Music as Pure Duration: a dialogue between music and philosophy

by

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Abstract

Music as Pure Duration: a dialogue between music and philosophy is a multi-method Practice Based Research project that contributes to dialogue between music and philosophy within the field of music. The thesis is comprised of a compositional portfolio and written component. It places hybrid of New Music and Electroacoustics in dialogue with Metaphysics. By interpreting Bergson's temporality and Husserl's consciousness of internal time through music, it questions how temporality is distinct in music compared to physical objects and sound. Chapter One defines the study. Chapter Two focuses on the composition of *Sedemus*, reading the design schematic of a chair as instruction for music. It discusses the relationship between spatiality and temporality, accuracy and interpretation. Chapter Three critiques *Sedemus*, leading to the dialogic composition of *Sedere Audire*. It differentiates analytical knowledge from intuitive knowledge in the context of music and sound. Chapter Four offers music as a metaphysical concept, realized as *Day Born*. It investigates the heard and the audible. Underpinned by Husserl's treatment of Phantasy, Image Consciousness, and Memory, it is succession, simultaneity, and continuity that appear critical to the differentiation of non-audio and audio entities. In the context of Hermann's definition, Chapter Five focuses on analytical accuracy in the sonification of a cuboid and uncovers a tension between validity and aesthetics. Chapter Six presents compositions informed by the concepts of unfolding (in *Struck*), differentiating analysis and intuition (in *Discern*), and piano as object or musical instrument (in *Reduce*). Chapter Seven summarises the research findings and points towards continuing research. *Sedemus*, *Sedere Audire*, *Day Born,* and the sonifications demonstrate new insights gained through practical and philosophical analysis whilst *Struck*, *Discern*, and *Reduce* demonstrate tacit and intuitive knowledge. This research is intended to be of interest to musicians, especially those seeking to embed their music practice within philosophy. It is expected that philosophers with specific interest in temporality, Bergson, or Husserl, may also find interest.

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Glossary

The purpose of this glossary is to present philosophical and technical terms that may be outside the working knowledge of musicians.

Consciousness
According to Husserl (1960), consciousness describes the experience of mental states with intentionality and temporality comprising its two primary features.

Corporeal spatial occupancy
Refers to solid, physical objects that occupy space.

Decibels relative to Full Scale (dBFS)
dBFS is a unit of measurement for amplitude in digital systems.

Epoché
Refers to the philosophical concept of suspending/ modifying judgment of the natural world to instead focus upon experience. Levine (2017) states: 'So the epoche therefore entails a change of attitude to reality, not the exclusion of reality. In this way the world is still something for me, but only as the pure correlate of my subjective acts, as something that is given'.

Heard
In this thesis, I use the term heard to refer to audio that is perceived within internal consciousness and does not require physical existence as sound to be perceived.

Intentionality
Husserl (1960, p.33) refers to intentionality as a mental state that is directed at something, and writes: 'Conscious processes are also called *intentional* […] the word intentionality signifies nothing else than this universal fundamental property of consciousness: to be conscious *of* something'.

Intuition
Bergson (1903) refers to intuition as a way of knowing that is informed by experience as opposed to analysis. Bergson (1903, p.2) writes: 'By intuition is meant the kind of *intellectual sympathy* by which one places oneself within an object in order to coincide with what is unique in it…'.

Image Consciousness
Husserl (2005, p.251) refers to image consciousness as imagining something that is not present and offers a literary analogy: 'Take the case of reading a novel in which the hero phantasies, dreams, remembers. The story in the novel: It is not, however, an actual story; on the contrary, it only represents such a story. This is an *image* consciousness'.

Metaphysics
In Bergson's (1903) 'Introduction to Metaphyics', he argues that metaphysics is a science for intuitive knowledge (as opposed to analytical knowledge) which expounds the pertinence of being, existence, and reality.

Objectivity
I use the term objectivity in this thesis to refer specifically to the reading of design schematic as notation data for the realisation of audio.

Open Sound Control
Open Sound Control (OSC) is a protocol for digital sound synthesis. OSC offers higher resolution than MIDI standard.

Phantasy
Husserl (2005, p.22) refers to phantasy as the imagining of something original, and explains it relative to image consciousness: 'In phantasy presentation in the ordinary sense, a mental image is there without being tied to such a physical excitant'.

Pure duration
Pure duration is a concept within Bergson's (1889) philosophy of time and consciousness that posits time as the quality of continuum constituted by indivisible, constant progression. Bergson (1889, p.100) writes: 'Pure duration is the form which the succession of our conscious states assumes when our ego lets itself *live*, when it refrains from separating its present state from its former states'.

Re-presentation
Husserl (1991, p.43) writes of re-presentation as the presentation of something that pre-exists: 'Perception in this case is the act that places something before our eyes as the thing itself, the act that *originally constitutes* the object. Its opposite is *re-presentation*, understood as the act that does not place an object itself before our eyes but just *re-presents* it'.

Sonification
The use of non-speech audio as data for the realisation of audio.

Spatiality
Bergson (1889) refers to spatiality as pertaining to existence within or of space.

Temporality
Bergson (1889) refers to temporality as pertaining to existence within time.

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CHAPTER ONE: INTRODUCTION

1.1 Music as Pure Duration

Music as Pure Duration: a dialogue between music and philosophy is a practitioner-research professional doctorate project that contributes to the areas of music and philosophy. The thesis is constructed through a dialogue of music and philosophy and cumulates in a compositional portfolio that reflects the knowledge gained through practice. Through a dialogue of music practice and philosophical analyses, I question how music is temporally distinct from physical objects and from sound, how philosophies of Henri Bergson and Edmund Husserl can be interpreted when placed in dialogue with music, and how temporality is essential to music. This probing provides new insights into the relationship between music and time, and this knowledge is expanded to inform developments to my compositional practice. The narrative of this thesis is chronological and accumulative, with knowledge articulated as it is developed through the research. In addition to the written element, this thesis contains sonification experiments and the compositions *Sedemus, Sedere Audire, Day Born, Sonification, Struck, Discern,* and *Reduce.* These compositions should be listened to when first discussed in the written counterpart of the thesis.

1.2 Practice Based Research

Methodologically, the research is multi-method and based in practice. Fundamentally, it can be understood as reflective, Practice Based research where music and philosophy are in dialogue. The knowledge and insights gained through the research are qualitative, however, in addition to qualitative intuition of philosophies through music composition, philosophy is interrogated through music composed through quantitative, analytical methods.

With practice forming a significant component of my research, describing my research has led to deep engagement with the debate surrounding the definition of practice research within the arts. Practice as Research, Practice Led Research, and Practice Based Research (amongst others) are terms attributed to research when practice is a component. There is an abundance of practitioner researches wherein there are vast differences in the ways that

knowledge is gained, practice and research are conducted, and the projects are articulated. Contradictions and multifaceted synergies between different research projects and definitions for methodologies have produced a complex climate where explicit categorisation cannot be readily applied. The difficulty in defining how knowledge is gained within practice research and the debate surrounding definition are typical of (and in a way, epitomize) the arts. However, there is commonality between these researches: practice is given explicit credence.

Pursuing an understanding of my research, guided by Nelson (2013), I have drawn upon ideas articulated within Allegue *et al* (2009), and by Haseman (2010 & 2006), and Gray (1996). Between authors, the numerous specific definitions for (and therefore differentiations of) practice research are often inconsistent. For example: author A might state that they appreciate author B's definition of Practice Led research as a slight variation of their own (author A's) definition of Practice as Research. In describing my methodology I do not intend to construct taxonomy of practice research, rather I am seeking to describe my own practitioner research.

I initiate my practitioner research through the composition of *Sedemus*, with reflection on the piece leading me to engage with Henri Bergson's (1889) 'Time and Free Will' and to question how music is temporally distinct. Following that, I engage with further practice through *Sedere Audire*, with the intention of deepening insights in a continuing dialogue of music and philosophy. The preliminary research findings direct me to Edmund Husserl's (2005) 'Phantasy, Image Consciousness, and Memory (1898-1925)'. Analysis and reflection of which leads to an essential understanding of time that I investigate through the composition of *Day Born*. Insights gained from that dialogue, lead me to engage with Bergson's (1903) 'Introduction to Metaphysics' and practical experiments in sonification. Through sonification experiments, I engage with an acute quantitative analysis of sound. I view this facet of my practice as analytical, with my compositional methods generally favoring increasing degrees of quantitative accuracy.

Those facets of my research can be understood as Practice-Led. Gray (1996, p.3) defines Practice-Led research as 'research which is initiated in practice, where questions, problems, challenges are identified and formed by the needs of practice and practitioners'. Similarly, discussing Practice-Led research, Haseman states:

> Above all it asserts the primacy of practice and insists that because creative practice is both on-going and persistent; practitioner-researchers do not merely 'think' their way through or out of a problem, but rather they 'practice' to a resolution.
> (Haseman 2010, p.147)

Throughout the research, methods are adapted as per the requirements of specific problems/ questions, and those methods can resist definition as either definitively quantitative or qualitative, consequently finding congruence with Haseman's performative research. Particularly with regards to my experiments with sonification, the practical methods of sonification are necessarily quantitative, however insight is gained from the sonifications through qualitative evaluation. The knowledge gained through those experiments is expressed in presentational form as sound and as music. Haseman (2006, p.6) states: 'alongside quantitative (symbolic numbers) and qualitative (symbolic words) – the symbolic data works performatively. It not only expresses the research, but in that expression becomes the research itself'.

Subsequent to my reflections on *Sedemus, Sedere Audire, Day Born*, and the sonification experiments, I articulate my findings through practice. I describe the way in which my compositions *Struck*, *Discern*, and *Reduce* are directly informed by the dialogue between music and philosophy. This shares commonality with Haseman's (2006) 'performative research' wherein research is articulated in presentational form as music. However, given the definite qualitative compositional methods employed, I am hesitant to draw any further similarity to performative research. Rather, I develop the method specifically from engagement with the dialogue between music and philosophy. Whilst the compositional techniques employed within *Struck*, *Discern*, and *Reduce* are

written, the purpose is to explore correlation between Bergson's philosophy and my music. In the conclusion of 'Introduction to Metaphysics', Bergson presents juxtaposition between analytical knowledge and intuitive knowledge. He discusses how analytical knowledge is akin to study before composition, stating:

> And it is not merely a question of assimilating the most conspicuous facts; so immense a mass of facts must be accumulated and fused together, that in this fusion all the preconceived and premature ideas which observers may unwittingly have put into their observations will be certain to neutralize each other. In this way only can the bare materiality of the known facts be exposed to view.
> (Bergson 1903, p.21)

I interpret his analogy as meaning that study or analytical knowledge as a gathering of material is limited to a status of analytical knowledge of materials. Furthermore, to which he states:

> But metaphysical intuition, although it can be obtained only through material knowledge, is quite other than the mere summary or synthesis of that knowledge. It is distinct from these, we repeat, as the motor impulse is distinct from the path traversed by the moving body, as the tension of the spring is distinct from the visible movements of the pendulum. In this sense metaphysics has nothing in common with a generalization of facts, and nevertheless it might be defined as *integral experience.*
> (Bergson 1903, p.21)

With *Struck*, *Discern*, and *Reduce*, I interpret Bergson's philosophy intuitively but informed by the analysis conducted with *Sedemus, Sedere Audire, Day Born*, and the sonification experiments.

This research represents dialogue of music and philosophy as practitioner research. I regard the term Practice Based research as best representative of my research. This is not to say that any one of the numerous definitions of Practice Based research is exhaustive, rather my understanding of my practitioner research is informed by a multitude of descriptions of practice research including projects defined as Practice as Research, Practice led

Research, and Practice Based Research. Simply, I regard the *term* Practice Based as applicable to my research because of semantic logic. To define my research as Practice-Led would not do justice to the aspects of my work that are not explicitly practical. Furthermore, whilst initiated by practice in the form of *Sedemus*, and at other times led by practice, my philosophical reflections also lead my research with equal significance (there is an essential dialogue). To define my research with the term Practice as Research interprets the practical component of my research as elevated above all other aspects. My research is constituted in part by a compositional portfolio: by practice. This practice is informed by and it reflects the knowledge gained through the dialogue between practice and philosophy. Dialogic process, as the methodological underpinning of my research, resists explicit hierarchy and dualism. Rather, semantically, Practice Based Research is appropriate in defining my research. Nelson (2013, p.10) defines Practice Based research as 'research which draws from, or is about, practice but which is articulated in traditional word-based forms'. My research is *situated* within practice, with practical, philosophical, theoretical, contextual, and critical aspects being practice oriented, and I regard myself, fundamentally, as a practitioner.

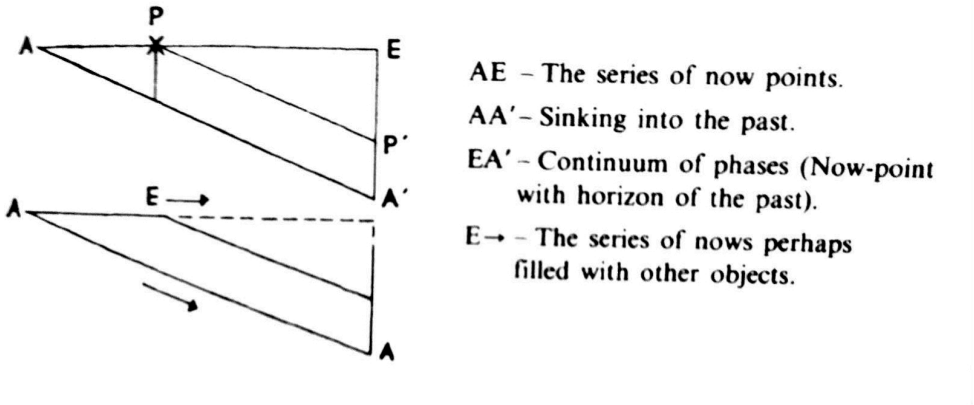
1.3 Reflective Practice

Reflective practice within my research is primarily informed by Donald Schön. Schön (1983) differentiates reflective practice by 'reflection-in-action' and 'reflection *on* action'. Schön's differentiation serves to illustrate the way in which I and many practitioner-researchers develop knowledge, their practice, and their research, through a synergy of reflective practice. During action (or practice), I have a sincere appreciation for tacit knowledge. Whether active music composition or philosophical study, through reflection-in-action I gain a specific kind of knowledge. Reflecting within that action, I am able to make decisions that are informed by the immediacy of tacit knowledge. The decisions I make and reflection I have during action are perceived so immediately that they seem to be known without any theoretical exertion. Schön gives tacit practitioner knowledge authority, arguing that it forms the basis for interpretation. Schön (1983, p.138) states that 'When a practitioner makes sense of a situation he perceives to be unique, he *sees* it *as* something already

present within his repertoire'. Subsequent to action, I have a different appreciation for tacit knowledge. I appreciate it for its inaccessibility. Reflecting on my action I have a responsibility to understand it and articulate it along with other decisions born of tacit knowledge. I view reflection on action within my practice as bringing synergy and order to reflections-in-practice.

This reflective practice is also represented within the dialogue of music and philosophy. I conduct my music practice with philosophy in mind and my philosophical studies with music in mind. If I was to focus upon each, isolated from the other, the relationship between them would be dualistic and the connection between them would be artificial. My reflection-in music practice is reflection on philosophical study; my reflection-in philosophical study is reflection on music. The reflective dialogue within this thesis is analogous to Nelson's (2013, p.5) definition of praxis, with 'theory imbricated with practice'.

My reflective practice wherein practice and theoretical underpinning are in continuous dialogue enables a synergy between embodied knowledge and rational knowledge. I interpret a commonality between the representation of Schön's reflection-in and reflection on action within my practice, and Husserlian philosophy on the consciousness of internal time (which is discussed extensively within this thesis). Husserl's 'The Diagram of Time' recognises the continuum of time within internal consciousness.



(Husserl, 1991 p.29)

Husserl posits that consciousness of internal time and temporality of perception are subject to the affect of a continuum of retention. Subsequent to a primal impression from perception, retention persists through conscious engagement. I interpret this as meaning that the continuum of retention is not merely a reiteration *ad infinitum*. Husserl locates his position within a musical example:

> The tone-now changes into a tone-having been; the *impressional* consciousness, constantly flowing, passes over into ever new *retentional* consciousness. Going along the flow or with it, we have a continuous series of retentions pertaining to the beginning-point. Beyond that, however, each earlier point of this series is adumbrated *in its turn* as a now in the sense of retention. Thus a continuity of retentional modifications attaches itself to each of these retentions, and this continuity itself is again an actually preset point that is retentionally adumbrated. (Husserl, 1991, p.31)

I interpret Husserl's description of retention of an initial impression as akin to the transfer of knowledge from reflection-in action where it is tacit, to reflection on action where it is more readily articulable. Transferability of tacit knowledge is of persistent difficulty for me as a practitioner. Tacit knowledge is grounded in subjective perception therefore my reflection-in-action is reliant on the retention of the knowledge through to reflection on action. With my reflective practice manifest in a dialogue of music and philosophy, I am better able to conceptualise my reflection-in practice through reflection on practice, because both facets of my reflective practice are concurrent. Within a dialogue, my reflective practice aids the difficult communication of tacit knowledge, and supports an articulation that is not in dualistic opposition to reflection-in-action.

1.4 Contextual Framework

Musically, the work contained within this thesis is in the context of New Music and Electoacoustics [EA]. The meeting of these 2 areas potentially locates my work within the field of EA, however, the aesthetic traditions of EA tend toward spatial techniques whereas my music is focused upon the metaphysical study of music's temporality. I view EA music's focus upon spatiality as distant from my practice however *Sedemus* and *Sedere Audire* have been recognised by EA audiences within academic contexts. I view *Day Born*, *Struck*, *Discern*, and

Reduce as compositions that are more readily consumable by non-academic (yet non-popular) music audiences, and it is these pieces that I feel properly represent the meeting of New Music and EA. Within my compositions, I interpret philosophy and communicate my findings by employing various time-based techniques that reflect my interpretations. The philosophical ramifications of my music inform further philosophical study, and my philosophical studies inform my music.

My philsophical studies were initially born of reflection upon my composition *Sedemus* wherein I observed a distinct relationship between music and time. Both my philosophical investigations and my compositional practice are informed by a dialogic reflective practice. The philosophical context of my research is *focused* upon Henri Bergson's (1889) 'Time and Free Will', his (1903) 'Introduction to Metaphysics', and Edmund Husserl's (2005) discourse on 'Phantasy, Image Consciousness, and Memory (1898-1925)'. Writing that extends beyond these key texts has influenced my philosophical studies within the period of this study. Husserl (1991), Hegel (1807), Merleau-Ponty (1968, 1964 and 1945), and particularly Heidegger (1927) have contributed to the way that I engage with philosophy and music. However, within this thesis, I only represent philosophy that is of specific pertinence to my praxis, much in the same way that the music within my portfolio only includes compositions that have direct pertinence to my philosophical studies. In this doctoral research, through music practice and interpretation of the key philosophical texts articulated by Bergson and Husserl, I interrogate music's distinct relationship with time.

CHAPTER TWO: SEDEMUS

2.1 Introduction

This chapter intends to illustrate the nascent stages of my compositional practice within the context of this thesis, and interrogate the extent to which dialogue is formed between music composition and philosophy. It begins by explaining the circumstances within which *Sedemus* was composed, its interdisciplinary underpinning, and the contextual framework within which it exists. Concurrently, it provides deeper insight into the practice of reading non-traditional music score. This is to present a framework that relates to the established practice of composition by graphic score, then introduces three-dimensional objects as instruction for sonification. The textual and methodological innovations to my practice are detailed with the intention to reflect some of the nuanced working methods I employ both within my composition and thought processes. Subsequent to discussion of the piece in the context of music composition, I engage within a reflective process whereby the ramifications of music that has a relationship to a non-musical, corporeal object are posited. These ramification are contextualised with the philosophy of Henri Bergson explicated within his 1889 thesis 'Time and Free Will'. These contents are then used to facilitate speculation as to the manner of compositional practice and route of philosophical interrogation that would develop the work with regards to gaining insight into the metaphysical qualities of music. Gaining insight into the metaphysical qualities of music informs the development of my original music practice.

2.2 Conception

Sedemus[1] is a composition and interdisciplinary collaboration with Rhianne van Rheede-Toas in which the design schematic of a chair is used as notation for musical realisation. At a nascent stage, inspiration for the concept was taken from composer and architect Iannis Xenakis' use of musical notation to inform his architectural design. Xenakis' (1958) architectural design for the Phillips Pavilion features long arching curves that relate to his experiments with

[1] CD1 - Compositional Portfolio: 1. *Sedemus* & CD2 - Appendices and Figures: Appendix 1. *Sedemus* Design Schematic and Score.

glissandi within his (1955) composition '*Metastaseis*'. Within Xenakis' practice the notated compositions were the foundation; the architectural designs were informed by experiments with glissandi. Reflecting on this work, Xenakis (1992, p.10) states: 'Thus I believe that on this occasion music and architecture found an intimate connection'. Interested by Xenakis' work and the concept of "musical architecture", in *Sedemus*, I sought to read the design schematic for a chair designed by Rhianne Van Rheede-Toas as a score for music.

To investigate this relationship practically, I examined Rheede-Toas' design schematic viewing it as visual instruction for music. Whilst reading the design schematic as though it were a score for music, I placed significant import upon retaining the properties of the chair as specified in the design schematic. Schematics within design are an example of instruction wherein reading the schematic does not require subjective interpretation. A schematic instructs how to construct an object. The object would be flawed if there were a flaw in the design or the reading of the schematic. Any such flaw could be critical, for example a misread dimension could cause structural instability. In comparison, musical notation can allow for greater freedom of interpretation. Tempo markings often leave room for interpretation (for example: *Andante* instructing walking pace between 76-108 beats per minute), as do dynamic instructions such as *mezzo piano* that results in a wide variety of dynamics within and between performances. To clarify: the reading of notation has intention and expectation yet there can exist a level of subjectivity of interpretation that cannot be present in the reading of design schematic. Given the reduced degree of subjectivity in the reading of design schematic, I became interested in the concept of accuracy of interpretation in music. I regard this accuracy as essential in upholding the integrity of process for this research so it became important to limit subjective freedom when interpreting the design schematic as music.

Further to reading the chair's schematic as instruction, for *Sedemus*, I worked with the condition that the sounds utilised within the composition reflect the chair's intended environment: a modern office space. This decision to orient the sonic aesthetic of *Sedemus* in terms of its intended environment is in accordance to the product, interior, and architectural design principle of contextual sympathy, what Wright (1954) refers to as 'Organic architecture'.

2.3 Method for Realisation

I viewed integrity of process, methodology, and aesthetic framework as essential prerequisites within the compositional process of *Sedemus*, with each representing a significant aspect of the work and the development of my practice. At the time of composition, the development of a method for reading Rheede-Toas' schematic was of practical importance. The method would need to instruct the essential components of pitch, and the initiation and termination of notes, whilst upholding the aforementioned prerequisites and defining the pragmatic reading of the schematic.

Regarding pragmatics, it was decided to compose for the plan, front, and side elevations in-turn, subsequently amalgamating all three. Pitch and time as parameters were allocated to the x and y axes respectively - this compositional decision was based upon projections as to the musicality of the finished piece, particularly the harmony between lowest and highest pitches enabled by the chair's arms. The initiation and termination of notes was to be read from/ represented by corporeal spatial occupancy (in this case, the physical occupancy of the chair as opposed to the space surrounding it).

The realisation of the composition was through the use of electric guitars and a sine wave oscillator effected by long delays. Textures were created by amplifying a noise-floor signal and affecting it with 4 deteriorated potentiometers. The intention was to reflect the ambient noises typically present within an office environment such as the sound of radiators, lighting fixtures, and friction upon carpet and seat fabrics. To read the schematics as notation and achieve the intended aesthetic, parameters needed to be set. Reading the schematics objectively, preordained many aspects of arrangement

therefore early decisions regarding musical factors became of vital importance; key and harmony would have a significant effect on the composition. A whole tone scale was selected with the intention of removing any emotional associations with rudimentary harmony.

By virtue of the imposed parameters, reading of the schematic as musical notation was enabled by the following rules:

Plan View (Figure 1):

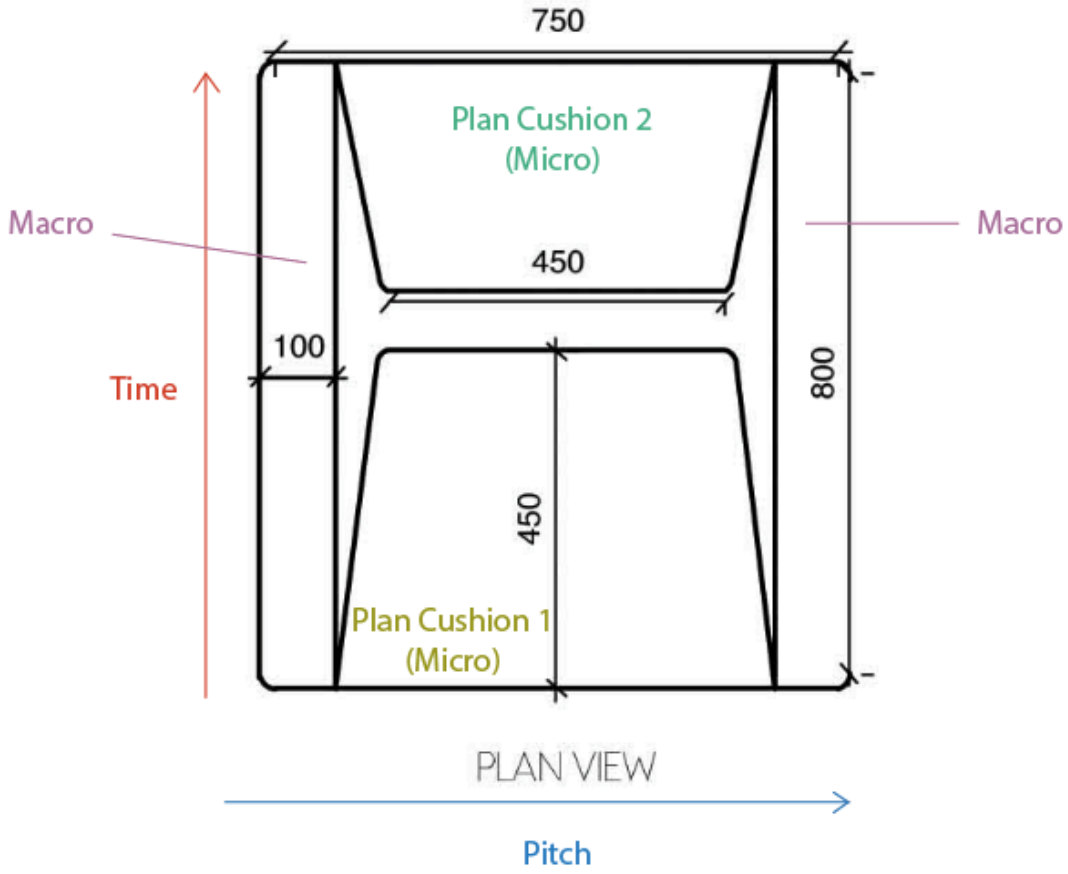


Figure 1. *Sedemus* - Annotated plan view 1

- Duration to be read from bottom to top.
- 800mm = 800s/13m20s.
- Pitch to be read left to right. Left low, right high.
- Wooden outers to represent Macro sounds.
- Macro sounds to be represented by drones existing throughout the piece.

- 100mm width of wooden outers to represent each drone consisting of two pitches, a whole tone apart.
- Overall width of 750mm not to be interpreted to allow a greater variation of pitch throughout the piece. Instead, each ‘section’ to be assigned its own range of pitch.
- 450mm Trapezium section (Plan Cushion 1) to be represented by Micro sounds.
- 300mm Trapezium section (Plan Cushion 2) to be represented by Micro sounds.
- Based on examples of similar fabric, it is assumed that using approximate values at each cushion’s widest point, there are 180 threads of fabric.
- Based on examples of similar fabric, it is assumed that using approximate values at each cushion’s narrowest point, there are 150 threads of fabric.
- Plan Cushion 1 is to lose 30 threads over 450mm = 450s/7m30s. Divided by 10 for clarity of audio, a loss rate of 3 threads over 450mm = 450s/7m30s. A rate of 1 thread every 150s.
- Plan Cushion 2 is to gain 30 threads over 300mm = 300s/5m00s. Divided by 10 for clarity of audio, a gain rate of 3 threads over 300mm = 300s/5m00s. A rate of 1 thread every 100s.
- Space between Plan Cushion 1 and Plan Cushion 2: 50mm = 50 second period without micro sounds.

Front View (Figure 2):

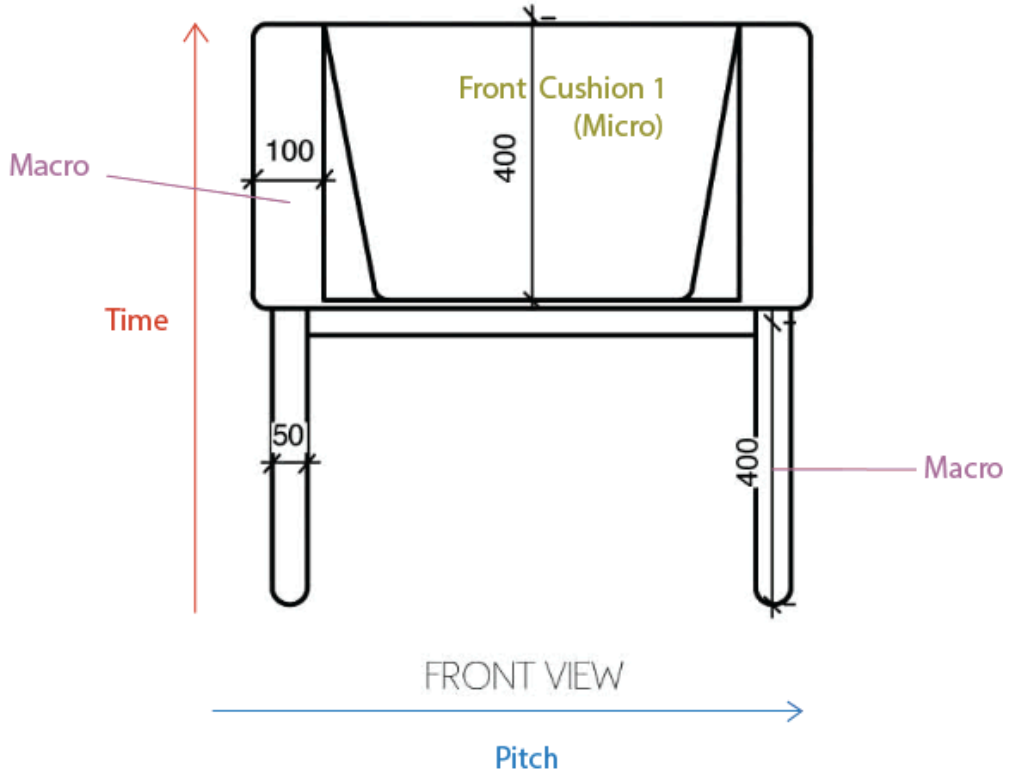


Figure 2. *Sedemus* - Annotated front view 1

- Duration to be read from top to bottom.
- 800mm = 800s/13m20s.
- Pitch to be read left to right. Left low, right high.
- Wooden outers to represent Macro sounds.
- Macro sounds to be represented by drones existing throughout the piece.
- 50mm width of wooden outers to represent each drone. Each drone consisting of two pitches, a semi tone apart.
- 100mm width of wooden outers to represent each drone. Each drone consisting of two pitches, a whole tone apart.
- Overall width of 750mm not to be interpreted to allow a greater variation of pitch throughout the piece. Instead each 'section' to be assigned its own range of pitch.

- 400mm trapezium section (Front Cushion 1) to be represented by Micro sounds.
- Based on examples of similar fabric, it is assumed that using approximate values at each cushion's widest point, there are 180 threads of fabric.
- Based on examples of similar fabric, it is assumed that using approximate values at each cushion's narrowest point, there are 150 threads of fabric.
- Front Cushion 1 is to lose 30 threads over 400mm = 400s/6m40s. Divided by 10 for clarity of audio, a loss rate of 3 threads over 400mm = 400s/6m40s. A rate of 1 thread every 13.3s.

Side Elevation (Figure 3):

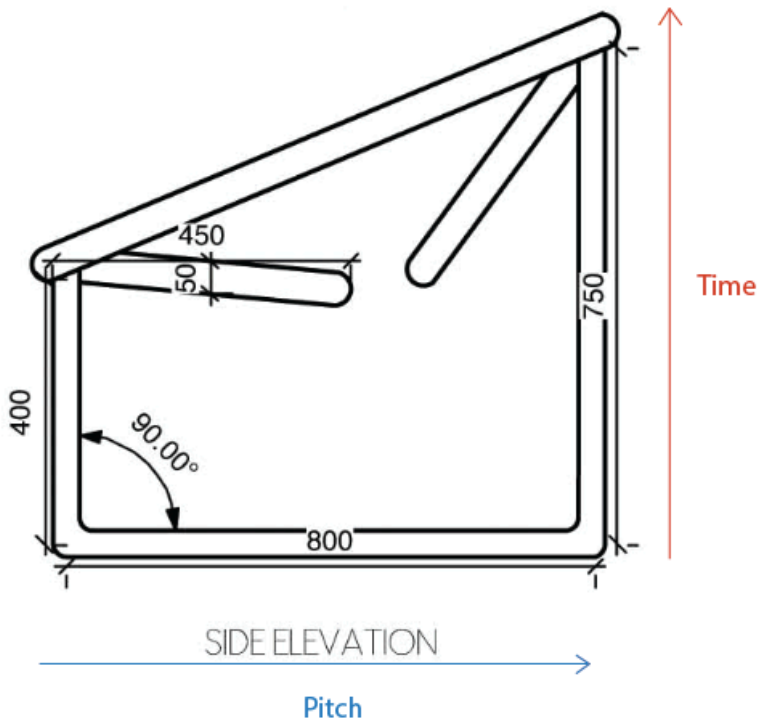


Figure 3. *Sedemus* - Annotated side elevation 1

- Duration to be read from top to bottom.
- 800mm = 800s/13m20s.
- Pitch to be read left to right. Left low, right high.

- Lower Wooden length representative of all notes. 18 notes over whole tone scale.
- Seat (slanted downwards from left to right from 400mm = 400s/6m40s mark) to be represented by 9 notes within whole tone scale, made up of 2 note harmonies decreasing in pitch over 50mm = 50s.
- Back (slanted upwards from left to right from 400mm = 400s/6m40s mark) to be represented by 6 notes within whole tone scale, made up of 2 note harmonies increasing in pitch over 400mm = 400s/6m40s.
- Arm (slanted upwards from left to right from 400mm = 400s/6m40s mark) to be represented by 18 notes within whole tone scale, made up of 2 note harmonies increasing in pitch over 400mm = 400s/6m40s.

Through the compositional process, significant difference between instruction for realisation of physical object (schematic) and of music (notation) became evident. To read instruction for the realisation of music, time must be considered because music unfolds through its duration, it is sequential, and – unlike a chair – the entire composition is not presented to consciousness simultaneously. To realise a physical object, only spatial parameters are required within the instruction. Temporal parameters are not by virtue of design, but by virtue of the physical object's existence - the chair is not sequential, it endures within time. Additionally, the function of the chair exists only post-realisation whereas, arguably, the function of music exists within the duration of its realisation.

To state:

1. Within the act of constructing the chair (it becoming), the period of time taken to realise the chair is essential for it to exist yet it is not its essence.
2. The period of time taken to realise the music (it becoming) is similarly essential for it to exist yet it is also its essence.

Perhaps then time is the essence of music?

2.4 Notation

Terms such as *andante*, *allegro*, classic tempi markings lack the aforementioned accuracy required in the reading of design schematic. However, whilst loose descriptions populate traditional compositions accompanied by wide debate about interpretation, contemporary music reveals some tendency to specify BPM or to not represent time explicitly. Graphic notation has a significant place within the history of new music practices since the 20th Century. Elements of graphic notation have found function within traditional staff notation particularly within the remit of Electroacoustic music. Typically, when notation for music differs from traditional staff notation, reading methods can include (but are not limited to) precise instruction for realisation, or intentional freedom for interpretation. Justification for any one composer's given reading method can range from the pragmatism of precise instruction, to ethos or ideological reasoning for freedom of interpretation, to social and political reasoning. However, this is not to state that freedom of interpretation is exclusive to graphic scores - within the performing directions for *In C* Riley (1989, p.1) states: 'Patterns are to be played consecutively with each performer having the freedom to determine how many times he or she will repeat each pattern before moving on to the next'. Within this discussion, Cardew's (1967) 'Treatise' is significant. It represents a seminal work within the area of graphic notation and its substance here is greater, given the apparent absence of explicit temporal instruction within the notation and Cardew's subsequent lament of the work.

The extent to which temporal instruction exists within *Treatise* is subject to interpretation. Above, I have used the word 'explicit' with the intention of communicating the absence of specific instruction (Beats per Minute, tempo expression, Minutes: Seconds *et cetera*) within the score whilst seeking to avoid an absolute statement. Furthermore, the use of 'explicit' intends to facilitate appreciation of the *implication* of time-based instruction I have interpreted through Cardew's use of left-to-right script and numbered pages – both of which indicate sequence.

In terms of pitch, the first tangible instruction (by virtue of the F Bass Clef) is a D-Flat (Db3) on page 4. Cardew did not include any additional instructions for performers within the score. It could be argued this freedom of interpretation renders the apparent expression of D-Flat on page 4 redundant. Similarly, the same instruction on page 4 is expressed as a non-stemmed crotchet. Reading this specific passage of notation as either an expression or non-expression of time, I am drawn toward two of many possible interpretations. My first interpretation is based upon Cardew's abstraction and subversion of standard staff notation as a feature of its visual aesthetic design thus the absence of the note stem could be purely a visual aesthetic choice. My second interpretation is that Cardew's intention could be communicating pitch without simultaneously communicating rhythm or time.

My first interpretation: that the absence of a note stem is based within a choice of visual aesthetic, is supported within Cardew's (1974) lament of *Treatise* where he states:

> So far I have identified two main diseases: first, the idea that each composition requires or deserves its own unique system of notation. […] Second, the idea that a musical score can have some kind of aesthetic identity of its own, quite apart from its realisation in sound, in other words that the score is a visual art work, the appreciation of which may depend on a consciousness of music and sound and the ways they have been notated, but with no certainty that the ideas of the composition can be transferred into and expressed through the world of sound.
> (Cardew, 1974, p.80-81)

Cardew's (1974, p.81) identification of the disease that '[…] a musical score can have some kind of aesthetic identity of its own, quite apart from its realisation in sound […]', suggests that the relationship between the notation and the intended music is distinct. If this is the case, it becomes a problematic position due to the conflict between freedom of interpretation for performers, and the composer's intention/ expectation; it creates a dichotomy.

Returning to *Sedemus*, it is important to re-examine the difference between music and physical object in the context of instruction and notation. Previously I had stated that music differs from physical object because of the necessity for the representation of time within the instruction for realisation - that a physical object does not need explicit instruction for how to realise its temporality, and that music does. As an opposing position, a brief analysis of *Treatise* demonstrates that explicit instruction for how to realise the temporality of the music is not a necessity. To be precise, *instruction* of time is not necessary however an interpretation of it or system for it is. Upon reflection, this is evident within *Sedemus*. Reading the schematic, there is no time-based instruction whatsoever. Reading the schematic as notation, there is no explicit time-based instruction rather there was an imposition of time upon the y-axis when I interpreted the instruction and that interpretation was necessary for realisation as music. Music then differs from physical object because of the necessary condition of time.

My original intentions for *Sedemus* were oriented around a process whereby dialogue between Rhianne van Rheede-Toas' chair design and my reading of it, would result in music. This is similar to the relationship between '*Metastaseis*' and The Philip's Pavilion that Xenakis (1992, p.10) defines as a relationship of 'intimacy'. However, there is a crucial difference. Shapes within Xenakis' notation inspire the design for The Philip's Pavilion - the relationship is thus one of spatiality. The schematic of *Sedemus* is understood as a spatial representation and the music has distinct temporality by virtue of duration. Furthermore, the form of the Philip's Pavilion was *inspired* by musical notation; the architecture's aesthetic is *derived* from shapes present within the notation. Adapting the notated shapes was essential for the construction to have structural stability not least three-dimensionality. For *Sedemus*, the schematic was viewed as instruction albeit with the imposition of a system for reading with duration, there was no adaptation of form between the disciplines.

The significance of Cardew's *Treatise* and my application of his subsequent detailed criticism to my own work with *Sedemus* is multifaceted. For both Cardew and for myself, the compositions represent material from which to base critical reflection upon practice, for the purposes of development. Furthermore, Cardew (1974, p.84) criticizes *Treatise* and the work of other composers for taking on the assumption that '[…] anything can be transformed into anything else' - a criticism that is pertinent within my praxis particularly when considering *Sedemus,* and subsequently *Sedere Audire,* and my work within the sonification of corporeal spatial occupancy. Cardew orients his criticism of the above assumption within a discussion of Cage, Stockhausen, and Boulez.

> And yet in Cage's work Atlas Eclipticalis patterns of stars in a star atlas are transformed into a jumble of electronic squeals and groans. This transformation is carried out through a system of notation (a logic) that has no connection with astronomy and only a very sketchy connection with music. In Gruppen Stockhausen transforms formant analyses of vocal sounds into flurries of notes on orchestral instruments. In Structures Boulez transforms numerical systems into random successions of sound on two pianos.
> (Cardew, 1974 p.84)

My interpretation of Cardew's criticism is that it is fundamentally related to notational logic. The issue with Cage, is clearer: the lack of connection between this notational logic and astronomy, and both with music. With Stockhausen the criticism appears to be oriented within the transformation from vocal analyses to instruments (perhaps Cardew would not reserve the same criticism for Lucier's (1981) '*I Am Sitting in a Room*' by virtue of the non-transformative method). With Boulez, my interpretation of the criticism is that the numerical systems as notational logic lack inherent musicality thus to impose them upon music is, to Cardew, a non sequitur. Based upon these criticisms, it is assumed that if Cardew were to critique *Sedemus*, his criticisms would find congruence with my own. Firstly concerning *Sedemus*, I began to regard the piece as one lacking a desired level of aesthetic sophistication. Whilst the notational system of the chair facilitated thematic development and repetition, the choice to work in whole-tone increments exaggerated the already

dense arrangement. Concurrently, the methodological foundation and the philosophical underpinning for *Sedemus* (and subsequently *Sedere Audire*) were underdeveloped and it was reflected that further engagement with the compositional method was required. By virtue of my reflections upon *Sedemus,* I sought to rectify issues of sonic density and investigate the methodological and philosophical aspects further through the composition of *Sedere Audire*.

With regards to reflection and development of my praxis, *Sedemus* was successful. It appeared to demonstrate that design schematic functions as notation when time is applied as a parameter. Within *Sedemus*, by virtue of the design schematic as notation with its own history that does not necessitate explicit statement or indication of temporality, time needs to be specifically indicated. This indication of time is an imposition that bears no relation to the chair, but to music. However, without such an imposition *Sedemus* would not *behave* like music, it would not unfold within duration, it could only be a single chord with all the spatial measurements translated as music parameters other than time. This version of *Sedemus* would then further lose an aesthetic character that is acquiescent to music and would be an extensity of sound. For me, *Sedemus sans* unfolding is more akin to an object or sonification proper than it is to music.

The discoveries through *Sedemus* that relate to music's distinct relationship with time are of substantial philosophical implication. Reflection upon completing *Sedemus* but before engaging in further compositional activity, concerned the following questions: If music is sequential and unfolds through its duration, how then can it denote an object that does not share these attributes? Given that the chair requires simultaneity and music requires unfolding, how can this compositional practice achieve integrity? Alternatively, given the attributes of a corporeal object (in this case a chair), including but not limited to simultaneous and enduring presence of its spatial dimensions, how can it be read as music? To draw significance to my previous statements:

1. Within the act of constructing the chair (it becoming), the period of time taken to realise the chair is essential for it to exist yet it is not its existence.
2. The period of time taken to realise the music (it becoming) is similarly essential for it to exist yet it is also its existence.

2.5 *Sedemus* and Duration

Seeking to understand and answer these questions, I engaged with the work of philosopher Henri Bergson. At that time, my initial studies were focused upon Bergson's discussion of the relationship between space and time within Bergson's (1889) 'Time and Free Will'. Bergson's philosophy is valuable to this study as it facilitates a discussion of an existential relationship between the corporeal object (*Sedemus qua* a chair) and the temporally transient realisation (*Sedemus qua* music). This relationship is thus far unsubstantiated beyond their roles within the compositional act. Bergson discusses the relationship between space and time as non-homogenous by using the permeation of consciousness as an example:

> […] we can understand that material objects, being exterior to one another and to ourselves, derive both exteriorities from the homogeneity of a medium which inserts intervals between them and sets off their outlines: but states of consciousness, even when successive, permeate one another, and in the simplest of them the whole soul can be reflected. We may therefore surmise that time, conceived under the form of a homogeneous medium, is some spurious concept, due to the trespassing of the idea of space upon the field of pure consciousness. (Bergson 1889, p.98)

Within this statement, Bergson is philosophising that the unfolding of temporal phenomena throughout their duration (in this case consciousness) is distinct from the manner in which space as a phenomenon exists and therefore time and space are not homogenous. Within the context of my own practice, I find that there is a manifestation of Bergson's philosophy within *Sedemus*. As a corporeal object, *Sedemus qua* a chair is simultaneous in its spatiality and does not unfold sequentially throughout the duration of its existence. Related to Bergson's example, *Sedemus qua* music bears relation to consciousness with

respect to its temporality whereby it has an unfolding sequence. To extend Bergson's statement from consciousness to music and therefore appreciating his philosophy within the external world and in terms of spatiality: within its capacity as music, *Sedemus*' spatiality still maintains distinction from the chair - it is sequential and unyielding to simultaneity.

Bergson's statement is framed within a comparison of corporeal object and consciousness and my understanding of it within my practice is framed within a comparison of corporeal object and music. Yet appreciating both corporeal object and music *through* consciousness further illustrates the significance of this philosophy to my practice. I cannot "use" the chair when it is located solely within conscious thought (for example: I cannot sit on the chair) whereas I can "use" the music (for example: I can "hear" the music). Both capacities of *Sedemus* can exist within the external world with all of their functionality as the entities that they are. Only *Sedemus qua* music can exist with the essence of its functionality available within internal consciousness and therefore with its spatiality subsumed.

Through his philosophical questioning of the homogeneity of space and time, Bergson defines space as quantitative and time as qualitative by virtue of the aforementioned permeating succession that separates the quality of time from the quantity of space. *Time and Free Will* is partially written within the context of Kantian philosophy and within that a riposte to Kant's position that free will is inaccessible within time and space. To briefly summarize a complex point: Bergson interprets Kant's position as a consequence of scientific time that reduces duration to the succession of distinct parts (for example: time viewed as divisions of seconds, one after another) as opposed to succession that is a permeating and unfolding with no distinction between parts. Bergson is of the position that the reduction of time to distinct parts is the imposition of spatiality on time, not what he defines as pure-duration. Bergson (1889, p.90) states: 'Homogenous time as the medium in which conscious states form discrete series. This time is nothing but space, and pure duration is something different'. With regards to free will, Bergson represents the view that scientific time is a reduction to causality whereby each second is derivative and caused

by the previous. Bergson argues that the imposition of space upon time begets causality, denies free will, and is fundamentally opposed to consciousness.

> To put duration in space is really to contradict oneself and place succession within simultaneity. Hence we must not say that external things endure, but rather that there is in them some inexpressible reason in virtue of which we cannot examine them at successive moments of our own duration without observing that they have changed.
> (Bergson 1889, p.227)

Whilst the questioning of free will and (or *versus*) causality, is not within the remit of my thesis, engagement with Bergson within the context of my music practice proposes that the conflict between space and time through which Bergson guides his position, is illustrated in the spatiotemporal difference between music and corporeal object that I have perceived thus far. Thus there is a resonance between my music practice and Bergson's (1889) 'pure duration'. Indeed, Bergson grounds pure duration within a musical example:

> […] it is enough that, in recalling these states, it does not set them alongside its actual state as one point alongside another, but forms both the past and the present states into an organic whole, as happens when we recall the notes of a tune, melting, so to speak, into one another.
> (Bergson 1889, p.100)

2.6 Conclusion

To conclude this chapter, it is speculated that the way in which music exists is distinct from the way in which a corporeal object exists, specifically with regards to each phenomena's temporality. I interpret the speculation therein as cause for further music practice - *Sedemus* was not initially composed from a position that was sensitive to philosophy. Thus I rationalize that the act of composition using similar if not refined methods would contribute to a greater understanding and further significance within my own practice. Interpreting Bergson's philosophy and subsequently understanding it within the context of my practice has enabled me to further understand the conflict between space and time that Bergson posits. At this stage, that conflict is understood as the differing ability to "use" or experience each entity within consciousness, and the correlation

between that ability and the spatiotemporal character of each entity. Understanding this conflict further through composition will facilitate a deeper appreciation of Bergson's philosophy and the significance of music composition that is derived from the spatiality of corporeal objects.

CHAPTER THREE: SEDERE AUDIRE

3.1 Introduction

This chapter explores the developments to my compositional practice when it is in dialogue with philosophy. Within the previous chapter it was speculated that further engagement with the compositional techniques present within *Sedemus* would be of substantial benefit to further intuiting an understanding of music with regards to its essence. At its conception and through to its realisation, *Sedemus* was not substantiated by the philosophical theory that is now considered to be paramount within my practice. My philosophical reflections took place after the composition was finished. Within this chapter, a new composition *Sedere Audire*[2] is approached as further practice-led research. The composition seeks to more intentionally uncover incongruences between the qualities of music found within the quality of unfolding, and the way in which a physical object (in this case, a chair) exists. Prior to detailing *Sedere Audire* this chapter enters into a critique of *Sedemus* with view of innovating the interdisciplinary and compositional processes. *Sedere Audire* is discussed in terms of its compositional construct, further to which, the benefits of having philosophical considerations at hand throughout the conception, composition and realisation of the piece are demonstrated within a discussion of the piece that regards philosophy. I draw upon Bergson's (1903) 'An Introduction to Metaphysics' in response to *Sedere Audire*, and begin to approach music from a metaphysical perspective. In conclusion, this chapter speculates that the temporal distinctions observed between physical objects, sound, and music, call for further practical investigation within a metaphysical context.

[2] CD1 - Compositional Portfolio: 2. *Sedere Audire* & CD2 - Appendices and Figures: Appendix 2. *Sedere Audire* Score.

3.2 Conception

Sedemus was conceived through an interest and appreciation of Xenakis' works and the concept of "musical architecture", specifically the relationship between music and physical form. That initial interest evolved into an examination of how schematic design could be used as notation. Subsequently, I observed that time was an essential parameter to the reading of the design schematic as music and this observation led to discussions of how the chair and the realisation of its design as music were different with regards to their relationships with time. Investigating this, I drew upon the philosophy of Henri Bergson as explicated within his (1889) 'Time and Free Will'. Music practice and philosophy were not in dialogue in *Sedemus* and it was my intention to rectify this with *Sedere Audire*.

Sedere Audire is conceived as an elaboration upon *Sedemus* and my findings through reflection on philosophy. The compositional process of *Sedemus* and subsequent the philosophical reflection established a relationship between my music practice and Bergson's philosophy. Given this, I propose that composing using similar yet refined methods to *Sedemus,* with consideration of Bergson's philosophy present *within* the process, will provide greater insight into that philosophy *through* music practice.

In addition to identifying the need for refinement of the compositional process with respect for forming dialogue with philosophy, there are further aspects of the compositional process that would benefit from refinement before composing new work. Critical analysis of the working processes and methods for *Sedemus* has enabled me to identify weaknesses within the composition and their causes. However, before presenting those weaknesses, I feel it is important to briefly recognize the successes of *Sedemus*. The composition and its concept were received positively by sound art and electroacoustic music audiences, leading to a feature in Twigs & Apples, an installation at The Penthouse NQ, and a performance at Toronto Electroacoustic Symposium. In addition to public successes, *Sedemus* has considerably informed the evolution of my practice and research, specifically with regards to my questioning of temporality's significance to music.

3.3 Critiquing *Sedemus*

Reflecting on the weaknesses of *Sedemus*, my most dominant criticisms pertain to the aesthetic outcome. As music *qua* music, *Sedemus* is sonically dense, and I find the structure of the composition uninteresting. Whilst *Sedemus* is not music *qua* music, I feel that it is beneficial to understand the weaknesses of the composition as opposed to granting it critical immunity because of its conceptual underpinning. Seeking to understand the cause of the sonic density, I began by listening to each elevation individually. Through this exercise it became apparent that overall, the side elevation was significantly clearer than the plan and front elevations. Furthermore, I felt that the side elevation was the most interesting structurally, with a clear progression of pitches in its second half. There is a relatively quick descent from Scientific Pitch Notation (SPN) F#2 to E1 followed by concurrent, slower ascents from E1 and E3 to C4 (figure 4). In comparison, whilst the plan and front elevations feature opportunity for pitch progression (figures 5 and 6), this opportunity was negated by my decision to represent the cushion textures sonically through non-pitch based material. This further contributed to the density of the arrangement.

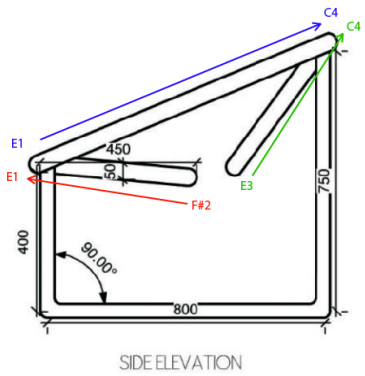


Figure 4. *Sedemus* - Annotated side view 2

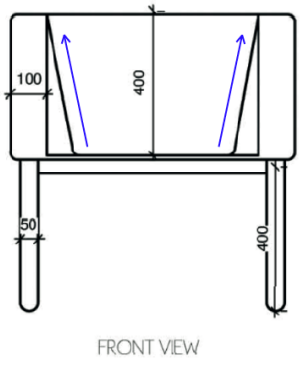


Figure 5. *Sedemus* - Annotated front view 2

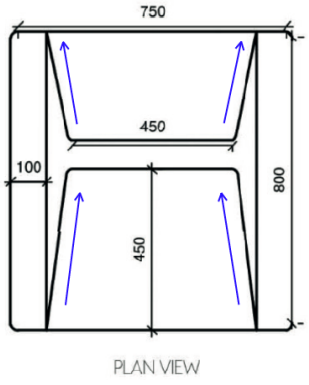


Figure 6. *Sedemus* - Annotated plan view 2

When viewing the schematic, the level of density within the front and plan elevations is evident. Read vertically, within the front elevation's first half there is relatively little spatial occupancy, followed by a dense second half. The plan elevation is dense throughout aside from the period between 7'30" - 8'20" wherein there is relief from the cushion textures. This density is exacerbated when the elevations are combined.

To illustrate: with each elevation placed atop one another, there is little space that is not occupied by physical material and therefore little relief sonically (figure 7).

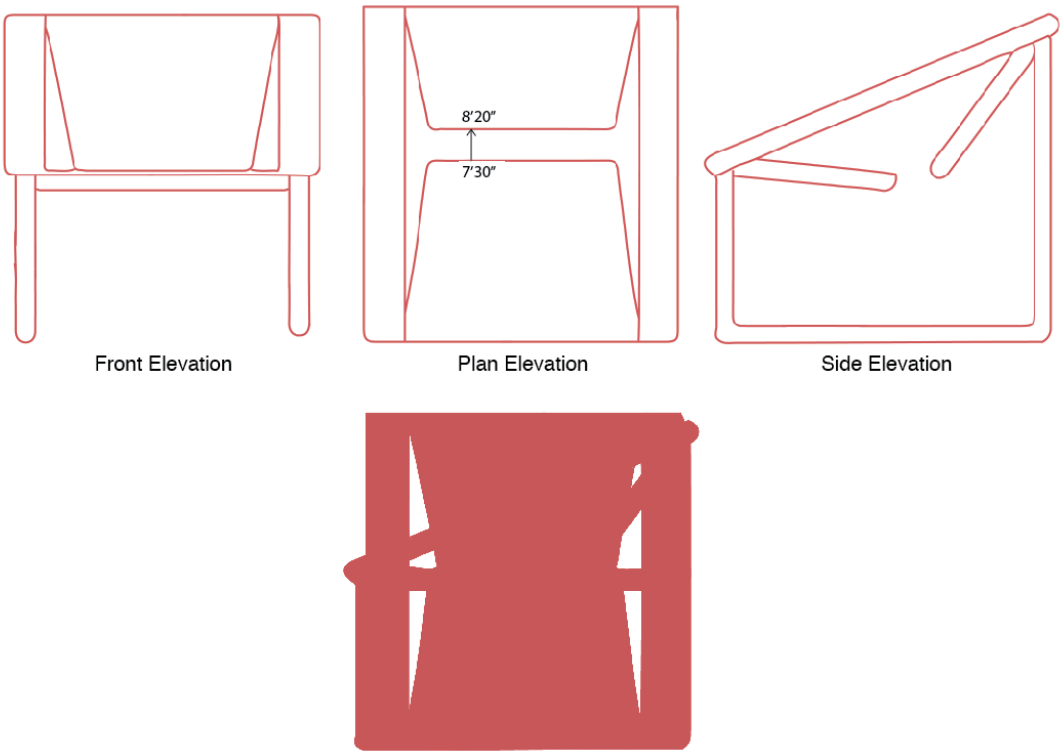


Figure 7. *Sedemus* - Spatial Occupancy

The schematic design, when viewed from the perspective of notation, has little space internally and because of this, it is not well suited for use as music unless density is desired.

On reflection, it appears crucial that the schematic was designed without knowledge of its subsequent use as notation. The collaborative process was successful in terms of the interpersonal relationship, communications, quality of labour, and execution of the given task, however the *sequence* of the process disabled the musicality of the musical realisation because the schematic is inherently non-musical, and had not been considered for its musical potential.

Rheede-Toas' design schematic was completed prior to the initiation of any interdisciplinary aspect of the project therefore when viewing *Sedemus* within the context of interdisciplinary arts praxis; the lack of dialogue caused by the sequential process deems the praxis artificial, with the relationship between the disciplines being imposed. Seeking to compose a second work using similar techniques to *Sedemus*, I speculate that when the design aspect of the process is informed by knowledge of its use as notation, therefore including more negative space, satisfactory results will be achieved, with the identified weaknesses of *Sedemus* subsumed.

Sedemus facilitated the development of philosophical considerations within my practice. However, without those considerations present during the practical realisation, I view them as post-rationalisations of the work. According to Schön's (1983) theory they are representative of reflection *on* practice, and dialogue between music and philosophy is absent. Within *Sedere Audire*, philosophical considerations would be present during the compositional process; therefore reflection *in* practice is facilitated.

3.4 Dialogic Process

Sedere Audire is my second composition wherein the design schematic for a chair is used as notation. Given the above discussion of *Sedemus*, *Sedere Audire* is fundamentally different due to the presence of philosophical considerations during the process, and changes to the interdisciplinary process. The design and composition process within *Sedere Audire* is articulated by Taylor (2013) in his 'Cutting up "Collaboration" or Why is working together not always collaboration?'. Presenting a four-way framework for working relationships between composers and artists within other disciplines, Taylor uses the dimensions of hierarchy within the working relationship, and division of labour, to define types of interdisciplinary relationships:

		Hierarchy in the working relationship	
		Yes	No
Division of labour with tasks split between participants	Yes	**Hierarchical working.** Tasks are divided between the participants, but one or more participants make decisions on the contributions.	**Co-operative working.** Tasks are divided between the participants, but decisions on the contributions are taken as equals.
	No	**Consultative working.** The participants all contribute to one task, but one person makes decisions on the contributions.	**Collaborative working.** The participants share the project as equals, both the tasks themselves and the decisions on the contributions.

(Taylor, 2013)

Sedere Audire represents an interdisciplinary process that is best understood as Co-operative working. The relationship between the disciplines of music composition and design is non-hierarchical and the tasks are divided. These changes to the process whilst apparently superficial, counter the consequents of the process that were weaknesses within *Sedemus*. By virtue of the new process, the schematic was designed both with knowledge of its use as notation, and within a music studio environment whereby designs could be realised musically before final decisions were made.

3.5 Composing *Sedere Audire*

Awareness that the design schematic would be viewed as notation enabled key musical instructions to be incorporated into the design schematic. Akin to *Sedemus,* the method for reading the schematic for *Sedere Audire* utilises the parameters of pitch (horizontal x-axis) and time (vertical y-axis). Seeking to realise a composition of non-complex harmony, pitch increments within D-Major scale between and including SPN D3 and E5 are equally distributed along the x-axis from left to right. To facilitate the reading of the schematic and a musical unfolding, the composition's duration is represented by converting each millimeter to a second along the y-axis, read vertically. To better aid the process of realising the schematic as music, the complete schematic was adapted to include the time and pitch parameters (figures 8 and 9). Additionally, studio notes were compiled to oversee the recording process of the composition[3].

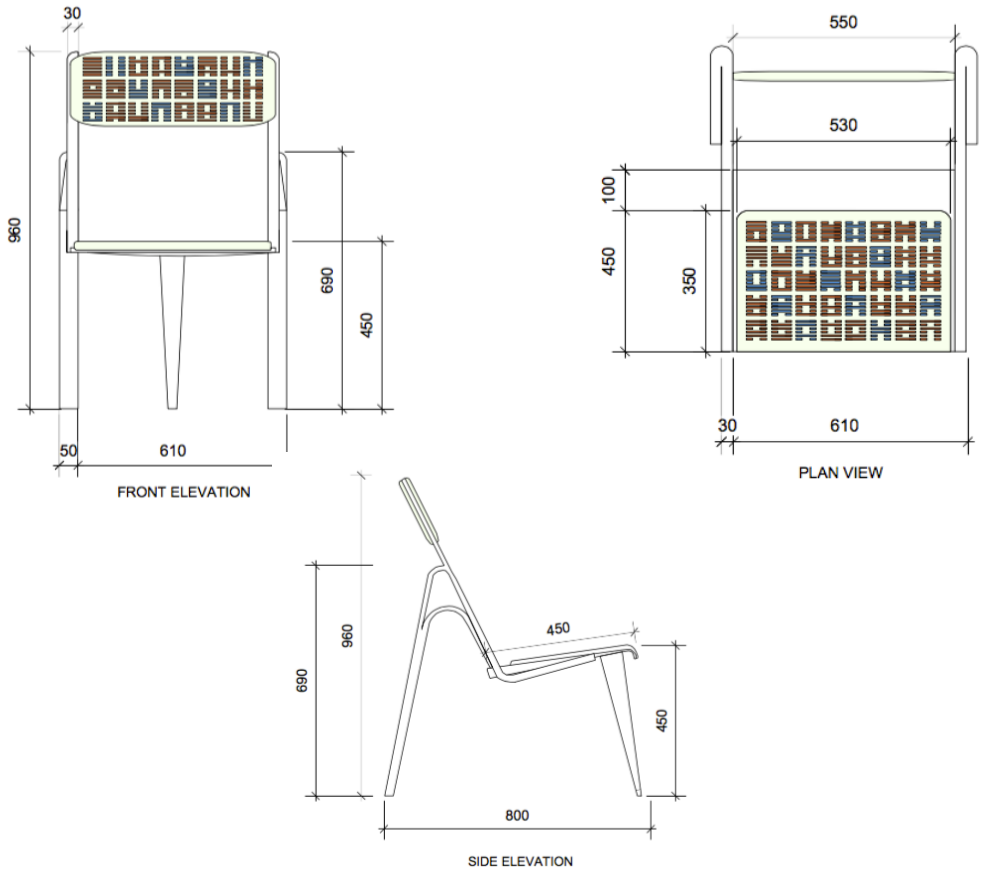


Figure 8. Sedere Audire - Elevations

[3] CD2 - Appendices and Figures: Appendix 3. *Sedere Audire* - Recording Notes

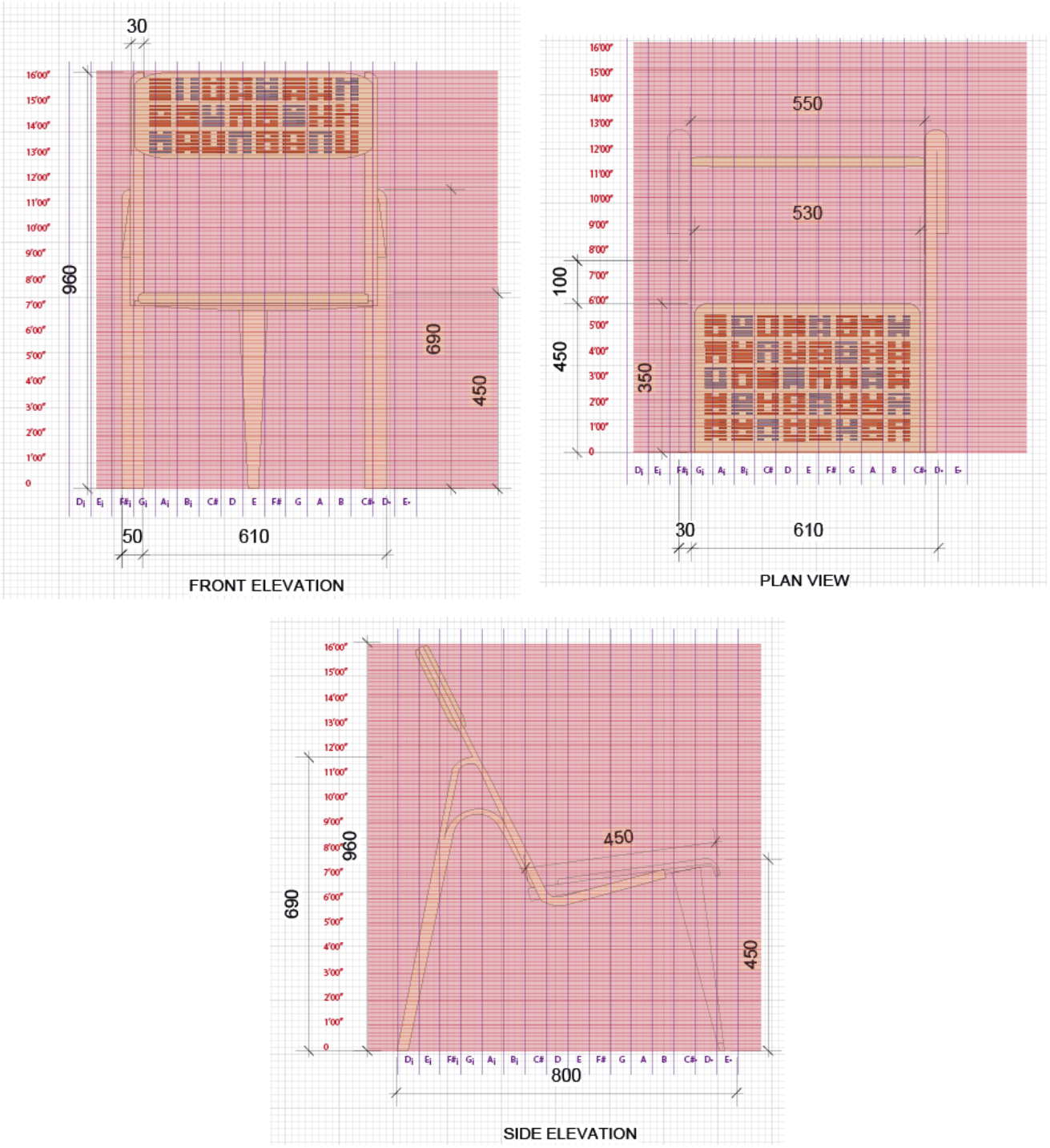


Figure 9. Sedere Audire - Annotated Elevations

As with the developments in the compositional and design process, decisions regarding the instrumentation for *Sedere Audire* were informed by my desire to enhance the musicality of the piece. The uses of sustained pitches on electric guitar remain from *Sedemus* whereas the amplified noise floor used for the cushion textures are replaced by tuned percussion. Additionally, Rheede-Toas

and I decided to use violin for the seat as viewed in the side elevation. This enabled the introduction of new instrumentation at the mid-point of the composition that allows the listener to distinguish the construct of the chair. Changes to the instrumentation and a more consistent method for reading the schematic enable the music composition to be entirely pitch-based.

In addition to being informed of its use as notation, the schematic was designed with knowledge of the reading method and instrumentation. This enabled a design that was intentionally responsive to its role within music composition. There is more space within the design with no one aspect of the chair dominating its spatial occupancy. Details were added to the seat and backrest to more effectively enable a musical passage where previously (within *Sedemus*), there would be a mass of indistinguishable pitch content. Creative design decisions are subject to projections of the qualities of the prospective musical realisation in addition to the completed design.

3.6 Reflecting on *Sedere Audire*

As an elaboration upon *Sedemus*, *Sedere Audire* is considered a success. The changes to the interdisciplinary process and the inclusion of exclusively pitch-based material facilitated an improved aesthetic outcome. Whilst a level of density is preordained because of the constitution of the physical object (the chair) and the method for reading it as music, the piece is less dense than *Sedemus* because of the meditated changes to the process and to the musical material. Furthermore, the piece has a definite musical structure that I hear as constructed of 4 movements.

Movement 1 [0’00” - 5’30”] is constructed of guitar drones instructed by the chair’s frame with sustained, reverberant tuned percussion instructed by the cushion pattern. The cushion pattern includes the *I Ching* with orange and blue colours corresponding to glockenspiel and marimba respectively. The *I Ching* was included within the design both to enable explicit melodic content within the composition and as a reference to John Cage’s use of the text as a tool for chance operations. Whilst the changes of process and awareness of the use of the chair design as music notation enabled Rhianne and I to forecast the music,

we were conscious that there would still be a level of unpredictability within the realisation process. Using the *I Ching* as the pattern detail was homage to this, and contributed to the contextualisation of the composition. In addition to the melodic content, the side elevation instructs a subtle upwards shift from SPN D3 to E3 in the lower register and a concurrent downward movement from E5 to C#5 in the higher register. This creates an apparent narrowing of the pitch range despite the constant presence of SPN F#3, G3, E4, C#5, and D5 as instructed in the front and plan elevations. Towards the end of the movement, SPN D4 and F#4 are added as instructed by the front elevation. This reinforces the guitar drones and suggests an extended D-Major chord. Movement 2 [5'30" - 8'20"] begins as the tuned percussion rests. The seat frame as per the side elevation instructs a quicker introduction of pitches extending both directions from SPN D4. This extension of the guitar drones acts as a prelude to the centerpiece of the composition where the violin section is introduced. The violins rise incrementally from SPN C#3 to A3 before a phrase of E4, D4, and B3 prelude a harmonic crescendo of pitches between A3 and D5. The violin section closes with a short harmony between SPN C#5 and D5, returning to a droning chord. Movement 3 [8'20" - 12'30"] is signaled by a pronounced SPN B3 that is followed by the onset of E3 and E5. This creates a sense of change within the composition through an E^5 chord, at which point the drone begins to slowly incrementally descend in pitch, most notably, from SPN B3 to F#3. Movement 4 [12'30" - 16'00"] sees the composition return to the theme of movement 1 with the reintroduction of tuned percussion. The melodic theme is not a repetition of that in movement 1 because of a different pattern. This creates a sense of theme and variation that resolves the structure of the composition.

Unlike *Sedemus*, I view *Sedere Audire* as having coherent musicality. It makes use of varied instrumentation and harmony, and presents an unfolding structure that is unified yet navigates through movements. When considered as an aesthetic relation to the chair design, I feel that it communicates the subtleties of the chair's form and in this sense, the two components of *Sedere Audire* can be appreciated as a dialogue between music and design.

With regards to the study of the philosophical aspects of the research, the piece, within a dialogue with philosophy, reiterates the issues observed within *Sedemus* yet more purposely represents my interpretation of Bergson's pure duration. When I engage with the piece as an abstracted representation of pure duration, I do not feel I am listening to a summation of sound, second by second. Through the duration of the music I am listening to a passing of musical material whereby I do not perceive any distinct separation or division. When I am inserted within the piece from the perspective of a listener, at any time during its course, I do not sense that what has passed has either been lost or has caused what is present. To this extent, I feel that the music in some respect embodies my interpretation of pure duration. However, the ability for *Sedere Audire* to actually embody my interpretation is in conflict with Bergson's (1903) 'An Introduction to Metaphysics' wherein he argues that representative concepts are an abstract, analytical knowledge that is in opposition to intuition. Fostering an understanding of the conflict between analysis and intuition with regards to music will enable me to better comprehend it as an entity beyond what is essential to it.

Bergson's (1903) 'An Introduction to Metaphysics' is in many ways an elaboration upon the ideas presented within his (1889) thesis 'Time and Free Will'. Within this text Bergson devotes his attention to the tension between the concepts of "analysis" and "intuition".

> A comparison of the definitions of metaphysics and the various conceptions of the absolute leads to the discovery that philosophers, in spite of their apparent divergencies, agree in distinguishing two profoundly different ways of knowing a thing.
> (Bergson 1903, p.1)

At the outset of the essay, Bergson regards analytical knowledge as relative, and intuitive knowledge as toward attaining absolute. My interpretation of these concepts is that analysis is close to a theoretical way of knowing, and intuition is a tacit knowledge that is closer to an experiential reality. Another way of understanding Bergson's discussion of analysis and intuition is through the relationship that analysis and intuition have to the ideas he

presents within Time and Free Will. In this sense, analysis can be understood as a spatial reduction or scientific measurement of an object of enquiry whereas intuition can be understood as consciousness within the irreducible flow that Bergson attributes to pure duration.

With regards to metaphysics, Bergson posits the discipline as the way of gaining knowledge without reducing the object of enquiry. It does so because it is the study of knowledge that comes from intuition not analysis. For example, I can begin to learn a new instrument, say a clarinet. To learn how to play the pitches within F-sharp Major on the instrument I can initially analyze a fingering chart, then analyze whether my fingers on the instrument are corresponding to the chart. Within this example, I have analytical knowledge of how to play the desired pitches. At the initial stages of learning the instrument, I may not be able to disregard the fingering chart because my knowledge is reliant upon that abstraction. Another way that I could learn the instrument is to accompany a piece in F-sharp Major and listen to whether or not the pitches I am playing correspond with the key. After some time, I will begin to reliably play only the correct pitches. If questioned, I could not necessarily identify the correct fingering for B-flat because my knowledge does not come from that abstraction or analysis. Rather the knowledge I have gained is intuited. If the clarinet is my object of enquiry, I am not analytically dissecting it by isolating fingering or breathing technique, hoping to then synthesize and combine elements of my analyses. I am instead gaining knowledge of the instrument that is more directly toward its essence. To give a simple example: I cannot learn how to juggle by analysing the intricacies of the movement because I don't understand it on a scientific level. The motion is intuited. Bergson is arguing that metaphysics is a science for intuitive knowledge as opposed to analytical knowledge.

Bergson argues that positive science is the analysis of empirical science through the reduction of experience to symbols. In contrast to positive science, Bergson (1903, p.3) states: 'Metaphysics, then, is the science which claims to dispense with symbols'. I understand this argument as analogous to Bergson's rejection of the idea posited within Time and Free Will. He

rejects the idea that spatiality (insofar as number) can be imposed upon time; doing so is an abstract conceptualisation of time. When I consider this position within the context of *Sedemus* and *Sedere Audire* I find that there is congruence with my observations that the reduction of the chairs' temporality to number (wherein duration become an instruction to be read), immediately misrepresents the reality of the chair. The chair, as a physical object does not have an unfolding existence whereby it is constantly becoming itself through modification. However, the isolated musical product of these compositions requires a constant becoming through unfolding to be music.

Yet whilst the music as a phenomenon unfolding through time appears to be more closely associated with Bergson's philosophy than the chair, it is still arguably an abstraction. As an abstraction it conflicts with Bergson's view that any conceptualisation is unable to communicate intuitive knowledge. Within 'An Introduction to Metaphysics', Bergson gives 2 contrasting examples in attempt to further explicate pure duration. His examples are a spectrum of colour and an uncoiling elastic body. Regarding the colour spectrum Bergson states:

> A current of feeling which passed along the spectrum, assuming in turn the tint of each of its shades, would experience a series of gradual changes, each of which would announce the one to follow and would sum up those which preceded it. Yet even here the successive shades of the spectrum always remain external one to another. They are juxtaposed; they occupy space. But pure duration, on the contrary, excludes all idea of juxtaposition, reciprocal externality, and extension.
> (Bergson 1903, p.4)

Within this description I find there is congruence with the chairs. As with the colour spectrum, the chairs exist with all of their essential parts separated spatially despite being part of a singular whole. Even a single aspect of the chair, for example the backrest, has spatiality and has dimensions. Within his example, Bergson is reading the spectrum within a period of duration akin to my reading of the chairs within *Sedemus* and *Sedere Audire*. This

durational reading facilitates a series of gradual, qualitative change yet there remains a juxtaposition of parts.

Bergson's second example presents a closer relation to pure duration. To paraphrase: Bergson describes an infinitely small, coiled elastic body - reading his description, I imagine something akin to a rolled up, cut rubber band. The body is unraveled in a line so that the body is its most advanced point and is in constant motion. This produces a constant line from where it has moved. If this action is executed without a pause, the action is indivisible. Bergson (1903, p.4) states: 'Finally, let us free ourselves from the space which underlies the movement in order to consider only the movement itself, the act of tension or extension; in short, pure mobility. We shall have this time a more faithful image of the development of our self in duration'. I interpret this second example as a depiction of a durational self that is indivisible in form and constantly extending. As such, no one point in its progression can be identified as separable from the others because it is constantly extending. Interpreting this second example in terms of music, I begin to find a distinction with sound. Sound, as a physical thing might not be constant whereas the music it is part of is. For example: a pitch of A at 440Hz could be sounding, stop completely, and then a pitch of C at 523.25Hz could be sounding. Sound in this example is divisible. If we engage with that passage of sound as music, we can observe that music, as a non-physical thing is not divisible. Despite sounding, not sounding, and then sounding again, the passage is a whole as music.

Bergson identifies both of his examples as flawed in so far as they depict pure duration. The colour spectrum is flawed because of the externality of each of its parts to one another. The uncoiling elastic is flawed because it focuses solely on the movement through states and not the quality of those states. Positing the characteristics of pure duration, Bergson (1903, p.4) states: 'The inner life is all this at once: variety of qualities, continuity of progress, and unity of direction. It cannot be represented by images'. The examples that Bergson gives are both undeniably spatial. Reading that they do not satisfy the requirements of a variety of qualities, continuity of progress

and unity of direction, I am hesitant yet tempted to argue the case for music as a more appropriate example of pure duration. Music is not like film whereby it is a literal, accelerated view of distinct frames, it is a becoming in time where what has already become in its duration is not present or formed but it is not lost[4]. I intuit this as akin to my experience of consciousness.

A guiding principle to 'An Introduction to Metaphysics' is that knowledge cannot be gained through concepts; the concept cannot contain "absolute" knowledge because they subsume the object of enquiry. My interpretation of this principle is that the concept of knowledge within a world of experience, that is defined by/ understood through science, inclines us to only state that something is known when it is studied through an abstraction of experience.

To posit a musical example: the quantifiable requirement of pressure that is needed to fret a pitch is something that can be known. Knowledge of this would be of significant use when a machine performs the fretting, yet this knowledge is impractical to a person seeking to produce the pitch. I can fret the pitch yet I cannot concretely articulate my knowledge of the required pressure beyond demonstration, which means to say, when abstracted from the act of fretting the pitch my knowledge is merely an abstraction too. This example finds agreement with Bergson's position on the limits of analytical knowledge.

Bergson, whilst arguing that concepts do not represent the knowledge of experience, does not completely discount their value. He states:

> But the simple act which started the analysis and which conceals itself behind the analysis proceeds from a faculty quite different from the analytical. This is, by its very definition, intuition.
> (Bergson 1903, p.21)

[4] As a side note, it is worth recognising that music as per this discussion is non-digital. Digital music is rendered in such a way that it is akin to film wherein it is an accelerated playback of samples similar to frames.

I interpret this statement as positing that the functionality of concepts is to elicit an intuition. That intuition is knowledge applicable to experience within the world, not from an objective, outside perspective and it has been gained through the engagement with analysis. To paraphrase his conclusion to the essay, Bergson uses literary composition as an example of the enumeration of analytical knowledge from which to imbue an intuition within the reader. He posits that knowledge is not within each or the sum and synthesis of expositions gained through analysis. Rather that intuitive knowledge is presented through the very act of observing, not the observations. Listening to *Sedere Audire* I intuit musicality from the temporality of the passage of sound and find association with my interpretation of pure duration. Yet I cannot articulate the essence of that musicality beyond its connotation with time.

3.7 Conclusion

Sedere Audire, more so than *Sedemus,* is a composition wherein the physical object of the chair and the aesthetic outcome of music are directly related. However, informed by Bergson, the extent to which the chair and the music are more than superficially, aesthetically, related is brought into further disrepute. Through innovations to the process that form a dialogic between the disciplines, awareness of method, and intent for musicality, *Sedere Audire* is a composition wherein music is related to a physical object, and the physical object is related to music. In this sense, the piece has a robust internal validity. However, metaphysically, the distinction between physical object and music/ sound is profound. If music is the perception of the durational movement of physical sound, in the case of *Sedere Audire,* the music and the physical object are distinct and their relationship is slight. The chair exists in a spatially complete state: all of its essential parts exist simultaneously. The music, as sound, exists as a spatial unfolding that quite paradoxically, does not require a constant sound. Throughout its duration each second bleeds into the next, and with it, the sound or lack thereof at that time. So what of a distinction between music and sound? What can I deduce as the cause of my knowledge that the passage intuits music, not merely sound?

Within the conclusion of the previous chapter, it was speculated that further practice to *Sedemus* would enable a greater understanding of the conflict between the non-audio entity of the chair and the audio entity of the music. *Sedere Audire* has enabled me to further appreciate that conflict but I do not comprehend it to a satisfactory extent. This chapter and the one preceding it have enabled me to conclude that compared with corporeal physical objects, music is metaphysically distinct because of its relationship with time. However, with my research also questioning music's distinction from sound, I have yet to come to an understanding of how. Given this, further investigation into the phenomena as they exist metaphysically is crucial. At this stage, I regard sound as a physical audio entity and music as conscious, intentional encounter with that physicality. I speculate that it would be of benefit to both my creative music practice and my philosophical understanding of music to study this further. I speculate that through creative practice, I can posit the distinction between sound and music when sound is the analytically accessible phenomenon, and music is the intuited quality.

CHAPTER FOUR: DAY BORN

4.1 Introduction

Reflection upon *Sedemus* within Chapter 2 focused upon a differentiation between the chair as a non-audio entity and the music as an audio entity and how there is a distinction in terms of their functional availability within consciousness. I reflected upon how, within the external world (a physical context) both the non-audio and audio entities are both functionally available whereas within internal consciousness, as a thought, only the audio entity has functional availability, as music. Reflection upon *Sedere Audire* focused upon a metaphysical distinction between music and sound whereby music is viewed as an intuited quality. This chapter seeks to elaborate upon these points, investigating them through a dialogue of philosophy and music.

Firstly, I revisit Bergson's use of music as an analogy within which physical objects and consciousness are compared.

> […] it is enough that, in recalling these states, it does not set them alongside its actual state as one point alongside another, but forms both the past and the present states into an organic whole, as happens when we recall the notes of a tune, melting, so to speak, into one another.
> (Bergson 1889, p.100)

Bergson's comparison here is used to substantiate the Meta point of Time and Free Will: that time is not analogous to space insofar as time is not a succession of distinct parts and therefore bound to causality (for example: time as divisions of seconds, each caused by the previous and causing the next). Bergson finds commonality between his philosophy of time and music.

Within this chapter, Bergson's philosophy of time is investigated through comparing physical objects and consciousness but instead using music as the constant. The investigation considers the manifestation of music in its physical form as audible sound, and its form in internal consciousness as heard music, and examines the dependency that each of these forms of music has upon time and upon space.

Given that this investigation involves perceptions of both external and internal phenomena, I draw upon Edmund Husserl's philosophical concepts of phantasy, image consciousness and memory. Husserl's phantasy, image consciousness, and memory are adopted because they represent philosophical concepts that are systematic and rational - I believe them to be a testament to Husserl's systematic approach to philosophy.

Furthermore, within this chapter I introduce the terms and concepts of "heard" and "audible" to distinguish music and sound. Crucially, these terms begin to highlight the distinctiveness of music with regards to its functional availability within consciousness - a context where spatiality is subsumed. These concepts of "audible" sound and "heard" music are investigated through practice, leading to the composition *Day Born*. Through dialogue of philosophy and compositional practice, the role of intentionality within the perception of music is observed and the relationship of each of the aforementioned concepts has with time and space is interrogated.

Finally, within this chapter I will reflect upon the practical outcome *Day Born*, interrogating the relationship between audible sound and heard music. Reflections upon *Day Born* provide insight into the qualities of music that afford the composition its status as either music or as not music. The status of *not music* is justified in *Day Born* by its relationship with time. Therein, I posit the knowledge gained from this investigation as suggestive of temporality being distinctly essential of music.

4.2 Music within Consciousness

To substantiate his position that time is not a succession of distinct parts or subject to causality, Bergson compares physical objects and consciousness. Music is an entity that manifests both as a physical form within the external world and internally within consciousness. Within Chapter 2, I initially engaged with Bergson's comparison from the perspective of *Sedemus* because *Sedemus* is a literal example of the relationship between music and a physical object. However, *Sedemus* is best viewed as a catalyst. The physical object of the chair enabled me to develop my research regarding Bergson's comparison. Resultantly, I am now proposing a comparison wherein music remains the manifestation of a phenomenon in consciousness with the physical manifestation being sound (instead of the chair).

With *Sedemus*, I reflected upon the distinctions between the chair and the music both as phenomena within the external world and within internal consciousness. That reflection found that there is a disparity between each entity within consciousness. In internal consciousness (or simply: thought) the chair is not available in terms of its primary function whereas the music *is*. I cannot sit in the chair yet I can in some respect "hear" the music. Given this apparent distinction I speculated that the theory would benefit from an elaboration through practice - effectively, a composition that would explore the phenomena of music and sound, and their relationship with the external world, internal consciousness, and subsequently spatiality and temporality. Of particular importance within this practical elaboration is to examine how music appears to be functionally available when it is separated from its physical, external manifestation of sound.

Music that is functionally available, which is to say, music that *is still music* solely within consciousness may seem to be a highly abstract concept. However, it is something familiar and by no means beyond comprehension. I can imagine a piece of music, hear it within my imagination, and it is functionally available to me as music. This might be a re-presentation of existing music (referred to as an ear-worm when repetition is excessive (Sacks, 2007)), or presentation of new, original music. However, within this chapter, I am seeking

to gain an understanding of how music remains music, even when removed of its external physical manifestation. That music can be music even when its spatiality is subsumed. To do so, I am now focusing upon internal perceptions.

Seeking to compose a piece that explores the possibility of music existing solely within internal consciousness, I first sought to understand the concept of music that does not exist within the external world. Music in this respect is music separated from its sound. Music "heard" within consciousness yet not "audible". As previously stated, these criteria can be satisfied superficially and they often are - I often hear music internally and sometimes compose internally, too. However, in these cases there is little restriction upon the internal music existing as sound in some way externally. Often I may hum, sing, or play on an instrument a melody that I have first heard internally. In the case of *Day Born,* I am seeking to interrogate the affordances and the relationship between "heard" music and "audible" sound by composing music that arguably cannot exist externally.

4.3 Music in Phantasy, Image Consciousness, and Memory

The concept of internal perceptions within consciousness or in this case heard music, is associated with phenomena such as memory and imagination, a philosophical territory explored rigorously within the work of Edmund Husserl. Husserl categorized these internal perceptions as phantasy, image consciousness, and memory. As a discipline, philosophy has an extensive history wherein the concept of internal perceptions is explored. Given the extent to which this topic has been explored I feel it is valuable to reiterate my justification for deciding to engage specifically with Husserl's writing on the subject.

Husserl is renowned as a logical and systematic philosopher. His methodology is a pragmatic, systematic, and arguably scientific approach to philosophy. This methodology is evident within much of his work particularly that concerning the epoché - the concept of suspending judgment of the natural world to instead focus upon experience. I view Husserl's philosophy as of significant value to a discussion of internal perceptions by virtue of his methodology. It enables an

investigation that is robust and grounded because the categories of internal perceptions are relatively exhaustive. Husserl's (2005) 'Phantasy, Image Consciousness, and Memory' includes a number of texts that pointedly define phantasy, image consciousness and memory. By interpreting these philosophical concepts, I have been able to gather a grounded understanding of the nuances of internal and external perceptions.

Firstly, Husserl (2005, p.251) offers a clear position on image consciousness within a literary example: 'Take the case of reading a novel in which the hero phantasies, dreams, remembers. The story in the novel: It is not, however, an actual story; on the contrary, it only represents such a story. This is an *image* consciousness'. My understanding of this definition of image consciousness is aided by Husserl's literary example, and further still by finding an analogy within musical narrative. As a parallel, Byars' (1975) '*The Sinking of the Titanic*' presents the account of the RMS Titanic's band continuing to play as the ship sank. Byars' composition does not explicitly tell the story or recount the events as they were; rather it is *representative* of the story, facilitating an image consciousness of the events. I interpret image consciousness to be a representation as opposed to a presentation.

For phantasy, Husserl gives a definition through a series of comparative distinctions. Firstly with physical imagination, Husserl (2005, p.22) states: 'In the case of physical imagination, a physical object that exercises the function of awakening a "mental image" is presupposed; in phantasy presentation in the ordinary sense, a mental image is there without being tied to such a physical excitant'. Interpreting physical imagination within a musical context, an analogy is "hearing" Vaughan Williams' (1967) '*The Lark Ascending*' when I look at a violin. Physical imagination is differentiated from phantasy because the imagined thing (in this case 'The Lark Ascending') pre-exists. Physical imagination therefore involves a *re-presentation*, not a presentation of an original. Further to physical imagination but not yet phantasy, when a re-presentation is manifest without being provoked by a physical object, Husserl (2005, p.251) defines it as '*memory in phantasy*'. To continue the analogy, memory in phantasy might be "hearing" *The Lark Ascending* without an

identifiable provocation. Finally then, phantasy is differentiated from physical imagination and memory in phantasy because it is not a re-presentation (the presentation of something that pre-exists). Rather phantasy is an internal perception that is an original presentation. Understood as such, phantasy finds acute relevance to my research as an eloquent definition for the internal manifestation of music in consciousness.

4.4 *Day Born* as "heard" Music

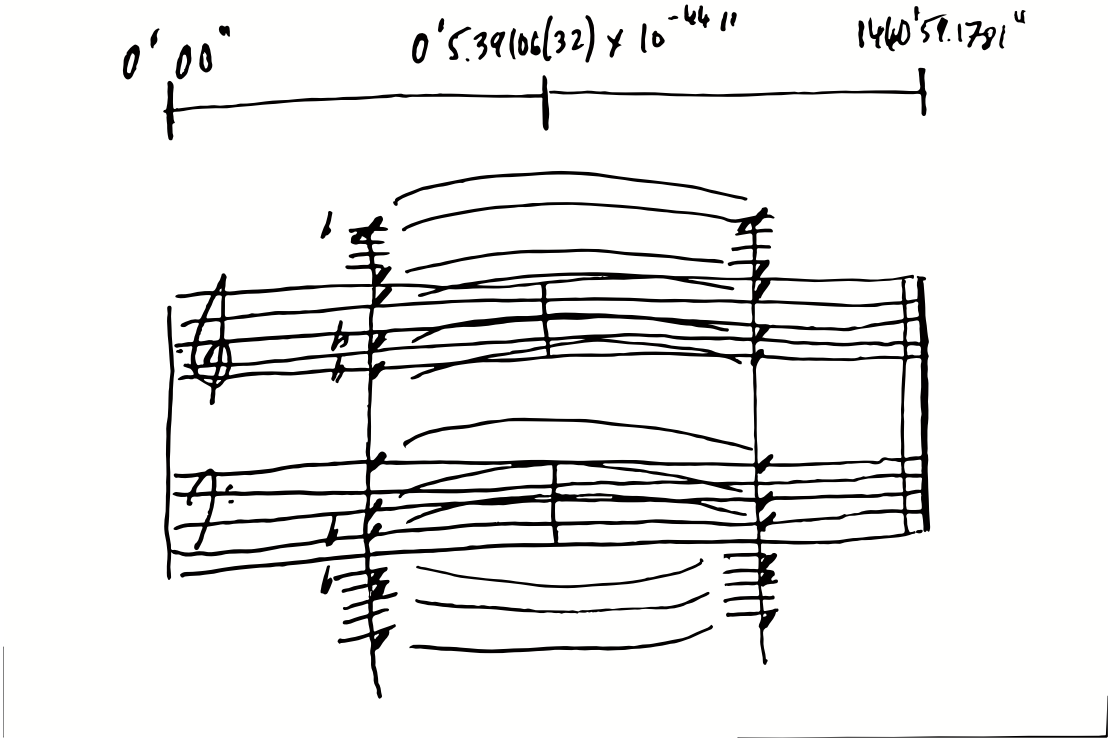


Figure 10. *Day Born*

Day Born[5] (figure 10) is a notated composition that explores the existential relationship of music and sound. *Day Born* depicts a chord with 12 pitches within a chromatic scale between SPN C1 and F#6. The chord's onset is between absolute zero (0'0") and Planck Time (0'5.39106(32) x 10^{-44}"), and it is sustained for the period of a day (1440'59.1781"). *Day Born* is a composition that represents sound that cannot exist within the external world by virtue of

[5] CD1 - Compositional Portfolio: 3. *Day Born*.

scientific rule of space, time, and sound. This is fundamentally due to the time required for an oscillating frequency to make an audible sound. The highest pitch within the depicted chord is SPN F#6, which oscillates at 1479.98Hz - the period of time between absolute zero and Planck time is insufficient for even F#6 to sound, let alone the lower pitches.

Max Planck's (1899) 'Planck units' represent the smallest objective measurements used within dimensional analysis in the field of mathematical physics. Planck time is the time taken for light to travel, in a vacuum, the distance of a Planck length (the smallest spatial measurement). The smallest objective measurement of time is therefore derived from the smallest objective measurement of space. *Day Born* utilises objective measurements of sound and time to probe the *idea* of music and the capacity for the existence of music (in this instance a sustained chord) when sound is impossible.

For sound to exist physically it must have the spatiotemporal properties of frequency, amplitude, pressure, speed, and direction. When working within physical law, the greatest and least extents of time (and therefore of space) help to illustrate the possibility of physical existence. Generally, time at its greatest extent can, and does contain sound. Cage's (2011) '*Organ^2/ASLSP*' is representative of this, the ongoing performance at Helberstadt in Saxony-Anhalt, Germany is set to last 639 years, from 2001 to 2640. Opposed to *Organ^2/ASLSP (As Slow as Possible)*, *Day Born* is a composition that is representative of time at its least extent, and being representative of such, it poses complications. I could view *Day Born* as a music composition, however it challenges that view. How can a composition *be* music when it cannot exist as sound or as silence? Given the impossibility of *Day Born* as sound, what status does it have as music? If we abide by the rule that music as differentiated from sound is the "heard" within consciousness, can I say that, I have the capacity to "hear" the chord within the given time period? No, I cannot.

Day Born is a practical outcome that was composed in dialogue with philosophical investigations into the possibility of internal perception of music *sans* the perception of sound within the external world. Due to this, I had at one

stage presumed that the piece was acquiescent to Husserl's phantasy, yet it remains resistant to this categorization. Given Husserl's categories of internal perceptions, I regarded *Day Born* as a phantasy perception by virtue of its apparent opposition to existence within the external world and therefore deduced that it must be a piece that is encountered within a solely internal perception. This position is compromised by the fact that I cannot hear the depicted chord internally. I can hear it, but only when the stated time period within the 1st bar is ignored. *Day Born* **without** Planck time within the 1st bar *is* possible in the external world and within internal consciousness, too. This implies that phantasy in the case of an internal perception of original music *is not* resistant to the external world. It may be "heard" as phantasy in the first instance and communicated as sound in the second instance. This phantasy that is "heard" and is subsequently "audible" is not by definition something that cannot exist within the external world, it is merely not realised there.

Perhaps then, *Day Born* is better engaged with as a thought experiment, a metaphysical concept, a kōan, or merely an artwork. The piece is composed with the intention of exploring how "heard" music might exist without the possibility of existing as "audible" sound. However, *Day Born* demonstrates that music and sound by the given definitions are inherently bound to one another. If a definition for music is that it has the capacity to be "heard" within consciousness, *Day Born* is not music at all. It appears that "heard" music must have the *capacity* to be "audible" whether it is encountered within an external environment or not.

This position finds congruence with my previous thoughts - that decision and intention are responsible for the interpretation of something as "heard", and the "heard" reflects the palette of possibilities that is defined by my encounter with the "audible". This means to say that "heard" and "audible" are maintained as a distinction between music and sound, and there is interdependency between the two based upon experience.

What is then, a distinction between music and sound beyond "heard" and "audible"? How do I engage with sound within consciousness to make it music?

These questions beget a brief engagement with Schafer's taxonomy of sound. Within his taxonomy, Schafer does not seek to explicitly differentiate sound from music rather he interrogates sound as it exists within the soundscape and places music at the top of a hierarchy. Schafer (1993, p.24) states: 'Today all sounds belong to a continuous field of possibilities lying *within the comprehensive dominion of music*'. Given this statement, Schafer's theory of sound and music differs from my own. Had Schafer defined sounds as *having* a continuous field of possibilities, there would be an alignment with my own view. I am able to reengage with the sounds present around me and interpret them as music because I have intention to. However the idea that sounds *belong* within the comprehensive dominion of music is counter to my position. Sound exists continuously around me and some of that sound is at times music. However a sound whose existence is non-intentional as music, cannot be music until it is encountered with the intention of being listened to as music.

This position is admittedly problematic. If indeed a sound, for example the sound of a radiator, does not have musicality prior to encounter - how then can it be interpreted as music? The logic of the question would suggest that musicality is brought by encounter and would therefore be representative of a phenomenological position. Metaphysically, this position pertains to the idea that intended music is music, and sound is *potentially* music where its status as music is dependent on it being listened to and heard as such.

Cage posits a number of questions within this area:

> Which is more musical, a truck passing by a factory or a truck passing by a music school? […] Are sounds just sounds or are they Beethoven? […] If my head is full of harmony, melody, and rhythm, what happens to me when the telephone rings, to my piece and quiet, I mean? And if it was European harmony, melody, and rhythm in my head, what has happened to the history of, say, Javanese music, with respect, that is to say, to my head?
> (Cage 1961, p.41-42)

Interpreting this series of questions, I believe that Cage is questioning the extent to which sound is musical, and the effect experience and encounter has upon the engagement with sounds as music. Primarily, Cage locates his line of

enquiry within the context of music, or more accurately, within a predisposition to music. As musicians, in some ways it is more difficult for us to *disengage* with sound as music. Whilst Cage humorously draws attention to the differential in context of a factory and a music school when hearing a truck, my interpretation is that he is subtly questioning the extent to which musicians can separate themselves from music within an auditory world. The sound of a truck would not ordinarily be regarded as music. However by virtue of its context within a sound conscious environment - the music school - an environment in which sounds are *listened* for to *hear* them as music, there is increased potentially for the truck sound to be "heard". It may be "heard" as distracting or augmenting any music from the music school but in any case, it has enhanced potential to be "heard" as opposed to merely being "audible". Furthermore, I view Cage's questions pertaining to harmony as further communicating the subjectivity of sound and music. In this version of his point, the significance of predisposition is again highlighted within the perception of music. Harmony, melody, and rhythm are posited as part of aesthetic histories. An individual exposed to Western music in the majority would have a different subjective perspective than a different individual who has been exposed predominantly to Javanese music. Each would likely have a different perception and interpretation of music. Finally, Cage draws a distinction between the music that is in his head and a telephone ringing. I view this position to be of direct relevance to my philosophical discussions of what is "heard" and what is "audible".

4.5 Conclusion

The methodological underpinning of my research is the dialogic of music and philosophy. That dialogue is demonstrated when philosophy is interpreted, communicated, or interrogated through music and when music is interpreted, communicated, or interrogated through philosophy. Within this chapter I have explicated Bergson's comparison of physical objects and consciousness by comparing sound and music. That comparison has led to a differentiation of sound and music by virtue of their existence in the external world and within internal consciousness. By virtue of whether they are "heard" or "audible". I have sought to understand music as a phenomenon encountered within internal

consciousness through interpretation of Husserl's definitions for phantasy, image consciousness, and memory. That interpretation resulted in *Day Born*, a practical output that was intended to realise my interpretation of the studied philosophy as music composition. Finally, *Day Born* is discussed and contextualised as an artwork that challenges definitions of music.

In this chapter, the questions regarding the differentiation between sound and music, specifically the relationship between the objective "audible" and the subjective "heard" are the most difficult concepts to communicate and certainly to conclude. I have stated that *Day Born* is perhaps better engaged with as a thought experiment because of *Day Born*'s lack of objective sound and therefore its incomprehension as "heard" music. Practically, the demands of the composition cannot be satisfied - the chord cannot exist as sound nor as music within the first time period therefore cannot be sustained throughout the second. Whilst the chord cannot be sustained because it has to exist between 0'00" and Planck time first, should the onset of the chord be attempted, it will *become* sound within the second period because the time period provided is sufficient.

Given this, philosophically, *Day Born* poses questions that are directly related to Bergson's philosophy, specifically the rejection of discreet divisions of time. Furthermore, the piece represents the theory I have presented that music is an intuited quality. In *Day Born*, the chord cannot exist within the first time period; consequently, it cannot be sustained within the second period. However, by incorporating Bergson's philosophical stance that time is not analogous to space, matters are changed entirely. Bergson's stance that time is not a succession of distinct parts, invalidates the bar line. Without the division in to bars, the chord can occupy the whole of the composition and *is* music. Whilst the first bar of *Day Born* provides a rational basis from which to discuss the philosophical concepts of "heard" music and "audible" sound, the piece also is a manifestation of my own musical and philosophical position, that time is a quality that is innately resistant to quantification. Spatial separation of time is a post-rationalisation of time that is founded upon analysis.

Day Born is a composition born of the dialogue between music and philosophy. The examination of the possibility of an exclusively internal perception of music is a philosophical exercise and the method of examination is music composition. That music composition is unsuccessful at *demonstrating* an exclusively internal perception of music, however it is successful in its examination. It substantiates the dialogue between music and philosophy within this research. *Day Born* gives rise to additional philosophical questions that pertain to the nature of music. Rationally, as it is written, *Day Born* cannot be music because it cannot be "heard" internally nor is it "audible" externally. I view *Day Born*'s function within my continued investigation into music as an example of what music is not. As an example of what music is not, those factors that prevent *Day Born* from being defined as music, allow conjecture about requisites *for* music.

My practice as represented by *Sedemus* and *Sedere Audire*, is musical yet with philosophy at its core. Additionally, it represents the use of sound and music to understand physical objects. Similarly, *Day Born* queries sound when it is understood as a physical object and how it differs from music. My practice has begun to reveal that temporality is a requirement for music, not only as essential (as time is for all things), but also as its essence. With the view of substantiating the qualities of music, how music's relationship with time is distinct from a physical object's, and why philosophical consideration of music is essential to my practice, I speculate that a non-musical perspective is required.

When reading the physical objects within *Sedemus* and *Sedere Audire* there is no deviation from the given instruction; this objectivity gained through analysis affiliates the pieces with sonification. Hermann, Hunt, and Nuehoff (2011, p.21) define sonification as 'the technique of rendering sound in response to data and interactions'. As such the rendered sound is precisely sound, or sound not in the capacity of music. With musical intention removed, sonification therefore facilitates the opportunity to study sound in isolation. If sound is isolated from music, then the things themselves that extend sound beyond its physicality to become music must be identifiable by virtue of their exclusion. Unlike the composition detailed thus far, sonification would be entirely responsive to the

physical objects. Its musical intentions would be removed, and therefore it would behave as the objects do. It would not have the quality of unfolding through its duration.

CHAPTER FIVE: SONIFICATION

5.1 Introduction

Within this Chapter, I will engage in contextual and practical study of sonification. Through contextual study, I will discuss a general definition of sonification as an objective practice. I will discuss how that definition is often in opposition to the way the practice is used within aesthetics based practice and make an argument against that use. This chapter discusses my practice within the area of sonification and how it renders audio as sound (as opposed to music). With sound in isolation, I will have the opportunity to study it as a-musical. Subsequently, I will seek to extend these sounds to music. In doing so, I experiment with the parameter of change within duration and how it has the potential to imbue sound with musicality, and therefore is non-essential to sound, but essential to, arguably an essence of music.

Sonification is a diverse area of practice and study that is contained within the remit of Auditory Display. Broadly speaking, the practice is the realisation of data as sound. The practice is inherently interdisciplinary, and is utilised across artistic and scientific disciplines. In addition to *aspects* of the practice being utilised within my aforementioned compositions *Sedemus* and *Sedere Audire*, my experience of sonification extends to creative practice and scientific research within which sonification has been a primary method. These projects have ranged from aesthetics led composition through the sonification of maker craft (Devol, Horsley (2015) 'A Maker's Dozen') to the sonification of mental representation of gait (Pearl *et al* (2016): 'Mental Representations of Gait: Developing a Protocol for Evaluating Parkinson's Disease Patients'). Informed by my observations within previous chapters, I intend to use sonification to explore how physical objects, or more accurately "corporeal spatial occupancy" can be realised as sound. Literally this involves analysing how material objects occupy space and realising their spatiality as sound.

Sedemus and *Sedere Audire* are compositions that are associated with sonification. They use the design schematic of a chair as data, and that data is realised as music. However, those compositions are distinct from sonification

because of the method for reading data - they are inherently musical. With the parameter of time mapped to the y-axis of the schematic, the output of the realisation has musicality because the chair unfolds, millimetre by second. In this sense, the chair is presented in sequence, when it does not exist as such. Through engaging more explicitly with sonification, I intend to realise “corporeal spatial occupancy”, through sound. Realising corporeal spatial occupancy through established sonification techniques as opposed to in the manner that *Sedemus* and *Sedere Audire* were realised will enable me to gain a perspective upon the existential relationship between physical object and sound with more validity. The sonifications will present corporeal spatial occupancy with simultaneity, as opposed to sequence. Phrased differently, the sound realisation will be static in the same way the corporeal spatial occupancy is, as opposed to unfolding and changing in a musical way. I speculate that achieving this will present an a-musical, sonic representation of a physical object. By virtue of the sonification lacking the inherent musical quality of unfolding, I will be able observe an aspect of what differentiates sound and music, and therefore gain insight into music as distinct from sound.

5.2 Definition and Contextualisation of Sonification Practices

The underpinning principle of sonification is the ability to understand data from the perspective of sound. Data is commonly represented through visual means, generally graphically using charts. Viewing data with this visual aid enables those engaging with the data to appreciate and understand it more readily than when the data is presented as number. Similarly, sonification offers an alternative or supplementary perspective on the given data. For example, Effenberg *et al* (2016) highlight the value of a multimodal engagement through sonification within motor learning and control when previously the area has been dominated by visually exclusive learning. Given its dependency upon data, sonification is inherently scientific, with theorists endeavouring to ensure that the practice has scientific provision; that sonification is definitively robust, and adheres to scientific method. Generally accepted as a definition for sonification, Kramer *et al* (1999, p.3) state: ‘Sonification is the transformation of data relations into perceived relations in an acoustic signal for the purposes of

facilitating communication or interpretation'. Elaborating upon this definition, Hermann offers the following taxonomy:

> A technique that uses data as input, and generates sound signals (eventually in response to optional additional excitation or triggering) may be called a **sonification** if and only if
>
> (C_1) The sound reflects *objective* properties or relations in the input data
> (C2) The transformation is systematic. This means that there is a precise definition provided of how the data (and optional interactions) cause the sound to change.
> (C3) The sonification is reproducible: given the same data and identical interactions (or triggers) the resulting sound has to be structurally identical.
> (C4) The system can intentionally be used with different data, and also be used in repetition with the same data.
> (Hermann 2008, p.2)

Hermann's definition is thorough, and as an elaboration upon Kramer *et al* (1999), it more explicitly embraces scientific method. Yet despite Hermann's definition offering clarity to what can be defined as sonification, I view much work that claims to be sonification as failing to adhere to Hermann's conditions for definition. However, before discussing examples of this work, it is of value to briefly consider the specific sub-set of sonification being discussed.

Grond and Berger (2011, p.383) state: 'Parameter Mapping Sonification (PMSon) involves the association of information with auditory parameters for the purpose of data display. Since sound is inherently multidimensional, PMSon is – at least in principle – particularly well suited for displaying multivariate data'. Elaborating upon the definition, they give a simple example wherein an oscillating frequency is mapped to boiling water with pitch increasing as water temperature rises. The parameter of temperature is therefore mapped to pitch. However, Parameter Mapping Sonification beyond its basic principle can be diverse and complex. Therein disagreements can be found and relations between the data and the sonification can be associated in a subjective way, not objectively. Grond and Berger identify these issues for Parameter Mapping Sonification and state that a compromise is needed to

make the practice effective. However, it is my opinion that the call to compromise is increasingly exploited to the extent that sonification as a scientifically robust practice is being appropriated for aesthetic purposes.

Reported in the UK national press (Clark, 2016; Davis 2016), and formalised within academic paper presentation (Armstrong Ed. 2016) Núria Bonet's (2016a) '*Sonification of Dark Matter*' uses dark matter data to create music. It is my opinion that this work represents the appropriation of the term "sonification" that is common when there are elevated aesthetic intentions. Firstly, with the sonified data within this work being derived from Dark Matter, and with Dark Matter being unobservable at the time of writing, the data itself, or rather what it claims to represent, is speculative at best. Furthermore, the work is readily (and accurately) located within the remit of music, a category I believe to be distinct form sonification by virtue of its aesthetic intentions. I feel it is important to highlight how work of this ilk is predisposed to a primarily aesthetic outcome, whereby the display of data, and an understanding of the sonified phenomena are subsumed.

Discussing the work, Bonet states:

> In fact, many sonifications are hardly pleasing to listen to, which undermines the usefulness of sonification as the listener is uncomfortable. Consequently, my work as a composer can also contribute to science as I apply my aesthetic judgment to improve a scientific method.
> (Bonet, 2016b)

Superficially, I am in agreement with Bonet's statement that many sonifications are hardly pleasing to listen to, however, this displeasing listening experience is usually, precisely due to the need for data properties or relations to be reflected *objectively* as per Hermann's 1st condition for definition as sonification. It is my opinion, that to achieve rigorous objectivity in a sonification, the scale of the input data should be considered, and reflected within the audio output. Bonet (2016b) discusses that the data was filtered both in size, and with intention to find 'interesting patterns'. My impression from listening to extracts of the work, reading Bonet's article, and listening to a paper presentation, is that

“sonification” for Bonet is an aesthetic pursuit within the remit of music composition.

Rhoades’ (2013) ‘Hadronized Spectra (The LHC Sonfications)’ presents the musical appropriation of sonification, with self-awareness. There is explicit justification for using sonification as a musical principle, however it is my opinion that despite this, sonification is still used as a contrivance. Rhoades’ paper is thorough and detailed in its outline of his compositional process. The presentation of this paper at Toronto Electroacoustic Symposium 2013 was a catalyst in my motivation to understand sonification and explore my compositions in that context. Rhoades’ understanding of the Large Hadron Collider (LHC), sonification, and his compositional process and principles are specified with honesty. Discussing the intentions of the sonification process Rhoades (2013) states: ‘First, I must remain true to the data that I am attempting to sonify, or what is the point? And second, I must create a musically satisfying result from the sonification’. These self-assigned rules are in conflict with one another, however it appears that Rhoades is creating a hierarchy for them whereby remaining true to the data is paramount. Initially, Rhoades seems to substantiate this hierarchy drawing upon Hermann, Hunt, Nuehoff (2011) however, he quickly reverses the order of priorities, elevating music composition. Rhoades states:

> Sonification is often thought of as a scientific approach that implies accurately representing data using sound in a way that portrays its source. However, for me it means that the data is intended to be the basis for a musical composition.
> (Rhoades 2013)

It is my opinion that this statement, and Rhoades’ (2013) ‘The primary goal is to create a very “musical” piece through an *interpretation* of the data. […] It is a secondary goal to represent the data as a reflection of its source’, clarify his priorities, depreciate his claims that his practice is indeed sonification, and represent the use of the term “sonification” as a contrivance to elevate practice that has primarily aesthetic intentions.

Representation of data often benefits from aesthetic considerations. When aesthetics are a concern, the skill of a sonifier or graphic designer is of vital importance to the quality of the display and the ability for a listener or viewer to interpret the data. However, when aesthetics (visual or sonic) are elevated to the extent that they are of primary concern the data can be misunderstood, misrepresented, or invalidated. For example: often, when there is a new astronomical discovery supported by rigorous scientific data (Gillon *et al* 2017, Baldwin, 2015), images (Rincon, 2017), and increasingly sounds (ESA, 2014) are used to publicize the findings though these images and sounds are frequently misrepresentative of the discoveries. These relatively recent occurrences are even addressed in parody by *Conseil Européen pour la Recherche Nucléaire* (Jarlett 2017) wherein they claimed that the Higgs boson sonification contains Beethoven's 5th Symphony.

Aesthetically led representations of data are *interpretations* or *artistic impressions*. By *interpreting* (whether consciously or not) the data with aesthetics paramount, Bonet and Rhoades are creating artistic impressions of the data *not* alternative realisations or representations. Declaring music as a sonification implies that there is a primary level of objectivity within the representation of the data. When the integrity of the data is compromised the ability to understand it is too. I find statements that claim sonifications to be objective representations of data when they are not, to be precarious in that they undermine the sciences, the arts, and their growing relationship. Discussing *Sonification of Dark Matter* in interview with Clark (2016), Bonet states: 'Hopefully audiences will enjoy them on a basic level, but if they can take away some knowledge of dark matter or its behavior that would be even better'. The origin of the data (unobservable phenomena), the filtering of that data in size and selection of patterns, and the apparently aesthetically motivated intentions do not invalidate this work as music composition, however they do call into question the extent to which *Sonification of Dark Matter* can be defined as a sonification, and especially the extent to which an audience will gain knowledge of dark matter through the work.

Sonification, akin to visualisation, is functional insofar as it provides insight that pertains to the data, or the research question that analysis of the data would supplement an answer. Barrass and Vickers state:

> Generally, the composer is concerned with the musical experience, rather than the revelation of compositional materials. However, when the data or algorithm is made explicit it raises the question of whether some aspect of the phenomenon can be understood by listening to the piece. When the intention of the composer shifts to the revelation of the phenomenon, the work crosses into the realm of sonification.
> (Barrass, Vickers 2011, p.146)

However, if a sonification does not pertain to the data the revelation of phenomenon is misleading.

Given the aforementioned definitions and context, my sonifications are informed primarily by the input data. Music or any aesthetic led outcome is considered unmethodical, as my intention is to realise the data of corporeal spatial occupancy as sound. Rigor of method within a sonification facilitates a realisation that is prescript: method as composition, instruction as notation and adherence as realisation. Qualitative compositional decisions are discounted in favour of integrity of process toward quantifiable outcome. This is to say: my sonifications are the result of objective practice wherein success of the sonifications is quantifiable, measured against representational accuracy. However, I seek to embed my practice within quantifiable accuracy of sonification only to subsequently liberate qualitative compositional decisions. As previously stated, my intentions in utilising sonification are to investigative the realisation of corporeal spatial occupancy as sound, therefore removing musical intention. With *Sedemus* and *Sedere Audire* as music related to corporeal spatial occupancy previously providing insight into the qualities of unfolding within music, sonification facilitates the opportunity to study sound as quantity.

5.3 Sonification Method

The method for my sonifications is developed through a series of experimental miniatures that test the affordances of variants. The experiments are accompanied by extensive discussion of data definition, data triangulation, quantifiable parameters of sound, the inherent limitations within digital audio, limitations of sound perception, scaling methods, the realisation process, and the internal validity of the study. My experiments are of crucial importance to understanding how I have developed my sonification methods, realised input data as sound, and subsequently developed a method for imbuing those sound-based sonifications with musicality. The experiments, methods, and discussion are critical to my research, however it is apparent that engagement with the large body of technical specifications and discussion would interrupt the current discourse therefore this body of work is contained within an extensive appendix to this thesis[6].

5.4 Sonification of Corporeal Spatial Occupancy

Contrasting *Sedemus* and *Sedere Audire*, with my sonifications, time (as an essential component to the realisation of corporeal spatial occupancy) is not mapped to a spatial parameter of the sonified object. As previously stated, doing so would cause a durational reading of the object and the realisation would unfold. Existing all at once in its spatial occupancy, the realisation of the sonified object should reflect all of its spatial properties simultaneously. Duration, within the sonification of corporeal occupancy is arbitrary providing that it allows the realised sonification to exist. In this way, the sonification and the sonified object have a mutual relationship with time. Consequently, no matter the choice of duration for the realised sonification, sonification of corporeal spatial occupancy that adheres to **Hermann**'s (2008) definition, must be realised as a single static chord. *Sedemus* and *Sedere Audire* utilised duration as a compositional parameter to facilitate reading of the object and facilitated the musical quality of unfolding. The musical qualities of these compositions were at the expense of invalidating the physical object because its objective properties are not represented simultaneously. By utilising duration to

[6] Please refer to Appendix 4: Sonification Method, p.85.

acquire musical unfolding, *Sedemus* and *Sedere Audire* each depict the chair as unfolding, with each second of audio depicting an aspect or "slice" of the object in sequence (akin to Magnetic Resonance Imaging (MRI)).

When sonification of corporeal spatial occupancy does not map duration to the input data, musical qualities are subsumed as demonstrated in *Experimental Miniature 3 - Motion (Static Isolated)*[7].

Upon first listening to my sonification, it appeared that the single static chord was counterintuitive to hearing relations within the data. However, upon further reflection I recognised that the sonifications were in this respect, a success. The spatial data of the sonified object reflects the spatial properties of a solid, spatially homogenous, and temporally simultaneous object. With regards to the sonification's musical qualities, any aesthetic sophistication beyond the relationship between frequency, amplitude and phase is subsumed. In the respect of subsuming musicality and producing a sonification of corporeal occupancy that was identifiable as sound, the sonification was successful, too.

5.5 Sonification as Quantifiable Practice

Speculating about the extent to which sonification is quantifiable as a reflection of objective properties poses numerous questions. Those questions pertaining to method and process can be addressed with clarity. However, it is the realised audio, for which the supposition of quantification presents deeper issues. As a musician, I am predisposed to qualitative appreciation of audio, whether a fully formed music composition or an isolated sound event. Yet the research herein pertains to a study of music that involves a metaphysical appreciation of audio phenomena therefore a differentiation of music from sound is imperative. I believe that one difference between sound and music is that aesthetics manifest in the subjective intention of the listener. Metaphysically, I view the difference to be bound by a relationship with time.

[7] CD2 - Appendices and Figures: Appendix 4.6b. Experimental Miniature 3 - Motion (Static Isolated).

The ideas posited by Bergson elevate time as a facilitator of qualities. He deems relation to spatial number as relative knowledge that is a-temporal. Interpreting Bergson's philosophy within my practice, my sonifications are intended to reduce an audio realisation to a solely quantitative outcome, removing all of the qualities associated with music through utilising time only in so far as it is essential. In doing so (and later imbuing the sonification with musical qualities), I am questioning sonification informed by Bergson's philosophy. As an objective practice, sonification has facilitated an acute observation of the aesthetic and metaphysical difference between sound and music. This observation is of substantial benefit to my music practice.

5.6 Sonification as Music

Seeking to imbue the sonification with musical qualities it is granted that I could apply one of hundreds of techniques available within digital sound processing. Directly mapping duration as a parameter, altering the pitches, envelope of the sound, applying modulation or reverb, are all adjustments that would add varying degrees of musicality to the sonification because they all allow the sound to more explicitly unfold within duration. These adjustments imbue the sound with change. However, doing so freely would at this stage be un-methodical and arguably discount the rigor of the research that is discussed within this chapter. Pertinently, with the intention to isolate the strict parameter that would imbue the sonification with musicality, it is imperative to alter the input data to effect the sonification. Doing so poses the question: without invalidating the object as it exists spatiotemporally, what is the musical potential of quantitative sonification?

If music unfolds within time, sound parameters are unfolding therein. Within that unfolding there is *change* within the given duration. Change enables a musical unfolding within duration and duration facilitates change. Rationally, change is essential to musicality and it happens through duration. Returning to spatial occupancy, it is locational change or rather *motion* within time that facilitates the unfolding musical qualities. This is demonstrated through

Experimental Miniature 3 - Motion[8] with the isolated motion demonstrated in *Experimental Miniature 3 - Motion (Motion Isolated)*[9]

5.6 Discussion

Within this chapter, I have discussed how sonification maintains its integrity as a practice when it seeks to reveal something of the sonified phenomenon as its primary outcome through adhering to the input data. I have examined compositions by Bonet and Rhoades wherein an aesthetic outcome is paramount within a sonification process. Through my examination of these compositions I have presented my opinion that, in some respects, claiming that works are sonifications when they do not adhere to the objective properties or relations in the input data is problematic. Reflecting upon this, I would assert that firstly, Bonet and Rhoades were selected due to the quality of their compositional outcomes and secondly, I do not intend to assign any fault. Perhaps the greater issue is that aesthetic works continue to be legitimised by a relationship with scientific disciplines. Artistic impressions of scientific data are acclaimed, often without scrutiny. Appreciation of these works is in part, a celebration of science as a body of knowledge and a cultural phenomenon, and the arts are an arena that continues to reflect our knowledge and culture.

Beyond the scrutiny applied to sonification in terms of definition and context, I have discussed sonification as a quantitative practice, and appended further debate as to the crucial considerations a practitioner faces when accounting for data definition, data triangulation, the quantifiable parameters of sound, the inherent limitations within digital audio, the limitations of sound perception and scaling methods, the realisation processes of sonification, and the internal validity of sonification based studies. Through reflection upon these discussions I have demonstrated the sonification of corporeal spatial occupancy wherein the outcome adheres to the objective relations and properties of the input data, and realises the data as sound. These sonifications are defined as sound because of the lack of musical qualities present within the audio. My

[8] CD2 - Appendices and Figures: Appendix 4.6a. Experimental Miniature 3 – Motion.
[9] CD2 - Appendices and Figures: Appendix 4.6c. Experimental Miniature 3 - Motion (Motion Isolated).

intentions with these sonifications are to elaborate upon *Sedemus* and *Sedere Audire,* subsuming the musical qualities enabled by durational unfolding of sound. By engaging with sonification that removes musicality, I intended to further investigate how music is distinct from sound beyond the observations made within *Day Born*. Through *Sedemus*, *Sedere Audire, Day Born*, and my sonifications, I have encountered key metaphysical differences between physical objects and the physicality of sound, and the perception of these phenomena and the perception of music.

5.8 Conclusion

Temporality is an existential essential for all things, but pertinent to my research, sound and music. Notably, it is only when sonification takes account of temporality as a facilitator for change that its sonority becomes indisputably musical. It is change that demonstrates musical qualities and this leads to the suggestion that temporality in the capacity of change is essential to music in the way it is not essential to sound. Throughout this research, I have sought to understand how temporality is essential to music and that endeavor has been through a dialogue of music and philosophy. However, as a musician I do not seek to locate my practice solely in respect of metaphysical analyses of music. My line of enquiry was born of *Sedemus*. Through reflection upon that work, I came to the acute observation that as related to a physical object, the musical aspect of the work was distinct by virtue of its relationship with time. The unfolding of the music was irrespective of the spatiality of the chair and therein, found relation to Bergson's rejection that time, conceived under the form of space is spurious. Investigating this, I have engaged in further practice through *Sedere Audire* wherein the same problem is manifest. I have composed and discussed work that explores the distinction as related to consciousness (*Day Born*), and interrogated sound as an a-musical phenomenon, subsequently imbuing it with musicality through the effect of change within duration through my experiments with sonification. My research has enabled me to observe an indication that temporality in the capacity of change is essential in how I differentiate music from sound. Seeking to conclude this research, I will create and discuss a compositional portfolio that embodies my findings.

CHAPTER SIX: INTUITIVE COMPOSITIONS

6.1 Introduction

Within my research I have placed music into dialogue with philosophy and this has led me to reveal the significance of time. Through dialogic study of philosophy and practical experiments, I have developed an understanding of the philosophies articulated by Henri Bergson and Edmund Husserl, and gained new insights into music. My research began with the creation and analysis of music composition, and through the course of study I have refined the line of enquiry. That refinement has involved philosophizing and experimenting with sound and music at a level of extreme reduction from *Sedemus* and *Sedere Audire* through to *Day Born* and my sonification experiments. Refining my inquiry through these works has been of substantial value to my praxis because it is has enabled me to theorize the relationship between time, sound, and music with a heightened level of analytical specificity and philosophical rigor. However, the value of my observations is most substantially realised in terms of how they inform my practice as a musician. To draw upon Bergson's differentiation of analysis and intuition, the value of my analytical studies is the intuited knowledge I have gained from that process.

This chapter describes my music compositions *Struck, Discern*, and *Reduce* that are informed by *Sedemus*, *Sedere Audire, Day Born*, and my sonification experiments. It explains how I have utilised and implemented knowledge accrued through research. The practice that is reflected within this thesis has so far relied upon analytical accuracy and the surety discovered from the dialogue of music and philosophy. The compositions articulated within this chapter intend to demonstrate the influence of my research on my music practice subsequent to *Sedemus*, *Sedere Audire,* and *Day Born*. Within this chapter, I will discuss *Struck*, *Discern*, and *Reduce*.

6.2 *Struck*

Struck[10] is a composition that utilises a single recording of a ceramic bowl as an idiophone and source sound. *Struck* implements change as a primary musical tool whereby basic material is subject to modification within its duration. The composition and arrangement are devised with the intention of focusing upon sound from a non-instrumental source, then subjecting that sound to a number of degrees of change that actively modify its temporality. The modifications are intended to imbue the basic material with a heightened sense of musical unfolding to emphasize the significance of change within duration. This element of *Struck* is conceived as an aesthetic reflection upon the techniques employed within my sonifications wherein sound is imbued with musicality by virtue of an adjustment to its temporality. However, primarily *Struck* is a musical composition that reflects my interpretation of Bergson's philosophy *through* music, specifically the following passage of text:

> Pure duration is the form which the succession of our conscious states assumes when our ego lets itself *live*, when it refrains from separating its present states from its former states: it is enough that, in recalling these states, it does not set them alongside its actual state as one point alongside another, but forms both the past and the present states into an organic whole, as happens when we recall the notes of a tune, melting, so to speak, into one another. Might it not be said that, even if these notes succeed one another, yet we perceive them in one another, and that their totality may be compared to a living being whose parts, although distinct, permeate one another just because they are so closely connected? […] We can thus conceive of succession without distinction, and think of it as a mutual penetration, an interconnexion and organization of elements, each one of which represents the whole, and cannot be distinguished or separated from it except by abstract thought.
> (Bergson, 1889, p.100-101)

In pre-production, the source sound is subject to modification of its playback speed, effectively re-pitching it. In addition to enabling a variety of pitches, manipulation of playback speed exaggerates the source sound's harmonic properties. This is intended to focus the listener upon the way in which the

[10] CD1 - Compositional Portfolio: 4. *Struck.*

tones' oscillating frequencies "beat" and therefore consider durational change at a micro level. From the bowl's original pitch of SPN C5, the basic musical material after the degree of change within the pre-production enables 8 pitches [C4, C3, G3, G2, F3, F2, D3, and D2] that are arranged as 4 chords, constructed of pitches an octave apart.

Struck is a composition that readily focuses upon time and embodies the philosophy articulated by Bergson. Making duration essential to the composition and change at a micro level characteristic of its musical qualities is clearly indebted to Bergson. In criticism, *Struck* is dependent upon awareness of Bergson's philosophy for appreciation of both aforementioned significances. However, they are apparent. As the piece evolves, each of its elements is subjected to change yet they are sonically and musically interconnected, demonstrably part of a singular whole.

Movement 1 [0'00" - 1'20"]

The piece begins with a period within which only the C chord is sounding. My intentions here are to initially give the listener the impression that the piece is solely a meditation upon the subtle beating of frequencies within that chord. To further enhance that compositional decision, movement 1 is composed without a tempo in beats per minute. The onset of the chords was decided based upon allowing each of the previous chords to fully resolve in their termination. Movement 1 is deeply informed by the knowledge I gained within the *Day Born* period of my research. A decreasing period of time between the onsets was decided so to suggest that the chords are becoming less isolated from each other as the piece progresses. Rests are utilised and at times there is no audible sound, however these periods can be listened to for their duration and *heard* as music in a way that sound is not.

As the duration of the rests decrease within movement 1, the sound of the C chord becomes increasingly unresolved. My intention is to discredit interpretation of *Struck* as a meditation on sound. The sounds are not allowed to resolve because they are not the focus of the process rather the focus is the

sounds as they exist within the duration of the music composition. In other words, duration is the essence.

Movement 2 [1'20" - 5'04"]

Movement 2 begins with a C chord that is onset during the final C chord from movement 1's continuant. It interrupts the previous C chord before it concludes. This is then followed quickly by a repetition of that interruptive gesture but this time it is interrupted by a G chord. My intention behind this short series of interruptive gestures is to demonstrate that each chord is no longer isolated sound but rather presented within a unified musical phrase. Concurrently, this gesture at the beginning of the movement contributes to establishing a chord progression that is repeated throughout movement 2. This progression becomes the basic musical material within the composition.

Within the chord progression, I implement a technique with the intention to maintain the presence of the C chord as a centerpiece of the composition. The interruptive gestures are continued throughout the sequence however the 3rd chord within the sequence is a C that is realised fully from onset to termination. My choice to maintain the C chord as the centerpiece of the composition is a philosophically informed decision. Within movement 1, I seek to illustrate sound becoming music. With movement 2 intended to be representative of the assimilation of sound into music, I feel it is essential to the dialogue between the music and the underpinning philosophy that the C chord, previously representative of sound, is continued to be fully realised as such whilst evidently existing now as music.

As movement 2 progresses, the basic musical material is accumulatively subjected to degrees of change. The second repetition of the chord sequence at 2'16" begins with the addition of a reverb effect and subsequently a subtle delay of the material at 2'48" (audible at 2'57"). My intention in subjecting only the reverb to delay was to begin a musical process that explicitly reflects Bergson's (1889, p.100) statement where he discusses '[…] the notes of a tune, melting, so to speak, into one another'.

As the musical material is further subject to the reverb and delay effects, I make further adjustments, causing the reverb's echo to become distant from the onset of the chord. The implementation of this technique is both musical and philosophical. Musically, the temporal distance that is created is intended to counter the decreasing period between pitches within movement 1, further emphasizing temporality as the essence of *Struck*. Philosophically, I intend for the distancing to illustrate that within *Struck*, the musicality of each chord is greater when its effect is allowed to continue to unfold through a longer duration.

Movement 3 [5'04" - 7'03"]

The closing movement of *Struck* is composed with the intention of communicating the piece as a progression toward music *qua* music, with the previously intended focus on sounds removed yet with both the past and present states here and now. From 5'04", the onset of the struck chords is removed with only the reverberant echo remaining. Temporally, this facilitates a shift whereby the music is now orientated from the upbeat. Subsequent to a single repetition of the chord sequence as it is presented within movement 2, movement 3 and the composition end with a chord sequence of G, F, D, D, and D. This progression is the resolved representation of the piece as music *qua* music with the C chord that initially represented sound within movement 1 removed but with the remaining material clearly still derived from it.

6.3 *Discern*

Discern [11] is a composition for xylophone and synthesizer. My primary intentions for *Discern* were to approach time as duration (as opposed to extensity), how prolongation of duration can enable additional timbral qualities, and the difference between analysis and intuition. *Discern* approaches these concepts through a number of devices. Within movements 1 and 3, extended xylophone technique is used to facilitate harmonic change that is intended to signify temporality, as opposed to an abrupt spatial relocation of harmony. The extended technique also facilitates an expansion of the xylophone's timbre by prolonging the instrument's envelope. Within movement 2, considerable repetition and variation of a phrase is utilised but with a shifting rest within the sequence. The use of this device is intended to reflect the difference between intuition and analysis by producing music that is confluent but appears complex when analyzed.

Movement 1 [0'00"] - [3'20"]

Movement 1 is an examination of the musical allowances granted when performance techniques and use of harmony are intentionally focused upon enabling durational qualities. The movement is a sequence, performed on xylophone using extended technique. As opposed to the traditional percussive method, I play the xylophone by exciting the keys with my fingers. This technique offers a different perspective on the xylophone, allowing me to use slow attack and longer sustain. Through the extended performance technique, the xylophone's timbre gains the qualities of subtle change through continued duration, with natural resonance and other timbral qualities of the xylophone maintained. Akin to the performance technique, the pitch sequence within the movement is intended to reflect the qualities of duration. Initially, the sequence presents the listener with major harmony, with C defining the key as Ab-Major. The initial sequence is then repeated but with the C replaced by B, redefining *Discern*'s harmony as minor.

Whilst relatively short, movement 1 serves to establish the composition's themes. Developing the extended technique prompted me to focus on the

[11] CD1 - Compositional Portfolio: 5. *Discern.*

subtleties available when duration is the primary focus. Initially, *Discern*'s 1st movement was composed with the xylophone sequence performed with traditional percussion technique. In that version, rhythmic pulsing dominated and disabled the effect of the harmonic shift; the shift was stark and I heard it as too immediate. In this sense, I felt the original version of the movement communicated the harmonic shift as a more spatially orientated device with the music moving to a different and disjointed place or location. With the instrumental performance utilising sustain and subsuming rhythmic pulse, my personal perception is that the sequence intuits patience, with the harmonic shift heard as becoming (rather than relocation).

The 1st movement ends with the addition of subtle, struck xylophone pitches, at which point the piece shifts to the 2nd movement. Given the intended focus upon temporality as opposed to spatiality, the beginning of the 2nd movement perceptibly unfolds from the xylophone sequence, 'melting' into the effects and synthesized sounds (Bergson 1889, p.100).

Movement 2 [3'20" - 9'50"]

Within movement 2, I focus upon the difference between analysis and intuition. To do so, I utilise considerable repetition of the pitch sequence: SPN C#3, F#2, A#2, D#2, F#2, C#2. Within the pitch sequence, I include a crotchet rest that moves forward 1 crotchet upon each repetition of the sequence. This initially establishes the phrase in 7/8 meter, however the 5th repetition of the sequence includes an additional rest at the end of the bar therefore the sequence is 4 bars of 7/8 followed by a single bar of 8/8 (figure 11).

1	2	3	4	5	6	7	8
C#3	F#2	A#2	D#2	F#2	𝄽	C#2	
C#3	F#2	A#2	D#2	𝄽	F#2	C#2	
C#3	F#2	A#2	𝄽	D#2	F#2	C#2	
C#3	F#2	𝄽	A#2	D#2	F#2	C#2	
C#3	𝄽	F#2	A#2	D#2	F#2	C#2	𝄽

Figure 11. *Discern* Movement 2 Pitch Sequence

The sonic quality, repetition, and gradual introduction of the phrase are intended to initially subsume analysis by concealing onset. Because 7/8 meter is less common than 4/4 and 3/4, it resists entrainment and potentially stimulates analysis. Given this, and the additional rest within the 5th repetition, I posit that the phrase provokes analysis, and when analyzed, its complexity is apparent. However, without analysis the phrase is perceptibly transparent. It is my intention to reflect a differentiation of analysis and intuition whereby analytical engagement begets complexity.

Movement 3 - [9'50" - 13'24"]

Movement 3, similar to movement 1, has xylophone as a primary focus. Akin to the latter part of movement 1, excited, struck and effected xylophones are combined but now with a balanced mix between these elements. The movement develops through a repeated struck xylophone sequence of SPN G#3 G#3 C#4 A#4, G#3 G#3 A#3 F#4 G#3 D#3 across the struck and effected timbres which is complemented by the timbral qualities from the extended technique. As the closing movement, this period of music is intended to demonstrate a unity between elements so that rather than considered as 3 parts, they form a cohesive whole that evolves throughout the duration of the movement. Drawing from Bergson (1903, p.4), this is intended to reflect 'variety of qualities, continuity of progress, and unity of direction' whilst resisting a basic combination of musical elements placed in unison.

6.4 *Reduce*

Reduce[12] is a composition that explores the relationship between physical object, sound, and music in a way that relates to philosophy conceptually. The piece explores an upright piano first as merely a physical object, then as a sound source, and finally as a musical instrument. The sound materials used within the composition were recorded during a 10-hour period within which I systematically deconstructed my piano. The recording of the deconstruction was approached with an ethos of musical performance so to best preserve the qualities of each sound or musical phrase. Whilst *Reduce* is a substantially edited version of the recorded audio, the composition is true to the sequence of events in so far as no sound is out of order, and sounds occur once.

Reduce is a compositional exploration of the philosophy explored previously within *Sedemus* and *Sedere Audire* wherein there is a relationship between a physical object and music. I intend for the composition to be an elaboration upon the concepts explored within *Sedemus* and *Sedere Audire*. However, in *Sedemus* and *Sedere Audire*, there is a direct relationship between physical object, spatial analysis, and the realisation of music. Whereas, within *Reduce* the relationship between physical object, sound, and music is more literal because the physical object acts solely as instrumentation. The intention is to use the instrument initially to point to its existence as physical object. The performance techniques produce rudimentary sounds that represent the piano as a construction of wood, ivorine, and metal.

Within *Reduce*, I intend to create a composition that expresses my interpretation of Bergson's philosophy as articulated within Time and Free Will. This musical interpretation focuses upon the concept of time's unfolding, and the differences between the spatial phenomena of physical objects and sound, and the temporal phenomenon of music. With the piano whole, it is a physical object equally usable as a source for sound and for music. By removing the piano's components through the development of the piece, I intend to communicate how reduction of its physical extent and its sonic possibilities do

[12] CD1 - Compositional Portfolio: 6. *Reduce*.

not reduce its musical potential. The last remaining components of the piano are its string. When these are removed the piece ends, representing the final reduction of the piano when its potential for musicality is completely subsumed. *Reduce* is composed in 3 movements:

Movement 1 [0'00" - 3'37"]

Within the first movement, the piano is explored with the intention of using little to no pitch-based material, with any pitch material derived passively from the strings resonating. This compositional decision was implemented to represent the piano primarily as a corporeal object as opposed to a musical instrument. As a physical object, the piano was relatively imposing; it occupied a substantial area of the room, with no subtlety of presence. To reflect this the 1st movement is composed using strong gestures. Another key aspect in expressing my intentions within this movement was the mixing of recorded material. Recordings from room microphones were mixed higher than those from the near-field microphones so that the piano's physicality and dimensions are expressed within the greater spatial context of the room. The movement ends with the sounds of the ivorine keys being removed, followed by sustained reverberations that are intended to communicate the removal of the piano's exterior components and the end of audio that reflects the piano as a sum of its parts.

Movement 2 [3'37" - 9'00"]

Movement 2 intends to explore the piano as a diverse sound source. This is expressed with the more explicit inclusion of pitch-based material. At this stage within the deconstruction, the interior components of the piano were revealed, allowing direct access to the strings and harp. Whilst the inclusion of pitch-based material within movement 2 is more explicit than in movement 1, it is intended that musical phrases are avoided. I am intending to focus the listener upon the object as a collection of components that are exterior to one another as distinct parts within a spatial context. In my perception, I achieve this effect but, arguably, no longer informed by Bergson's philosophy, instead relating to it. Forming phrases would unify the sounds and instill them with a sense of musicality. This is intentionally avoided within this movement. The movement

begins with the sound of loose strings oscillating against each other thereby introducing new textures to the composition amongst the sounds of struck wood that remain from the 1st movement. As the movement progresses, the strings become my focus. Initially with regards to their pitch and subsequently their tension. In closing movement 2, I chose to include the sound of strings being broken. This involved repeatedly striking the strings close to the bridge, which caused each string to become lower in pitch before breaking. These sounds are intended to demonstrate the reduction of available strings and therefore pitches, reflecting the subsuming of spatiality within the composition as musicality is introduced and temporality becomes the primary focus.

Movement 3 [9'00" - 12'43"]

Movement 3 explores the piano with explicit rhythmic, tonal, and melodic phrases. Within this movement, the piano's strings are played with greater expression and with clearer pitch content than in previous movements. The forming of phrases and the expressive performance within this movement unify the sounds, creating a sense of musicality. Movement 3 concludes the composition by using the final strings that remain intact. Using the few remaining strings, an explicit, musical phrase is established and elaborated upon through repetition. At this stage within the composition, the spatial occupancy of the piano was reduced. As the piano was deconstructed, with its components steadily stripped away, I was left with few components that allowed me to play the physical object as a musical instrument. *Reduce* is concluded with the sound of the last string being broken. With no strings remaining, means for musical performance are removed.

6.5 Critical Reflection

Reflecting upon *Struck, Discern,* and *Reduce* as compositions that are intended to intuitively inform composition with the insights gained through my analytical studies, fundamentally, I regard the compositions as successful. However, true to the methodological and philosophical underpinnings of my work, I reflect that communicating tacit and intuited knowledge is problematic. As previously discussed, I appreciate my analytical studies for their increased specificity. In addition, I also appreciate the potential difficulty in reflecting that specific knowledge through music composition.

Tacit and intuited knowledge is resistant to explicit articulation in written form. In writing, articulation of knowledge involves reducing the knowledge to concepts. Bergson (1889, p.vi) states: Concepts break up the continuous flow of reality into parts external to one another, they further the interests of language […].' Indeed, the music that interprets the insights I have gained is accompanied by written description that highlights the specific analytical knowledge that influences the practice, and the way in which those concepts are interpreted musically. Critically, appreciation of the philosophy underpinning the music is somewhat dependent upon the written descriptions. However, *Struck, Discern* and *Reduce demonstrate* tacit and intuitive knowledge.

The accumulative nature of my compositional portfolio demonstrates the development of knowledge and advancement of my practice. *Sedemus*, *Sedere Audire* and *Day Born* epitomize the analytical knowledge I have gained. *Struck, Discern,* and *Reduce* elaborate, removing analysis as a method of composition. Instead, they demonstrate the insights I have gained through my practitioner research. Altogether, my research demonstrates tacit knowledge of how music is temporally distinct from physical objects and from sound, how Bergson's and Husserl's philosophies can be interpreted when placed in dialogue with music, and how temporality is distinctly essential to music.

CHAPTER SEVEN: CONCLUSION AND REFLECTION

7.1 Conclusion

Engaging with my compositional portfolio as whole, *Sedemus*, *Sedere Audire*, and *Day Born* represent music that is in dialogue with philosophy in an analytical way, whereas *Struck*, *Discern*, and *Reduce* represent music that is in dialogue with philosophy intuitively.

The knowledge gained from entering a dialogue between music and philosophy has informed the creation of my compositional portfolio. The portfolio reflects both research through practice in the form of *Sedemus*, *Sedere Audire*, and *Day Born*, and practice-based research through *Struck*, *Discern*, and *Reduce* wherein the knowledge accrued through the course of this thesis is manifest within composition. Engaging with Bergson and Husserl has enabled me to knowingly innovate my praxis through the composition of music. Throughout the course of my research I have discussed how these philosophical ideas have influenced and informed my creative, technical, and theoretical approaches to music. It is anticipated that the dialogue between music and philosophy that is articulated within this thesis and embedded in my practice, will be of potential benefit to other practitioners seeking to embed their music practice within philosophy, and philosophy within music practice. The philosophical discussions articulated within this thesis are of significance to my research, and through positioning them in dialogue with my compositional practice, I have gained new insights. I have found that engaging with music as a qualitative duration from compositional, listening, and philosophical viewpoints has enabled me to create music that expresses my interpretation of philosophy musically. I am satisfied that I have been able to embed my philosophical knowledge within my music and my musical knowledge within my interpretation of philosophy. I feel I have done so in a way that resists undermining both the rigor of my investigations and my personal aesthetic standards. Achieving this has been of personal significance.

For the development of my research, *Sedemus* was the catalytic composition: through unifying the instructions for the realisation of a physical object and

music, I found significance in the observation that music has a distinct relationship with time wherein it unfolds through its duration. Upon observing this, I began engaging with the philosophy of Henri Bergson and sought to create further practice with the intention of understanding the commonality between Bergson's philosophy of pure duration and music.

Sedemus and *Sedere Audire* are compositions that are representative of differences between audio and non-audio entities. With my research questioning how music is temporally distinct, it was essential to the enquiry to compare music and sound. Through *Day Born*, I was able to differentiate music from sound, music being "heard" whereas sound being "audible". As composition, *Day Born* evidenced the complexities of analysis, and paradoxically it is an a-music composition that demonstrated what music is not, through musical means. This enabled me to confidently speculate that time is not merely essential to music but it is accountable for music's qualities beyond its physical manifestation as sound. The analytical phase of my research was concluded through practical sonification experiments that were informed by what I had learnt. I sought to create sound from and as an object and then to set the object in motion. At this point, I had succeeded in narrowing my line of enquiry to extreme analytical specificity. My analysis revealed that change affords potential for music and that pure duration is essential to music. Reflecting upon that knowledge, I understood it for its specificity. The analytical knowledge I have gained has been of substantial benefit and it has informed my music and research practices both within and beyond this professional doctorate.

Reaching an acute level of specificity through analysis has informed my approach to composition as a musician. *Struck, Discern*, and *Reduce* embody my interpretation of Bergson's philosophy and demonstrate the knowledge I have gained through music. If the first stage of my research is thought of as the dialogue between music and philosophy wherein philosophical thought is subjected to the rigors of practice, the second stage involves informing music practice with that philosophy.

Reflection

In addition to the compositions presented within this thesis, this research has served to enhance my music in several other ways. *Sedemus* and *Sedere Audire* have enabled me to appreciate artistic disciplines that are lesser explored through music. This appreciation has accumulated in 2 paper presentations wherein I have discussed the relationship between physical sculpture and music, in addition to the compositions themselves being performed internationally. Sonification practices have enabled me to appreciate how sound and musical practices can be significantly valuable within scientific studies. Appreciation of this has resulted in an interdisciplinary research project wherein a protocol for the address of freezing of gate in Parkinson's disease sufferers was developed in collaboration with researchers from the fields of biomechanics, neuroscience, and psychology. Through *Day Born* I engaged with music as a form of visual art and Fluxus practice leading to the notation being published and exhibited within a number of group exhibitions. *Day Born* has also served to establish collaborative relationships with artists working within fine art contexts.

My doctoral research has had a significant influence upon how I view myself as a musician. I have typically practiced my music in 2 ways - as a musician who is demonstrably research active and as a musician who is not. I have previously separated these 2 ways of practicing. As a research active musician, I seek to communicate my practice within the academy wherein the rigor and integrity of the work is paramount. At times this has been at the expense of engaging wider audiences. As a musician outside of academic contexts, my work is simply influenced by my research. It benefits from the knowledge and ideas I have gained through my research but does not attempt to formalize them within the practice or explicitly communicate them to an audience. Aesthetics are of primacy within that work. However, in producing the pieces within my compositional portfolio those two separate strands are beginning to find unification.

Deep engagement with temporality from both philosophical and musical perspectives has enabled me to produce music that is *inspired* by the qualities

of durational change. I released */prəˌnʌn.siˈeɪ.ʃən-s/* (Pronunciations), a 4 track EP on Concrète Records under the pseudonym “yehoshua” with relative success. Tracks from the record are played on national and international radio stations including broadcast on BBC Radio 3’s Late Junction - here it was noted how Bergson inspired the content of the release. Other musical reflections upon the distinctions between physical object, sound, and music include *Catharsis*, a composition that has been performed at both Ingmar Bergman’s cinema (Uppsala, Sweden), and Tate Modern’s Turbine Hall (London, UK). I feel that these works represent a meeting of my music that had previously been separated into 2 audiences, an endeavor I intend to continue beyond my doctoral studies.

APPENDICES

APPENDIX 1: SEDEMUS DESIGN SCHEMATIC AND SCORE

Please refer to CD2.

APPENDIX 2. SEDERE AUDIRE SCORE

Please refer to CD2.

APPENDIX 3 SEDERE AUDIRE - RECORDING NOTES

Please refer to CD2.

APPENDIX 4: SONIFICATION METHOD

The content of this appendix has been omitted from the main body of the thesis due to the manner of its discourse. It is of substantial value to understanding the methods explored and employed within my sonifications, particularly with regards to my view that a definition of audio as sonification is dependent upon a scientific level of objectivity as defined by Hermann (2008). However, as it assumes the identity of a technical log, with in depth discussion of the technicalities, I feel that the manner of discourse herein interrupts the philosophical discourse within the main body of my thesis.

This appendix references audio files and documents throughout and therefore contains sub-appendices that are referred to as decimals. Appendices 4.1 through 4.7 are contained on CD2. Figures within this appendix are referred to alphabetically. Figures A and B are contained on CD2.

To refine my method of sonification, I engaged with a course of practical study wherein the issues of data definition, data triangulation, quantifiable parameters of sound, the inherent limitations within digital audio, limitations of sound perception, scaling methods, the realisation process, and the internal validity of the sonifications were investigated. My sonifications concern corporeal spatial occupancy as the input data. Initially, this study involves producing a number of experimental miniatures, which practically investigate methods for realising the input data as sound with the highest level of objective relation between the input data (corporeal spatial occupancy) and the output audio. A number of different potential methods are compared for their affordances and the most appropriate method is identified.

Once this method is defined, I realise corporeal spatial occupancy as strictly sound (as opposed to music). The measure for defining that sonification as sound is the absence of musical unfolding. Corporeal spatial occupancy is concurrent in its form with all of its parts and dimensions existing simultaneously. Subsequent to the outcome that is strictly sound, I design a method for sonification that is imbued with musicality so to reflect upon the qualities present within the input data that are accountable for the musicality.

Those qualities, when manifest in audio are identified as essential in the differentiation of music form sound, and are subsequently used to inform my portfolio of music compositions.

To understand the sonification of corporeal spatial occupancy, the input data needs to be basic in its form. This course of practical study is concerned with developing a robust and systematic knowledge of the methods involved. To achieve the required level of scientific rigor, the input data is required to be rudimentary. I decided that static cuboids would be the best form for my purposes.

Data Definition

With the form of the corporeal spatial occupancy decided as static cuboids, the method for defining the form as input data involved assigning, reading, and documenting numerical data from Read Points (RP) upon an *xyz* axis. RP are essential for reading the input data correctly and accounting for each dimension's extremity. For example, if a dimension has a measure of 2 units, that dimension has 3RP; if a dimension has a measure of 4 units, that dimension has 5RP; 8 units, 9RP (figure A). Therefore RP = n + 1.

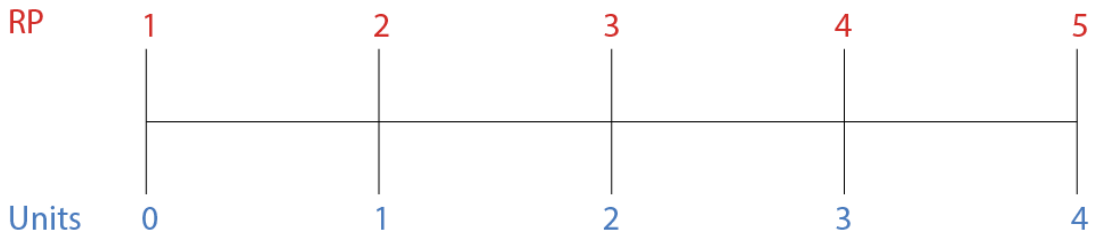


Figure A. Units to RP

Experimental Miniature 1 - Scaled Distribution[13] and *Experimental Miniature 2 - Non-scaled Distribution*[14] use the same input data - a static cuboid with the following dimensions:

$x = 2, y = 4, z = 8$

$\therefore\ x = 3RP, y = 5RP, z = 9RP$

The sonification of a cuboid of these dimensions has a total of 17RP, with each read point being a combination of 3 audio parameters. This has implications particularly when amplitude is accumulated and is discussed below under the heading **Quantifiable parameters of sound**.

Achieving Surety through Triangulation when Reading and Documenting Data

I implemented three stages of triangulation to ensure data collection is robust and allocation of sound parameters is without bias. The first stage is a six-fold triangulation of parameters wherein each possible order is accounted for[15]. This is in avoidance of false assertions (for example: *x* is and can only be Frequency). The second stage is a three-fold triangulation that serves as a method to ascertain accuracy through the reduction of the impact of human and/ or human input error(s) when conducting the third stage of triangulation. Within the second stage of triangulation, RP are read and documented manually, the total number of RP is compared to the outcome of the equation:

$RPx\text{ -x- }RPy\text{ -x- }RPz = RPXYZ$

[13] CD2 - Appendices and Figures: Appendix 4.1. Experimental Miniature 1 - Scaled Distribution.
[14] CD2 - Appendices and Figures: Appendix 4.2. Experimental Miniature 2 - Non-scaled Distribution.
[15] CD2 - Appendices and Figures: Appendix 4.3 Six-fold Triangulation Chart.

The content of RPXYZ is then compared with the outcome of the following script:

```
#!/usr/bin/python

for x in range(-1,2):
  for y in range(-2,3):
    for z in range(-4,5):
      print("x="+str(x)+", y="+str(y)+", z="+str(z))
```

The third stage RPXYZ-fold triangulation is thus the result of the second stage, should congruence be found.

Quantifiable Parameters of Sound

To map sound parameters to each of the 3 axes, sound parameters were considered in so far as they relate to the spatial quantities of height, width, and depth. Furthermore, the sound parameters were selected because of their primacy as essential characteristics of sound. Amplitude and frequency were selected due to their primacy within the quantification of sound (further properties of a sound wave are partially determined by amplitude and/ or frequency). Within initial experiments, velocity was selected due to its common usage within Musical Instrument Digital Interface (MIDI).

A discussion of amplitude within the outlined methods for *Experimental Miniature 1 - Scaled Distribution* and *Experimental Miniature 2 - Non-scaled Distribution* has particular significance due to the way in which it acts beyond the role of parameter differential. Each stage that includes an audio bounce (with the exception of both stages 8) includes surplus application of amplitude. Furthermore, in amalgamative and consolidation stages, amplitude is cumulative. Due to this, I limited amplitude at the final output stage - amplitude is adjusted to the highest achievable limit below digital audio clipping (0 Decibels relative to Full Scale (dBFS).

In the interest of internal validity, the following example should be considered: The sonification of a cuboid with the dimensions of x2, y4, z8 would have 17RP.

Each RP would instruct an amplitude level thus there would be an accumulation leading to a significantly high level of amplitude overall. Amplitude is therefore limited to 0dBFS. If one of the RP instructs -20dBFS, it is precisely *decibel relative to full scale*. The full scale for each RP is therefore amplitude of 0dBFS, and *that* amplitude is relative to the level of amplification upon playback by the listener.

With regards to internal validity, the limiting of amplitude at stages 10 and 11 of the methods is robust.

Imposed Limitations of Digital Audio Workstations and Digital Audio

Digital Audio Workstations (DAWs) facilitate acute control of parameters compared to analog technology. The use of industry standard software packages Logic Pro 9 and Max 6 imposes certain limitations in parameter specification, which has direct effect upon the composition and realisation processes. I identify limitations as follows: a high degree of accuracy within specification of dBFS can be achieved within Logic Pro 9 yet in consideration of perception (which is discussed in detail below) and consistency of parameter to axis allocation, Logic Pro 9 does not offer specification to the same level of consistency as Max 6; Max 6 permits specification to a degree of 1.0dBFS throughout the scale of amplitude appropriate to the size of each audio file; however Logic permits specification to the degrees of 0.1dBFS (between 6dBFS and -6dBFS), 0.2dBFS (between -6dBFS and -18dBFS), 0.5dBFS (between -18dBFS and -30dBFS), 1dBFS (between -30dBFS and -42dBFS), 2dBFS (between -42dBFS and -60dBFS), and 5dBFS (between -60dBFS and -90dBFS), beyond which there is no specification (between -90dBFS and -∞ dBFS). Upon reflection, consistency and perceptibility is valued over the accurate yet inconsistent specification permitted by Logic. In regards to frequency, which has potential to bring forth similar discussion as to that of amplitude, the decision (which is discussed in detail below) to utilise the frequency allocation of the standard eighty-eight key piano's twelve tone equal temperament (with an additional increment of a lower, eighty-ninth frequency ((SPN) Ab0/ 25.95Hz), avoids issues concerning the degree of specification permitted within DAWs. When sound audio datum of specific frequency,

velocity, and amplitude is realised in Max (at both stages 8), control amplitude is brought forth as a factor that has direct effect upon the sonification process. Prior to considerations of audio perception, usage of datum of lowest frequency (SPN Ab0/ 25.95Hz) and lowest velocity (1) as control, facilitated valuable insights into the limitations of digital audio file size and controlled amplitude. In initial experiments, the upper limit for amplitude specification was 16dBFS. Before consideration of digital audio clipping it was evident that the sound audio datum of lowest specific frequency and velocity could not be scaled to amplitude of 16dBFS therefore it was rescaled to its upper limit of 5dBFS. The same audio file datum was used as control in experimental measurement of lower limit for amplitude specification. Reiterating that these initial experiments occurred prior to considerations of audio perception, the lower limit for amplitude specification was determined arbitrarily as -76dBFS, inaudible and with no visual confirmation of audio output upon Max 6's dBFS monitor object live.gain~, amplitude was rescaled to the lowest limit of visual confirmation: -69dBFS. That lower limit was rescaled further upon reflection of audibility (which is discussed in detail below).

Imposition of Limitations according to the Perception of Sound

Discussions of parameter scaling have alluded to the significance of perception and audibility. Whilst the sonifications in this study are intended to be quantitatively robust, ultimately they need to be audible to a general audience. This limits the scale of audio parameters.

The logarithmic scale of amplitude and the measure of amplitude as dBFS within DAWs had already called for an adjustment to the way in which parameters are allocated to axes; further adjustment was required to satisfy the demands of general audibility. Through experimentation, it became apparent that the lower limit of -69dBFS amplitude, whilst visually confirmed, was too quiet during playback on a number of typical systems typically used for playback (laptops, mp3 players, and home stereos). -51dBFS was identified as a lower extreme for general audibility thus to compensate for different equipment and hearing levels -41dBFS was selected as the lower limit for

amplitude. In addition to amplitude, frequency was also considered with regards to perceptual audibility. Whilst a range of 20Hz - 20kHz is generally considered as a standard for human hearing range, the standard 88 key range and the twelve tone equal temperament of a piano was considered an ideal model for both range and discernibility between frequencies. With regards to velocity, the standard 128bit scale (0-127) was considered appropriate.

Discussion of Scaling Methods

Firstly, it is noted that when the totality of RP upon any axis is of numerically odd value (as opposed to even value), opportunity is presented to define a centre RP between the upper and lower thresholds. It is more accurate for the centre RP to be defined as a non-rounded parameter when the opportunity is presented. Due to this, an additional lower limit of SPN Ab0/ 25.95Hz is given to frequency, facilitating an odd numerical total of 89 points (consolidating all numerical totals of points on scale as odd (47 points for amplitude and 127 points for velocity).

The fundamental difference between my initial sonifications is the parameter scaling method for each. The different methods of scaling are specified at stage 5 of each sonification's detailed method. The key difference between each scaling method is whether the distribution of audio parameters is scaled to include the lower and upper extremes of the audio parameters. *Experimental Miniature 1 - Scaled Distribution* is scaled to include the lower and upper extremes of the audio parameters, and *Experimental Miniature 2 - Non-scaled Distribution* is not. I will hence refer to each as *Experimental Miniature 1 - Scaled Distribution* and *Experimental Miniature 2 - Non-scaled Distribution*, respectively. The difference in sound between each scaling method is recognizable when listening. Each of the methods used has strengths and limitations.

Experimental Miniature 1 - Scaled Distribution demonstrates scaling that includes upper and lower limitations of each parameter with equidistant distribution. The implementation of this scaling method allows for a wider spectrum of limits.

When corporeal spatial occupancy is sonified in this way, the size of the corporeal spatial occupancy can be discerned based upon the number of sounds heard. Yet the fundamental limitation of this scaling method is apparent when multiple corporeal spatial occupancies are placed within the same context. For example: 3 cuboids (*a:* x=2n, y=4n, z=8n; *b:* x=200n, y=400n, z=800n; and *c:* x=3n, y=5n, z=9n) are placed within the same context and sonified using the scaling method of - *Miniature 1 (Scaled Distribution*. Cuboids *a* and *b*, even with equal lower and upper thresholds and center points, are discernably different because of the difference in total RP. However, with cuboid c there is substantial difficulty in differentiating its size from cuboid *a*. The scaling method implemented within *Experimental Miniature 1 - Scaled Distribution* facilitates greater discernible difference for individual realisations when isolated, but it does not allow for sufficient differentiation beyond that.

Experimental Miniature 2 - Non-scaled Distribution demonstrates scaling wherein the centre RP corresponds to middle quantification of parameter with further quantification of sound parameters distributed incrementally on a linear scale to the negative and positive values of one (-1, +1) relevant to each parameter, to each negative and positive RP. This scaling method demonstrates a representation of size that is lacking in the scaling method employed within *Experimental Miniature 1 - Scaled Distribution*. Furthermore, when multiple corporeal spatial occupancies are placed within the same context, the heightened accuracy in representation of size facilitates a discernible difference. However, there are limitations with regards to the size of the input data when using this method. The chosen quantitative measurements of sound parameters offer accuracy of specification yet numerical limitations confine their usage. Triangulation of parameter allocation to axis, and incremental distribution of RP (therefore also parameters) limits the extent of numerical value in the totality of RPs any corporeal spatial occupancy can have upon each axis to the parameter with the lowest total numerical points (in this case: amplitude, due to parameter scale of -41dBFS - 5dBFS, thus linear scale of 48 possible RP, from a limit of 47 increments for any given axis). Using the

non-scaled distribution method limits the size of corporeal spatial occupancy that can be sonified.

An additional limitation demonstrated within the composition and realisation of *Experimental Miniature 1 - Scaled Distribution* is that parameter values require numerical rounding when assigned to RP upon an axis. However, limitation that necessitates estimation is not exclusive to this method. The scaling method implemented within *Experimental Miniature 1 - Scaled Distribution* brings forth an issue wherein parameters are assigned between two RP, for example: when velocity is assigned to an axis of 5RP the equidistant parameter value between RP3 and RP5, at RP4, reads as 95.5 and, as velocity cannot be defined as a decimal value, the value must be rounded as per mathematical rule (therefore rounded up to the nearest whole value of 96), therefore accuracy within this scaling method is fractionally imprecise.

The scaling method within *Experimental Miniature 2 - Non-scaled Distribution* necessitates an instance of estimation when total RP upon an axis are of numerically even value (as opposed to odd value), this is due to the scaling methods reliance upon the center RP corresponding to the middle quantity of a parameter. The estimation *in lieu* of this limitation is to impose a center pseudo-RP to permit the linear incremental distribution of parameters from that center pseudo-RP. As with the scaling method within *Experimental Miniature 1 - Scaled Distribution*, accuracy of the scaling method within *Experimental Miniature 2 - Non-scaled Distribution* is compromised but the inaccuracy is viewed as miniscule.

On reflection, it appears that the methods for *Experimental Miniature 1 - Scaled Distribution* and *Experimental Miniature 2 - Non-scaled Distribution* have ideal applications. The method for *Experimental Miniature 1 - Scaled Distribution* would be best implemented when sonifying a single corporeal spatial occupancy without reference to others. The method for *Experimental Miniature 2 - Non-scaled Distribution* is best implemented when numerous corporeal spatial occupancies are placed within the same context, with the axis of greatest numerical value not exceeding the value of the parameter with the

lowest total numerical points on scale. However, there are two further adjustments that support the method for *Experimental Miniature 2 - Non-scaled Distribution*. The first adjustment is inconclusive but warrants recognition: adjusting the increment at which amplitude is read from a degree of specification of 1dBFS to that of 0.5dBFS would allow for corporeal spatial occupancies of larger dimensions to be sonified. Given this adjustment, amplitude would have a total of 95 numerical points thus the parameter with the lowest total numerical points would be frequency (89), greatly increasing the size of corporeal spatial occupancy able to be realised as sound. This adjustment to parameter increment has one arguable, and one limiting flaw: firstly, perception of reduced increments becomes increasingly difficult, secondly and significantly, this adjustment to increments is limited to the point at which velocity is the parameter of lowest total numerical points on scale (127), as velocity cannot be reduced to decimal value. The second adjustment is concerned with the scale at which the corporeal spatial occupancy itself is measured: scaling of quantitative measurements of distance (millimeter, centimeter, meter, *et cetera*) can be adjusted, thereby maintaining the validity of this method whilst facilitating the realisation of corporeal spatial occupancies of greater size as sound, albeit with accuracy reduced. It is speculated that should this reduction of accuracy present further issues of significance, it may be countered through the introduction of additional sine waves that are subject to additional effect pre-parameter specifications, albeit with ramifications regarding (but not limited to) amplitude control.

Corporeal Spatial Occupancy as Music, as Differentiation from Corporeal Spatial Occupancy as Sound

Compositional *Experimental Miniature 1 - Scaled Distribution* and *Experimental Miniature 2 - Non-scaled Distribution*, represent the initial experiments of sonification. The process is outlined as objectives as follows: (please note: the key difference between miniatures is detailed within point 5 of each method):

Experimental Miniature 1 - Scaled Distribution

1. Draft schematic design of physical corporeal spatial occupancy.
2. Finalise physical corporeal spatial occupancy design as three-dimensional model upon an xyz axis[16].
3. Assign one sound parameter (frequency, velocity, amplitude) to each of the axis then conduct first stage triangulation.
4. Conduct second stage and third stage triangulation and enter each Read Point(s) (RP) into Parameter/ Axis Chart for data sets 1-6[17].
5. Scale quantification of sound parameters to each axis so to include upper and lower limitations with equidistant distribution scaling between.
6. Read each axis individually from lowest to highest numerical point (from left-to-right, near-to-far, and bottom-to-top) and complete the chart for each of the data sets 1-6.
7. Bounce each realised sound audio datum of specific frequency and velocity using Logic Pro 9 with channel and output sliders scaled to 0dBFS.
8. Bounce each realised sound audio datum of specific frequency and velocity as sound audio datum of specific frequency, velocity, and amplitude using Max.
9. Amalgamate realised sound audio data as one (1) sound realisation for datasets 1-6; and
10. Bounce each realised amalgamation with channel slider scaled to 0dBFS and output slider scaled to highest limit below digital audio clipping.
11. Consolidate amalgamation with channel slider scaled to 0dBFS and output slider scaled to highest limit below digital audio clipping and bounce with channel slider scaled to 0dBFS and output slider scaled to highest limit below digital audio clipping.

[16] CD2 - Appendices and Figures: Appendix 4.4. 3D Model.
[17] CD2 - Appendices and Figures: Appendix 4.5 Example Parameter/ Axis Chart.

Experimental Miniature 2 - Non-scaled Distribution

1. Draft schematic design of physical corporeal spatial occupancy.
2. Finalise physical corporeal spatial occupancy design as three-dimensional model upon an xyz axis.
3. Assign one sound parameter (frequency, velocity, amplitude) to each of the axis then conduct first stage triangulation.
4. Conduct second and third stage triangulation and enter RP into Parameter/ Axis Chart for data sets 1-6.
5. Scale quantification of sound parameters to each axis wherein the centre RP corresponds to middle quantification of parameter with further quantification of sound parameters distributed incrementally on a linear scale to the negative and positive value of one (-1, +1) relevant to each parameter to each negative and positive RP.
6. Read each axis individually from lowest to highest numerical point (from left-to-right, near-to-far, bottom-to-top) and complete the chart for each of the data sets 1-6.
7. Bounce each realised sound audio datum of specific frequency and velocity using Logic Pro 9 with channel and output sliders scaled to 0dBFS.
8. Bounce each realised sound audio datum of specific frequency and velocity as sound audio datum of specific frequency, velocity, and amplitude using Max.
9. Amalgamate realised sound audio data as one (1) sound realisation for datasets 1-6; and
10. Bounce each realised amalgamation with channel slider scaled to 0dBFS and output slider scaled to highest limit below digital audio clipping.
11. Consolidate amalgamation with channel slider scaled to 0dBFS and output slider scaled to highest limit below digital audio clipping and bounce with channel slider scaled to 0dBFS and output slider scaled to highest limit below digital audio clipping.

Discussion of Validity and Future Use

Through reflection upon these miniatures, I have established what I view as ideal methods for the continuation of experimental miniature composition. Informed by discussion of *Experimental Miniature 1 - Scaled Distribution* and *Experimental Miniature 2 - Non-scaled Distribution*, the methodical processes for realisation demonstrated within *Experimental Miniature 2 - Non-scaled Distribution* are intended for future use in the sonification of corporeal spatial occupancy as sound, and these will be adapted for the realisation as music. The experimental compositional miniatures have acted as a substantial study. Practical processes and philosophical discourse developed accordingly whereby discrepancies within the realisation process were illuminated within the dialogic process of this research: development of thought through consideration of motion begot the revision of the realisation process that is detailed within the method and discussion of compositional *Experimental Miniature 3 - Motion*[18].

Corporeal Spatial Occupancy as Duration

To emphasise the significance of temporality within the realisation of corporeal spatial occupancy, motion was considered whereby space that is occupied changes throughout the duration of a realisation. The realisation of motion within *Experimental Miniature 3 - Motion* implicated the need to change the realisation method. Simply: the use of MIDI velocity as a parameter disables the ability to automate change within the duration of a give note - a problem hitherto not encountered because of previous miniatures being realisations of static corporeal spatial occupancy. Therefore it became pertinent to establish an alternate auditory parameter that will enable the compositional realisation of corporeal spatial occupancy that is transient. Firstly, MIDI was seen as contributory to the issue; the issue of MIDI has been alluded to previously given the resolution (wherein the scale is between 0 and 127) thus whilst remaining within digital synthesis, a solution was sought through use of Open Sound Control (OSC) within Max 6. OSC enables the use of floating point values thus allowing for greater accuracy than with the previous limitations imposed by MIDI. Secondly, whilst refining the accuracy at which one can realise corporeal

[18] CD2 - Appendices and Figures: Appendix 4.6a. Experimental Miniature 3 – Motion.

spatial occupancy as audio, Max 6 enabled the design of a digital synthesizer (Figure B) authored specifically for the purpose of realising *Experimental Miniature 3 - Motion* thereby previous issues wherein multiple software were used became redundant. The chosen parameter to replace velocity was phase thus the new method to be used in Experimental Miniature 4 is comprised of the parameters: frequency, amplitude, phase, and duration. The implication of motion enables duration as the fourth parameter.

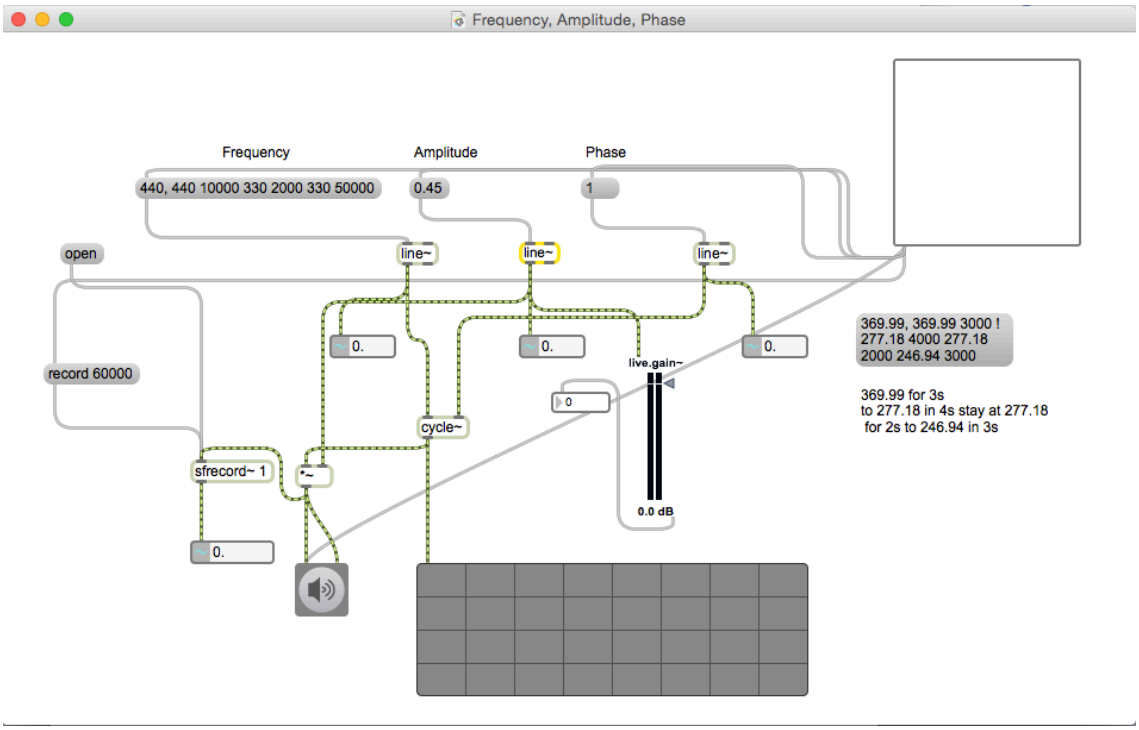


Figure B. Max patch -
Frequency, Amplitude, Phase

Further to the differences outlined above, the method for realisation of *Experimental Miniature 3 - Motion* required the development of techniques to reflect motion. The method used maintains the principles established within previous compositional miniatures yet required the automation of parameter changes for each RP throughout the duration of individual notes when in motion. The method to achieve this considers corporeal spatial occupancy that is moving within duration, in relation to states wherein it is motionless. RP change during motion are subject to linear change through automation, for example: RP1 of Cuboid2 (x1, y1, z1) begins with a 3 second period at State1 (x3, y4, z0); it moves through RP at a linear rate between State1 and State2 (x-

2, y4, z0) over a period of 4 seconds; it remains at State2 for 2 seconds; it moves through RP at a linear rate between State2 and State3 (x-4, y-1, z4) over a period of 3 seconds; it remains at State3 for 3 seconds.

There is further difference in the method for *Experimental Miniature 3 - Motion* than in previous miniatures. Triangulation and the subsequent amalgamation of parameters to axes are absent from the method. The absence of these objectives from the method is due to the reflection that triangulated and amalgamated parameters convolute the auditory realisation of corporeal spatial occupancy to the extent that the audio arguably misrepresents the corporeal spatial occupancy. Furthermore, the allocation of parameters to axes is arbitrary therefore triangulating parameter allocation misplaces import upon the representation of each possible realisation of corporeal spatial occupancy. One realisation suffices.

Experimental Miniature 3 - Motion

1. Draft schematic design of physical corporeal spatial occupancy.
2. Finalise physical corporeal spatial occupancy design as three-dimensional model upon an xyz axis.
3. Animate motion of corporeal spatial occupancy.
4. Assign one sound parameter (frequency, phase, amplitude) to each of the axis.
5. Enter RP into Parameter/ Axis Chart for corporeal spatial occupancy that remains static throughout the duration.
6. Enter RP into Motion Parameter/ Axis Chart for corporeal spatial occupancy that is in motion for any period within the duration[19].
7. Scale quantification of sound parameters to each axis wherein the centre RP corresponds to middle quantification of parameter with further quantification of sound parameters distributed incrementally on a linear scale to the negative and positive value of one (-1, +1) relevant to each parameter to each negative and positive RP.

[19] CD2 - Appendices and Figures: Appendix 4.7 Motion Parameter/ Axis Chart.

8. Read each axis individually from lowest to highest numerical point (from left-to-right, near-to-far, bottom-to-top) and complete both charts.
9. Bounce each realised sound audio datum of specific frequency, phase, amplitude, and duration using Max 6.
10. Amalgamate realised music audio data as one music realisation.

Summary

The process of the composition and realisation of *Experimental Miniature 3 - Motion* has enabled the development of new perspectives on the philosophical implications of the auditory realisation of corporeal spatial occupancy. These perspectives and their theoretical and philosophical implications have enabled reflection from which to garner a greater understanding of the significance of temporality and change within my research.

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