Music Composition Portfolio and Commentary

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Abstract

This practice-based research project explores the development of a compositional approach that begins with an interest in sonifying biological patterns. It utilises an emergent, exploratory methodology that draws on a variety of contexts—including acousmatic music, metaphor, psychedelics and electronica—which are combined through a portfolio consisting of six musical works. More specifically, the emergence of a sonic typology that involves experimentation, prior musical experience(s), and a revitalising process originating in reflections of biological patterns plays a central role in the development of the portfolio. It culminates in a multiscale approach to musical composition where strands of materials, ideas and techniques coalesce.

Portfolio Contents

The works in the portfolio were composed in the following order and spatial formats:

1. ***Image 8*** - (Duration: 9.19)

   — *Image 8* was composed for stereo and discrete 4.1 formats.
   — The stereo file is titled *Image 8 (Stereo).wav*
   — The 4.1 files are titled,

      - *Image 8 (4.1) – L.wav*
      - *Image 8 (4.1) – R.wav*
      - *Image 8 (4.1) – Ls.wav*
      - *Image 8 (4.1) – Rs.wav*
      - *Image 8 (4.1) – LFE.wav*
      - *Image 8 (1st Order FuMa).aif*

   — The last file above is a 1st order Furse-Malham ambisonic file which is to be played back alongside the discrete multichannel files.

2. ***0_2*** - (Duration: 12.07)

   — *0_2* was composed as a 1st order Furse-Malham ambisonic file.
   — The ambisonic file is titled *0_2 (1st Order FuMa).aif*
   — A stereo reduction of the ambisonic mix for *0_2* is also provided. It is titled '*0_2 (Stereo Reduction).wav'* - this is for reference purposes only.

3. ***Bh/5ONiCr (aka Barons Haugh Sonicar)*** - (Duration: 12.27)

   — *Bh/5ONiCr* was composed as a 1 storder Furse-Malham ambisonic file.
   — The ambisonic file is titled *Bh/5ONiCr (1st Order FuMa).aif*
   — A stereo reduction of the ambisonic mix for *Bh/5ONiCr* is also provided. It is titled '*Bh/5ONiCr (Stereo Reduction).wav'* - this is for reference purposes only.

4. **@** - (Duration: 19.51)

   — @ was composed for binaural format.
   — The binaural file is titled *@ (Binaural).wav*

5. ***W-4*** - (Duration: 35.11)

   — *W-4* was composed for binaural format.
   — The binaural file is titled *W-4 (Binaural).wav*

6. ***î-n-k .', 26*** - (Duration: 15.36)

   — *î-n-k .', 26* was composed for binaural format.
   — The binaural file is titled *î-n-k.', 26 (Binaural).wav*

Commentary Contents

Acknowledgements

I would first and foremost like to thank my supervisor Professor Nick Fells for his guidance, encouragement and support throughout this research project.

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1. Introduction

The underpinning methodology for this practice-based research project is an emergent one. It begins with a focus on reifying biological patterns in sound and musical composition, before being recalibrated and broadened to embrace different avenues of exploration. Some of these avenues include different 'lenses' of style and musical affect through which to view my work(s). These lenses and a collection of specific sonic types emerged as the portfolio developed. In particular, 3 revitalising sonic types come to play a central role in the development of the portfolio.

The portfolio transitions through different spatial formats—and bottom-up and top-down approaches to form—culminating in a multiscale approach where strands of materials, ideas and techniques coalesce.

This trajectory, essentially an unfolding of a compositional methodology, is elaborated in detail throughout this commentary.

The following introduction begins by discussing the revitalising sonic types. There is then a summary of the development of the approach, followed by a detailed discussion of prior musical experience(s) and ways in which these have shaped the portfolio. A summary follows discussing the progression of spatial formats. It concludes with a discussion of similarities between some contemporary pieces and my work.

This introductory chapter[1] therefore lays the groundwork for the writing on each piece that follows.

[1] I use the word *chapter* for the main numbered parts of the commentary, and *section* for headings within a chapter.

1.1 Revitalising Sonic Types

1.1.1 Introduction

Various sonic types had a particularly significant effect in shaping the development of this portfolio. I describe them collectively as *revitalising sonic types* in the commentary; after they emerged, they provoked new ways of thinking and making that helped the portfolio to develop. This is discussed in more detail in the writings on the pieces. Individually I describe them as:

- Algorithmic Chains of Sonic Shards
- Streams of Digital Fizz
- Field Recordings and Human Voices

The following sections provide some context for further discussions regarding these sonic types. Their emergence and influence in the development of the portfolio is discussed in the writings for the compositions.

1.1.2 Algorithmic Chain(s) of Sonic Shards [2]

I create Algorithmic Chains of Sonic Shards using a Slippery Chicken[3] script which contorts audio files according to rhythmic and pitch data structures. The script's output comprises sharp-edged fragments of sound (what I have called shards) that are linked together in a staggered manner to form a chain of sound. In using the metaphor 'chain' I am evoking a physical chain as opposed to a mathematical evocation, such as a Markov Chain.

The script requires the insertion of multiple audio files to generate output. When one inserts new audio files, variations of shards are produced. The timbre of each shard, within a chain of shards, is differentiated according to the audio files inserted into the script.

[2] Link to Algorithmic Chain(s) of Sonic Shards script and audio:
https://www.icloud.com/iclouddrive/042xLLQDEEILFt-br3u71TFpg#Algorithmic_Chains_of_Sonic_Shards_-_Script
[3] Slippery Chicken is an algorithmic composition software program: https://michael-edwards.org/sc/

Such a chain constitutes a cycling through of the inserted audio files, with a simultaneous contortion of these files according to the script's data structures.

This process appears to evoke granulation in that it takes time-slices of different input files and reorders their sequence. However, the duration of each shard is longer than the typical duration of a grain within the context of granular synthesis, which is a few milliseconds (Kuehnl, 1995). Other characteristics associated with granulation are also lacking in this script and its output—such as freezing, random selection and grain size variation. (Roads, 2015)

1.1.3 Stream(s) of Digital Fizz [4]

I use the word 'stream' to describe the continually wavering nature and flowing process of this sonic type as it unfolds. In this way it seems to evoke the persistent flowing of liquid (like a river) as opposed to a finite data stream, or the continuous flow of computer data or instructions.

I create Streams of Digital Fizz using a Max Patch that outputs an unlimited amount of constantly fluctuating sonic material. The patch that generates streams of fizz contains a sampling component that requires the insertion of an audio file to generate output. The patch contorts the inserted audio file according to stochastic algorithmic structures; it mutates the file beyond recognition. More specifically, the patch transforms the file into a stream of buzzes, glitches, rustles, clicks, hisses, mangled tones and gritty noise. A stream of fizz can also seem more active, thin, dense, robust, louder or quieter depending on the audio file dropped into the patch.

1.1.4 Field Recordings and Human Voices

Most field recordings comprise widespread spectral content that possess "broad acoustic energy distribution of various intensities." (Loufopoulos and Mniestris, 2011)

[4] Link to Stream(s) of Digital Fizz Max patch and audio:
https://www.icloud.com/iclouddrive/0Nz7vsu2NjyEXQlaJx9JbFfuw#Streams_of_Digital_Fizz_-_Patch(es)

Field recordings are highlighted in most of my works through being sporadically juxtaposed with more spectrally restricted abstract sounds (e.g. due to digital production or filtering). The only piece where field recordings are absent is in *Image 8*; it was composed before I began incorporating such recordings more consistently in the portfolio. Each iteration of field recordings in my pieces is also a different recording of a different scene. Including distinct recordings facilitates engagement in my listening through trying to decipher the relation(s) between scenes.

I included field recordings depicting sounds of the everyday to reify ideas—including psychedelic effects and notions of tension—that arose as the portfolio developed (these ideas are discussed in greater depth later when discussing the pieces). Besides, sounds of the everyday increases the chance of engaging a listener's imagination as they are likely familiar to most. As John Young mentions in *Inventing Memory: Documentary and Imagination in Acousmatic Music*: "By capturing sounds of actions and objects, recording engages our habitual mechanisms of sound-source recognition, which may embrace associative meanings we ascribe to sounds in daily life, with the potential to evoke 'images' that may be available as form-bearing elements through reference and narrative." (Young, 2008) Listening to familiar sounds of recorded actions, objects or locations can more reliably facilitate associations in a listener's imagination, perception and memory than purely abstract sonorities. (Truax, 2012)

The familiarity of the voice also seems to have even more potential in generating associations for a listener, through being a particularly recognisable sonic type. Trevor Wishart mentions that the human voice,

> …. has a high intrinsic recognisability…. partly due to the obvious immediate significance of the human voice to the human listener, but also the unique complexity of articulation of the source. The ability to produce a rapid stream of timbrally disjunct entities is uncharacteristic of any other source (except perhaps bird mimics of human beings such as parrots). (Wishart, 1996)

In this way, the inclusion of voices in the portfolio is another potential point of engagement.

In discussing field recordings and human voices in the commentary, I am only drawing briefly on specific aspects within the extensive fields of research and activity that comprise soundscape studies. The use of such recordings spans many research areas and topics that are beyond the scope of this commentary.

1.1.5 Revitalising Sonic Types Overview

I disperse the above sonic types sporadically in each piece as this seems to make them more noticeable than if they were a constant presence. The main way they interact in my works is through layering. They often move over, across or below each other and other sonorities. The application of them evokes Edgard Varèse's *zones of intensities*:

> These zones would be differentiated by various timbres or colours and different loudnesses. Through such a physical process these zones would appear of different colours and of different magnitude, in different perspectives for our perception. The role of colour or timbre would be completely changed from being incidental, anecdotal, sensual or picturesque; it would become an agent of delineation…. These zones would be felt as isolated, and the hitherto unobtainable non-blending (or at least the sensation of non-blending) would become possible. In the moving masses you would be conscious of their transmutations when they pass over different layers, when they penetrate certain opacities, or are dilated in certain rarefactions. (Varèse, 1966)

In a similar way, each of the sonic types I have called attention to thus far are audibly demarcated when deployed in a work; they remain as discrete sonic entities, as opposed to coalescing into one sonority within a piece. The only exception is human voices which, in some field recordings, are situated within a real-world soundscape.

Each iteration of the revitalising sonic types is different in the portfolio; no iteration of each sonic type is repeated precisely. The varying spectral properties between discrete iterations of sonic types in a work afford more paths of experimentation and shapes of extension to work with than if they were repeated exactly.

1.2 Portfolio Summary and Context

This section summarises the development of the portfolio, reflecting on context and prior musical experiences. The research process is then discussed in more detail in the following chapters on each individual piece.

1.2.1 Summary of Some Important Points in the Development of the Portfolio

I began this practice-based research project by attempting to sonify biological patterns (Fibonacci, L-systems and Swarms) to explore their potential in composition. My initial attempts in using such patterns as the foremost approach to constructing works seemed to inhibit more flexible explorations of varied materials and the production of aesthetically compelling output. This approach diverged into metaphorically reflecting such patterns through synthesis evoking animal sounds, and field recordings, in the first three works.

After composing *Image 8*, I reused and modified some materials developed for that piece to form significant parts of *0_2*'s construction. Some of these materials included Algorithmic Chains of Sonic Shards and Streams of Digital Fizz. I also introduced human voices in *0_2* to enhance the aesthetic potential of the piece, and to enhance a sense of focus in my listening. Although all of what would become revitalising sonic types emerged in *0_2*, their compositional utility, distinctiveness, and adaptability became more apparent through working on *Bh/5ONiCr*. Sounds that metaphorically reflect biological patterns (i.e. animal sounds) then simply increased the chances of engaging a listener's imagination, as opposed to being more central in underpinning a compositional approach.

A change from focusing on implementations of biological patterns to relying more on shards, fizz, voices and diverse field recordings when beginning to construct a work seemed to permit more efficiency, flexibility and new ways of thinking that facilitated the development of the portfolio. In other words, this saw a departure from a sense of rigidity produced by adhering to reflections of biological patterns, to more flexible and robust

ways of making and thinking in the portfolio. This change prompted by the use of shards, fizz, field recordings and voices is why I call them revitalising sonic types.

Some of the new ways of thinking included the consideration of other lenses in which to view my work—namely, through the lenses of psychedelic effects, intimacy and tension. These lenses became apparent when composing @ and significantly influenced decisions in the next piece: *W-4*. The techniques established in *W-4* then became important parts of the compositional approach for the final work in the portfolio: *î-n-k.', 26*. This piece is a culmination of the ideas, techniques and reflections developed through the portfolio.

In *î-n-k.', 26* I created distinct sections based on techniques established in prior works, before consolidating them to construct most of the piece. In other words, part of the approach for *î-n-k.', 26* constituted a top-down strategy where several templates are created that can be placed at different points in a work to change the form, and whose details are filled in at a later stage of composition.

I used more of a bottom-up approach for most of the other works in the portfolio wherein form is constructed by piecing together materials on lower-levels of structure that then grow into an extended form, rather than through a prior high-level conception of structure. This accords with Curtis Roads' description of bottom-up planning where form is constructed,

> …. as the final result of a process of internal development produced by interactions on low levels of structure—like a seed growing into a mature plant…. [these kinds of compositions] are pieced together out of little blocks during long periods of gestation, revision, major reorganization, and all manner of editing and refinement in which the final form is only discovered far into the process. (Roads, 2015)

This way of constructing a piece also corresponds with Trevor Wishart's notion of slow improvisation: "In general, all the time proportions in my work are 'calculated' by listening; a typical experience is to create a musical phrase which feels (after continued listening, reworking, etc.) just the right length, only to have to cut it down (or even reject it altogether) when it is placed in its musical context in a piece I'm building." (Wishart, 2009)

Selecting, arranging and processing sonorities in an improvisatory manner can be thought of as a process of 'intuitive' decision-making. As Keith Swanwick asserts in *Musical Knowledge: Intuition, Analysis and Music Education*, intuitive decision-making "may lead us in effect to say, 'I feel that this is the right thing to do/way to go/answer to the problem'. There is at least the appearance of logic in our intuitive judgements—'the heart has its reasons'—though they do not by themselves attempt to explain why, to analyse." (Swanwick, 2002) From a psychological perspective, it seems that intuitive decision-making is predicated on nonconscious judgements that rely on domain-specific knowledge accumulated in the past. (Sinclair, 2010)

In the context of this portfolio, the nonconscious judgements employed appear to have been influenced by prior experience of making and listening to music. More specifically, three successive periods of engaging with specific types of music seem to have been particularly influential in shaping what appears as intuitive decision-making in the portfolio, namely, making and listening to:

- Psychedelic Blues-Rock
- Electronica
- Electroacoustic music

The following subsections discuss significant experiences in each of these periods, draw comparisons between pieces associated with such experiences and my works, and detail how these experiences appear to have influenced the development of my compositional approach. Many other experiences have also influenced intuitive decision-making when making this portfolio; the following accounts appear salient with regards to significant points in the development of the approach. A comprehensive overview of all intuitive decision-making in the portfolio is beyond the scope of this commentary.

1.2.2 Psychedelic Blues-Rock and *Voodoo Chile*

I regularly listened to blues, rock and related genres as a teenager. The types of music I listened to at this time seem to have been influenced by being in a band that played

psychedelic blues-rock music, akin to the work *Evaporate* by 35007. One recording that I listened to repeatedly and probably more than any other around this time was *Voodoo Chile* by Jimi Hendrix. *Voodoo Chile* features recurring waves of intensity that grow and decay. The moments of highest intensity heard in *Voodoo Chile* feature virtuosic and seemingly improvised guitar and organ playing taking centre stage, departing from more constrained formulaic playing in the relative plateaus of the work. The sections of more constrained playing are also accompanied by the singing of lyrics that seem to evoke other worlds, congruous with the Jimi Hendrix brand that is associated with psychedelics. The departure from the singing of such lyrics and more constrained formulaic playing into flurries of improvisation appears to evoke a sense of attempting to transcend the mundane world. In a similar way, tranquil everyday field recordings sometimes precede flurries of intense abstract activity in my works (e.g. at 2.45 in Bh/5ONiCr and 6.44 in W-4) evoking a sense of transcending the everyday into an abstract sound world.

The recurring waves of intensity that grow and decay in *Voodoo Chile* also resemble the recurring growth and decay of intensity in my works. The more placid sections in my works, and in *Voodoo Chile*, appear to build anticipation—making bursts of intensity more impactful than if the continuum of intensity was more restricted. The sense of anticipation seems predicated on comprehending the growth and decay of intensity as a repeated structural pattern. The duration of more placid sections in my works also appears to have been influenced by the duration of more tranquil passages in *Voodoo Chile*.

Moreover, the psychedelic allusions of the Jimi Hendrix brand, and in *Voodoo Chile*, seem to have influenced the sonic images of psychedelic effects that I became aware of through composing @—and why associated materials were included and sculpted as they were in the first place.

1.2.3 Electronica

My musical interests changed radically from rock, blues and related genres to EDM genres such as house, acid-techno and breakcore, after having several rapturous experiences listening to such music at raves. Subsequent interests resided in trying to make works that resembled the pieces I had been affected by—e.g. works akin to *Au Seve* by Julio Bashmore, *s950tx16wasr10 [163.97][earth portal mix]* by Aphex Twin, *and*

Hairmetal by Duran Duran Duran—in attempts to recapture some of the euphoria experienced when listening to similar music at the aforementioned raves.

Some aspects from this period of listening and making electronic dance music of this kind appear to have seeped into the compositional decision-making for this portfolio, especially in the final two works (*W-4* and *î-n-k . ', 26*). For instance, the passage between 1.47-2.37 in *W-4* appears to sound like a combination of the coarse breakbeats in *Phlange Phace* by Aphex Twin, algorave akin to *5schim* by Richard Devine, and breakcore akin to *Fuck Anyone Who Wasn't Into The Stuff I'm Into Before I Was* by Dev/Null. The section between 6.45-7.12 in *W-4* also seems to evoke frenetic breakcore akin to *Stormtower* by Xanopticon, as well as intense stuttering effects heard in *War on Codex* by Cocktail Part Effect. The synthesiser lines heard between 7.06-7.12 in *W-4* and between 0.10-0.19 in *î-n-k . ', 26*, also resemble the main synthesiser lead in *Tamphex – Headphuq Mix* by Aphex Twin. More broadly, tropes of EDM such as syncopated hi-hats, off-beat synthesised handclaps and the four-to-the-floor kick drum are featured between 3.15-4.15 and at 10.10-10.25 in *W-4*, and at 2.23 in *î-n-k . ', 26*. The section between 3.15-4.15 in *W-4*, in particular, features these tropes of EDM and strongly evokes the percussion patterning and timbres of *0303am* by Tv.Out.

The ambient music in my works appears to have also been influenced by experiences of the aforementioned raves. These events continued long into the morning in someone's living room with ambient music, akin to *An Excrement Suite for Voices Lost Again* by Kyle Bobby Dunn, playing to seemingly counteract the intensity of the EDM experienced hours prior in a club. In a similar way, the ambient soundscape that emerges at 13.05 in *W-4*, and at 6.05-6.40 in *î-n-k . ', 26*, appears to have stemmed from associating this seemingly ethereal kind of ambient music with a counterbalancing of sonic intensity.

Moreover, I used DAWs such as Ableton Live to make works during this period. Habits and patterns of using DAWs, and their affordances and limitations, will have likely influenced intuitive decisions when using such software for this portfolio. For instance, I habitually employed Ableton Live's 'Time-Warping' sampling feature when sculpting material because of its ease of use, as well as the rich and varied sonic results it provided. The limited parameters of this device, and the differing accessibility of each parameter, will have inevitably influenced the kinds of sculpting decisions that I made.

My regular use of numerous softsynths and other plugins when composing music during this period seems to have also influenced the kinds of processing and synthesised material that appear in the portfolio.

1.2.4 Electroacoustic Music and Trio

Beginning to study electroacoustic composition before undertaking this PhD uncovered more experimental music works across different eras, and ways of composing that were new to me (e.g. via algorithms).

Trio by Maja Ratkje was one piece that seemed to trigger a change in the development of my compositional practice. Initially perceiving the work as a manifestation of free expression generated a desire to compose more experimentally, rather than adhering to the formulaic tropes of EDM that I had been pursuing. Although, trying to compose more experimentally created music that seemed to combine real, virtual and non-real environments (Field, 2000)—in comparison to *Trio* which appears to reside in real and virtual environments. Nonetheless, *Trio* and most of the works in the portfolio share some comparable features; it seems that listening to *Trio* and having been inspired to compose in a more experimental way may have influenced other decisions when making pieces.

Trio features adept vocalisations and studio-recorded sound effects that appear to interact throughout the work as two distinct lines of material—with the vocalisations seeming to imitate and respond to the sound effects, and vice versa. The vocals and sound effects seem to continuously move and interact via stabbing gestures, often interrupting and overlaying each other. This kind of interaction, and the continual juxtaposition of landscape morphologies (ibid. 2000) that never seem to resolve, appears to evoke a sense of tension between the two lines of material. It seems the vocals reside mostly in the real throughout the piece, only occasionally sliding into the virtual when processing is applied. The sound effects on the other hand seem to reside predominantly in virtual environments; Ratkje processed most of these sounds in such a way as to provide features and cues of the real, without representing the real per se.

The juxtaposition between two distinct types of material in *Trio* that occupy different parts of the landscape morphology continuum, appears to evoke the juxtaposition between everyday field recordings and an abstract soundscape which became a significant feature of my works. The stabbing interactions of vocals and sound effects that interrupt and overlay each other in *Trio* also seem to evoke the abrupt cutting in and out of everyday field recordings in my abstract sound worlds. However, field recordings appear intermittently in most of my pieces, as opposed to the continuous presence of vocals and sound effects in *Trio*. When field recordings cut in and overlay the abstract soundscapes in my works, tension seems to arise in a similar way to that perceived when listening to *Trio*. Although, it seems the abrupt transitions that field recordings often exhibit in my pieces—where they eject from a real or virtual environment into a non-real soundscape—is a way of resolving the sense of tension that never appears to come in *Trio*. It seems that the tension I perceive in *Trio* also influenced decisions in later works to include and reflect on it as a recurring feature in the portfolio.

As the portfolio developed, a greater variety of materials and spectral diversity was afforded by combining non-real, virtual and real environments in my works—seeming to enable greater scope for sonic experimentation and exploration (a desire *Trio* had initially inspired). For instance, working in a non-real environment, combined with the real and virtual, seemed to afford more diverse spectral characteristics than exclusively working in a non-real environment (as in *Image 8*). The greater diversity of materials and spectral characteristics helped to provide a more dynamic shape to each work.

During this period of beginning to study and make electroacoustic music I also used stark high-frequency material intermittently in a piece to enhance a sense of a wide spectral contour. In other words, such high frequency material helped illuminate the canopy dimension of Denis Smalley's *spectral space framing* (Smalley, 1997) in these works; the material stood out by appearing distinct from other sounds in each piece. This technique is also featured intermittently in each work of this portfolio (e.g. at 14.05 in î-n-k.', 26), helping to create shape.

Another technique I used during this period, and in this portfolio, was distorting materials to broaden a sense of dynamic range—which seems to have been influenced by listening to *Trio*. The dynamics of the voice and sound effects in *Trio* appear to mirror each other

throughout the work, with most of the piece sounding quite subdued before culminating in a section of high intensity. This sense of high intensity seems produced by the application of distortion to the vocals and other sounds. Similarly, a wide dynamic range is enhanced in works for this portfolio through the use of distortion and noise after more subdued periods (e.g. between 11.03-11.12 in *Bh/5ONiCr*).

The section of high intensity towards the end of *Trio* seems to also evoke the temporal placement of similar textures in some of my works, e.g. between 9.15-10.05 in *0_2*. However, the density, spectral characteristics, duration and intensity of such textures varies between my pieces, and they have more of a droning quality than that heard in *Trio*. Nonetheless, they appear to have been inspired by this section in *Trio*. Sounds that evoke screaming, and the kinds of vocal articulation in @ (e.g. between 11.03-12.27 and 12.44-13.19) and *î-n-k.', 26* (e.g. between 7.24-8.10 and 8.29-8.48) also seem to have been influenced by the kinds of screaming and vocal articulation characteristic of Ratkje's style.

During this period of first encountering some of Ratkje's work and studying electroacoustic music, I was also introduced to potential ways of working with the sonification of biological patterns. This sparked curiosity with regards to the aesthetic effects this approach could create and whether it could enhance the ways of making I had been using up until then. Most of the works I was aware of that had used biological patterns had done so via electroacoustic composition. It then seemed appropriate to begin the compositional process for this portfolio by continuing to work in a more experimental acousmatic manner, excluding overt instances of earlier musical interests. More aspects from the above three periods of engaging with different types of music gradually seeped through into the compositions, as the approach became less concerned with conceptualisations of biological patterns.

Other considerations—including techniques and reflections on sonification, metaphor, psychedelics and acousmatic music—influenced compositional decisions at different stages throughout the portfolio (as detailed in the following discussions of the works). Some of these decisions included choices of spatial format(s), which progressed from discrete multichannel and stereo, to ambisonics, and then to binaural in the latter stages of developing the portfolio.

The switch from discrete multichannel diffusion to ambisonics was initiated by attempts to create a sense of material beyond the speakers. Ambisonic diffusion permitted a more satisfactory mode of projecting a sound beyond the speakers than discrete multichannel diffusion. It also became apparent that ambisonics enables the spatial attributes of a work to be played back more consistently in diverse presentation environments.

One reason for then switching from ambisonics to binaural was that the latter appeared to be the immersive format that most closely resembled the all-encompassing personal immersion in other worlds often associated with psychedelic experience(s)—which I became interested in trying to represent as part of my approach.

I also used the binaural format because of its capacity to reinforce a sense of intimacy in a piece. Reinforcing a sense of intimacy could enhance engagement in listeners' perception of my works.

Besides, binaural seemed more efficient and portable than the spatial formats previously used.

These points regarding spatial formats are discussed in greater detail in the following chapters.

1.2.5 More Similarities in Other Works

Drawing on various approaches, reflections, and styles from different contexts evokes George Crumb's compositional method. Many of his pieces use a web of approaches and references which form a large part of their basic construction. (Petersen, 2010) More precisely, Crumb uses musical quotations, various musical styles, numerical symbolism, verbal and linguistic references and 'mythologizing strategies' in many of his works—such as in *Black Angels*. (ibid. 2010) As Nils Holger Petersen mentions in *Quotation and Framing: Re-contextualization and Intertextuality as Newness in George Crumb's Black Angels*: "…. musical—as well as intermedial—intertextuality is part of [Crumb's] style, manifested not only through musical quotations and references to historical musical styles but also through verbal references in work titles as well as instructions in the score which

connect the composition to other items, works, genres, features, or discourses, in various media." (ibid. 2010) Crumb's considered assimilation of miscellaneous references out of a plethora of choices seems to help imbue his work with a sense of distinctiveness. The inclusion of diverse approaches and references also seems to provide a glimpse into some of Crumb's interests and experience(s), musical and otherwise.

A more contemporary work that appears constructed via an amalgamation of diverse material(s) is *8* by Klara Lewis and Simon Fisher Turner. *8* comprises several discrete sonic types that more closely align with the kinds of sonorities in my works, in comparison to those featured in Crumb's pieces. Some predominant sonic types in *8* that resemble sounds in my works include human voices, field recordings, electronica, and ethereal ambient soundscapes that combine to form a multi-layered abstract sound world. The overt appearance of select materials throughout *8* seems to help imbue the piece with a sense of distinctiveness and provide a glimpse into some of Lewis' and Turner's musical interests—as with Crumb's works.

Moreover, recurring moments of tension in *8* seem to be created by discrete types of material abruptly emerging and cutting off other predominant sonorities to gain prominence (e.g. at 3.17 and 6.03)—evoking the cutting in and out of material in my works (e.g. at 8.27 in *0_2*, 7.40 in *W-4*, or 0.52 in *î-n-k . ', 26*). The recurring cutting in and out of discrete material in *8* and my works appears effective as a structural device that opens divergent paths of sonic exploration in listening. The opening of such paths occurs through deviation from the sonic development cultivated before the overt change of predominant material(s).

One pronounced difference between my works and *8* is that the spectral envelopes of sounds in my pieces change much more frequently than those in *8*. In this sense they are more akin to the continually altering spectral envelopes in another contemporary work: *Sky Dice / Mapping the Studio* (*SD/MtS*) by Marcus Shmickler. The sense of continuous rapid change in *SD/MtS*, and my pieces, helps anchor my focus in each moment of listening; each moment features sonorities that appear distinct from prior material heard in the work(s). Furthermore, the ebb and flow of intensity in *SD/MtS*—with recurring louder sections contrasting with relative plateaus—helps to shape the work. The shape and wide dynamic range of *SD/MtS* are more akin to that of my pieces, than that of *8*.

The next chapters will present the portfolio works in more detail, referring back to the above discussion(s) intermittently.

2. *Image 8*

Image 8 is a discrete 4-channel work that was premiered in November 2018 at the Centre for Contemporary Arts in Glasgow, for the Sound Thought postgraduate research conference. The piece also exists in stereo format. As the first work composed for this portfolio, *Image 8* permitted experimentation with various materials—some of which would later develop into what I have called revitalising sonic types. In particular, what I later regarded as Algorithmic Chains of Sonic Shards and Streams of Digital Fizz were incubated in this work—formed out of attempts to map Fibonacci patterns. Flexible approaches in working with Fibonacci sequences appeared to permit more experimentation and aesthetically compelling material, than strictly adhering to the sonification of biological patterns as an approach to construction.

Sonifying Biological Patterns

I began making *Image 8* with the intention of sonifying biological patterns, such as Fibonacci and L-system patterns, to evaluate their aesthetic effects in composition. I took inspiration from the *natural environmental model* in environmental aesthetics whereby scientific knowledge about nature and natural patterns can reveal their aesthetic qualities. (Carlson, 2020) I was interested in mapping *scientific representations* of biological patterns into sound to explore potential aesthetic outcomes. A scientific representation is "any representation that is the product of a scientific endeavour" (Frigg and Nguyen, 2020), and can include "thermometer readings, flow charts, verbal descriptions, photographs, X-ray pictures, digital imagery, equations, models, and theories." (ibid. 2020) For my purposes, I was concerned with sonifying the numerical representation of biological patterns—such as the Fibonacci sequence (i.e. 0, 1, 1, 2, 3, 5, 8, 13, etc).

An initial assumption was that by sonifying biological patterns, listeners would be able to hear the patterns, and recognise them as patterns. However, biological patterns that exist in visual and conceptual domains, such as Fibonacci and L-systems, have no sonic correlate(s) in nature.[5] It became apparent that even if listeners understood how I had

[5] Although Fibonacci and L-system patterns have no sonic correlates in nature, there are precursors to using biologically-influenced patterns as compositional mechanisms—e.g. in the piece *Cells* by Hanspeter

applied numerical representation(s) of these patterns in my works, they would be unlikely to discern their audio mappings from listening (not least, within the context of a long musical piece).

Moreover, sonified data can become influenced by the mapper's own aesthetic bias. When translating data into the sonic domain, there can be a lot of manipulation by the mapper regarding how the data will sound—such as what type of synthesis will be employed to playback material. Much of the data used for mapping is also often manipulated to conform to the supposed ideal of an imagined listener. For instance, in the piece *The Climate Symphony*[6] the temporal characteristics of the data are manipulated to conform to realistic listening timescales of human listeners. (Quinn, 2001) A considerable amount of data in *The Climate Symphony* is also arbitrarily assigned to musical parameters that seem unconnected to the initial statistics. In any case, with mapping any kind of data into sound, one would have to select desired parameters to map to (e.g. pitch, timbre, duration and volume). The decision would inevitably skew the precision of the sonification; sonified data is likely always going to be influenced by preferential biases of the mapper and listeners. Additionally, literally mapped representations of data limit the scope for variation and manipulation, which can often result in output lacking distinctiveness and what we might describe as points of sonic interest or musical shape. Acknowledging this, my compositional interests were concerned with the aesthetic potentialities of imitating data in sound; it was not essential for the mapping of biological patterns to be a literal representation of data in sound.

My initial intention was to explore the potential in mapping one type of biological pattern before focusing on others. I chose the Fibonacci sequence for *Image 8*, having been aware of how some composers had implemented it in their works. For instance, the Fibonacci pattern contributes significantly to the form of *Klavierstücke IX* by Karlheinz Stockhausen. (Kramer, 1973) Stockhausen also subtly used the Fibonacci pattern in other compositions, such as *Telemusik* where the durational scheme includes Fibonacci proportions. (ibid. 1973) Furthermore, Béla Bartók seems to have used the Fibonacci

Kyburz where the compositional procedure is defined by L-System rules (Pasquier, 2020), and in *Adieu* by Karlheinz Stockhausen where the Fibonacci series influence durations in the piece. (Kramer, 1973)

[6] *The Climate Symphony* is a one-hour performance of sonification research by Marty Quinn of Design Rhythmics Sonification Research Lab and BAE Systems. (Quinn, 2001)

sequence to determine durational proportions in *Music for Strings, Percussion and Celesta* (Lendvai, 1999); Edgard Varèse employed the Fibonacci sequence to determine proportioning strategies for *Poème Électronique* (Arnold, 2006); Luigi Nono used successive note-lengths derived from the Fibonacci sequence in *Il Canto Sospeso* (Kramer, 1973); Iannis Xenakis assigned pitches to a durational value corresponding to a Fibonacci number in *Anastenaria, Le Sacrifice* (Barthel-Calvet, 2011); and Ernst Krenek also constructed proportions in his work *Fibonacci Mobile* using the Fibonacci series (Ogdon and Krenek, 1972).

Mapping Approaches

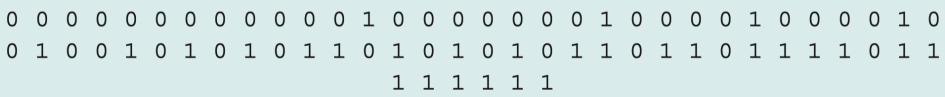
I designed a Fibonacci-based algorithmic script in Slippery Chicken to create opening material for this piece. Richard Bunger's *Pianography: Fantasy on a Theme of Fibonacci*, influenced the decision to use this output as opening material for *Image 8*. In *Pianography*, a Fibonacci theme is expressed at the outset, heralding the various Fibonacci proportions to come in the piece. (Kramer, 1973) Drawing on Bunger's work, I wanted to construct opening material for *Image 8* that would announce a Fibonacci theme. In a similar way to *Pianography*, the stating of the Fibonacci theme at the outset seemed like it could be an interesting way to set up the theme of the piece, whilst potentially signalling that more Fibonacci mappings were to come.

I used Slippery Chicken's Fibonacci-based transitions as integral components within the rhythmic, pitch and structural parts of the previously mentioned script.[7] As the creator of Slippery Chicken (Michael Edwards) has written, the Fibonacci-based transitions use "Fibonacci-based 'folding-in' structures where the new material is interspersed gradually until it becomes dominant; for example, a transition from material 0 to material 1 might look like [Figure 1]." (Edwards, 2011) I also organised the sequence of pitch-groups in accordance with Fibonacci patterning. A wide range of arbitrarily selected pitches were included in each pitch-group to allow for broad pitch distribution in the output as well. Otherwise, the pitch variations appeared too bland for the energetic opening theme I wanted. I also experimented with rhythmic patterns in the script to produce what seems

[7] Link to Fibonacci-based script:
https://www.icloud.com/iclouddrive/046KsZVhOwwmh1Vh0vuGFcEKg#sc-image8-fibonacci-code

like a basis for a strong melodic voice. This script was also the foundation for what would develop into Algorithmic Chains of Sonic Shards in the next work.

Figure 1. Fibonacci-based transition from material 0 to material 1. Note the first appearance of 1 is at position 13, with the next eight positions after that, the next again five positions after that, and so on; all these numbers are so-called Fibonacci numbers.



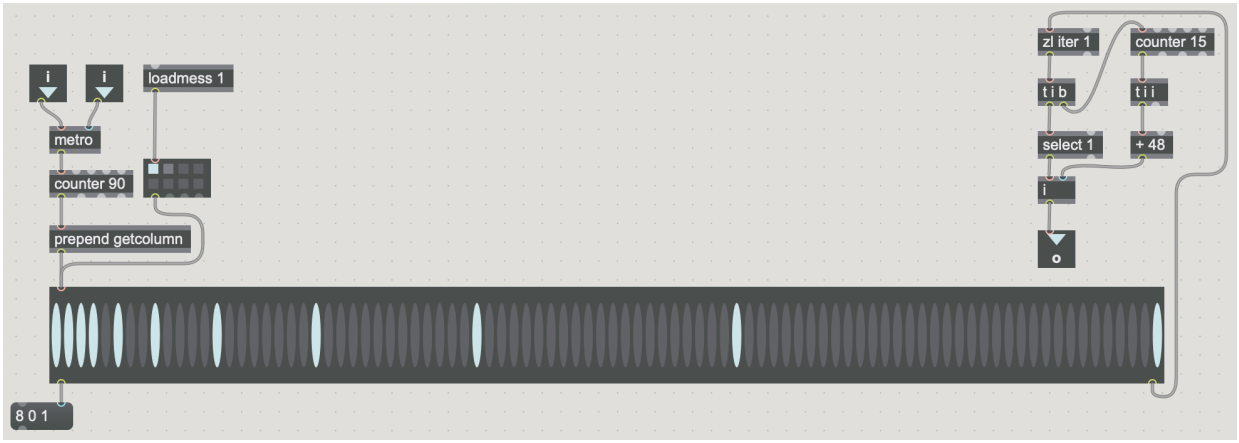
Edwards, 2011

I realised the MIDI output from this script using synthesiser DAW plugins (within Ableton Live) with non-Fibonacci-based methods. I processed the MIDI in this way to disrupt the seemingly rigid character of the Fibonacci-based Slippery Chicken output; further Fibonacci-based processing appeared like it would create more rigidity in the resulting audio. I experimented with different synthesiser devices and parameters, duplicated versions of the original Slippery Chicken output, and intertwined resultant layers to create a dynamic and aesthetically compelling sonic entity. Nonetheless, rhythmic, durational and pitch characteristics of the original script's output remained audible.

The notion of rigidity also seemed pertinent in adhering to one audio programming language when trying to implement the Fibonacci sequence in composition. With an awareness that different audio programming languages offer distinct compositional possibilities, the scope for creative output seemed limited if doggedly adhering to Slippery Chicken when trying to implement the Fibonacci sequence in *Image 8* (and other pieces). A visual programming language like Max appeared to have quite different capabilities than Slippery Chicken and could offer distinct Fibonacci approaches and output. Max's real-time interactive programming capabilities also seemed potentially useful for works to be composed after *Image 8*.

Having initially lacked programming experience in Max, experimenting with the software's functionality by creating miscellaneous patches was a way of obtaining familiarity with it. An intention was to create more Fibonacci-based patches after having developed some competence in using the software. One of the Max patches created included a Fibonacci-based abstraction that I used to trigger other sound files, effects and sub-patches according to a specific rhythmic pulse. This rhythm corresponds with the Fibonacci sequence—up to 89 until the pattern repeats (the sequence stops at 89 as the duration between events after 89 was too large for my aesthetic preferences). I named this abstraction Fibonacci Rhythm Generator (Figure 2).

Figure 2.



Metaphor and Animal Sounds

The resultant audio of some other Max patches—initially generated to learn more about Max's functionality—seemed to combine well with the Slippery Chicken script's output. I was particularly drawn to some of the Max patches' output that appeared to evoke animal sounds via what Smalley describes as an *indicative relationship* whereby a "listener, in responding to the object of perception refers to a range of phenomena outside the work; this indicative process, prompted by the object of perception, can embrace real/imagined sources and causes detected in the work, as well as more fanciful and autobiographical listener constructs." (Smalley, 1999) For instance, the predominant audio between 2.00-3.00 seems to evoke insect sounds. The bass sonority between 3.00-5.00 appears to conjure a dangerous beast; it seems to switch intermittently between growling and roaring. Transient interjections between 1.55-2.14 and 2.55-3.12 appear to

evoke bird and rodent shrieks as well. As I was interested in exploring biological patterns in composition, the evocations of animal sounds heard appeared like a metaphor for biological patterns; animals seem like a physical embodiment of such patterns through being biological entities.

The sonification of biological patterns is also inherently metaphorical through being a sonic representation of data derived from visual and conceptual domains. Both the sonification of biological patterns and evocations of animal sounds accord with Lakoff and Johnson's twofold criteria for metaphor in *Metaphors We Live By*: "(a) a difference in kind of activity, and (b) partial structuring (use of certain selected parts)." (Lakoff and Johnson, 1980) Lakoff and Johnson state that if the metaphorical structuring was total, "one concept would actually be the other, not merely be understood in terms of it." (ibid. 1980)

However, recognising sonified biological patterns or the evocations of animal sounds in my works is contingent on who is listening. Most auditors are likely to hear the sonification of biological patterns that exist in visual and conceptual domains (e.g. Fibonacci and L-systems) as a third or remote order of surrogacy (Smalley, 1997), through having no sonic correlate(s) in nature. The orders of surrogacy are also increased for most listeners through the mapping of data to specific parameters (e.g. pitch, timbre, duration and volume) that inevitably skews the precision of sonification and overt detection of source. The sonification of biological patterns resides in aural discourse on the aural-mimetic continuum for most listeners, especially when further processing is applied to sonified biological patterns. When I listen to my attempts to sonify biological patterns, the musical discourse moves towards the mimetic through recognising the source of the sonified audio and that the initial intention of sonifying biological patterns in the pieces was via imitation. As Simon Emmerson explains, mimetic discourse is that which imitates nature (i.e. the physical world), or aspects of human culture not usually associated with musical material. (Emmerson, 1986)

The audio synthesis that appear to evoke animal sounds reside in similar areas of the aural-mimetic continuum. For instance, the evocation of animal sounds in my listening to the audio synthesis resides in mimetic discourse. The same sounds may be interpreted by

listeners differently than the evocations of animal sounds that I perceive—by virtue of their third or remote surrogacy.

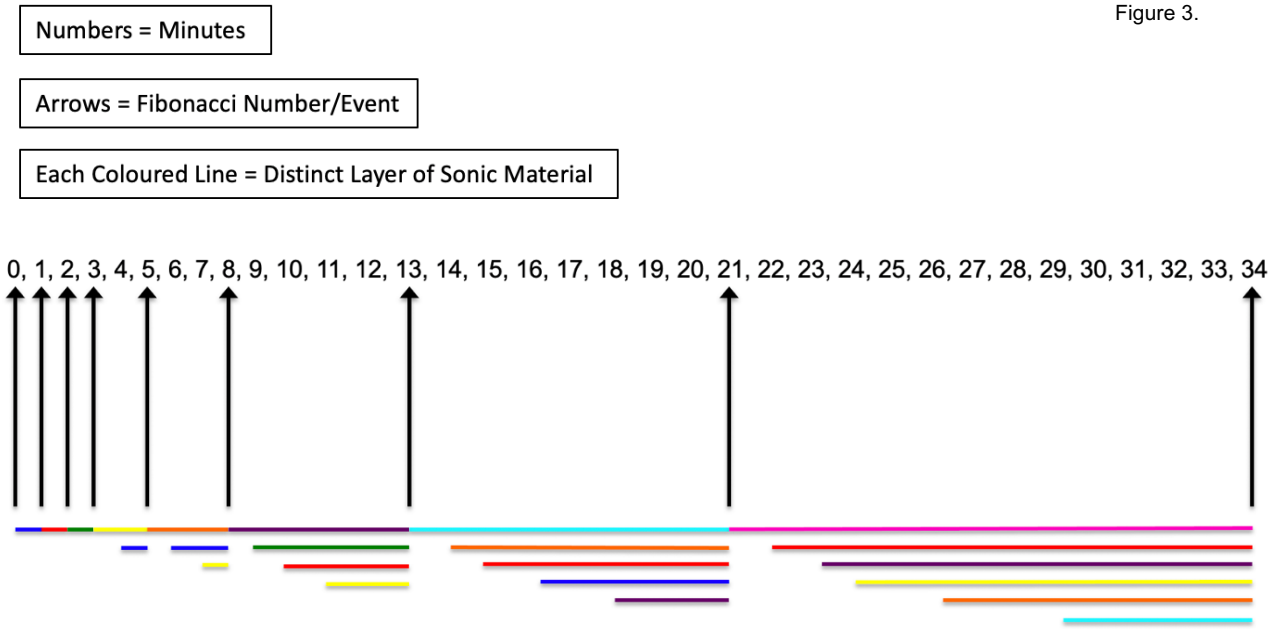
The sonification, and the audio synthesis that appear to evoke animal sounds, also reside in abstract syntax; I did not structure them according to the "acoustic properties of the sound materials." (ibid. 1986) Recognising sounds in my works as representing biological patterns through sonification methods is contingent on understanding the poietic context of the sonorities. On the other hand, recognising animal sounds is contingent on interpreting such sounds in a similar way to how I have.

This discussion concerning metaphor, surrogacy and Emmerson's language grid, lays a foundation for later discussions regarding how the notion of biological patterns developed in the portfolio.

Fibonacci Form

In any case, I assembled many of the patches in *Image 8*, whose output appeared to evoke animal sounds, as modules within a master patch. This approach created a formal structure and seemed to open another path in exploring biological patterns in composition—alongside sonification. One of the Max modules included a sub-patch whose output constituted an embryonic version of what would develop into Streams of Digital Fizz in the next work. I collated each module's output into a Fibonacci-based form:

Figure 3.



In the diagram above, each minute that correlates with a Fibonacci number triggers a burst of sonic activity gesturing the imminent termination of the previous section before a new distinct layer of sonic material appears. Before further editing and mixing, the distinct layers of material constituted the output of each Max module. Each new layer of material that emerges at each Fibonacci point (i.e. minutes 0, 1, 2, 3, 5 and 8) was made to have a distinct sonic identity, to emphasise the demarcation of sections. On the minutes that are not featured in the Fibonacci series (i.e. 4, 6, 7 9, 10, 11, 12, 14, 15, etc), I introduced a variation of a prior layer of material as an additional layer within the piece—creating more diverse textures as the work progresses. Furthermore, layers of material are triggered seconds before, or after, a particular minute in the completed piece; I was more interested in the overarching shape that the Fibonacci-form permitted as opposed to doggedly adhering to precise values.

Sonic Imprint of Electronic Music's Past

One strong narrative mode that appeared to be evoked after arranging the output of Max modules according to the Fibonacci formal model was the *studio narrative mode*. The studio narrative mode "deals with 'listening to the making of the work' – or rather, 'listening to the (perceived or imagined) making of the work'." (Andean, 2016) With the Fibonacci-form in Image 8, each passage ends by abruptly cutting-off before a new

distinct layer of sonic material ensues. The abrupt conclusion of each section appears to evoke styles of tape-music from prior eras of music-making. More specifically, it conjures the abrupt and conspicuous tape-cutting technique(s) akin to those I hear in Michel Chion's *Requiem: Dies Irae* (for example). However, unlike *Dies Irae*, or even Luc Ferrari's *Visages V*, "with its short, rapid gestures generated through hands-on manipulation of the tape reels" (ibid. 2016), the evocation of tape-cutting heard in *Image 8* is merely redolent of tape manipulation; the technique of tape-cutting was not used in *Image 8*. In *The Materiality of Space*, Peter Nelson states that,

> …location becomes evident as more than the implacable phenomenon of spatial extension, and starts to encompass notions that are geographical and historical. Radio and sound recording allow quite different locations to appear where you are, and those locations can bear tangible, material imprints: the sounds of instruments playing as no instruments now play, or the energy of a music identifiable as coming from a different place. One could say that sound recording has allowed the trading of space; as the acquisition and sharing of: actual locations, both current and historical; ambiences; social spheres, and constructed non-places. (Nelson, 2015)

In a similar way, we can consider the seeming evocation of tape-cutting from prior eras of music-making in *Image 8* a sonic imprint of electronic music's past. However, the listener's detection of ostensible tape-cutting, and any sonic imprint of electronic music's past, is contingent on their knowledge of electronic music history. A sense of immediate termination of sections (evoking tape-cutting) could also be achieved via multitude formal structures; it is not exclusive to the Fibonacci-form used.

Accumulation of Textural Density

The Fibonacci-form also seemed to establish an accretion of textural density. The concept of building-up textural density through the accumulation of layers seemed akin to Nono's *Il Canto Sospeso*, wherein he cultivates a sense of intensity through the layering of four voices in the coda. Analogously, it appeared that the sub-divisional layering in *Image 8*'s Fibonacci formal model could also operate as a mechanism for developing intensity as the work progresses—culminating in maximum intensity at the end of the work.

However, as the piece began taking shape, the intensity level between the 7 thand 8th minute intuitively seemed more appropriate as a climax for the work; the succession and layering of specific audio materials used to fill sections of the Fibonacci formal model presented such intensities. The rest of the initially planned 34-minute Fibonacci-form subsequently appeared redundant for my aesthetic preferences. Nonetheless, a sense that there is an accumulation of textural density is audible in *Image 8*, despite the finished work being shorter in length than the Fibonacci formal model initially proposed.

The realisation of form, engagement with indicative processes of listening, and flexible implementation of the Fibonacci pattern via algorithmic processes in *Image 8*, seem to have afforded more experimentation and aesthetically compelling material—than adhering to more precise and comprehensive sonification of biological patterns as an approach to construction.

Spatial Formats

Image 8 was initially composed in stereo as a relatively simple spatial format in which to construct material, before branching out into more elaborate spatial environments.

The inspiration for creating a surround-sound mix of *Image 8* was to develop a version that could be more engaging in a concert environment than a 2-channel mix, evoking Peter Lennox's comments that, "instead of the convention of the listener sitting passively facing a sound stage, one would have music that a listener could get inside, even explore, be an active participant rather than recipient." (Lennox, 2011) Although working in an immersive sound environment (like ambisonics) could offer a more expansive space for a listener to 'explore', the spectral envelopes in the stereo version of *Image 8* seemed appropriate for discrete multi-channel diffusion:

> If you want to create large and expansive environments.... in looking at things like human scale and human presence in a vast landscape.... ambisonics is great for that. But if your music is about timbre and point-sources of sound—take, for instance, Smalley's Wind Chimes (Smalley 1990) or Harrison's Klang (Harrison 2000)—then maybe that's best diffused on a discrete-speaker diffusion system. It's up to the piece. It's also up to the composer. (Field, 2001)

As the more evocative material in the stereo version of *Image 8* seemed to reside in timbral and textural domains, I thought like *Wind Chimes* or *Klang*, that *Image 8* could be better suited to a discrete multichannel mix than a fully immersive one.

Moreover, part of the reason for specifically deciding to create a quadraphonic surround mix was due to 4 loudspeakers being the maximum number regularly available at the time. I also wanted the surround piece to be fairly portable in terms of loudspeakers, for the potential of being played in various spaces. Additionally, working with a discrete quad set-up appeared useful in determining how I would approach spatial formats in later works.

Spatial Approach

When considering how to deal with the spatial aspects of *Image 8*, a logical approach appeared to lie in enhancing the composed spaces already suggested by the audio materials included in the piece. This evokes Smalley's approach of enhancing the spatial contexts suggested in the spectromorphologies of the implemented audio material. (Smalley, 2000) As Smalley mentioned in an interview:

> There are varieties of spatial perspective composed into a piece…. [impressions of space] are often created through artifacts or spatial by-products of the sounds, textures, and processing techniques [used]…. In a diffusion system, one should be able to expand these dimensions: in other words, make the distant more distant, exaggerate closeness, exaggerate distance, play with the height of the image, thereby adapting the space composed into the music to the dimensions of the listening space…. I would never seek to contradict what is composed into the spaces and spectromorphologies of the piece. I seek to enhance them. (ibid. 2000)

Like Smalley, I wanted to enhance the spatial contexts that the materials suggested. I avoided using new mappings of Fibonacci patterns, or other extraneous structures, to deal with the spatial aspects of *Image 8*; such mappings seemed like they would contradict the space(s) already present in the materials used. Besides, the piece was fusing into what

appeared like an aesthetically compelling work; it seemed logical to follow and enhance its trajectory rather than obstruct it.

After producing the stereo version of *Image 8*, most of its composed space appeared quite pronounced and easy to enhance in the discrete quad environment. However, a layer of material that emerges around 5.30 seemed to uncover a potential limitation of a discrete multichannel set-up. This smooth, texturally thin and seemingly ethereal layer appeared to evoke a space beyond the speakers. Initial attempts to convincingly create a sense that the material was actually beyond the speakers were ineffective, despite the material suggesting a context residing outside the speaker array. One technique initially used in trying to achieve a sense of beyond was via reverb:

> ….the perceptual impression of range (distance between source image and listener; distinct from distance between items in the environment) can be manipulated by altering the dry-reverb (or direct-to-indirect signal) ratio or balance using artificial reverberation. So, some images can appear to be beyond the line between the two speakers, adding the illusion of depth of field…. (Lennox, 2011)

Although reverb can, in some cases, apparently create a sense of distance between the source image and the listener, configurations and implementations of reverb that were tried, did not appear to physically project material beyond the speakers. It appeared, as Ambrose Field asserts, that "traditional loudspeaker orchestra [and smaller discrete multichannel] diffusion can never really place a sound in physical space that is outside the bounds of the speaker array." (Field, 2001)

Ambisonic diffusion seemed to permit a more satisfactory mode of projecting sound beyond the speakers; I encoded the layer of material that emerges around 5.30 in *Image 8* into ambisonic format and then played it back alongside the rest of the 4.1 mix to more convincingly project the sense of beyond desired. It became apparent that ambisonics affords more flexibility, ease and clarity in constructing spaces that appear located outside the bounds of the speakers—in comparison to discrete multichannel diffusion.

Continuing to explore the potential of ambisonics in later works seemed constructive—having glimpsed the flexibility, ease and clarity that ambisonic diffusion can afford.

3. *0_2*

0_2 is a horizontal-only ambisonic work that was premiered in February 2019 at The Old Hairdressers in Glasgow for the Sound Thought postgraduate research conference. It is the second work created for this portfolio.

In composing *0_2*, I established the mechanisms for generating Algorithmic Chains of Sonic Shards and Streams of Digital Fizz. This piece featured the first instances of human voices and field recordings in the portfolio as well. These sonic types became significant in making the next work, triggering a change in the direction of the portfolio.

I also realised the metaphorical reflection of biological patterns via field recordings through composing *0_2*, whilst a sense of rigidity seemed to arise due to stubborn adherence to sonification methods.

Spatial Formats

Exploring more of the aesthetic and spatial potentialities of the ambisonic domain in *0_2* seemed constructive having glimpsed the flexibility, ease and clarity that such diffusion can afford (in developing *Image 8*).

Besides, discrete multichannel diffusion (DMD) presented further limitations, aside from being unable to construct spaces that appear located outside the bounds of the speakers with the same flexibility, ease or clarity as when working in the ambisonic domain. For example, DMD relies on assigning sounds to particular loudspeakers, whereas ambisonics can encode spatial information in a form that is not reliant on the number of available speakers. A piece's spatial image can be maintained better via ambisonics when the desired specifications for presentation are unavailable, or when a larger number of speakers is available for diffusing a work. (Field, 2001) In other words, ambisonics enables the spatial attributes of a work to be played back more consistently, than DMD, in diverse presentation environments.

Ambisonics also offers a more expansive space for a listener to 'explore' compared to DMD. One also has more options in mixing spatial attributes in the ambisonic domain. For instance, as Field asserts: "You can deal with sound in ambisonics as points, if you want. You can pan sound from left to right quite easily. But ambisonics also permits you to move the whole space. It allows you to make the listener feel that one minute they're in a large open area, and the next minute they're shut in a closet." (Field, 2001)

In these ways, ambisonics permitted the flexibility of approach I wanted at this stage in the portfolio, so I composed *0_2* in the ambisonic domain.

I nevertheless constructed the spatial trajectories and shapes in *0_2*, and later works, in a similar way to that of *Image 8*. Specifically, in the works for this portfolio I experimented with spatial distribution, panning and perspectives as each sound was included and evolved, instead of having a predetermined spatial design when beginning to compose the works. Some of my decisions regarding spatialisation in the portfolio were also based on habits developed through prior experiences of spatialising audio in the quad domain before starting this project. For instance, prior tendencies to pan sounds in a kind of ring conception around the listener's vantage point, at times, influenced the way I panned sounds in this portfolio (e.g. at 1.44 in *0_2*).

Horizontal-only

I initially composed *0_2* in horizontal-only ambisonic format as it seemed that there were many spatial possibilities to explore in the horizontal plane before considering the incorporation of the height dimension. Four was also the maximum number of speakers regularly available at the time, so it seemed more efficient to compose spatial attributes in the horizontal dimension first.

Furthermore, the work was already scheduled to be premiered at The Old Hairdressers during the early stages of developing the piece, and I knew that only four loudspeakers would be available for use at the venue. The development of the next work in the portfolio had also already begun by the time the piece was made and premiered as a horizontal-only work; it seemed that there could be opportunities to explore the height dimension in the following work(s). *0_2* remained as a horizontal-only piece.

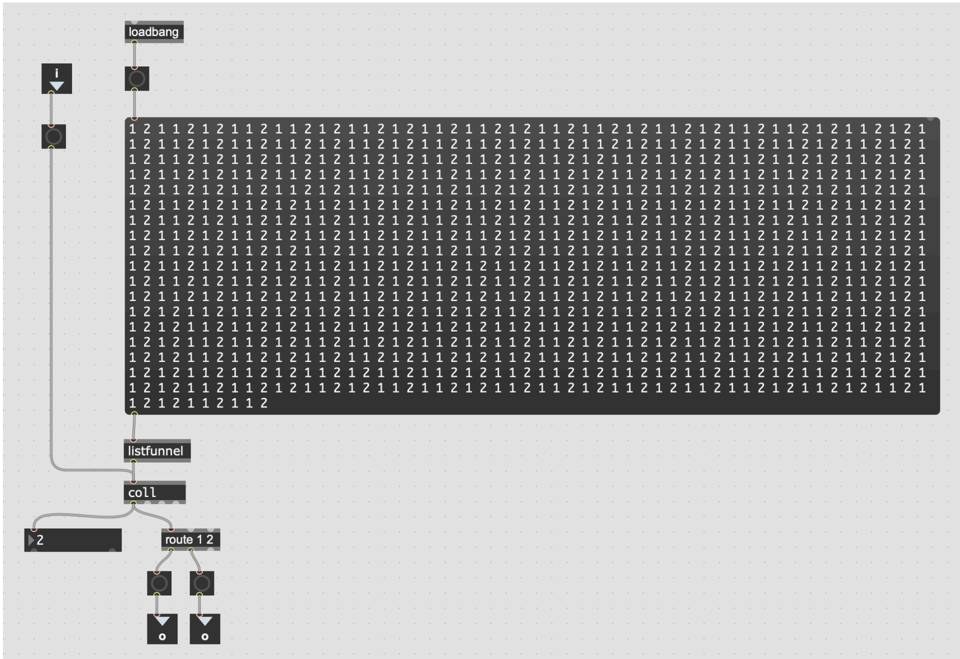
L-systems, Swarms and Ambisonics

The aesthetically compelling material developed using the Fibonacci pattern in constructing *Image 8* influenced my decision to continue implementing biological processes in *0_2*. I used L-systems and swarms in *0_2* instead of Fibonacci patterns in an attempt to produce distinct outcomes from those that emerged in *Image 8*, as well as to discover whether the sense of rigidity that emerged when using the Fibonacci sequence would appear if employing different biological processes. I selected L-systems and swarms over other biological patterns, such as genetic algorithms or cellular automata, having already been aware of some sophisticated tools that facilitated composing with L-systems and swarms—namely Slippery Chicken's functionality and the ICST ambisonic tools.

The composition process for *0_2* began by constructing a Max patch which included material derived from an L-systems-based Slippery Chicken MIDI script[8], and iterations of an L-systems-based abstraction (Figure 4) that triggered Max objects and values connected to ICST ambisonic tools.

[8] Link to L-systems-based MIDI script: https://www.icloud.com/iclouddrive/0M-PidoxV3Qdm0vAUWNhROVFA#l-systems-based-sc-midi-script

Figure 4. The binary numerical sequence in the diagram below is an L-systems-based pattern that I generated using Slippery Chicken code. Once the Max L-systems-abstraction is triggered, it sends out bangs according to the L-systems-based numerical sequence. Link to binary sequence code: https://www.icloud.com/iclouddrive/0uiEEMAqzDIA-ZQOLDLESbVxQ#L-systems-binary-number-sequence



Using these tools seemed like a productive way of exploring more of the ambisonic domain whilst also investigating the aesthetic effects of swarms in acousmatic composition. Being able to easily integrate the Max patches developed in *Image 8*—if I wanted to reuse and modify such patches—also influenced my decision to work with the ICST tools in Max.

The L-systems-based Slippery Chicken MIDI script[8] uses L-system rules as integral components within rhythmic, durational and structural parts to generate MIDI material. I processed this material using sample-based synthesis in a DAW before integrating the material back into the main Max patch. I used a field recording of swarming flies as input for the sample-based synthesis and the ambiencode~ external.

Using a field recording of swarming flies appeared to timbrally and texturally complement the ICST ambisonic tools' swarming functionality and reflect biological patterns metaphorically via mimetic discourse. The spatial 'expansion' of the stereo field recording of swarming flies, via the swarming functionality of the ambisonic tools, appeared to also evoke Susan Derges' photography work. In some of Derges' images she

tries to imbue a sense of an 'inner life', or perspective, of an animal looking up at structures larger than themselves from within the scale of their worldview. (Derges, 2017) Similarly, using the stereo field recording of swarming flies as input for the ICST tools appeared to materialise an inner life of the swarming spatialities created by the ambisonic tools.

However, a similar sense of rigidity that emerged in Image 8 became pronounced in *0_2* as the L-system and swarm patch became more technically complex. This made it difficult to shape resulting materials into coherent structures and a compelling overall form. The sense of rigidity also appeared to hinder the nuanced exploration of space that the ambisonic domain can afford. Part of the reason a sense of rigidity emerged again seemed due to stubborn adherence to mapping biological patterns (i.e. L-systems and swarms in this piece), at the expense of more flexible explorations of materials. Consequently, I halted the development of this sketch as there appeared to be a lack of direction and potential via this approach.

Nonetheless, it appeared that building this piece up from materials already generated through this aborted sketch would be more efficient than spending more time trying to devise a top-down strategy like the Fibonacci formal model used in *Image 8*.

I also still constructed *0_2* in the ambisonic domain using the Envelop for Live Max for Live devices. Working with the Envelop for Live tools within Ableton Live seemed to permit more flexible and precise ways of handling materials than what was available when using Max as the principal domain for arranging and sculpting the piece. The Max for Live functionality of Ableton Live also facilitated the integration of materials already developed in Max.

Animal Sounds, Shards and Fizz

The synthesised L-systems-based output was one feature of the aborted sketch that I extracted and reused to reorient the construction of *0_2*. This sonority appeared to reflect biological patterns metaphorically via sonification and field recordings, whilst also evoking a similar indicative relationship to certain sounds in *Image 8*. In this way, there

seemed to be potential in combining the L-systems-based output with material(s) generated for Image 8.

More specifically, in the writing on *Image 8* I mentioned that I interpret certain sonorities that have a remote order of surrogacy as animal sounds. The L-systems-based output in *0_2* (3.53) appears to evoke a similar indicative relationship through perceiving this sonority as evocative of fly sounds, whilst incorporating more mimetic discourse than the sounds metaphorically reflecting biological patterns in *Image 8*. Using a field recording of swarming flies to realise the L-systems-based MIDI output affords more mimetic discourse through timbral and spectral properties of the field recording being audibly identifiable after processing has been applied via the script.

However, the Slippery Chicken L-systems processing applied to the recording of swarming flies shifts the discourse towards the aural and creates what Ambrose Field describes as a virtual environment (Field, 2000). The processing applied to the field recording creates features and cues of the real, without representing the real per se. It moulds the recording into short repetitive rhythmic twitches that waver according to the L-system data structures in the script, whilst retaining the timbral identity and some of the spectral properties of the original recording. These twitches seem to evoke the sounds flies might make by rubbing their legs together, drinking and flying. In this way, Adam Basanta's notion of *syntax as sign* is invoked, whereby abstract sounds that mimic patterns of real-world sounds create associations in listening—even if the precise character of the abstract and real-world sound(s) differ(s). (Basanta, 2010) While a listener may interpret the L-systems processing differently from how I have, the audible remnants of the field recording should be detectable as flying insects to most listeners.

I created other synthesised materials in *0_2* with the intention of representing animal sounds. For example, the gesture at 6.29 seems to evoke an animal shriek and sounds in the following passage at 6.36-7.08 appear suggestive of insect calls and fluttering insect wings. This continued the path of exploring biological patterns via synthesis evoking animal sounds that was discussed in *Image 8*.

Recognising a similarity between *Image 8* and *0_2*—with regards to seeming evocations of animal sounds—resulted in revisiting some of the material developed for *Image 8* and

combining such material with the synthesised L-systems-based output. In experimenting with different materials, I modified the Slippery Chicken script that generated most of *Image 8*'s opening material from a MIDI to a sampler device. This enabled the contortion of inserted audio files according to structural, rhythmic and pitch data structures. Fragments of field recordings depicting animal barks, roars, buzzes and flutters, as well as recordings of abstract synthesis from *Image 8*, were inserted into the sampling component of the script. This also enabled more mimetic discourse to be articulated through such animal recording extracts being identifiable in the script's output. The articulation between this mimetic discourse, and more aural discourse established by the synthesis and script's processing, appeared similar in this respect with regards to the L-systems-based output discussed above. This sense of affinity was further enhanced through the modified Slippery Chicken script's output appearing to share a similar sense of morphological repetition with the L-systems-based output. Accordingly, they seemed compatible as main components of sections that sit adjacent to each other (heard in the two adjacent passages between 2.43-4.02 in *0_2*; crossing over at 3.52). This modified script produces what I consider to be Algorithmic Chains of Shards.

In composing *0_2*, I also revisited and modified a sub-patch within the main Max patch used to create *Image 8*. This reconfigured patch produces what I consider to be Streams of Digital Fizz. I initially revisited this sub-patch because it seemed to metaphorically reflect biological patterns via mimetic discourse; the fluctuating buzzes, hisses and grainy specks of noise appeared to evoke insect sounds. After reconfiguring the sub-patch to function as a standalone Max device, its resulting sonorities appeared to fill spectral emptiness in the mid-frequency range when mixed with other sounds in *0_2*. Upon perceiving this effect of apparently filling a spectral gap in *0_2*, I applied the patch's resulting sonorities to *Image 8* to assess the efficacy of this technique. The fizz seemed to have the same effect of filling spectral emptiness in the mid-frequency range throughout *Image 8*, creating a greater sense of spectral cohesion.

This technique invokes the *emptiness* and *concentration* attributes within the four qualifiers that Smalley uses to describe the *occupancy of spectral space*. (Smalley, 1997) As Smalley asserts, emptiness concerns "whether spectromorphologies occupy smaller areas, creating large gaps, giving an impression of emptiness and perhaps spectral isolation." (ibid. 1997) He describes the concentration attribute in terms of "whether

[sound] is concentrated or fused in regions." (ibid. 1997) In this regard, the fizz invokes these concepts of emptiness and concentration through appearing to fill spectral gaps in a concentrated region of spectral space.

I mention the use of fizz and shards in this section as using them in these ways influenced their functionality in the next piece. Both sonic types became significant in the development of the portfolio.

Human Voices

Human voices are another sonic type included in *0_2* that became salient in the development of the portfolio. I initially included human voices as it became clear, after constructing most of this piece, that the aesthetic potential of the work was limited when trying to view the compositional development solely through the lens of biological patterns.

Including voices with semantic meaning at 4.49 and 10.57 in *0_2* became a way of engaging my listening when my attention was drifting. These recordings drew me in more than other instances of voices; if I recognise that vocal sounds possess semantic meaning, my sense of curiosity is often enhanced in trying to decipher what is being articulated.

Perceiving tension in the vocalisations used also seems to focus my attention. More specifically, each recording of human voices in *0_2* appears to evoke mild struggle; a confrontation can be heard at 4.49, what is being said at 10.57 indicates discomfort from an intrusion of personal space, the short yelp at 11.00 seems like a cry of frustration, and we can regard the coughing at 11.13 as a kind of brief struggle from the lungs. The sense of struggle evoked at these moments intensifies the tension established by the recordings abruptly cutting in and out of abstract soundscapes, and the juxtaposition between these two distinct types of material that occupy different parts of the landscape morphology continuum (as mentioned in section 1.2.4). These moments of tension are resolved in 0_2 when non-real soundscapes re-emerge and takeover from the real or virtual environments of human voices. We can consider the interaction between these materials as a kind of narrative interplay, evoking Varèse's comments on composing in terms of energies and

fluxes: “There are interplays and struggle between the different states of matter, like confrontations between characters in a play.” (Varèse, 2004)

Sonic Imprints, Narrative Modes and Ahistorical Dimensions

A sense of narrative also appeared via sonorities evoking sonic imprints of electronic music’s past in *0_2*—as in *Image 8*. The narrative modes that seem to coincide most noticeably with what I perceive as sonic imprints of electronic music’s past in *0_2* are *material* and *mimetic*, rather than the studio narrative mode in *Image 8*. The distinction between material and mimetic modes is that “material narrative is based on object recognition – for example, ‘a ball’ whereas mimetic narrative is based on behaviour recognition – for example, ‘bouncing’.” (Andean, 2016)

1.42-1.56 in *0_2* features an example of these narrative modes. Material narrative is suggested via the predominant sound appearing to be recognisable as an accelerating ‘futuristic’ vehicle, whilst mimetic narrative is suggested via the sound’s approaching trajectory. The mimetic and material narratives I perceive from listening to this sonority appear to evoke the recording heard between 2.46-2.56 in *Points De Fuite* by Francis Dhomont. The recording in *Points De Fuite* seems identifiable as an approaching accelerating car, bearing a strong resemblance to the high-speed futuristic vehicle-like sound in *0_2*.[9] The resemblance between the futuristic vehicle sonority and the car in *Points De Fuite* seems to afford the former with an energy identifiable as coming from an earlier time in electronic music history. We can also consider this relational process between such sounds an *acoustic chain* whereby “the recognition of similar signifiers from one acousmatic work to another may stimulate a similar chain of signification at an indicative level.” (Adkins, 1999)

3.10-4.36 in *0_2* is another instance where acoustic chains appear in the form of material and mimetic narrative. This instance and 3.53-4.50 in *Il Était Une Fois* by Luc Ferrari both feature animal roars, growls and shrieks that combine in a flocking manner—creating an acoustic chain. Material narrative is indicated by animal roars, shrieks, growls

[9] Despite this resemblance, I initially included this sound in *0_2* as it appeared like an elongated and processed restatement and combination of the animal calls that directly precede it at 1.36 and 1.41.

and voices, whereas mimetic narrative is indicated through internal textural components moving in a flock. This flocking behaviour is also linked via an acoustic chain to the section between 0.24-1.00 in *Rumeurs* by Robert Normandeau, wherein he uses disparate materials to create a compound texture with "a collective behaviour that, in its details, is distinct from the recorded behaviour of any of its single recorded materials taken individually." (Andean, 2016)

Perceiving sonic imprints of electronic music's past in my works seems to create a kind of dialogue with prior eras of electronic music-making. However, there are dimensions to the sounds perceived as sonic imprints of electronic music's past that are ahistorical—namely, temporal, tactile and spatial dimensions.

As Wolfgang Ernst contends, all digitally produced sounds are ontologically present having gone through a process of transmutation from binary values within a computer to soundwaves. (Ernst, 2016) Such soundwaves ontologically originate from the micro-temporal digital processing space within a computer, as opposed to macro-temporal culturally determined evocations (Ernst, 2011)—such as perceived sonic imprints of electronic music's past. Realising the ontological origination of digitally produced sounds subverts the macro-time of sounds interpreted as imprints of electronic music's past, to reveal the sounds as more ontologically present than the historical interpretation(s) of them.

The sense of presence revealed by realising the ontological origination of digitally produced sound(s) is further enhanced through the process of hearing; the time-form of the immediate transpires after soundwaves reach our ears, and we perceive them. (Ernst, 2016) As Ernst notes: "hearing is based on the very touch of soundwaves." (ibid. 2016) In this manner of tactility all sounds are present upon hearing them, regardless of any prior media-cultural epochs evoked from listening to the sounds.

When hearing sonorities as imprints of electronic music's past, the acoustic vibrations also permeate the space the listener is in—rather than the spaces and places evoked by the sound material in listening. Thus, such sonorities are more spatially present than the historical interpretation(s) of them.

Acknowledging ahistorical dimensions of sonorities perceived as sonic imprints of electronic music's past subverts the following notions:

— That explorations and applications of sonorities ostensibly from electronic music history have been exhausted.

— That composing with sounds apparently from electronic music's past is a "backward step from the grand vision of ever more sophisticated digital engagement." (Nelson, 2015)

Reflecting on ahistorical dimensions of sonic imprints of electronic music's past whilst making *0_2* influenced the decision to permit such acoustic chains to remain in later works—rather than trying to revise such imprints on their supposed unoriginality within the scope of electronic music history.

Bh/5ONiCr, the next work in the portfolio, features an example of a strong imprint of electronic music's past; this work shares what Adkins describes as a *homologous environment*[10] (Adkins, 1999) with *Sud I* by Jean-Claude Risset. Specifically, the section between 4.30-09.30 in *Bh/5ONiCr* evokes the arrangement of water and bird sounds against a background of gentle noise between 0.00-1.30 in *Sud I*. The flying bee at 8.19 in *Bh/5ONiCr* also strongly resembles the trajectory and proximity of a similar sonority in *Sud I* at 8.54.

Other sonic imprints in later works include the scream at 10.28 in @ which appears to evoke the scream at 0.02 in *Red Bird* by Trevor Wishart, and the ambient pad at 13.00-16.20 in *W-4* that evokes much ambient music—such as *2/2* by Brian Eno.

In any case, sounds that appear to conjure the sonic imprints discussed may be interpreted differently by other listeners (as with any sound). People interpret sounds, and experience more broadly, in a different way to one another. A listener's detection of sonic imprints

[10] A homologous environment is an *extended acoustic chain* whereby a constellation of similar signifiers in one acousmatic work may stimulate a similar chain of signification at an indicative level in another. (Adkins, 1999)

of electronic music's past is also contingent on their knowledge of electronic music history.

4. *Bh/5ONiCr* (aka *Barons Haugh Sonicar*)

Bh/5ONiCr is the output of an RSPB site-specific artist residency, responding to the nature reserve Barons Haugh in Motherwell, Glasgow. The finished piece is a horizontal-only ambisonic work which was premiered in August 2019 at the University of Glasgow concert hall for the Sound Thought postgraduate research conference. It was also presented in September 2019 at the Riverside Museum in Glasgow for the research festival Explorathon. It is the third work composed for this portfolio.

Bh/5ONiCr marks an important stage in the development of the portfolio because the compositional utility, distinctiveness and adaptability of my revitalising sonic types became more apparent through composing this piece. This realisation seemed to indicate that these sonic types could afford a more flexible way of approaching the construction of later works, than attempts in adhering to conceptualisations of biological patterns.

The inspiration for composing *Bh/5ONiCr* came from a desire to further explore the potential of field recordings in reflecting biological patterns via metaphor. In developing *Image 8* and *0_2*, it seemed that prior attempts to sonify biological patterns were creating a sense of rigidity in the compositional process at the expense of more flexible explorations of materials.

Whilst the brief for the residency was to create a piece responding to Barons Haugh, there was also a stipulation to ensure that I conveyed some features of the reserve through the work. I straightforwardly achieved this via field recordings.

Ambisonic Recording and Horizontal-only

The composition process for *Bh/5ONiCr* had already begun by the time I composed *0_2* and premiered it as a horizontal-only work (as mentioned in the writing for *0_2*). I also deferred exploring the ambisonic height dimension in *0_2* having foreseen opportunities to explore it in *Bh/5ONiCr* and later works. *Bh/5ONiCr* was scheduled to be presented at the Riverside Museum soon after I composed and premiered *0_2*. Due to space restrictions, health and safety regulations and a limited budget, I knew that only four

loudspeakers would be available for use at the museum. It then seemed prudent to compose the work in the horizontal plane first to ensure optimal functioning of the piece when presented at the Riverside Museum.

I nevertheless employed ambisonic recording, using the RØDE NT-SF1 microphone, to capture sounds on the reserve—enabling the vertical information of the recordings to be used and experimented with if I was to add the height dimension. Capturing and using the full sound field initially seemed like it could more closely reflect listening experiences on the reserve than exclusively using mono or stereo recordings. I also used other microphones to capture narrower ranges of sound and more diverse environmental perspectives, including the RØDE NTG5, NT4, i-XY, Zoom H4N and Soundman Binaural microphones.

I approached recording on the site in an improvisatory and exploratory manner—selecting places to record, and positioning microphones, arbitrarily. I tried to capture a wide range of different recording perspectives of the site so that I could then decide what seemed most aesthetically compelling with regards to constructing a piece.

I layered and alternated ambisonic, stereo and mono recordings throughout the work to generate changing spatial perspectives. Combining more spatially restricted recordings with more expansive fields of sound articulated from all directions enabled the construction of soundscapes that appeared more spatially complex and dynamic than those created exclusively using stereo, mono or ambisonic recording(s). This spatial complexity and dynamism facilitated a sense of attention in my listening, which I initially perceived when composing and listening back to the work exclusively in the horizontal plane.

As composition progressed in the horizontal dimension for *Bh/5ONiCr*, it became apparent that a sense of vertical space was at times suggested by the materials being used—according with Smalley's view that space "can be implied rather than actually exist." (Smalley, 2007) For example, the aeroplane sounds heard at 4.16 and 7.21 appear to emerge, remain and disappear in elevated space suggesting a space above the listener's vantage point, and above other material appearing as a horizontal reference point.

The implications of height and the spatial complexity afforded by combining ambisonic, stereo and mono recordings in the horizontal-only dimension appeared sufficient in terms of spatial experimentation for this work, and the aims of the residency. The vertical information of the ambisonic recordings then became redundant for my purposes; I finalised the work as a horizontal-only piece.

Car Sounds

On each visit to Barons Haugh there seemed to be a clear transition between the soundscape outside the reserve and the soundscape within. I intended to reflect this transition in an abstract way in *Bh/5ONiCr* through the changing of sonic contexts at 1.42 in this piece.

Much of my sonic environment when travelling to the reserve also included car sounds: e.g. the straining of the gear stick, the cry of a creaky clutch, the ticking of the indicators, the muted roar of the engine and the closing of the door and boot upon arrival. The soundscape within the car was spectrally diverse and comprised many other active sonorities including rattles, wavering hums and intermittent jabs. The car sounds' continual fluctuation of intensities also seemed to make the car soundscape compelling to listen to.

I used the car recordings for the work's opening section to reflect the initial journey(s) of visiting the reserve. As well as finding them interesting, I included these recordings as they were part of my experience of engaging with the site.

On a few of these trips I strapped a RØDE i-XY stereo microphone to the passenger seat to record some of the sounds heard while driving. I recorded the car sounds in stereo, rather than in ambisonics, as this seemed more practically viable. The stereo microphone was easier to stabilise than the ambisonic microphone when driving.

The spatial limitations of the stereo microphone used to record the car sounds also appeared to create a sense of restriction when juxtaposed with more expansive ambisonic recordings of the reserve. The sense of spatial restriction appeared to enhance the contrast

between the enclosed space of a car, and the perception of expansiveness heard on the site.

Sounds of the Reserve

The reserve's soundscape predominantly comprised commonly heard sounds such as birdcalls, moving water, and wind blowing against trees—shifting between keynote and signal sound status depending on what sounds I focused on in listening. (Schafer, 1977) The reserve's soundscape also appeared to lack soundmarks (ibid. 1977); the sounds of Barons Haugh could be attributed to several nature reserves. The seeming generality of sounds captured in the field recordings of the site may narrow the scope for listeners to recognise the sounds as coming from Barons Haugh. However, the sounds of the reserve should trigger memories, familiarity, and associations in a listener's mind; most listeners will be familiar with sounds such as birds, moving water, and wind. In any case, these sounds will likely be perceived by everyone if they visit Barons Haugh, and if they listen to this piece.

I also included some sonorities that were memorable in my experience of the reserve. This included my footsteps (9.23-10.14), bees flying close to my ear (8.19), and the voice of another visitor speaking to me whilst recording on the site (9.31-10.20). Attending to these sounds when listening on the reserve stimulated positive emotions in me and evoked a sense of intimately engaging with the reserve, and those that frequent it.

Intermittently attending to the soft crunching sound of my footsteps on the gravelled paths appeared to caress my hearing, soothe my mood, and bolster a sense of tangible connection with the reserve. The sound of a bee whizzing past my ear appeared like a warm, soft and gentle line of sound that grazed my personal space for only a moment. This moment of close proximity with a bee was exciting due to the unexpectedness, rarity, and intimacy of the experience. The unexpected sound(s) of a human voice appearing in close proximity, and interacting with my voice within the broader soundscape of the reserve, was also refreshing after having been exclusively listening to non-human sounds of the site (e.g. wind, water, birds, etc) for extended periods. The familiarity of voices and the spectral, timbral and semantic differences between voices and other sounds heard on the reserve, caused the oral dialogue to appear as pronounced in my listening. The

snippets of voices also overlay footsteps between 9.23-10.14; the footsteps seem to provide a sense of corporeality when the disembodied voices appear. I also included fragments of a discussion with someone else on the reserve in an attempt to convey that there was a social dimension to my experience of being on the reserve. Since the beginning of the residency, the intention had been for the resulting piece to be a response to my experience of Barons Haugh; including sounds depicting physical experience(s) of being on the reserve added more of a self-narrative dimension to the work.

Processing and Landscape Morphologies

The selection of specific extracts of field recordings from a wider set of lengthy recordings captured at the reserve evokes the *timescale compression* (Field, 2000) in Luc Ferrari's *Presque Rien No. 1*, wherein extracts of day-long recording at a beach constitute the 21-minute work. As Ambrose Field notes, "Ferrari's Presque Rien series demonstrates hyperreality in audio-art. Presque Rien No. 1 compresses the timescale on which real events happen. Although the work is clearly the product of extensive editing processes, the end result is the aural impression of a heightened reality, where time, it seems, has no consequence." (Field, 2000) Similarly, the edited field recordings in *Bh/5ONiCr* portray a compressed timescale of events heard on the reserve, creating hyper-real environments within the work. The field recordings of Barons Haugh seemed overly protracted without such editing, taking much time for pronounced change to appear in the soundscape.

Virtual and non-real environments also appear in *Bh/5ONiCr*. Some of the lighter processing intermittently applied to field recordings (e.g. at 4.56) produce abstract shapes of extension, or short-lived virtual environments, that draw my attention back to the hyper-real scene that I created through editing and layering field recordings. This type of processing—that "extends and expands the inherent capacities of the sounds, rather than transforming them completely into new identities" (O'Callaghan, 2011)—is common in soundscape composition. As O'Callaghan notes, this type of processing "is used as a means of extending and exploring the sounds used, or processing 'through' the sound, as opposed to reconfiguring the sound entirely by applying processing 'onto' the sound." (ibid. 2011)

This piece also features instances of processing onto sound—e.g. at 3.58 and 09.38—which I included partly to help create shape and dynamism. I also included some of these heavily processed moments to abstractly reflect the urban sounds that seem to impinge on the soundscape of the reserve—such as motorway noise and the sound of machinery. The contrast of intensity between these more heavily processed moments and relatively tranquil sections also seems to build tension in the work, intensifying a sense of focus and creating a seeming desire for resolution when the heavily processed materials appear. Other sounds in *Bh/5ONiCr* that seem to have processing applied onto them are those that constitute Algorithmic Chains of Sonic Shards. Although, the script that produces such sonorities contorts the morphologies of field recordings more severely and distinctively than is heard in the other heavily processed materials in this piece.

The shards I used between 2.45-3.12 and 11.26-12.07 feature timbral qualities of birdcalls. One difference between these instances lies in interactions between landscape morphologies. The latter instance layers shards with a hyper-real soundscape, creating more of an interplay between the virtual and hyper-real when compared with other heavily processed materials that combine more virtual and non-real environments—such as in the former instance between 2.45-3.12. The sharp-edged shards that move in aggressive chugging motions, and the tranquil bed of sound that comprises the hyper-real soundscape at 11.20-12.03, seem to complement each other via clearly demarcated spectral envelopes—whilst building tension through juxtaposing intensities and landscape morphologies. In the passage between 2.45-3.12 I also layered different chains of shards to try to create a sense of flocking whereby there is a "loose but collective motion of micro or small object elements whose activity and changes in density need to be considered as a whole, as if moving in a flock." (Smalley, 1997) I thought the flocking behaviour coupled with the timbral qualities of birdcalls could reflect the activity of birds on the reserve in an abstract way. I designed some of the other trajectories of abstract materials in the piece to try to mimic flying motions of birds as well—e.g. at 3.58-4.15.

Layered streams of digital fizz between 5.50-6.53 also seem to mimic some of the bird sounds, and the wavering sounds in the field recordings that it overlays, in an abstract way. When the fizz cut-off at 6.12, 6.21 and 6.52, and field recordings remain the most prominent sonorities, my attention is drawn to the recordings having noticed a marked change: a resulting sense of spectral emptiness in the mid-frequency range. I also included

various streams of fizz at 2.45-3.12 to subtly fill spectral gaps in the linear sequence of sound objects, which created a greater sense of cohesion in this passage.

The sampling component of the devices that produce streams of fizz and chains of shards also seemed to enable a greater sense of cohesion between the fizz, shards and field recordings. The sampler devices recycled the field recordings to produce the fizz and shards in this residency work. More precisely, the field recordings I used as input to the sampling devices influenced timbral features of the shards and fizz with the influence appearing more overt in the instances of shards. The timbre of fizz seems less overtly affected by the field recordings I used as input. However, the fizz still appeared to produce a greater sense of cohesion when placed alongside field recordings of the reserve in the piece, as opposed to when I trialled other recordings as input to the device that produces fizz.

Recognising the seeming capacity for shards and fizz in producing a sense of cohesion and tension—and in spectrally complementing field recordings in *Bh/5ONiCr*—helped indicate their compositional utility. It also became apparent through developing this piece that the differing spectral envelopes between each iteration of shards, fizz and field recordings in *Bh/5ONiCr*, created differing shapes of extension and paths of experimentation that I could explore in composition.

The sustainment of the shards', fizz's, field recordings' and human voices' identities across my works also became evident through composing *Bh/5ONiCr*—having used them in prior works. The sustainment of such identities across pieces created the sense of an audible coherence between the first three works of the portfolio.

Furthermore, I identified a broader sense of efficacy in using these sonic types after recognising their adaptability, compositional utility, and strength of identity in composing *Bh/5ONiCr*. It seemed that I could develop a piece more quickly and flexibly using these sounds as signposts and anchors for other materials to interact with and respond to—rather than prior implementations of reflecting biological patterns via sonification, synthesis evoking animal sounds, and field recordings as a guide to construction. I then considered sounds metaphorically reflecting biological patterns via field recordings (i.e.

animal sounds) one of many sonorities within such recordings that increase the chances of engaging a listener's imagination, through being familiar to most.

Semiotic Transformation

We can consider the development in metaphorically reflecting biological patterns across the first three works of the portfolio a kind of semiotic transformation. The signifier gradually changes from sonification, to synthesis evoking animal sounds, to field recordings—whilst the signified metaphor of biological patterns remains in my listening. Nonetheless, other listeners may interpret the signifier differently than the evocations of biological patterns that I perceive (as discussed in the writing on *Image 8*).

The semiotic transformation of biological patterns also reflects the evolving nature of such patterns. As Lakoff and Johnson discuss regarding argument metaphors,

> The fact that we in part conceptualize arguments in terms of battle systematically influences the shape arguments take and the way we talk about what we do in arguing. Because the metaphorical concept is systematic, the language we use to talk about that aspect of the concept is systematic. We saw in the *argument is war* metaphor that expressions from the vocabulary of war, e.g., attack a position, indefensible, strategy, new line of attack, win, gain ground, etc., form a systematic way of talking about the battling aspects of arguing…. not only our conception of an argument but the way we carry it out is grounded in our knowledge and experience of physical combat. (Lakoff and Johnson, 1980)

Similarly, biological patterns seem in part conceptualised in terms of evolution; the way the signifier of biological patterns changed across the first three works of the portfolio reflects the understanding that biological patterns evolve. This change of signifier from sonification, to synthesis evoking animal sounds, to field recordings creates a further association in my listening that appears to expand the conceptualisation of evolution initiated by considering and implementing biological patterns via sonification. More specifically, the notion of birth appears a salient association when perceiving animal sounds as metaphorically reflecting biological patterns through synthesis and field recordings; birth or spawning is a fundamental process by which animals emerge and

procreate. The recognition of biological patterns being reflected via animal sounds when making *Image 8* potentially influenced the emergence of my revitalising sonic types through the understanding of animal sounds being associated with birth. As Lakoff and Johnson note,

> In birth, an object (the baby) comes out of a container (the mother). At the same time, the mother's substance (her flesh and blood) are in the baby (the container object). The experience of birth (and also agricultural growth) provides a grounding for the general concept of *creation*, which has as its core the concept of *making* a physical object but which extends to abstract entities as well. (ibid. 1980)

In a similar way, the perception or evocation of animal sounds across the first three works can be regarded as a container in which the revitalising sonic types emerge from—retaining aspects of biological patterns in the metaphorical reflection of such patterns via field recordings, Streams of Digital Fizz, as well as via Fibonacci-based data structures within the script that produces Algorithmic Chains of Sonic Shards. We can also consider human voices as retaining aspects of biological patterns; they kind of metaphorically reflect such patterns through being produced by animals per se.

In reflecting on the conceptualisation of biological patterns in terms of evolution and birth, it appears that the semiotic transformation in representing biological patterns when making the first three works in this portfolio can, in part, be considered an implicit process and conceptualisation for producing my revitalising sonic types.

5. @

@ is a binaural piece and it is the fourth work composed for this portfolio. This work marks another important stage in the evolution of the portfolio; fresh perspectives on my work(s) became apparent through composing @. These perspectives strongly influenced later developments in the portfolio.

Beginning to compose @ using shards, fizz, field recordings and voices seemed to afford more thinking space for considering other lenses through which to view my work—in comparison to earlier pieces when my approach and thinking was shaped more by conceptualisations of biological patterns. These other lenses included psychedelic effects and intimacy, with the latter being a subcategory of psychedelic effects in a metaphorical sense (explained in the writing for this piece). Regarding psychedelic effects, I refer to sonic images relating to changes in sensory awareness, mental imagery, experience(s) of time, perception(s) of self, and perceptions of other worlds (for example). On the other hand, intimacy seems invoked via the binaural format and recordings of everyday sounds. These notions of psychedelic effects and intimacy influenced how I perceive works in the portfolio, the choice of spatial format in @, and the kinds of materials and decisions made in later works.

Whilst composing @, I also realised that tension was a recurring feature in the portfolio. This influenced significant developments in later works.

Tension

I decided to include a greater variety of field recordings in @ than in earlier works. In composing prior works, it became apparent that including distinct field recordings facilitated engagement in my listening through trying to decipher the relation(s) between scenes.

Including more diverse recordings in @ seemed to enhance this sense of engagement and also enhance tension through contrasting sources and spaces. Recognising this and other instances of tension in composing this piece helped me realise that it was becoming a

recurring feature in the portfolio. Other instantiations of it in @ include between 18.35-19.20 where Algorithmic Chains of Shards and Streams of Digital Fizz seem to be fighting for dominance.

The same kind of narrative interplay appears in the interaction between shards and the line of noise at 8.56-9.16. However, the spectral envelope of this line of noise is distinct from the quick short articulations of both the fizz and shards—creating more tension than the prior example at 18.35-19.20. The tension between 8.56-9.16 is further enhanced through the sonorities masking vocalisations, evoking a sense of subjugation as the voices struggle to cut through the soundscape. In this way, this section appears to constitute a *translucent spectral space*—described by Smalley (1997) as a spectral space that has a masking effect.

The section between 12.40-16.00 in @ also features a translucent spectral space where heavily processed moans and distorted screeching noise combine to evoke an apparent sense of distress. More globally, this section enhances tension in the piece by contrasting with the ambient music soundscape that opens @.

Identifying a recurrence of tension in the portfolio thus far influenced decisions to find other ways of expressing it in the next piece: *W-4*. It seemed that finding other ways of including tension in the following piece could be combined with the ways it had been established in earlier works—potentially strengthening it as a feature in the portfolio. However, I also wanted to create instances of coherence in later works, as this appeared to make the instances of tension more impactful and engaging than if there was constant tension in a piece. Besides, this theme was one of several in the portfolio; attempting to establish more of a balance between them in later works seemed to create more aesthetically compelling pieces. Wanting to expand the idea of tension, and being drawn to it in the first place, may have also been influenced by my earlier listening to *Trio* by Maja Ratkje (as described in section 1.2.4). In any case, the other techniques for producing tension in *W-4* contributed to a more developed compositional approach that I realised in the final work.

Binaural Format and Intimacy

I initially composed @ in binaural because, after composing the previous works, I recognised that it was a more efficient and portable spatial format than those used previously. Pieces could be developed in a greater variety of locations and situations in binaural than with a multi-speaker set-up, by virtue of the affordability, compactness and ease of use of portable headphones. The affordability, compactness and portability of headphones and playback devices also seemed to facilitate accessibility for those wanting to listen to my pieces. Accordingly, the configuration and use of a multi-speaker set-up appeared more laborious than a binaural one, in terms of development and playback.

I also thought that the immersive aspect of the binaural format afforded a similar sense of spatial freedom and expansiveness as with ambisonics (when compared to discrete multichannel set-ups). I nevertheless composed @ on more of a horizontal plane in binaural format. This seemed to create a sense of coherence regarding prior works, having composed them as horizontal-only discrete multichannel and ambisonic works.

In developing @ it seemed that binaural headphone listening produced a greater sense of intimacy. A sense of intimacy is partly created through the listener being encased in a 'private' world of sound that comprises a sense of interior and exterior space. In *From Stethoscopes to Headphones: An Acoustic Spatialization of Subjectivity*, Charles Stankievech notes that a sense of subjective interiority can be twofold:

> The imaginative powers of the mind's ability to imagine space coincide with a literal location of an interior space 'in the head'. We can read Linda Montano's Heart Murmur as a performative example of this transposition of interior space. In 1975, the American performance artist taped a stethoscope to her heart for 3 days…. For Montano, the head is emptied, or rather the space between the ears is pounded out to create a space for another interior space: the heart. One organ is remapped onto another organ, one instrument onto another, one space into another space. (Stankievech, 2007)

Similarly, listening to a musical work through headphones can be thought of as an 'insertion' of a composer's sound world into the listener's headspace—an intimate

interaction by virtue of the seeming traversal of personal space. In other words, the composer manipulates sound to produce imaginary space (a piece) within another imaginary space (the listener's imagination). As Peter Batchelor asserts in *Grasping the Intimate Immensity: Acousmatic Compositional Techniques in Sound Art as 'Something to Hold on to'*, "The embedding of oneself in the imagination of another is to surrender to, and be immersed in another's imagination." (Batchelor, 2019)

Binaural works arguably permit a more intimate mapping of imaginary space than immersive multichannel pieces. Most immersive multichannel playback systems afford a less private presentation space as others can share it, a greater sense of quasi-tactility of the spatial image through being diffused in physical space, and the possibility of further distance from a work's spatial image within the presentation space. Although, smaller multichannel systems that fit only one listener inside, such as the spherical installation piece *Beyond: Willow* by Peter Batchelor and Ian Bilson, seem to afford a greater sense of privacy. (ibid. 2019) However, most of these systems appear to produce a sense of exterior space, as opposed to the sense of interior and exterior space afforded by binaural headphone listening.

Moreover, including a variety of everyday field recordings in @ seemed to afford the potentiality of reinforcing a sense of intimacy; the recordings act as a kind of surrogate memory and offer a sharing of implicit personal experience. Some vocal sounds in @—such as coughing at 0.05, crying at 4.43, laughing at 4.52, screaming at 13.03 and vomiting at 0.31, 0.42 and 4.36—also appeared to suggest intimacy through being close-miked and overtly evoking human presence. As Batchelor contends: "Nowhere is intimacy through close-miking more effective than when recording the voice, which offers the listener the most familiar and most versatile instrument there is, as something to hold on to. It is, after all, the most direct embodiment of human presence, and offers us the most intimate of sounds, when captured close up." (ibid. 2019) However, sounds of vomiting, crying and screaming appear to be particularly intimate in any context regardless of spatial proximity; they are usually more private acts than other vocal sounds, such as coughing and laughing, which are usually more socially normative and common in public space. In any case, the binaural format seemed to enhance the inherent intimacy of such vocal sounds in @ by positioning them in the foreground, whilst creating a sense of distance around and beyond the head with regards to other sonorities in the sound field.

Psychedelic Sonic Images

After including vomiting sounds in @, it seemed that the first-order surrogacy of the sonorities evoked the physiological response of vomiting commonly experienced after drinking ayahuasca: the potent Amazonian psychoactive brew that induces vivid hallucinations when ingested. (Shanon, 2011) Upon interpreting the transient injection of vomiting sounds at the beginning of @ as evocative of ayahuasca, the sonic context subsequently appeared imbued with suggestions of ayahuasca. More specifically, the immersive abstract sound world of @ thereafter appeared to evoke some of the consciousness-altering effects of drinking the brew—feeling "absorbed and swept into what is experienced as another frame of being, or another reality altogether." (ibid. 2011) The spatial abstraction of using everyday field recordings in @ also then seemed to evoke the apparent locational shifting of sounds when undergoing an ayahuasca experience, whereby sonorities come "from locations and directions that do not correspond to their real-world locations." (ibid. 2011) In these ways, the vomiting sounds operate in a transcontextual way in my listening—being clearly identifiable sonic entities that change the implications of the sonic context in which they reside. (Field, 2000)

The psychedelic allusions of the vomiting sounds perceived in @ also helped to engender an awareness of other apparent sonic images of psychedelic effects in the portfolio—namely regarding sensory awareness, increased production of mental imagery, experience(s) of time, levels of absorption, attentional focus, perception(s) of self, and perceptions of other worlds. For example, the spatial abstraction of using everyday field recordings, the layering of distinct spaces, and the almost constant spatial movement of abstract sonorities in my works, seem to evoke the transcendence of everyday spatial norms that is a common feature of mystical-type experiences occasioned by ingesting psychoactive compounds, such as psilocybin. (Johnson, Barrett and Griffiths, 2015) The appearance of everyday field recordings within my abstract sound worlds also seems to reflect the way(s) that everyday life experiences can intermingle with more hallucinatory experiences when undergoing psychedelic-induced altered states of consciousness. (Masters and Houston, 1967) The variety of field recordings captured at different places and points in time, and the differing timescales between each recording, also evokes the distortions of time that participants often encounter in such psychedelic experiences. (ibid. 1967) Additionally, I recognise traces of myself in recordings capturing aspects of

previous experiences, in the selection of materials in my works, in the ways materials are manipulated and interact, and when hearing snippets of my voice in the portfolio. The recognition of disembodied traces of self in abstract sonic form appears to evoke the dissolving of border between corporeal selfhood and more transcendent modes of experience, as reported in accounts of altered states of consciousness induced via psychedelics (Leary, Alpert and Metzner, 2008). The sense of absorption in undergoing a potent psychedelic experience also reflects the immersive spatial environments of my works. This correlation is strengthened with binaural headphone listening. The binaural format appears to create a sense of my abstract worlds residing within, and traversing, interior and exterior space—akin to all-encompassing spatial experiences of abstract worlds induced via psychedelics. (Masters and Houston, 1967)

Recognising a seeming affinity between my works and various effects of psychedelic experiences generated a desire to continue including material that appeared to evoke the latter. For instance, I subsequently created more processed voices and drone-like materials in @ to evoke the odd voices and stretching of time reportedly encountered in psychedelic experience. (Weinel, 2018a) Some of the voices and vocal articulation used seem to have also been influenced by prior listening to *Trio*, as mentioned in section 1.2.4. Desiring the inclusion of material evocative of psychedelic effects may have been influenced by the evocation of psychedelics in *Voodoo Chile*, which I listened to regularly as a teenager—as mentioned in section 1.2.2. This desire influenced decision-making in later works and the decision to finalise @ as an exclusively binaural work; it seemed to be the immersive format that most closely resembled the kind of all-encompassing personal immersion in other worlds that is often associated with psychedelic experience(s). The decision to finalise @ as an exclusively binaural work was also influenced by the capacity of binaural headphone listening in reinforcing intimacy recognised through developing this piece. It seemed that reinforcing a sense of intimacy was a way to potentially enhance engagement in listeners' perception of @.

Nonetheless, listeners' perception of @ and my other works will differ from my interpretations of the sounds used. A listener's interpretation of the real-world sonorities in @, and across my works, will likely give rise to the audio reality effect wherein a listener "infers and superimposes their own memories and experiences into their [listening of a] piece… after identifying the source of a sound used in a musical context."

(Underriner, 2017) Listeners will also likely engage their imagination to make sense of how different orders of surrogacy are combined in my works—evoking Charles Francis Underriner's comments regarding the interweaving of different surrogate orders of sounds:

> When the listener is forced to generate their own mimetic meanings out of ambiguous sources, the audio reality effect comes into play as the listener draws on their own experiences to make sense of the hybrid spatial information. For example, if a listener is accustomed to hearing or making blender sounds in their home, the introduction of a blender sound into [an abstract sound world] could evoke memories and tactile experiences of using a blender in their home. The memory of a specific location can mingle with the aural or constructed aspects of the piece to create a collage of mimetic meaning. (ibid. 2017)

Similarly, the intermittent injection of real-world sounds in each of my abstract sound worlds will afford meanings to arise in listening that are particular to each listener. Real-world sonorities, and the memories conjured when listening to them, can mix with more ambiguous constructed discourse in a piece to create a collage of mimetic meaning for a listener (as with the blender example above). The articulation of structure and discourse within the aural-mimetic continuum can prompt listeners to reflect on previous understandings of, and memories associated with, the perceived source of the recordings (Norman 1994)—through encouraging listeners to compare their "pre-existent understanding of real-world sounds - their referential, cultural and symbolic meanings - with a composer's interpretation." (ibid. 1994) The potentiality of altering prior understanding and memories through listening to the interaction between mimetic and aural material in this way appears to create an implicit link to the evocations of psychedelic effects that I perceive in my works; a common outcome of undergoing potent experiences occasioned by ingesting psychedelic compounds is the altering of one's perspectives regarding everyday life and personal memories. (Griffiths, 2021) Recognising this apparent link when making @ strengthened the desire to continue including material that appeared to evoke psychedelic effects.

Psychedelic Images in Other Works

We could interpret many other acousmatic pieces in a similar way to the psychedelic associations I perceive in my works; they share a *homologous environment* (Adkins, 1999).[11] Many such pieces, e.g. *Sud I* by Jean-Claude Risset or *Rumeurs* by Robert Normandeau, create dream-like scenarios traversing the gamut of the aural-mimetic continuum. Jonathan Weinel discusses the interpretation of electroacoustic music as psychedelic in *Shamanic Diffusions*:

> Journeys through abstract worlds and strange sonic landscapes of the unreal are pervasive in electroacoustic music…. when 'unreal' is taken in fairly broad terms…. it comes close to being a catch-all theme for much of the contemporary electroacoustic repertoire, since many compositions incorporate synthetic or heavily processed materials that lend their performances a sense of abstraction and dissociation from sounds we might usually hear in everyday acoustic environments. In these terms, the strange and illusory aspects of these electroacoustic compositions could be considered as inherently 'hallucinatory' in some respects. (Weinel, 2018a)

Although, some acousmatic works seem to have been made with the intention of representing dreams and psychedelic experience. For example, the evocation of a dream appears part of the intention behind *Dreamsong* by Michael McNabb (ibid. 2018a)—as well as Åke Parmerud's *Dreaming in Darkness*, "which seeks to provide sounds on the boundaries of unreality, in order to 'create surrealistic fragments of a blind person's dreams'." (ibid. 2018a)

A work that uses psychedelic hallucinations as more of a basis for composition is *Entoptic Phenomena* by Weinel. As he notes, "Entoptic Phenomena is based on an imagined hallucinatory experience that occurs in an isolation tank. In order to represent a hallucinatory narrative, Entoptic Phenomena incorporates the use of sonic materials that represent specific features of hallucination." (ibid. 2018a) For instance, *Entoptic*

[11] As mentioned in the writing on *0_2*, a homologous environment is an *extended acoustic chain*. (Adkins, 1999)

Phenomena features rotating streams of percussive sounds that symbolically represent visual funnel and spiral patterns of hallucination (ibid. 2018a).

Entoptic Phenomena and my works seem to traverse the gamut of the 'mode of representation' axis which,

> …. describes the use of approaches ranging from 'accurate' to 'stylized' representations of subjective experience. 'Accurate' representations provide sounds that correspond with the subjective aural experience as closely as possible. For example, the design of internal sounds such as auditory hallucinations in an accurate manner would require the use of sounds that recreate a similar aural experience as would be perceived subjectively during the hallucination. For instance, if a deep voice were heard during a hallucination, then a corresponding voice may be designed using vocal sounds in the low-frequency range. In contrast, 'stylized' sounds may present materials using a variety of artistic techniques that provide more impressionistic, symbolic, or metaphorical effects. Works may incorporate techniques that are partially realistic or stylized. (ibid. 2018a)

Accordingly, it seems that *Entoptic Phenomena* and my works lean towards the stylised end of the continuum most of the time. The techniques in each piece constitute more metaphorical reflections of psychedelic experience, as opposed to sounds that correspond with the aural subjectivity of undergoing a psychedelic experience. I wanted to include more stylised representations of psychedelic effects in works after @, as this seemed to permit a greater sense of aesthetic freedom than more 'realistic' depictions of psychedelic experience.

Nonetheless, the sonic images of psychedelic effects in *Entoptic Phenomena* and my works appear to reflect psychedelic experience(s) more accurately than other genres more commonly associated with psychedelia—such as psychedelic rock. As Weinel notes, "…. psychedelic rock music uses analogue electronics to subtly warp or colour the sounds of an instrumental performance, so that it is heard as if under the influence of psychedelic drugs. Yet in… the imaginary soundscapes of electroacoustic music, digital sounds [can be] used to construct detailed spatial representations of hallucinatory sound-worlds." (Weinel, 2018a) In this way, psychedelic rock, and other genres commonly associated

with psychedelia, remain "constrained by the boundaries established by the group performance tradition" (Weinel, 2018b)—with regards to representing depictions of psychedelic experience. Besides, such genres typically explore "a variety of conceptual themes besides actual drug experiences [that] broadly relate to the concerns of psychedelic culture…." (Weinel, 2018c) For example, broader reflections on the cosmos, death and subjectivity are often featured in the lyrics of psychedelic rock music. (ibid. 2018c)

On the other hand, it seems other conceptualisations that appear salient in the development of this portfolio accord with psychedelic effects. For instance, the sense of intimacy I perceive in @ and in later works is related to psychedelic experience as such an experience is inherently private and personal. The recurring moments of tension in the portfolio also accord with psychedelic experience(s); such adventures can feature difficult moments for the participant and there is inherent tension between the "recognisable and the strange". (Weinel, 2018a) Animal sounds, and earlier reflections of biological patterns in the portfolio, also seem related to psychedelic effects through the profound sense of ecological interconnectedness commonly reported by individuals who have undergone potent psychedelic experiences. (Luke and Krippner, 2010)

In these ways, notions of intimacy, tension and animal sounds are metaphorically coherent in the portfolio. As Lakoff and Johnson note, "There is a difference between metaphors that are coherent (that is, 'fit together') with each other and those that are consistent." (Lakoff and Johnson, 1980) Metaphors that are consistent form a single 'image', whereas metaphors that are coherent fit together "by virtue of being subcategories of a major category and therefore sharing a major common entailment." (ibid. 1980) In this sense notions of intimacy, tension and animal sounds fit together by appearing as subcategories of psychedelic effects.

6. *W-4*

W-4 is a binaural piece; it is the fifth work composed for this portfolio.

Several features developed in *W-4* became important parts of the compositional approach for the next and final work—*î-n-k.', 26*—which is a culmination of the ideas, techniques and reflections developed through the portfolio. Notions of psychedelic effects that I had become more aware of whilst composing @ influenced some of these features in *W-4*. Other aspects of *W-4* that became significant in *î-n-k.', 26* included mechanisms for creating tension in the portfolio.

Binaural Listening in *W-4*

I created *W-4* as a binaural-only work, influenced by the desire to continue including material that appeared to evoke psychedelic effects. Binaural seemed to be the immersive format that most closely resembled the kind of all-encompassing personal immersion in other worlds often associated with psychedelic experience(s)—as mentioned in the writing on @. I also desired the sense of intimacy that binaural headphone listening seemed to afford; establishing a sense of intimacy was a way to potentially enhance engagement in listeners' perception of a work (also discussed in the writing on @).

In listening back to @, it appeared that using more of the vertical dimension would create a greater sense of immersion—than predominantly working on a kind of horizontal plane—transporting the listener more fully into my sound world(s). I thus used more of the vertical dimension in *W-4*, than in previous works, as it enhanced the resemblance with the all-encompassing immersion in other worlds often associated with psychedelic experience(s). Working in this manner also afforded more room for spatial exploration than predominantly working on a kind of horizontal plane.

As in prior works, I constructed the kinds of spatial trajectories and shapes in *W-4* by experimenting with spatial distribution, panning and perspectives as each sound was included and evolved—as opposed to using a predetermined spatial design.

Changing Landscapes

In *W-4* and most of my other works, distinct real-world sound material resides within a predominantly abstract soundscape—enhancing a sense of immersion. Trevor Wishart alludes to this relation of the real to the abstract:

> The absorption of finite portions of recognisable recorded musical forms within an ongoing stream of electronically generated sound-materials tends to suggest a particular sort of relationship to the pre-existing music i.e. their absorption in a larger process and hence a view from outside or above the cultural substratum from which the musics come. We are here in a sort of 'cosmic' media space which, generally speaking, has no real-world reference. This 'distancing' or detachment from the real… predisposes us to perceive the pre-recorded musics…. in a distanced way. As, however, they are the only elements which refer directly to our experience of real acoustic spaces, we are viewing the real world as if at a distance. (Wishart, 1996)

A sense of detachment from the real in this way accords with my desire of including sonic images of psychedelic effects, as mentioned in the writing on @. A feature of @ and *W-4* that appears to evoke psychedelic effects and a detachment from the real is the frequent changing of spaces—e.g. through successive variations of distinct everyday field recordings. As Nicolas Marty notes in *Deleuze, Cinema and Acousmatic Music (or What If Music Weren't an Art of Time?)*, "One piece of music could be a single space, or it could be developed as a succession of spaces, establishing virtual relations between spatial forms, movements, actual relations, potential relations and the interweaving of time and space." (Marty, 2016).

One relation between differing spaces that appears salient in *W-4* is via the changing of what Wishart describes as *landscape*. (Wishart, 1996) At 3.42 in the section between 3.15-4.15 in *W-4*, the processed drum loop changes from appearing in a succession of unreal-objects/unreal-space landscapes to more unreal-objects/real-space landscapes—seeming to create a smoother transition to the real-objects/real-space field recording passage that follows at 5.00. The dramatic change of dynamics, materials and spatial contexts between the latter field recording section and the sonorities with unreal-space

landscapes that precede it, may have seemed more jarring if the landscape of the drum loop passage had remained in unreal-space(s). The intermittent injection of real-world sounds within the abstract soundscape (e.g. the voices at 1.16, roar at 1.42, and growl at 2.39) leading up to the synthesised drum loop at 3.15, also seem to make the appearance of the more extended field recording section at 5.00 less jarring. Accordingly, we can consider the intermittent injection of real-world sounds an understated kind of sign—preparing the listener for the more extended field recording passage to come. Realising the utility of changing landscapes as a bridge between disparate sections of material, in composing *W-4*, afforded potential in reusing similar techniques in the final work of the portfolio.

EDM

The use of expressive percussion gestures between and after sections of EDM sounds (i.e. 2.52-3.05, 4.02-4.20 and 4.48-4.59) also produces a sense of coherence between passages in *W-4*. EDM and the more expressive percussion gestures appear linked through sharing the signifier of percussion sounds. The more expressive percussion sounds appear to also afford a greater sense of convergence with the broader abstract soundscape(s) in *W-4*, through sharing less overtly rhythmic morphologies than those heard in the instances of EDM. The specific types of dance music material included were also intuitively selected—influenced by prior experiences of listening to and making electronica (described in more detail in section 1.2.3).

Instances of EDM in *W-4* also seemed to accord with the desire to continue including material evocative of psychedelic effects. The association of EDM with experiences of timelessness, ecstasy and loss of subjective self—as reported in accounts of listening and dancing to it (Malbon, 1999)—appeared related to the psychedelic effects discussed in the writing on @. Although, instances of EDM seem to accord more with psychedelic culture than more accurate representations of subjective psychedelic experience (as discussed in the writing on @). I nevertheless included this type of material because it appeared somewhat related to psychedelic effects *and* because it seemed like an opportunity to reintroduce part of my earlier musical experience into this compositional practice.

In any case, a common feature of much EDM is “the use of layers which are introduced and stacked to create structural and compositional development.” (Ramsay, 2014) Including layered instantiations of related materials seemed effective as a mechanism for enhancing moments of intensity and focus in the piece (e.g. between 1.47-2.37). As Linda Salter mentions in *What Your Hear Is Where You Are*,

> Music that is extremely loud, has heavily repetitive rhythms and phrasing, emphasizes bass tones, and is up-tempo can capture our attention and be excitatory. The sympathetic nervous system is activated. There is a surge of excitatory neurotransmitters such as epinephrine and dopamine. The arousal parts of the brain are activated, and arousal hormones are produced. These are naturally accompanied by physiological changes such as increased heartbeat, respiration, and blood pressure. (Salter, 2019)

Focused attention also seems enhanced by the contrast between repetitive phrases of EDM in *W-4* and less overtly rhythmic soundscapes that occupy most of the piece—creating tension when instances of EDM appear.

Tension in *W-4*

I included a few other techniques for generating tension in this piece after recognising, through composing @, that it was a recurring feature in the portfolio. For example, the predominant sonority between 8.08-8.46 in *W-4* seems to evoke screaming. As Wishart notes,

> [A scream] may be characterised as a continuous, high-frequency, loud, broad-spectrum emission. It usually indicates a state of extreme terror or pain and may be heard in humans, chimpanzees, frogs, birds, pigs and even a normally silent hare when it is torn to pieces by hunting dogs. In fact this indicator is so universal that we may assume that any sustained high-frequency, loud (and usually broad-spectrum) signal will carry the connotations of terror. Even in the highly-formalised musical context of Schoenberg's Erwartung the sustained, high-frequency, loud but pure-toned pitches which are sung at certain points retain the 'resonance' of screaming. (Wishart, 1996)

Likewise, the piercing synthesised sonority between 8.08-8.46 in *W-4* also seems to retain the resonance of screaming through its continuity, high-frequency and loud volume. This 'scream-synthesis' in *W-4* creates tension via the sense of cutting through other sounds in the mix to become dominant. When this sonority begins to rise in pitch at 8.30 it also generates a sense of anticipation, signalling that some kind of resolution or climax is approaching. In this way, it relates to Smalley's ideas regarding motion and growth processes, in that such processes "have directional tendencies which lead us to expect possible outcomes." (Smalley, 1997)

Another example of tension in *W-4* appears in the quiet field recording passage at 5.00 which dynamically contrasts with other sections in the piece. As Curtis Roads mentions, "…. slowing down the action and allowing the direction to meander provides an opportunity to build up suspense–underlying tension." (Roads, 2015) Noticing that the tranquil section at 5.00 in *W-4* was a less forceful mechanism for creating tension than the 'scream-synthesis' described above, suggested that there were different dimensions of tension in the piece.

There is another dimension of it in *W-4* at 9.46 where dialogue between myself and another person is heard. When listening to this excerpt, I recall the anxiety that I felt during the interaction. John Young mentions that "a recorded sound, even if imperfect in its reproduction, is close enough to our own experience to be capable of bringing back all of the original context and the feelings associated with it." (Young, 2008) Accordingly, I perceive a physical reaction of nervousness when listening to the field recording at 9.46, through the triggering of the original context and feelings that I remember from the event. My reaction of anxiety is predicated on this recorded interaction being a comfort zone challenge. A comfort zone challenge is the act of placing oneself in an anxiety-inducing situation for the purposes of personal development. (Page, 2021) In this challenge that I set for myself I approached a stranger on the street and engaged them in a conversation about their appearance. Most other listeners will likely react more neutrally when hearing the recording as it is ostensibly a normal conversation.

In any case, I mention these three techniques for creating tension because they became fundamental parts of the compositional approach for the final piece: *î-n-k.', 26*. This final

piece is a culmination of the ideas, techniques and reflections developed through the portfolio.

Closing Movement of *W-4*

Another technique in *W-4* that influenced the development of *î-n-k.', 26* is the restatement of materials from earlier in the piece, evoking ternary form which "at its broadest level…. is a narrative of 'the return'." (Andean, 2016). More specifically, the closing movement from 19.08 onwards in *W-4* features restatements of material—e.g. the EDM drum loop at 20.47, the heavily reverbed synthesis at 23.02, and the scream-synthesis at 22.19 and 28.16—whilst implicitly expanding the glimpses of ambient music between 13.07-16.00 in the piece into a predominantly ambient music soundscape.

In this way, an acoustic chain (Adkins, 1999) is created with other acousmatic works such as *Rumeurs* by Robert Normandeau wherein the section between 11.00-12.00 features "referencing of material from earlier in the work, whose return marks this passage as climactic and points towards the impending end of the piece." (Andean, 2016). The section between 10.53-14.10 in *Parade* by John Cousins is also linked to the final movement in *W-4* through featuring "multiple layers of superimposition and recapitulations of materials previously heard." (Young, 2008)

Furthermore, "the fact that the same snatches of recordings [in *Parade*] are reiterated in new contexts epitomises the creative, fluid and contextual nature of memory; the specific experiences are the same, but the context in which they are recalled, and therefore the perspectives offered on them, have altered." (ibid. 2008) The reprocessing of sounds from earlier in *W-4* can also alter listeners' perspectives on such material. Recognising this when composing *W-4* influenced the decision to reprocess material in a final movement; the potential of altering listeners' perspectives in this way reflects the changing of outlooks and memories associated with psychedelic experience/s (as discussed in the writing on @). It seemed that creating this closing movement was then another way of reflecting my desire to continue including material that appeared to evoke psychedelic effects.

7. *î-n-k.', 26*

î-n-k.', 26 is a binaural piece; it is the sixth and final work of this portfolio. It features a culmination of the ideas, techniques and reflections developed throughout the portfolio.

I approached this piece using a set of templates for creating distinct high-level structures. These templates included evocations of screaming, an extended quiet section or plateau, a field recording of a conversation, and a variation of ternary form. Each of them emerged in the previous composition, *W-4*. Specifically, the plateau and variation of ternary form were the basis for the high-level structures at 5.00-6.44 and 19.08-35.00 in *W-4*, respectively. The evocations of screaming at 8.08-8.48 and the field recording of a conversation at 9.46, in *W-4*, emerged and functioned more as lower-level structures within a higher one.

The change from lower levels in *W-4* to higher ones in *î-n-k.', 26*, with regards to the evocations of screaming (0.53-2.22 in *î-n-k.', 26*) and field recording of a conversation (2.57 in *î-n-k.', 26*), evokes Smalley's discourse on *structural levels*: "At one moment…. one may be following discrete, short units, and at another a large-scale structure whose continuity and coherence refuse to be dissected and demand to be considered more as a whole...." (Smalley, 1997) Although the field recording of a conversation in *W-4* has a similar temporal length to that of the same sonic type in *î-n-k.', 26*, I consider the latter to constitute a higher-level structure because it seems to contain all other sonorities when it appears. On the other hand, the recording of a conversation in *W-4* appears on the same structural level as other discrete lower-level sonorities—i.e. a bass sonority and gritty noise—which together comprise a higher-level construct.

In any case, I wanted to use all the above templates in *î-n-k.', 26* because they had attracted my attention in the previous composition and they seemed to afford the generation of varied lower-level materials when used as the basis for high-level structures.

Accordingly, it seemed these templates could be useful high-level starting points for helping to quickly create varied materials in a work. As Manuella Blackburn mentions regarding the use of vocabulary sets and combinations as starting points for sound

material creation: there can be a variety of interpretations when responding to word prompts in composition, and that "a multitude of meaning and imagined instances can be generated from a single word. This variety transfers over, yielding diversity in the composed event." (Blackburn, 2010) Similarly, the conceptions of screaming, a conversation, a plateau and a variation of ternary form seem to afford manifold imagined instances and permutations in sound, whilst retaining their fundamental essence. This sense of variety in terms of permutations is enhanced through extending small-scale structures into large-scale ones; in such extensions, "morphologies often develop other inherent or organic behaviours over time that might not be predicted when starting out." (Blackburn, 2011) In this way, using most of the aforementioned templates in *î-n-k.', 26* as the basis for large-scale structures seemed to afford more variety of behaviours than if they constituted or underpinned small-scale ones; larger-scale structures afford more time for trajectories and interactions to unfold. Nevertheless, the field recording of a conversation is temporally shorter than the other high-level shapes as I initially intended for it to function as a transitionary section (as discussed in the following section on this template). It seemed that this field recording's striking presence would be diminished if I temporally extended it and used it more than once in this piece. I used the excerpt as a high-level structure because it seemed to contain a variety of lower-level interest.

Other materials from earlier works in the portfolio that I used in *î-n-k.', 26* included instances of ambient music, EDM, shards and fizz. However, I kept such material as lower-level structures in this piece because the aforementioned templates appeared more suitable for creating high-level structures. In the previous composition I implicitly expanded a small-scale instantiation of ambient music into a large-scale closing movement as a way to establish ternary form. In *î-n-k.', 26* I avoided expanding instances of ambient music (e.g. between 6.00-6.40) in a similar way because the section preceding the final movement in this piece suggested a more intense ensuing passage. This evokes the notion of *spectromorphological expectation* (Smalley, 1997), as discussed in the following section regarding the plateau in *î-n-k.', 26*. I also kept instances of EDM as lower-level structures in *î-n-k.', 26* (e.g. at 2.23) because it seemed that a higher-level instantiation of EDM would be more laborious to construct than the aforementioned templates. I could more readily conceive of different ways of using such templates to create higher-level structures; they appeared more efficient than instances of EDM at higher levels. Furthermore, shards and fizz also seemed restricted in terms of the variety

of lower-level material and behaviour they would produce if I used them as high-level structures.

It also became apparent in composing this piece that the high-level structures I used were more effective as starting points for constructing a work than lower-level materials, in that they generate or suggest a greater amount and variety of material for use in composition. Accordingly, implementing the aforementioned templates as the basis for high-level structures in *î-n-k.', 26* seemed a quicker way of beginning to construct a work, as much of the lower-level material was already suggested.

I nevertheless used lower-level materials to fill in apparent gaps before, in-between, within, and after higher-level structures. In this sense one could consider these lower-level materials as secondary to the higher-level structures. However, some of these materials, such as shards, fizz, EDM, and ambient music, appear to stand out due to their distinctiveness. This creates more of a balance in my listening between higher and lower levels of structure in terms of perceptual interest—which I wanted.

In any case, the multiscale approach used for *î-n-k.', 26* seems akin to solving an n-dimensional jigsaw puzzle where,

> …. each piece in the puzzle is a sound object with a potentially unique morphology. How the pieces will ultimately fit together is not evident at the beginning…. Unlike a conventional jigsaw puzzle, however, one can construct new sound objects to fill in transitional gaps, or transform existing objects so that they fit better. This process of solving a compositional puzzle can involve advance planning guided by predetermined design goals, but it can also be intuitive, exploratory, and open-ended. (Roads, 2015)

This multiscale way of beginning to construct a work using predetermined high-level templates, whilst filling in details according to more of a bottom-up strategy, constitutes a flexible kind of blueprint for approaching a piece.

The following sections provide more detail on the higher-level templates mentioned above. This detail should help in understanding how and why I used them in in *î-n-k.',*

26. It should also help in understanding how I can reuse them in future works to create a greater sense of coherence and identity between pieces, whilst affording such works a sense of distinctness.

Evocations of Screaming in *î-n-k.', 26*

The counterpoint between the sine wave and sound mass at 0.53-2.22 in *î-n-k.', 26* features loud, high-frequency and broad-spectrum material—retaining the resonance of screaming discussed in the writing on *W-4*.

In a similar way to the sonority in *W-4*, it creates tension through contrasting spectral envelopes—in this case between those of the sine wave and sound mass. The sound mass also creates tension through constituting an intense, distorted and dense monolith of sound. The intensity of this sound mass in *î-n-k.', 26*, and the rising pitch of the sine wave and mass, also reflects similar characteristics to that of the sonority appearing to evoke screaming in *W-4*.

However, this sine wave and sound mass combination seemed to accord more with the notion of psychedelic effects that I was drawn to, in comparison to the sonority in *W-4*. Both instances in each work rise in pitch, evoking moments in *The Shaman Ascending* by Barry Truax where,

> …. [sound] materials undergo various sonic adaptations to reflect the 'internal' experiences of a shaman's ecstasy and spirit flight. The digitally transformed sounds symbolize the shaman's ecstatic 'ascension' towards the spirit world above, through the use of rising pitch…. These materials may be understood as metaphorical since they do not reflect the type of sound one would actually expect to hear during a shamanic ritual (i.e. due to auditory hallucination), but rather they suggest the shaman's spirit flight symbolically through sound. (Weinel, 2018a)

Similarly, the aforementioned rising of pitch in *î-n-k.', 26* and *W-4* appears to metaphorically reflect the notion of flight, and in turn, of euphoria or being 'high'. However, associations with psychedelic effects seem further enhanced in the counterpoint section in *î-n-k.', 26* through the timbre of the sound mass from 1.40 onwards appearing

to mimic the sound of an aeroplane taking off. This sonic image of a plane appears to suggest travel, and in turn, a colloquialism for a psychedelic experience: a 'trip'. The apparently stronger accordance with the notion of psychedelic effects in this counterpoint passage influenced my decision to include the sine wave and sound mass instead of the sonority in *W-4*; I still wanted the inclusion of material that appeared to evoke psychedelic effects.

The rising of pitches in this section and between 8.29-8.48 in *W-4* also acts as a reference point, indicating that a reorientation of sonic direction is about to manifest. As with the instance in *W-4*, this instance in *î-n-k.', 26* is also related to Smalley's ideas regarding motion and growth processes:

> "…. if we encounter a slow, ascending contour, we could expect a variety of outcomes but not any outcome…. it could increase in richness leading to an impact point; it could be joined and absorbed by other events; it could change direction…. Whatever it eventually does may surprise us (if there are sudden changes) or it may do what we expect particularly if its rate of change gives us clues to its future." (Smalley, 1997)

In the case of *î-n-k.', 26* and *W-4*, the rising pitches appear to herald the beginning of a new movement; we can consider this technique as reifying the structural narrative mode in that it seems to establish "a system and a pattern that is recognised as such and that can then be developed or contradicted." (Andean, 2016)

Plateau in *î-n-k.', 26*

The plateau between 3.40-7.45 in *î-n-k.', 26* creates suspense. In a similar way to the quiet field recording section in *W-4* between 5.00-6.44, this less forceful passage in *î-n-k.', 26* features a different type of tension than moments of intensity—such as the counterpoint section described above. The contrasting dynamics between the more intense counterpoint section and this plateau helps create shape in the piece.

It also became apparent through composing *î-n-k.', 26*, that this plateau technique shares a similar structural role with the resonances of screaming described above—i.e. it

indicates that a reorientation of sonic direction is about to manifest. Akin to the resonances of screaming, the plateaus in *î-n-k.', 26* and *W-4* build suspense before developing into a new movement. In this way, the screaming techniques and plateaus share similarities in terms of *spectromorphological expectation*. (Smalley, 1997) They appear aligned with Smalley's description of an altered *graduated continuant archetype* whereby "increasing the spectral energy towards termination, [leads] towards, and [creates] the expectancy of, a new note-gesture." (ibid. 1997) However, a difference between the screaming techniques and plateaus is that the latter precipitate more intense sections, whereas the former precede more subdued passages.

Furthermore, the lengthy *continuant phase* (ibid. 1997) that constitutes most of this section may have contributed to a sense of focused attention I perceive when listening to this plateau section. Smalley asserts that lengthening a continuant phase draws attention away from the onset towards sonic progression. (ibid. 1997) This sense of focused attention seems enhanced through trying to identify the quiet sounds in this plateau in *î-n-k.', 26*, and whether they reside in real, virtual or unreal environments (Field, 2000).

The way this passage focuses my listening, and its relaxed character, also seems to afford a kind of intimacy. This section appears to reinforce the apparent feature of intimacy established through other means in *î-n-k.', 26*, such as via the binaural format (as discussed in the writing on @).

Recorded Conversation Excerpt in *î-n-k.', 26*

It initially seemed that including the field recording of a conversation at 3.00 before the plateau section described above would act as a bridge between disparate passages through the changing of landscapes (in a similar way to the changing landscapes between 3.15-4.15 in *W-4*). Specifically, the change from a predominantly unreal-objects/unreal-space soundscape to the real-objects/unreal-space landscape where the field recording excerpt appears, seemed like it could create a smoother transition to the following plateau section—which initially featured a real-objects/real-space landscape with an overt field recording as its main component. However, the overtness of this recording diminished as the piece developed; I overlayed other abstract sonorities and reduced the volume of the recording. This obscuring of the field recording in the plateau section appeared to then

undermine the original intention of creating a smoother transition via the changing of landscapes.

Nonetheless, I kept the field recording excerpt because it was effective in other ways. The explicit presence of human voices and the semantic dimension of vocal articulation facilitate engagement. As Curtis Roads asserts, "Vocal material attracts instinctive human interest. It immediately injects all of the referential baggage of language (narrative, literal meaning, etc.)." (Roads, 2015) The narrativity in this field recording excerpt creates tension in my listening through the recalling of an anxiety-inducing moment where I asked a stranger to borrow £100 as part of a comfort zone challenge—akin to the field recording at 9.46 in *W-4* which captured a similar comfort zone challenge. (Page, 2021) These were activities that I undertook for the purposes of personal development. However, a listener is more likely to perceive a sense of tension in the recording in *î-n-k.', 26* through the interaction appearing as more socially unusual than the ostensibly normal conversation in *W-4*.

The apparent illogicality of these kinds of field recordings appearing briefly in my abstract sound worlds, and then disappearing, seemed to evoke the illogicality of dream-like hallucinations—which accorded with my desire to continue to include allusions of psychedelic effects.

After composing *W-4*, it seemed that including an explicit conversation between people also facilitated engagement through simulating the experience of eavesdropping. This appears to contribute to the dimension of intimacy that I wanted to reinforce in *î-n-k.', 26*, through a kind of listening in on a private interaction. The prominence of this type of field recording when it appears in *î-n-k.', 26*, and that it is the only instance of verbal dialogue in the piece, also seems to enhance engagement.

Variation of Ternary Form in *î-n-k.', 26*

The restatement of materials from earlier in *î-n-k.', 26* appears in the final movement of this piece—7.45-15.30—in a similar way to *W-4*. However, *î-n-k.', 26* features restatements of materials heard earlier in the piece *and* materials from earlier in the portfolio. For instance, an excerpt from @ can be heard at 10.19, from *0_2* at 10.23-11.29,

Bh/5ONiCr at 12.03-12.17, *W-4* at 12.30-13.00, and *Image 8* at 10.06, 11.18, 11.38, 11.49 and 12.56. The reprocessing of material from earlier in the portfolio appears to extend the ternary form "metaphor of 'coming home', of travelling out and then coming back to where you started" (Andean, 2016)—strengthening a sense of coherence with regards to the overall portfolio. This restatement of materials also appeared to suggest a sense of closure for the portfolio.

Furthermore, I wanted to include such material from earlier pieces in *î-n-k.', 26* as it seemed to evoke the notion of interconnectedness commonly reported in accounts of altered states of consciousness induced via psychedelics. (Harris, et al., 2017) I reinforced this apparent sense of interconnectedness in *î-n-k.', 26* through including new iterations of sonic types developed and used in prior works—such as shards, fizz, EDM, ambient music and sounds mimicking animal calls.

Through using these sonic types and the above high-level templates in *î-n-k.', 26*, it appeared that each was adaptable in their implementation. As Roads states, "multiscale organization can be likened to…. partial systems that come into and go out of being…. but reserves the right for the composer to interact, intervene, edit, and transform at any time. (Roads, 2015) In this way the details and placement of techniques and sonic types in my compositional toolkit can be altered with each new piece—whilst retaining their fundamental essence. In other words, using these components enables each work to follow its own path and have distinct qualities at different structural levels, whilst retaining a compositional identity.

8. Conclusion

The principal aim of this research was to develop a compositional approach from a beginning point of sonifying biological patterns in an acousmatic music style.

My initial attempts in using such patterns as the foremost approach to constructing works actually seemed to inhibit more flexible explorations of varied materials and the production of aesthetically compelling output. Therefore, this approach diverged into metaphorically reflecting such patterns through synthesis evoking animal sounds and movement, and field recordings in the first three works. This afforded more flexibility in reflecting biological patterns than sonification.

Other sonic types also emerged as the portfolio developed including Algorithmic Chains of Sonic Shards, Streams of Digital Fizz, human voices and more diverse field recordings. These sonic types seemed, in part, implicitly produced via the semiotic transformation in representing biological patterns across the first three pieces—as discussed in the chapter on *Bh/5ONiCr*. It was viewing such a transformation in terms of evolution and birth that gave rise to a sense of coherence between the reification of biological patterns in sound and the subsequent production of these sonic types.

Working with shards, fizz, voices and diverse field recordings afforded a more efficient and flexible way of approaching the construction of a work, rather than being constrained by trying to devise and adhere to conceptualisations of biological patterns. They afforded more thinking space for considering other lenses through which to view my pieces.

These other lenses included psychedelic effects, intimacy and tension, which influenced how I perceive works in the portfolio. For instance, recurring features of tension in the portfolio became more noticeable in my listening after including more diverse sounds of the everyday in my abstract sound worlds. It became clearer that many aspects of my works, such as this, reflected the hallucinatory character of psychedelic experience. Composing and listening in binaural format also appeared akin to all-encompassing spatial experiences of abstract worlds induced via psychedelics. The binaural format also seemed to permit a more intimate listening experience than the ambisonics and discrete

multichannel pieces composed at the beginning of this project. It became apparent that notions of intimacy, tension and reflections of biological patterns, such as animal sounds, fit together by appearing as subcategories of psychedelic effects (which alongside the other points in this paragraph is discussed in the writing on @).

Notions of psychedelic effects, intimacy and tension influenced decisions made in the final two pieces, such as the inclusion of specific techniques and materials. Some of these constituted evocations of screaming, an extended quiet section, a field recording of a conversation and a variation of ternary form.

I used these techniques as high-level templates in *î-n-k.', 26* because they appeared to suggest a variety of lower-level material. In this way, they seemed useful as starting points for helping to quickly create varied materials in a work. I also specifically used these techniques in this final work because they had attracted my attention in the previous composition, *W-4*. Other materials from earlier works in the portfolio that I used in *î-n-k.', 26* included instances of shards, fizz, ambient music and EDM. However, I kept such material as lower-level structures in this piece because the aforementioned templates appeared more suitable for creating high-level structures. It also became apparent that the high-level structures I used were more effective as starting points for constructing a work than lower-level materials; they generate or suggest a greater amount and variety of material for use in composition.

Devising other high-level templates that generate or suggest lower-level material could be a way to expand this top-down dimension of my approach in future pieces. Establishing different variations of the high-level templates featured in *î-n-k.', 26* is also a potential path of exploration in future works.

In any case, I used lower-level materials to fill in apparent gaps before, in-between, within, and after higher-level structures in *î-n-k.', 26*. Some of these materials appear to stand out due to their distinctiveness, creating more of a balance in my listening between higher and lower levels of structure in terms of perceptual interest.

The culmination of this kind of multiscale approach enables each new work to follow its own path and have distinct qualities at different structural levels, whilst retaining and enhancing a sense of compositional identity.

In developing the portfolio, I also recognised that some sounds I was using had an energy identifiable as coming from a previous time in electronic music history. These sounds appeared to suggest a kind of dialogue with prior eras of electronic music-making. I call these sounds *sonic imprints of electronic music's past* and there are dimensions to them that are ahistorical—namely, temporal, tactile and spatial dimensions—as discussed in the writing on *0_2*. Acknowledging ahistorical dimensions of sonorities perceived as such imprints subverts the notion that explorations and applications of sounds ostensibly from electronic music history have been exhausted, and that composing with sounds apparently from electronic music's past is a "backward step from the grand vision of ever more sophisticated digital engagement." (Nelson, 2015)

Nevertheless, such sounds may be perceived as historical by those well versed in electronic music history. Thinking about this further, it seems that this potential inescapability of these imprints being regarded as historical—despite their ahistorical dimensions—opens up a path for future exploration regarding to what extent electronic music documents its own history.

Another avenue for developing the project further is in continuing the trajectory of reflecting psychedelic experience in future works. Creating more refined techniques traversing the gamut of the mode of representation axis[12] could help further my desire to represent psychedelic effects according to my aesthetic sensibilities. Broadening the practice into the audiovisual domain could extend this path of development; visual processes are often among the most prominent features of psychedelic experiences. (Császár-Nagy, Kapócs and Bókkon, 2019)

This research has thus opened up further paths to explore. It established a robust creative approach which features an essential collection of sonic types, techniques and conceptual

[12] As mentioned in the writing on @, "The 'mode of representation' (y) axis describes the use of approaches ranging from 'accurate' to 'stylized' representations of subjective experience." (Weinel, 2018a)

lenses that traverse different structural levels. In conjunction with the binaural format, using these components has developed an approach that facilitates the production of varied material(s), whilst reinforcing a sense of compositional identity.

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