

MUSIC AND SOUND

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With thanks to Dugal McKinnon and Michael Norris

My practice as a composer has many influences but amongst the most important are the ideas generated through the spontaneity and immediacy of improvisation. Throughout the discussed works there is an underlying project of negotiating a relationship between composition and improvisation that allows for the shaping of musical forms which are flexible in their interpretation and performance without being structurally undermined by the formal limitations of “real-time composition”¹. Across the five works that make up my submission I have explored a spectrum of composition ranging from formalism to free improvisation. While making connections between the differing methodologies and delineating a pattern of musical form there is an overall pre-occupation with constructing a language of music as ‘sound matter’². The compositions presented are a response to this idea and find form through timbral distinctions and contrasting gestures that in their various aspects can communicate things over and above the immediate perception of sound matter as “noise”. The three compositional works that have been configured to include an aspect of such improvisation are *Body and Soul*, *5 Violas* and *Mirrors*.

In these pieces it is expected that the musicians have a capacity to respond to the *moment* of musical utterance singularly (as in *Body and Soul*) or as a group to interact with what is happening between the musicians in the present, rather than being strictly tied to a prescriptive score. The writing thus has a ‘looseness’ that places an emphasis on the ability of performers to interpret shapes and contours from graphic notation and directions, and demands that they listen closely to each other. Autonomy is passed to the player through the use of cueing whereby musicians must listen for signals given by the other players, and are

¹A term used by Austrian composer and improviser Karlheinz Essl, among others.

²By sound matter I am referring to the physical nature of sound, environmental sounds.

dependent on this, in order for the piece to unfold successfully. The music is in the relationship between the musicians, or musicians and the score *equally*, with a focus very much on listening, listening to each other and to the sound that is produced between the players and in the moment. In this sense the strength of the music lies in the spontaneity of the musicians' interpretation as much as in the outline of what I as the composer have detailed. The pieces are formed as a project shared between the performers and the composer as a type of co-production. This is a re-configuring of the traditional relationships between performer and composer that stereotypically divides the roles between servant and master, into a more equal type of approach.³

All of the works presented are sound-based,⁴ and concentrate on shifting elements of timbre, dynamics (soft and loud), spectrum and density that evolve through the interplay of their opposed dimensions. In creating form in these works it is interesting to observe the structures that translate from conventional music into sound-based music, which seems to me most apparent in the dramatic interplay of ideas: a sense of dialogue and contrast between distinct materials. You can always hear 'voices' or 'characters', that is distinct sonic cells or materials as equivalents to themes or motifs, that are identified and followed as they unfold in various ways. It is the unfolding of these voices that underpins my music, whether it is improvised or notated.

The formalist work *Parabola* stands apart from the rest of the works in that it is a completely objective creation of structure through the mathematical calculations of a computer, devoid of

³ See for example the discussion of the differences between collaborative music making in bands and the traditional authorial role of the composer in Kim-Cohen (2009), *In the Blink of an Ear*, New York: Continuum, 193-209.

⁴ A term "suggested by Leigh Landy in his book 'Understanding the Art of Sound Organisation'. Sound-based music is the art form in which the sound and not the musical note is the basic unit." Ears: Electroacoustic Music Resource Site, <http://www.ears.dmu.ac.uk/spip.php?rubrique1397> (accessed 13 June 2011)

any humanly determined expressive gesture and moulded from arbitrarily selected notes on the organ. In chapter 3 of my exegesis I have compared this work to my practice as an improviser. There is however an interesting correlation between both in the approach to form as a plastic block of sound. These two works can be regarded in terms of their structural dialectic as sharing close similarities. The parameters of each work produce a multiplicity of sound events and sonic cells that evolve as complex noisy structures, swarming sound fragments that are moulded into an overarching frame.

The starting point for all of these works is an interest in sound potential to reflect the underlying fabric of the ‘world’ and how it can connect us to it through music. Starting with the smallest sounds, the peripheral aspects of conventional timbres, I have developed an understanding of musical shape that is structured around the physical properties of sound – the beauty of sound – that can be connected to in a direct and simple way. It is the exploration of things (sounds) ‘as they are’, the perception of sound as belonging to and being of the world, and in this forming a multiplicity of meaning, that informs my practice. In this mode of understanding, sound has a ‘neutrality’ that can be moulded to express ideas and to communicate new ways of seeing and thinking. This approach is similar to Annea Lockwood:

For me, every sound has its own minute form – is composed of small flashing rhythms, shifting tones, has momentum, comes, vanishes, lives out its own structure. Since we are used to hearing sounds together, either juxtaposed or compared, one sound alone seems quite simple; but so are the round scuffed stones lying about everywhere, until you crack one apart and all its intricate beauty takes you by surprise.⁵

Beyond this, my practice is also defined by what might be called a deconstructive approach to composition. This is subject to continuing debate though much less so than during the heyday

⁵Annea Lockwood (1997) Liner notes to the Glass World [CD]

of post-structuralism, but I understand it in a sense very similar to that given by Terry Eagleton (1983):

‘Deconstruction’ is the name given to the critical operation by which [binary] oppositions [such as music/noise, performer/composer] can be partly undermined or by which they can be shown to partly undermine each other... The tactic of deconstructive criticism... is to show how texts [any system of meaning is defined as a text] come to embarrass their own ruling systems of logic.

It is through a deconstructive approach that I am to create new musical experiences. By undermining what are typically understood to be stable systems, such as the performer/instrument relationship or binary, the elements in such systems can be ‘denatured’ or ‘de-familiarised’ thus intensifying and revitalising our experience of them.

The chapters that follow include an analysis of each work and discussion around conceptual intent. Beginning with *Mirrors*, chapter 1 looks at the nature of sound in relation to space, and the de-centering of the listening perspective. Chapter 2 examines *Body and Soul* and 5 *Violas*, drawing comparisons between the two in the de-construction of conventional modes within Western art music practice.

MIRRORS

Mirrors is a site-specific work written for artist Mladen Bizumic. It was performed as part of the Designs for Living Exhibition at the Adam Art Gallery alongside *String 1*, and is a response to Bizumic's sound installation *Holding a Bird in Your Hand and Feeling the Heartbeat*, shown previously as part of his Cube to Ball (chapter 1) solo exhibition at the Sue Crockford gallery in Auckland last February (2010). The installation consists of a bunch of plexiglass light-shades with small speakers inside that funnel a collage of unidentified field recordings of New Zealand bird-song into the space (appendix 1).⁶

The basis of *Mirrors* is a single chord derived from a Fast Fourier Transformer analysis⁷ of two seconds of birdsong from Mladen's installation: a superimposed major and minor third of B, D, and D sharp – the tenth chord in a series of seventeen derived from the analysis. This note passed the bird's beak in a fraction of a second but has been captured in the recording, and much like a fossil, is now an artifact that traces the place and time of its existence. It has been slowed down, analysed, refracted, expanded, repeated, and dispersed, this little fraction of sound has been caught and is iterated through time and space as light is captured and expanded and diffracted through mirrors. The piece works with a single frame of static sonic information, so to speak, captured from the FFT process.

In relation to this the overall form of the piece revolves around static blocks of sound that sit like objects within the gallery space and are framed by silence. There are two figures that

⁶A field recording from an unidentified New Zealand forest of native birds is funnelled into the room under plexiglass light shades. (This installation was not shown at the Designs for Living Exhibition)

⁷The spectral analysis was made using Amadeus Pro software

shape the works overall form: the birdsong sonority as a *tutti* chord, and a noise based *ostinato* figure that is passed between individual instruments. Each repetition of the birdsong chord lasts between twenty to thirty seconds within which the notes shift in duration and dynamic to reveal various colours. The *ostinato* figure emerges from the shifting parameters of sonic material within the chord and becomes a counterpoint of independent noise-based material. The dialogue between these contrastingly static and dynamic sound-blocks underpins the overall form of the piece, which is structured around increasing tension and ends without resolution in the second theme.

Of fundamental importance to the discussion of the piece is the architecture of the Adam Art Gallery and the specific acoustic properties that arise from such qualities as ‘open plan’, surface and distance. In relation to this stasis and movement is a recurring theme throughout the work and can be identified on three levels: the movement within the musical material between stasis and dynamism, the near and far relationship to the sound within space itself, and the physical movement of the musicians. All of which are coordinated in direct response to the acoustic and architectural properties of the Gallery. I shall examine each of these elements in turn.

The Adam Gallery has remarkably live acoustics, with very high ceilings and flat acoustically reflective surfaces. It is a tall and narrow building with geometrically complex interior spaces that stack up the hill of Kelburn on which Victoria University sits (see appendix 2).⁸ It was designed by Ian Athfield to occupy a small site between three other University buildings and incorporates an existing stairwell. The stair is the main axis of the gallery with two floors that run off it beneath the ground level entrance; it has an open plan with rooms whose shapes are

⁸ Floor plan of the Adam Art Gallery

formed from corners and corridors. As a result the spaces have a high porous acoustic relationship. The lower and upper Chartwell galleries are one long rectangular room with the upper gallery suspended above the lower. From the top you can see down to the bottom with a second floor that gives way between them. There is a balcony from the second floor over the bottom that adjoins the central landing of the stairwell. From the lower Chartwell you can see both floors and vice versa. The acoustic qualities of the space are largely “accidental”⁹, a by-product of the architecture of the space.

The building’s high reverberation makes it impractical for many of the gallery’s functions such as opening speeches, guest lectures, and artist talks. Words are blurred and sound is distorted by the buildings acoustic – something which Laura Preston, the gallery’s Assistant Curator commented on.¹⁰

The difficulty of the acoustics dictated specific parameters within which to work when writing the piece. To make use of the high reverberance as a feature of the work, but without creating too much bleeding of sounds and unwanted reverberant transformation of sonority it was important that there be a good deal of silence in the work. I have used long silences to separate the iteration of the birdsong chord and to give space to the sonic elaborations that surround them. The piece is slow moving with long rests in synchronicity with the space and its acoustical effects.

The large open plan design of the Adam Art Gallery has been strongly integrated into the piece. The musicians are positioned throughout the building and act as points on two

⁹ Blesser, Barry and Slater, Linda-Ruth (2007). *Spaces speak, are you listening?: Experiencing Aural Architecture*. Cambridge, Mass.: MIT Press.

¹⁰ Personal conversation on the 4 October 2010.

intersecting planes that cross the central landing of the stairwell and span the lower floors of the gallery. They are spread across a large space; approximately 73 square meters, and have only a limited view of each other. The first violinist and accordionist stand at either end of the lower Chartwell and from there can see the theremin player that stands on the balcony of the second floor. The saxophonist is positioned in the corridor of the second floor that leads from the Kirk Gallery and between him and the thereminist stands the second violinist. The trombone is positioned at the bottom of the stairs on the lower floor and can only see the second violinist.

The spacing of the musicians is influenced by the acoustic properties of each instrument and the type of role they play in the piece. It relates to the initial intention of the work, exploring dynamism and stasis within space and sound, and plays an important role in de-centering the listener through the use of contrasting acoustical perspectives. Within this context the instruments are placed according to a “near and far” relationship to each other and to the audience. The saxophone is slightly hidden; it is placed down a corridor with a low ceiling, a relatively dull space, in order to limit its tone and for it to be a far off or secret sound. The trombone is placed in a very resonant spot at the bottom of the stairs to give a high reverb to its tone and to create a sense of the far-away, and of traveling, to its sound. The two amplified instruments are necessarily fixed: the theremin is positioned on the second floor balcony to give the sound presence throughout the whole building, and the second violin is on the second floor landing with a low ceiling to give a more muted and closer feeling to its tone. Violin II is projected through its amplifier, which gives a near and far perspective within the sound of the instrument at the same time (a point I shall discuss in the following paragraph). The positioning of the players brings an interplay of different acoustical perspectives to the listener, creating a “near and far” in relation to the audience. This

undermines the idea of an ideal listening point, but rather opens the work up to a multiplicity of possible acoustic vantage points, making the work similar in this respect to spatialised instrumental works of composers such as Pierre Boulez and Iannis Xenakis (discussed below).

This idea of multiple view-points in the work is also explored through a type of magnification that relates to the original birdsong treatment discussed above. There is a strong relationship between the magnification and fragmentation of the source sound and the magnification and dispersal of sounds within the space. The microsecond of birdcall has been isolated and magnified; what was remote and minute in the field recording has been brought to the fore and enlarged. This idea is also explored in the work through the combination of an acoustic and amplified violin. The second violin is amplified which brings it closer to the listener's ear, artificially increasing proximity to the sound, an example of Dennis Smalley's "microphone space" making small sounds large (rather as a microscope does visually), while the first violin is left alone and remains remote.¹¹ At 3'20" the second violin enters with the percussive lateral bows of the second theme. Because it is amplified, the incidental sounds of this technique are brought to the fore against which the first violin enters with scurrying high notes marked *ff* "as high and fast as possible." The second violin is heard over the first because of its amplification – despite the first violinist exerting more energy. Thus there is a play upon perception of energy, effort and production of sound. There are two dimensions to the sound of the violin at the same time, a confusion of viewpoints, an added layer or added dimension. Attention is drawn to the distance between the two instruments both sonically and physically, as well as confusing the two within the sound of the second violinist in itself.

Because of the amplification the second violin is as close or closer in proximity to the

¹¹ This is an example of microphone space, as discussed by Smalley (2007), which allows a reconfiguration of what Smalley calls proximate and distal space.

listener's ear than the first, despite the first violin play *ff*. Sounds that would usually be marginal are made louder than violin I by the amplifier.

As the preceding paragraphs have made clear, the positioning of the musicians is fundamental to almost every aspect of the work and reflects not only the original concept of the magnification and refraction of birdsong – being “mirrored” throughout the building – but also structural and practical elements.

In terms of listening perspective, there is no single point at which to view the performance from. The traditional division between audience and performer is discarded with no seating arrangement and listeners are invited to sit or stand and move about as they please in order to experience the multi-directionality of the piece. The layout challenges what has been referred to by Denis Smalley (2007), 48) as perspectival spatial listening and comes after the spatial practices developed by high modernist composers such as Iannis Xenakis' *Terretektohr* (1965-66) and *Nomos Gamma* (1967-68) in which audience and performers are intermingled in a circular layout. Boulez's *Repons* (1955-57), for ensemble surrounded by audience surrounded by soloists/loudspeakers is also an example of such de-centered listening, as is Stockhausen's *Gruppen* (1955-57) for 3 orchestras and 3 conductors. The important point of difference between *Mirrors* and these works is that *Mirrors* is distributed through *different* spaces (rather than a single space) in which sound as much as sight is an important co-ordinating medium – players *have to* listen to each other to play the piece. This undoes the visual relation between performers, score and conductor as in notated music, another point of difference to the works just mentioned.

With different instruments in different parts of the building the importance of cueing in the work is twofold. Without being able to see each other aural communication through call-and-response becomes an intrinsic part of the piece's structure. Cues operate to signal the beginning and end of sections within the work as well as coloristic effects within each chord. They also work as a way of bringing voice to the different spaces within the building and creating physical movement and directionality within the sound. These aspects of the work will now be discussed.

Throughout the work the sound travels from far away to near, and from one part of the gallery to the next, illuminating various parts of the building as it moves. A different instrument cues each chord, and as each note is gathered into it the unique part of the gallery that the sound emanates from is voiced along with the distance that it crosses: the space itself speaks.¹² The gallery is treated as a meta-instrument that reverberates and projects its own shape through those of the instruments being played inside it. For example the opening chord of the piece is cued by the accordion and so passes from the end of the lower Chartwell to the Kirk Gallery through the first violinist, then the trombonist, on to the theremin, the saxophone, and ends with a single note in the second violin that stands on the second floor landing of the stairs. Thus the opening chord travels from the Lower Chartwell to the second floor landing, swelling and trembling as the building sounds. The colour of the sound transforms as it travels to reveal not only the individual timbre of each instrument but also where they are in the building, and in this its different spaces, acoustics and distances are thus incorporated into the work.

¹²The role of acoustics in musical composition and performance are discussed extensively by Barry Blesser and Linda Salter in their book *Spaces Speak, are you listening?: Experiencing aural architecture* (2007). See in particular Chapter 4.

This travelling of the sound is also pointedly played out through the use of physical movement that connects to the idea of stasis and dynamism. There is a slow game of hide-and-seek or peek-a-boo throughout the work with two of the musicians moving about the building. This also highlights the limit of visual communication and the player's partial independence from the score that is fundamental to the work as a whole, a point I will shortly expand upon.

The miniature drama of peek-a-boo is instigated and played out by the trombonist who takes a walk up the stairs, and then down the lower Chartwell Gallery, sounding his instrument as he goes. As he introduces the work's second theme at 2'20" he walks up to meet the second violinist, appearing on the landing, the percussive sound of his theme moving with him.

When it returns again at 4'40" he walks the length of the lower Chartwell, collecting the accordionist who takes it up at 5'40" and follows him back to the bottom of the stairs.

This theatrical element was conceived to be part of a sort of fractured fanfare with the trombone moving symbolically to open and lead the way for the guests of the exhibition's opening. The trombone break's rank; he is a prankster, his percussive call pierces the sustained notes of the chord, rupturing its timbral fabric but also displacing the spatial pattern and orientation of where sound is coming from within the building. His movement also demonstrates the general form of the work as being constructed around aural cues. The closing passage of the work is built on the process of waiting for the accordionist and trombonist to stop moving. At 5'40" the two violins must sustain their sounds until the accordion and trombone appear at the bottom of the stairs, at which point the final passage commences.

The players are without a conductor, and rely only partially on the score – the whole function of the work rests on the communication between them. This undermines a traditional dependence on the authority of the score and of a conductor. The score is not a concrete reference to the outcome of the work. It gives only directional indications that rely on circumstance. Durations are only approximated, and there is no rhythmic complexity or synchronicity of entrances that would necessitate the use of a conductor. The work is a ‘happening’ it exists in its performance rather than in the score. The score is an element of the work rather than the authority. The musicians have to listen to each other and the music reflects the interaction between all of them equally, not between each individual in relation to a leader, as in traditional western music. This conceptual frame has a clear relationship to the musical outcomes of the work as has been outlined above, which are: the sound travels throughout the building on the basis of aural cues, and the performers themselves move around the room creating a “mobile” sound.

In connection to the formal outcome of the work musically, the looseness of the score relies on the clear and simple direction of musical ideas within it. Two discreet and clearly contrasting ideas are presented in the piece and it is this that holds the attention of the listener and creates tension in the work. The score is easy to follow, and the piece is open enough to allow for individual interpretation without undermining my intention as a composer. It is important to me that the musicians have freedom in interpreting the score, a freedom to move within an idea. This also bears some relationship to my interest in incorporating elements of improvisation into my compositional practice, a point which is discussed in the introduction.

In terms of a purely musical structure *Mirrors* is formed around the interplay and tension between noise and note played out through aural cues or triggers that serve both musical and

performative functions, as they are also a means for players to coordinate with each other without visual cues. At a musical level, the triggers play an important structural role, which I will now detail. The long sustained chords of the piece's opening contrast with the rhythmic and percussive theme introduced by the trombone at 2'20",¹³ the sound transforming from the sustained notes of the chord to the percussive noise of the trombone through cues given by the theremin and violins: the violins at 2'10" trigger the entrance of the trombone theme at 2'20". On its third entry at 1'40" the bird-chord modulates up a minor third, a movement that is anticipated by the increased energy of a vibrato line of the theremin in the closing of the second chord at 1'20". And in conjunction with a small *glissando* in the theremin the violins begin *tremolo* bowing at 1'50". The theremin responds with a wide vibrato that triggers the scrubbing in the violins at 2'10", this resolves into the mouth *pizzicato* of the trombone at 2'20". This technique of progressive tension communicated through triggers is used throughout the piece.

There are three main figures in the work: the tutti bird-song chords of a superimposed minor and major third, the ostinato 'as a clock' rhythm, and the ascending *glissando* and melismatic figures of the theremin and violins. The tension generated through the disintegration of the (relatively tonal) birdsong chord of a major and minor third into the 'noise' of the *ostinato* rhythm replaces that which is traditionally created through the relationship of consonance and dissonance, note versus noise becomes an extension of this basic formal principal.¹⁴ The piece uses a mixture of both harmonic and sonic devices to create form, with the chord's modulation at 1'40" triggering the appearance of a second theme that unfolds around the development of rhythmic and noise based sounds. Between these transformations is the

¹³ The score is organised by seconds.

¹⁴ A perspective on the note-noise relationship, and one typical of contemporary composition, is offered by Kaija Saariaho discusses this approach in her article "Timbre and harmony: interpolations of timbral structures" in *Contemporary Music Review*, 1987, pp.93-133. For a perspective that offers a broader view on the matter, including critique of contemporary composition's formalist understanding of noise, see Kahn (1999), Cambridge, MA: MIT Press, 20-157.

element of melisma present in the rising lines of the theremin and violins that follows a similar rational as the ascending line in the work *5 Violas* (discussed in chapter 2). The rising lines within *Mirrors* work as pointers that draw the listener from one sonic event to another through gathering intensity in the internal frequency of the notes. This technique can be clearly seen in the theremin at 2'20" and 4'40" between the introduction of the second theme in the trombone and the bird-song chord respectively.

As discussed above, these elements interact and evolve throughout the work as a series of cues between the players in accord with the acoustical environment. Overall the work is structured towards drawing the listener into a multi-dimensional experience of sound within space, which reconfigures the traditional relationship between audience, performer, and composer.

BODY AND SOUL & 5 VIOLAS

Body and Soul and *5 Violas* were formulated within the same conceptual parameters. These two works explore the relationship between the player and their instrument and the score through the use of amplification, extended technique and ‘wrong ways’ of playing. They are sound-based works that peruse the deconstruction of the instruments’ traditional function and identity.¹⁵ In terms of form their trajectories vary but the pieces are joined by similarities in technique. I shall begin by discussing the conceptual intention of each piece starting with *Body and Soul*, as *5 Violas* was developed out of it.

Conceptual Intent

BODY AND SOUL

Body and Soul is written for solo dulcian – a Renaissance double reed instrument with a folded conical bore – and a wah-wah pedal. It explores the physicality of sound and its relationship to the body through the re-configuration of both the instrument, and the player’s traditional method of sound production. The instrument is played without its reed and the player blows directly into the crook. This sound is shaped and projected by a wah-wah pedal and amplifier as a kind of prosthetic for the distorted voice of the instrument.

Playing without the reed subverts the instrument’s identity as well as the common parameters of performance practice within the Western musical tradition. The reed’s vibration, as is the case with all reed instruments, is fundamental to the production of both timbre and pitch on a

¹⁵Such deconstructive practices are not uncommon in contemporary composition and can be understood as deriving from the deconstructive practices of a composer such as Mauricio Kagel, whose work very much presented a critique and disassembly of the norms of Western art music. The sociopolitical dimensions of this are often very strong in both Kagel and other composers, such as Helmut Lachen. See for example Ruzicka, Peter (2004), “Toward a New Aesthetic Quality. On Helmut Lachenmann’s Aesthetics of Material”, *Contemporary Music Review* Vol. 23, No. 3/4, 97-102.

dulcian – without these the instrument is “voice-less,” divorced from its musical identity so to speak. The removal of the reed means the instrument continues to look like a dulcian but doesn’t sound like one – the listener expects to hear notes but instead there is noise – it becomes aurally unrecognisable. The removal of the reed renders it an object, a piece of wood with some holes in it and a metal tube attached, its inherited meaning is displaced and its sound is dismantled.

With the instrument as an object that is displaced within the traditional structures of Western concert music in this way, the work focuses on the mechanics of the player’s body working in tandem with the deconstructed instrument. In this the piece becomes about the physicality of sound and its relationship to the body and to the instrument. Furthermore, through the use of amplification what is presented instead of notes is the usually minute sound of the breath itself and the action of the fingers. This is what constitutes the musical material of *Body and Soul*, the physicality of the player and the basic physical-acoustic characteristics of the components out of which the instrument is constructed. This of course relates to and extends the electroacoustic transformation of the violin in *Mirrors*, making this transformation one of the focal aspects of the composition.

The use of wah-wah pedal and amplification is fundamental to the overall deconstructive aim of the work and functions on two levels: it allows access to the “body” of the musician which is usually unheard, but is also intended as a conflation of low and high culture that points to the question of identity and social structure within music. Socioculturally amplifiers and wah-wah pedals are of a popular music idiom that has become widely familiar through the music of rock icons such as Jimi Hendrix and many artists since. Using this sound effect in the context of Western art music (high culture) extends the traditional scope of both the pedal

and the instrument, it highlights the separation between the two and the pedal is raised to the status of an ‘art object’. In this context the wah-wah is an added contrapuntal layer, opening and closing the envelope of the instrument’s sound and exploring another level of its voice. The use of amplification is also an instance of Denis Smalley’s (2007) “microphone space” allowing access to the intimate sounds of the body with microscopic details of the sound projected into the foreground. The added use of wah-wah pedal distorts the spectrum of these sounds, amplifying the lower partials as it is applied and displacing the origin of the sound both in its spectrum and in physical space as it is heard to emerge from a loudspeaker rather than from the instrument itself. This physical displacement is another way in which the instrument’s traditional function and music o-cultural identity is reconfigured.

5 VIOLAS

5 Violas was conceived as ‘organic’, reflecting forms from nature and the environment such as the waves of the ocean, the noise of traffic from a distance. These sounds are evoked on the viola through a collection of extended techniques that are set against static pitch material that slowly rises and so draws the ear in, enfolding the un-pitched sounds into its ascending line. This can be seen as analogous to a view of the sea, a sea of blue with a boat that draws the eye in its passage leaving traces of white water, synthesizing the environmental surrounds into the line of its trajectory. Beneath this is a deconstruction of the relationship between instrument and musician as with *Body and Soul* and an exploration of the noise-pitch dichotomy. A pitched line surrounded by the sound of ‘wood’ and ‘strings’ that is fundamental to its form.

Although the instruments are approached conventionally in *5 Violas*, i.e. with a bow and with fingers on the fingerboard, there is an element of displacement that is common to both works

and explored in *5 Violas* through the use of extended technique and ‘wrong ways’ of playing. Deconstruction in this work is present in the various sounds of the instruments constituent parts (the wood of the bow, the hair of the bow, the wood of the body, and the metal of the strings) and their unconventional interactions. In a similar manner to *Body and Soul*, *5 Violas* is constructed around the player’s physicality and its connection to the sound the instrument produces. Areas of the instrument peripheral to its formal locus are explored through a language of wood on string, metal on wood, and wood on hair.

The instruments are largely played in an unconventional manner. The musicians are asked to treat their valuable and cherished violas as mere objects, attaching contact microphones to the body and potentially destroying the varnish as well as using their bows as percussive sticks. For the portfolio performance there was an understandable reluctance amongst the performers that compromised the recording of the work. For example Viola II, despite direction, found it difficult to generate sufficient volume playing *col legno* and is thus absent from the recording. As a result part of the fundamental frame of the work is lost. A future performance of *5 Violas* would need musicians better prepared to work outside their usual paradigm; the idea of treating every part of the instrument as having the potential for music is a fundamental element of sound based composition.¹⁶

In the same manner that *Body and Soul* uses the dulcian, the violas in *5 Violas* are being used as noise-makers rather than fitting into the tonal system that forms the basis of their traditional use; what they would typically be understood to represent. Here too there is the

¹⁶This relates the influence of *musique concrète*, and the practices which emerged from it (such as acousmatic and electroacoustic composition), on instrumental composition. This relationship is well summarised by instrumental composer Helmut Lachenmann’s concept of *musique concrète instrumentale*, or concrete instrumental music. For a useful summary see Steenhuisen, Paul (2004), “Interview with Helmut Lachenmann — Toronto, 2003”, *Contemporary Music Review* Vol. 23, No. 3/4, 9-14.

conflation of high and low with the use of amplifiers and wah-wah pedals that subverts the usual distinction between the different genres of music. There is also a displacement of the instruments in a sonic context through the de-centering of pitch contour and sound-source in using wah-wah pedals and amplifiers. As with the use of an amplifier in *Mirrors*, the use of amplifiers in *5 Violas* displaces the sound-source of the music from a single source (the instrument) into two places: the amplifier and the instrument as a fused sound in the room that is further displaced through the shifting envelope of the wah-wah pedal.

Having discussed the conceptual and expressive aspects of these pieces, I will now outline how the various sounds of each are produced.

Method

Body and Soul requires a significant amount of skill on the part of the player. The work explores the breath, working with two discreet sonic materials that interact and are developed throughout the work. The first is an extended technique of sucking and blowing directly into the crook of the instrument, which when a large amount of air-pressure is created, results in a loud brass-like sonority. The player must employ a completely new technique in order to exact pitch while sucking over the crook. The large amount of air-flow that is required demands a totally different embouchure be learnt by the musician, as it is the air-flow around the crook that creates the sound not what is sucked from inside it. In contrast to this there are percussive sounds utilising a mouth *pizzicato* articulation (a conventional *staccato* tonguing) and the sound of the musician's hand tapping the wood of the instrument's body. The piece is amplified through a contact microphone attached directly to the bore so both of these techniques are quite loud.

5 *Violas* uses similarly unconventional methods of sound production, the work employs various extended bowing techniques on different parts of the instrument's body. A large portion of the work is played *col legno stratto* (playing with the wood of the bow drawn across the string) *col legno battuto* (bouncing the wood of the bow on the string), which are used in contrast with each other; *col legno stratto* produces a very quiet sound that exacts a small amount of pitch, and *col legno battuto* is akin to a *pizzicato* but the sound is brighter, shorter and also quiet. There is also bowing using the side of the bow for louder passages, and bowing *ordinaire* but these are largely used in unconventional places on the instrument. The bow is never drawn between the bridge and the fingerboard except by Viola I that produces the pitched line, but instead on the body of the instrument itself near or at the scroll, behind the bridge, on the bridge, and also *sul tasto*. As with *Body and Soul* this piece thus explores all the 'other' sounds that the instrument makes.

Both the scores for these works are temporally organised by seconds and minutes rather than bars. Clock time is a more appropriate medium for their notation as there is no metered pulse operating in the music. The scores are largely graphic, and the music relatively aleatoric, with directions given on a broader level and the details left to the discretion of the performers.

Writing this type of sound-based music is challenging because without notes it is difficult to stay connected to the sonic outcome of the score. I needed to maintain a very clear sense of the sounds that I was creating, and to do this I defined sonic cells with which to build an overall shape of each work according to relative dynamic and texture. The pieces are organised around degrees of intensity within texture and timbre that replaces the conventional elements of consonance and dissonance (as *Mirrors* also does). Of equal importance to structuring direction in these sound-based works is defining the dynamic of each sound,

either loud or soft. In *5 Violas* it was important to consider whether each sonic cell or gestural line would sit within the textural contour of the work as a whole, which sound was important to be heard over the others in terms of leading the evolution of the work and how to support it with surrounding sounds. Thus classified in terms of intensity and dynamic, it is the unfolding of these sonic cells that creates tension and resolution and is the basis of form in both *5 Violas* and *Body and Soul* – a device used broadly in my practice as discussed in the introduction.

Structure

Body and Soul is based on the interaction of two opposed sonic identities (cells): the long breath sucking and blowing through the crook as the first, and the short *mouth pizzicato* and percussive hand taps as the second. Their development guides the overall form of the work, with a dialogue between them shaped most particularly around the difference in length and dynamics of each occurrence. The two cells join through the use of variation, with one sonic idea leaking or morphing into the other.

The piece has an arch-like ABA form with the first section up to 1'30" dominated by the first sonic cell that opens the piece: a legato run up and down seven notes of a fingered, but not perceptible, whole tone scale from a low C lasting 6 seconds (to 6" in the score). This develops from a near silent articulation on an in-breath that swells to *piano* and *mezzo piano* in turn (*p* at 5", *mp* at 10", *p* at 40" and again *mp* at 50") and then to the loud brass-timbre tremolo passages on an out-breath at *mezzo forte* from 55" to 1'13" and into the second sonic cell (also an out-breath) of *mouth pizzicato* runs finishing at 1'25".

A fragment of the second cell is first introduced at the end of the first line and acts as a kind of cadence for the phrase at 35". The interruption of a perceptually 'other' sound, a sound that has not yet been heard in the piece, brings closure to the phrase with three *sforzando mouth pizzicato* followed by a six second rest. The first phrase is then repeated but with variation on the first cell introduced with the wide tremolo at 55" and 1'05" that precludes the pieces climax at 3'55". From 1'25" there is a passage of strong interplay between the first two contrasting cells that transforms them and lays a foundation for the shift into the B section. The tension between cells is increased through the shortening length of each iteration, and they disintegrate in a type of 'fight' from 1'45" to 2'05". Interrupting and dividing each other into fragments with increasing dynamic. This passage begins at 1'15" with the second cell lasting for ten seconds and then twelve seconds at 1'30" with the first cell appearing for eight seconds between (1'45"). After this initial statement the cells begin to break up, interrupting each other as at 1'55" and 2'05", each reduced to 4" lengths and crossing between without rests. This is resolved into the B section that begins with the *tremolo* passage of fifteen seconds from 2'05" to 2'25". In the B section there is a new combination of both cells – the use of *staccato* tonguing to articulate the first cell is a cross-over to the *mouth pizzicato* of the second cell – and with this development is the introduction of the *fortissimo tremolo*, which is the sonority of the piece's climax at 3'55". After this we return to the first cell of the A section (the sounds of the opening), except quieter and slower than in their first appearance, which is how the piece concludes.

5 *Violas* differ from *Body and Soul* in the use of its materials. Although it's structural progression relies on the dramatic tension between two ideas, its underlying form is ramp-like

rather than arch-like with an increase in the density and dynamic of sonic cells. This acts in counterpoint to an ascending microtonal line in the first viola played *ordinaire*, which gradually rises in pitch throughout the duration of the piece. Thus the parameters of pitch and density/dynamic, while used independently to each other, are structurally coupled as a means to create the ramp-like form of the piece. The work was conceived as one continually evolving block of sound, moving from quiet near pitch-less and static material to dynamic and pointillist textures surrounding a pitched line.

The piece is very quiet in the beginning, it opens with the fundamental sound of the wah-wah pedal shifting the spectrum of a white-noise produced by Viola V. Viola V begins solo with the pitch-less sound of the bridge being bowed *ordinaire*, creating a noise like that of the ocean of the wind, to which the wah-wah pedal applies a transformation – closing its spectrum. This awakens a response in Viola IV at 30” with the body of the instrument being bowed “from slow to fast” the “fast” bow being excited by the “*tremolo* bow body” in Viola V at 35”. The sound of the bridge being bowed is taken up by Viola III at 1’00” after the entrance of similarly un-pitched material in Viola I, the bow being drawn on the body of the instrument *ordinaire* at 45”. This pattern of passing sounds between the instruments is followed throughout the piece, with cues between the players working much as they do in *Mirrors*.

As in *Body and Soul* a fragment of the contrasting idea – the ascending line of harmonics – is heard towards the end of the first phrase in Viola IV at 1’13” with the introduction of pitch in a triangle note-head marked “*the highest note, sul pont*”. As with the *sforzando pizzicato* at

the closing of the first phrase in *Body and Soul*, this note in Viola IV acts as an anticipatory interruption that presages the developmental endpoint of the piece.

The work is divided into three by two sonic markers that signal a shift between each section and link to the release of the solo lines in Viola II at 3'07", and Viola IV at 5'07". These two passages follow an ascending line of *glissandos* that point to and reflect the slowly ascending line of harmonics in Viola I that is the back-bone of the piece. The markers are a transformative movement in texture and dynamic; a swelling that is passed between Viola II and III at 1'48", and Viola II and IV at 4'30". They signal the exchange between the two solo lines, which are a type of 'out-put' of the surrounding activity, and work to draw the ear "up" – pointing to the high harmonics in Viola I. The violas fall into two roles: accompanying figures and leading figures. The ascending line leads and the 'noises' frame it. The three violas that make an ascent arrive towards the end of the piece in a type of trio at 6'20" that resolves into the solo passage in Viola IV that ends the work.

When determining a way to convey the production of sound in both pieces – necessary given that conventional notation does not suffice – I have used largely graphic notation that gives direction for three independent parts: the wah-wah pedal, the mouth or the bow, and the fingers. This type of score is a reference to the work of Lachenmann, whose scores tend to determine how sound is to be physically produced rather than symbolically representing the type of sound that will be heard (which is what conventional notation does) as can be seen in his score of *Pression* for solo cello (1969-1970). Here there is a distinct separation between

the score and what sounds are produced.¹⁷ This type of approach in composition necessitates the composers' involvement in the rehearsal process – the composer 'co-produces' the piece with the performer. As was made clear in the introduction, this relates to my overall interest in refiguring all kinds of traditional relationships in the creation of music.

¹⁷As Clements (in Grella-Mozejko, 2005, 69-70) puts it in discussing Lachenmann's *temA* (1968), "The notation of *temA* is...prescriptive, but in the writing for flute, mezzo-soprano and cello the emphasis has shifted [from the earlier *Streichtrio* and *Trio fluido*] away from the minute prescription of pitch, duration, timbre, and articulation and *towards instructions that concentrate instead on how the sounds are produced.*" [Italics mine].

PARABOLA and STRING 1, STRING 2

String 1 and *String 2* and *Parabola* were created using opposed methods and temporal perspectives. *Parabola* is an almost completely objective formulation of music that exists in the score (outside of the time of its performance) and follows a formalist technique developed by Iannis Xenakis using statistical models to calculate sound as a reflection of scientific principles. *String 1* and *String 2* are two solo piano improvisations – free improvisations – which are the entirely subjective creation of form via direct physical engagement with the piano, in and of the *moment* of their performance. Within this chapter I shall deconstruct these two methodologies as binary opposites and discuss ways in which they converge or meet within my practice as an exploration of music as ‘sound mass.’

There are two fundamental levels at which *Parabola* and *String 1, String 2* diverge: one is on a temporal level and the other a physical. *Parabola* is an aural representation of a mathematical figure that exists in the score – a representation outside of time – an entirely cerebral exercise that is performed in the recording included with this thesis by a computer. It is the ‘sound’ of a parabolic curve, produced in collaboration with statistician Roger Mackey and created using the computer programme *R* with set parameters of pitch, density, and rate of occurrence. In contrast to this *String 1, String 2* are my own improvisational performances that took place at the Adam Art Gallery (6 March 2011). As ‘free improvisation’ this aspect of my practice is temporally fixed in the present and in the body, it is the immediate and subjective response to sound that relies on the *senses* and its shape is determined by my capacity to think ahead: to develop material towards a logical yet surprising conclusion in the

present moment, much as a composed work is shaped albeit *outside* the moment in which the sounds are generated. In many ways these two works are diametrically opposed, maths-music versus intuitive-music, but there is a convergence in how I approach both works which produces a similar outcome despite these differences.

There is an overarching frame within which composition and improvisation sit, both work in the field of sound and involve the production and organisation of sonic elements in time. As such they are both art and share an underlying purpose and intent in the expression of thought and ideas in music. Art is an inquiry into being; it pushes at the boundary of our reality and operates on many levels beyond the present. It points beyond the immediate, the mundane, questioning things we don't question in the habitual scope of life. Habitually we operate within 'territories' recognising things in connections made through memory, and we are resistant to things that are different or confront this.¹⁸ Composition and Improvisation are two such territories within music that do not easily intersect; they exist in very different aesthetic and social domains that are antithetical in ideology and practice. But to have the two disciplines 'talk' to each other is very useful and in my practice has helped to make inroads towards defining my own musical language. I have discovered things beyond my habits in both, extending territorial practices within each discipline and through their connection extending my understanding of the world through music.

¹⁸Such a perspective on the role of art, including music, is encountered in many genres and practices. See for example: Murphy, Timothy S., "Composition, Improvisation, Constitution: forms of life in the music of Pierre Boulez and Ornette Coleman", *Angelaki*, 1998, pp.75-92; and also Lachenmann in Steenhuisen (ibid).

For me each discipline seems to lack what the other gains: improvisation is challenging because it is difficult to be objective about the music as it is made. Composition is challenging because it is difficult to imagine the experience of sounds as they are put together on the page. But in exploring both ends of this spectrum I have adopted a general approach to the construction of musical form using the dramatic interplay of musical ideas. As discussed throughout my exegesis the delineation of two or more ‘sonic cells’ in their interaction create tension and resolution. This approach translates well into an improvisational framework, providing a clear structural outline in which to organise sonic material as it transpires in the moment. As a strictly formalist work *Parabola* was not created in this way, and so sits in an interesting relationship to *String 1, String 2* which was, but at a *micro* level. At a *macro* level both *Parabola* and *String 1, String 2* are structured out of blocks of sound as ‘mass’ within which there is a ‘rhizomatic’¹⁹ unfolding of material. Both works function as a multiplicity of gestural subsets: in improvisation these arise out of the arbitrariness of physical habits within playing, and in stochastic music the arbitrary output of mathematical formulation. Both arrive at forms created from blocks of sound containing shifting timbral and rhythmic fragments (rhizomes) that cross-pollinate to form directional material. Within the sound mass is a complexity of ideas that evolve and mutate organically to create an overarching shape but in a ‘non-teleological’ manner, i.e. non-developmentally in the common practice sense, but rather rhizomatically in which there is no clear structural hierarchy such as a theme/motif to be developed, instead there is a multiplicity out of which particular configurations emerge to create formally distinct sections.

¹⁹ By this I mean a non-linear process which is unlike a traditional process of thematic development. The term rhizome is to be understood as it is posited by Deleuze and Guattari (1987) who draw upon the biological definition of the rhizome in defining it as follows “Principles of connection and heterogeneity: any point of a rhizome can be connected to any other...”

FREE IMPROVISATION - STRING 1, STRING 2

As with my approach to composition as outlined above and in the previous chapters, the structural logic of my improvisations is based on the interplay of contrasting sonic cells or gestures. On a micro level there are opposing voices or gestures that interact to create directionality within the different sections of the work. In terms of an overall form, these sections contrast with each other and are constructed through varying densities of musical texture and spectrum. Pitch is approached in terms of spectrum rather than notes (I do not use scales or keys), through both the preparation of the instrument which de-tunes it, as well as in the use of cluster chords in differing registers. Musical gesture or phrasing is found within the shifting morphology of each note's harmonic spectrum or envelope, and above this in terms of textural variance within sound mass.

String 1 was performed at the Adam Art Gallery (6 March 2011) alongside *Mirrors*, and *String 2* is a shorter study recorded privately at the Adam Concert Romm (1 March 2011). For this concert at the Adam Art Gallery a grand piano was shifted into the space and prepared uniquely to make a connection to the building itself. As with the work *Mirrors*, the improvisation at the Adam Art Gallery was site-specific.²⁰ The piano was connected to the walls of the gallery by lengths of piano wire pulled to varying degrees of tension and attached to the strings. This installation was an important visual element extending the inside of the piano into the room, presenting the instrument as a type of sacrifice, a symbolic act of disembowelling. The innards were pulled out pointing to the basis of its construction, the relationship between its various elements of iron, metal strings, and wood, as well as extending the sonic scope of the performance when the strings to the walls were plucked in

²⁰ See chapter one for a discussion of site specificity.

the second improvisation. The performance consists of two pieces: the first is an extensive exploration of the keyboard, and the second a short improvisation plucking the wire that was attached to the walls in combination with single notes from the keyboard.

The main piece *String I* is formed around differing shapes of density and spectrum, which relates to the formulation of structure in *Parabola* as discussed below. *String I* can be divided into two sections or overarching ‘movements’ that build to a central climactic point through increasing density of material. Sonic cells within these sections are constructed using different combinations of notes from each register and, as discussed in the introduction, I begin with a gesture then respond to that with a contrasting one. Out of this I develop the overall form of the piece with the dialogue between many concurrent gestures creating a multiplicity of angles or potentials around which evolves a block or wall of sound that is easily formed by playing a mass of notes in a single register.

For example, from halfway through the performance the improvisation shifts to smaller quieter gestures and builds toward the second climax. At 9’50” the tone of these *arpeggio*-type gestures changes with a new dynamic of *forte* (in contrast to the last section of the *piano*), and the density and range of material begins to increase with the introduction of *fortissimo* chords in the bass register and in response a greater number of notes in the treble. The music shifts between the *fortissimo* voice to the preceding quieter gestures and here new material is introduced with a fast run of cluster chords in the upper treble at around 10’30” which then disintegrates into a spray of fast running notes that move towards the bass. This becomes a longer gesture that is repeated and evolves to cover the whole keyboard, with the fast running passage moving to the bass and the cluster of the treble chords sounding over and against it. These cluster chords are heard alone from approximately 12’00” onwards, and themselves become the central figure articulated in counterpoint to a contrasting figure of

single chords or notes sounded sparsely in the lower register. Out of the wall of sound that evolved in the treble is picked a single note from a string with a screw in it that has a bell-like sonority. The playing in the higher register becomes faster and quieter and the piece concludes with *tremolo* passages in the highest register and the bell-like note returning and sounding out against it to end the work.

Within the performance there are distinct voices that are formed through the different treatment of each register. The sound of the piano varies greatly as you move from low to high in its range and from thick and long to short and thin in its strings. I use these differences to create clear spectral breaks in the music, creating blocks of sound and contrasting gestures. At the bottom end of its register the piano has single string wrapped in one or two layers of wire that produce long wave-form with a wide spectrum; for example the second to lowest C – C1 (33 Hertz) – is a double wrapped string and has 35 partials, so the sound is dense and the pitch slightly distorted by the high number of partials. As you move up to the middle register the notes are produced using two, then three unwrapped strings, and the partials drop away from 20 partials at C3 (131 Hz) to only 2 at C7 (2093 Hz).²¹ In these two performances *String 1* and *String 2*, I leave the lowest register relatively free of preparation because it has such a lovely opaque spectrum. Treating these strings however is also limited by the fact that there is only one string for each note, and hence nothing to insert an object between. Instead I use ice-block sticks or paper threaded between the strings, which rattle with their vibrations. The second set of notes on the keyboard, which have sets of two wrapped strings, are prepared with bolts screwed between them at different harmonic nodes to create either a sub-tone or over-tone above the fundamental. For the rest of the strings I

21 Rossing, Thomas, *The Science of Sound*, 2nd ed. Addison-Wesley Publishing Company, Reading Massachusetts 1990.

used a combination of small screws and blue-tak; the blu-tak mutes the notes and the screws enliven different partials, often creating a bell-like sound. The preparation works on two levels, it creates a contrasting collection of noises and notes with which to work, and also partially deconstructs the instrument in a similar manner to my approach to the dulcian in *Body and Soul*.

The second improvisation *String II* can be divided into three sections and, as with *String I*, is constructed through shifts in texture and spectrum. The work revolves around a single note from the middle register with a screw between its strings, which is heard as a repeating gesture at the opening of the piece. The first section of the work is played both inside the piano and on the keyboard with the exploration of this note in relation to other that are dampened and plucked from inside. This is contrasted at 4'25" with a second field of sound: a blur of notes in the lower register that has a continuous percussive rattle of the ice-block sticks sounding above the, The piece progresses with the contrasting shift between this low register gesture and the voices of the middle and upper notes of the keyboard. At 7'35" the initial sound returns – the repeated single note of the opening – but this time its iteration has a faster tempo and the *ostinato* moves to other notes, against which the brighter gestures of the middle section are played. This forms the third section of the work and takes it to its conclusion with the *ostinato* sounding in a step-wise movement down the keyboard.

Improvisation is challenging in that the form is created as you play it. No sounds or notes can be rejected as they are in composition,²² everything must be worked into the overall frame, some part of it returning or continuing throughout the entire form in order to make the

²²After the Jazz truism “there are no mistakes”

performance coherent. This results directly in the type of multiplicity discussed in the introduction, where the music forms rhizomatically through distinct sets materials interacting and cross-pollinating to create a structure that evolves and mutates organically. Ideas are elaborated and developed in conjunction, they bounce off each other and are transformed almost randomly into a mass of sound within which are shifting rhythmic and melodic fragments. This same type of rhizomatic form is present in *Parabola* where elements such as pitch, timing, and duration are arbitrarily governed – not by physical habits as in improvisation, but by mathematical law.

MATHEMATICAL MUSIC - PARABOLA

Parabola is a formalist piece for solo organ determined via mathematical processes modelled on the work of Iannis Xenakis. It was created in collaboration with statistician Roger Mackey and is derived using a stochastic method as detailed in Xenakis's book *Formalized Music: Thought and Mathematics in Music*.

I approached the work with the intention of creating an organ piece that would evolve over time as one continuous block of sound, much as in my improvisational practice which contain contrasting subsets of an overarching form. *Parabola* was inspired by the ideas of Iannis Xenakis, and explores the possibility of reflecting mathematical law as an aesthetic.

Xenakis' book proposes a completely objective music that reflects the scientific nature of sound as matter, going beyond the physical limitation of 'thehuman' in making music with the

assistance of computers; exploring sound as material much like light. He says there are elements of composition that the artist taints with their subjectivity, and that certain aspects are better served by computers creating independently of the artist.

...the creative thought of man gives birth to mental mechanisms, which, in the last analysis, are merely sets of constraints and choices...the role of the living composer seems to have evolved...to inventing schemes (previously forms) and exploring the limits of these schemes...these explorations necessitate impressive mathematical, logical, physical, and psychological impedimenta, especially computers that accelerate the mental processes necessary for clearing the way for new fields by providing immediate experimental verifications at all stages of musical construction.²³

Parabola was constructed using the statistical language R^{24} , and is modelled on Xenakis's use of stochastic process in the piece *Achorripsis* (1957). *Achorripsis* was formed according to a Poisson distribution, which is a statistical calculation that models the rate of occurrence of events in a given system. *Parabola* was calculated using this same model and uses a Poisson distribution to dictate almost every aspect of the work: how notes change in pitch, their rate of occurrence, and duration.

A Poisson model of distribution would show the distribution of things happening over a set length of time. To create music using this framework of probability, all notes are rendered equal, and their rate of occurrence arbitrarily set by given parameters. What creates form through the use of this model is the exponential increase of events that occurs naturally within the system; if something follows a Poisson distribution it also follows an exponential

²³ Xenakis, Iannis, *Formalized Music: Thought and Mathematics in Music* pg130-135

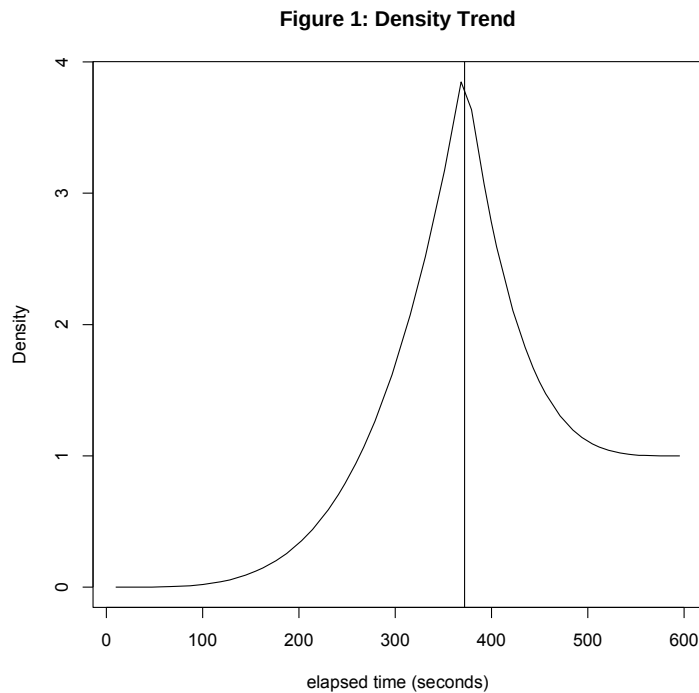
²⁴ [▯]A software environment for statistical computing and graphics

distribution so that the occurrence of notes over time increases, creating a mass of sound that builds in density.

Using this mathematical program Mackey and I set the length of *Parabola* to ten minutes (600 seconds), then divided it into shorter events or sequences the length of which was randomly generated but set with a mean length of fifteen seconds. This is an exact model of Xenakis' workings of *Achorripsis* as detailed in *Formalized Music* (134). From there we moved to determining the shape of density.

In his workings Xenakis lets the density change using a random process over time. We also used a random process called 'the random walk' but then added a trend to it with the aim of having the piece build slowly to a high point two thirds of the way through and then drop off again. The trend of the density is modeled using parabola. Figure 1 shows the trend in a graph with two concave lines drawn back to back that reach a peak and then drop off again – two parabolic shapes. To this shape we added the random component which produces the final density of the piece: density trend + the random walk.

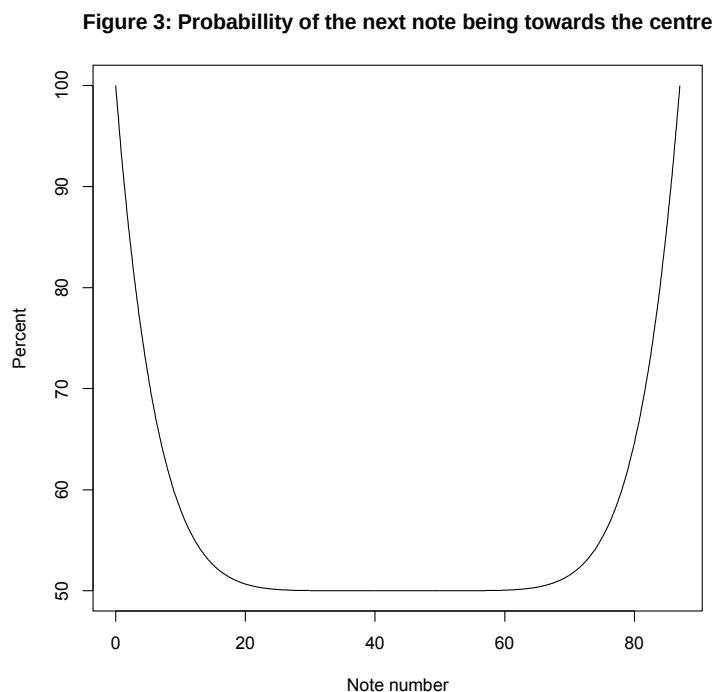
Figure 1:



A random walk is a statistical model which at any point in time the value is equal to the previous value + *a random component*. Mackey explains this system as being analogous to someone who has had too much to drink, then walking across a rugby field from one end to the other. Their destination is a specific point but the line of approach is slightly distorted by a lack of bodily control. If we consider the length of the field as time, and the degree of the drunks stagger to the left or to the right the random element we have a ‘random walk’: their place at any point in time is very much related to where they were a moment ago but there is a random component, which is the extent to which they stagger left or right.

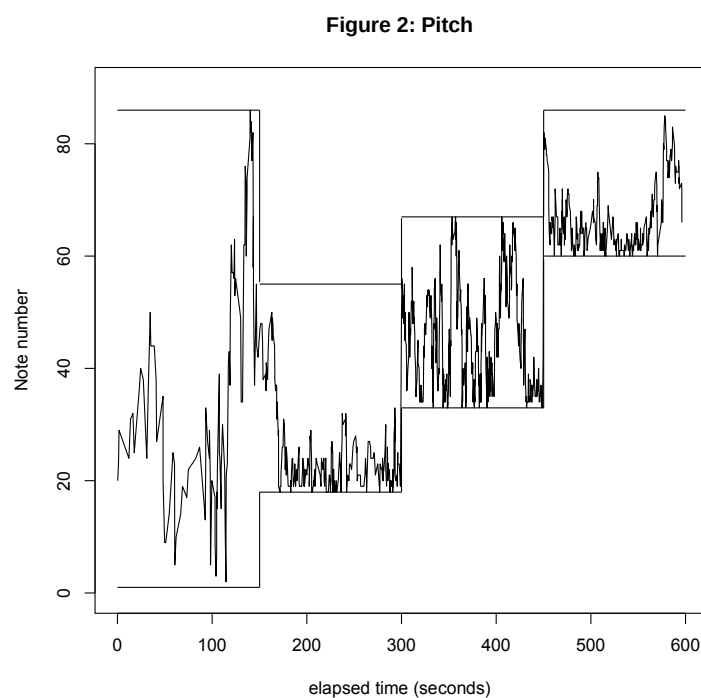
Having determined the overall density of the piece, the next calculation determines pitch. Our pitch generally follows a random walk, but because the range of notes on a keyboard is limited, as well as how many notes the performer can play at once, a polynomial process was applied to keep the notes within certain limits. Because the pitch is determined by a random walk there is a high correlation between notes: you might wander all over the keyboard but are less likely to jump from the lowest note to the highest in an instant. But in case the pitch jumps outside the allowable boundaries there is an added parameter to draw it back in. This is analogous to modeling the rugby field with high-sided banks on either side. If the drunk proceeds towards the edge they are pushed back down to the field. Their path may stagger all over the rugby field as they walk down it but as they get to the edges there's something that tips them towards the middle. Figure 2 shows the various controls.

Figure 2:



Having determined that process of controlling the pitch within the allowable range of the piano, we then altered the allowable range as we went through the piece. It was divided into four sections that can be seen graphed in figure 3. This shows the eventual pitch that was generated and the dotted lines shows the boundaries within which the pitch was allowed to vary.

Figure 3:



The data that was produced was then run through the program MIDICSV²⁵ and converted to MIDI, which was then edited using the score-writing software Sibelius to be readable and playable. I shortened the piece, eliminating much of the second section, which lacked directionality, as well as re-configured the rhythmic patterns and arrangement of chords to make it less challenging for the performer. Although this has detracted from the mathematical purity of the work, in order for it to have a life beyond the programs that it was developed

²⁵Text processing tool that transforms data into MIDI

through it is important that it does not extend too far beyond the scope of practicality. The work is in many senses antithetical to the rest of my compositions, meant rather as an inquiry into stochastic music.

Within my approach to these divergent methodologies (improvisation and formalist composition) there is a convergence upon the exploration of music as ‘sound mass’: in formalism this approach is taken at an intellectual level outside the temporal scope of the piece itself, in improvisation it is taken at a physical level and as the piece is happening.

In conclusion to the chapter, composition and free improvisation could not be more different from one another and I do not claim that they are the same, or that one could be a component of the other. Fundamentally though, both are an expression of thought or inquiry through the invention of music, and equally, both composition and improvisation are confined to the habits and limitations of the author.

Conclusion

Across the works that make up my submission I have had an overall pre-occupation with constructing a language of music as ‘sound matter’. The compositions presented are a response to this idea and find form through timbral distinctions and contrasting gestures that in their various aspects can communicate things over and above the immediate perception of sound matter as “noise.” In this approach I have used a mixture of conventional and graphic notation (*Mirrors*, *5 Violas*, *Body and Soul*) to communicate my ideas. Autonomy is passed to the player through the use of cueing whereby musicians must listen for signals given by the other players, and are dependent on this, in order for the piece to unfold successfully. This places an emphasis on the relationship between the musicians, as equal to each individual relationship with the score.

In my study of Xenakis and creation of the formalist work *Parabola* I explored the idea of music as a reflection of more complex forms as detailed through mathematical calculation. In Chapter 3 I compared this work to my practice as an improviser and found correlation between both in the approach to form as a plastic block of sound. In both *Parabola* and *String 1*, *String 2* there is a multiplicity of sound events and sonic cells that evolve as complex noisy structures, swarming sound fragments that are moulded into an overarching frame.

The starting point for all of these works is an interest in sound potential to reflect the underlying fabric of the ‘world’ and how it can connect us to it through music. Starting with the smallest sounds, the peripheral aspects of conventional timbres, I have developed an

understanding of musical shape that is structured around the physical properties of sound – the beauty of sound – that can be connected to in a direct and simple way. It is the exploration of things (sounds) ‘as they are’, the perception of sound as belonging to and being of the world, and in this forming a multiplicity of meaning, that informs my practice.

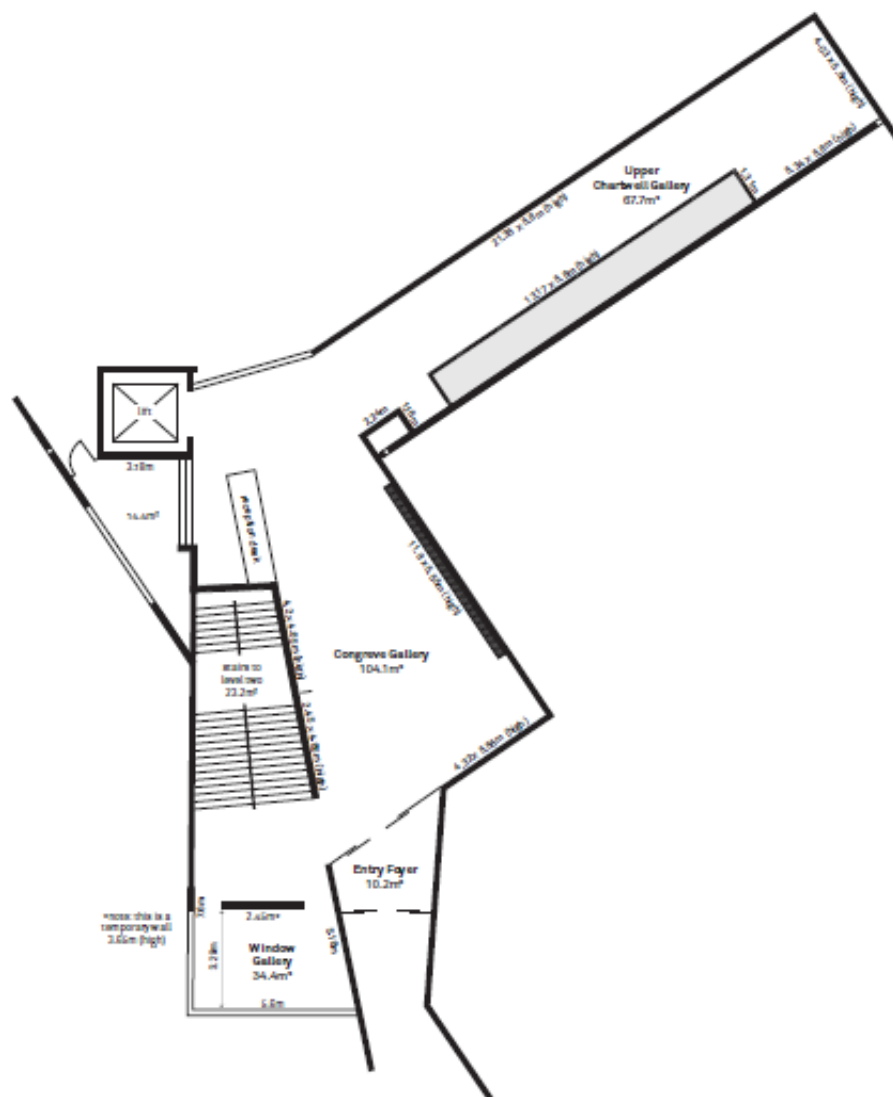
Appendix

Appendix 1

Holding a Bird in Your Hand and Feeling the Heartbeat, by Mladen Bizumic from his exhibition *From Cube to Ball* (chapter 1) shown at the Sue Crockford gallery in Auckland (February 2010)



Level Three



Te Adam
Pātaka Art
Toi Gallery

Floor Plans
Scale at A4- 1:200

Appendix 2: Floor Plan of the Adam Art Gallery

Bibliography

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