible, believable being through sound. Generally, although our response to vision tends to be cognitive (and, at times, aesthetic), sound has the capacity to make ‘things’ visceral and emotional. Possibly more than in any other genre, the mute button in science fiction eviscerates and emasculates, utterly vaporizing both drama and power. Even the most spectacular compaction of any CGI excitement can be rendered impotent when viewed in silence. We no longer care about plot, nor are we moved by dramatic spectacle when we can’t actually hear it. Ultimately, a vacuum robs such events not just of presence but reality (in a way that a blackout does not). In the light of the experience of muting the audio, to boast that sound in normal film then exists as “half the picture” (Lucas, cited in Blake, 2004) is, if anything, a

potentially gross underestimation.ⁱ

But there is a second agenda in this *Sunshine* epiphany scene. With vision now believable (and hence, the plot engaging) through sound design, sound moves from environmental authentication into another mode. Having firstly materialized the image, confirming scale, importance and excitement, sound is then used to execute a major perspective shift. We have moved from an ambient subjective experience of the main character - where we have been sharing his perception of diegetic sound, inhabiting the same location. At a particular point, our *umwelt* morphs with his. Not only, for some reason, do we stop hearing the sounds of his/our environment (what Chion has termed “suspension” [1994, 131]), we are also flooded by something else - something which has been there the whole time but now assumes center stage - music. From a scene that was previously working to generate “outcome emotions” (Brown, 2014) - whether they are triggered by a relief/excitement over the character’s success, or possible sadness over his sacrifice - we have now moved into a different, more involved emotional space.

An analysis of film sound necessarily makes a distinction between the sound design’s grounding in, and support for, the diegesis (the world of the film), whilst identifying the score’s traditionally non-diegetic status. But there is an issue with such a dichotomy. Whilst the parameters of that demarcation are well established (the terminology grounded in Ancient Greek literature), its sonic application in film is not a perspective audiences are usually conscious of. There is no accompanying experiential support when immersed in a film for what is essentially such a conceptual separation. We absorb all sound in the cinematic experience. We hear no diegetic/non-diegetic split. The “world *of* the film” is more than just the “world *in* the film”. And whilst we can argue that the score often has theoretical equivalence to a conversational cinema-goer in the auditorium, commenting back on what is happening in the diegesis, perhaps this conceptual separation has less value than traditionally assumed. For when *experiencing* a scene such as the end of *Sunshine*, the move to music actually draws us more fully *into* an immersive world, rather than reading as a detached commentary. My question then: does the innate subjectivity in the idea of the *umwelt* address this schism? The score is just another element of the sensory experience, and, to the extent that it entrains the audient to feel what the

subject on screen is feeling, is as enmeshed and legitimate a part of that organism's environment as anything else.

When music starts exploring a sense of Capa's heightened subjectivity, one could argue that the emotional territory the score encompasses is actually even deeper in the world of the film, than apart from it. In this instance, Chion's 'sound *en creux*' (1994), a phantom soundscape that exists a 'gap' away from the objective reality of the *mise-en-scene*, does not have to be considered as a negative space against the 'positive' sonic reality of the character's environment. Rather, one could argue that what we experience as an audience at this point is an aural representation of Capa's neurochemical experience. Given the corollaries between the characteristics of mystical and musical states as previously outlined however, the score does more than just 'represent'. Beyond the effect of processing a plot point, music can *generate*, rather than *approximate* the sense of the sublime, awe, the unexplainable, or expansive joy.

Branigan's definition of the diegesis in this instance is useful: "the implied spatial, temporal and causal system of a character – a collection of *sense data* which is represented as being at least potentially accessible to a character" [emphasis added] (1992, 35). A traditional diegetic/non diegetic split of action and sound would act to conceptually separate the territories of the environment and the character's psychology. By exploring the idea of the *umwelt*, we can both unite the two at a phenomenological level, whilst still leaving open questions of strange ambiguity, perspective, and experience. The score as audiowaves may be inaccessible to the character. But the "sense data" is actually the emotional state the sound suggests and mediates, and not the music itself. Audio then is merely a means to weaken the boundaries between Capa and the audience. Through score, the "viewer is symbiotically, inter-subjectively aligned with a character as they experience this deterritorializing moment: together (within one another) they face the awesomeness of the sound image before them, and are doubly lost for words." (Redmond, 2011, 54) With such an approach, the soundtrack is no longer telling us what Capa is experiencing. His *umwelt* is ours and the music elicits the same emotional chemicals in our brains as in his.

But in other films, the where, who and what of our *umwelt* is far less clear – and is a

cause for concern.

5_a scared/scarred organism

Panos Cosmatos' "neon nightmare" (Howell, 2001), *Beyond the Black Rainbow* (2010), provides a useful case study. Here, the score isn't interested in clarifying the mechanics of the narrative (Gorbman), synchronizing group emotions (as John Williams may be doing in *Star Wars*), or neatly guiding one to any ecstatic epiphanies (as Hyde does in *Sunshine*). Instead, the soundtrack has a different agenda. Within the aesthetic of a 70's science fiction psychological thriller, surreal drugscape/dreamscape, the sound avoids neat anchorage and takes license to make nothing clearer, everything richer, whilst daring the audience to deny "the reality of the world with which they're presented". It led the Village Voice to claim "...it's not often that we're reminded with such potency that movies are most delightful as sensory experiences" (Holcomb, 2012). And whilst the film could be charged with faltering in the final act (when it moves away from sensory experience to focus on plot resolution) it's at its best when feeding uncertainty about the reliability and identity of the *umwelt* we *feel* like we are experiencing.

Once more, sound is a key instrument in this agenda. Smearing across lysergic levels of surreality, unfolding at a hypnagogic pace with close-miked performances designed to maximize the likelihood of an autonomous sensory meridian response (ASMR), the audience seductively shares with the central victim, the uncertainty of (and anxiety about) what is actually unfolding. Again, in this instance, there is limited value to a conceptual diegetic/non-diegetic split between sound design and score - quite simply because in Jeremy Schmidt's analogue synthesizer soundtrack, it is unclear where the former ends and the latter may begin. The sustained textures which accompany cutaways to glowing structures or strange rooms don't encourage any perceptual separation in defining what is *in* and what may be *outside* the world of the film. The actual cinematic frame - including drugs, psychotic breaks, mental torture, and surveillance, is broad enough to contain absolutely *everything* we hear. Where *Sunshine* provided clear emotional and narrative guidance through sound, *Beyond the Black Rainbow* revels in the ways in which sound can confidently seduce, confuse and raise the stakes associated with identity and uncertainty. Irrespective of the agenda, both are examples of films that, like other science fiction examples,

“revolve around relatively unconventional subjectivities... (and are) marked by a manifest dependence on their soundtracks” (Sarkar, 1997, 26).

In *Beyond the Black Rainbow* (2010) as surreal as it may be, we may have a sense of where we are. Observing the narrative as it unfolds, we have a suspicion about who we are. Whether latent or explicit, the unexplained cutaways to pulsing structures, unexplained forms, and strange perspective shifts in our point of audition, open up the final question just *what* we are....

And whilst Cosmatos’ film provides a rich sensory experience to open up seams of uncertainty and ambiguity, perversely, this question may actually become more perplexing, the *less* alternative the film. To demonstrate - let’s follow this umwelt principle back to the mainstream of science fiction – a territory where sound is used to authenticate, anchor, focus and guide the audience’s response. If we follow this organism’s ‘subjective experience of their environment’ to its logical conclusion, there might be a problem. For if we are no longer in a cinema, and instead, newly inhabit an alien world, just *where* on Alderaan is the orchestra (and why won’t it shut up)?

6_a subjugated organism

For a moment, let us consider the problem of the score within the context of the acousmetre - a term Michel Chion uses to explain the position of the omniscient narrator in cinematic voiceovers. Chion argues that there are “three powers and one gift” (1994, 129) that fiction film bestows on this special voice that is “neither inside or outside the image”. The acousmetre is all-seeing, omniscient, omnipotent and often ubiquitous. All four are characteristics which equally apply to John Williams’ score as they do to the opening narrator’s voice in *Pitch Black* (Twohy, 2000). William’s horn section seems to ‘know’ what it is ‘talking about’, it feels like it is aware of the bigger picture (and the attendant emotions which accompany that knowledge), it has great power, and simultaneously comes from everywhere and nowhere. Whilst musical commentary is an established and expected convention in film, there are issues when explored within the umwelt frame that the score’s traditional agendas (working outside the diegesis to synchronize group emotions, clarify meaning, drive pace etc.) fail to address.

For there are two types of feelings that music generates. The first is whatever the appropriate local emotion is needed for the scene. It is an attempt to make a *perceived* emotion (cognitively assessed in the consumption of the narrative) a *felt* emotion. The subjective differences in emotional responses to music have tended to result in a history of established musical codes, and - at its worst - lowest common denominator compositional hotkeys. But there is a second type of feeling that accompanies the experience of music in film. It is more difficult to articulate, but, much like the *acousmetre*, involves a residual feeling, something ineffable, generated by the *position* of the score in the *umwelt* as much as its actual content. There is something about the score's status, feeling like it's neither inside or outside the image, which is perceptually transformative.

Whilst not addressing film soundtrack itself, sound theorists Augoyard and Torgue write to this principle of ubiquity in 'Sonic Experience' (2005, 131).

The listener is in search of information. The ubiquity effect is based on the paradoxical perception of a sound that we cannot locate, but we know is actually localized. ... Often it is important to know where a sound comes from; sometimes it is vital information that we need to determine whether to flee, to attack or to remain motionless. The uncertainty produced by a sound about its origin establishes a power relationship between an invisible emitter and the worried receptor. The ubiquity effect is an effect of power....

With levels of uncertainty in the consumption of science fiction film amplifying the perception of danger, this power relationship may well lead to a worried receptor. *Beyond the Black Rainbow* again: Given that a) it seems like Schmidt's sound is confident, declaratory and seems to know something we don't, and b) it's not really clarifying or minimizing the "terror of uncertain signs", c) collapses points of demarcation between diegetic and non-diegetic sound, then d) uncertainty related anxiety feels like an appropriate response whilst we try to understand just what this dominant, ubiquitous sonic force actually represents.

Ultimately, our evolutionary biology, as well as enculturated responses from cinematic consumption, makes us predisposed to sound generating strong intuitive perceptions as well as numinous emotions in the face of fantastic worlds, characters

and situations. Science fiction is short sold if it does no more than simply transact narrative danger at cognitive level. (Ultimately, the question of Captain America's likely success in the final reel is hardly an interesting one.) At its best, this genre is a rich territory for the exploitation of our fundamental primal and cultural susceptibilities. Importantly, we are already protected from the dangers of plot and elements of fantasy polluting stores of extant, real world knowledge (Tooby & Cosmides, 2001, 10). Efficient neurological firewalls protect, encourage and preserve adaptive lessons whilst being resistant to any lasting effects of imaginative, useless or corrosive 'entertainment'. So armed, we are free to roam fictive danger whilst extracting from the experience valuable lessons - ethical, moral, personal, spiritual - to draw back into our everyday lives. No - the real danger has never lied in the questions of what will happen or any garden-variety technophobia. Whether by effortless, subversive grace or the effortful, absolute force coming from the speakers, the reasons for our excitement, wonder, fear and anxiety resonate well beyond plot and 'lessons'.

Ultimately, the more intriguing possibilities science fiction opens involve questions about the aural construct of identity, it's perspective, stability and reliability. These issues are unsettling enough. In the face of challenging environments, general uncertainty and broad suspicion, the umwelts we inhabit can start to feel truly dangerous. "...cracks in the universe are experienced as cracks within you, through which a 'swarm' of intensities hive and host" (Redmond, 2011, 56). Science fiction's gift, with sound as its mechanic, is its capacity to exploit our aforementioned susceptibilities to counterweight the dangerous unknown with the sublime unknown, whilst all the while making us *feel*. It's the genre most likely to lead us into a territory to question:

Just what kind of an organism am I?

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2001: A space Odyssey. 1968. Stanley Kubrick (director), A.W. Watkins (sound supervisor).

AVP: Alien versus Predator. 2004. Simon Gershon & Jeremy Price (supervising sound editors), Harald Kloser (composer).

Beyond the Black Rainbow. 2010. Panos Cosmatos (director), Eric Paul (sound designer), Jeremy Schmidt (composer).

Contact. 1997. Randy Thom (sound designer), Alan Silvestri (composer).

Gravity. 2013. Alfonso Cuarón (director), Glenn Freemantle (sound designer), Steven Price (composer).

Hardware. 1990. Kate Hopkins & Jonathan Miller (sound effects designers), Simon Boswell (composer).

Oblivion. 2013. Ren Klyce (supervising sound designer), Anthony Gonzales, M83, Joseph Trapanese (composers).

Ophelia: Apophenia. 2012. Richard Grant (director), Darrin Verhagen (sound designer & composer).

Panic Room. 2002. David Fincher (director), Ren Klyce (sound designer), Howard Shore (music).

Pitch Black. 2000. David Twohy (director), Tom Myers (sound designer), Graeme Revell (composer).

Solaris. 1972. Semyon Litvinov (sound), Eduard Artemev (composer).

Star Trek V: The Final Frontier. 1989. William Shatner (director), Mark Mangini (sound effects), Jerry Goldsmith (composer).

Star Trek: The Motion Picture. 1979. Robert Wise (director), Richard L. Anderson (supervising sound editor), Jerry Goldsmith (composer).

Star Wars. 1977. George Lucas (director), Ben Burt (sound designer), John Williams (composer).

Sunshine. 2007. Danny Boyle (director), Glenn Freemantle (sound designer), Underworld & John Murphy (composers).

Terminator 2: Judgement Day. 1991. James Cameron (director), Gary Rydstrom (sound designer), Brad Fiedel (composer).

The Terminator. 1984. James Cameron (director), David Campling (supervising sound editor), Brad Fiedel (composer).

Tron: Legacy. 2010. Joesph Kosinski (director), Steve Boeddeker (sound designer), Daft Punk (composer).

Westworld. 1973. Michael Crichton (director), Richard S. Church & Harry W. Tetrick (sound), Fred Karlin (composer).

ⁱ Eyetracking research by Russell, Redmond, Robinson and Verhagen build upon established sound/no sound tests of viewer film experiences in the exploration of this idea. (*In print.*)