

Evolving Sounds

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Abstract

This work concerns the role of musical time and space in relation to the body of compositions that form part of this research. Although these two areas are immense, they are nonetheless unavoidable in music composition.

The physics of the last one hundred years confirms, the movement of time is relative. This is no less the case in music. There is clock time which marks the passage of our existence but there is also another time that is both complex and liberating. The latter time can seem to be stretched or compressed or completely static. These are the parameters that can be experimented upon in music composition.

The contents of successive slices of time are also fruitful areas for experimentation. Space can be filled so that it seems dense and massive. Alternatively, it may be filled very delicately so that it is almost transparent. When sounds become thin enough, they give way to silence.

The compositions that make up this research explore various aspects of time and space as outlined above. For example, in “Suspiramus”, the silences, marked by fermatas of varying length, have the same status as the audible sound. Just as with breathing, in this composition, the silent rested part is as important as the noisy in-out movement.

The research presented here explores the connection between the static work of art, visible in an instant and music which unfolds over time. It looks at the influence a number of art works have had on the composition of these pieces. For example, the role of dynamism in painting and its influence on the buzzing snare drum rolls on which *Mjöllnir* is built.

As the representation of time and space in compositions becomes more complex and problematic, issues around the notation of these are examined.

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Introduction

*There is no such thing as an empty space or an empty time.*¹

The title *Evolving Sounds* is used as a description of the compositions and theoretical approach taken in this research. It points towards two fundamental and, for the composer, unavoidable aspects of music. These are the basic facts that musical time progresses and that something is happening during that time. Cage's quote above leaves us with very broad possibilities as to what will happen and exactly when it will happen during the progress of musical time.

Underlying this progression of musical time, providing a theoretical backdrop, the research looks at two parameters, time and space. Clearly, these are immense and complex concepts but in the context of music composition they are unavoidable. The pieces presented here are not intended to be realizations of some space-time effects. Therefore, with these pieces, no particular psychoacoustic effect on the listener is sought. They are, rather, experiments into the possibility of using spatial or temporal phenomena or visual art as strong guiding principles in their creation and the process of composition itself is built on aspects of space and time.

Evolving Sounds draws attention to the body of compositions that lies at the centre of this work as essentially 'sounds' that are realized as music. Across the ten compositions that are the focus of this work, various aspects of evolving sounds are explored. As sounds occupying space, this music is made of a range of densities and textures. These range from relatively dense (*Mjöllnir*, *Ymir* and *Salve Regina*) to great sparseness (*Suspiramus*, "Hier Wohnte" and *Poltergeist*). In some compositions, the texture is relatively uniform throughout ("After the Rain" and *Abbandonati*), while in others there is a mix of the two extremes (*Propellers* and *L'Infini Vivant*).

The aims of this research have been tackled through the use of small ensembles. While the size and makeup of these ensembles is, to some extent a matter of practicality, composing for these ensembles also puts an emphasis on the writing for and the notation of very specific instruments and techniques.

¹ (Cage 1973) 8.

The compositions that make up this research, along with their instrumentation, is shown in Figure 1 below.²

Abbandonati - Solo marimba
Mjöllnir - Snare Drum Duet
*Poltergeist*³ - Cello, Soprano
*L'Infini Vivant*⁴ - Soprano, Timpani, Strings
Salve Regina - Female Choir
Propellers - Flute, Bass Clarinet, Accordion, Violin, Cello
*Ymir*⁵ - Bowed metal percussion, recorded water drops on metal
*String Quartet 1*⁶
I – “After the Rain”
II – “Suspiramus”
III – “Hier Wohnte”

Figure 1 Compositions that make up this research

In broad terms, in this research, the ensemble types are utilized to explore the following areas:

Vocal music – fragments and collage
Percussion – densities and dynamism
String Quartet – the progress of time

With the focus on sound, notions of key, pitch centre or even pitch at all, become less important. In this context, the density of a chord or a cluster is of much greater importance than its pitch material. One of the characteristics of the densities achieved in these compositions is the non-primacy of pitched material or any resultant established harmony. Free from this conventional parameter, the music can reside somewhere along a spectrum. At one extreme there is silence, effectively the thinnest of textures. Silence, therefore, is an

² The website www.evolvingsounds.com has audio examples of the compositions presented here.

³ Winner of the DAAD/Embassy of Germany in Ireland Creative Arts Prize, 2014.

⁴ Winner of the Francois de Roubaix Composition Award, Marseilles, 2014.

⁵ Commissioned by TCD/Discover Research Dublin, 2014.

⁶ The pieces that make up *String Quartet 1* could not be considered as ‘movements’ in any conventional sense. They are rather, pieces that are linked in terms of technique, colour and treatment of musical time.

important feature of a number of the compositions presented here and also an important aspect of the discussion of how musical space is filled. At the other extreme is the accumulation of texture to the point of creating noise. This is an important aspect of the composition *Ymir*.⁷

The research presented here then, follows in a tradition of late twentieth composition.⁸ In his 1958 essay, *The Composer as Specialist*, Milton Babbitt outlines developments in new music that differentiate it from what went before. Among these, he mentions the characteristics of the basic building blocks of music:

Along with this increase of meaningful pitch materials, the number of functions associated with each component of the musical event also has been multiplied. In the simplest possible terms, each such “atomic” event is located in a five-dimensional musical space determined by pitch class, register, dynamic, duration, and timbre. These five components not only together define the single event, but, in the course of a work, the successive values of each component create an individually coherent structure, frequently in parallel with the corresponding structures created by each of the other components.⁹

With regard to his own compositional development, Ligeti refers to the repurposing of conventional material, ‘Pitches and intervals now had a purely global function as aspects of compass and note density’.¹⁰ In the compositions presented here, an emphasis is placed on such alternative uses of this material in, for example, the creation of stasis, echoes, pulsing, cycling, blurring and densities.

These aspects of music are explored in the chapters below. The following is an overview of the chapters in this research:

Chapter One looks at musical time. It examines the importance of duration as a means of musical measurement. It also looks at stasis, when time appears unmoving or inactive and also

⁷ Musical density is explored in Chapter Two with reference to Xenakis, Cage and Stockhausen.

⁸ Throughout this research there is a particular emphasis on the writings of twentieth-century composers in particular. Though some of these date from the 1950s, 1960s and 1970s, times when genuinely new sound worlds were being created, these works are insightful and important in the context of the research presented here.

⁹ (Babbitt 2003) 49, Babbitt’s punctuation.

¹⁰ (Ligeti et al. 1983) 128.

looks at dynamism, where time is packed with activity. The role of drones and echoes are explored as sound events that play with the notion of duration. Finally, sounds fragmented across time, especially those produced by the voice are explored.

Chapter Two looks at space, how space is occupied in general and in music. A feature of this chapter is the idea that space is filled with waves and that these act as carriers for musical information such as timbre and pulse. This chapter also looks at how musical space is occupied with, for example, noise, silence and timbres.

Chapter Three is concerned with the influences that lie behind these compositions. As the subject matter of this research is time and space, a strong connection is drawn between the temporality of music and the spatiality of visual art. The effect of particular examples of visual art on the structure of some of the compositions presented here is examined. Similarly, the relationship between the mood or tone of an artwork and a composition is explored.¹¹

Chapter Four deals with how the various aspects of the compositions are realized through notation. As the pieces present novel approaches to time and space, there is a requirement for unconventional and original methods of notation.

As mentioned above, the pieces that make up this research are concerned with the use of space and time in music composition. This is however just the starting point of writing and the compositions are, ultimately products of the imagination. The ideas presented here about evolving sound help at the pre-compositional phase and in the realization of scores. The concept of evolving sound continues through the playing events (workshop – rehearsal - performance) and on to the revisions of scores. These stages, rather than being endings in themselves are part of the process, enabling the sounds and whole compositions to evolve into the completed works that make up this research. This iterative process, the shaping of material by the composer is expressed by Xenakis. Regarding the process of beginning his compositions with statistical material and then shaping material derived from a computer program, Xenakis reminds us that the composer will, ‘instill his own personality in the sonic results’.¹²

¹¹ In the case of the painting *Abbandonati* (1903), a pervading mood of gloom is depicted.

¹² (Xenakis 1992) 144.

1 Time

*Real musical time is only a place of exchange and coincidence between an infinite number of different times.*¹³

1.1 Introduction

Gerard Grisey concludes his 1987 essay, *Tempus ex Machina*, with the line given above. In doing so he accepts that time has become something altogether different from what it had traditionally been for centuries in Western music. Time acts in units and groups, it can exist somewhere between ordered and disordered and most importantly, the perception of time in music is a function of the sounds from which that music is made.

The definition of time has always been a thorny subject as the view of St. Augustine attests: ‘if no one asks me I know; but if someone asks me and I want to explain it, I do not know.’¹⁴ Much later Schopenhauer concludes, ‘Time in itself is empty and without properties’.¹⁵ Later still, Einstein discovers that the most essential quality of time is that it is not absolute. How time passes depends on other factors. Fundamental to this is Einstein’s conception of special relativity which tells us that, in absolute terms, the passage of time is relative to the perceiver of time. His classic example of this makes reference to the different perceptions of temporal events by a person on a moving train and another standing on a station platform watching the train pass by.

Einstein’s conclusion, that time has a looseness to it, is the starting point for the current research. It gives a license for the exploration of musical time through the creation of compositions.

The notion that musical time is not an absolute or that it can, at least, have two fundamental characteristics, has long been recognized. Two approaches to time are given by David Epstein, ‘Time has dual modes of structure. One is essentially clocklike, a measurement mode that mechanically delineates equal periods. The other mode relies upon experience for its demarcation – experience that is particular and unique’.¹⁶ Epstein continues:

¹³ (Grisey 1987) 274.

¹⁴ *Confessions* Book XI.

¹⁵ (Schopenhauer 1958) 51.

¹⁶ (Epstein 1995) 7.

Both modes run simultaneously, in some respects serving to reinforce one another, in other situations achieving dissonant opposition by being out of phase. Chronometric time, by its periodic nature, is structured by constant factors. Integral time is structured by elements intrinsic to its unique situation(s).¹⁷

In his *Poetics of Music in the Form of Six Lessons*, Stravinsky presents the thinking of Pierre Souvtchinsky who, like Epstein above, notes that there are two kinds of musical time, one running parallel to ontological time, the other running counter to it. Of this second, termed ‘psychological time’, Stravinsky writes, ‘It is not self-contained in each momentary tonal unit. It dislocates the centers of attraction and gravity and sets itself up in the unstable; and this fact makes it particularly adaptable to the translation of the composer’s emotive impulses’.¹⁸

With the psychological aspect of musical time dislocated from the ‘centres of attraction’, as Stravinsky terms it, or musical time uncoupled from clock time, Mark Delaere identifies what happens to rhythm when it is detached from metre. According to Delaere:

... the most radical innovation in the composition of time in twentieth-century music is arguable the use of (non-metric) ABSOLUTE RHYTHM. To imagine rhythmic structures independently from metre is to deviate considerably from common practice in the composition of Western art music. With absolute rhythm, durations do not result from the division of a metrical pattern or beat but are used as values *per se*.¹⁹

The identification of time units that exist *per se* or that are intrinsic to their unique situations as Epstein terms it, is extremely important. It raises this question: if units of musical time are detached from clock time, what are these units of musical time? Sethares goes some way in identifying these units. He suggests that a rhythmic passage can be interpreted as 1) a sequence of events or 2) a sequence of durations.²⁰ The second of these, the notion of duration as a discrete element in musical time and musical composition, was later championed by John Cage (see section 1.2 below).

The first of these interpretations, time as a sequence of events, had previously been explored

¹⁷ (Epstein 1995) 10.

¹⁸ (Stravinsky, Knodel, and Dahl 1970) 31.

¹⁹ (Delaere 2009) 25, Delaere’s capitalization.

²⁰ (Sethares 2007).

by Messiaen in his “Little Theory of my Rhythmic Language” in the introduction to his score for *Quartour pour la fin du temps*. There, Messiaen proposes his alternative to conventional rhythmic measurement, ‘the notions of ‘bar’ and ‘time’ are replaced by the idea of a short value (the semiquaver, for example) and of free multiplications; ...’.²¹

Messiaen’s ‘free multiplications’, without the use of bars, became a mainstream approach for many composers subsequently. Here Ligeti explains his own relationship with barred music:

...I had to get away from the idea of seeing music divided by bars altogether. Of course, I went on using bar-lines and conventional musical notation in most of my compositions; in the actual music, however, bar-lines had no other function for me than as points of reference, to keep the four string players of a quartet for instance from drifting away from one another. My music is a continuous flow, unbroken by bars, like a Gregorian melody.²²

Delaere refers to ‘multidimensional time and non-linear time.’ He describes these as, ‘the superposition of several time layers, each moving at its own speed and more or less directionless’. He cites Ives’ *The Unanswered Question* as a good example of this with its layers of textures, pitch collections and novel timings. Referring to Ives, Delaere’s explains the idea of multidimensional time:

In the case of Charles Ives, the superposition of time layers is usually motivated by programmatic ideas in general and childhood memories in particular. Past and present are combined simultaneously in a ‘stream of consciousness’, which makes Ives’ music arguably the musical counterpart of Marcel Proust’s *A la recherche du temps perdu*.²³

This quality of stream of consciousness is a feature of the three pieces in this research that make up my *String Quartet 1* presented in this research. In “After the Rain”, for example, there is no demarcation of time, no rhythm, events just seem to appear. “Hier Wohnte” is made from pulses of echoes that form their own ‘rhythm’. These pieces, therefore, are built from spans of time rather than points in time. In these pieces, time is a function of the specific musical events internal to the pieces and not reliant on any external source of time.

²¹ (Messiaen 1941) ii.

²² (Ligeti et al. 1983) 14.

²³ (Delaere 2009) 28. Presumably here Delaere is drawing a comparison based on stream of consciousness.

Spans of time are of interest not in terms of what happens temporally within them, how long they are or what rhythm they have, but also in terms of how they accumulate or dissipate (see 2.4 below), what timbre develops within them (see 2.5 below) or how they interact with each other (see 2.2 below).

Kramer defines meter as the ‘patterned succession of accented timepoints’. However, in his explanation below he reveals an interesting and pertinent view of musical time:

Just as there is an infinite number of points between any two points in geometric space, so there is an infinite number of timepoints between any two successive timepoints in music, no matter how closely together they occur. Not all these intervening timepoints are important, however. Meter singles out certain timepoints from the infinite succession and marks them for musical significance. It is because of the constant flow of timepoints of varying degrees of accentuation that we can feel meter as motion.²⁴

So, underlying meter (the demarcation of time) is a flow of timepoints that manifests itself as motion.²⁵ In his description of the flow of time, Kramer uses a variety of terms such as motion, continuity, progression, pacing, proportion, duration and tempo.²⁶

The notion of movement through time points is the essential area of study in Epstein’s book, *Shaping Time*. According to Epstein:

The essence of temporal experience is movement, or motion, through time. Motion may thus be the quintessential factor in music, the aspect of music to which all else is ultimately subservient, the aspect that in turn “moves” us in our affective experience with music.²⁷

From the comments of both Kramer and of Epstein, it seems that we do not perceive time, we perceive changes. Time, therefore, is a function of the changes between the slices that it

²⁴ (Kramer 1988) 83.

²⁵ Kramer’s time points are a rather ‘digital’ way of looking at time. Another, more ‘analogue’ approach is to look on musical time as waves. This is explored in 2.2 below.

²⁶ (Kramer 1988) 2.

²⁷ (Epstein 1995) 5.

contains. If there are no changes then we perceive time as standing still, just like a movie that has been paused on a single frame.

Messiaen deals with the concept of movement and non-movement and takes movement to be fundamental to the differences between 'Time' and 'Eternity'. While considering the thinking of Saint Thomas on the concepts of eternity and time, Messiaen arrives at an interesting definition of time. He looks at the absence of movement and concludes that without movement, there is no time. Without movement, there is permanence and that is the realm of eternity.

As eternity is the proper measure of permanent being, so time is the proper measure of movement; and hence, according as any being recedes from permanence of being, and is subject to change, it recedes from eternity, and is subject to time. Therefore, the being of things corruptible, because it is changeable, is not measured by eternity, but by time; for time measures not only things actually changed, but also things changeable; hence it not only measures movement but it also measures repose, which belongs to whatever is naturally movable, but is not actually in motion. This explains what stasis is.²⁸

In the compositions in this research, time sometimes passes rapidly (*Mjöllnir*). Sometimes slowly (*Abbandonati*, *Propellers*) and sometimes it is nearly static (*Salve Regina*, "After the Rain"). These pieces look at what happens to time when space is filled and dense (*Ymir*) or empty and spacious (*Suspiramus*, "Hier Wohnte").

The expansion of time from something instantaneous to something lasting many minutes is explored in two pieces. Just as *Propellers* is the unfurling of a single image (see 3.3 below), *Poltergeist* is the unfurling of a single word (see 1.4 below). With *Poltergeist*, a linguistic event that should last a moment is time stretched so that a single word occupies the space of several minutes. In effect, the music is structuring time.

Ultimately, musical time tends to be quantized or segmented. There are few instances in music where this does not happen. This segmentation happens all the more when music has to be notated, when the composer's intentions have to be encoded in some systematic way. The

²⁸ The classic example of stasis is La Monte Young *Composition 1960 Number 7* that consists of just two notes and the instruction "To be held for a long time".

pieces in the current research attempt to go some way along this path and this could be summed up by saying that what is encoded or notated is a sense of periodicity. There is a sensation of cycles, loose or strict. For this reason, a number of the pieces here relate to natural rhythms, cycles or pulses. These include *Mjöllnir*, *Salve Regina* and “Hier Wohnte”. To facilitate this the notation in these pieces tries to find ways to loosen the periodicity.²⁹

The sections below deal with aspects of the research pieces presented here. These include the idea of duration as an autonomous unit of music composition, pertinent to all the compositions in general but to *Suspiramus* in particular, Dynamism (*Propellers* and *Mjöllnir*), Stasis (“After the Rain”), Drones (*Abbandonati*), Echoes (“Hier Wohnte”), Fragments (*Poltergeist*, *L’Infini Vivant*, *Salve Regina*).

1.2 Duration

As shown above, durations of musical time consisting of passages of time (as opposed to collections of beats or segments of metre) became extremely important for composers and for none more than John Cage. For Cage, duration has the special property that silence, which he regarded as being on a par with other characteristics of music, could be incorporated within it.

Sound has four characteristics: pitch, timbre, loudness, and duration. The opposite and necessary coexistent of sound is silence. Of the four characteristics of sound, only duration involves both sound and silence. Therefore, a structure based on durations (rhythmic: phrase, time lengths) is correct (corresponds with the nature of the material). whereas harmonic structure is incorrect (derived from pitch, which has no being in silence).³⁰

In the following, Cage integrates three fundamental ideas of his music (silence, duration and form) into a single unified theory, “The strict division of parts, the structure, was a function of the duration aspect of sound, since, of all the aspects of sound including frequency, amplitude, and timbre, duration, alone, was also a characteristic of silence’.³¹ So for Cage, form is

²⁹ This would go beyond conventional aperiodicity such as *rubato*, *accelerando* or *ritardando* (Yeston 1975).

³⁰ (Cage 1973) 63.

³¹ (Cage 1973) 18-19.

duration. That definition allows for the creation of *4'33"*, for example, where the 'content' of the piece is that which occupies the duration of the piece.

According to Cage, 'Schools teach the making of structures by means of classical harmony. Outside school, however (e.g., Satie and Webern), a different and correct structural means reappears: one based on lengths of time'.³² Using different terminology, Stockhausen similarly recognizes the structural importance of duration or what he terms, *phases*:

Music consists of order-relationships in time; this presupposes that one has a conception of such time. We hear alterations in an acoustic field: silence – sound – silence, or sound – sound; and between the alterations we can distinguish time-intervals of varying magnitude. These time-intervals may be called *phases*.³³

The designation of musical time into durations or phases has an interesting side effect, one that concerns our perception of these quantities of time. Grisey explains as follows:

Let us imagine a sound event, *A*, followed by another event, *B*. Between *A* and *B* exists what one calls the density of the present, a density which is not a constant but which expands and contracts according to the event. In effect, if the difference between *A* and *B* is virtually nil, in other words if the sound *B* is entirely predictable, time seems to move at a certain speed. By contrast, if the sound *B* is radically different, and virtually unpredictable, time unfolds at a different speed.³⁴

The notion of time unfolding at different speeds is recognized as a psychoacoustic phenomenon of use in the composition of music, but flexibility of our perception of time is also of much broader significance and is of fundamental importance in the work of Albert Einstein. In his theory of Special Relativity, time and space are flexible depending on the location and movement of the perceiver. So, for example, at higher altitudes, time runs faster. and time runs slower the closer we are to very dense matter. This phenomenon is known as Time Dilation and seems to have parallels in music. Musicians follow the regular beat of the conductor, so for them 60 beats at 60 bpm takes one minute. For a member of the audience that duration may seem shorter or longer due to any number of influences.

³² (Cage 1973) 63.

³³ (Stockhausen 1959) 10.

³⁴ (Grisey 1987) 258.

On this question of the perception of time and the perception of stasis, Zakay and Block look at how time is estimated based on what is perceived in the moment and what is remembered.

Because cognitive variables (e.g., the attentional demands of a task) greatly influence estimates of short durations, many theorists have proposed cognitive models of psychological time. Psychological time depends on complex interactions among the conditions under which a duration is experienced and the context in which the estimate is given. (Block, 1989). One important factor is the time estimation paradigm. The differences between prospective and retrospective time estimations are now becoming clear. Under prospective conditions, participants focus their attention on time during a target duration and accumulate relevant temporal cues. Under retrospective conditions, however, participants primarily construct a duration judgement from information stored in memory representing the number of contextual changes that occurred during an interval.³⁵

Messiaen recognizes the effect of time dilation in the most mundane of situations, 'If we address the present, it is evident that waiting and inaction create a void which slows the passage of time. On the contrary, joy, work, and all that occupies us and captivates our attention speeds the passage of time.'³⁶ To extend this to musical time, the implication is that what time is filled with determines how that time is perceived.

Returning to Grisey on this same point, he presents a useful analogy for how time can appear to contract or expand corresponding to the compression and rarefaction of air.

'There must exist holes in time, analogous to what aeroplane passengers call "air pockets". Chronometric time is never obliterated but our perception of it can overshadow the linear aspect for a more or less brief instant.

Thus, for example, an unexpected acoustic jolt causes us to skate over a portion of time. Sounds perceived during the ensuing moment of readjustment - a moment which is necessary for us to regain a relative equilibrium - no longer have anything like the same emotional or temporal value. This jolt which disturbs the linear unfolding of time and

³⁵ (Zakay and Block 1997) 13.

³⁶ (Baggech 1998) 19.

which leaves a violent impression in our memories, makes us less likely to grasp the shape of the musical discourse. *Time has contracted*.³⁷

On the other hand, a series of extremely predictable sound events gives us ample allowance for perception. The slightest event acquires an importance. Here, *time has expanded*. It is moreover this sort of predictability - this expansion of time - which we need to perceive the *microphonic* structure of sound. Everything happens as if the effect of a zoom lens, which brings us closer to the internal structure of sounds, was only able to function by way of an opposite effect in relation to time.’³⁸

Finally, in this regard, Xenakis give license to the composer to take advantage of the plasticity of time:

When a composer writes music he uses time. That means that he has the possibility of creating time in his own way. In some cases it goes very slowly, and in other cases it is very complex, and time can be full of ‘things’, multiple layers, for example. Music is something you can repeat, but time is irreversible.³⁹

From this, we can see that time can be manipulated and that the composer can mold time’s malleability.

In the compositions presented here, *String Quartet 1* offers an exploration of the use of durations, how they are used structurally during composition and how they are ultimately perceived by the listener. In each of the 3 sections of the piece, a different aspect of duration is explored. The importance of durations, or phases, as structural units is most clearly demonstrated in this research with the use of ‘cells’ in “Hier Wohnte” from *String Quartet 1*. In this piece, each cell is an independent entity with a duration determined by its contents (see Figure 2). The structure of the piece as a whole is, therefore, determined by the interweaving of cells.

Within each cell, the sound material remains the same; the essential content of each is an echo that persists for some duration, dissipates and ends. The score makes use of ‘cut’ notation to

³⁷ Grisey’s punctuation.

³⁸ (Grisey 1987) 258-59.

³⁹ (Beyer and Christensen 2000) 297.

emphasize the distinctions between the cell material. So, clearly, on the surface perceptual level, there is progression. In this sense this piece differs from the featureless surfaces of the pieces mentioned above. However, there are two aspects which cause stasis. Firstly, the cells are echoes and these echoes suggest a sense of place, a fixed place where the echo reflections occur and where the reflections ultimately decay. Secondly, we intuitively know that an echo refers back to a single event that has already taken place in the past and that is no more. In contrast, if the initial event was recurring we would not have decaying echoes, but rather a pulse. Also, if the initial sound was not discrete but was instead continuous, we would have a drone.

Still focusing on the context of durations, that is, sustained notes rather than repeated echoes, “After the Rain” is built of layers of held string harmonics (see Figure 3). In this composition there is no metre or sense of pulse. Durations are at the discretion of the players, within the global expression indication of ‘slowly’. The harmonics are held until the sound has become established and the player is ready to move on. As with each section of *String Quartet 1*, in “After the Rain”, all the musicians play from the score and, therefore, a good degree of communication is needed to coordinate the sequencing of the changes.

The image displays three systems of musical notation for the piece "Hier Wohnte". Each system includes staves for Violin I (Vn. I), Violin II (Vn. II), Viola (Vla.), and Violoncello (Vc.).

- System 1 (Measure 3):** Vn. I has a whole note chord marked *mf*... Vn. II has a whole note chord marked *pp*. Vla. and Vc. have eighth-note patterns marked *mf*... and *pp* respectively.
- System 2 (Measure 49):** Vn. I has a whole note chord marked *pp*. Vn. II has a whole note chord marked *mf*... Vla. and Vc. have eighth-note patterns marked *pp* and *mf*... respectively.
- System 3 (Measure 59):** Vn. I has a whole note chord marked *mf*... Vn. II has a whole note chord marked *pp*. Vla. and Vc. have eighth-note patterns marked *mf*... and *pp* respectively.

Dynamic markings include *mf* (mezzo-forte), *pp* (pianissimo), and *mf*... (mezzo-forte, continuing). The notation includes various note values, rests, and slurs.

Figure 2 “Hier Wohnte” - cells

slowly

Violin 1

Violin 2

Viola

Violoncello

Figure 3 “After the Rain” - durations

The remaining section from *String Quartet 1* deals with musical duration, but from a different perspective – the perception of durations

“Suspiramus” plays with the idea of succession. Usually with two successive events, one moves into the past as the next moves into the present. The human breath does not simply move into the past; the past inhalation comes with the expectation of the exhalation. Depending on the durations between these events, there can even be an expectation of ‘when’ the next event will occur. This expectation of the next event is, effectively, rhythm. In “Suspiramus”, therefore, the focus is on when something will happen and what it is that will happen. The piece deals with the expectations of durations, how long a breath lasts and what occurs within the spaces of a breath. It is the most elemental of human rhythms.

Outside of conventional musical time, the basic units of time in “Suspiramus”, are ever-changing. So too are the musical events that take place within each ‘cell’ (see Figure 4). “Suspiramus” is concerned with the idea of durations and when repetitions occur. In the piece, the cells, as mentioned already, are of varying lengths. Also, it is never clear to the listener when the next cell will occur. The silences in the piece have the structural role of spacing out the musical sound. This raises the issue of what happens when that which we expect to occur does not occur? Will there be another event? Was the event just passed the last event? More broadly, what does it mean for the passage of time in a piece of music when we do not know the period of its pulse and we cannot rely on the pulses reoccurring regularly?

Spacious, breathing deeply

$\text{♩} = 60$

Violin 1

Violin 2

Viola

Cello

Figure 4 *Suspiramus* - 'cells' of varying duration

Suspiramus makes extensive use of the fermata. In the overall construction, fermatas add a structural unity. They punctuate the patters of in and out breaths. They also function to create expectation around the ending of the piece. There is nothing in the piece (in terms of harmonic progression at least) to suggest when it will end. So, the duration of the piece is not anticipated. The internal durations of the piece resolve to fermatas, but the duration of the whole piece resolves to a fermata of infinite length.

1.3 Stasis

As described above, time can be compressed or stretched so that our perception of duration can be manipulated and time will appear to run faster or slower. Somewhere in between we can have the perception that time does not move at all. Just like the perceptions mentioned earlier, stasis is something of an aural illusion. A characteristic of music that does not seem to move is that at some, probably very minute, level, it has a lot of movement.⁴⁰ On this effect, with regard to his *Continuum*, Ligeti says, ‘... it is like the wheel of a railway engine, which at high speed seems stationary’.⁴¹

In her discussion of Minimalist music, Sarah Davachi refers to what she terms the ‘spatiotemporal complex’:

This essentially ‘unreal’, yet lived temporal experience is typically created through the use of sustained or repeated sounds and patterns. These elements create a more multi-dimensional sense of phenomenal ‘space’ in music in that they extend the reduced sound or aural object over time. In so doing, the listener is, in a sense, positioned so as to approach the internal and oftentimes surreal ‘world’ of the sound.⁴²

The names commonly given to this type of music, such as mass, block or static cluster, reinforce the sense that the music creates a tangible and concrete, albeit surreal, world.

Drawing on his own compositional practice Morton Feldman arrives at an interesting connection between sound that ‘moves’ and sound that does not:

⁴⁰ For Pierre Schaeffer’s view on the role of discrete and continuous sounds see 2.4 below.

⁴¹ (Ligeti et al. 1983) 65.

⁴² (Davachi 2013) 5.

But I work very much like a painter, insofar as I'm watching the phenomena and I'm thickening and I'm thinning and I'm working in that way and just watching what it needs. I mean I have the skill to hear it. I don't know what the skill is to think it, I was never involved with the skills to think it. I'm the only one that works that way. But it's like Rothko, just a question of keeping that tension or that stasis. You find it in Matisse, the whole idea of stasis. That's the word. I'm involved in stasis. It's frozen, at the same time it's vibrating.⁴³

The period of which Feldman writes, the late 1950s and 1960s, saw the explosion of apparently unmoving music made from large sound masses. Notable composers in this regard are Ligeti, Penderecki and Xenakis. Ligeti talks of his 'static' period of composition:

I first began to think about a kind of static music you find in *Atmosphères* and *Apparitions* in 1950; music wholly enclosed within itself, free of tunes, in which there are separate parts but they are not discernable, music that would change through gradual transformation almost as if it changed its colour from the inside.⁴⁴

Speaking of these pieces, and also of *Lontano* and *Volumina*, Ligeti says they all have in common "a kind of musical aura". He explains, 'It is music that gives the impression that it could stream on continuously, as if it had no beginning and no end; what we hear is actually a section of something that has eternally begun and that will continue to sound forever'. This aura, sometimes referred to by Ligeti as a 'mist', has its origins at a minute level in what he calls 'micropolyphony'. So, at the macro level, the surface appears to be unmoving, within the piece however, there are large quantities of small gestures, bow movements, changes in pitch, etc.

It is evident that the amassing of sound material in space has a direct effect on the perception of time; density causes stasis. This is analogous to time dilation mentioned above, where Einstein describes how time slows down in the vicinity of large masses. It is this apparently simple connection that is the backdrop to the examples of stasis in the compositions presented here, particularly in *Salve Regina* for choir.

⁴³ (Feldman and Zimmermann 1985) 168.

⁴⁴ (Ligeti et al. 1983) 33.

The background to *Salve Regina* is presented in Chapter Three. The piece aims to achieve an atmosphere of unsettled, disembodied stillness.⁴⁵ This is done primarily through the use of voiced whispers that result from voicing the in and out breaths. The dynamic throughout is quiet and the sound is relentless. To achieve this the text is spread across all twelve singers so that at any one moment there will be at least six voices. This results in the creation of a block made of woven clusters of noise.⁴⁶ As can be seen in Figure 5, the manner of weaving the sounds is fundamentally canonic.

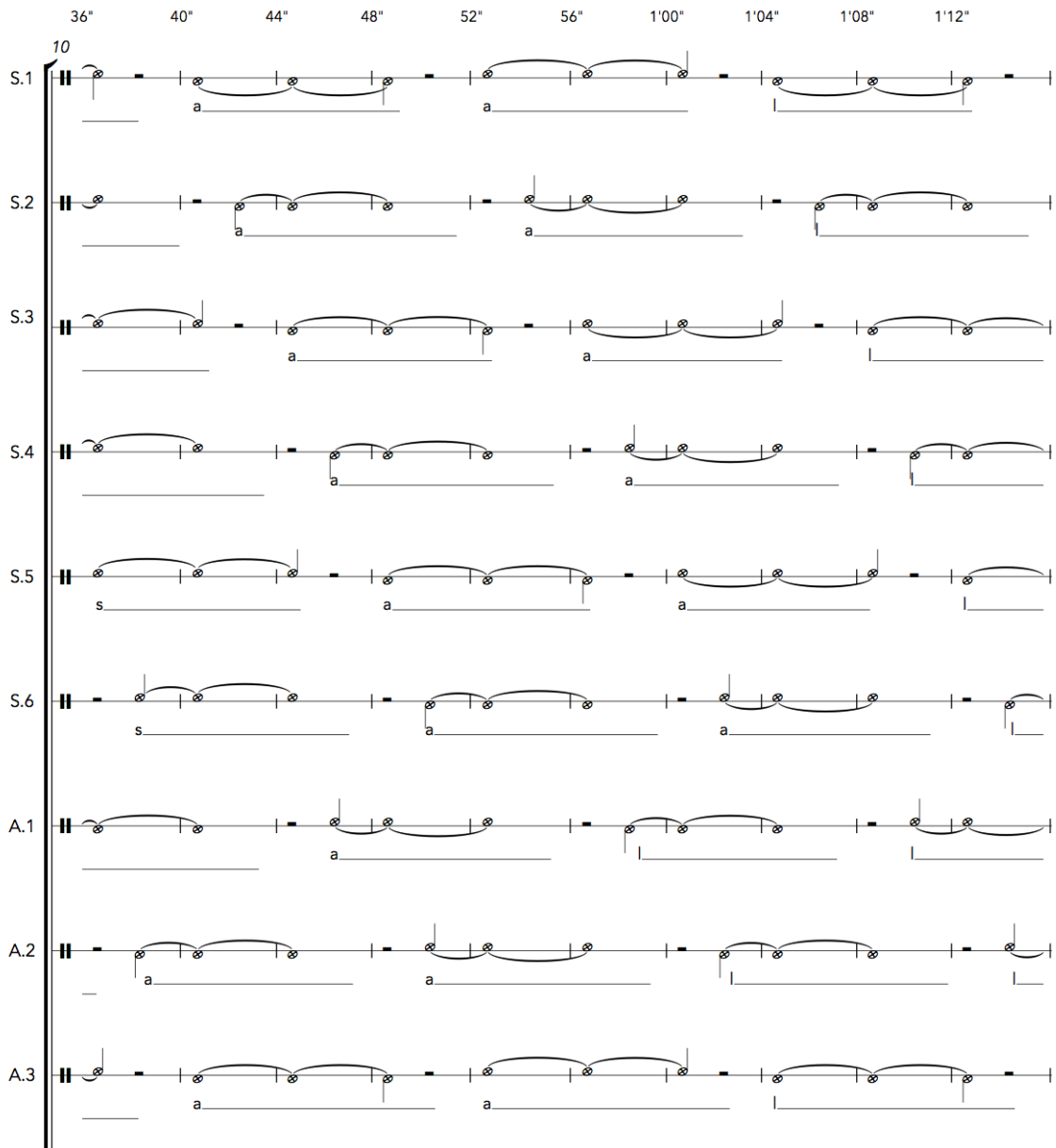


Figure 5 *Salve Regina* extract with first nine voices

⁴⁵ The visual source for this piece is given in Figure 28.

⁴⁶ On the use of noise in *Salve Regina* see 2.5 below.

The vocal lines are long and featureless so that there is as little surface movement as possible. The only perceptible changes are in the movements between sounds. Inevitably, in a vocal piece such as *Salve Regina*, it is necessary to have caesuras but the piece is constructed in such a way as to appear to have no gaps in the stasis and thereby achieving the aim of having as solid a cluster as possible. In contrast to voice, with strings, breaks in the flow of the piece do not have to arise and note changes can be hidden with suitable bowing. For example, the flow of sound in “After the Rain” is truly relentless as shown in Figure 6.

Figure 6 “After the Rain”

1.4 Echoes & Drones

As sounds, audible moment by moment, recede into the past we can experience what Grisey refers to as, ‘this permanent distortion of sound in our cognitive memory’. He suggests ways to overcome this forgetting:⁴⁷

1. Repetition of sounds
2. A jolting sound that leaves a trace
3. Sound that is so ‘flat’ and featureless that there are no features to forget.
4. The beginning and ending of a piece endure because of their locations.

The first of these is the fundamental technique of the string quartet, “Hier Wohnte”.⁴⁸ The piece explores the extra-musical sound phenomena known and innate to humans that are echoes. Naturally occurring echoes give us information about our environment. They tell us about the surfaces in our vicinity, how near or far they are, their density, their texture and how many of them there are. This is one sonic phenomenon with which we interact and readily interpret and from which we glean localization information.⁴⁹ In short, we can use echoes to know where we are in the world.

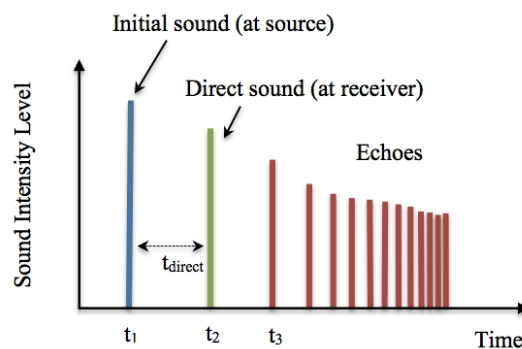


Figure 7 Development of an echo over time⁵⁰

⁴⁷ (Grisey 1987) 273.

⁴⁸ The paper, ‘Remembering One, Remembering All’, dealing with *Hier Wohnte*, was presented at the University of Limerick “Designing Commemoration: Performance, Process and Participation” in 2015 (See Appendix A below).

⁴⁹ Though echoes may carry information, the extent to which we use the information varies. Numerous studies have been carried out which study how and to what degree room echoes are used by subjects to determine their location (see, for example, (Kellogg 1962), (Plumbley 2013) and (Wallmeier, Geßele, and Wiegerebe 2013))

⁵⁰ (Forinash 2010).

According to Stockhausen, ‘When we have never heard a particular sound before, we don’t always know whether it is far or close. We have to have heard it several times before in the context of the music, in order to know how it sounds when closer and further away.’⁵¹

When we hear an echo, we are experiencing something that disappeared some time ago. In naturally occurring echoes, the timespan is short as sound waves generally dissipate their energy and become inaudible quite quickly. The idea of capturing this fading event and the notion that the past can be encoded as string notes through the use of echoes are explored in “Hier Wohnte”.

So, echoes encode, but in a very impermanent way. They are copies of an original event, but due to the effects of time and travel across space, they become inaudible. Echoes lose energy based on a number of factors. They are in effect, real-time evidence of a phenomenon that existed at some point in the past but does not exist anymore. This is analogous to the electromagnetic radiation waves that astronomers detect today and are echoes of bodies and events that ceased to exist long ago. Although these waves move quickly, they have travelled great distances and through time, their source may no longer exist.

“Hier Wohnte” is concerned with experiencing the traces of what has gone before, as if we can tune into a sequence of echoes that continue for some period of time (see Appendix A below). It is as if the echoes have always existed and we are able to perceive short bursts of them. They appear, interact, create complex patterns and they recede.

With regard to echoes and their use in “Hier Wohnte”, the thoughts of Xenakis on repetition and persistence are of interest:

And yet, each event, like each individual on earth, is unique. But this uniqueness is the equivalent of death which lies in wait at every step, at every moment. Now, the repetition of an event, its reproduction as faithfully as possible, corresponds to this struggle against disappearance, against nothingness. As if the entire universe fought desperately to hang on to existence, to being, by its own tireless renewal at every instant, at every death.⁵²

⁵¹ (Stockhausen and Maconie 1989) 106-7.

⁵² (Xenakis 1992) 267.

Echoes have implications for what we understand as duration, how long something lasts. With echoes, cycles repeat and fade and their duration becomes unclear. It is not clear when the process will come to an end. There is indeterminacy around where an event, one of a sequence, falls within in that sequence. Is it the last, will there be another? We do not know when the last conversation or meeting or kiss or when the last breath will be. “Hier Wohnte” therefore has implications for the notion of ‘ending’. When or how does a musical phrase end?⁵³ Essentially, when does the time span of something stop or at least when do we stop perceiving it? It is like sailing away from a shore that eventually becomes imperceptible to us.

As described above, the fundamental building block of the string quartet “Hier Wohnte”, is the echo. Every musical phrase or section is essentially based on the same model and that is the particular characteristic of the echo. This has a gradual reduction in sound level, a quickening of the rate of the reflections and a change in quality of the sound. The echo is always pointing to something that is in the past. Coveney and Highfield discuss the notion of looking backwards into the past and the possibility of reversing time:

Space surrounds us, yet time is experienced bit by bit. The distinction between right and left is trivial compared with that between past and future. We can shuffle around freely in space yet by our actions we can only affect the future, not the past. We have memory, not precognition (clairvoyants apart). Materials generally seem to decay rather than to assemble spontaneously. So it seems that although space has no preferred directional characteristics, time does. It travels like an arrow. The evocative term ‘the arrow of time’ was first coined by the astrophysicist Arthur Eddington in 1927.⁵⁴

Addressing the notion of time moving backwards, Xenakis mentions, ‘Indeed, much like a god, a composer may create the reversibility of the phenomena of masses, and apparently, invert Eddington’s “arrow of time”’.⁵⁵

⁵³ Within a tonal environment of tonality and cadences, endings are clearer.

⁵⁴ (Coveney and Highfield 1991) 24.

⁵⁵ (Xenakis 1992) 255.



Figure 8 “Hier Wohnte” Time being ‘reset’

In “Hier Wohnte” time is not reversed, but is continually being ‘reset’ to an earlier time.

Figure 8 shows how a single violin harmonic has the shape of an echo ‘mapped onto’ it. Each instance of the harmonic is identical, yet transformed with the meaning encoded in the echo. So, in this example, we hear what has gone before because we learn the pattern. In “Hier Wohnte”, this strategy is unchanging, we always learn the pattern, we always hear the past.⁵⁶

The other strategy for creating a sense of ‘holding’ the past is through the use of a drone. A drone is a sustained frequency, however achieved. In the case of a string, continuous bowing produces a drone effect. Natural resonances can also create a drone. These resonances could be in the environment, as in the case of Alvin Lucier’s *I Am Sitting In A Room*, or in an instrument as is the case of *Abbandonati* for solo marimba. By enhancing these resonances, the aspect of sustain, the typical dynamic envelope of a sound, made up of its attack, decay, sustain and release, can be disrupted and a drone is created. Writing in the context of drone vocal music, Howard and Angus give the following account of the essential characteristics.

The basic principle is that if individual harmonics are accentuated in amplitude sufficiently, that harmonic becomes a note in its own right; it “breaks away” from the holistic spectrum of its complex tone to be a sine wave that is heard as a second note.⁵⁷

⁵⁶ Details of the visual artwork that points to the past and is the motivation behind *Hier Wohnte* are given in section 3.4 below.

⁵⁷ (Howard and Angus 2017) 340.

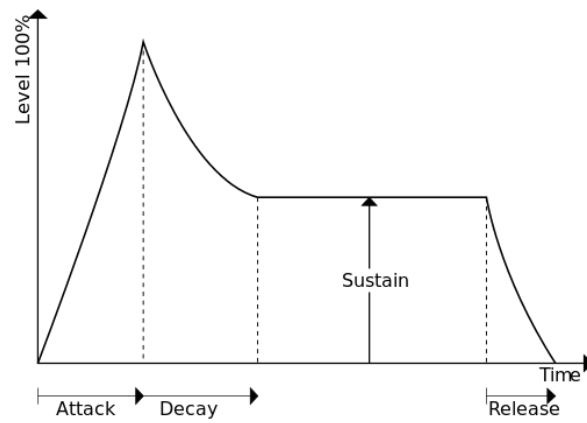


Figure 9 Typical form of ADSR

Alvin Lucier outlines the process whereby his composition creates a sustained droning effect, ‘... the space acts as a filter; it filters out all of the frequencies except the resonant ones. It has to do with the architecture, the physical dimensions and acoustic characteristics of the space.’⁵⁸ Again, with regard to Lucier’s discussion of room resonances, ‘So by playing sounds into a room over and over again, you reinforce some of them more and more each time and eliminate others. It’s a form of amplification by repetition’.

Typically, a drone is harmonically rich. This is evident from instruments such as the diggeridoo or the uilleann pipes which readily produce drone sounds. *Abbandonati* makes use of the drone sound that is to be found in the harmonically rich lowest bars of the five-octave marimba which ranges from C2 to C7. This is achieved through the use of a tremolo or ‘mandolin’ technique. The result of this is that the normal decay of the instrument is never allowed to occur. Instead, the short-lived, natural resonances of the bars are reinforced through the repetition of the tremolo and the result is a din overlaid on the piece.

⁵⁸ (Lucier and Simon 1980) 87.

Brian Keegan

Soft Mallets

L R

From & to silence
or as silent as possible.

All note durations are approximate, use rubato at will.

Ethereal, airy.

Instrumentation: Piano (P), Violin (V).

Tempo/Character: $J = 60$ (Quarter note).

Key Signature: One flat (B-flat major / D minor).

Time Signature: 4/4.

Dynamic Markings: *p* (piano), *f* (forte), *mf* (mezzo-forte), *mp* (mezzo-piano).

Articulation: Slurs, accents, and various bowing/playing techniques indicated by markings above and below notes.

Structure: The score is divided into two systems. The first system includes a piano introduction and a violin entry. The second system continues the musical development with complex interplay between the two instruments.

Figure 10 *Abandonati* extract

1.5 Fragments & Voices

In each of the three vocal pieces in this research, text is broken apart, stretched and manipulated to the point where it occupies a time line very different from that of its origins.

A considerable part of Hans Werner Henze's 1996 lecture, *Language, Music and Artistic Invention*, deals with his views on the meeting of poetry and music. He describes the relationship as 'adventurous' and that in their coming together, 'there are no rules and no principles'. While his take on the subject is itself somewhat poetic, he expresses a sentiment that is akin to the approach taken here to the use of text in *Salve Regina*, *Poltergeist* and *L'infini Vivant*. Henze explains:

... it can happen, as we have seen, that the music slowly consumes the text – its words and its syntax – as the praying mantis devours her mate, until nothing remains but disjointed syllables, vowels and consonants. The poet's words have turned into noise and resonance, the notes have seized complete control, the meaning of the verse has been transformed into pure sound.'⁵⁹

What are the results of using very fragmentary texts? What are the implications for meaning? Although fragmentation has been in use since the 1950s, there were still composers of note who followed a different path. Christian Wolff states, '... I really want the words to be understood. I don't want the voice all over the place; I don't want funny noises or any of that. I just want the text to be there'.⁶⁰ From Wolff's assertion that he wants words to be understood along with the evidence from his own music, it is clear that he is concerned with the semantic function of the words. Words, of course, can have meaning other than semantic meaning.

The main area explored in the vocal pieces presented here is the temporal elongation of the text. The origins of this technique, as it is used here, lie in a lecture by Stockhausen in which he discusses what he terms, 'Unified Time Structuring'. Stockhausen presents a scenario in which an entire Beethoven symphony is compressed in duration so that it occupies the time of

⁵⁹ (Henze 1996) 15.

⁶⁰ (Chase and Gresser 2004) 25.

a single second.⁶¹ He continues by speculating on the effects of going in the opposite direction and of elongating sound:

... if we were to take any given sound and stretch it out in time to such an extent that it lasted twenty minutes instead of one second, then what we have is a musical piece whose large-scale form in time is the expansion of the micro-acoustic time-structure of the original sound.⁶²

The movement between micro and macro levels that Stockhausen proposes, where the ‘sound DNA’ will remain during various time transformations is reminiscent of the quantum mechanics of Einstein that was mentioned above. In that, energy exists in small packets or quanta. These quanta share characteristics with entities that are vastly bigger. From this we have the manifestation of the physical world as well as the energy forces that keep that world together. In these vocal pieces, there is an attempt to get to the smallest possible elements and explore what can be done with them. In the case of light, the smallest packet would be the photon, in the case of speech, the smallest element is a phoneme.⁶³

Poltergeist, for soprano and cello, attempts to imagine what would happen if the word *Poltergeist*, with a spoken duration of about a second, was time stretched so that it occupied the space of more than six minutes.⁶⁴ For the purposes of this composition, the word *Poltergeist* is taken to mean something like, ‘noisy or clumsy ghost’. This semantic information, lost in the fragmentation of the word, is re-encoded into the piece as a whole through the particular sound world created with the solo cello and voice. The music evokes an eerie tenderness. There is at times a lost or sad quality to the voice while at other times there is an angry frustration. This is very fitting for a piece that is essentially a love song for a noisy ghost: *polter - geist*.

⁶¹ Stockhausen’s points are made in the context of creating electronic music. The time compression and expansion that he proposes would be achieved electronically, by slowing down and speeding up tape recordings. This approach is realised in his *Kontakte* (1958-60). In contrast to this, the ‘time stretching’ in *Poltergeist* is achieved by breaking the text, a single word, into its most elemental phonemes and using these as the basis for time expansion.

⁶² (Stockhausen and Maconie 1989) 47.

⁶³ Serious investigation by composers into the use of the smallest elements really began with the emergence of electronic music studios in the 1950s. The work of Berio, Cage, Maderna and Nono, working at the ‘Studio di Fonologia Musicale’ in Milan, is particularly noteworthy in this regard. See also Ligeti (1983) *Conversations* 37.

⁶⁴ See Appendix B for the concert material for *Poltergeist*.

The manner in which the text is divided up and sung is reminiscent of the Dadaist artists Raoul Hausmann and Kurt Schwitters. Schwitters' iconic Dadaist composition *Ursonate* has its origins in a poem by Hausmann entitled *fmsbw*. The *Ursonate* is a particularly good example of the classic features of sound poetry composition. In *Poltergeist* a number of these features are present which include: the combination of the sung (pitched) and the spoken (unpitched), repetition which goes to extreme lengths, the absence of meaning in individual phonetic pieces, the colouring of sounds though the shaping of the mouth and the presence of emotion expressed through material which does not have any inherent emotional content.

However, unlike the collage of Schwitters, which is an act of assembly, *Poltergeist* manipulates the fragments and duplicates them. The text is reduced to phonemes and these are used as the building blocks for the piece. Figure 11 shows the opening of the composition and the repetition of the opening /p/ sound.

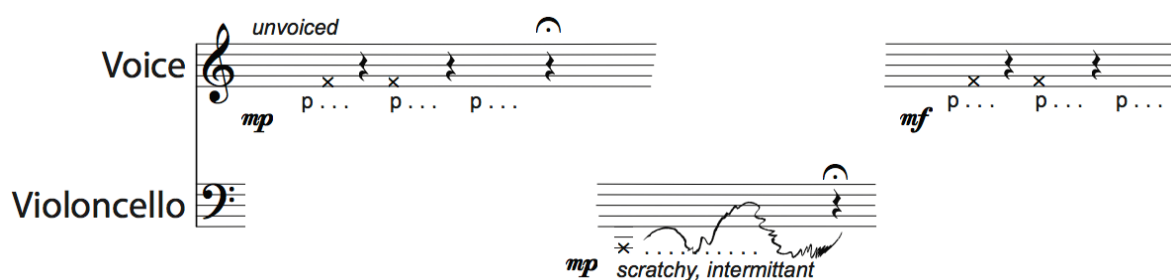


Figure 11 *Poltergeist* extract

Poltergeist is therefore an homage to the *lautpoesie* of these two artists which arose from a poetry reading where Schwitters first heard *fmsbw* read by Hausmann in Prague and also to the collage artwork of Schwitters and others working in Germany in the middle of the twentieth century.

The technique of text reduction to phoneme level is also used in *Salve Regina* for twelve female voices and also in *L'infini Vivant*. In each, however, this approach yields different results. In *Salve Regina* the semantic role of the words disappears and sound content alone is left. The text is stretched so much that the meaning is left behind and the text becomes non-representational and indistinct. As described above a dense sound/noise texture is created from the use interlocking of vocal sounds. In the case of *Salve Regina*, the elongation creates the effect of slowing down real time, so that we listen not to progression (temporal) but to colour/timbre (spatial). The degradation and repurposing of the well-known Latin text is

significant as the piece is a commemoration to those who have died without a voice or in degrading circumstances.

L'infini Vivant presents a wide range of textual distortion, from clear, exaggerated childlike clarity (see Figure 12 below), articulation, through to gross manipulation. Throughout the composition, the aim is to maintain the semantic integrity of the original text by Jules Verne. As the example in Fig. 12 shows, the fragmentation of the piece facilitates playful interchange with the other instruments in the ensemble.

1.6 Conclusion

The passage of time is relative. The physics of the last one hundred years confirms this. So too does the experience of composers who have grappled with temporalization of their compositional intentions. There exists a clock time which reliably ticks through our existence. Then there is the other, stretchy time that is as liberating as it is complex. One way to navigate the latter is to regard it as being comprised of durations. How long these durations are and what they are filled with are questions that the composer can answer. The compositions that form part of this research address them from a number of perspectives. In *Mjölnir*, buzzing snare drums compress packets of time as the percussionists play their rolls as fast as possible. In contrast, “Hier Wohnte”, with its lingering, decaying echoes stretches time and pulls the listener back into some distant past.

When time is neither being stretched nor compressed it may appear to be static. The surface of this music seems unmoving except, perhaps, for slow changes in timbre. Within, though, static music is made from the tiniest of materials in motion. *Salve Regina* is made from slithers of pitchless, noisy, breathy sounds layered on top of each other. On the outside, the piece transforms its way through a text drained of its semantic content. The droning stasis of *Abbandonati* harnesses the rich harmonics of the lowest marimba bars and casts a resonantly sombre mood across the piece.

The fragmentation of time into quanta allows for the accumulation of sounds temporally. This time stretching can facilitate sounds to fill durations that would be unthinkable otherwise. *Poltergeist* reduces the word ‘poltergeist’ to its smallest pieces and then puts them back together again. It takes a duration of just a moment and turns it into a love song to a noisy ghost that lasts for minutes.

The musical score is divided into two systems. The first system includes staves for Timp. 1, Timp. 2, and Vox. Timp. 1 and Timp. 2 parts feature glissando markings and dynamic changes (p, mp, f). The Vox part includes lyrics: les, s ε t, diz j ε m, dy, gjob. The second system continues the Timp. 1, Timp. 2, and Vox parts. Timp. 1 and Timp. 2 parts include a section marked with a double bar line and a repeat sign. The Vox part includes lyrics: t ε R ε STR. The score also includes a diagram of a speaker system with labels: 7, 8, 18", 8", 18", Detune, Timp & Cymbal, f, 2", Vla., 2", Db. 1, 2".

Figure 12 *L'Infini Vivant* extract

2 Space

2.1 Introduction

*...music is made with sounds, not just musical sounds.*⁶⁵

This research has been exploring evolving sounds with respect to time and space. The topic could be reduced simply to the questions, what happens and when does it happen?

Throughout the research, time and space have been presented as two complementary dimensions. Years before Einstein and special relativity, this connection had been made by Leibniz who, writing in the nineteenth century, gives this assessment:

As for my own opinion, I have said more than once that I hold space to be something purely relative, as time is; that I hold it to be an order of coexistences, as time is an order of successions. For space denotes, in terms of possibility, an order of things that exist at the same time, considered as existing together, without entering into their particular manners of existing.⁶⁶

If time is a sequence of things that exist simultaneously, like slices, what occupies these slices? The quote by John Cage that opens this chapter unlocks a wide spectrum of possibilities in answer to this question. This chapter looks at how the concept of musical space occurs in the compositions presented here and also looks at the background to this concept. In a tonal environment, space consists of harmonic material in a vertical axis. In the non-tonal world of the present research, space refers to the accumulation of sounds, resulting in densities, these thicken or thin or even thin to such an extent that the result is an absence of sound and result in silence.

A number of composers have recognized and made use of the idea that musical time exists as sequences of slices. Schoenberg states:

THE TWO-OR-MORE-DIMENSIONAL SPACE IN WHICH MUSICAL IDEAS ARE PRESENTED IS A UNIT. Though the elements of these ideas appear separate and independent to the eye and the ear, they reveal their true meaning only through

⁶⁵ (Kostelanetz 2003) 61.

⁶⁶ (Leibniz, Clarke, and Ariew 2000) 14.

their co-operation, even as no single word alone can express a thought without relation to other words. All that happens at any point of this musical space has more than a local effect. It functions not only in its own plane, but also in all other directions and planes, and is not without influence even at remote points.⁶⁷

The interdependency that Schoenberg refers to is also pointed out by Ligeti. Referring to his *Lontano* for orchestra he imagined, ‘... a vast space of sound in gradual transformation, not through dense chromaticism but through a constantly changing pattern of colour like a *moiré* fabric.’⁶⁸

The use of ‘colour’ vocabulary in describing the contents of musical space is commonplace. Zuckerkandl proposes that sound is like light and can be mixed like two colours (red and blue) can be mixed to produce a new colour (green). According to Zuckerkandl, ‘A new tone added to one already sounding draws no boundaries in space, occupies no location that belongs to it alone, does not drive the first tone away from anywhere, is not in a different place from the first; they are both in the same place ...’.⁶⁹

So, the content of time slices, that is, what they are filled with, gives rise to transformations over time. Ultimately, what fills musical space will give rise to musical form. The idea of space is important in that what occupies the space determines the form of the piece. According to Stockhausen:

As the word says, a musical “composition” means putting sounds together. You can put them together at any speed, density, or distribution in a given time and space field of the audibility range. You can produce a structure and relate it to any natural event. You could, for instance, distribute sounds the way the leaves on a tree are distributed.⁷⁰

This chapter looks at how the content of musical space is carried in the form of waves and goes on to investigate the contents of time slices.

⁶⁷ (Schoenberg, Stein, and Black 1975) 220. Schoenberg’s capitalization and punctuation.

⁶⁸ (Ligeti et al. 1983) 56.

⁶⁹ (Zuckerkandl and Trask 1972) 283-84.

⁷⁰ (Stockhausen and Cott 1974) 71.

2.2 Waves

Waves fill space. It turns out that our world is awash with waves. Even the force that sticks us to our planet results from the soup of gravitational waves in which the planet floats. So waves ‘carry’ so much of our elemental experience of the world; light, sound, gravity. This concept is taken into the present compositions, where *Propellers*, for example is built upon pulses and periodicity, “Hier Wohnte” is built from echoes and both “Suspiramus” and *Salve Regina* have the cycle of breathing at their starting point.

Levenson outlines the classical approach to this.

The planets moving through the heavens gave off sounds, “the music of the spheres,” which exemplified the perfect organization of nature on the largest scale. The original thought, as Aristotle records it, was that the great bodies of heaven could not move without making noise, but that later traditions created a musical cosmology. The regular motions of the planets suggested ratios of number, of intervals; the suggestion was enough to produce the image of celestial bodies ringing harmony throughout the universe. Such glorious music would yet be imperceptible – continuous, unbroken, it surrounded the listener from birth to death, with never a moment of true silence to act as its foil.⁷¹

In his essay, *Rests and Repetition in Music*, Christoph Peter gives an account of his subject across musical periods. Throughout his approach there is the notion that underlying musical rests and repetitions is an elemental force. In the following, he pulls together the various strands of his thinking into a unified approach:

The whole of nature pulsates with the most diverse rhythms. Every organism has its own rhythm. It is subject to the rhythmical influences from the environment and at the same time itself affects the rhythm of other organisms. The change from day to night, from summer to winter, ebb and flow, the regular fluctuation in air pressure, the winds, terrestrial magnetism, the breath, digestion and growth processes; these and all the other natural phenomena occur in certain rhythms. In the low point of the rhythmical

⁷¹ (Levenson 1995) 24.

curve, however, between relaxation and renewed tension, between exhaling and inhaling, between death and coming into being, a (more or less long) anti-climax, or point of rest is included, in which nature begins a new movement, developing renewed force. The rest, which we have studied in music, has a similar significance in nature.⁷²

Stockhausen, referring to music from Beethoven to the 1950s, gives the following assessment:

‘There is a unity underlying all the different events which occur. That is why, when we listen to this music, we shouldn’t become caught up too much with their differences, but try to sense and discover the underlying proportioning principle – the genetic principle – that gives birth to them all.’⁷³

In a similar light, Stravinsky states that, ‘All music being nothing but a succession of the impulses and repose, it is easy to see that the drawing together and separation of poles of attraction in a way determine the respiration of music’.⁷⁴ Though here, Stravinsky refers metaphorically to the respiration of music, *Suspiramus* deals directly with respiration as a structural element in composition.

On this subject, Grisey tells us, ‘What would bring us to a better definition of sound would be the knowledge of the energy which inhabits it and of the network of correlations which govern all its parameters.’⁷⁵ Grisey further says:

From now on it is impossible to think of sounds as defined objects which are mutually interchangeable. They strike me rather as force fields given direction in time. These *forces* - I purposely use this word and not the word *form* - are infinitely mobile and fluctuating; they are alive like cells, with a birth, life and death, and above all tend towards a continual transformation of their own energy. There exists no sound which is static, immobile, any more than the rock strata of mountains are immobile.⁷⁶

Cage presents a very holistic assessment of this relationship and makes reference to a unifying force:

⁷² (Peter and Stott 1992) 42.

⁷³ (Stockhausen and Maconie 1989) 42.

⁷⁴ (Stravinsky et al. 1970) 36.

⁷⁵ (Grisey 1987) 269.

⁷⁶ (Grisey 1987) 268.

The term "atonality" makes no sense. Schoenberg substitutes "pantonality," Lou Harrison (to my mind and experience the preferable term) "proto-tonality." This last term suggests what is actually the case: present even in a random multiplicity of tones (or, better, sounds [so as to include noises]), is a gravity, original and natural, "proto," to that particular situation.⁷⁷

These composers are recognizing, albeit using different language, a connection between the various phenomena of which they write. Here, that connection is taken to be wave forms. Accumulation of waves can result in varying densities (see 2.4 below) when the interference among the waves is constructive as in Figure 13 below. If the interference between the waves is destructive, sounds will be cancelled out and if cancelled completely, the result is silence as in Figure 14. The accumulation and cancellation of waves happen in nature where in one moment starlings, or fish or insects seem to form a dense cloud only to seem, in another moment, to disappear completely.

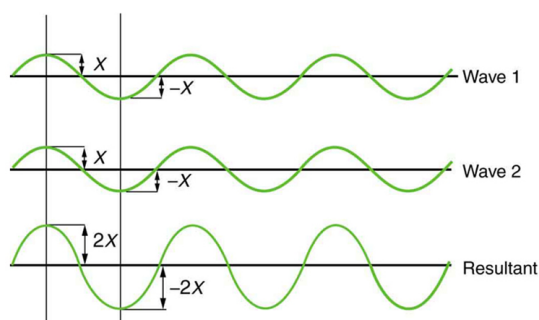


Figure 13 Constructive Interference

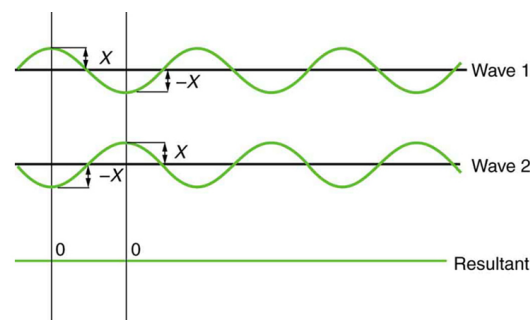


Figure 14 Cancellation

Waves therefore, are a means to accumulate and their presence or absence indicates thinness or thickness of timbre, density and pace.

⁷⁷ (Cage 1973) 63, Cage's punctuation.

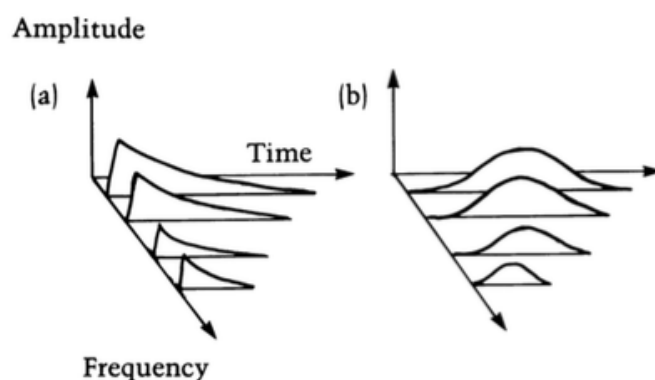


Figure 15 Waves evolving over time

Propellers for mixed ensemble has at its core the intersection of waves and has its origins in the movement of actual propellers as depicted in the painting by Mary Swanzy (see 3.3 below). Sounds reoccur as their wave-cycles disappear then re-emerge. Some sounds appear only for a moment only to disappear and not return. To carry this proposition further, if the piece were longer, these non-repeated waves may reappear, that is, if the piece was sufficiently long that it encompassed the period of the wave.

In *Suspiramus*, for string quartet, breathing, a most fundamental of biological cycles is the impetus behind the piece. During the piece, the duration of the wave phases varies. The context of the phases also changes and evolves. To this end, the piece explores the fragments of what happens between the phases.

Mjöllnir, for four snare drums, goes to the heart of periodicity and wave forms. It recognizes that although on the surface level there may be variations of periodicity, fundamentally, everything has its own mode of oscillation. Just as in nature, everything, including the rate that neurons in the brain fire, the passage of the moon, the transmission of gravitational waves, has its own rate at which it moves. In *Mjöllnir*, this idea is encapsulated into the drum rolls. Throughout the piece, rolls on the snare drums move at a variety of velocities and intensities. In the extract in Figure 16 they are notated as ‘buzz’ rolls played at the maximum speed for the percussionist.

Durations & tempi are approximate

$\text{♩} = 40$

x 2

Player A

snare 1

snare 2

Player B

snare 3

snare 4

2"

The musical score is written on four staves, each representing a snare drum. The first two staves are for Player A (snare 1 and snare 2), and the next two are for Player B (snare 3 and snare 4). Each staff begins with a double bar line and a key signature of one sharp (F#). The notation consists of eighth notes with a 'p' (piano) dynamic marking. A bracket above the first staff indicates the sequence is repeated twice (x 2). A 2-inch scale bar is shown to the right of the staves.

Figure 16 *Mjöllnir* extract

2.3 Form

As waves give ‘shape’ to individual sounds, they can also give overall shape to compositions. The smallest part can be a microcosm of the whole. On the difference between form and content, Varèse tells us, ‘There is no difference. Form and content are one. Take away form, and there is no content, and if there is no content, there is only a rearrangement of musical patterns, but no form’.⁷⁸

Busoni, writing in 1911 with reference to, “our lawgivers” or those who would prescribe what musical form should be, asks, ‘Is it not singular to demand of a composer originality in all things and to forbid it as regards form? No wonder that once he becomes original, he is accused of formlessness’.⁷⁹

On the same subject, Varèse gives the following assessment:

Each of my works discovers its own form. I could never have fitted them into any of the historical containers. If you want to fill a rigid box of a definite shape, you must have something to put into it that is the same shape and size or that is elastic or soft enough to be made to fit in. But if you try to force into it something of a different shape and harder substance, even if its volume and size are the same, it will break the box. My music cannot be made to fit into any of the traditional music boxes.⁸⁰

The idea that the form of a piece is directly proportional to the space it occupies is dealt with in Bernard, ‘...spatial models of musical structure are of particular interest in the study of form, since the idea of ‘form’ in music is essentially an abstraction from spatial configurations, from the proportions of objects extended in space’.⁸¹

In the case of vocal music, when it adheres to the text, the form of the piece wraps around the text. In the present research, the form of *L’Infini Vivant* is determined by its content. It is true that, as it is based on a text of fixed length, it may begin life with some semblance of form

⁷⁸ (Varèse and Wen-chung 1966) 17.

⁷⁹ (Busoni and Baker 1911) 7. Busoni’s original Italian work was translated into English in 1911.

⁸⁰ (Varèse and Wen-chung 1966) 16.

⁸¹ (Bernard 1987) 210.

derived from the text itself. In contrast, this is not necessarily the case as with *Poltergeist*, where one word, three syllables, fits into a space of more than 6 minutes. Therefore, the relationship between text and space is fluid.

So, with *L'Infini Vivant*, the sounds that fill the space and ultimately give it its form, are determined by a range of factors. At times the semantic content determines the sound content as in Figure 17 where the word *existence* is delivered with awe and reverence as the syllables are stretched over time.

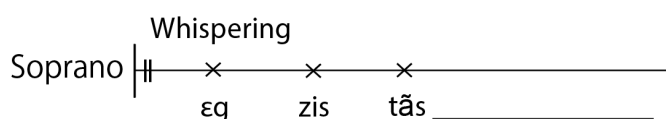


Figure 17 *L'Infini Vivant* 'existence'

At times, it is the phonetic content that determines how space is filled, as illustrated in Figure 18, where the singer glides between the phonemes that make up the words *je l'aime*.

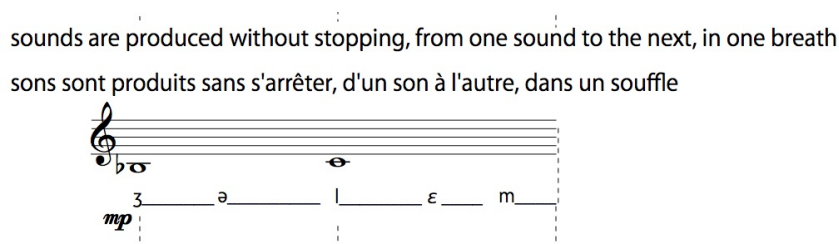


Figure 18 *L'Infini Vivant* 'Je l'aime'

At times, it is the attitude of the vocal delivery that determines how space is occupied. This is shown in Figure 12 where the words, *les sept dixièmes du globe* are delivered like a child showing great seriousness at discovering some new facts.

Following on from the earlier remarks on waves, Varèse explains how 'shapes' interconnect to create form:

There is an idea, the basis of an internal structure, expanded and split into different shapes and groups of sound constantly changing in shape, direction, and speed,

attracted and repulsed by various forces. The form of the work is the consequence of this interaction.⁸²

This idea is developed by Berry who uses ‘lines’ as analogous to the ‘shapes’ of Varèse, ‘Musical structure may be said to be the punctuated shaping of time and “space” into lines of growth decline and stasis hierarchically ordered’.⁸³

These relate to *Suspiramus* where the typography of the breath becomes the fabric underlying the piece. This is presented in Figure 19 below.



Figure 19 *Suspiramus* Wave of breathing in the end

2.4 Transparency & Density

The effect of the interaction of layers or levels etc., is to create space that is dense and filled with sound masses. Alternatively, it may result in space that is not filled with very much and creates transparency and perhaps, ultimately, silence.

In his description of his use of statistical methods in composition, Xenakis refers to density as it applies to crowds of people:

A crowd of 500,000 persons is assembled in a town square. If we examine the group

⁸² (Varèse and Wen-chung 1966) 16.

⁸³ (Berry 1976) 5 (Berry's italics).

displacement of this crowd we can prove that it does not budge. However, each individual moves his limbs, his head, his eyes, and displaces his center of gravity by a few centimeters in every direction. If the displacements of the centers of gravity were very large the crowd would break up with yells of terror because of the multiple collisions between individuals.⁸⁴

This point is echoed by Stockhausen who extensively explored concepts of grouping, both in his writings and in his compositions.⁸⁵

When we cannot count the individual notes in a group anymore, they surpass the group. ... Or there are too many events all happening at once, like a swarm of bees; when you perceive the swarm as a shape, it becomes a single entity. If we see a tree, we don't count the leaves, but are still able to tell a pine tree from a beech. It is an effect of the elements, but there is something else, the shape, the overall form, that characterizes the mass.⁸⁶

Alternatively, density may be looked at not in terms of thickness, but of thinness.⁸⁷ Structures can be delicate almost transparent or at times, non-existent (silence). This is the case with a thin fabric or some material that has been honed or polished so that it results in a translucence. This also reflects the composition process. In this there is a process of scraping away at the sound to reveal the essence or the essential. This puts a different perspective on the use of silence. Silence then becomes a gap where something was, or what is left after the removal of something, it could be the dissipation of what went before or perhaps the antecedent of what follows.

In this regard, I pose the following questions:

Exactly when this disappearance happens, we can't know. We are left with a sound so thin it seems there and not there at the same time. The reduction results in the thinning of sound so that it is a kind of musical homeopathy. When the sound undergoes rarefaction, what are we listening to? Does our brain or ear fill in the 'silence' for us? What musical trace is left in the musical instrument, in the air, in our physiology or in our imagination?⁸⁸

⁸⁴ (Xenakis 1992) 61.

⁸⁵ *Gruppen* and other group pieces.

⁸⁶ (Stockhausen and Maconie 1989) 43-44.

⁸⁷ For the view of Saariaho on thinness of texture and instrumentation see 2.5 below.

⁸⁸ (Keegan 2015) 16.

The sense of imperceptibility that is a characteristic of the continuum between massive and thin is given in Flann O'Brien's description of a needle in his novel, *The Third Policeman*.

“That is the real point”, said MacCruiskeen, “but it is so thin that it could go into your hand and out in the other extremity externally and you would not feel a bit of it and you would not see nothing and hear nothing. It is so thin that maybe it does not exist at all and you could spend half an hour trying to think about it and you could put no thought around it in the end.”⁸⁹

In the pieces presented here, the most extreme exploration of densities occurs in *Ymir* for bowed metal percussion and recorded water drops. At its thinnest, *Ymir* uses single bowed crotales and cymbals to create a brittle and unstable sound (see Figure 20 below). Although the crotales are tuned and are notated as such, each is awash with overtones. This results in single sounds that develop over time as partials emerge and disappear. Sounding two or more simultaneously creates more overtones that beat and interact with each other, again increasing the indeterminacy of pitch.



Figure 20 Maeve O'Hara performing *Ymir*

⁸⁹ (O'Brien 1996) 68-69.

The other part of the sound world of *Ymir* is made up of recordings of individual water drops falling onto percussion cymbals.



Figure 21 Water drops shatter on impact with a cymbal.⁹⁰

These drops are arranged into densities of varying degrees and constitute, in effect, a piece of *musique concrète*. The thinnest of drop densities come from single isolated drops. They are represented by the isolated circle notation in Figure 22 as the density of drops thickens, the characteristics of individual drops begin to disappear.⁹¹

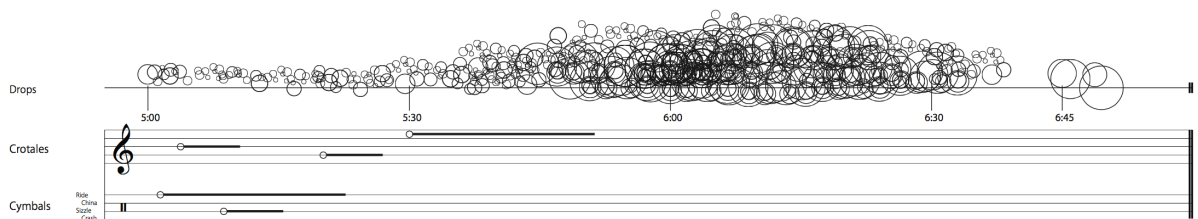


Figure 22 *Ymir*

The *concrète* part of *Ymir* is mixed with as wide a stereo stage as possible in order to allow some drops be discerned from the mass. Nonetheless, the accumulation of the discrete drop sounds continues and by about 6 minutes into the composition, there is a continuous din. This is

⁹⁰ Image: Brian Keegan.

⁹¹ For more on notation in *Ymir* see Chapter Four.

reminiscent of the crowd of people of Xenakis or the swarm of bees of Stockhausen mentioned above.

The use of *musique concrète* in this piece has its origins in Pierre Schaeffer and his idea of the sound object. He points to the relationship between a minimal entity, a sound object, and the result of repeating it, 'The repetition of a variety of different causes often produces the same sound effects as the sustained action of a single source; such objects will be referred to as *accumulations*'.⁹² For Schaeffer, the inevitable conclusion of this relationship is that truly sustained sound does not exist.

Sustainment is, after all, a succession of pulses. A slow-motion picture of the movement of a bow even proves that the purest friction, the steadiest of sustainments, is due to a succession of micro-pulses. Between *pulses* and *sustained sounds*, a third kind of execution comes in, called *iterative* execution. The most common example of this is a roll on a percussion instrument.⁹³

Such rolls are explored in *Mjöllnir*, as mentioned above and in *Abbandonati* as described in 1.4 above.

2.5 Silence, Noise, Colour

Musical textures thin to the level of transparency and even sustained sounds, according to Schaeffer, are actually made up of discrete instances of sound. It seems silence is never far from musical sound. Grisey describes the relationship between sound and space, 'This brings us back to "composing around space", rather like sculptors (cf. Henry Moore) whose hollows are not holes bored into the material, but forms in negative around which the volumes are articulated'.⁹⁴

⁹² (Schaeffer and Reibel 1998) 75.

⁹³ *Ibid.*

⁹⁴ (Grisey 1987) 258.



Figure 23 Henry Moore, *Reclining Connected Form* (1969).⁹⁵

Just as ‘empty’ space serves a functional purpose in the work of Moore (Figure 23) for Cage, more than most composers, silence has a similar role. According to Cage:

Since I had no feeling for harmony or tonality, I was in no position to define those parts by means of cadences. So, these empty spaces of time would be as hospitable to noise as musical sound, and they could be clarified by a variety of means, including silence.⁹⁶

Cage expresses the extent to which silence is part of his compositional practice:

What silence is is the change of my mind. It’s an acceptance of the sounds that exist rather than a desire to choose and impose one’s own music. That has been at the center of my work ever since then. I try when I make a new piece of music to make it in such a way that it doesn’t essentially disturb the silence which already exists.⁹⁷

In his analysis of Messiaen’s *Le Banquet Céleste*, Jan Christiaens notes:

⁹⁵ Image: Brian Keegan.

⁹⁶ (Kostelanetz 2003) 54.

⁹⁷ (Kostelanetz 2003) 244.

If silence were to be understood as total absence of sound, there would be no possibility whatever to evoke silence in music. But silence is not just absence of sound, or emptiness. Besides this evident psycho-acoustic definition, silence can also mean a certain quality in the mind of the listener, brought about by a specific acoustic atmosphere in the music. As such, silence stands for a definite kind of presence rather than absence.⁹⁸

Christiaens continues with reference to the music of Nono, Feldman and Pärt, ‘In this kind of music, silence is the starting point. It is the continuum surrounding the composition, the silent totality in which the sounding composition emerges as an island in a sea of silence’.⁹⁹

This is an interesting analogy, but there is another way that sees the music not concrete like an island, but fine, like gossamer. For an island without a clear coastline, what is island and what is water? There is also the boundary or non-boundary that is imperceptible where space occupied by sound becomes space occupied by silence.

Margulis (485) provides a concise definition of silence, ‘Acoustically, silences can be defined as periods during which the acoustic signal descends below some threshold of detectable volume.’¹⁰⁰ Significant here is the word ‘descend’. It implies a level of content, in this case noise or music, that reduces gradually. Clearly, silences can occur instantaneously, but it is the gradual reduction that is explored through the decay of echoes in “Hier Wohnte”, for example.

Musical stasis (examined in 1.3 above) also applies to periods of silence. Here too, in these periods of a complete absence of music, time appears to be frozen especially if there is no indication of when the musical activity will recommence. Also, if the period of silence persists, it becomes more difficult for the listener to be certain as to how much time has actually passed. In the string quartet “Suspiramus”, there are silences but these are of a length that implies they are the remains of what has gone, an out breath, or the anticipation of what is to come, the next in breath.

⁹⁸ (Christiaens 2007) 57.

⁹⁹ *Ibid.* 58.

¹⁰⁰ (Margulis 2007) 485.

So it is clear, when music is ‘filled’ with something the perception of its duration is variable. However, the perception of musical time passing is also variable when that music is apparently filled with nothing or is silent. This distinction is made by Margulis (2007), Kakajima (1987) and Zelliner (1994). According to Margulis:

The same acoustic silence, embedded in two different excerpts, can be perceived dramatically differently. Impressions of the music that preceded the silence seep into the gap, as do expectations about what may follow. These impressions and expectations can cause two identical acoustic silences to seem like they occupy different lengths of time, or carry different amounts of musical tension, or function differently in other ways.¹⁰¹

It is clear that silence exists as a musical entity and can have a functional role in the structure of music or can change the perception of musical time. In *Suspiramus*, for example, silence fulfils the roll of facilitating the breathing pulses of the strings and also sets up a sense of anticipation as the audible sound material is shaped around it. The use of the silent fermata is important in the piece in that it is a recurring structural element around which the audible sounds lie (see Figure 19).

Silence, then, is multifunctional and certainly multifaceted. According to Luigi Nono, ‘There are many kinds of silence and it is an amazing form of expression. I find silence full of voices, thoughts, full of listening’. The following list is from Nono’s *Fragmente–Stille, an Diotima* and gives a sense of the range of silences that Nono encodes in fermatas.

Each fermata should always sound different from the others, with free fancy

- of dreaming spaces
- of sudden ecstasies
- of unutterable thoughts
- of tranquil breaths

¹⁰¹ (Margulis 2007) 485.

– of silences “intemporally” sung¹⁰²

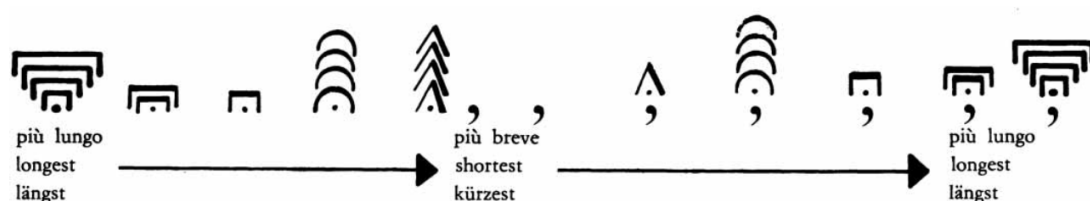


Figure 24 Luigi Nono *Fragments*

If silence is at one musical extreme, noise is at the other. Just as silence has its own qualities so too can noise be subjectively named as pink or white, depending on the frequency content. Just as there is a continuum between types of noise, there is also a related continuum between noise and pitched material. In a lecture from 1971, Stockhausen outlines his four criteria of electronic music. The fourth of these, “the equality of sound and noise”, is relevant to this discussion.¹⁰³ According to Stockhausen:

So the continuum between sound of fixed pitch and noise is nothing more than that between a more and a less stable periodicity: the noisiest noise being the most aperiodic. This discovery of a continuum between sound and noise, the fourth criterion of electronic music, was extremely important, because once such a continuum becomes available, you can control it, you can compose it, you can organize it...¹⁰⁴

Although Stockhausen’s criteria apply to the generation of electronic music, this fourth criterion has applications in music using conventional instruments, albeit using unconventional playing techniques.¹⁰⁵

The continuum that Stockhausen refers to is characterized by Kaija Saariaho as an axis:

In an abstract and atonal sense the sound/noise axis may be substituted for the notion of consonance/dissonance. A rough, noisy texture would thus be parallel to dissonance,

¹⁰² Translation by Nielinger-Valil. P. 257 From the Nono piece *Fragments*. (Nielinger-Vakil 2000)

¹⁰³ Reproduced in (Stockhausen and Maconie 1989).

¹⁰⁴ (Stockhausen and Maconie 1989) 93.

¹⁰⁵ On the role of waves and periodicity, see 2.2 above.

whilst a smooth, clear texture would correspond to consonance. It is true that noise in the purely physical sense is a form of dissonance pushed to the extreme.

She continues, giving some actual examples:

The "noise" in itself can actually manifest itself in different ways — soft, harsh etc. In a general way, the concept of "noise" signifies to me utterances such as breathing, the sound of a flute in a low register or a string instrument playing "sul ponticello." By contrast, a pure sound would be more akin to the ringing of a bell or a human voice singing in the Western tradition.¹⁰⁶

In *Ymir* sound evolves until the clarity of individual water drops form a dense noise. That the noise is made of discrete pieces is evident. The noisy passage in Figure 25 begins with a single drop event (circle-shaped notation) that has a discernable timbre. As these drops accumulate the piece moves between the two states that both Stockhausen and Saariaho refer to. As the score implies, as one accumulation becomes more dense, more noisy, the wedge shape of its crescendo fills the dynamic space, not just with increasing noise but also with loudness.¹⁰⁷

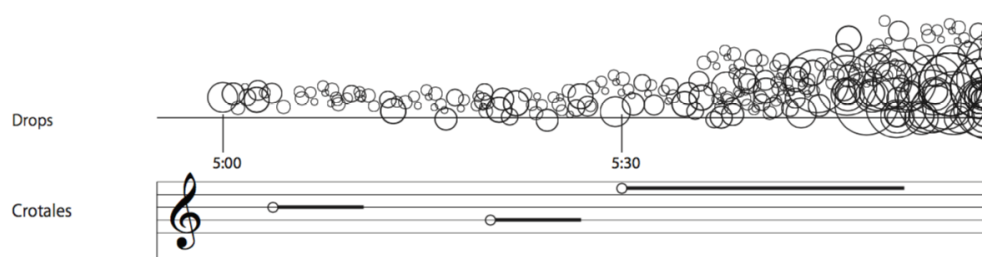


Figure 25 *Ymir* extract

As mentioned in 1.2 above, the space of “*Suspiramus*” alternates over time between sound and silence. Further, the sound alternates between pitched material and noise. To achieve the noise elements from a string quartet, the least ‘pitched’ parts of the instruments are played. Also, notes that are ordinarily pitched are, in this composition, dampened to an extreme degree. This is achieved by touching stopped strings between the point where it is stopped and the rest of the instrument. In this way, the balance between the pitch of a stopped note and the noise produced by a dampening can be controlled.

¹⁰⁶ (Saariaho 1987) 94.

¹⁰⁷ In contrast to this noise, *Suspiramus* increases in complexity, but not in loudness.

In “Suspiramus” there are what could be termed, ‘noise chords’ where the noise from all four string instruments is sounded at the same time. In Figure 26 the violins are producing a pitchless white noise from the bridge while the viola and cello are playing unpitched, muted double stops.

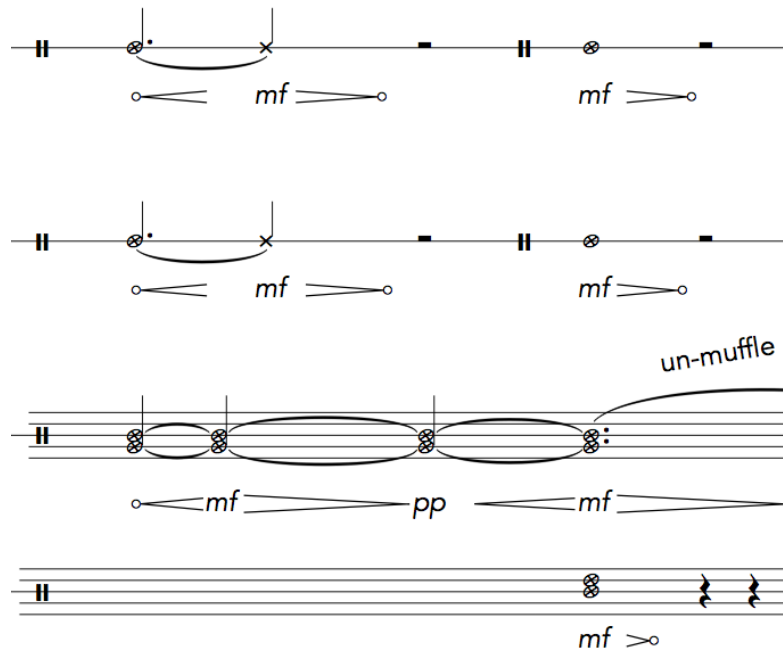


Figure 26 “Suspiramus” 'noise chord'

2.6 Conclusion

Time gives sequences and successions. Space gives us what is contained within them. Slices of successive space create the reality around us and the reality of music. How these slices proceed and what they contain are two areas with particular relevance to this research and its compositions.

It is proposed here that the ancient idea of the music of the spheres is indeed valid because there is underlying it a never-ending stream of waves. Contemporary physics has confirmed that our universe is awash with waves. Even gravity, thought to be a stalwart force that keeps us all on the planet is, in fact, the result of gravitational waves that penetrate the universe. Perhaps music is the manifestation of some very small segment of wave activity that exists already. *Propellers* makes use of this notion through its weaving of pulsing sounds. Some of these are slow and the pulse is imperceptible. Others are overtly jittery.

Space can be filled so that it is dense and massive. Or it can be filled very delicately so that it is almost transparent. At some point, when sounds become thin enough, sound gives way to silence. Even silence though can just be the replacement of one sound by another less audible. Silence comes before every composition and returns after each composition ends, so in a sense, sounds are shaped by silence. Within compositions, silence can have a structural role. In *Suspiramus*, the silences, marked by fermatas of varying length, have the same status as the audible sound. Just as with breathing, in this composition, the silent rested part is as important as the noisy moving part.

There is a broad spectrum of ‘fillings’ that musical space can have. At one end, there is silence, with no frequency content within it. At the other is noise which can contain all frequencies at the same time. The cells of which *Suspiramus* is comprised, contain for the most part, noise. This is realised by the playing of the unpitched bridge of a string instrument or by dampening stopped strings to the point where little or no pitch is left audible.

3 Translation

3.1 Introduction

For a body of pieces that is so concerned with the role of time and space in composition, it is perhaps inevitable that visual art should play such an important role in the creation of these pieces.¹⁰⁸ This chapter looks at how visual representations, particularly of dynamic subjects, have influenced the research. The role of dynamism was touched on in Chapter One, but the discussion is widened here to include the significance of the Futurist art movement to the compositions, *Mjöllnir*, *Abbandonati* and “After the Rain”.

Although the sources of these pieces may be figurative, the music coming from them is not suggestive of or representative of anything. This music then could not be considered as being programmatic. As previously mentioned, the compositions presented here do not make use of themes or motifs, the essential material of programmatic music. Such an approach is at its most literal in works such as Modest Mussorgsky’s *Pictures at an Exhibition* (1874) where the music is evocative of the visual source. No. 8, *The Catacombs*, for example, is based on Viktor Hartmann’s painting of himself examining catacombs in Paris by candlelight (Figure 27). In the painting, the light from the lantern reveals rows of skulls on shelves while the music is correspondingly eerily evocative of the grim atmosphere.

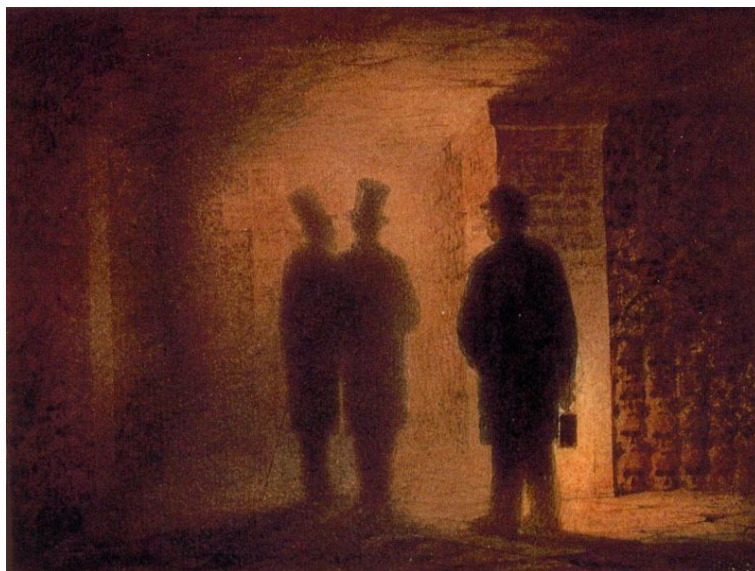


Figure 27 Viktor Hartmann *Paris Catacombs*¹⁰⁹

¹⁰⁸ A number of the pieces in this research result from quasi synesthetic experiences of art works. An exploration of synaesthesia is not within the scope of this research.

¹⁰⁹ Image: Public domain.

So, the visual sources described here are not of value for some narrative quality that they reveal over time. The paintings and sculpture of interest here inherently contain all that they are within themselves and, unlike music, they reveal themselves instantaneously. The music that comes from them has the role of giving temporality to their instantaneity and space to their simultaneity. For example, *Salve Regina*, is strongly influenced by Michelangelo's unfinished statue of the *Rondanini Pietà* located in the Castello Sforzesco in Milan. This sculpture consists of unfinished parts, misshapen attempts and indistinct features (Figure 28). While it takes time to survey the statue and notice its features, essentially, the statue itself reveals itself in the moment and does not reveal itself over time. The composition *Salve Regina* is, therefore, a temporalization of the statue.



Figure 28 Michelangelo *Rondanini Pietà*¹¹⁰

Likewise, other art works have given rise to the particular qualities of the compositions presented here. In *Propellers*, the texture is swirling, moving and undulating. In “After the Rain”, the texture is flat and shimmering with features popping out of it. The relationships between these pieces and their respective images are dealt with in the sections below.

¹¹⁰ Image: Castello Sforzesco, Milan

In many ways, therefore, the compositions in the present research are acts of translation. That is a translation in the mathematical sense of “mapping onto”. This mapping occurs especially with regard to the following pieces:

Timbre (of a statue) – *Salve Regina*

Density (of a painting) – “After the Rain” from *String Quartet 1*

Pace (in a painting) – *Propellers*

In these examples, there is the transference from the static phenomena to the dynamic. It is taking something that is fixed in time and space, for example, a painting or a sculpture and translating or decoding it so that it has spatiality and temporality.

In general, then, the use of visual material in this research can be summarized with the following relationships:

visual texture with sound texture,
visual density with sound density,
spatial movement with temporal movement.

In this way, a generalized common point is found between the source and the composition; texture, density, temporal movement. This is useful in the pre-composition and composition phases. An art work may be used as a ‘source’ for any number of reasons and to any extent in the creation of the music. Whether this is apparent to the listener or not is unimportant. In effect, what is described in the following sections is essentially the use of a compositional aid. In this sense, it is similar to Cage’s use of dice or playing cards, the stochastic techniques of Xenakis or any other compositional tool that a composer might use.

3.2 Crossings

The distinct spaces occupied by visual works and by musical works is described Zuckerkandl as follows:

As visual space has its order, which gives the eye the visual arts and thought the art of measurement (geometry), auditory space has its order, which gives the ear the art of

music. Without an order of visual space, there would be no architecture and no physics; but, equally, without an order of auditory space there would be no music.¹¹¹

Although Zuckerkandl is describing two spaces that are clearly distinct from one another, the connection between the visible and the audible, the physical and the musical, has been investigated for centuries, at least since the description of the *musica universalis* or ‘music of the spheres’ by Pythagoras (see 2.2 above).

In his 1910 neo-Pythagorean version of the relationship between music and architecture, Claude Bragdon, gives a spirited account of the central role played by music in the world of the arts.

The relation of masses one to another – of voids to solids, and of heights and lengths to widths – form ratios; and when such ratios are simple and harmonious, architecture may be said, in Walter Pater’s famous phrase, to “aspire towards the condition of music.”

In a similarly enthusiastic vein he continues to praise the primacy of music:

In the arts the creative spirit of man is at its freest and finest and nowhere among the arts is it so free and so fine as in music. In music, accordingly, the universal law of becoming finds instant, direct, and perfect self-expression; music voices the inner nature of the *will-to-live* in all its moods and moments; in it, form, content, means and end, are perfectly fused.¹¹²

Though Bragdon’s praise of the centrality of music is, perhaps, overly enthusiastic, he does point to a fundamental connection between the visual and the audible arts, what he refers to as, ‘the universal law of becoming’.

There are innumerable examples of the crossover between music and the visual arts. We can see this in the work of Paul Klee who frequently depicts sound elements in his work and uses sound or musical terminology in naming his paintings.¹¹³ The converse of this, music that is somehow ‘painterly’, recurs among composers since the middle of the twentieth century.

¹¹¹ (Zuckerkandl and Trask 1972) 337.

¹¹² (Bragdon 1910) 85.

¹¹³ (Düchting 2002).

According to Ligeti, 'Sounds and musical coherence always arouse in me ideas of consistency and colour, of visible and recognizable form. And vice versa: I constantly combine colour, form, texture and abstract concepts with musical ideas'.¹¹⁴

In Morton Feldman's *Why Patterns?*, the connection becomes very literal. Feldman presents us with a 'translation' of a rug, made up of only patterns, into a piece of music where the form of the music is based on the patterns.

The most interesting aspect for me, composing exclusively with patterns, is that there is not one organizational procedure more advantageous than another, perhaps because no one pattern ever takes precedence over the others. The compositional concentration is solely on which pattern should be reiterated and for how long, and on the character of its inevitable change.¹¹⁵

Feldman gives a sense of the extreme connection that exists between his music and at least the metaphor of visual creation. 'My obsession with surface is the subject of my music. In that sense, my compositions are really not 'compositions' at all. One might call them time canvasses in which I more or less prime the canvass with an overall hue of music'.¹¹⁶

During the twentieth century, since the cubists, music and the visual arts have frequently coincided in their respective theories. The cubists in their experiments with collage incorporated banal everyday materials as avant-garde composers introduced everyday sounds such as automobile horns, cannon shots and telephone bells in their compositions.¹¹⁷

The composer who is perhaps most noteworthy in the way his practice crosses disciplines is Xenakis. He was a practitioner in the fields of architecture, writing and composition and managed, especially with architecture and composition to use the cross fertilization between disciplines as the basis of his creative output. Xenakis, with his origins in architecture, integrates the core areas of his output, emphasizing the beneficial cross-fertilization that arises:

¹¹⁴ (Ligeti and Wehinger 1970) 7.

¹¹⁵ (Feldman 1985) 129.

¹¹⁶ (Feldman and Villars 2006) 178.

¹¹⁷ (Ashton 1962) 201.

For more than twenty years now, I have strived like a mosaic artisan, unconsciously at first, then in a more conscious way, to fill this philosophical space with an intelligence which becomes real by the colored pebbles which are my musical, architectural and visual works and my writings. These pebbles, at first very isolated, have found themselves brought together by bonds of relationships, of affinities, but also by opposition, gradually forming figures of local coherencies and then vaster fields summoning each other with questions and then the resulting answers.¹¹⁸

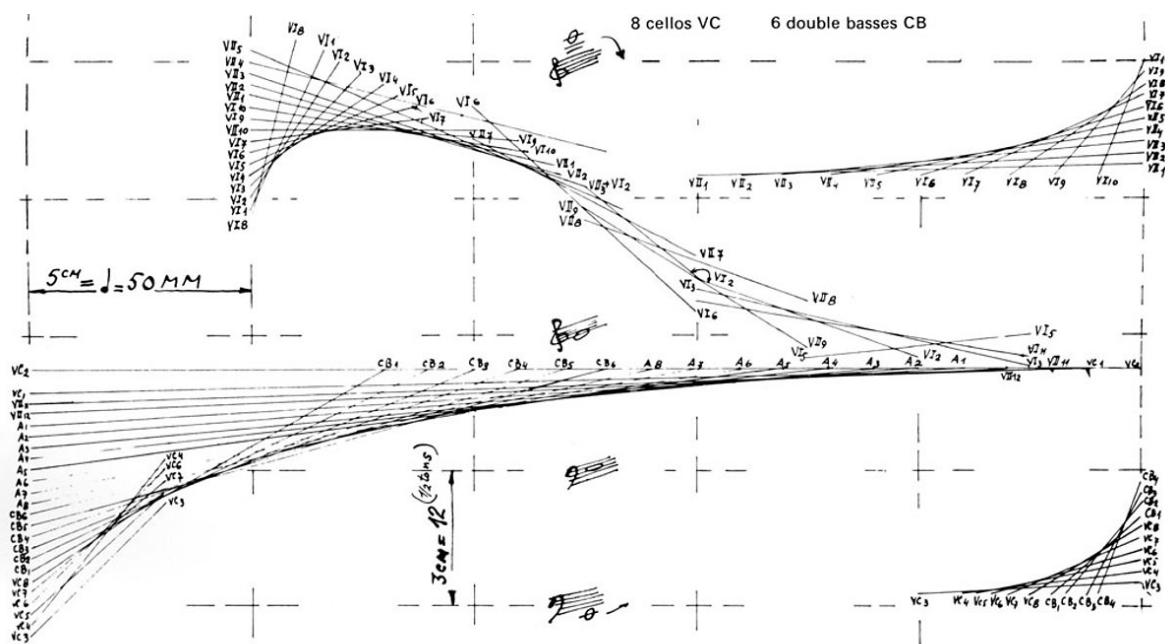
In the work of Xenakis, there is a very close connection between the spatial and the musical.

If glissandi are long and sufficiently interlaced, we obtain sonic spaces of continuous evolution. It is possible to produce ruled surfaces by drawing the glissandi as straight lines. I performed this experiment with *Metastasis* (this work had its premiere in 1955 at Donaueschingen). Several years later, when the architect Le Corbusier, whose collaborator I was, asked me to suggest a design for the architecture of the Philips Pavilion in Brussels, my inspiration was pin-pointed by the experiment with *Metastasis*. Thus I believe that on this occasion music and architecture found an intimate connection.¹¹⁹

Figure 29 illustrates how the visual dynamism of the pre-compositional sketches are ultimately translated in the movement and accumulation of string glissandi in *Metastasis*.

¹¹⁸ (Xenakis and Kanach 1985) 6.

¹¹⁹ (Xenakis 1992) 10.



With Xenakis, the ‘intimate connection’ goes far beyond one piece of work being an inspiration or providing a ‘program’ for the other. His connection relates to the very forms and structures and internal fabric of his work. The visual acts as structural material for the composition in an example of how the interchange between the visual world and the sound world can be seamless.

The effect of Xenakis on the research presented here has been to open the door to a freedom of transference between media. As explored below, it has created the possibility of a continuum of connection ranging from the translation of a visual structural element as in *Propellers* (see 3.3 below) to the translation of a mood as in *Abbandonati* and *Salve Regina* (see 3.4 below).

3.3 Simultaneity

In the context of the research works presented here, one artistic movement has had more influence than any other in crossing between space, time, visual art and music. The Futurist movement of the early twentieth century, particularly its depiction of dynamism, serves as a backdrop for *Abbandonati*, *Mjöllnir*, *Propellers*.

¹²⁰ (Xenakis 1992) 3.

The *Technical Manifesto of Futurist Painting* of 1910, clearly states that the depiction of simultaneity is central to their approach, both philosophically and practically. According to Boccioni:

The gesture which we would reproduce on canvas shall no longer be a *fixed moment* in universal dynamism. It shall simply be the *dynamic sensation* itself. Indeed, all things move, all things run, all things are rapidly changing. A profile is never motionless before our eyes, but it constantly appears and disappears. On account of the persistency of an image upon the retina, moving objects constantly multiply themselves; their form changes like rapid vibrations, in their mad career. Thus a running horse has not four legs, but twenty, and their movements are triangular.¹²¹

A good example of the aspirations of the manifesto meeting a work of art is Giacomo Balla's *Dynamism of a Dog on a Leash* (1912) which depicts, in a frozen moment, the simultaneity of movement of the feet of the person and the legs of the dog (Figure 30). If the painting shows, as Boccioni proposes, the *dynamic sensation* itself, then it should be possible to extract that abstract manifestation, and repurpose it in music composition.



Figure 30 Giacomo Balla *Dynamism of a Dog on a Leash* (1912)¹²²

¹²¹ (Boccioni et al. 1910) 1.

¹²² Image: Estate of Giacomo Balla / Artist Rights Society, NY / SIAE, Rome.

Boccioni's comment and Balla's painting are the starting point for the composition *Mjölnir*, for four snare drums. This composition takes the essential abstraction of Balla's painting and turns it into sound. The result is a fluttering, buzzing sound which is the characteristic sound of the whole piece. Figure 31 shows buzz rolls, played as fast as possible, becoming less tight and transforming into conventional fast percussion rolls and then back again. The result is a pulsing flutter that opens and slows then tightens and quickens. The wave movement that underlies this pulsing is explored in 2.2 above

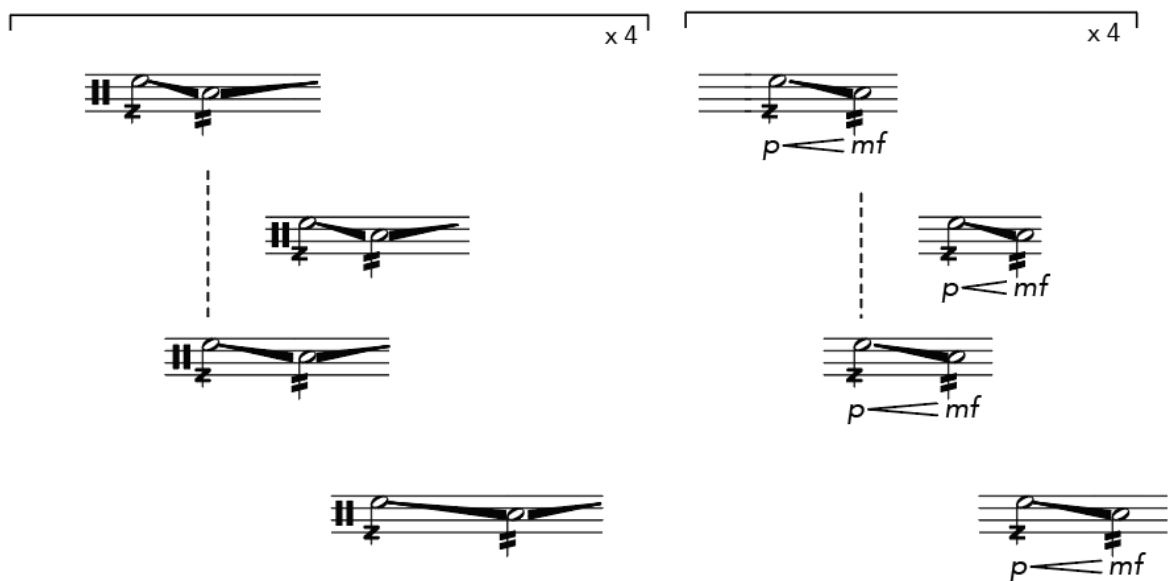


Figure 31 *Mjölnir* buzz rolls

Boccioni's intention of capturing the essence of dynamism is made more overt in photography than it is in painting. The notion that a static representation can capture the trace of how an object is moving or where it has been can be seen in the photo in Figure 32. Here the edge of the propeller blade leaves a trail of bubbles that precisely inscribes the path taken by the blades. The bubble traces that are left reveal the otherwise hidden world of the propeller as it moves through space and time. In the photo, movement is trapped in simultaneity, like a coiled spring, it has potential energy that can be realized as sound. This is achieved in the composition *Propellers* and is discussed below.

The propeller itself was a dominant motif in Futurist art and music. Speaking of the airplanes at the Paris Air Show in 1912, Fernand Léger remarked, "This is the end of painting. What could be more beautiful than this propeller?" While Futurist art depicted the moving propeller,

George Antheil's *Ballet Mécanique* (1924) is scored for an ensemble that includes 3 actual airplane propellers. Balla, perhaps most enthusiastic of all, even named his daughter Elica, the Italian for propeller.

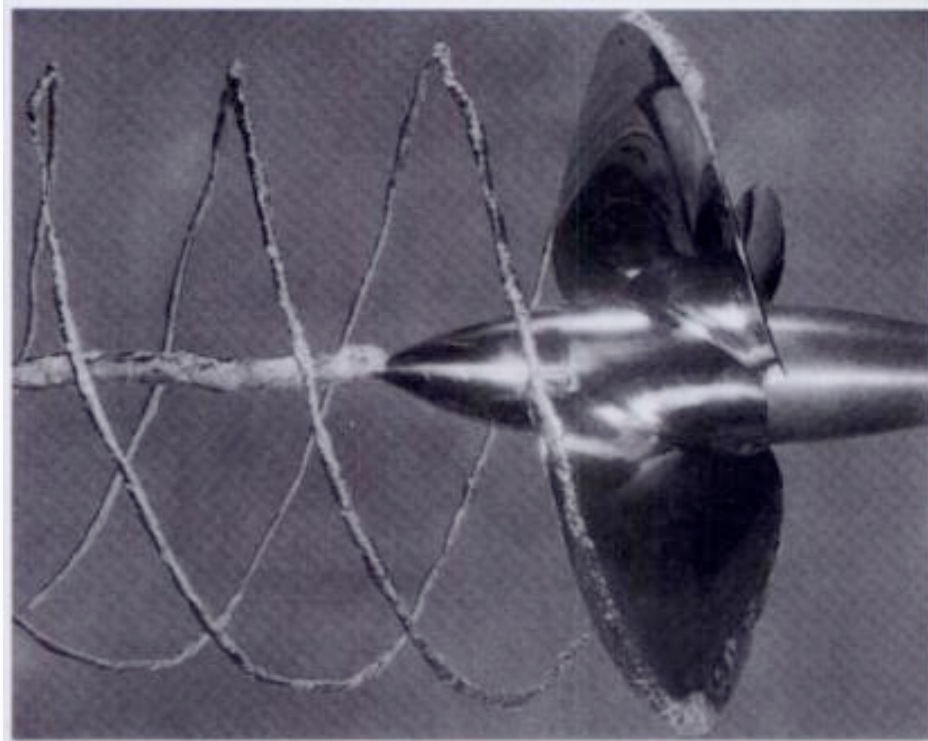


Figure 32 Hydrodynamics of ship propellers ¹²³

Mary Swanzy's painting, *Propellers* (1942),¹²⁴ is an abstract depiction of a view that is never seen - the movement of propellers underwater, or perhaps in air, in multiple positions at the same moment. It is a collision of time and space. Though Swanzy's painting dates from many years after the heyday of the Futurists, it nonetheless has the essential Futurist attributes. As the title tells us, there are propellers, but they are disembodied and exist in an unspecified environment. Most importantly though, the 'time' of the piece, the moment when the image is captured, is not a moment at all, but is a blur of moments smeared across time. By focusing on the object itself, Swanzy shows us what propellers do rather than showing us what they are.

¹²³ Image: Breslin, J. P. and Andersen, P. (1994) *Hydrodynamics of Ship Propellers*. Cambridge: Cambridge University Press.

¹²⁴ Mary Swanzy's painting is referred to here as *Propellers* (1942) in order to differentiate the name from the composition *Propellers*.

Propellers, for mixed ensemble,¹²⁵ is more about the movement than about the object that is moving. The composition is essentially an unfurling of the dynamism that is pent up in the painting. The overriding structure of *Propellers* suggests a continuous movement of sound toward then away from the listener. During these two phases, the overall sound is a little vague and there are merely hints as to what this moving sound comprises. In between these two phases, the sound is at its closest to the listener. At this point, the sound as a whole is at its loudest and the components of the complete sounds are at their most discernable. During this middle phase, the interaction between instruments can be discerned, as rhythmic patterns come in and out of phase. In Figure 34 below, from rehearsal mark 13, the interplay between the cello and the accordion can be seen. The intention is to emphasize a sense of periodicity and this is achieved by seamlessly handing the sound from one instrument to the other.¹²⁶

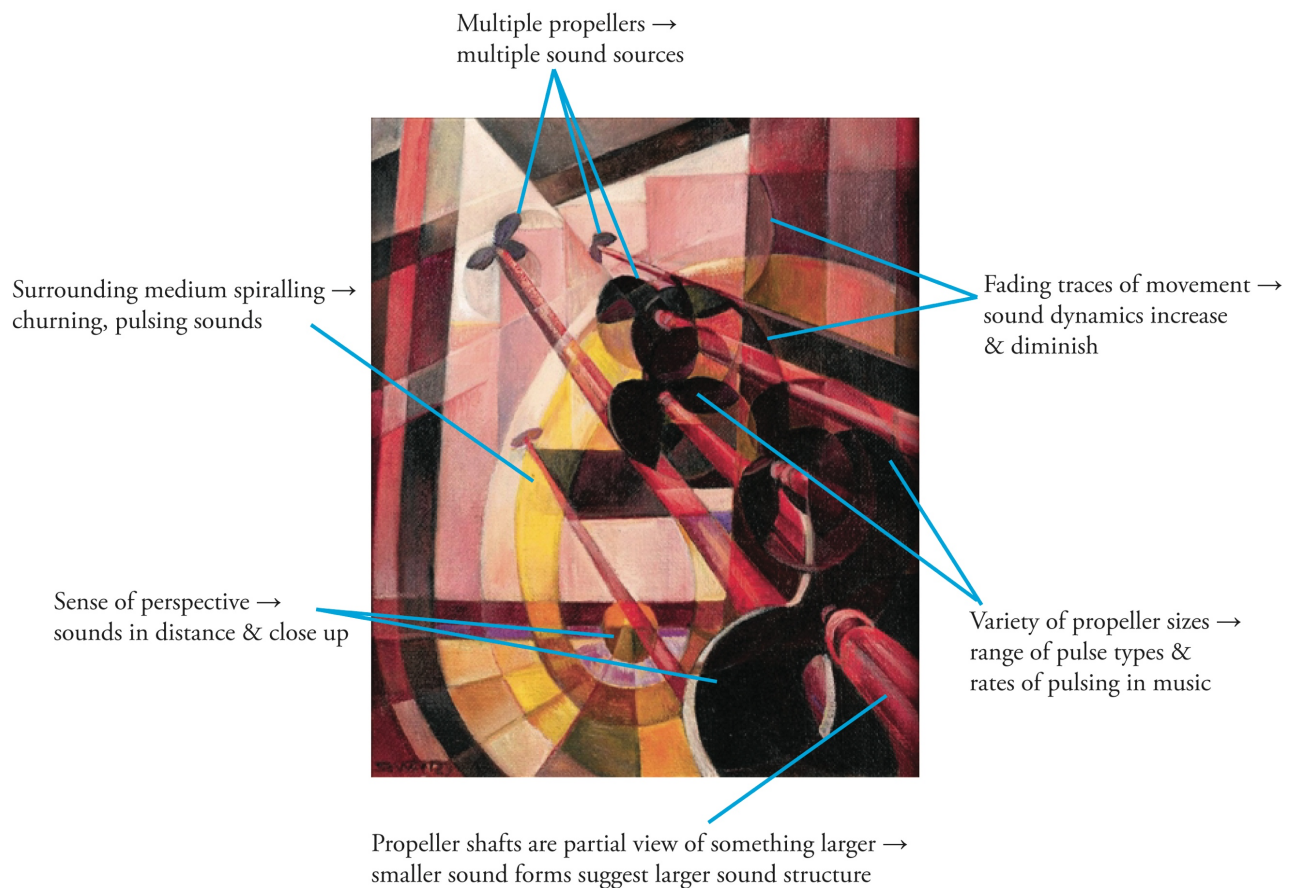


Figure 33 Visual Analysis of *Propellers* (1942)¹²⁷

¹²⁵ Flute, Bass Clarinet, Accordion, Violin and Cello.

¹²⁶ A recording of the composition *Propellers* is held in the Mary Swanzy archive in the National Gallery of Ireland.

¹²⁷ Image: National Gallery of Ireland. Analysis: Brian Keegan.

Figure 34 *Propellers* extract

11 6" 2" 6" 2" 6" 2"

Fl. B. Cl.

rit. 5x 2x 3x

ff

Vln. Vc.

12 8" 2" 1" 2"

Fl. B. Cl.

ff

13 6" 2" 6" 2" 6" 2"

Fl. B. Cl.

ff

14 6" 2" 6" 2" 6" 2"

Fl. B. Cl.

ff

Beating

Vln. Vc.

ff

Various other aspects of the Swanzy painting give rise to the handling of sound in this composition. Again, in Figure 34, just before rehearsal mark 12, the accordion plays staccato cluster bursts reminiscent of the faint traces of rotation that appear in the painting. The opening dynamic of the composition is from nothing, where the clarinet note emerges from breathy silence. This appearance from silence is mirrored closely in the *al niente* dynamic hairpin mark where the flute and violin disappear into silence. In *Propellers*, each instrument weaves its way through the piece as a solo, moving through its own cycles. At various times through the piece, these come together and apart, constructively and destructively, creating the overall wave pulse of the piece.

3.4 Mood

While the previous section dealt with the unravelling of a captured moment of dynamism, this section looks at the translation of the sentiment or mood of a visual representation into sound in *Abbandonati* for solo marimba and in the string quartet, “Hier Wohnte”.

Abbandonati began with a painting by Luigi Nono¹²⁸ called *Abbandonati* (1903). This is a realist depiction of a street scene which is almost photographic in its representation. There is great detail and clarity in the technique, but there is no clarity around the identity of the two figures, or even if they are mother and son or sister and brother. Regardless of how the painter handles the detail of identity, the two figures point to the notion of pairs or doubling. So this visual feature of painting became a structural feature of the composition as the core technique of the piece is octave doubling.

This doubling is achieved through the use of one hand mandolin rolls played with both hands; two pairs of sticks, creating two rolls. Mandolin rolls on the marimba or xylophone are usually associated with communal festivity. In this case, the mandolin effect is used ironically in response to a poignant scene that is far from festive.

The choice of resister and mallets further reflects the atmosphere of the painting. In order to reflect a sense of pervading gloom, there is a drone sound over the piece. The manner in which the drone is created is examined in 1.4 above. Through the use of dark mallets, playing

¹²⁸ This Luigi Nono was an Italian painter who lived from 1850 till 1918 and not Luigi Nono, the Italian composer of the same name who lived from 1924 till 1990.

in the lowest register, keeping the piece in the bottom half of the instrument and the constant repetition of sound due to the rolls, the drone can be maintained.

The music attempts to tip toe around the figures in the painting, capturing the emotion of the intimate, almost claustrophobic setting. There are two musical entities at any one time reflecting the two subjects of the painting. Musically though, they come together as a single sound, bound together by the relentless, droning texture from the marimba. The hushed sound of the marimba is like the hushing to sleep by the girl to the boy in the painting. The piece, therefore, is about the subtlety of voicing. This is achieved through the use chords and their inversions and from notes from chords that are held over on which new chords are built.



Figure 35 Luigi Nono *Abbandonati* (1903)¹²⁹

Abbandonati is a real attempt to create a sound texture that carries an emotional depth that is transmitted through the painting. It is an attempt to re-encode the emotion in the painting and resend it via a different medium. The capacity for strings or woodwinds to transmit emotion or sentiment is well established. The innovation here is to do this through percussion. This is very much in keeping with what Evelyn Glennie says about percussion and emotion:

¹²⁹ Image: Ca' Pesaro Museum, Venice

I feel that percussion, and the family of instruments, is capable of tremendous emotional depth. And that includes long lines, legato, singing and even if you're playing a snare drum or a tambourine or a triangle or something you make it sing and singing doesn't necessarily mean 'nice'. Singing can mean delving into all sorts of emotions.¹³⁰

The encoding of a sentiment trapped in a moment of time but given an existence that evolves over time is at the heart of "Hier Wohnte" for string quartet. The composition has its origins in the commemorative brass *stolperstein* or 'stumbling stones' by the German artist Gunter Demnig (Figure 36). The challenge with this composition is to capture the sense of a voice that is long gone but which persists and continues to speak.



Figure 36 Gunter Demnig *stolperstein*.¹³¹

This is achieved through the use of echoes. The manner in which the echoes are created is discussed in 1.4 above. In taking this approach, a sentiment gets encoded as a 'cell', a structural element. The strong sense that any one of Demnig's *stolpersteine* tells parallel stories of many people, gives rise to the variety of cells. Consequently, the cells vary in duration, intensity and character. Waves of cells interact with each other. At times, their interaction creates beating or syncopation. Sometimes the wave of cells thins to a single echo that dies away.

¹³⁰ (Meth 2004)

¹³¹ This particular *stolperstein* reads, 'Here lived Edmund Wissmann. Born 1918. Arrested several times, finally 1939. Imprisoned 1940 Sachsenhausen (and) Flossenbürg. Survived?'. Image: Gunter Demnig

The translation of a sentiment or emotion, visually revealed in an instant, into temporal form, sonically revealed over time, is central to *Salve Regina* for female choir. This composition is strongly connected with Michelangelo's unfinished statue of the *Pietà* and a number of features of the statue are distilled to their essentials and make their way into the composition.

Figure 37 gives a breakdown of some of these features. From these a number of overriding compositional strategies arise.

There is the aspect of chipping away and removing material only to be left with something vague. Consequently, the text of the *Salve Regina* has much of its phonetic material and all of its semantic content removed. Another aspect of the sculpture is the sense of depletion. The statue is solid but at the same time is insubstantial. This translates into the use of in and out breathing made up of vowels and some voiced sounds. In the piece, through the use of the breath and the lack of 'solid' consonant sounds, there is the sense that there is not enough energy to sustain or even create them. The overall sound world is one that is tired, even exhausted. In the composition, we get an impression of what is in the statue, an outline, vague detail. Over time, the slight detail fades into no detail.

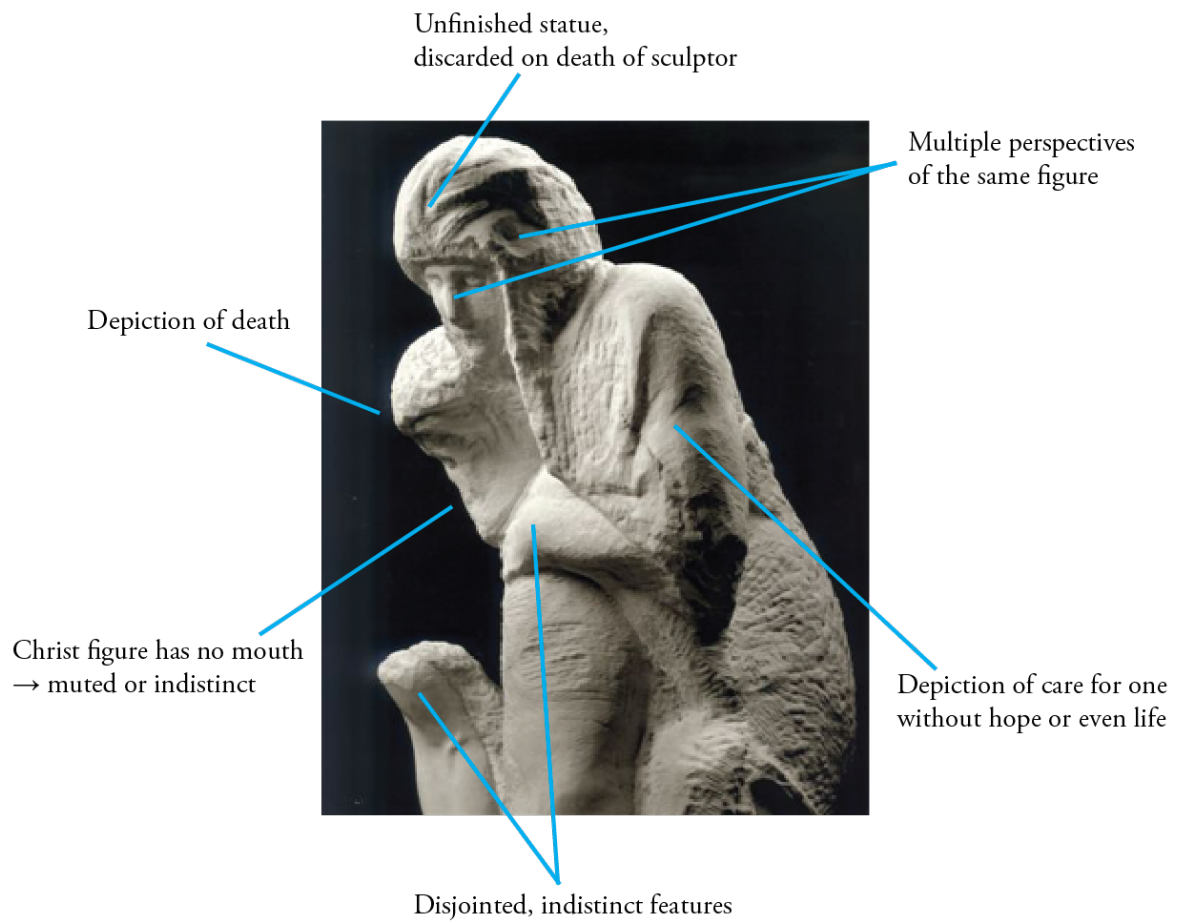


Figure 37 Visual Analysis of *Rondanini Pietà*¹³²

The remaining visual influence in this section relates to the composition “After the Rain” for string quartet. The source is the painting *Paisaje Iluvioso* by Eusebio Sempere. The space within the boundaries of the painting is packed with the depiction of a rainy landscape created through the use of bold blocks and clear edges. Yet Sempere’s painting technique is full of delicacy and translucence.

¹³² Image: Castello Sforzesco. Analysis: Brian Keegan.

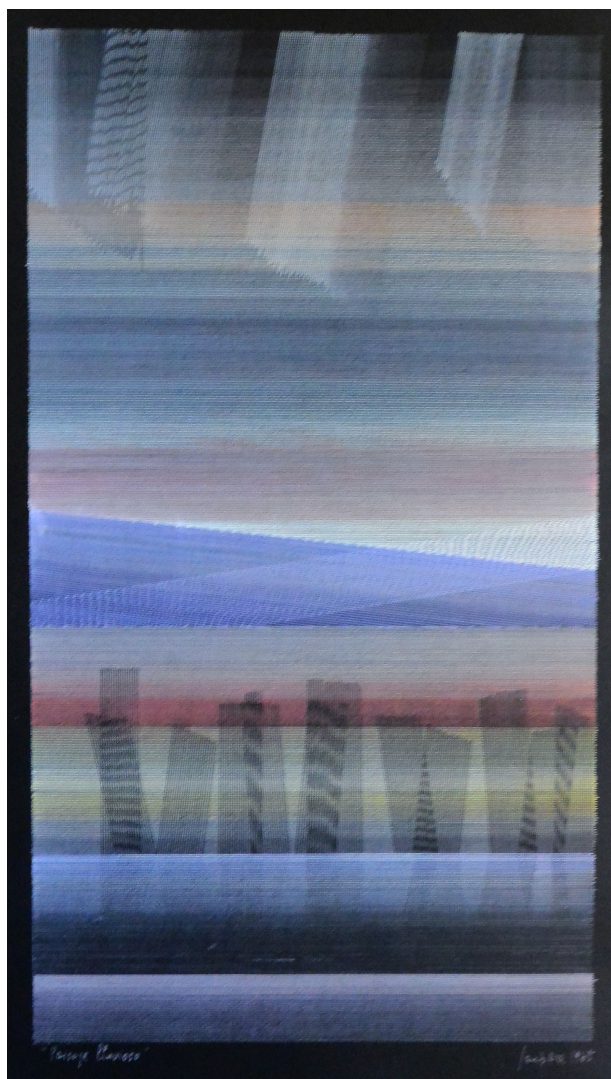


Figure 38 Eusebio Sempere *Paisaje Lluvioso* (1965)¹³³

In places, there is a shuddering aspect to the painting and there are moments where the parallel lines interfere to create a kind of visual beating or strobing. As a result, the image is both substantial and insubstantial at the same time. The example in Figure 39 illustrates how, through the use of tremolo on harmonics, this delicate shimmer is given temporality.

¹³³ Image: Fundación Juan March, Cuenca.

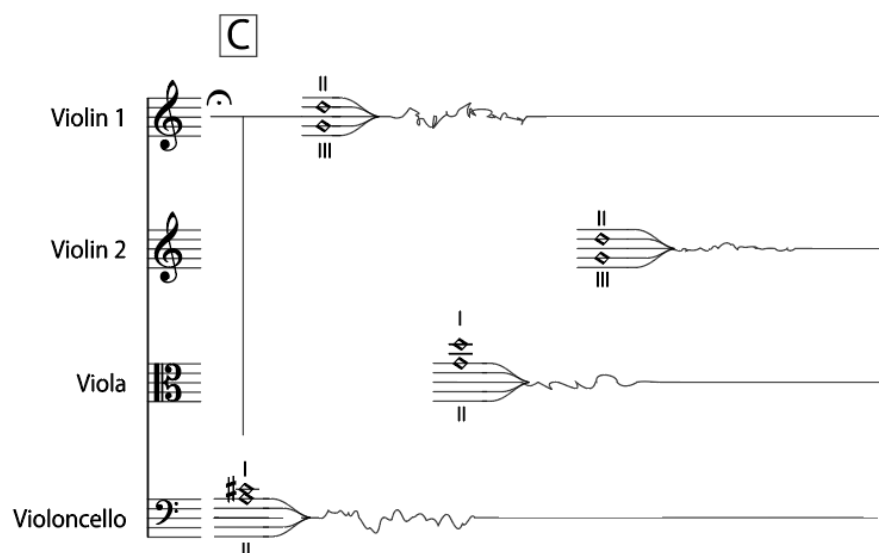


Figure 39 “After the Rain” - tremolo

3.5 Conclusion

The threads of time and space that run through this research and through its compositions have their origins in visual art with, perhaps, a quasi-synesthetic connection between both areas.

The connection between music and art and even between music and all that the universe contains, is long established. It has even been suggested that music is the glue that keeps all art in a union that is harmonious and eternal. For the compositions in this research, in a number of pieces, visual art acts as a compositional tool that provides strategies and structures for creating music.

The most notable connection is between a number of the compositions presented here and the early twentieth century Futurist art movement. This movement’s focus on capturing dynamism through simultaneity has been translated into a number of pieces here. The fluttering image of feet moving gave rise to the buzzing rolls on which *Mjöllnir* is built. Similarly, the spinning of the propeller, that most iconic artefact for the Futurists, is at the heart of *Propellers*. Through these connections, these compositions attempt to temporalize and spatialize that which the Futurists had attempted to capture through their depictions of simultaneity.

Apart from the Futurist influence, less dynamic moods and sentiments that are encoded into works such as Michelangelo's *Pietà* or Nono's *Abbandonati* or Demnig's *stolpersteine* offer compositional possibilities. The pieces presented here attempt to decode the moods that are overt in these art works and re-encode them. In this way, there is a transformation from being static to being dynamic and from existing in an instant to living over time.

An act of translation enables a transference from one art form to another, from say, visual art to music. So, the composer can find this in an intangible form or be a translator of what is already there, a text, an image, an emotion. According to Gubaidulina, 'You have to translate from many dimensions. For me it's nearly like a crucifixion every time.'¹³⁴ Bruno Maderna goes even further and suggests that the music itself already exists and that the composer finds it. Writing of his *Oboe Concerto No. 3*, Maderna remarks, 'I thought, writing it, that the music already existed, that it had always existed. Even as I write. It's just an act of faith to hear it around you, inside it and transcribe it later on the paper.'

¹³⁴ (Dervan 2010).

4 Notation

4.1 Introduction

*The most complicated thing is to put the sounds you hear in the atmosphere on the flatness of a piece of paper.*¹³⁵

Sofia Gubaidulina gets to the essence of the composer's problem of encoding the most fleeting and insubstantial of worlds into a medium that is comprehensible to musicians. If, as described in Chapter Three and embodied in the compositions that make up this research, composition can fruitfully be regarded as the translation of the visual into sound, what are the implications for notation and performance? This raises questions as to what a music score should be if it is a representation of sound elements that originally represent visual elements. Should the musicians not therefore be asked to simply 'play' an image?¹³⁶

There are, of course, examples of this, such as *Paintings* (1965) by Louis Andriessen where the image is played directly. From Cage's collection, *Notations*, there is the example of *Mississippi River South of Memphis* by Philip Corner (see Figure 40 below). In this score, the vertical grid lines indicate time while the wiggling lines representing the river indicate pitch. Therefore, the map is literally played.

¹³⁵ (Dervan 2010).

¹³⁶ John Cage's 1969 *Notations* amounts to a compendium of the state of notation at that time. It illustrates how widespread the use of radically alternative notation was for many composers then.



Figure 40 Philip Corner *Mississippi River South of Memphis*.¹³⁷

Not all composers at that time embraced the new and potentially ambiguous notation techniques as Christian Wolff's no-nonsense approach attests, "The main criterion of any notation which is unconventional is that it produces an effect which cannot be produced by other existing notations."¹³⁸ Sharon Mabry gives an overview of the difficulties and discrepancies in the development of notation:

Composers who were struggling with the problems of notating musical flow began to discard familiar metric indicators for new ways of sensing space and time. The gradations of musical pacing also received a new look. Writers on this subject and composers often categorize notation into descending levels of precision, such as exact notation, frame notation, proportional/spatial notation, indicative notation, indeterminacy, and musical graphics. The lines between these levels are quite blurred and become meaningless when a composer chooses to use elements of each in one composition.¹³⁹

¹³⁷ (Cage 1969).

¹³⁸ (Chase and Gresser 2004) 27.

¹³⁹ (Mabry 2002) 59-60.

4.2 Notating Time and Space

One of the key difficulties in composition is how to codify a sense of musical progression. According to Xenakis, ‘The ‘problem’ with time in music is the notation of it.’¹⁴⁰ As mentioned above, musical time can demonstrate great plasticity and be somewhat illusive. Clearly, the counting of measured units, or bars, has been the mainstay of notation. However, as mentioned above in 1.2, composers have increasingly sought to have more freedom of expression by building pieces from durations rather than adhering to metronome time and counting in a conventional bars and beats framework.

Stockhausen notes the indeterminacy that arises once the composer moves away from counting and towards durations of indeterminate length:

Here, the beginning and end of each duration are played with much less certainty than before. Instead of ‘counting’ – dividing up the durations into quanta – the eye measures the time-proportions, and converts them into the action of playing. Optical size-relationships must be translated into acoustical relationships of durations.¹⁴¹

This connection between the auditory duration and the physical distance on the page is an important one as it allows the composer to express indeterminate musical concepts in terms of space on a page. Ligeti describes his first encounter with this in Darmstadt, ‘... I heard of space notation, in which there are no bars, only a time-scale given, for instance, in seconds. Up till then I had not got beyond the concept of notation based on metre...’.¹⁴²

Another approach, one used and developed extensively by Lutosławski is to employ “small scale” or “aleatorism of texture”¹⁴³ Of this technique he writes:

Many scores in the prealeatory period reduced the role of the performer to that of a counting-machine, thus making it impossible for him to play freely and naturally, and depriving him, therefore, of all the pleasure one usually associates with the performing of ensemble music. In this situation the advent of aleatorism can be regarded as a true

¹⁴⁰ (Beyer and Christensen 2000) 297.

¹⁴¹ (Stockhausen 1959) 33.

¹⁴² (Ligeti et al. 1983) 33.

¹⁴³ (Ligeti, Lutosławski, and Lidholm 1968).

liberation, as it restores to the performer the possibility of exploiting his own artistic resources, in contradiction to former techniques, which led to a complete mechanization and automatism.¹⁴⁴

To this end, many of Lutosławski's works use a 'cut score' technique. In the research presented here, this score for *Mjölnir* relies hugely on the notion of a cut score. This entails the removal of bars and bar lines that would otherwise be superfluous to the music. The example in Figure 41 shows how the removal of empty bars shows clearly to the musicians how the snare drums hand over the rolls one to another.

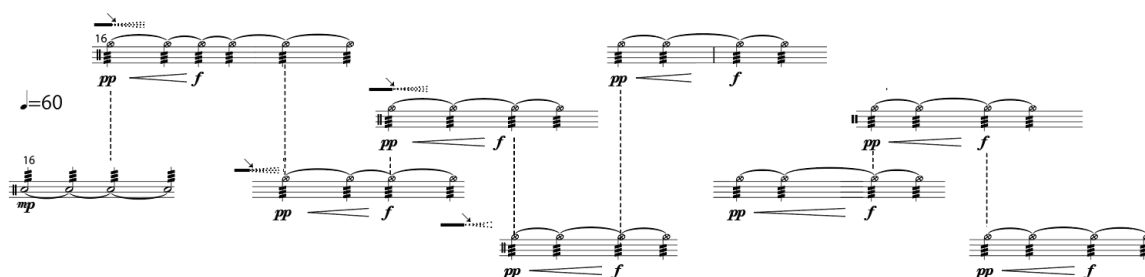


Figure 41 *Mjölnir* 'cut score'

The same technique is extensively used in *L'Infini Vivant* as shown in Figure 42.

Figure 42 *L'Infini Vivant* 'cut score'

¹⁴⁴ (Ligeti et al. 1968) 44-45.

In the composition “Suspiramus”, there is a variety of unconventional stave formats. These include, normal five line staves for each of the string instruments, single line staves for the unpitched and airy body sounds. There are a variety of approaches to these types of playing, however, in the case of this piece, the stave types were chosen to best reflect the flow of the music. In effect, each stave type represents a location on the instrument; moving among staves equates to moving around the instrument.

A useful approach to unusual playing technique has been the use of images and pictograms. On this matter, Arnold Schoenberg remarks in his 1923 essay, *Pictorial Notation*, ‘It is my opinion that in musical notation one should express as little as possible with letters, or even words, and make ever-increasing use of signs (if possible, pictures) which have nothing to do with letters.’¹⁴⁵ He goes on to present a number of pictographs that could have, but ultimately have not, replaced such run of the mill expression markings as *arco* or *pizzicato*.

Despite Schoenberg’s prediction, this type of notation has not become the norm. For some composers however, it has provided the most direct route to describing their intentions. Of particular note in this regard is Helmut Lachenmann. Below, Figure 43 shows an example of Lachenmann’s approach to non-standard bowing in his composition for solo cello *Pression*.¹⁴⁶

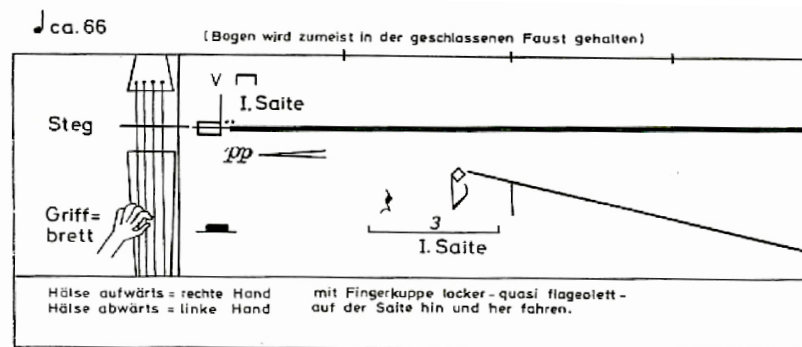


Figure 43 Lachenmann *Pression*

In the compositions in this research there are many instances where sound is represented graphically. The score for *Ymir* is, for the most part, a pictogram of the composition. The *musique concrète* aspects of the piece are notated, to help the musician navigate the piece, with

¹⁴⁵ (Schoenberg *et al.* 1975) 351.

¹⁴⁶ (Lachenmann 1969).

drop-like circles. In *Poltergeist* the indication for the singer to growl is given by a growling dog image Figure 44. This instruction to the soprano could have been given in a number of ways. The image that features in the score is there to encapsulate ideas such as doggedness and grittiness as well as humorous growling.

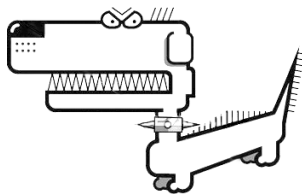


Figure 44 Growl direction from *Poltergeist* ¹⁴⁷

With pictograms and graphic notation in general, the score indicates what the musician does rather than what should be heard. This is the case in the pictographically laden scores of Helmut Lachenmann. In *Pression* for solo cello, he explains:

Except for places where pitches are notated in the traditional manner, the notation of the piece does not indicate the sounds, but the player's actions, i.e. at what place on the instrument the right hand (bowing: note-stems point up) and left hand (stems point downwards) should operate.¹⁴⁸

Closely related to the pictogram is the use of tablature which itself refers to the concrete geography of an instrument rather than an abstract system of notation. Figure 45 shows a note to the performer from *Mjöllnir* for snare drum duet. In this composition, the percussionists play drum rolls that move about the drum head. The specific parts of the head that are played are important as they give rise to the various timbral qualities that give the piece its character. Here, a four-line stave is used, not uncommon in percussion literature, to indicate the four discrete locations on the drum are to be played. Drum sizes and possible tunings are also specified.

¹⁴⁷ Image: Copyright free.

¹⁴⁸ (Lachenmann 1969).

snare 1	5"	- A
snare 2	6.5"	- B
snare 3	6.5"	- C
snare 4	7"	- D

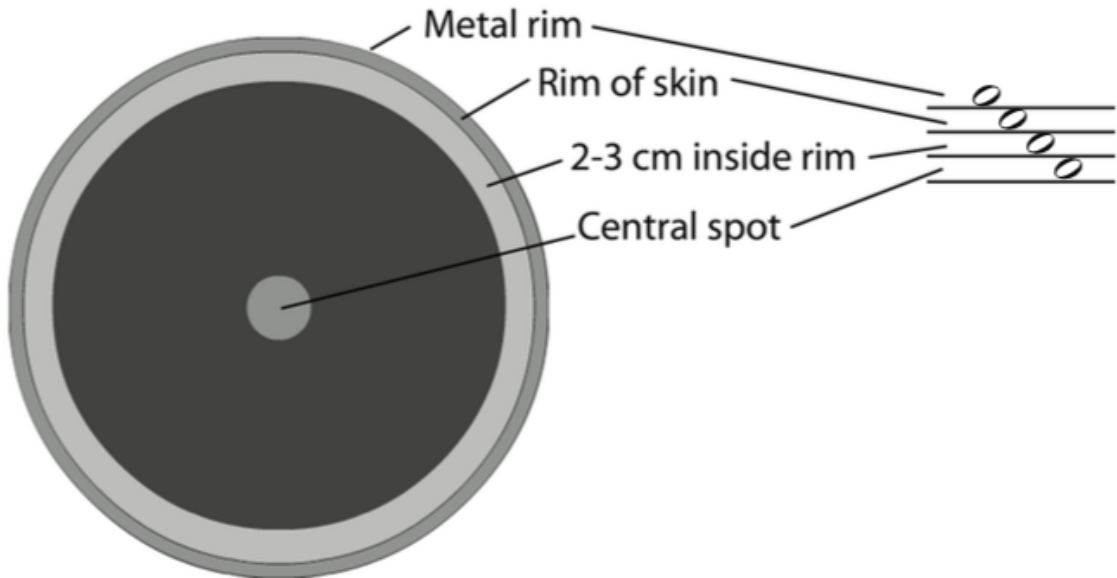


Figure 45 *Mjöllnir* tablature

To return, finally, to the role of artistic influence in these works, the use of a visual source for the notation of sounds appears most overtly in the connection between the notation for *Ymir* and Bridget Riley's *Fragment No. 6* (see Figure 46 below). This painting is an example of Riley's 'op art', where, in this case the after looking at the black dots, permanence of vision will create in the viewer a sense that they see white dots. However, its relevance to *Ymir* is that the piece is made up entirely of only three sizes of dot. Anything that the dots may represent is contained in only a small set of minimal units.

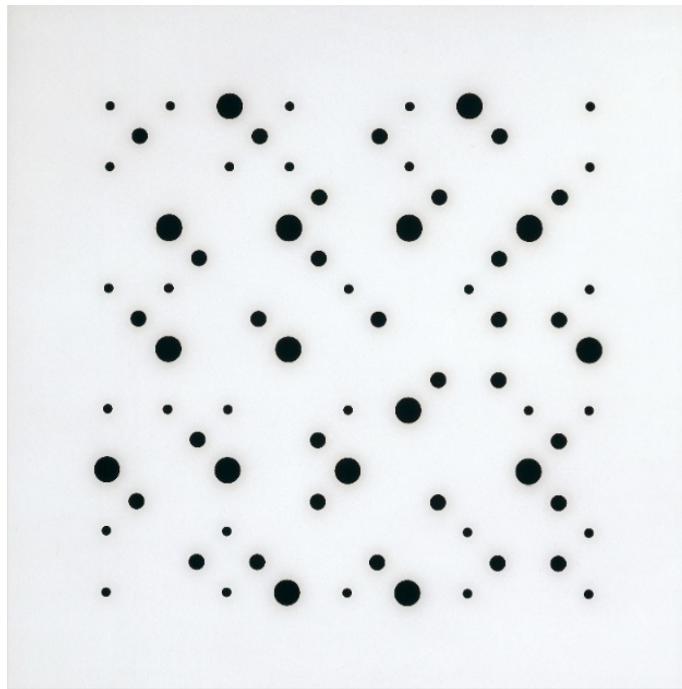


Figure 46 Bridget Riley *Fragment 6* (1965)¹⁴⁹

The adoption of the number three in this way is not uncommon; high-medium-low, left-centre-right, near-middle-far. In *Ymir*, the recorded water drops fall into three ‘weight’ categories; light, medium and heavy. Using the three dots in this way allowed for the recorded, *concrète* part of the piece to be transcribed into a simple language that allows the percussionist to navigate the piece (see Figure 25 above).

4.3 Conclusion

In her discussion of new notation and the notation of indeterminate pitches and rhythms, Sharon Mabry writes of the practicalities encountered when a composition is performed:

Notation, whether traditional or modern in concept, is full of variables. When it is translated into sound it is not possible to have an exact replica of that notation with each performance. The performers’ musical finesse and sensitivity, and their intellectual understanding of the musical symbols and their ramifications, contribute to the final interpretation of the simplest musical notations. When the notations are more complex and less well understood, these factors have a greater effect on the outcome.¹⁵⁰

¹⁴⁹ Image: Tate Modern.

¹⁵⁰ (Mabry 2002) 59.

As notation has become more specific and complex, to mitigate against confusion, the role of the performer has expanded to include that of advisor on extended technique. All the while, their input into the practicalities of performance and notation increases.

In the research presented here, musical space, in the form of discrete timbre and colour has been translated into geographical space. This is most notably so in *Mjöllnir* where timbres are mapped onto instrument locations using novel tablature.

5 Conclusion

This dissertation has presented a view of music composition as being essentially an act of transforming space as time passes. The composition pieces that make up this research have all been created and developed from this standpoint. They are, in a sense, the testing grounds of the views that have been put forward here. Though the subject of time and space is immense and complex, it has been contained here in order to give the clearest expression of the background to the compositions.

The distinction made between the two main views of time is an important one. The uncoupling of musical time from clock time has, since the latter half of the twentieth century, given great freedom of expression to composers. It has opened up the possibility of exploration and investigation that has resulted in the compositions presented here.

Throughout these compositions there is an attempt to write outside of regular, every day, countable time. The result of this is, for example, the instruction to the musicians playing *Mjöllnir* to play as fast as possible or the gentle pace of “After the Rain” where the string players move to the next note when they feel their current note has sounded sufficiently clear.

The same sensibility has allowed time to be compressed and expanded through the manipulation of text. In the case of *Salve Regina* and *Poltergeist*, it has facilitated, without any qualms, the removal of textual meaning and the concentration on the purely phonetic.

The connection between visual art and the pieces presented here cannot be overestimated. Most of these pieces would not exist if it were not for some formative encounter with a work of art. However, none of these pieces are ‘about’ an art work. In this sense, this mode of working is no different from working with any other composition technique where the end result is never about the technique itself.

The freedom alluded to above comes at the cost of notation that is novel, experimental and problematic. The concerns of a number of very experienced and accomplished composers have already been raised here. It would seem that for a score that is fully notated, not relying on an aleatoric or improvisational approach, there is a proportional relationship between the amount of freedom that is notated and the act of notating it.

Building on Cage's comment above that, '...music is made with sounds, not just musical sounds', invites exploration into the possibilities for filling musical space. In this research, this has resulted in a body of compositions where there is relatively little pitched material and where any sense of conventional, vertical harmony is nonexistent.

Just as with the experiments in time that are mentioned above, these experiments in space open up many interesting possibilities. If we embrace noise as a valid constituent of music, we allow the possibility of the layering of noise that occurs in *Suspiramus*. This also expands the scope for exploration of instruments and how they are played. The fetish that has built up over many years for using extended techniques for their own sake seems to have tarnished the reputation of genuine exploration of instruments. If we accept that music is made up of sounds of all sorts then perhaps we must keep looking for them.

Appendix A - “Hier Wohnte”

8th October 2015 – UL, Theatre 1

2.30 – 4.00 Session 1: Contemporary commemorations

Chair: Dr. Niamh NicGhabhann, UL

Brian Keegan “Hier Wohnte” – Remembering One – Remembering All

This paper concerns my recent music composition, “Hier Wohnte”, for string quartet. The piece commemorates the life of an individual and this is reflected in the title which simply means ‘here lived’. The phrase in German appears on the tens of thousands of *stolpersteine* that appear on brass plates embedded in streets across Europe, mainly in Germany. These are the work of the German artist Gunter Demnig. These stones commemorate those individuals who lost their lives during the regime of the national socialists during the 1930s and 40s. While each stone represents the life of one person, each is also an echo of the greater tragedy of mass transportation and mass murder. “Hier Wohnte” commemorates the life of an individual who lived during this time but survived. Their life is both ordinary and extraordinary, spanning a period of long stability but also a period of immense suffering. It is a life of day-to-day survival and survival on an epic scale. This paper asks the question: when we commemorate an individual, to what extent are we commemorating all those who lived ‘parallel’ lives? When we remember those who survived, do we also remember all those, unknown to us, who did not? As an art form, a piece of music, “Hier Wohnte” reflects on the most basic of facts; the fact that somebody lived. The music consists of sequences of echoes. Sometimes these are solitary, fading to silence or noise. Sometimes they are part of a cacophony of traces. From the echo, this most elemental of sonic phenomena, musical texture and form are created. (Keegan 2015)

Poltergeist Brian Keegan

Musicians	Victoria Massey - Voice Anne Murnaghan - Cello
This piece takes the German loan word, 'poltergeist' and elongates it to the point where it ceases to be simply a word. Instead, its phonological attributes are explored and these act as the basic compositional material of the piece. <i>Poltergeist</i> is made entirely of tiny phonetic pieces and so the underlying structural and compositional technique of the piece is the accumulation of fragments. Here, the visual source is the collage work of Kurt Schwitters. The primary technique of Schwitters in his collage and poetry is to arrange tiny fragments. In the collage work, these fragments came from disposable sources such as old newspapers and travel tickets; essentially words or parts of words are used as the raw material. <i>Poltergeist</i> is scored in a very free manner. There is no time signature and the duration of individual notes relies on the playful exploration of the musicians. The visual influence for the piece is carried into the score itself with the inclusion of the image of the dog showing its teeth as a means of conveying the generally musically unconventional singing technique of 'growling'. The overall 'theme' of the piece is the notion of a poltergeist, or clumsy ghost, as it stumbles about.	



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