

ORIGINAL COMPOSITIONS USING
CONTEMPORARY
CLASSICAL AND JAZZ TECHNIQUES,
ACCOMPANIED
BY TECHNICAL ANALYSIS
VOLUME 1 OF 3

**A thesis submitted in fulfillment of the requirements
for the Degree of Master of Arts in Music Composition**

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by Dennis Wijers 2011

Supervised by Dr. Eric Sweeney

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Declaration

I hereby declare that this thesis and portfolio of compositions is my own original work and that I have not received outside assistance.

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Signed

Dennis Wijers
24/09/11

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ABSTRACT

Original composition using contemporary classical and jazz techniques, accompanied by technical analysis

Dennis Wijers

This portfolio of compositions consists of six major works and is accompanied by a technical analysis of each. Nature, the sky, astronomy, clouds and many fields of science have always fascinated me and four of the works presented here are heavily influenced by this fascination. The two remaining works are inspired by my interest in computing, computer programming and the possibilities opened up by the use of computers in composition.

The first work, title *Jupiter Moons Suite* is a five-movement work for solo piano that is composed using the four permutations of a twelve-tone row. The first four movements each describe one of the four Galilean moons of Jupiter, while the final movement describes the surface of Jupiter itself.

Aurora Borealis, the second work submitted, is for an eight-voice female choir. It is a setting of a passage of prose about the northern lights that uses synesthesia to relate sounds to colours.

If-Then is a work for improvising ensemble that looks at the possibility of allowing the performers to determine large-scale compositional elements based on chance events that happen during the performance. It is a jazz-inspired suite that has many improvised passages.

Cumulus is a string quartet in one movement. It is influenced by my interest in the clouds. It uses melodic movement along a symmetrical axis and has asymmetric rhythmic ostinatos.

The fifth work is *Elements*, a piece for chamber ensemble and triggered sounds. It uses spectral analysis to blend live and pre-recorded sounds.

The final work *Zenith* is for 16 voices and orchestra. Like *Cumulus*, it is strongly influenced by the changing of clouds in the sky.

INTRODUCTION TO THE PORTFOLIO

Jupiter Moons suite is a five-movement suite for solo piano. It is a programmatic work where each of the first four movements describe the environment and landscape on the four Galilean moons of Jupiter. Named after their discoverer Galileo Galilei, each of the four moons has its own unique characteristics while all four are held in orbit by the common gravitational pull of the gas-giant Jupiter. The work is composed using a 12-tone row without any transposition. In much the same way as the same gravitational pull exerts influence on the moons, the same 12-tone row directs the compositional process for each of the first four movements. However, each movement uses a different permutation of the tone-row. Movements 1 to 4 use the tone-row as retrograde, inverse, original, retrograde, inversion, retrograde-inversion and original respectively. The fifth movement represents aspects of the surface of the planet Jupiter itself. Being the object that exerts a massive gravitational influence on the four moons, the four tone-row permutations are all incorporated into the compositional process of this movement.

The second work is for an eight-voice female choir with four sopranos and four altos. It is a setting of excerpts from a passage of prose written by the American writer Eduardo Roditi. The passage tells a mythological tale about the origins of the northern lights and the their changes in colour come about. The compositional setting is programmatic, describing how the tale tells of the character 'Samson' who hides behind the green pillars of light, emerging and sprinkling blood over them to turn them red. As the piece progresses, Samson returns to his hiding place and the pillars return to their green colour. The composition is written based on my interest in synesthesia and the relationship between colours and sounds. To my ears, certain chord types sound 'green'

while others sound 'red'. Using this starting point, the work progresses from green to red and back to a green resolution.

The third composition in the portfolio is a work for an improvising ensemble. The title *If-Then* refers to an aspect of computer programming where two or more possibilities are given to the computer and the option chosen is based on the inputted data. A simplistic example is a programme that determines whether the letters 'ABC' have been entered. If the user enters 'ABC', show the word 'alphabet', otherwise show the words 'not the alphabet'. This approach has been applied to the large-scale structure of a suite of seven parts. Only four of these musical episodes are played during any performance and the choice is determined random chance happenings during certain passages in the work. The suite looks at typical jazz tune structure, jazz rhythms and interplay between musicians. Improvised solo passages are a core parts of the suite.

Cumulus, the fourth work in the portfolio, is a single-movement work for string quartet. It is influenced by both my interest in asymmetrical rhythmic ostinatos and my general fascination with the clouds and the sky. In the piece, I describe the clouds passing overhead, with momentary rays of sunlight shining through. The work also describes travelling through the clouds and builds a great deal of rhythmic tension using non-symmetrical repeating rhythms. The topic of clouds passing overhead is one that I later revisited while composing *Zenith*, my work for 16 voices and orchestra. Melodically, the work explores symmetrical intervallic movement using a technique developed by the American saxophone player and theorist Steve Coleman. After the work was composed, it was later arranged for string orchestra.

During the second year of the research project, I became very interested in the possibilities of using computers to assist in composition and to use them to create sounds and heighten the strength of a work. The field of electroacoustic music literally offer composers a limitless environment within which to operate, no longer leaving them with the restrictions of the practical limits of the acoustic instruments. The fifth work in the portfolio, *Elements*, is one that heightens the quality of the performance of a chamber ensemble by surrounding the sound of the five live instruments with timbres derived from spectral analysis. The work aims to seamlessly blend the elements of live performance and pre-recorded triggered sounds, using speaker placement and coupling of live and synthesized timbres. To generate the pre-recorded sounds, I used the commercial application Max/MSP to build a digital subtractive synthesizer. This synthesizer allows me to create specific timbres with data from a spectral analysis of the live instruments.

After the work had been composed for chamber ensemble and triggered sounds, I arranged the work for saxophone and piano duo with live sound processing. For this, I wrote a new software application that took live sound samples and processed them on stage to recreate the textures of the chamber ensemble work. The live arrangement will be performed at the Irish Sound Science and Technology Convocation at University of Limerick in August 2011.

The final work in the portfolio is heavily influenced by my fascination with the ever-changing sky. *Zenith* is a work for 16 voices and orchestra, the title of which is an astronomical term for the point in the sky directly above the viewer. By narrowing the viewer's field of vision to just this zenith point and remaining focussed on it, he or she can watch as clouds pass through this region in the sky. All clouds have commonalities

but each is unique, distinct and only exists in that shape for that brief glancing moment. Some are small and almost transparent while others start thin at the edges but are incredibly dense and complex at their centre, particularly large storm clouds. It uses polytonality and polyrhythms of the same motif repeated by different instruments at different speeds. This results in a work that focuses on the varying of textural density to create a sense of movement and of tension and resolution.

1, JUPITER MOONS SUITE FOR SOLO PIANO

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1. GENERAL ANALYSIS

1.1.1, *Rationale*

The suite was conceived to use one tone-row in its original, retrograde, inversion and retrograde-inversion forms to create four distinct textures without transposing any of the four pitch rows. The fifth and final movement of the suite would use all four of the pitch rows and use transpositions.

The Galilean moons of Jupiter were an ideal subject to use to create these textures. These are the four moons that Galileo discovered orbiting Jupiter by observing the night sky in the early 17th century. Each is very distinct and it lends each of the movements a unique texture while all are held in orbit by the same common element, the gas-giant Jupiter.

I imagined that the four versions of the tone row were four ways of looking at the same thing. The results were all unique, but at their core, each is held in orbit around the one set of pitches in the same way as the moons orbit the one planet. To stay as close to this starting point as possible, I kept the four permutations of the tone row in their original, non-transposed form.

1.1.2. *Introduction to each movement*

Europa – Movement I:

Europa is a planet with an icy surface but is thought to have a deep ocean of liquid water under its surface. This liquid water is one of the solar system's most likely

contenders as an area to harbour life. The piece starts by viewing the icy surface and, as the movement progresses, signs of life are observed. To describe this texture, the movement primarily uses open-sixth chord voicing in the mid-region of the instrument. The rhythm constantly changes to give a sense of life and movement.

Callisto – Movement II:

Callisto is a dead, dusty wasteland. At present there is little activity on the moon. However, in the past, it has been under attack from meteors as can be seen from its crater-riddled surface. I tried to capture this in the second movement. Although uneventful, the moon has a dark history and even still at present it sees occasional attacks from meteors. A slow, ascending pattern forms the basis of the movement. It is first heard in the very low register and later in the upper register.

Io – Movement III:

Io is one of the most exciting regions in the solar system. Because of its close orbit to the surface of Jupiter, the gravitational effect creates constant volcanic activity. The planet has a burning surface of lava and molten rock. The third movement captures the sense of doom felt while on the surface of this moon. Clusters and asymmetric rhythms form the basis of this movement. It focuses on the lower register, with sudden bursts in the upper register to signify the explosive volcanoes.

Ganymede – Movement IV:

Ganymede is a bleak, icy, uneventful moon. It is not a particularly hostile terrain and its surface appears very smooth. I created a texture that was sparse, smooth and bleak using open sixths and a constant meter and pulse.

Jupiter - V:

Jupiter is a gas-giant planet with rings of ammonia crystal clouds visible on its surface. These clouds travel at different speeds and so the surface is always changing. I described these clouds travelling at different speeds by using a triplet-based melody over a quaver/crotchet based bass. When the melody repeats it appears at a different point. The second half of the movement is based on the storm in the giant spot. The giant red spot on the surface is a massive storm almost three times the diameter of Earth. Percussive clusters are heard. The final phrase of the movement described the sense of relief having left the storm and travelling away from the planet.

1.2, TECHNICAL ANALYSIS

1.2.1, *Pitch Analysis*

Tone-row chosen

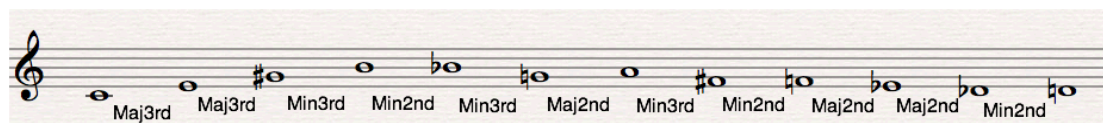


Fig. 1.1 : Original tone row

Pitch-class analysis

INTERVAL	#
min2nd/maj7th	3
maj2nd/min7th	4
min3rd/maj6th	3
maj3rd/min6th	2
perf4th/perf5th	0
tritone	0

Fig. 1.2 : Analysis of the numbers of each interval type

As seen above, the most common interval type is the major 2nd/minor 7th that appears four times. Both the minor 2nd/major 7th and the minor 3rd/major 6th appear three times. The major 3rd/minor 6th interval is used twice in the chosen tone-row. There are no occurrences of either the perfect 4th/perfect 5th or the tritone.

The programmatic nature of the subject chosen required the music to explore a wide variety of textures. The principle intervals were sixths and seconds in order to create a wide range of options. The perfect-intervals and the tritone were deliberately omitted in order to maintain a sense of atonality when parts of the row appear as melodic fragments. The omission of a tritone in the row reduces its level of inherent melodic dissonance.

1.2.2 *Europa*

Europa introduction and tone-row

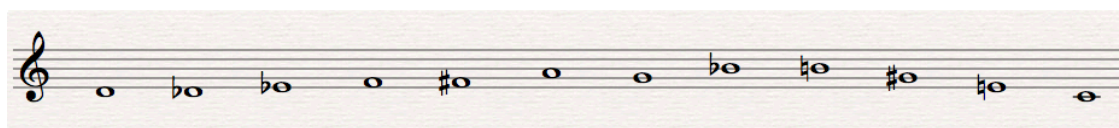


Fig. 1.3 : Europa tone-row, retrograde of the original

Europa is based on the retrograde permutation of the tone row. The movement uses pedal bass notes in rapidly ascending figures. The movement is marked as 'light, animated, full of life and intrigue'. The movement is a theme and variations in three sections.

Theme

The exposition (bars 1-15) establishes the two themes of the movement.



Fig 1.4 : Bars 1-8, Europa Theme 1, ascending melodic line



Fig. 1.5 : Bars 9-15, Europa Theme 2, ascending melodic line over a pedal bass

Theme 1 (*fig. 1.3*) starts with a melodic fragment based on two ascending figures with a distinct rhythm. The tone-row is explicitly stated in bars 1-2 in a four bar phrase which is answered by a second phrase in bars 5-8. The second phrase opens with an odd-meter bar to upset the sense of pulse.

Theme 2 (*fig. 1.5*) is a series of ascending and descending phrases over a pedal bass. This theme uses a more developed rhythm. The core tensions are created by the relationship between quavers and quaver-triplets and by the pedal bass moving in semi-tones.

Bars 9-10 use two ascending quaver-based phrases to create tension, which is released by the descending triplet figure at bar 11. Four more ascending phrases build new

tension, as two quaver-triplet phrases and then as two semi-quaver figures. Some of the tension is released by the descending triplet figure at the end of bar 15.

Variation 1

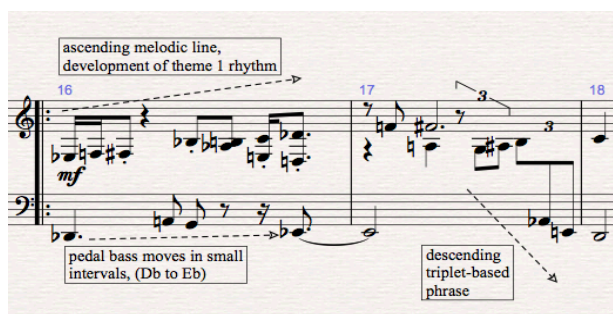


Fig. 1.6 : Bars 16-24, Europa Variation 1, development of theme 1 rhythm

The development is a repeated melodic passage based on elements from the two themes. The rhythm at bar 16 (*fig. 1.6*) is a development of the rhythmic figure at the start of theme 1 (*fig. 1.4*). It forms a four-bar phrase, ending on the Ab at bar 19:3.

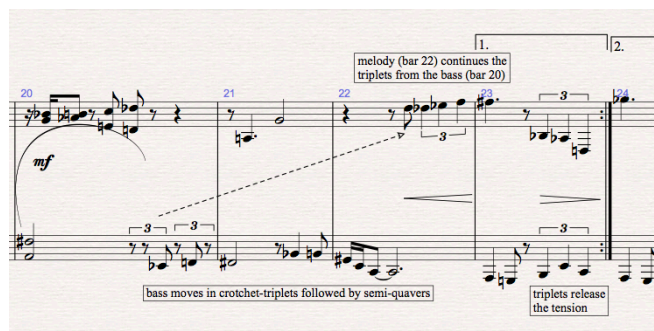


Fig. 1.7 : Bars 16-24, Europa Variation 1 (cont'd)

The development is primarily a melodic passage where the rhythmic interest is created by the tension between quavers and triplets. The bass uses the pedal idea from theme 2 (*fig. 1.5 and fig. 1.6*), which is then rhythmically developed by using crotchet triplets (*fig. 1.7*). The bass continues into a descending semi-quaver figure at bar 22, while the melody uses the crotchet triplet rhythm to create a cadence (*fig. 1.7*). Bar 23:3 uses a descending triplet phrase to release the tension in preparation for the repeat to bar 16. On the second-time ending, (*fig. 1.7 bar 24*) a similar descending three-note phrase is

heard. This time it is in quavers that create tension leading to the first repeated note of the movement (*fig. 1.7 bar 25*).

Variation 2

This section, from bars 25 to 39, further develops the themes by extending the ideas over longer phrases.

Fig. 1.8 : Bars 25-39, Europa Variation 2

Bars 25-28 (*fig. 1.8*) establish tension by using a repeated staccato bass note ascending in semi-tones. The melodic line is a racing semi-quaver passage finishing on a broken descending chord at bar 28. The repeated bass notes are a rhythmic development of the slowly ascending pedal bass from bar 16 (*fig. 1.6*).

metric modulation where all crotchets are sounded as crotchet-triplets (see appendix item 1)

bass establishes the triplet theme

Fig. 1.9 : Bars 25-31, Europa Variation 2 (cont'd)

Having extended the semi-quaver idea, the triplet rhythm is developed from bar 28:3 to bar 32. (fig.1.9). Bar 30 uses a metric modulation, where the crotchets written are sounded as crotchet-triplets.

wide descending intervals

rhythm from bar 32 repeated in bar 33 strengthening the sense of odd-metre pulse

Fig. 1.10 : Bars 32-39, Europa Variation 2 (cont'd)

Bars 32-38 (fig. 1.9) further develop the semi-quaver and crotchet-triplet rhythms. Bars 32-33 use two wide descending melodic intervals over an odd-meter quaver rhythm. The rhythm is the same in both bars, strengthening the sense of odd-meter pulse. Bars 34 to 38 extend the triplet motif from bars 30-31 (fig.1.9).

The movement ends with a final statement of the repeated bass note. It is played in the

low register to prepare for the following movement.

Conclusion

The movement is marked as ‘light, animated, full of life and intrigue’, demanding the music to be lively, bright and vibrant. To achieve this aim, it makes extensive use of inherent tension and release afforded by combining semi-quavers with quaver-triplets in similar melodic contexts. As the movement develops it becomes more exciting by the use of repeated pedal rhythms. With each variation of the theme, the material becomes more vibrant and rhythmically active, using metric modulations and odd-meter bars to obscure the basic pulse.

This lively movement is starkly contrasted by the slow, sinister second movement, ‘Callisto’.

1.2.3, *Callisto*

Callisto introduction and tone-row

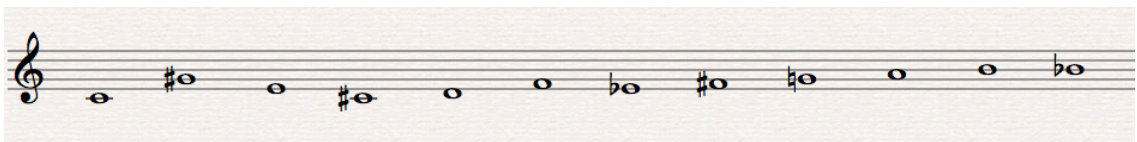


Fig. 1.11 : Callisto tone-row, inversion of the original

Callisto uses a slow, ascending, melodic phrase drawn from the inversion of the tone row. The tempo is marked as slow and sinister, with a metronome marking of {crotchet=55}. The movement is based in the very low registers of the instrument where the instrument produces an unsettling, sinister timbre.

The form, as in the first movement, is a theme and variations with two variations. The theme is heard from bars 1 to 9. From bars 10 to 17, variation 1 is heard and bars 18 to 25 is variation 2.

The dynamics of the movement never move above mezzo-piano and the momentum of the piece is created by the relationship between legato phrasing and staccato articulation. For example, the ascending legato phrase at bars 1 to 4 is answered by a descending staccato phrase at bars 5 to 7.

Theme

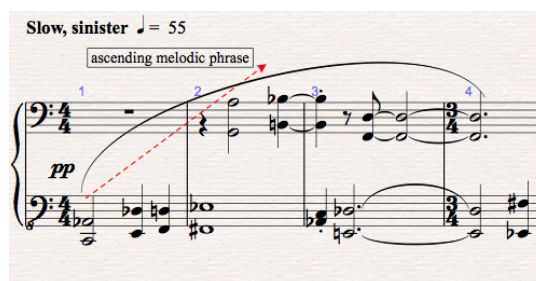


Fig. 1.12 : Bars 1-9, Callisto theme

The theme is an ascending melodic phrase using wide intervals. In its original form (fig.1.12) it is heard as a series of harmonically-sounded intervals in the low registers of the instrument. Its slow, creeping, ascending line is answered by a staccato descending phrase (bars 5-7) and a cadence point at bars 8 and 9. The rest at bar 9 allows the music to breathe before the start of variation 1 in the following bar.

Variation 1

Fig. 1.13 : Bars 10-17, Callisto Variation 1

The first variation (bars 10-17) opens with a restatement of the phrase from bars 1-2, developed at bar 12 with a broken chord. It is answered by a descending phrase at bar 15:3 to bar 16 which ends with a staccato cadence at bar 17. The hiatus point, at bar 13:3, is marked by the short staccato motif that appears throughout the suite.

Variation 2

Fig. 1.14 : Bars 18-25, Callisto Variation 2

Variation 2, from bars 18 to 25, is a further development of the original ascending melodic phrase. The opening notes are broken into melodic intervals. From bars 20 to 24 the triplets create a sense of metric modulation, previously heard in the 'Europa'

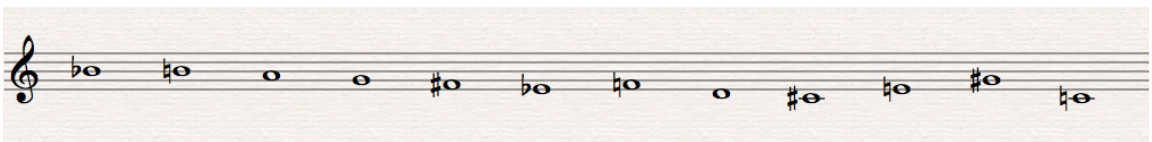
movement. It builds tension by using short, staccato notes that allude to the third movement which follows.

Conclusion

The movement is a theme and variations with a narrow dynamic range. Its momentum is generated by the use of the tension evident in the relationship between legato phrases and staccato articulation. The thematic material is varied and developed by breaking the block chords and letting the melodic line slowly creep up into the higher registers of the instrument. It ends with an agitated, triplet-based figure that prepares the ear for the dramatic third movement that follows.

1.2.4, *Io*

Io introduction and tone-row



1.15 : Io tone-row, retrograde-inversion of the original

The third movement describes the volcanic activity on this moon. It is based on the retrograde-inversion of the original tone-row. It is marked as 'aggressive and agitated' with {crotchet=120}.

The Themes

Unlike the first two movements, *Io* uses three different themes. It is in ternary form

(ABA) with themes 1 and 2 forming part of the A sections.

The A Section

The A sections of the movement are built from themes 1 and 2. They primarily use asymmetric rhythmic material and create tension and resolution by the relationships between conflicting rhythms.

Theme 1

1.16 : Bars 1-6, Theme 1

Theme 1 (*fig. 1.16*) is a rhythmically-asymmetric passage using many time signature changes, triplet and semi-quaver tension and very percussive staccato notes in the low range. It uses two-note cluster, generally in intervals of seconds or thirds. Theme 1, is repeated (bars 7-13) with a 'second time ending' at bars 12-13 leading to theme 2 bar bar 14.

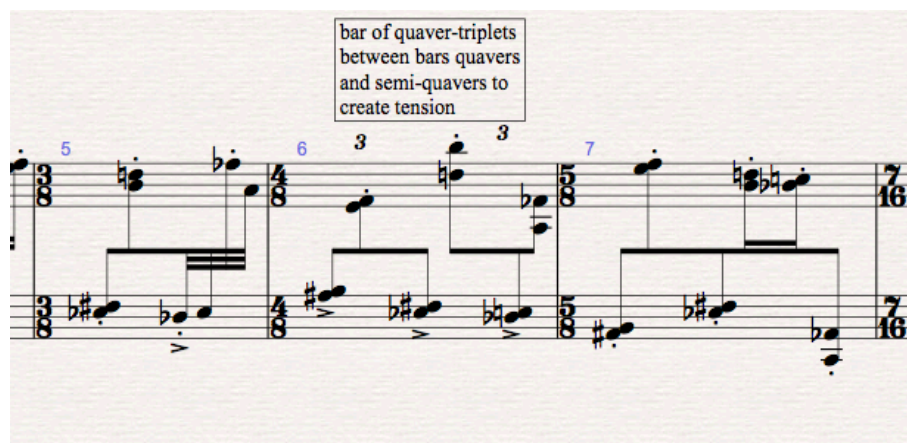


Fig. 1.17 : Bars 5-7, Theme 1: relationship between quaver-triplets and quavers

Theme 1 creates its tension and resolution from the relationship between semi-quavers and quaver-triplets (fig. 1.16).

Bars 1 to 6 present a rhythmic phrase built on this semi-quavers/quaver-triplet relationship. Bars 1-5 use rhythms built using a non-repeating rhythm to remove the sense of pulse. The phrase ends at bar 6. Here the quaver triplets create a sense of rhythmic cadence by further heightening the tension created by the odd grouping of rhythm from bars 1 to 5. The next phrase (bars 7-13) starts with a repetition of bars 1 to 5. Bars 12 and 13 form a cadence leading into theme 2 at bar 14.

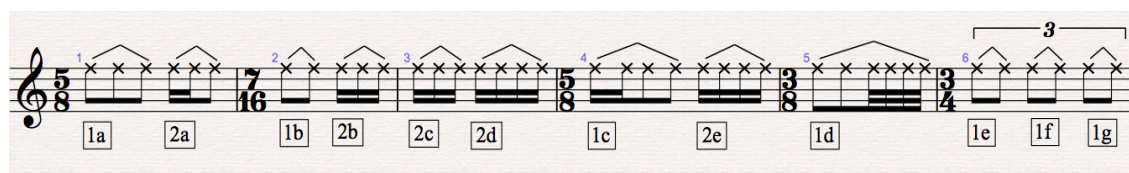


Fig. 1.18 : Theme 1, rhythmic analysis

The rhythmic material used for theme 1 is based on two rhythmic motifs that are expanded and contracted by adding and removing notes to create tension and release (see fig. 1.18). The first is a three-note quaver motif (1a), the second a three-note motif using two semi-quavers and a quaver (2a).

A great deal of tension and rhythmic interest is created by the different development of these two motifs. While motif 1 is gradually compressed, motif 2 is gradually expanded. Over these bars, motif 1 is first developed with a reduction (see 1a and 1b) but then gradually compressed with the introduction of extra notes (see 1c and 1d). The tension created by compressing motif 1 is then release by a final rhythmic reduction coupled with a metric modulation into quaver-triplets (1e, 1f and 1g). While motif 1 is gradually compressed, motif 2 is gradually expanded. After the initial compression of the motif at 2b and 2c, it is expanded at 2d and 2e.

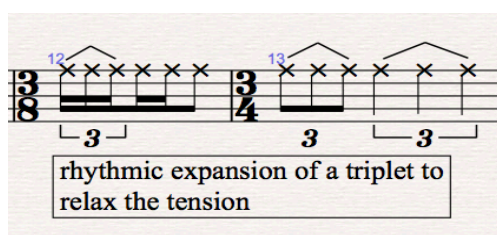


Fig. 1.19 : Bars 12-13, Theme 1 (cont'd)

Bars 12 and 13 (fig. 1.19) use a three-note triplet rhythm that doubles in length twice. Bar 12:1 shows the triplet based on semi-quavers, then bar 13:1 uses quaver-triplets and bar 13:2 uses crotchet-triplets. This expansion of rhythm removes a great deal of the inherent tension in bars 1 to 11 and prepares the ear for theme 2 which is not as rhythmically intense.

Theme 2



Fig. 1.20 : Bars 14-21, Io Theme 2a



Fig. 1.21 : Bars 22-27, Io Theme 2b

Theme 2 (example: bars 14-21, fig 1.20) uses long note-clusters in the low range. There is no sense of meter. Where theme 1 uses the semi-quaver/quaver-triplet relationship to create tension, theme 2 uses the minim/dotted-crotchet relationship. Theme 2 is heard from bars 14 to 27 and uses a slower harmonic rhythm, balancing the tension created by the fast, asymmetric rhythms of bars 1 to 14.

Two phrases are heard. The first (bars 14-21, fig. 1.20) is a series of four-note block

chords placed in rhythmically asymmetric positions. Here, the bar-by-bar movement from minims to dotted-crotchets obscures the basic pulse.

The second phrase (*bars 22-27, fig. 1.21*) starts with a melodic fragment that acts as a metric modulation. Where bar 21 is based on five crotchet beats, the bass of bar 22 is based on dotted crotchets and the melody in that bar uses dotted-quavers. The melodic fragment ascends, creating tension and leading to the first beat of the cadence bar at bar 27 which leads the listener to the development of material from theme 1 (bars 30-32).

Repetition and Development: bars 14-16 & bars 17-21

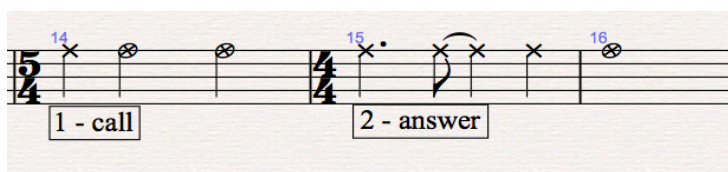


Fig. 1.22 : Bars 14-16, Rhythmic analysis

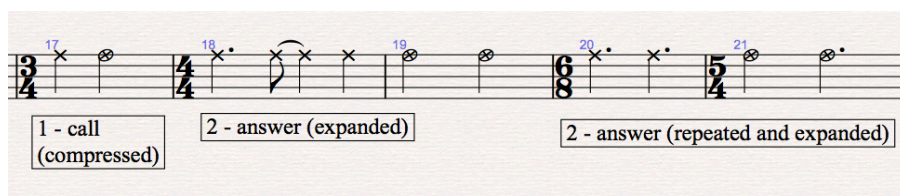


Fig. 1.23 : Bars 17-21, Rhythmic analysis

The phrase from bars 14 to 16 uses a rhythmic 'call and answer' (*see fig. 1.22*). This phrase is repeated and developed using a rhythmic expansion, where the answering passage is repeated, delaying the resolution.

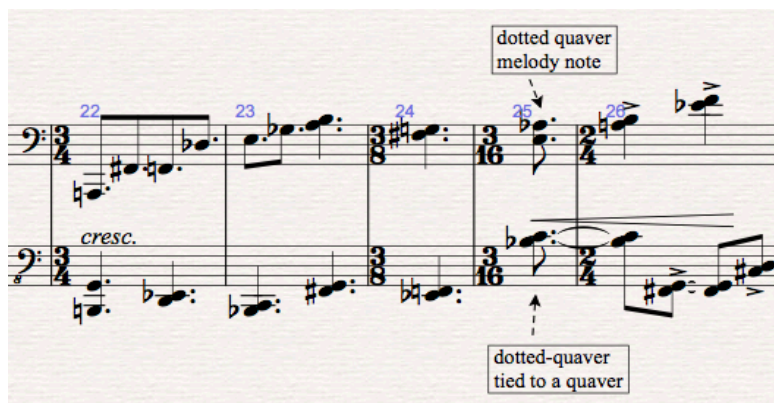


Fig. 1.24 : Bars 22-26, Implied metric modulation to dotted rhythms (bar 22-24)
followed by the obscuring of the pulse (bars 25-26)

The pulse of bars 14 to 21 is generally based on a series of crotchet rhythms, although this is obscured slightly at bars 15, 18 and 20 by the use of dotted-crotchets. From bar 22 (*fig. 1.24*) the rhythm implies a metric modulation, where the basic pulse shifts to dotted-crotchets and dotted-quavers until the end of bar 24.

Bars 25 to 26 further obscure the pulse, first by the use of a dotted quaver melodic note over a 'dotted-quaver tied to a quaver' in the bass. The obscuring of the pulse serves to create tension and leads the movement to the development of theme 1 from bar 27.

Development: Theme 1

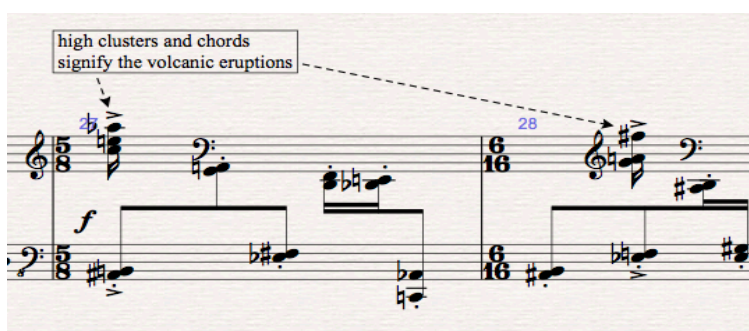


Fig. 1.25 : Bars 27-32, *Development: Theme 1*

Theme 1 returns briefly at the end of the A section (bars 27-34). The thematic material

is interspersed with percussive, accented clusters high in the range, signifying the eruption of the volcanoes.

Interlude

The image shows a musical score for two staves, bass and treble clef, in 5/8 time. The key signature has one sharp (F#). The score covers bars 33, 34, and 35. A dashed line with an arrow points downwards from bar 33 to bar 35, labeled 'descending melodic line and diminuendo'. A bracket under bars 33 and 34 is labeled 'dim.'. A bracket under bars 34 and 35 is labeled 'p'. A box at the bottom contains the text 'repeated rhythmic pattern stabilises the pulse for the rhythmic ostinato from bar 35 onward' with an arrow pointing to the rhythmic pattern in bar 35. The number '34' is written above the second staff in bar 34, and '35' is written above the second staff in bar 35.

Fig. 1.26 : Bars 33-34, Interlude

Bars 33-34 act as an interlude. The material used is an adaptation of the theme 1 (fig. 1.25) in a meter of five. Bar 34 is an exact repetition of bar 33, transposed down an octave. The descending melodic curve of the interlude leads the movement from the upper and mid range of the instrument to the low range of the rhythmic ostinato that follows from bar 34.

The 'B' Section, Theme 3

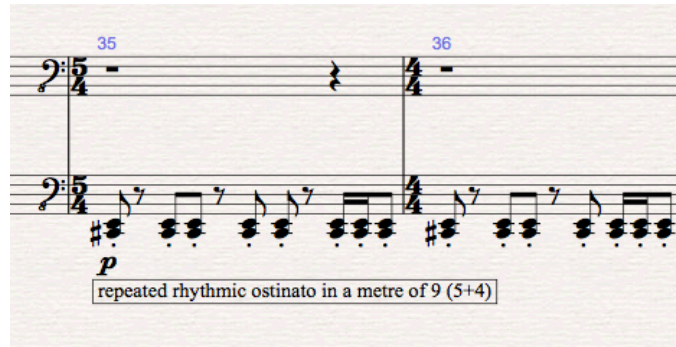


Fig. 1.27 : Bars 33-34, Theme 3, pedal point

Theme 3 uses a pedal bass rhythmic ostinato first heard at bar 33. The ostinato has a meter of nine.

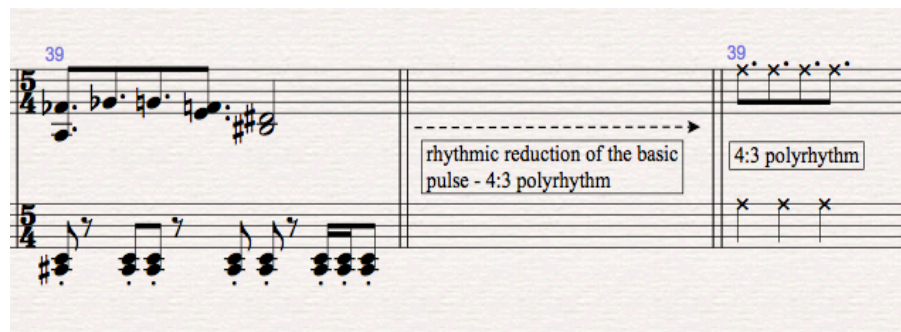


Fig. 1.28 : Melodic material creates 4:3 polyrhythm

From bar 39, a dotted-quaver melodic line is juxtaposed over the left-hand ostinato. The melodic material used comes from the retrograde-inversion of the tone-row, starting the row from the last two notes (C and Ab/G#).

The dotted-quaver rhythm juxtaposed over a crotchet/quaver bass ostinato creates a 4:3 polyrhythm and lends a deal of lyricism to the melodic line, starkly contrasting the repeated rhythmic phrase in the left-hand. The melodic line meets with the first beat of each bar and then steps away from the pulse using the 4:3 polyrhythmic relationship

with the bass ostinato. This return to the first beat of each bar give the section a deal of unity while still using the effect of a polyrhythm.

The image shows a musical score for two staves, treble and bass clef, in 4/4 time. Bar 46 is marked with a dynamic of *mf*. A bracket above bars 46 and 47 highlights a '3-note rhythmic figure' in the right hand, consisting of a quarter note, an eighth note, and a sixteenth note. The bass line features a steady eighth-note ostinato pattern.

Fig. 1.29 : Bars 46-47, Rhythmic right-hand figure

The theme 3 melodic phrase is heard from bars 39 to 44. The material is briefly repeated at bar 46 before the tension is heightened with the rhythmic right-hand figure at bars 46-47 (*fig. 1.29*). This three-note motif appears throughout the suite as a device that creates a rhythmic cadence.

The image shows a musical score for two staves, bass clef, in 16/8 time. Bar 49 is marked with a dynamic of *mf*. A bracket above bars 49 and 50 highlights 'repeated melodic & rhythmic material'. The melody consists of a sequence of eighth notes, and the bass line features a steady eighth-note ostinato pattern.

Fig. 1.30 : Melodic material based on semi-quavers

The figure at bars 46-47 states the short three-note rhythmic figure that is heard throughout the suite (*fig. 1.30*). The phrase is developed in the following bar as a five-note figure leading to the rhythmic expansion that follows.

The image shows a musical score for three bars, numbered 51, 52, and 53. The score is written in bass clef with a key signature of one flat. Bar 51 is in 3/4 time and contains a five-note rhythmic figure based on quavers and quaver triplets. Bar 52 is in 4/4 time and contains a triplet of eighth notes marked *sfz*. Bar 53 is in 9/8 time and contains three crotchet triplets. A dashed arrow points from a box labeled "rhythmic expansion to relax the tension" to the triplet in bar 53.

Fig. 1.31 : Bars 51-53, Rhythmic expansion

Bar 51 is a five-note rhythmic figure based on quavers and quaver-triplets. The figure is repeated in the next bar. Bar 53 takes the rhythm of the quaver-triplets and expands it to three crotchet-triplets, relaxing the tension and creating a point where the music can breathe before the return to theme 1 for the second 'A' section.

The image shows a musical score for bar 53. The score is written in bass clef with a key signature of one flat. The time signature is 9/8. The bar contains three crotchet triplets. Above the staff, the text "D.C. al Coda" is written. Below the staff, a box contains the text "3-note rhythmic figure appearing throughout the suite".

Fig. 1.32 : Bar 53, Three-note rhythmic motif

The three-note motif is used at a cadence point in bar 53. It is used throughout the entire suite.

The second 'A' section and the Coda

The second 'A' section is an exact repetition of the first 'A' section and is heard as far as the coda sign at bar 32.

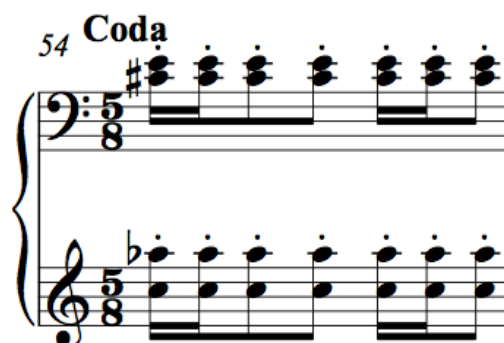


Fig. 1.33 : Coda motif, Augmented triad with a C# in the lower voice

The coda is a rhythmic figure repeated three times (*fig, 1.33*). It is an open augmented triad heard in sixths. The triad has a C# added in the lowest voice.

Conclusion

The movement is in ternary form showing two basic themes; the odd-meter rhythmic phrasing and the melodic line over a repeated rhythmic ostinato. The focus of the movement is on the obscuring of the sense of metre and pulse. The frequent time-signature changes and metric modulations make it difficult to feel where the basic pulse lies.

The tension and release within the movement is created through expansion and contraction of the rhythms of motivic material. Themes are presented, then rhythmically condensed to create tension and then expanded to create a sense of relaxation.

1.2.4, *Ganymede*

Ganymede Introduction and tone-row

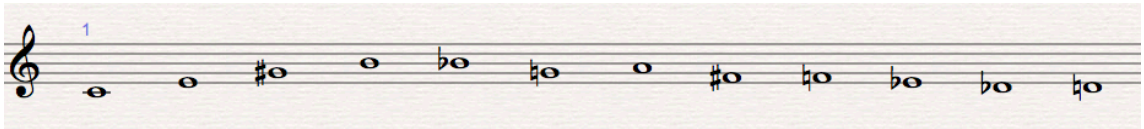


Fig. 1.34 : Ganymede tone-row, original

Ganymede is a slow, passive movement based on a texture created by major and minor sixth intervals heard harmonically. In stark contrast to the previous movement, Ganymede has a clear sense of pulse and a definite melodic line throughout. Apart from a brief, four-bar phrase, the dynamics of the movement do not go above mezzo-piano.

The movement is in ritornello form (ABACAD) with a development of the theme on each repetition.

Ritornello form: Thematic material



Fig. 1.35 : Bars 1-4, A1' Section

The theme at A is an ascending melodic figure first heard in bars 1 to 4. It is primarily built using four-note chords where the two upper and two lower voices are each a sixth apart. The sense of tension results from varying the interval between the two middle voices.



Fig. 1.36 : Bars 5-10, B' Section

The answering phrase at B (bars 5-10) releases the tension by outlining a similar melodic phrase descending.

The theme returns from bars 11 to 16 with a rhythmic expansion from bar 13 to 16 (*see fig. 1.40*).



Fig. 1.37 : Bars 17-27, 'C' Section

Section C (bars 17-27, fig. 1.37) is a melodic line reminiscent of the opening to movement 1 *Europa*. In contrast to the previous sixteen bars this phrase uses broken chords rather than block chords. It builds in dynamics, crescendoing to forte at bar 24, the emotional climax of the movement. From here the phrase reduces in dynamic leading to the pianissimo at bar 28. At bar 23, the phrase uses a motif that appears throughout the suite. Three clear staccato notes are heard, which give a strong sense of movement to the phrase. A rhythmic compression of the motif appears later in the movement at bar 31.

The next repetition of the theme (fig. 1.41) is in broken chords in the mid- and upper registers of the instrument. The descending three-note motif heard at bar 23 is heard again as a rhythmic compression at bar 31. Here the motif is heard as semi-quavers which acts as an interrupted cadence.

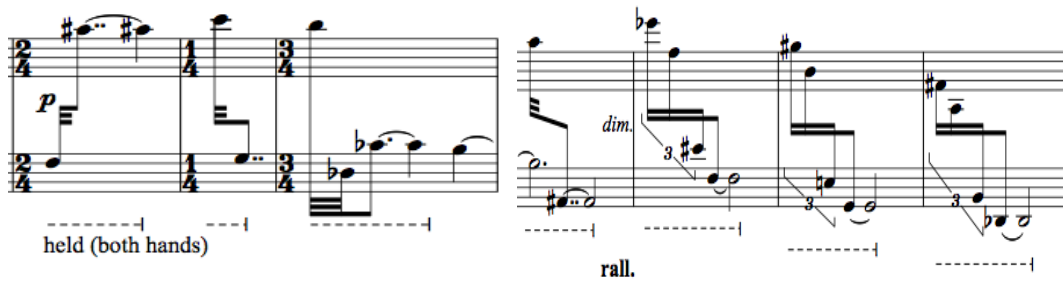


Fig. 1.38 : Bars 32-38, 'D' Section

The movement continues with the D section from bars 32 to 38 (*fig. 1.38*). Wide, two-note intervals are heard as broken chords. Bar 36 to 38 uses semi-quaver triplets to break the descending chords and to release tension.

The movement ends with a final, brief statement of the theme at bar 39 to 40 (*see fig. 1.42*).

Analysis of development in 'A' Sections



Fig. 1.39 : Bars 1-4, 'A1' Section

The thematic material (*fig. 1.39*) is built on the voicing of major and minor sixth intervals, heard harmonically, with the upper voices of the intervals creating a melodic

line.



Fig. 1.40 : Bars 11-16, 'A2' Section

Here (fig. 1.40, bars 11-12), the phrase opens as an exact repetition of bars 1 and 2. On the third bar of the phrase (bar 13), the Db-D interval is inverted, placing the D-natural in the melodic line, creating tension. From bars 13 to 15, the rhythm is expanded to delay the resolution of the melodic tension created by the D-natural in bar 13. The pulse is distorted by the lack of a clear rhythm on the first beats of bars 14 and 15.

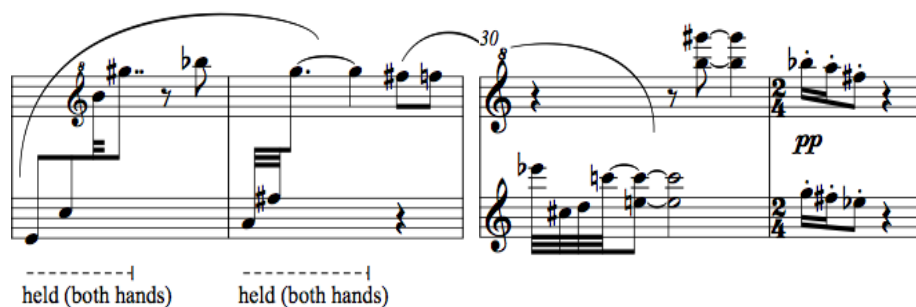


Fig. 1.41 : Bars 28-31, 'A3' Section

In bars 28 to 31, we hear the thematic material as a series of broken chords with the notes held.



Fig. 1.42 : Bars 39-40, 'A4' Section

The final presentation of the material at bars 39 to 40 hears the original theme from bar 1, relaxing all the tension created through the development of the material.

Conclusion

The movement is a ritornello form with a large degree of development on the repetition of each of the 'A' sections. These 'A' sections are developed through rhythmic expansion, inversion and the breaking of chords.

It uses quiet dynamics, only briefly moving above mezzo-piano. Marked as 'sparse, bleak and tranquil', the movement is in stark contrast to the third movement, 'Io', and the strident quality of the final movement, 'Jupiter'.

1.2.6, *Jupiter*

Jupiter introduction

'Jupiter', the fifth and final movement of the suite uses elements of each of the four tone row permutations. The thematic material is built using ostinatos juxtaposed with non-repeating rhythms.

The movement is in AA¹BC form, where A¹ is the repetition of A with the left and right hand rhythmically shifted apart by a bar.

The 'A' Section



Fig. 1.43 : Bars 1-15, The 'A' Section

Theme 1 is first heard from bars 1 to 15 and then developed from bar 16 to 30 by shifting the position of the melody notes in the opening of the melodic phrase. It is based on the ensuing tension resulting from the juxtaposition of even-quavers and quaver-triplets, two melodic ideas which are rhythmically unrelated. This is a typical tension-building device employed in jazz music.

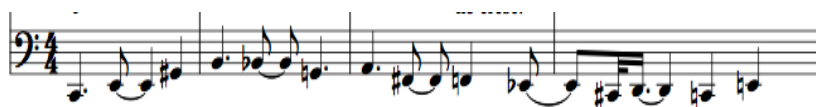


Fig. 1.44 : Bars 1-4, Bass line

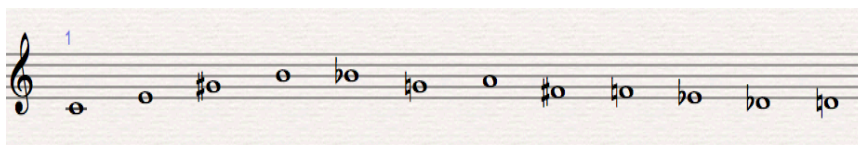


Fig. 1.45 : Original tone-row

The bass line from bars 1 to 4 (*fig. 1.44*) is a rhythmic displacement of the original tone row (*fig. 1.45*). Its rhythm uses quaver, crotchet and dotted-crotchet rhythms. As the bass-line progresses, the tone-row repeats with rhythmic development on each repetition.

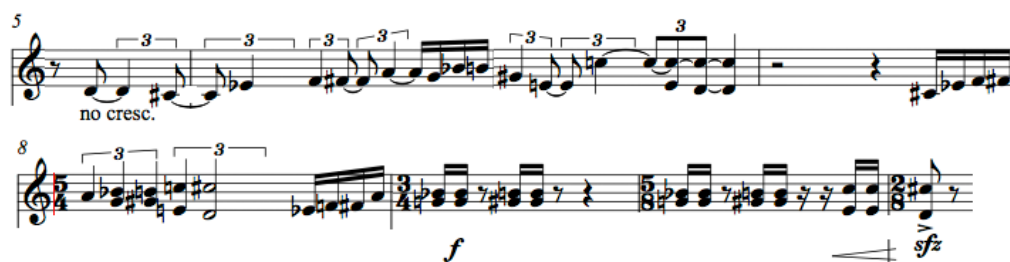


Fig. 1.46 : Bars 3-10, Melodic material, retrograde tone-row

The melodic lines throughout the section incorporate motifs and phrases from each of the tone-row permutations. For example, the melodic material heard from bars 3 to 10 is based on the retrograde tone-row heard in the 'Europa' movement.



Fig. 1.47 : Bars 11-12, Original tone-row (RH) and retrograde inversion (LH)

As mentioned earlier, the core tensions of the movement are created by the juxtaposition of the contrasting rhythms in the left and right hands, or built and released using rhythmic expansion and contraction. From bars 8 to 9 the right-hand rhythm becomes more active, using only short, two-note figures in semi-quavers. The heightened tension reaches a climax at bar 10 where the rhythms of the left and right hands coalesce on an accented *sforzando*.

The metric modulation at bar 11 relaxes the rhythmic tension created by the juxtaposition of quaver-based and quaver-triplet based rhythms. Melodically, the right-hand is a descending line taken from the original tone-row heard in 'Ganymede'. The left-hand plays two-note clusters from the retrograde-inversion of the tone-row heard in 'Io'.

Bar 11 dissipates this tension using a number of techniques. Melodically, the line descends, contrasting the earlier ascending line. The rhythm is an expansion created using a metric modulation that gives the effect of a series of seven crotchet-triplets. There is also a three-over-two polyrhythmic figure between the LH and RH that

resolves on beat 1 of bar 12. This series of melodic and rhythmic devices creates a cadence point that eases the tension from the phrase and prepares the listener for its repetition.



Fig. 1.48 : Bars 13-14, Jazz rhythms, original tone-row

The triplet-based melodic phrase at bars 13 to 14 is taken from the original tone-row. The triplet-rhythm relaxes the tension from the earlier juxtaposed phrases.

The phrase from bars 12 to 15 acts as a further rhythmic expansion. The bass material is borrowed from bars 1 to 4. The melodic material is new and uses a triplet-based 'jazzy' phrase based on transpositions of sections of the original tone-row.



Fig. 1.49 : Bar 15, rhythmic contraction creating a brief metric modulation to quaver-triplets

The phrase at bar 15:2 acts as a rhythmic contraction to heighten the tension for the return to the original theme at bar 16. The accents on the first, third and fifth of the six

quaver-triplets act as a brief metric modulation. The resulting rhythmic contraction heightens the tension for the return to the original theme at bar 16 and also alludes to the full metric modulation that will occur later at bar 31 (see fig. 1.52)



Fig. 1.50 : Bars 2-4, 'A' Section



Fig. 1.51 : Bars 17-19, 'A' Section

The melodic material in the 'A' section opens on the third bar from the start of the bass line (bar 3, fig. 1.50). On the A¹ section this same melodic phrase is repeated but starts a bar earlier, on the during the second bar from the start of the bass line. This shifting of material subtly changes the relationship between the melodic material and the bass line. A metric modulation occurs when a new pulse is introduced, generally based o a subdivision of the previous pulse. It allows an ensemble to make sudden expansions and contractions of rhythmic phrases with extreme precision. Metric modulations are a common element in most of the works submitted in this portfolio.

The 'B' Section

The 'B' Section opens with a metric modulation that heightens the tension and drama. This excitement is built upon by the contrasting rhythms and phrases in the left and right hands. The two hands will be analyzed separately.

'B' Section - Left Hand

The role of the left hand in the 'B' section is to create a quaver-based ostinato and, from bar 47, to create a steady pulse upon which the right-hand can create contrasting rhythmic groupings.



Fig. 1.52 : Bars 31-46, The 'B' Section: bass ostinato. A six-note motif is heard as quavers then metrically modulated to quaver-triplets

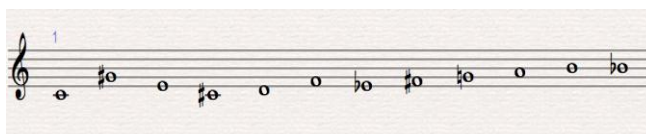


Fig. 1.53 : Inversion of the original tone-row

Theme 2 appears after a metric modulation. A bass ostinato (*fig. 1.54*) is heard which uses a 4+3 metre with a metric modulation of the bar of 3 on each second repetition (*as indicated in 1.52*). The result is a series of bars in 4+3+4+2 where the bar of 2/4 uses the material from the 3/4 bar in quaver-triplets. The series of pitches is taken from the inversion of the tone-row, which formed the basis for 'Callisto', movement 2 of the suite.

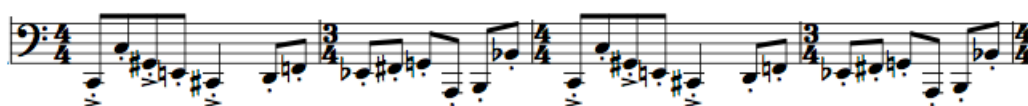


Fig. 1.54 : Bass ostinato without the metric modulation

From bar 47, the bass ostinato is repeated using only the 4+3 metre, omitting the metric modulation. This gives the remainder of the movement a steady pulse.

'B' Section – Right Hand

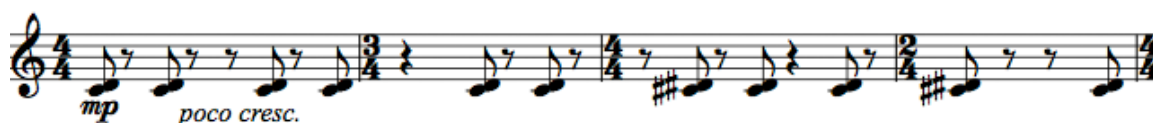


Fig. 1.55 : Right-hand clusters grouped in 2+3



Fig. 1.56 : Clusters in the opening of the third movement, *Io*.

The right-hand plays two-note clusters (fig. 1.52) reminiscent of the clusters in Io (fig. 1.56). The clusters are grouped in a 2+3 rhythmic grouping creating a polyrhythmic effect with the bass ostinato continuing in 4+3+4+2.



Fig. 1.57 : Quavers grouped in threes (2+1).

The effect of a rhythmic compression is created at bar 44 (fig. 1.52) where the 2+3 grouping condenses to a grouping in threes before returning to a grouping in fives at bar 46:2.

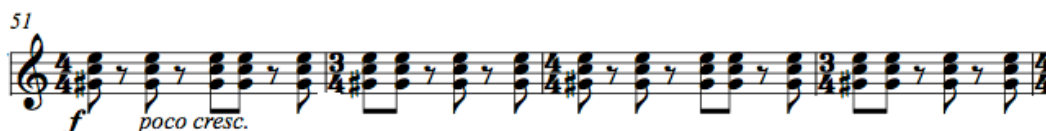


Fig. 1.58 : Right-hand: augmented triad

From bar 51, the right-hand forms a three-note augmented triad based on the opening three notes of the original tone-row (fig. 1.58). The rhythm of the triads matches the metre of seven. At bar 55, the augmented triad is transposed up a minor-third with the upper-most note of the previous triad added. The same chord is transposed up a minor-third at bar 59.

'B' Section Left and Right Hands

The image shows a musical score for three bars (63, 64, and 65) in 5/4 time. The top staff is in treble clef and the bottom staff is in bass clef. The key signature has one sharp (F#). The first bar (63) contains four chords, with the first three marked with a fermata. The second bar (64) contains three chords, with the first two marked with a fermata. The third bar (65) contains three chords, with the first two marked with a fermata. The first bar is labeled '4 notes' and the second and third bars are labeled '3 notes' and '3 notes' respectively. The third bar is also labeled 'crotchet triplets'. The dynamic marking 'fff' is present in the first bar.

Fig. 1.59 : Bars 63-65, Rhythmic expansion

Bars 63 to 65 (fig.1.59) creates a rhythmic expansion of the chords in both the left and right hands, dissipating the tension created from bar 31 to 62. The four note rhythm of bar 63 is first reduced by omitting the third chord. This three-note rhythm is moved from quavers to crotchet-triplets, relaxing the rhythmic tension and leading to the coda section at 'C'.

The 'C' Section: Coda

The image shows a musical score for two bars (66 and 67) in 5/4 time. The top staff is in treble clef and the bottom staff is in bass clef. The key signature has one sharp (F#). Both bars contain rests in both staves. The first bar is labeled '66' and the second bar is labeled '67'.

Fig. 1.60 : Bars 66-67, Rests

The rests at bars 66 and 67 allow the music to breathe at the start of the final section of

the suite which acts as a coda.



Fig. 1.61 : Bars 68-78, New material

At bar 68, new melodic material is introduced in a short ternary form. The metric modulation at that bar further relaxes the tension from the 'B' section.

Thematically, the melodic line from bars 68 to 70 is based on the original tone-row, most reminiscent of the bass-line that opened the Jupiter movement. There is no clear sense of pulse and the section is dynamically quieter, opening mezzo-piano. Bars 71 to 74 for the answering phrase. The melodic line is then repeated pianissimo ending on a chord reminiscent of the opening phrase in the Ganymede movement.

3. CONCLUSION

Being twelve-tone music, the suite demand a series of techniques beyond traditional functional harmony to create tension and release within the work. A variety of methods are employed to achieve this. In particular, a set of rhythmic and melodic devices are used to heighten tension and bring about its satisfactory resolution.

Use of rhythm

Rhythm is used extensively as a means to create tension and resolution. The suite makes

use of the inherent tension and release afforded by the juxtaposition of contrasting rhythms and the possibilities of tension and release generated through rhythmic expansion and contraction.

Juxtaposition of contrasting rhythms creates a great deal of tension. This technique is used at the opening movement five. Here, quaver-triplets in the melody act as a rhythmic contrast to the quaver-based bass-line.

Expansion and contraction of rhythm is often used to create cadence points throughout the suite. Melodic figures can be contracted to heighten tension and then expanded to release the tension.

Use of motifs

Although many melodic building-blocks are used throughout the suite, a small number appear regularly.

Short staccato phrases

Brief two- and three-note staccato appear in each of the five movements, acting as a motivic figure that unifies the overall work. They are generally used at cadential points to either heighten or dissipate tension. The motivic phrases appear at many points throughout the work, including mov't.1 bar 39, mov't. 3 bars 46-47 and at mov't. 3 bar 53.

Augmented triad

An augmented triad is often heard throughout the work to allude to a tonal centre while still maintaining an ambiguous tonality. An example of this is seen at movement 1 bar 37.

Approach to harmony

Tension and release is created harmonically by varying the intervals between pitches. Seconds create tension while thirds and sixths create resolution and consonance. Fourths and fifths are rarely used in the suite, as they imply a tonality.

1.4, LIST OF FIGURES AND DIAGRAMS

Europa

Fig. 1.1 : Original tone row

Fig. 1.2 : Analysis of the numbers of each interval type

Fig. 1.3 : Europa tone-row, retrograde of the original

Fig. 1.4 : Bars 1-8, Europa Theme 1, ascending melodic line

Fig. 1.5 : Bars 9-15, Europa Theme 2, ascending melodic line over a pedal bass

Fig. 1.6 : Bars 16-24, Europa Variation 1, development of theme 1 rhythm

Fig. 1.7 : Bars 16-24, Europa Variation 1 (cont'd)

Fig. 1.8 : Bars 25-39, Europa Variation 2

Fig. 1.9 : Bars 25-31, Europa Variation 2 (cont'd)

Fig. 1.10 : Bars 32-39, Europa Variation 2 (cont'd)

Callisto

Fig. 1.11 : Callisto tone-row, inversion of the original

Fig. 1.12 : Bars 1-9, Callisto theme

Fig. 1.13 : Bars 10-17, Callisto Variation 1

Fig. 1.14 : Bars 18-25, Callisto Variation 2

Io

Fig. 1.15 : Io tone-row, retrograde-inversion of the original

Fig. 1.16 : Bars 1-6, Theme 1

Fig. 1.17 : Bars 5-7, Theme 1: relationship between quaver-triplets and quavers

Fig. 1.18 : Theme 1, rhythmic analysis

Fig. 1.19 : Bars 12-13, Theme 1 (cont'd)

Fig. 1.20 : Bars 14-21, Io Theme 2a

Fig. 1.21 : Bars 22-27, Io Theme 2b

Fig. 1.22 : Bars 14-16, Rhythmic analysis

Fig. 1.23 : Bars 17-21, Rhythmic analysis

*Fig. 1.24 : Bars 22-26, Implied metric modulation to dotted rhythms (bar 22-24)
followed by the obscuring of the pulse (bars 25-26)*

Fig. 1.25 : Bars 27-32, Development: Theme 1

Fig. 1.26 : Bars 33-34, Interlude

Fig. 1.27 : Bars 33-34, Theme 3, pedal point

Fig. 1.28 : Melodic material creates 4:3 polyrhythm

Fig. 1.29 : Bars 46-47, Rhythmic right-hand figure

Fig. 1.30 : Melodic material based on semi-quavers

Fig. 1.31 : Bars 51-53, Rhythmic expansion

Fig. 1.32 : Bar 53, Three-note rhythmic motif

Fig. 1.33 : Coda motif, Augmented triad with a C# in the lower voice

Ganymede

Fig. 1.34 : Ganymede tone-row, original

Fig. 1.35 : Bars 1-4, A1' Section

Fig. 1.36 : Bars 5-10, 'B' Section

Fig. 1.37 : Bars 17-27, 'C' Section

Fig. 1.38 : Bars 32-38, 'D' Section

Jupiter

Fig. 1.39 : Bars 1-4, 'A1' Section

Fig. 1.40 : Bars 11-16, 'A2' Section

Fig. 1.41 : Bars 28-31, 'A3' Section

Fig. 1.42 : Bars 39-40, 'A4' Section

Fig. 1.43 : Bars 1-15, The 'A' Section

Fig. 1.44 : Bars 1-4, Bass line

Fig. 1.45 : Original tone-row

Fig. 1.46 : Bars 3-10, Melodic material, retrograde tone-row

Fig. 1.47 : Bars 11-12, Original tone-row (RH) and retrograde inversion (LH)

Fig. 1.48 : Bars 13-14, Jazz rhythms, original tone-row

Fig. 1.49 : Bar 15, rhythmic contraction creating a brief metric modulation to quaver-triplets

Fig. 1.50 : Bars 2-4, 'A' Section

Fig. 1.51 : Bars 17-19, 'A' Section

Fig. 1.52 : Bars 31-46, The 'B' Section: bass ostinato. A six-note motif is heard as quavers then metrically modulated to quaver-triplets

Fig. 1.53 : Inversion of the original tone-row

Fig. 1.54 : Bass ostinato without the metric modulation

Fig. 1.55 : Right-hand clusters grouped in 2+3

Fig. 1.56 : Clusters in the opening of the third movement, Io.

Fig. 1.57 : Quavers grouped in threes (2+1).

Fig. 1.58 : Right-hand: augmented triad

Fig. 1.59 : Bars 63-65, Rhythmic expansion

Fig. 1.60 : Bars 66-67, Rests

Fig. 1.61 : Bars 68-78, New material

**2, AURORA BOREALIS FOR EIGHT VOICE FEMALE CHOIR
SSSSAAAA**

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2.1, GENERAL ANALYSIS

2.1.1, *Rationale*

The work is a setting of a selection of text from a short story by the American writer Eduardo Roditi. It tells a mythological tale about the origins of the northern lights and how their changes in colour come about. The character, Samson, hides behind the green pillars of light and as he emerges, he sprinkles them with blood and colours them red.

2.1.2, *Introduction*

The setting of the poem uses different types of chord structures to describe the different colours. Green is heard as a highly-consonant structure based on diatonic intervals of a second and a third. Red is heard as a tense structure using clusters. The movement from one colour to another is generally slow, mimicking the changes in the colours of the northern lights themselves. Other techniques are also used throughout the work to describe various elements of the Nordic environment. To represent the arctic winds, the performers are instructed to blow air or to whisper a given text to create a murmuring effect.

For the following chapter, the term 'tonality' refers to passages that are based on chord progression and cadential sequences resolving to particular tonal centre. 'Tonality', as termed here, can appear for brief chord progressions in the 'key of the moment' and shift quickly from one tonal centre to another. The term 'modality' refers to passages based on

the interchange between various melodic modes without necessitating the harmonic support of a chord progression leading to a particular tonal centre.

2.2, TECHNICAL ANALYSIS

2.2.1, *Large-scale structural analysis*

The large-scale structure of the work can be broken into three phases, relating to the colours that they represent.

Phase 1 (bars 1-44)

Phase 1 represents the green pillars of light calmly hanging above the arctic landscape. Brief moments of melody and harmony are carried over the wind and disappear as quickly as they appeared. The character 'Red Samson' hides in the background. To describe this, the three augmented chords use the three syllables of his name. These appear at bars 8-11, 19-21 and 27-30.

Phase 2 (bars 45-83)

The serenity from the previous phase is suddenly lost as the character Samson emerges, throwing blood onto the pillars of light and turning them red.

Phase 3 (bars 84-105)

As Samson returns to his hiding place behind the pillars, the green lights start to reappear and slowly the lights of the aurora colour the sky green once again.

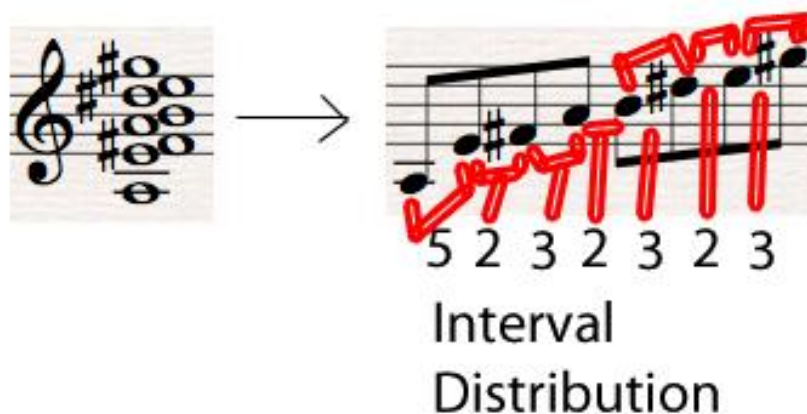
Harmonically, a great deal of the consonant sections of the work are grounded in various types of triadic movement. However, there is no definite tonal centre throughout

the work. The consonant phases 1 and 3 move between G Lydian and A Lydian with phase 1 also using triadic movement that moves around the tonal centres of Bb minor and C minor. Phase 2 is largely based on quartal chords with no clear tonal centre.

2.2.2, Phase 1 analysis

Section A (bars 1-7)

The 'A' section acts as an introduction, opening with a consonant C major triad that spreads into a C-Lydian cluster. This is followed by a canonic diffusion of three semi-quavers around the eight voices, rebuilding of the chord one voice at a time, giving a



sense of movement and pulse.

Fig. 2.1 : Bar 7, Structure of the A-Lydian chord as a perfect fifth follow by diatonic seconds and thirds.

The tonal centre of C briefly moves to a G Lydian tonality before coming to rest on a large A Lydian chord, built with an interval of a fifth in the two lowest voices and the upper six voices singing diatonic seconds or thirds. See fig 2.1, that shows the A Lydian chord voicing. This chord structure is common throughout the work.

Section B (bars 8-17)

The eight voices are divided into two groups. Group 1 is S1, S2, S3, A1 and A3. Group 2 is S4, A2 and A4. Group 1 sings specific pitches while group 2 creates non-pitched sounds such as wind-sounds and whispering.

The augmented triad with a major second at its base (bars 8-11) is carried over both the wind and the whispering. It seems to appear from nowhere and then disappearing in the same manner.

Bar 13	Bar 14	Bar 15	Bar 16	Bar 17
Bb-minor Eb	F minor	Bb aug C aug	Db Bb minor	Db

Tonality **Blurring the tonality** **Tonality**

Fig. 2.2 : Bars 13-17, Harmonic progression starting in Bb minor, blurring the tonality with augmented chords and ending in Db major

The writing is syllabic, largely in rhythmic unison. The passage seems to open in a clear Bb minor and close in its relative major key of Db. In between, the tonality is blurred at bar 15 by the use of augmented triads in Bb and C.

Section C (bars 18-26)

Section C opens with the second of the augmented chords, carried over the wind sounds of the whispering. S2 joins group 2 by whispering and leaving the groups with four

members each.

Bar 22	Bar 23	Bar 24	Bar 25
Bb minor	F# minor F minor	C minor	C minor

Movement down a major third (Bb to F#)

Fig. 2.3 : Bars 22-25, Triadic progression using a major third movement

The voices of group 1 sing canonically, each entering with a crescendo from pp to p and ending with a diminuendo *a niente*. Harmonically, the passage opens with a Bb minor, with a triad movement of a major third to an F# minor. This moves to an F minor to rest on a C minor. Triadic movement in thirds is a device used often in the work.

Section D (bars 27-41)

Section D opens with the third of the three augmented chords. The roles of groups 1 and 2 are reversed with a hand-over at bars 27-28. One-by-one the members of group 1 start to whisper while the Db of S1 is carried over to S2 and an augmented chord is built downwards.

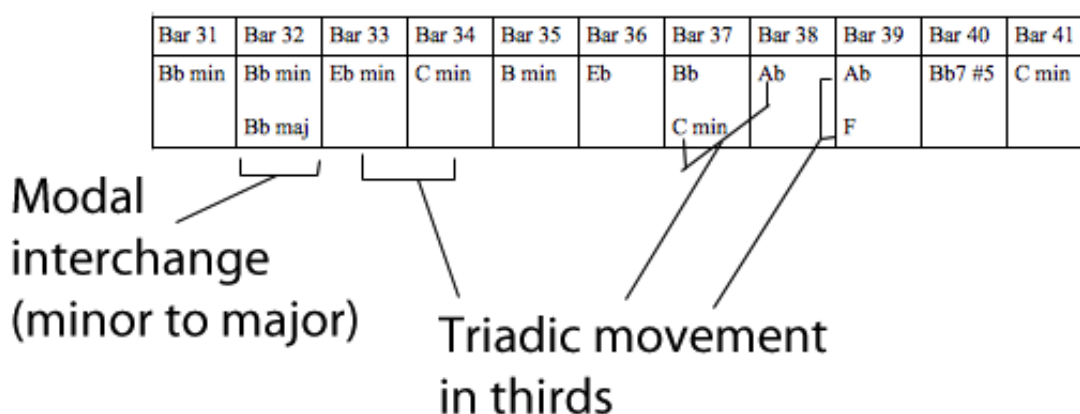


Fig. 2.4 : Bars 31-41, Harmonic progression using modal interchange and triadic movement in thirds

As with group 1 in Section C, the voices of group 2 enter canonically. The melodic lines are rhythmically asymmetric and there are frequent time signature changes. The harmonic progression of the section is based on the movement of major, minor and augmented triads can be broken down into three sections, from bars 32-34, bars 35-38 and bars 39-41 each coming to rest in the key of C minor. It opens in Bb minor, quickly moving to Bb the VII of the C minor chord that follows. After briefly side-stepping up a semitone to Db, the first phrase comes to rest on C minor at bar 34. The second phrase starts with a B minor followed by a movement of a third to Eb and a descending fifth to Bb, again the VII of C minor. The third phrase starts with a descending third to Ab, followed by a further descending third to F. The progression descends by a fifth to Bb+ and Bb+7 before resting on C minor.

Section E (bars 42-44)

Section E is a short phrase whispered in unison. It ends the consonant first phase of the

work, acting as a cadence point that allows the work to move into the more tense phase that follows.

2.2.3, Phase 2 analysis

Section F (bars 45-49)

Section F opens with a notated passage that establishes the rhythmic cell that will be developed. ‘Red Samson’ is repeated, with different voices forming parts of the quartal chord. The phrase at bar 49 allows the eighth voices to enter with a specific pitch whenever they feel is appropriate. The texture becomes more and more dense, leading to the climactic stamp of the feet at the start of section G.

Section G (bars 50-63)

Section G opens with the eight singers stamping their feet once, signalling the change from green light to red sky, followed by a large quartal chord. The harmonic progression can be broken into two parts. The first runs from bar 51-54 and the second from 55 to 62.

Bar 51	Bar 52	Bar 53	Bar 54
Bb minor	Bb minor Eb aug	F minor	F minor

Simple progression modulating from Bb minor to F minor via an Eb aug (bar 52)

Fig. 2.5 : Bar 51-54, The first part of the harmonic progression. It modulates from Bb minor to F minor

The first part of the progression is a simple modulation from Bb minor to F minor, using

an Eb augmented chord at bar 52 to add colour. The progression firmly establishes a tonality of F minor, although it quickly modulates away from here at bar 55.

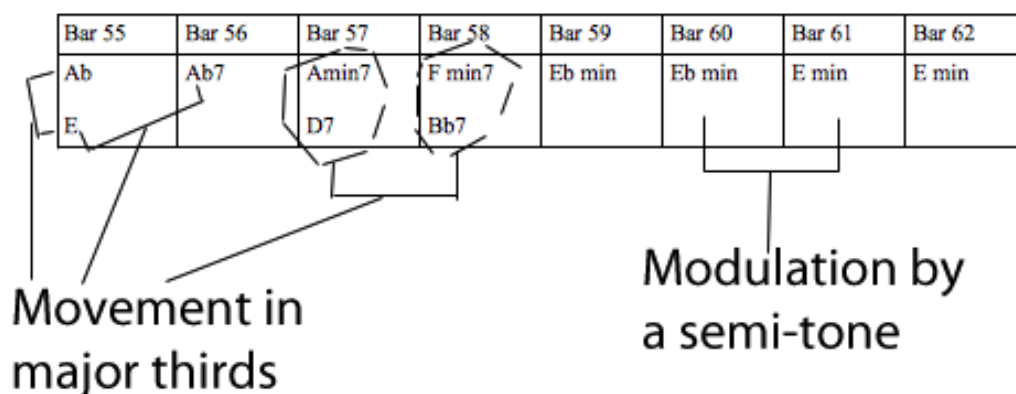


Fig. 2.6 : Bars 55-62, The second part of the progression. It uses triadic movement in thirds and a modulation of a semi-tone.

From bar 56 the tonality moves away from an F-minor towards the Eb-minor at bar 59 following a longer, more complex progression. The phrase opens with an Ab major moving by a major third to E and back to Ab, this time a dominant chord of Ab7, the bVII7 of Aminor. The progression A-7 D7 | F-7 Bb7 is a II-7 V7, first in G major and then transposed to Eb major, a transposition of a major third. It leads to the tonal centre of Eb-minor, where it rests for two bars before it is abruptly raised to E-minor at bar 61.

Section H (bars 64-74)

Original motif 1/2 motif motif developed motif further developed

C Phrygian F phrygian E dorian E phrygian Eb dorian

F# phrygian E lydian F# dorian F ionian F# ionian

1/2 motif new motif development development

Fig. 2.7 : Bars 64-74, Abrupt changes of modes during the melody

The four alto voices sing a melodic line in unison with many changes of time signature and asymmetric rhythmic grouping. It's melody is modal, although each of the modes is only heard for a brief period making the melody appear atonal. Motivic material is developed and transposed using modal interchange. For a further discussion of modal harmony and modal interchange, see appendix item 5.

Section I (bars 75-83)

S1 and S2 sing an ascending line while A3 and A4 provide pedal notes that descending in minor and major seconds. S3, S4, A1 and A2 sing a repeated rhythmic ostinato on a G# which expanding from bar 78 to follow the harmonic progression.

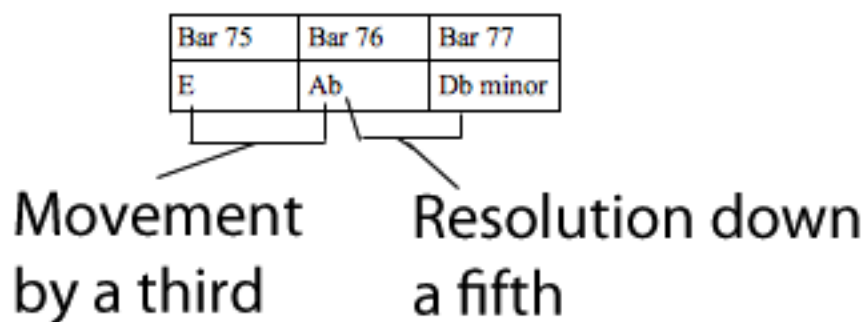


Fig. 2.8 : Bars 75-77, part one of the harmonic progression

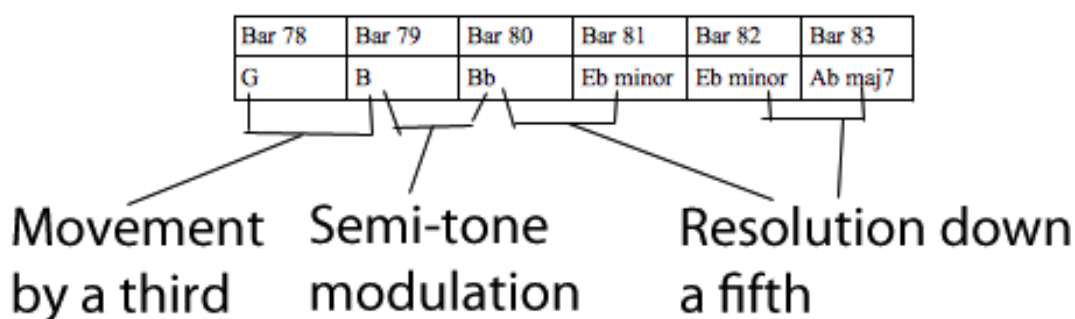


Fig. 2.9 : Bars 78-83, Part two of the harmonic progression, longer and more complex with a semi-tone modulation at bar 80

The harmonic progression is built on two series of chords, both opening with a major triad, jumping a major third and resolving down a perfect fifth. The first (bars 75-77) opens with an E triad, followed by a move of a third to Ab and a resolution down a fifth to Db minor. The second phrase (bars 78-83) opens with a G triad, a tri-tone away from the Db minor of bar 77. The G triad jumps a major third to a B, modulates by a descending semitone to Bb and resolves down a fifth from there to Eb-. It stays in Eb-

for a second bar before finally coming to rest down another fifth to Ab.

It reaches a climax with the three-syllabic 'Red Samson' at bar 83 that opens and closes phase 2.

2.2.4, Phase 3 analysis

Section J (bars 84-105)

Section J represents Samson's return to hiding and the emergence of the green lights from behind the red blood. It opens with four voices whispering and with S2 cueing the emergence of the green aurora. This cue develops into a four-voice quartal chord starting at 88:4. From bar 91 introduces more pitches into the chord and ushers the tonality towards G lydian.

The image shows a musical score for three voices (Soprano, Alto, and Tenor) across six staves. The lyrics are 'au - ro - ra' and 'ra'. The score illustrates a canon of diatonic seconds in A-lydian mode. The first voice begins with a half note 'au' on G4, followed by a half note 'ro' on A4, and a half note 'ra' on B4. The second voice enters in the next bar with a half note 'au' on G4, followed by a half note 'ro' on A4, and a half note 'ra' on B4. The third voice enters in the third bar with a half note 'au' on G4, followed by a half note 'ro' on A4, and a half note 'ra' on B4. The canon continues through the remaining staves, with each voice entering a bar later than the previous one, maintaining the diatonic second interval.

Fig. 2.10 : Bars 93-95, Diatonic seconds sung canonically in A-lydian

At bar 94, the tonality moves to A lydian with a canonic diatonic through all voices (*fig 2.10*). It briefly returns to G lydian for two bars at 102 before coming to rest on an A lydian at bars 104-105.

The image shows a musical score for two voices, likely a choir, with lyrics: "au - ro ra bo - re - a - lis". The score is divided into three measures. The first measure is labeled "Perfect fifth", the second "Major sixth", and the third "Perfect fifth". The notes are: Measure 1: G4 (soprano), E4 (alto); Measure 2: A4 (soprano), D4 (alto); Measure 3: A4 (soprano), E3 (alto). The lyrics are: "au - ro ra" (Measure 1), "bo - re -" (Measure 2), "a - lis" (Measure 3). The notes are: "au - ro ra" (Measure 1), "bo - re -" (Measure 2), "a - lis" (Measure 3). The notes are: "au - ro ra" (Measure 1), "bo - re -" (Measure 2), "a - lis" (Measure 3).

Fig. 2.11 : Bars 102-105, Lower two voices alternate between perfect fifths and major sixths at the final cadence. G lydian to A lydian.

The final seven bars use large cluster chords similar to those at bar 1. The lower two voices alternate between perfect fifths and major sixths.

3. CONCLUSION

The work aims to describe the bleakness of the arctic landscape and the vivid colours of the northern lights. To achieve this, a range of techniques and devices are employed.

The arctic winds are described using whispering, allowing half the choir to sing pitches that seem to be carried over the wind.

Harmonically, a great deal of the progressions move triadically in major or minor thirds.

Chords are stacked in alternating diatonic seconds and thirds, often with a perfect fifth between the lower two voices. The augmented triad makes frequent appearances throughout the work. It creates a sense of consonance without implying a particular tonality.

4, LIST OF FIGURES AND DIAGRAMS

- Fig. 2.1 : Bar 7, Structure of the A-lydian chord as a perfect fifth follow by diatonic seconds and thirds.*
- Fig. 2.2 : Bars 13-17, Harmonic progression starting in Bb minor, blurring the tonality with augmented chords and ending in Db major*
- Fig. 2.3 : Bars 22-25, Triadic progression using a major third movement*
- Fig. 2.4 : Bars 31-41, Harmonic progression using modal interchange and triadic movement in thirds*
- Fig. 2.5 : Bar 51-54, The first part of the harmonic progression. It modulates from Bb minor to F minor*
- Fig. 2.6 : Bars 55-62, The second part of the progression. It uses triadic movement in thirds and a modulation of a semi-tone.*
- Fig. 2.7 : Bars 64-74, Abrupt changes of modes during the melody*
- Fig. 2.8 : Bars 75-77, part one of the harmonic progression*
- Fig. 2.9 : Bars 78-83, Part two of the harmonic progression, longer and more complex with a semi-tone modulation at bar 80*
- Fig. 2.10 : Bars 93-95, Diatonic seconds sung canonically in A-lydian*
- Fig. 2.11 : Bars 102-105, Lower two voices alternate between perfect fifths and major sixths at the final cadence. G lydian to A lydian.*

3, 'IF-THEN' SUITE FOR IMPROVISING ENSEMBLE

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3.1, GENERAL ANALYSIS

3.1.1, *Rationale*

As a jazz musician, I have always found it tantalising to investigate the potential of improvised music. The 'chance' element in jazz music is one that opens its performance up to a great deal of exciting opportunities. During a performance, the musicians can be given varying degrees of freedom to make certain compositional decisions. These degrees of freedom can range from brief improvised solo sections to wider compositional decisions about the large-scale structure of a work. Another factor that can be explored is exactly how decisions are to be made by the musicians.

I have chosen and developed a series of techniques that are used throughout the work to allow the musicians to make compositional decisions in real-time, some being individual decisions and others being decided by the group as a unit.

3.1.2, *Standard practices in jazz composition and jazz performance*

Jazz song-form and performance

Jazz is an approach to musical performance that has developed rapidly over its 100 year history. Its idiomatic approach to rhythm is derived from African music as a result of the mass-migration of African slaves.

Its unique ethos towards musical performance encourages musicians to use their own individual musical sensibility to dictate certain compositional factors, most obviously

displayed during the improvised passages, a common, if not inherent feature of the style.

A common set of parameters is understood within the jazz performance community wherein the musicians can operate. Both individuality and spontaneity are encouraged and a performance framework has evolved around this. In a typical jazz performance, the melody is heard first, followed by a series of improvised solos, finishing with a repetition of the original melody. During the improvised sections, the lead soloist builds a new solo on the harmonic progression used as the building block for the original melody. There is sometimes a reference made to the original melody/theme. However this is not necessary and is left to the soloist's discretion. The content of these solos is left entirely up to the performer and the quality of the solo is judged by the effectiveness of its delivery.

In the '*If-Then*' suite, most of the phases of the work use this same framework for improvisation. The ensemble is given a specific melodic line and bass line. Then, during the solo/improvised sections, the performance of the music is left to the players discretion. However, the nature of improvised music is such that the solo has to be easily understood in relation to the melody. Therefore, it is implied that the solos will maintain the general textures and thematic material established during the melody section, while still offering the performers enough freedom to deliver their own musicality and their own individuality.

Jazz Rhythms

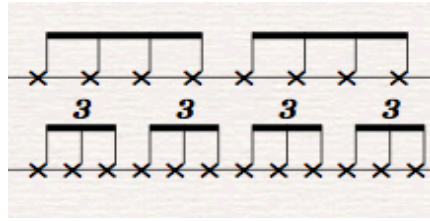


Fig.3.1 : Jazz rhythms, juxtaposition of two quavers with three quaver-triplets

A typical aspect of jazz music is its distinct approach to rhythm. Historically, one of the core tensions in jazz was derived from the juxtaposition of two quavers with three quaver triplets. Most of the tensions throughout the suite originate from the juxtaposition of quaver-based rhythms with triplet-based rhythms, most notable in the contrast between the rhythms of the melodic line and the bass ostinato.

Melodically, the suite combines improvised passages with pre-composed sections. The melodic lines are generally atonal and use the internal resolution of melodic phrases, a technique used through the submitted portfolio of works. See appendix item 1 on the internal resolution of melodic phrases.

3.1.3. *Introduction to the suite*

Large-Scale compositional decision-making : the 'selectors'

‘If-Then’ is a collection of related pieces and improvised sections. The path that the performers take through the suite is determined by chance-happenings occurring during the performance. It uses the nature of improvised music, that of interactivity and spontaneity, to decide which section of the suite will be performed.

At various places throughout the suite, called ‘selectors’, two of the performers are

simultaneously given two options of notes each. For example, they might have the choice of either an ascending or descending line. The results can either be (1) parallel (ascending or descending) or (2) contrary motion. If the result is (1) parallel motion, then the subsequent section to be performed will be section 'A'. If the resulting motion is (2) contrary, the ensemble will skip to section 'B'.

The rationale for giving two players options each, leading to one of two possible outcomes, is founded on maintaining as much of the chance elements as possible in formulation of the musical path through the suite. For example, the same selectors could be used to decide which of four outcomes would be performed. However, this would allow each of the players the freedom to opt out of playing two of the four possible sections. Giving each player two options in a process of selecting one of four sections, option 1 could, for example, lead to section A or B, and option 2 lead to section C or D. This gives the player the opportunity to narrow the possible outcomes down by half.

There are no stages within the chosen selection processes where either of the performers have any control over the result. If one player chooses an ascending line, the possibility remains 50:50, still fully dependent on the choice made by the other musician. This fully maintains the element of chance within the piece and, coupled with the inherent interactivity heard in all improvised music, will create a framework that gives its performers a challenging environment to operate within, while offering enough freedom to create spontaneous, exciting dialogue.

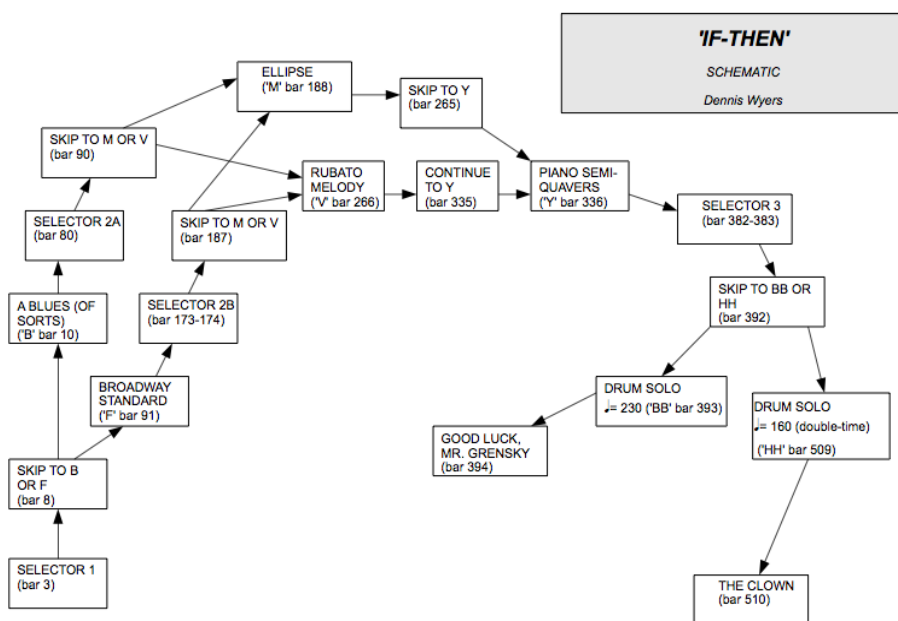


Fig.3.2 : If-Then suite schematic

Expansion and contraction

Expansion and contraction, in various forms, is one of the building blocks of the suite. Much of the tension and resolution is built by implying metric modulations, expanding the pitches from a central point or by expanding or contracting the pitch-range, duration or number of notes in a motif .

3.2, TECHNICAL ANALYSIS

3.2.1, *Large-scale structure*

Phases

The suite is conceived as being in four phases. Phases 1, 2 and 4 have two possible paths, while phase 3 is the only lengthy section that will be played at each performance. The two possibilities within phases 1, 2 and 4 are related through a common texture to give the work an overall coherence regardless of the path taken. The two possible movements of phase 1 both use contrasting rhythms, phase 2 uses slow, delicate melodies and textures. Phase 3 uses chaotic tension in the drums and piano, juxtaposed with a lyrical rubato melody on the saxophone and double bass. Phase 4 uses two possibilities, both based on the concept of a rhythmic groove.

PHASE 1	PHASE 2	PHASE 3	PHASE 4
<i>Contrasting</i>	<i>Slow and delicate</i>	<i>Juxtaposition</i>	<i>Rhythmic Groove</i>
<i>Rhythms</i>			
A Blues (of sorts)	Ellipse	In the after-a-while	Good luck, Mr. Grensky
Broadway Standard	Rubato Melody		The Clown

Fig.3.3 : The four phases of the suite

3.2.2, *Phase 1 analysis*

General introduction to Phase 1

Phase 1 is based on contrasting rhythms between the bass/drums and the

saxophone/piano. It uses two possible routes, either 'A blues (of sorts)' (A to E) or else 'Broadway Standard' (F to L).

In-depth analysis of Phase 1

Introduction and selector 1 | Section A

The suite opens with bass and drums in rhythmic unison, establishing some of the thematic material that will be used for the sections that follow. The section is marked ‘straight eighths (even quavers), kind of menacing’. The bass line is played pizzicato and the part for drums is given only as a series of rhythms to be used however the performer sees fit. The technique of reducing the drum part to basic rhythms gives the performer greater freedom to interpret the part as is appropriate to the particular performance. This technique is used throughout the suite.

Bar 3 is a selector that determines whether the section played after bar 9 will be section B or section F.

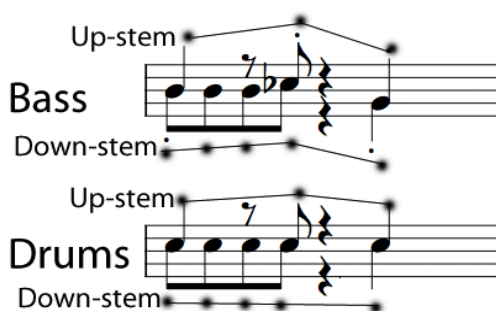


Fig.3.4 : Selector 1: bar 3, the bass player and the drummer can choose either up-stems or down-stems and the composite result determines that path to be taken through the suite.

The selector gives both the bass and the drums two rhythmic options, either up-stems

(crotchet, quaver, crotchet) or down-stems (four quavers and a crotchet). This determines the path to be chosen at bar 9, moving to section B or skipping to section F (bar 91).

A Blues (of sorts) / Section B

‘A Blues (of sorts)’ {crotchet = 115}, kind of menacing

This section is based on a 12-bar blues chord progression typical in jazz music. The progression itself is in C dominant and moves to the IV7 chord at bar 5 (that is, bar 5 of the 12-bar song-form).

The roles of the instruments are divided, with the bass and drums in unison and the saxophone and piano in unison.

The core tension of the section arises from the contrasting rhythms between these two groups. The bass and drums play a quaver/crotchet-based rhythm while the saxophone and piano play a semi-quaver/quaver-triplet based melody. The effect is one of a super-imposed meter.

The melodic material played by both of these groups is built on a simple, three-note motif heard at bar 10.

Note: In standard jazz notation, the percentage symbol (%) denotes a repetition of the chord in the previous bar.

C7 Ab7 (F7)
F7 Bb7
A7 G7

Analysis of the bass line for sections B and C

Fig.3.5 : Bars 9-20, The bass line for the 12-bar blues form

Chord progression

C7 | % | Ab7 | %

F7 | % | Bb7 | %

A7 | % | G7 | %

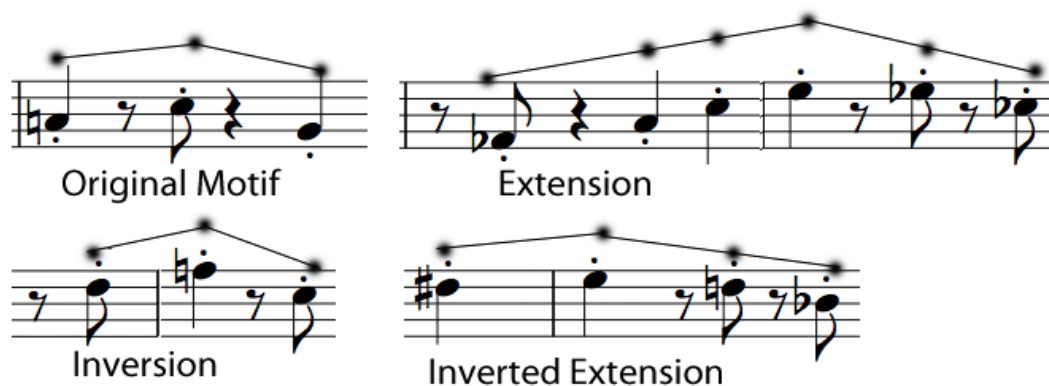
Typical 12-bar blues progression in C dominant:

C7 | % | % | %

F7 | % | C7 | %

G7 | F7 | C7 | G7

The bass-line is a 12-bar ostinato that repeats, outlining the fundamental structure of the 12-bar blues including the movement to the sub-dominant in bar 5 of 12, and to the



dominant in bar 11 of 12.

Fig.3.6 : Development of the the up-down motif in the bass ostinato, original (bar9), extension (bars 11-12), inversion (bar 12-13) and inverted extension (bars 17-18)

This shape is manipulate through transposition and inversion. This ascending/descending contour form the basis of many of the melodic phrases and motifs throughout the entire work.

The rhythm played by the drums mirrors that of the bass.

Analysis of the melodic line for section B

There are two motifs used to structure the melody. The first is the interval of an ascending sixth. The second is the up-down motif.



Fig.3.7 : Bars 11-19, Use of the interval of a sixth in the melodic line

The melodic line at section B is played in unison by the piano and saxophone. It is based on a series of ascending major and minor sixths (*fig 3.7*).The ascending sixth intervals hold the melodic line together.

The image displays two staves of musical notation. The top staff is in treble clef and shows a melodic line with a 7/8 time signature. It features an 'Original' motif of three notes (up-down-up) and an 'Extension by semi-quavers and answering phrase' consisting of a series of eighth notes followed by a triplet of eighth notes. The bottom staff is in bass clef and shows a similar melodic line with an 'Extension by semi-quavers, answering phrase and resolving with three semi-quavers', including a triplet of eighth notes and a final resolution of three eighth notes.

Fig.3.8 : Development of the up-down motif in the melody. Original (bars 10-11), extension by semi-quavers and answering phrase (bars 11-12) and extension by semi-quavers, answering phrase and resolution (bars 12-13)

The melodic passage from bars 11 to 19 also uses a rhythmic expansion to progressively develop the three-note motif. The melody opens with the up-down motif played with three notes. This is developed three times using semi-quavers and triplets to build and release tension. The first development adds unresolved tension by opening with semi-quavers and ending with an answering phrase in triplets. The second development resolves some of the tension by expanding on the first development with a group of semi-quavers to close. The third expansion of the motif opens with an expansion of the semi-quavers from developments 1 and 2 and, after a lengthy triplet phrase, it resolves fully with a series of semi-quavers that firmly establish the pulse.

Section C

Bars 35-43 are an exact repetition of bars 11-19.

The first improvised section of the suite is from bars 44-55. It is based on the 12-bar harmonic progression used in the melody. The improvisers are given free rein to solo, although they are encouraged to use material from the melody and to interact with the other musicians. Interaction is paramount in the improvised passages throughout the suite.

Sections D to E

Almost an exact repetition of the melodic theme heard at B and C from bars 10 to 43. The melody ends on the bar 89:1. It differs from B and c in that it contains a selector at bar 80.

The selector is a choice of rhythms given to the bass and the drums. Each can play either a single crotchet followed by two quavers, or a group of three triplets followed by two quavers. If the resulting rhythms are the same for both instruments, the music moves to section M at bar 90. Otherwise, it moves on to section V.

Broadway Standard / Section F

Sections F to L are an alternative to route to sections B to E, just discussed. The rhythmic phrases are similar in that both are based on the juxtaposition of a triplet and semi-quaver melody over a crotchet- and quaver-based rhythmic pattern. The melody is

based on swung eighths/quavers.

Harmonically, sections F to L are based on a 32-bar chord progression that is an adaption of a common song-form from the 1930s, hence the title of the section '*Broadway Standard*'.

Section F is marked {crotchet = 115}, straight eighths, kind of menacing. The melody opens with an ascending major sixth, contrasting the minor sixth in the opening of '*A Blues (of sorts)*', the melody at B,

The melody is an asymmetric phrase that uses triplets grouped as 'swung' quavers. These are interspersed with groups of four semi-quavers and quavers that upset the sense of pulse.

The bass-line is built using the up-down motif that features throughout the suite. It opens with the motif in three notes, followed by an inversion, two transpositions, an inversion, an expanded inversion and a cadence figure. At bar 9 of the song-form (bar 99 of the suite) the bass restates the up-down motif followed by a new development of it. The motif has now been extended with a repeated two-note figure.

Section G

Long notes and guide tones stabilise the rhythmic tension in the surrounding passages. Section G acts as a rhythmic oasis, with a slower harmonic rhythm. Harmonically, the 8-bar section is a series of dominant chords for two bars each. It is derived from the cycle of fifths at the bridge of the song-form of George Gershwin's '*I've got rhythm*', a popular tune from the jazz repertoire. The progression used here uses tritone

substitutions of dominant chords. The F#7 is a tritone away from C7, the V7 of the F that follows. F7 resolves down a fifth to Bb7, the bVII7 of C major. The C#7 at bar 113 is the tritone substitution of G7, the V7 of C major.



Fig.3.9 : Bars 107-114, Descending waves are a development of the up-down motif. The phrase has five hiatuses.

The melodic material also uses the up-down motif as a series of five descending waves with hiatuses at 107:3, 109:1, 110:3, 112:1 and 113:4.

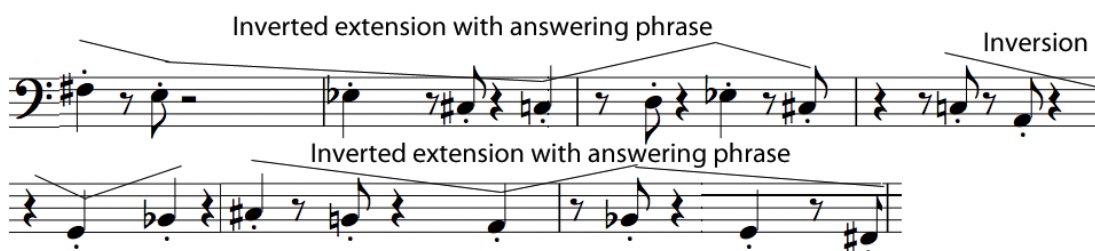


Fig.3.10 : Bars 107-113, Development of the up-down motif in the bass ostinato

The bass-line at G is built using two extended inversions of the up-down motif, at bars 107-111 and 112 to 114.

Section H

Section H is almost an exact repetition of bars 91 to 98, but with a different rhythmic cadence point in both the bass figure and the melody at bar 122 that resolves the rhythmic tension remaining from the melody.

Section I

The solo form is a 32-bar chord progression that is repeated until the cue from the lead soloist. The approach to soloing is similar to that of section C. All performers are encouraged to continue in a similar style to the syncopated figure in sections F-H and create melodic lines outlining the harmony.

Section J

Section J is an exact repetition of the melody at section G.

Section K

Section K is an exact repetition of the melody at G except for the selector at bar 173-174. The selector gives the saxophone and the piano a choice of two options. The piano part is based on a choice of two rhythmic figures, while the saxophone has a choice of ascending at bar 173 to a B-natural, or descending to an A-natural. The up-stem/down-stem method is used to differentiate the two possibilities.

Section L

The melody at L is an exact repetition of the final eight bars of the theme, heard earlier at H.

3.2.3, Phase 2 analysis

General introduction to phase 2

Phase 2 of the suite demonstrates the delicacy of the instruments in the ensemble. 'Ellipse' from M to U, is the first of the possible routes. It is a passage using improvised harmony that offers the musicians rough parameters to operate within while giving them enough freedom to respond to the possible tension and release that can be achieved. It focuses on expansion and contraction from a central pitch, generally middle-C.

'Rubato melody' from V to X, follows a typical approach to jazz composition in that the melody is heard first, followed by an improvised passage based on the harmonic structure, finally ending with a repetition of the original melody.

In-depth analysis of phase 2

Ellipse / Section M

M to U forms 'Ellipse' which is a series of different improvised and written parts using a rough tonal centre of C Major. The structure opens with a unison middle-C on saxophone, piano and arco double-bass. From here it expands outwards using the C Major scale, with the saxophone and piano RH moving up and the piano LH and the

double-bass moving down. The piano improvises an arpeggiated figure using the C Major scale to fill out the space between the outer voices without creating block chords. The motion within section M is created through the development of the piano's improvisations from rhythmically sparse (at bar 188) to rhythmically dense (climaxing at bar 191) and returning to sparsity (at bars 194-196).

The section returns to middle-C at bar 196:2 and prepares for the second expansion at N. The drums outline the pulse throughout, without giving a clear indication of the meter.

Section N

Section 'N' uses a similar technique as is used in M, in that it starts on middle-C, expands and then contracts. However, the section is far more tense because it no longer moves along tones from the C Major scale. Dense chromatic clusters are formed. The sections range is also narrower than M, being a minor-7th at its widest point (bar 204) compared to the minor-20th at 191:2. The improvisational element in the piano part has been removed and it forms the long-note clusters with the saxophone and the double-bass.

Section O

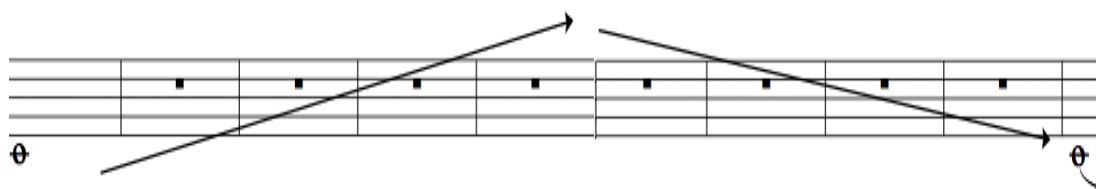


Fig.3.11 : Bars 213-217, Improvisational curve for the saxophone, starting and ending on middle C and playing a phrase that ascends and descends using notes from the C major scale

Section O opens with the expansive C-Major figure first heard at bar 188. The saxophone improvises an ascending series of long notes using the C-Major scale, while the piano and double-bass play a written part similar to that of M.

The drums continue to roughly outline the pulse without implying the meter. The section contracts back to middle-C from bar 218 to 222.

Section P

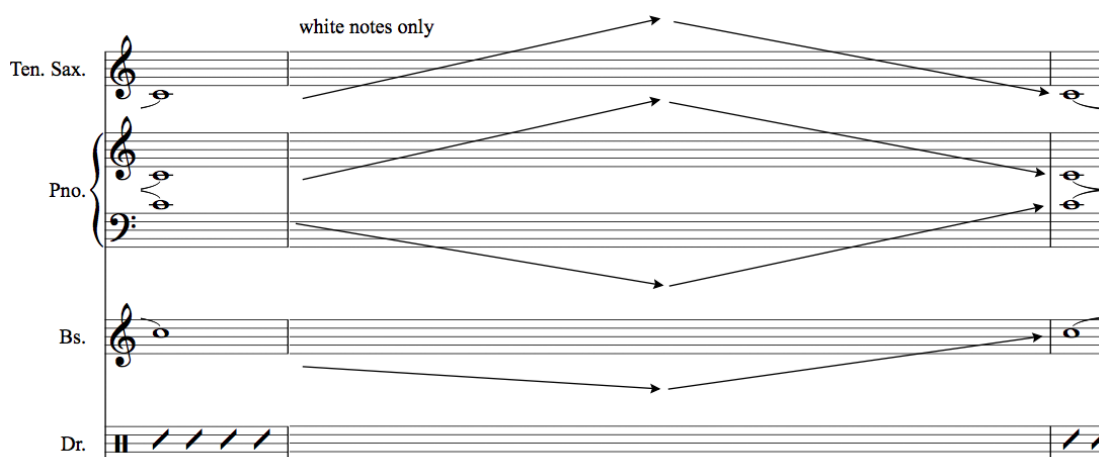


Fig.3.12 : Bars 222-224, Improvisational curve for sax, piano and bass. They follow the indicated direction using notes from the C major scale. The drums are given free rein to respond to the other musicians.

Here, the saxophone and piano RH are given an ascending and descending curve with

the indication 'white notes only'. The piano LH and the double-bass are given the same instructions with a descending followed by an ascending curve. The resulting sound will expand from and contract towards middle-C using a C-Major tonality from the 'white notes only' marking. This is followed by the far-more-dissonant section Q.

Section Q

Q uses similar indications to P. However, the resulting sound is far more dissonant due to the marking 'all notes possible'. The group create chromatic clusters and tensions and are allowed to resolve them however they see fit. As with other sections, the passage expands from a unison tone and contracts back to unison, here moving outwards from middle-C back to Bb.

Bar 229 acts as a moment of silence to allow the music to rest between the tension of Q and the resolution of R.

Section R

R opens with the expanding material at the start of section M, serving as a point of departure for the improvised section S.

Section S

The improvised section continues the rapidly arpeggiated figures from M to add a sense of rhythmic movement to the passage. It expands in a C-Major tonality and then

contracts by allowing the performers a choice of all chromatic notes to build the tension. It ends with a four-note cluster, cued by the bassist with a B-natural.

Section T and U

T and U are retrogrades of sections M and N, with some notes adjusted in the melodic line to make it more logical. The retrograde moves the passage from the tension section T to the resolved, tonal section U.

Section U comes to rest on the middle-C that opened section M and that is used as a point of departure for most of the expansions.

Rubato Melody / Section V

The rubato melody opens with a descending major-sixth, one of the intervallic building blocks of the suite. The rubato melody is in two parts. The A section of the song-form is from 266-276. The B section runs from 277-291. Both are comprised of three phrases in ternary form.

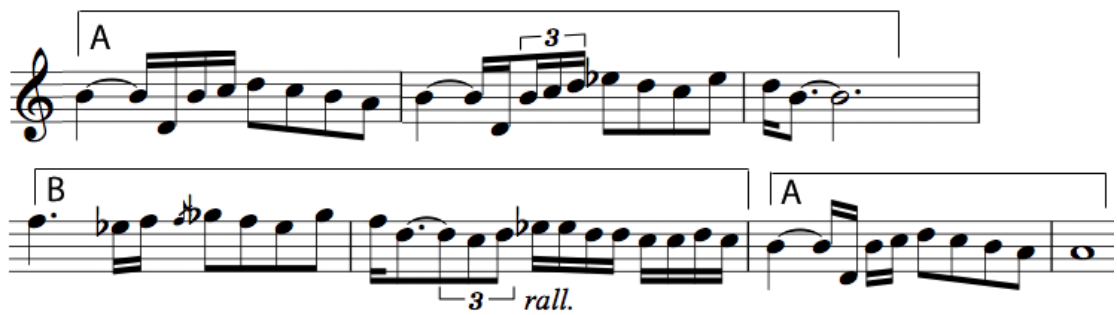


Fig.3.13 : Bars 277-291, Melody in ternary (ABA) form

The A Section uses three melodic phrases, the first of which starts with a descending

major sixth and follows an ascending-descending contour, using the up-down contour that is often used through the suite.

The second phrase uses a development of the material that opened the first phrase, starting a tritone higher on an F-natural. The harmonic progression is also derived from a tritone movement, moving from E minor (relative minor of G Major) to a C# Major triad (the #IV in G Major).

The third phrase is an answer to the first. It uses the opening material resolving to an A (the major third of the bVII in G Major).

The B Section of the song-form, from bars 277-291, opens with an ascending major sixth, contrasting the descending major sixth that opened the A section. It is comprised of three phrases in ternary form. Each of these phrases are themselves call-and-answer.

First phrase (bars 277-281:3)



Fig.3.14 : Bars 276-280, Up-down motif used to build a melody. Original motif extended and developed

Second phrase (bars 281:4 – 286)



Fig.3.15 : Bars 280-285, Modal interchange during the second phrase, following the contour of the up-down motif

Third phrase (bars 281-291)

The third melodic phrase is an exact repetition of the first. However, it is harmonised differently.

Harmonic analysis of the Rubato Melody / Analysis of the harmonic progression at 'V'.

The melody is in binary form (AB). The harmonic progression is also in binary form.

The melody in the 'A' section of the song-form is divided into three phrases, as stated earlier. The first and third melodic phrases are identical. However, the third phrase is harmonised differently to the first.

The 'A' section of the song-form moves from E minor to its relative major of G Major.

The melody tends to emphasise the major or minor third in the chord.

It opens with the first phrase, harmonically moving from E minor to C minor

Bar 266	Bar 267-268
Im	bVIIm
Eminor	Cminor

The second phrase modulates the progression to G Major.

Bar 269		Bar 270		Bar 271
#IV	V7	bVIIIm	bVII7	I
C#	D7	Fm/E	F7	G

The third phrase is melodically identical to the first. However, harmonically it is in G Major rather than E Minor.

Bar 271	Bar 272-273	Bar 274-275
I	bVII	I
G	F	G

The 'B' section of the song-form, bars 276 to 290, is clearly in G Major, although it briefly moves to unrelated key centres.

The first phrase opens in G Major and progresses via an F7 (a D7b9 chord with an added F as the root note), to a D7 in first inversion, the F from the previous chord ascending by a semi-tone to the F#. This resolves back to the tonic G Major.

Bar 276-277	Bar 278	Bar 279	Bar 280
I	bVII7	V7 _{6/3}	Imaj7
Gmaj7 -> Gmaj9	F13	D7/F#	Gmaj7

The start and end of the second phrase modulates briefly to Bb Major and vacillates between I and IIm, followed by Im II7.

Bar 281	Bar 282	Bar 283	Bar 284:1	Bar 284:2	Bar 285	Bar 286
---------	---------	---------	-----------	-----------	---------	---------

bIII	I _{6/3}	II _{m6/3}	Im	II7	bIII	I
Bb	G/B	Am/C	Gm	A7(b9)	BbMaj7	GMaj9

The third phrase is harmonised exactly like the first.

Bar 286-287	Bar 288	Bar 289	Bar 290
I	bVII7	V _{7/6/3}	Imaj7
Gmaj9	F13	D7/F#	Gmaj7

Section W

Section W is a solo improvised section following the chord/harmonic progression of ‘V’. It is played slowly in rubato. Each chord is cued by a member of the group, generally, but not necessarily, the saxophone.

Section X

Section X is an exact repetition of section V following the typical melody-improvisation-melody song-form.

3.2.4, Phase 3 analysis

General Introduction to phase 3

Phase 3 is the only phase in the suite with a lengthy section that is played at each performance. All other phases of the work leave some of the compositional processes to chance.

Phase 3 juxtaposes a fervent, dense rhythmical texture with a slow lyrical melody. This

is later resolved by a harmonisation of the lyrical melody

In-depth analysis of phase 3

In the after-a-while / Section Y to Z

Sections Y to Z juxtapose a C minor tonality with an atonal melody. The difference in rhythmic tension between the two sound-events helps to distance the two from one another.

The piano plays an ascending/descending contour in C minor. Rhythmically, it is a 9/16 phrase that is interrupted on every fourth repetition by a bar of 3/16. The drums enter at bar 340 with a groove that mirrors this rhythmic cycle.

The tension created by the asymmetrical rhythmic cycle is counteracted by the slow, lyrical melody on soprano sax and arco double bass, a melody that is later harmonised in section AA.

Section AA

'AA' is an exact repetition of the melody at Z, accompanied by a complimentary harmonic progression.

Analysis of the harmonic progression

The harmonic progression opens in C# minor but modulates quickly to C major.

C#m	Am/C					
Im		bVI _{m6/3}				
G/D	Bb/Db	Fmaj7/C				
II _{6/4}		bVII _{6/3}		IV _{6/4}		
C	Abm/Eb	Bb7/D	C			
I		bVI _{m6/4}		bVII _{7/6/3}		I

Selector bars 82 and 83 determine the direction of the work after bar 392.

F#/C#	Bb/D	F/C	
C	D	E/B	
F/C	C	B	F#(tritone)

3.2.5, Phase 4 analysis

General introduction to phase 4

Phase 4 is an energetic passage that juxtaposes quavers with triplets to create a great degree of rhythmic tension. It opens with a drum solo that starts slowly and builds in intensity. Both of the possible routes of the music use groove-based ostinatos on the double-bass and drums with melodies that cross the bar-line and create brief metric modulations.

In-depth analysis of phase 4

Good Luck Mr. Grensky / Section BB

Section 'BB' is an open-form drum solo, meaning that the drums are allowed to solo alone without the parameters of a song-form to follow, as is the case with all other improvised passages. The improvised drum solo acts as a segue between the tempo of 'AA' {crotchet=60} and either CC {minim=115} or 'II' {minim=130}.

Section CC

The main tensions in the melodic section from CC to EE are derived from the fast tempo {crotchet=230}, the syncopation in the melody and the interplay between the rhythm of the bass ostinato and the non-repeating drum rhythm.

Structurally, the melodic passage of the song-form from CC to EE is in binary AABA form. The 'A' section and its repetition are from bars 394 to bar 409, the 'B' section running from 410 to 425 and the final A section from 426 to 441. Each section is 16-bars long and in 4/4. However, the 'B' section of the song-form (section DD) displaces the rhythm and blurs the placement of the downbeat.

As with most of the melodic passages in the suite, the melody is based around the rhythmic and melodic development of a short motif.

The figure displays four staves of musical notation in treble clef, starting with a tempo marking of ♩=230. The first staff shows a melodic phrase with slurs over groups of notes, annotated with the text "Development of the up-down motif by extension". The second staff shows a descending melodic line with slurs, annotated with "Use of the two-note descending motif". The third staff continues the melodic development with slurs, annotated with "Development of the up-down motif by extension". The fourth staff shows a more complex melodic line with slurs, annotated with "Two-note and up-down motif used together".

Fig.3.16 : Bars 394-401, Use of the up-down motif and the two-note descending motif in the melody.

The first eight-bar melodic phrase (bars 394-401) opens with a fast syncopated rhythmic development of the up-down motif and the major sixth interval and ends with a development of the two-note descending motif using longer note lengths to resolve some of the rhythmic tension.

The second eight-bar melodic phrase (bars 402-409) opens with the same syncopated rhythm as the first phrase. However, it does not resolve the rhythmic tension with a phrase using long notes. Its final four bars are a series of syncopated quavers that extend the jagged rhythm at bar 405.

Section CC is then repeated.

Section DD

DD is the 'B' section in the binary form of the melodic passage from CC to EE. It is based on the repetition of an 18-bar phrase, which revolves around the 4/4 bass ostinato. The drums continue with the same passage as before, with and added accented crash-cymbal after every 18-beats.

Section EE

EE is an exact repetition of the melodic passage at CC.

Section FF

Section FF is a passage for collective improvisation. The performers are encouraged to use material from the melody and the bass ostinato in their improvisations. Structurally, it is a 16-bar cycle using dominant-7th chords. Opening with a Bb7, it moves through the cycle of fifths to F7, C7 and then jumps back to Bb7. The turnaround (cadence point) over the last four bars vacillates between the V7 and the bVI7 in Bb.

Section GG

GG is an exact repetition of the melodic passage from CC to EE, with a rhythmic passage at bar 506 to end the suite.

Section HH

HH acts as a segue from the slow tempo of AA to the new tempo of {crotchet=160} with a double-time feel.

'The Clown' | Section II

Section II, titled 'The Clown', is based on a melodic passage with a repeating bass ostinato and a rhythmic hemiola on the drums. Much of the tension is derived from the juxtaposition of brief metric modulation in the melody with the drum hemiola and the consistent pulse of the bass ostinato.



Fig.3.17 : Bars 497-501, Call and answer of the motivic material in the melody

The melody makes use of call-and-answer phrases and tends to be motivic-based followed by a series of syncopated staccato notes. The first call phrase is bar 497 to 501, a phrase that opens with a flowing triplets line and ends with a series of syncopated quavers in groups of threes (one quaver followed by two quaver rests).



Fig.3.18 : Bars 502-504, Answering phrase using triplet material from the opening of the call-phrase

The answering phrase is from bar 502 to 504, a shorter phrase using triplet material from the opening of the call-phrase.



Fig.3.19 : Bars 505-506, Blurring the meter with a brief metric modulation

The next melodic passage, from 518 to 524, is not rhythmically resolved. It is structured similar to the call-phrase at bar 510-514, but with a more complex metric modulation that crosses the bar-line at bar 518, blurring the sense of meter. This blurring is cleared by the strong sense of a down-beat at bar 520:1 and 521:1.

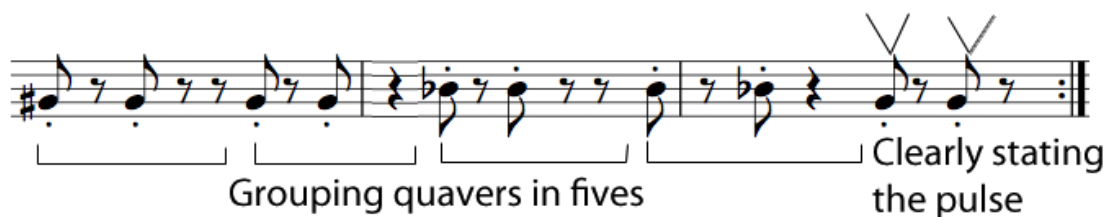


Fig.3.20 : Grouping quavers in fives and then resolving the rhythmic tension by clearly stating the pulse with two quavers on the beat

Having clearly stated the meter, it is once again blurred by the grouping of quavers from bar 522-524. The quavers are grouped in fives. (*see fig 3.20*)

Bars 525-539 further blur the sense of meter. There is a brief metric modulation in the way the quaver triplets are accented at bar 528. The dotted-crotchet rhythm that was used at bar 512 is extended at 534-535 and 538-539.

Section JJ

JJ is a section for collective improvisation. The chord progression given acts as a guide and the performers are given a great deal of room to superimposed other harmonic progressions over this.

The progression itself is a simple series of dominant-7th chords in a fifteen-bar cycle.

C7 | % | Bb7 | %

F7 | % | A7 Ab7 | Bb7

C7 | % | Bb7 | %

F7 | % | A7 Bb7

It opens with a C7 and, like the blues progression (section B) and the 32-bar standard (section F), it moves to the IV7 at bar 4, here moving via the bVII7 of Bb7. The ‘turnaround’ (cadence point) at bars 7 and 8 is a VI7 bVI7 bVII7 progression returning

to the I7 at bar 9. The ‘*turnaround*’ (cadence point) at bar 15 is a truncated, compressed version of the same progression.

While the saxophone, piano and bass play in a 15-bar 4/4 cycle, the drums plays in a 15-beat cycle that resolves with the other instruments after every fourth cycle.

Section KK

Section KK, the final section of the suite, is an exact repetition of the melodic passage at section II, with a syncopated rhythmic figure at bar 614 to end the work.

3. CONCLUSION

Tension and release

The core tensions of the suite are derived from the juxtaposition of contrasting rhythms. Quavers and semi-quavers are played alongside quaver-triplets to create a 3:2 polyrhythm. This tension is the driving force behind much of the music in the suite.

Improvisation

Many forms of improvisation are explored, ranging from the soloing over a chord progression to a freer approach like improvised harmony in “*Ellipse*” and soloing completely free of parameters, as with the drum solo at sections BB and HH. Collective improvisation is used to encourage interplay between the musicians.

Large-scale structural improvisation is explored in depth. There is roughly twice as much music composed as will ever be played at one single performance. The “*episodes*”

played are decided by chance happenings in real-time on stage.

Use of motifs

The three major motifs that are developed throughout the suite are the up-down motif, the two-note descending motif and the use of major and minor sixth intervals.

The up-down motif

The up-down motif, often heard as a three-note motif, is heard in the bass line in A. In the bass-line in B. It is the building block of the melodic line t B and the shape is reused with longer notes at C.

The same three-note figure is used in F to H, with the melodic material at G distorting the three-note motif. It is distorted but it is used as a foundation for writing the melodic lines.

The up-down motif is extended to form the contour of many of the melodic phrases used throughout the work.

The two-note descending motif

The two-note descending motif is often heard with long note-lengths to resolve a degree of the rhythmic tension built earlier. It is used in the melody at section B and at CC.

The major and minor sixth intervals

The major and minor sixth intervals have a distinctive melodic quality that is often drawn upon as a building block for melodic material. The rubato melody opens with a development of sixths, as does the melodic line at section B, section F and section CC. The use of the interval of a sixth is used to build coherence throughout the melodic line.

4.4, LIST OF FIGURES AND DIAGRAMS

- Fig.3.1 : Jazz rhythms, juxtaposition of two quavers with three quaver-triplets*
- Fig.3.2 : If-Then suite schematic*
- Fig.3.3 : The four phases of the suite*
- Fig.3.4 : Selector 1: bar 3, the bass player and the drummer can choose either up-stems or down-stems and the composite result determines that path to be taken through the suite.*
- Fig.3.5 : Bars 9-20, The bass line for the 12-bar blues form*
- Fig.3.6 : Development of the the up-down motif in the bass ostinato, original (bar9), extension (bars 11-12), inversion (bar 12-13) and inverted extension (bars 17-18)*
- Fig.3.7 : Bars 11-19, Use of the interval of a sixth in the melodic line*
- Fig.3.8 : Development of the up-down motif in the melody. Original (bars 10-11), extension by semi-quavers and answering phrase (bars 11-12) and extension by semi-quavers, answering phrase and resolution (bars 12-13)*
- Fig.3.9 : Bars 107-114, Descending waves are a development of the up-down motif. The phrase has five hiatuses.*
- Fig.3.10 : Bars 107-113, Development of the up-down motif in the bass ostinato*
- Fig.3.11 : Bars 213-217, Improvisational curve for the saxophone, starting and ending on middle C and playing a phrase that ascends and descends using notes from the C major scale*
- Fig.3.12 : Bars 222-224, Improvisational curve for sax, piano and bass. They follow the indicated direction using notes from the C major scale. The drums are given free rein to respond to the other musicians.*
- Fig.3.13 : Bars 277-291, Melody in ternary (ABA) form*
- Fig.3.14 : Bars 276-280, Up-down motif used to build a melody. Original motif extended and developed*
- Fig.3.15 : Bars 280-285, Modal interchange during the second phrase, following the contour of the up-down motif*
- Fig.3.16 : Bars 394-401, Use of the up-down motif and the two-note descending motif in the melody.*
- Fig.3.17 : Bars 497-501, Call and answer of the motivic material in the melody*
- Fig.3.18 : Bars 502-504, Answering phrase using triplet material from the opening of the call-phrase*
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4, 'CUMULUS' FOR STRING QUARTET

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4.1, GENERAL ANALYSIS

4.1.1, *Rationale*

'*Cumulus*' is a single-movement work for string quartet that has many different episodes. It is inspired by the clouds. Like a cloud, the work can be delicate with a thin texture and, at other times, be aggressive, percussive and intimidating like a thunderstorm. The topic of clouds passing overhead is one that is also used as an inspiration for *Zenith*, the sixth work in this portfolio. *Cumulus* features frenetic, relentless asymmetrical rhythms and a melodic composition technique that allows the melody to unfold according to symmetrical intervallic movement.

4.1.2, *Theory of symmetrical movement*

Much of the melodic and pitch-based writing of the work is built using the technique of symmetrical melodic movement. The 'Symmetrical Movement Concept' is a compositional technique developed by saxophonist and composer Steve Coleman. The concept views a melodic figure as a series of intervals stretching out from the central axis of one or more pitches. Once an initial axis has been established, the phrase balances each pitch with a counterpart pitch the same distance from the axis but in the opposite direction. (Coleman, 2006)



Fig.4.1 : C symmetrical axis, major 3rd up and major 3rd down

In the simplistic example above, the motif above opens with the axis pitch of C5. This is followed by an E5, a major third above the axis. This ascending major third is balanced/neutralised by the Ab4, a movement of a major third descending from the axis. This approach to melodic writing can be extended in a range of ways. The axis need not be the first note, nor does it even need to be played. It needn't be a single pitch. The neutralising pitch does not need to appear immediately. As long as all the pitches are balanced at some point during the phrase, it will hold to the theory. The pitches themselves can be in any octave to stay within the parameters of the concept.

The theory extends further to groups of notes. A series of three notes, for example, can be played one after another and then balanced by movements to their respective symmetrical 'partners'. This balance can also be played in retrograde. Using this, long lines of atonal melodic material can be generated that still maintains a strong sense of balance as it pivots around on common fulcrum.

4.1.3, Overall structure of the work

The work can be divided into four phases

Phase 1 (bars 1-39), Melodies rotating around a G axis of symmetry

Phase 2 (bars 40-52), High indistinct harmonics

Phase 3 (bars 52-90), G axis of symmetry with rhythmic ostinato resolving on a

D major tonality (dominant key)

Phase 4 (bars 91-167), G axis of symmetry resolving on a G major chord

4.2, TECHNICAL ANALYSIS

4.2.1, *Phase 1 analysis*

Section A / Introduction to Section A

Section A is marked as {crotchet=58}, ‘with intrigue and mystery’. Dynamically very quiet, with Violin II, Viola and Cello playing at *ppp*. It uses a great deal of *pizzicato* and *tremolo* to set this air of mystery, with fragments of the main melodic theme heard quietly on Violin I.

Theme 1, the lyrical theme, is established by Violin I and a second theme, the ascending theme played *pizzicato*, moves from the Viola to the Cello and Violin II. The sections opens with a C-drone on Cello, the subdominant of the G-axis that forms the anchor of the work.

Technical Analysis

The section opens with a *tremolo* on Violin II, setting up the ‘intrigue and mystery’. The Cello plays an low C-drone, establishing the C as a brief anchor point before moving from it, the subdominant, to the main anchor of the work, G.

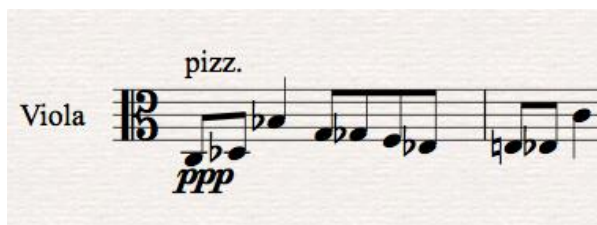


Fig.4.2 : Bars 2-3, Simplified version of the Viola line ascending phrase with pizzicato

The Viola builds on the *tremolo* texture with the ascending theme played *pizzicato* in quavers. It uses octave displacement by semiquavers.



Fig.4.3 : Bar 3, Cello takes over the ascending phrase from the ‘pizz.’ Viola. Plays it ‘arco’ then moves to displaced ‘pizzicato’.

The ascending theme is heard again on Cello at bar 3. Here it is played arco without the octave displacement.



Fig.4.4 : Bars 3-4, Violin I, fragments of the main lyrical theme

From bar 3, Violin I plays fragments of the lyrical theme, theme 1.

The theme is a melodic line that is used throughout the work. It opens with a descending

major sixth and an ascending major third.



Fig.4.5 : Bars 4-5, Cello takes over the pizzicato ascending displaced phrase

At bar 4, having played the ascending theme arco, the Cello takes over from the Viola and plays it *pizzicato*, with octave displacement.

The roles of the Viola and Cello swap at bar 4. The Viola had played the ascending pizzicato while the Cello held a low C drone. At bar 4, the Viola takes over the C drone and the Cello takes the pizzicato line.



Fig.4.6 : Bars 5-7, Violin II takes pizzicato ascending line, Viola states the G axis

Violin II takes over the ascending pizzicato theme. The Viola states the G tone that forms the anchor point for the work.



Fig.4.7 : Bars 5-17, Viola pitches rotating around a G-axis

The tremolo pitches held by the Viola from bars 5-17 are a long passage working out from the G axis by way of symmetrical movement. The notes are G, A, B, Eb, F. First, the G-axis is stated. From here, the Viola move up to a major second above and then to a major third above. This is balance in retrograde by the Eb a major third below the axis and an F a major second below the G-axis.

Section B / Introduction to Section B

Section B uses a series of regular rhythms that rotate around one another. The hemiola is created by juxtaposing the 5/4 Violin II rhythm with the 10/4 rhythm of the Cello. The long tremolo on the Viola distorts the sense of clear metre and the fragmented pizzicato melodic motifs on the Violin I are placed in 4/4 but with varying rhythmic subdivisions.

Bars 7-16



Fig.4.8 : Bars 7-9, Violin II 5-crotchet phrase side-stepping the G-axis by a semi-tone

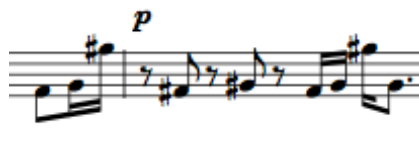
The hemiola is established by the pizzicato on Violin II. The figure is a 5/4 syncopated cycle using F# and G#. These pitches sit a minor second either side of the G-axis.



Fig.4.9 : Bars 8-10, Cello side-steps from the G-axis by a full-tone and plays a 5-beat phrase that inverts every second time, creating the perception of a 10-beat phrase.

The Cello plays a 10/4 melodic cycle. Rhythmically, the phrase repeats every five beats, with the pitches inverting every second repetition. These pitches F, A, F are balanced by their inversion A, F, A when the rhythm repeats. These notes side-step the G-axis by a major second, double the distance of the side-step made by the Violin II at the same bar.

The Viola continues the long tremolo notes, moving away slowly from the G



symmetrical axis.

Fig.4.10 : Bars 9-16, The Violin II phrase becomes more active with the octave displacement of the first G# in the phrase

At bar 9, the Violin II becomes more active by displacing two of the G#s by an octave.

The use of the high-E string for the G# creates a distinct tone and this lets the displaced

G# be perceived as a separate rhythmic pattern that sits above the fragmented melody of the Violin I.

Having established the sense of pulse but blurred the sense of metre, the listener's attention is drawn to the melodic writing on the Violin I which sits just below the G#5 on the Violin II. From bar 10-23, the thematic material is alluded to using short fragmented passages that vary in their rhythmical makeup.



Fig.4.11 : Bar 10, Violin I melodic phrase (i), either side of the G-axis.

[[up 6, down 6] {up min.2, down min.2}] without stating the G-axis itself.

The first of these fragments follows the contour of the opening of the lyrical theme. The pitches are built by side-stepping from the G-axis. The pitches E, Bb, Ab and Gb balance each other around the axis as:

[[up 6, down 6]{up min2, down min2}]

The same contour is used as a common element across all the subsequent melodic fragments until bar 20.



Fig.4.12 : Bar 12, Violin I, phrase (ii), same down-up contour of bars 3-4 and 10. Also around G-axis

The second fragment is at bar 12. The pitches A, F, E and Bb sidestep the G-axis by:

$$[[\text{up } 2, \text{down } 2]\{\text{down min}3, \text{up min}3\}]$$



Fig.4.13 : Bar 13, Violin I, phrase (iii)

The third phrase side-steps the G-axis with an octave displacement of the A.

$$[[\text{up min}2, \text{down min}2]\{\text{down } 2, \text{up } 2 \& \text{oct}\}]$$



Fig.4.14 : Bar 14, Violin I, phrase (iv)

The next melodic phrase is a longer six-note motif pivoting around the axis. It moves:

$$[[\text{up min}3, \text{up min}2, \text{down min}3, \text{down min}2]\{\text{up } 2, \text{down } 2\}]$$



Fig.4.15 : Bar 15, Violin I theme 1, phrase (v)

Violin I uses the opening figure from the lyrical theme.



Fig. 4.16 : Bar 18, Violin I, theme 1 transposed, phrase (vi)

Phrase (vi) transposes part of the lyrical theme down a minor 10th.

Section C - Bars 17-22



Fig. 4.17 : Bar 17, Violin II, establishes new melodic material

Violin II establishes new melodic material built around a moving axis. The axis starts at D# for the first beat (the F natural is a passing tone and has no symmetrical function), moving to G for $\frac{3}{4}$ of the second beat. It moves back to D# for a full beat from the last semi-quaver of beat 2 to the last of beat 3. The B-Bb and E-D# are then built around a G axis. The final E is a passing note leading to the D# that follows.

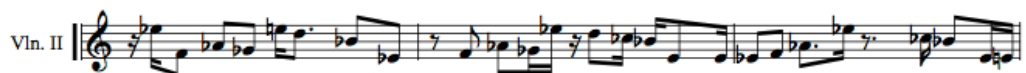


Fig. 4.18 : Bars 22-24, Violin II, repeated melodic material with certain pitches replaced by rests

This melodic material is then repeated by Violin II with certain notes removed to maintain interest.



Fig.4.19 : Bars 18-20, Viola ostinato, each pitch is balanced by symmetrical movement away from the G-axis

The arpeggiated quintal chord at bar 20 is repeated at the resolution into D major at bar 81.



Fig.4.20 : Bars 20-25, Cello, 8-crochet ostinato using the G-axis and a chromatic approach tone

The Cello figure from bars 20-25 is an 8-note motif built using the G-axis

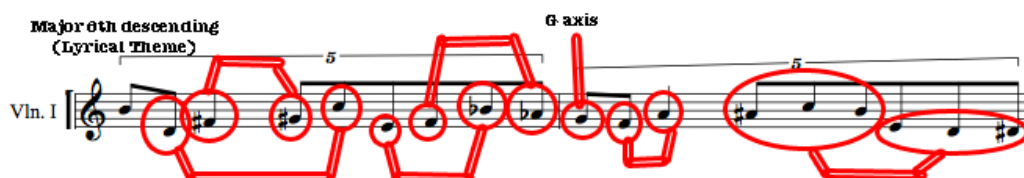


Fig.4.21 : Bars 22-23, Violin I, Melodic line built around the G-axis

At bar 26, Violin I plays a melodic line built using extended axial motion. The first three notes, B, D and F# are borrowed from the lyrical theme. From this, the D and F# are balanced by a G# and C. Next, we see E and F coupled with Bb and Ab. The G restates the axis followed by a down-up contour using F and A. The next A#-C-B pattern is balanced by an E-D-Eb.

Section D

The main melodic material on the Violin I becomes less fragmented and the lines more lengthy. Violin II continues as before, with the semi-quaver motif with certain tones removed to maintain interest. The Viola septuplet theme rhythmically doubles in tempo, with an extended motif. The Cello ostinato becomes more active with the introduction of some quaver-notes. The section introduces the 'rays of sunshine' theme with harmonics shining through the rhythmic imbalance.



Fig.4.22 : Bar 25, Violin I, whole-step/half-step diminished scale

D opens with an ascending diminished scale on Violin I. This moves the Viola from crotchet septuplets to quaver septuplets.

Violin I repeats the phrase from bar 22-23 at bar 26-27. It then plays a new motif built in the same way, extending the material. $[[A, F]\{G\text{-axis, repeated}\}\{G\# \text{ (repeated)}, F\#]$

The final F# in fig.4.21 is the first of a series of notes following the whole-step/half-step diminished scale, starting with the whole-tone from F# to G#. This continues until the end of bar 29.

The whole passage on Violin I from bars 26-29 is repeated from bars 30 to 33, ending with Violin I playing a new theme, the 'rays of sunshine' theme that uses natural and artificial harmonics.



Fig.4.23 : Bar 26, Viola figure moves from septuplet crotchets to septuplet quavers.

The Viola halves the rhythmic value of its phrase, doubling in tempo. The new motif works inwards towards a G-axis, followed by an ascending half-step/whole-step diminished scale. This figure is repeated by the Viola, occasionally broken up by one of the harmonics that are sent around the group.

'Rays of sunlight' theme

The fifth of the seven beats of the Cello line is an harmonic. The harmonics form the 'rays of sunlight' theme. The theme is built on the call-and-answer of melodic motifs with similar contours.

The first motif is a three-note figure with an up-down contour. Heard first as G-A-D across the cello and viola from bars 27-29, it is answered by the F#-A-C on cello and violin II from bar 30-32.

The second motif is a two note figure, first heard as a G-C# on cello and violin II at bar 32. It is then heard as A-G# a bar later, across violins I and II. This two-note theme is then played as a repeated A on violin II and viola (bar 35) followed by a final A at bar

36, on violin II. This brings the 'rays of sunshine' theme to a close, leading into the ascent to the longer harmonics.

Under this, the cello develops its line rhythmically by replacing some crotchets with quavers while maintaining the same pitches.

Section E

As the cello starts its ascent into the harmonics with wide-leaping quavers, Violin I moves to arco played *sul ponticello* alluding to the high harmonic passage that follows at section F.



Fig.4.24 : Bar 35, Violin I, arco sul ponticello

Violin I plays a long ascending melodic line that stretches from C#5 (with a brief F#4) at bar 35 to A7 at bar 40. This line opens with a three-note motif mirroring the contour of the opening to the lyrical theme (bar 3-4).



Fig.4.25 : Bar 37, Violin II, alberti-style semi-quaver figure

Violin II continues with the semi-quaver passage from bar 35-36. At bar 37, it moves to

an alberti-style semi-quaver figure, placing a low pitch on each beat and leaping by over an octave. This figure ascends with Violin I.



Fig.4.26 : Bar 37, Viola quaver septuplets

The viola continues with the quaver-septuplet rhythm from section D. The pitches start an ascent with the violin I and II. It moves into artificial harmonics at bar 38 coming to rest on an A7 at bar 41, section F.



Fig.4.27 : Bar 37, Cello moves to artificial harmonics

The cello moves to artificial harmonics in an ascending quaver line leading from G#4 to G7 at bar 39.

4.2.2, Phase 2 analysis

Section F

The tempo changes to {crotchet=95}. The rhythmic tension created by the polyrhythm and the melodic tension from the long ascending phrase is relaxed by the Violin II that

repeats a two-note motif that gets progressively slower.

After a long ascending passage on each of the four instruments, the ensemble comes to rest around G7 and A7. Violin I, Viola and Cello all sustain long, high artificial harmonics. Violin II provides a rhythmic reference point. It plays a two-note G-F figure that expands rhythmically from two beats per note to three beats, relaxing the rhythmic and melodic tension created in section E.



Fig.4.28 : Bar 48-51, Violin I, ascending melodic line ends as it began with a transposition of the opening motif, itself a development of the lyrical theme.

The final three notes on Violin I (bar 48-51) are a transposition of the melodic material that opened the ascending arco line at bar 35 (down P5, up min6).

4.2.3, Phase 3 analysis

Section G

After the 'floating' section F, which offers the listener few reference points for a sense of the metre, section G contrast this with a strong rhythmic pattern.



Fig.4.29 : Bars 52-53, Violin I & II, Viola 8vb and Cello 15mb. Pitches chosen using axial symmetry

It opens with a 4/4 phrase grouped in 6+6+4 semiquavers (bar 52) followed a retrograde of this grouping with a bar of 4+6+6 (bar 53). The pitches of this melodic line are built by applying subjecting the lyrical theme to a transposition by axial symmetry.

Violin I then plays a melodic line with irregular rhythmic groupings of semi-quavers in 3s and 4s., followed by the introduction of the main rhythmic pattern underpinning sections G, H and I.



Fig.4.30 : Bar 56, Violin I, Rhythmic ostinato in sections G, H and I. Semi-quavers grouped in

3+4+3+4+4

The rhythmic ostinato underpinning G, H and I is a series of semiquavers and dotted-

quavers with strong accents at the start of each group. The dotted-quaver + 4 semiquaver group is extended every second time to become 3+4 followed by 3+4+4. Violin I at bars 56-57 establishes this ostinato.

Once it has been established, the viola and cello play a contrasting rhythm, based on a transposition of the lyrical theme. The melody has a slower harmonic rhythm to the rhythmic ostinato, distorting the clear sense of metre that the Violin I had established. While the rhythmic ostinato gives a clear sense of pulse and firmly establishes the first beat in each bar, the juxtaposition of the melody on viola and cello distorts both of these factors. The melodic phrases start at differing points within each bar, first on the fourth quaver (bar 58), beat 1 (bar 61) and on the fourth quaver of bar 62. Violin II enters at bar 64, joining the rhythmic ostinato of Violin I a whole-tone higher, each pitch sitting a semi-tone either side of the G axis. The cluster between the two instruments is moved to a double-stop on Violin II at bar 67 and Violin I playing a major sixth interval as a rhythmic ostinato.

The sound landscape develops gradually, slowly moving towards a consonant melodic and rhythmic resolution. Violin II widens the double-stop cluster to a major third at bar 72. The cello uses onset points for its notes that match the rhythm of the ostinato, tending to place notes on the first and eighth semi-quaver (bars 69 to 90). The melodic tension is resolved with the broken quintal chord on Viola. The chord uses D as its root, the dominant V tone from G-major, G being the axis of the work. Rhythmically, the viola juxtaposes a 5/4 rhythm with the 7+9/16 ostinato, eventually coming to rest with the Violin I, II and cello on a D major chord at bar 89.

4.2.4, Phase 4 analysis

Having come to a consonant resolution at bar 89, a new rhythmic ostinato is established on Viola and Cello at bar 93, after a three-bar frenetic descending passage. The ostinato, in 7/8, is heard as a D-pedal in octaves with a juxtaposed pizzicato melody entering at bar 97 in fortissimo unison on Violins I and II. The melody is a series of melodic fragments reminiscent of the Violin I melody from bar 10 to 33. It uses brief metric modulations by accenting specific quaver-triplets (i.e. bar 98). This rhythmic ambiguity builds a great deal of rhythmic tension and distorts the clearly defined perception of bar-line placement. This rhythmic blurring resolves with two melodic notes on the first beats of bars 106 and 108. As this tension resolves, new unrest is created as the cello and viola become more active, with the viola eventually developing a broken pattern using a fourth and an octave with D as the root. These pitches start to allude to the resolution to G-major that occurs at bar 146.

The second melodic phrase of the passage runs from bars 110 to 116. This time there is a greater degree of pulse-distortion. Rather than resolving the rhythmic ostinato, as happened at bar 89, the phrase releases into an asymmetric passage from 118 to 129.

Bar 118 is a sudden, highly dissonant textural change. Violin I holds a D/E cluster while Violin II and Viola play a series of asymmetric melodic phrases two octaves apart, each ending with a brief metric modulation. The cello plays an ascending phrase using crotchets and minims to keep a clear sense of rhythmical unity. The first of these phrases runs from bar 118 to 120, the second from bar 121 to beat two of 124 and the third from beat two of 124 until the brief resolution at 128 before the frenetic passage at

129.

The ascending Violin II and Viola line at 129, played at two octaves, releases into a pantonal polyrhythm. The polyrhythm develops and becomes more tonal and consonant, with each instrument, one-by-one, moving to G-major and the common 7/8 pulse. The cello is the final instrument to play in G-major. A four-note pattern is heard from bar 146 where the cello displaces a G by an octave and two octaves. As the work comes to a final resolution, the space between these notes widens, starting in 7/4 (bar 129) and widening to two bars of 4/4 at bar 158. The pattern cycles and Violin I, II and Viola come to rest on a tremolo G-major chord, with the work ending on a final pizzicato G on cello.

4.3, CONCLUSION

The work combines a range of different compositional approaches. Much of the music is written with a view to heightening and relaxing the level of tension. Opening with the melodic material developed using the symmetrical movement concept, the phrases ascend into the high artificial harmonics, signifying an ascension into the clouds. After a brief period, there is a sudden change of texture as the quartet drops into a relentless asymmetric rhythmic ostinato with a non-repeating pizzicato melody. This eventually reaches a resolution, before descending further into a lower ostinato. The final resolution is tonal in G major, the tonal centre that is the main symmetrical axis for much of the melodic writing.

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5, 'ELEMENTS' FOR CHAMBER ENSEMBLE AND TRIGGERED SOUNDS

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5.1, GENERAL ANALYSIS

5.1.1, *Rationale*

Elements is a work that blends live acoustic instruments, pre-recorded, synthesised sounds. It blurs the space between these two sound-sources using spectral analysis and speaker placement. Pre-recorded sounds were created using spectral data from the live instruments. They can closely match the live instrument or else emphasis upper harmonics and appear to alter the sound of the acoustic instrument. The synthesised sounds are channeled to a hemispherical speaker near the respective live instrument. This spatially blends the live and pre-recorded sounds, both of which have a similar spectral envelope. By grouping sound-sources, the origin of each element is blurred. Rather than recognising the creator of individual sounds, the listener hears the composite sound and how their elements relate to each other.

The triggered sounds were generated using the data from a spectral analysis of water-related sounds and the timbres of the live instruments.

Water can generate many interesting timbres and, using spectral analysis, these can be applied to live instruments and synthesizers. Here, the timbres are applied to a small ensemble, using modified pre-recorded sounds to access the frequency bands from 6kHz to 22kHz which, although audible, can only be accessed on conventional instruments as harmonics on a different fundamental pitch. It also aims to take the noise-type sound of a water-pump, which has a wide frequency spectrum, and filter it to remove particular frequencies at specific times to create momentary tonality. It aims to

reveal the beauty that is trapped within a noise sound.

Other triggered sounds heard are derived from the spectral analysis of the live instruments to generate material that will blend the live sounds seamlessly with the tape sounds. It uses a sound synthesizer built in the software application Max MSP.

One of the major issues in this work is that of seamlessly blending the triggered sounds with the live ensemble. The effect that is sought is that the entire sound is emanating from the ensemble. To achieve this, I used a variety of techniques. The sounds on the tape should support the live sound as much as possible. To achieve this, I conducted a spectral analysis of each of the instruments in the live ensemble.

5.1.2, Introduction to the 64X

The 64X is an application that the author built using the Max/MSP framework application created at IRCAM. Max/MSP allows the user to develop complex sound synthesizers to fit their exact specifications. It works in much the same way as a physical modular synthesizer by letting the programmer link or 'patch' together small modules that each carry out a specific function. The programme that was built to create the sounds for 'Elements' is titled 64X after the 64 narrow band-pass filters it uses and also after the 4X, a sound synthesizer developed by IRCAM in the early 1980s that was used during performances of Pierre Boulez's 'Repons' for chamber orchestra and live electronics. For more detailed technical information about the 64X programme, see appendix 2.

The 64X has 64 narrow band-pass filters that allow the user to pin-point specific frequencies in a noise-sound source, like a shower-motor. The motor creates sounds that cover a wide sound spectrum, effectively creating a huge range of different frequencies simultaneously, causing it to sound like noise. 64X takes this sound source and allows the user to separate out the sound in a similar way to how a prism can separate white light into its constituent parts.

64X gives the user a great deal of control over the sounds. It can select up to 64 different regions from a sound sample and the user has complete control over each of these individual regions. The width of each region can be dictated as can the central frequency of each of the filters. The frequency can be inputted in Hz or in musical notation (i.e. C4, F#9 etc). Once the duration of the sound has been inputted, the user can determine the development of the volume of each of the 64 filtered regions. This allows a great level of control over how the timbre changes as a the sound progresses. It also allows for interesting possibilities like letting specific high-frequency sounds to appear for very brief moments in specific places in the sound.

There are two categories of audio samples in the triggered sound-bank, both of which result from the same water-pump sound source, but extracted using different approaches to filtering and subtractive synthesis. The first approach creates timbres that are only related to the live instruments through their frequency range. For example, the sound may be sent through a low-pass filter, removing its higher frequencies and resulting in a low, rumbling timbre that is blended with low-frequency live instruments. In the second approach, the data from an analysis of the spectral envelope of each of live instruments is applied to the synthesised sound. This results in a timbre similar to the sounds live-

instrument counterpart and allows the live and triggered sounds to blend easily.

Once the bank of sounds was generated, a simple application was built in Max/MSP to allow a technician to trigger each sound in sequence by following the score.

The 64X was adapted in July 2011 for a performance by saxophone, piano and live processing. The concert is scheduled for August 2011 at the Irish Sound Science and Technology Convocation at the University of Limerick. As well as triggering the pre-recorded sounds, the adapted application takes live sound-feeds from both the saxophone and the piano and processes them in the frequency domain to reproduce the work '*Elements*' as a duo. For more technical detail about the adapted 64X, see Appendix Item 3.

5.1.3, Introduction to timbre and spectral music

The harmonic series is a progression of frequencies/pitches that follow a mathematical series. It exists within each of the pitches played by each of the instruments in this ensemble. These harmonics are also sometimes called overtones or partials.

The row follows a mathematical progression:

Fundamental | Oct | Oct+5 | 2Oct | 2Oct+3 | 2Oct+5 | 2Oct+b7 | 3 Oct | 3Oct+2 | 3Oct+3
| 3Oct+4 | 3Oct+#4 | 3Oct+6 | 3Oct+b7 | 3Oct+7 | 4Oct

From the fourth octave onwards it continues into microtones.

For every single note played on each of the instruments in the ensemble, this series is also naturally played, with varying degrees of volume naturally being placed on each of the harmonics. The variance in the relative volume of each of these harmonics is what determines the overall timbre of the instrument, and the overall timbre of any sound that can be heard. It is the presence of these harmonics that give the sound depth and allow different instruments, and indeed musicians, to sound different.

Clearly, the fundamental is the loudest sound that is heard and that is the pitch name that is given to the resulting sound. If, for example, a violin plays a middle-C (C4), it is also simultaneously playing C5, G5, C6, E6, G6, Bb6, C7, D7, E7, F#7, G7, A7, Bb7, B7 and C8, plus a theoretically infinite number of harmonics above this. The timbre of the violin is heard in the relative volumes of each of these harmonics. C4 is loudest, C5 is about half as loud and each harmonics after that is progressively quieter.

The clarinet has a very different timbre to the violin and this comes about by its unique spectral envelope. All of the odd-harmonics are almost removed from the series, vastly reducing the inherent tension in the tone, as the harmonics do not clash with one another as easily as they do on a violin. This produces a very warm tone.

Similar acoustic phenomenon can be observed by analysing the spectral envelope of the trombone, cello and flute. To read more about spectral analysis, see appendix item 4.

The timbre of the instruments in this ensemble is determined by the harmonic series and the relative volumes of each of the harmonics as the instrument is played.

Approach to dynamics and the use of dove-tailing

I studied computer-based sound synthesis which got me interested in the limitless possibilities of electronic music. I also become interested in the potential of a sound to develop as it progresses. A chord can change 'shape' by reducing some dynamics while simultaneously increasing others. This approach, called 'dove-tailing', transforms the sound as it develops and is used throughout the work. This is coupled with the staggering of the onset points of each pitch within the chords, giving the chords an organic quality that lets them brim over with vitality and life.

5.2. TECHNICAL ANALYSIS

5.2.1 General structural analysis

'*Elements*' is a work conceived in three-phases.

Phase 1

The first phase is from A to F. It is a series of musical moments that surround a blended sound in the low frequencies.

Phase 2

Phase two is G to L. The phase opens with the results of a spectral analysis of a series of water droplets. This is followed by four polyrhythmic episodes that become more dense.

The pizzicato and staccato represent raindrops.

Phase 3

Phase three is from M to O. It is based on a repeated rhythmic ostinato. The melodic and chordal material enters at different points in the bar, disrupting the sense of

repetition.

5.2.2, Phase 1 analysis

Section A

The work opens with a series of spectral chords that seamlessly blend the tape part with the live instrumentation. The sounds on the tape-part are derived from a detailed spectral analysis of the timbre of each of the live instruments. This data is applied to the sound of the 64X software sound-synthesizer to extract timbres that match the natural sound of the live instruments.

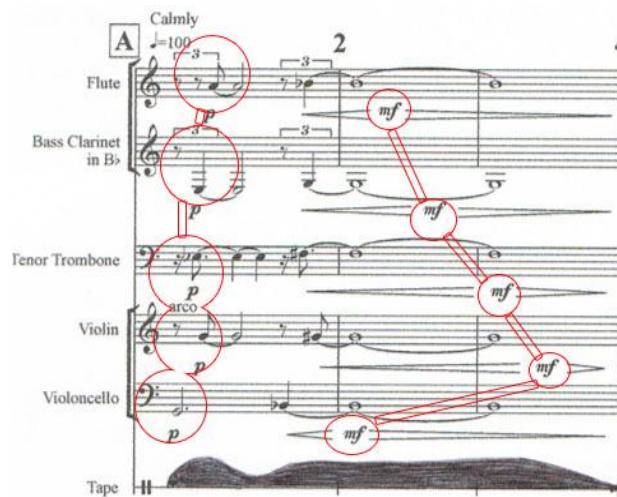


Fig.5.1 : Bars 1-3, Staggering the onset points of each note and dovetailing the dynamics

Throughout the work, the dynamics tend to be staggered. Both the live instruments and the tape act in the same manner with regards to dynamics and onset points for the pitches.

Fig.5.2 : Bars 1-8, Progression is in two parts, the second part extending the first with a

Bar 1	Bar 2	Bar 3	Bar 4	Bar 5	Bar 6	Bar 7	Bar 8
G aug	Bb7#5	Bb7#5	G aug	Bb aug	G#min13	G#min13	G#min13
			Bb aug				
G aug => Bb aug			G aug => Bb aug => G#min13				

cadential chord of G#min13

The harmonic progression is based on augmented chords leading to a climactic G#min13 at bar 6. It can be divided into two parts, bars 1-3 and 4-8. The first is the movement of a minor third by an augmented triad, the Bb of which also uses the b7 pitch Ab. The second part of the progression is an extension of the first, opening with a G aug to Bb aug as before and proceeding to reach a cadence point at bar 6 with a G#min13.



Fig. 5.3 : Bars 9-11, Staccato motif, a textural motif that disrupts the clear sense of metre

The section introduces two of the main textural motifs for the work. The first is the staggered chord as seen in figure 5.1 where the onset points of each composite pitch is at a slightly different time and the dynamic hiatuses are at different points in time for each of the instruments and elements of the tape-part. The second theme that the section

introduces is that of the staccato motif, heard here at bars 9-11. It uses short, punchy staccato clusters to disrupt the clear sense of metre.

At bars 9-11, the section ends with three of these staccato motifs (*fig. 5.3*). These note-clusters act as an anacrusis to the low rumbling that follows.

Section B & C

Section B opens with a low-frequency rumble in the tape part. The bass clarinet plays a repeating four-bar ostinato with an asymmetric rhythm. The four-bar figure is atonal but uses a G as an axis. The pitches of the bass clarinet figure fits within that frequency band of the tape part so both blend into one-another, causing the bass clarinet to vanish within that sound of the tape. The flute, violin and trombone, along with their respective accompanying sounds on the tape-part, create chords with staggered onset points and dove-tailed dynamics. This changing of timbre, coupled with the different points of entry of each of the instruments, blurs that sense of metre and gives an organic quality to the overall sound. Each of the instruments playing the staccato motif often have different onset points too, giving a further sense of the organic nature of the work.

Bar1 2 3 4 5 6 7 8 9 10 11 12 13

27. The staccato motif stops and the cello enters with material borrowed from the bass clarinet figure. It too blends in with the tape-part, giving fresh, new life to the rumbling sound.

Section E

The texture of the tape part changes significantly, opening up the filters to higher frequencies. The repeated figure on the bass clarinet ends and it plays a staccato-based melodic phrase reminiscent of the staccato motif. This is surrounded by rich, warm chords on the live instruments and the tape-part.



Section F

Fig. 5.5 : Bars 44-46, Dovetailing of the dynamics

This section is a brief passage that resolves the tension of the preceding sections into one large lydian chord, before moving on into the tense section G. The resolution point occurs at bar 44 with a C-lydian chord. Both the live instruments and the tape part perform this chord and both use dove-tailing of dynamics to vary the timbre of the

sound as it progresses in time.

5.2.3, Phase 2 analysis

Section G

The pitch material is derived from a spectral analysis of recordings of water splashes. The first cluster creates a great deal of tension, which is dissipated by two answering phrase at bars 50 and 53. They use progressively lower pitch material, removing the higher-frequencies of the spectral analysis.

Section H

The image shows a musical score for cello, spanning bars 56 to 61. The score is written on two staves. The first staff is the treble clef, and the second is the bass clef. The music is marked with 'pizz.' (pizzicato) and 'p' (piano). The tempo/mood is indicated as 'like raindrops' and 'short and delicate, like raindrops'. The score shows a melodic motif in the treble clef staff, consisting of five crotchets (quarter notes) grouped together. The notes are: G4, A4, B4, C5, and B4. The bass clef staff has a corresponding accompaniment. The score is marked with 'p' and 'p as delicately as possible like raindrops'. The bars are numbered 56, 58, and 60.

Fig. 5.6 : Bars 56-61, raindrop melodic motif grouping the cello in five crotchets

Sections H-K is marked as 'delicately, calm like raindrops' and has a new tempo marking of {crotchet=90}. This section is the first of a series of four polyrhythmic clusters that represent raindrops, each with a different level of intensity (Sections H-K). The instruments are each assigned a different rhythmic subdivision and the tension is built and released in part by the density of the overall texture. Instruments are added and removed, and the number of pitches played is increased to build tension to a climactic moment during the fourth of the four polyrhythms. The different subdivisions of rhythm, coupled with the asymmetric rhythmic grouping of the melodic material, creates a rhythmic cluster that builds and releases tension using varying degrees of

textural density.

Section H opens with cello pizzicato introducing the raindrop melodic motif, playing a rhythmic series based on crotchets grouped in five beats with a dynamic marking of '*piano*'. The bass clarinet enters at bar 58, playing a rhythmic phrase using the raindrop melodic motif and a rhythmic subdivision of 5:4 crotchets. The passage ends with a single cello pizzicato note at bar 61. This technique acts as a cadence for each of the four polyrhythmic groups.

Section I



Fig. 5.7 : Bars 63-68, Dynamics increasing and rhythmic tension created with the entrance of the flute

The second of the polyrhythmic groups opens with the bass clarinet and cello pizzicato together, both playing the rhythmic subdivisions of before and developing the pitch material of the raindrop melodic motif with a dynamic marking of '*piano*'. The flute enters at bar 66 with crotchet triplets, while the bass clarinet and cello increase the dynamic to '*mezzo-piano*'. It introduces new tension to the overall ensemble sound, reaching a dynamic high-point at 67:3 with a brief mezzo-forte, ending the polyrhythm

the same way at section H, with a pizzicato B on cello. The tension created by the flute remains unresolved.

Section J

This section opens like the preceding two, with both the cello and bass clarinet playing sparsely together with their respective rhythmic subdivisions of crotchets and 5:4 crotchet triplets. At bar 71, the flute returns, continuing with the same degree of tension that it had established near the end of section I. The texture thickens with the introduction of the violin pizzicato and the increased activity in the cello part. Tension continues to build, using melodic phrases built using the raindrop melodic motif and a new motif, heard first on bass clarinet at bar 76, then on flute and then reaching a high-point when the trombone is heard for the first time at bar 77. The polyrhythm again ends with a cello pizzicato, this time a tense F a tritone away from the B that ended the last two polyrhythms.

Section K

The most tense of the four polyrhythms, this section opens with flute playing a very active melodic line. The bass clarinet joins with a lively phrase and the texture thickens with all five instruments from bars 80-84, reaching a climactic point at the start of bar 81 and then gradually thinning out. The tension is dissipated when the violin and cello use repeated notes with rhythmic expansion.

Section L

Section L is a relaxed passage that acts as a segue between the tense polyrhythms and the rhythmic ostinato that follows from sections M-N. It uses a call-and-answer of

melodic material between flute, bass clarinet and violin, with the violin using artificial harmonics. The melodic material on flute is derived from the fourth polyrhythms.

Section M

Sections M and N both have a low rumbling sound on the tape-part, coupled with chords that accompany the chords of the live instruments.

Section M opens with an Ab harmonic held from the previous section by the violin. This note is held while the trombone and the cello introduce the rhythmic ostinato that forms the basis for the tension and resolution throughout sections M and N. The ostinato is brought in first as a series of non-repeating semi-quavers and demi-semi-quavers on trombone which are coupled at octaves by the cello a bar later. At bar 101, the ostinato-proper is introduced. It is a figure written in 7/4 but sounding like two bars of 7/8. The violin resolves its held note down a semi-tone to G at bar 102, the start of section N.

5.2.4 Phase 3 analysis

Section N

The rhythmic interest is created by varying the point in the bar where the other instruments and the tape parts enter with chords. At bar 102, the resolving violin firmly establishes where the first beat of the bar is. However, from bars 103-106, the sense of meter is quickly blurred by the introduction of chords with staggered onset points and the first beat of the bar is unclear until it is re-established at bar 107 by the bass clarinet.

Section O – P

The image shows a musical score for five instruments: Flute (Fl.), Bass Clarinet (B. Cl.), Trombone (Tbn.), Violin (Vln.), and Viola (Vc.). The score covers bars 108 and 109. The Flute and Violin parts are circled in red, highlighting quaver triplets. The Flute part starts with a dynamic marking of *f* and a triplet of eighth notes. The Violin part is marked *pizz* and also features a triplet of eighth notes. The Trombone part has a complex rhythmic pattern of sixteenth notes. The Bass Clarinet and Viola parts have simpler rhythmic patterns.

Fig. 5.8 : Bars 108-109, The flute and violin pizzicato enter with an implied metric modulation using quaver triplets

This section further establishes the meter and then quickly blurs it. The bass clarinet had made it clear where the bars started, but the flute and *pizz* violin play a unison melodic line in triplets that upsets this sense of meter. The ostinato moves down a tone at the middle of bar 109, further upsetting this sense of meter and bars 111-112 use chords with staggered onset points to continue the blurring. It is resolved for a moment at the end of bar 112 when the ostinato is heard alone, before the violin pizzicato enters with a non-repeating semi-quaver figure.

The bass clarinet plays a melodic phrase from bar 114 that is based on the material heard from bar 108 on flute and violin *pizz*. It ends with three short staccato notes at bar 115 that become a rhythmic and melodic motif at section Q.

Section Q



Fig. 5.9 : Bars 119, Call-and-answer of the three note motif between the flute and the bass clarinet

The motif on flute is developed from bar 116-118 and then passed between the flute and bass clarinet from bars 119-121 to create tension. It eventually resolves with a unison crotchet-triplet at bar 121, leading into the resolved section R.

Section R



Fig. 5.10 : Bars 124-126, Cello ostinato simplifies to pizzicato

The cello repeats a melodic figure with intervals of a perfect fourth. As this figure develops, first arco and then pizzicato, the duration between its repetitions is extended, thus dissipating the tension created by the rhythmic ostinato of sections M-N and the strophic writing for flute and bass clarinet from bars 119-121. The repeated cello figure is surrounded by chords on the live instruments and the tape part. These chords gradually become more resolved, leading to a final G-lydian chord that brims over with

life and vitality. The work ends with one final pizzicato G on cello.

5.4 CONCLUSION

Elements is a work that seamlessly blends live instruments with pre-recorded sounds, triggered using an application built in the Max/MSP environment. Using data from spectral analysis, the pre-recorded timbres match with the sounds produced live, allowing both of these different sound sources to merge. Coupled with this, the performance of the work uses a speaker setup geared towards a further blurring of the lines between live and pre-recorded sounds. Each sound is panned to the physical location of its live instrument counterpart, allowing the two to further blend.

It uses various different compositional devices, including polyrhythms and spectral modeling of the instruments. The onset points of the chords are staggered, giving the work an organic feeling. Added to this, the dynamics are generally dovetailed, a device typically used in additive sound-synthesis to give the resulting tone a greater degree of nuances.

5.4 LIST OF FIGURES AND DIAGRAMS

Fig.5.1 : Bars 1-3, Staggering the onset points of each note and dovetailing the dynamics

Fig.5.2 : Bars 1-8, Progression is in two parts, the second part extending the first with a cadential chord of G#min13

Fig. 5.3 : Bars 9-11, Staccato motif, a textural motif that disrupts the clear sense of metre

Fig. 5.4 : Bars 1-29, Call-and-answer between long, staggered chords and short, staccato chords.

Fig. 5.5 : Bars 44-46, Dovetailing of the dynamics

Fig. 5.6 : Bars 56-61, raindrop melodic motif grouping the cello in five crotchets

Fig. 5.7 : Bars 63-68, Dynamics increasing and rhythmic tension created with the entrance of the flute

Fig. 5.8 : Bars 108-109, The flute and violin pizzicato enter with an implied metric modulation using quaver triplets

Fig. 5.9 : Bars 119, Call-and-answer of the three note motif between the flute and the bass clarinet

Fig. 5.10 : Bars 124-126, Cello ostinato simplifies to pizzicato

6, 'ZENITH' FOR 16 MIXED VOICES AND ORCHESTRA

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6.1, GENERAL ANALYSIS

6.1.1, *Rationale*

The zenith is the region of the sky that is directly overhead. If a person looks upwards and their field of vision is limited to this small part of the sky, they will sometimes see no activity, only static blue sky. Other times they will see thin wisps of the edges of clouds or else they will see deep into the heart of thick clouds that pass directly overhead.

This work tries to capture the essence of this. It is a series of clouds of varying densities and complexities. The progress of the work is built using a series of clouds, each with their own unique character. All dynamics crescendo from *niente* to an hiatus and back to *niente*.

Many of the harmonic progressions and chord voicings are derived from modal interchange. It allows the harmony to remain atonal while still alluding to certain tonal or modal anchor-points. For more information about modal harmony and modal interchange, refer to appendix item 5.

Polytonality is a common feature in the dense clouds. Different sections of the orchestra move through conflicting tonal centres in much the same way as different parts of a storm cloud move along erratic, unpredictable paths.

6.1.2, *Large-scale structural analysis of the work*

The work is in three phases. The first, from sections A to C, is titled 'Storm brewing'. The second phase, from sections D to G is titled 'The centre of the storm' and the final phase, sections H to I, is called 'Storm has passed'.

Phase 1 : Storm brewing

This section builds from a series of short clouds, some consonant, some slightly dissonant and active. The clouds become progressively larger and longer. At section C, the cloud changes texture and timbre often and develops into the first storm cloud. Pizzicato on strings describes the rainfall.

Section A		Section B		Section C
Short calm clouds		Short clouds with some activity		Long cloud, changing often

Phase 2 : The centre of the storm

The lightning bolt, played by the tubular bells, signals the start of the first storm cloud. It is a short cloud that dissipates into a calm vibraphone ostinato. This 'calm before the storm' builds in tension until the three loud lightning bolts and the centre of the storm.

Section D		Section E		Section F
Lightning bolt		The calm before the storm		Three lightning bolt

Section G
Centre of the storm

Phase 3 : Storm has passed

Section H		Section I
Resolving		Atonal raindrops

The work was first written using graphic notation. This gave the work an overall structure and made it clear where the tension and release was evident.

6.2, TECHNICAL ANALYSIS

6.2.1, *Phase 1 analysis*

Section A – Bars 1-20

Section A has three cloud with a structure that progresses from consonance to dissonance, resolving to consonance at the end of the third cloud.

Cloud 1, bar 1



Fig. 6.1 : Bar 1-2, Cloud 1 chord progression

The opening progression has a C 6/4 triad in first inversion at its core. Juxtaposed with this is the raised eleventh (F#) and a flattened 13th (Ab). This Lydian chord progresses to a chord built using the 'A' whole-tone scale stacked on top of a C 6/4. The chord ends with a moment's rest at bar 3.

Cloud 2, bar 4



Fig.6.2 : Bars 4-6, Cloud 2 chord progression

Cloud 2 is a development of cloud 1. It uses a progression derived from modal interchange, moving from A dorian to Bb locrian, keeping an A pedal point across the two chords.

Cloud 3, bar 7

Bar	7	8	9	10	11	12	13
Flutes				<---	G -lydian -	----->	
Oboes				< G-lydian	--> <-- F	ionian-->	<Bb dorian
Alto		< atonal	cluster	chords----			<Bb dorian
STB	< G-lydian	-----	-----	----->			<Bb dorian

Fig.6.3a : Bars 7-20, Cloud 3 chord progression

Bar	14	15	16	17	18	19	20
Flutes	Bb dorian	----->	<- E major	----->			
Oboes	Bb dorian	----->	<-E lydian	----->			
Alto	Bb dorian	----->	<-E lydian	----->	<----- A	aeolian-----	---->
STB	Bb dorian>	<-E lydian	-----	----->	<----- A	aeolian-----	---->

Fig.6.3b : Bars 7-20, Cloud 3 chord progression

At the heart of cloud 3 there is a dense polyrhythm, first heard on oboes 3 and 4, then later moving to oboes 1 and 2 and flutes 1 to 4. The rhythmic activity dissipates as the voices resolve at the end of the cloud. Harmonically, the cloud is based on the G lydian

scale coupled with tense cluster that resolves towards the end.

Cloud 3 ends with a pause at bar 20, allowing the music to breathe before entering section B.

Section B – Bars 21-32

This sections develops the harmonic material heard in section A, with a greater degree of rhythmic activity in the woodwind. It uses a series of short, relatively dissonant clouds that build tension leading to a single punctuated chord at bar 31.

Cloud 4 – Bar 21

Bar	21	22	23	24	25	26
Flutes		<-	Chromatic	pentatonic	poly 3:4:5-->	
Clarinets	<-- cluster	poly 5:6---->				
Bassoons	<-- 3 pitches	from SATB	poly 3:4:5->			
Altos	<-C6/4 b13>	<C# D#	cluster----->	/ Large clust	er -----	--->
STB	<-C6/4 b13>	<A wt&C6/4	><A dorian>	\ 11 of 12 pit	ches-----	--->

Fig. 6.4 : Bars 21-26, Cloud 4 chord progression

This cloud opens with a similar vocal chord to that at bar 1. It has a dense polyrhythmic texture from the outset. The woodwind section plays a polyrhythmic figure where each instrument plays a similar phrase using a different rhythmic subdivision. The clarinets takes the F#, G and Ab from the top pitches of the chord at bar 1 and presents them as a polyrhythmic figure. Each player uses the same pattern but plays them using a different rhythmic subdivision, a technique used throughout the work. Here, the rhythms used are quintuplets and septuplets. The bassoons take three pitches from the SATB chord and play the pattern as a polyrhythm, with each player in either triplets, semi-quavers or quintuplets.

From bars 22-25, flutes 1 and 2 have different phrase lengths. Flute 3 has the same phrase as flute 1, but in quaver triplets.

At bar 22, while the woodwind section maintains a dense polyrhythmic texture, the soprano, tenor and bass singers outline a modal chord using the A whole-tone scale with a C 6/4 chord at its base. The alto sing a two-note cluster with C# and D#, creating tension that they later will resolve. Bar 23 is in A dorian with the altos expanding to a larger cluster of C#, D#, E and F#. From bar 24, the 16 voices create a large cluster around C4 with wide intervals between the upper two and lowest three voices.

Cloud 5 – Bar 27

Cloud five opens the same way as cloud 1 at bar 1 but its harmonic progression develops differently.

C-lydian/G chord | A-whole-tone/G | C7b13/Ab

Cloud five ends with a short staccato notes in the choir using the pitches from the C7b13/Ab

Bar 31 has a brief empty space the does not last long enough to relax the tension created by the previous series of chords.

Section C – Bar 32-52

Bar	32	33	34	35	36	37	38
Flutes				<-G-axis	3:4:5----->	<Gb major	-----
Oboes		<--Maj2nd	3:4:5:6--->			<----7 note	3:4:5:6--->
Clarinets	<--Min2nd	4:5:6----->					
Bassoons						<-Gb maj.	-----
Horns					<--F axis	3:4:5----->	
Vib.Celest.							
SATB	<-C7b13->	<A aeol-->	<-cluster->	<A-lyd.b9	>		<----cluster
Strings			<-A-lydian	micro	polyphony	-----	-----

Fig. 6.5a : Bars 32-52, Schematic of the cloud 6 chord progression showing polytonality

Bar	39	40	41	42	43	44	45
Flutes	----->	<- F#7b13	----->	<- G lyd.->	<-Ab maj.	-----	-----
Oboes		<- F#7b13	----->	<- G lyd.->	<-Ab maj.	-----	----->
Clarinets		<- F#7b13	----->	<- G lyd.->	<-Ab maj.	-----	-----
Bassoons	----->	<- F#7b13	----->	<- G lyd.->	<-Ab maj.	-----	----->
Horns					<-Ab maj.	-----	-----
Vib.Celest.							
SATB	cluster---->		<-Gb phry.	-----	-----	----->	
Strings	----->					<- Pizz	micro

Fig. 6.5b : Bars 32-52, Schematic of the cloud 6 chord progression showing polytonality

Bar	46	47	48	49	50	51	52
Flutes	-----	-----	----->				
Oboes							
Clarinets	-----	-----	-----	-----	-----	-----	----->
Bassoons							
Horns	-----	-----	-----	-----	-----	-----	----->
Vib.Celest.							
SATB	<C#6/4>	<B 6/4>	<Cmaj.>	<Bb7>	<C#min.>	<-Bb7-----	----->
Strings	polyphony	-----	-----	-----	-----	-----	----->

Fig. 6.5c : Bars 32-52, Schematic of the cloud 6 chord progression showing polytonality

Section C is cloud six, a long cloud with many textural changes. It opens with consonance and moves over and back from consonance to dissonance, eventually building to the lightning strike at the start of section D.

It opens with a C7b13/G chord in the STB with a D#-E cluster in the altos. This progresses to an A-aeolian chord with a C#-D cluster in the altos.

The image displays a page of a musical score for a string ensemble, specifically focusing on bars 34 through 38. The score is arranged in a traditional orchestral format with multiple staves. The top section consists of 18 staves for violins and violas, labeled 'Viola 1' through 'Viola 18'. The bottom section consists of 9 staves for violoncellos, labeled 'Violoncello 1' through 'Violoncello 9'. The violins and violas are playing rhythmic ostinatos, with some parts marked 'ppp' (pianissimo) and others 'mf' (mezzo-forte). The violoncellos are playing sustained notes, with some marked 'mf'. The overall texture is dense and complex, characteristic of micropolyphony.

Fig.6.7 : Bars 34-38, Micropolyphony in the string section. Outlining an A-lydian chord with the violins and violas each playing a different rhythmic ostinato

The voices, woodwind and pitched percussion enter, creating a dense polyrhythmic texture. Clarinets 1 to 3 play a minor-second pattern with the rhythmic subdivisions of 4, 5 and 6. The pitched percussion enters for the first time, adding to the dense polyrhythm. The vibraphone plays the main melodic line, an atonal chromatic 17-note repeating pattern. The glockenspiel picks out each of the vibraphone pitches that land on a beat. The right-hand of the celesta plays unison with the vibraphone, entering a beat later and finishing a beat earlier. The left-hand of the Celeste plays a section of the melody transposed down by a major 13th. The gradual thickening of the texture mimics the density of a cloud's centre and the sparsity of the cloud's edges.

The woodwind section at bars 33-35 adds to the polyrhythm with oboes and flutes and the horn section make an entrance also. The oboes 1 and 2 play a major second pattern as a 3:4 polyrhythm. While oboes 3 and 4 play a three-note motif approaching a 'G' from a semitone above and below. They play the pattern as quintuplets and sextuplets. Later, clarinets 1 to 4 enter, playing a seven-note pattern as a 3:4:5:6 polyrhythm.

The flutes 1 to 3 enter at bar 35. Each plays a different pattern but all patterns rotate around the note 'G'. Flute 1 plays a five note pattern. Flute 2 has a seven-note pattern and flute 3 uses a four-note pattern. The overall rhythm is a 3:4:5 composite polyrhythm.

At bars 36 to 37, the horns use a five-note pattern at different rates. Horns 1 to 3 use the note F as a symmetrical axis, together creating a composite polyrhythm of 3:4:5. Horns 4 and 5 play a six-note patter with triplets and semiquavers.

At bar 33, the strings join with micropolyphony, a technique developed by Gyorgy

Ligeti. The string section all play parts of a chord outlining an A Lydian tonality. However, the micropolyphony occurs when a brief diatonic second ascending step is placed at different rhythmical points on each instrument. This gives the passage a shimmering quality and a sense of activity.

At bar 34, the SATB voices sing a large cluster with a major sixth interval between the lowest two voices. The tension of this cluster is juxtaposed with the shimmering, tonal sound of the A-Lydian micropolyphony held by the string section.

The SATB chord at bar 35 is an A-Lydian with the added tension of a b9. Again, the major sixth interval between the two lowest voices helps to stabilise it. This is followed by a large cluster chord from bars 38-39.

Bar 37	Bar 38	Bar 40	Bar 42
G-major	Gb major	F#7b13	G-Lydian

Fig. 6.8 : Bars 37-42, Woodwind chord progression

The large chord progression heard from the flutes at bar 37 spreads to the horns and the SATB while the string section maintains the A-Lydian micropolyphony. The progression in the woodwind section at bars 37-38 of G-major to Gb-major is contrasted by a reversal of the root movement at bars 40-42. Here, the progression is F#7b13 to G-Lydian. This proceeds to an Ab-major at bar 44.

At bars 41-44, the voices sing a modal Gb-phrygian chord by singing the G-Lydian chord with a Gb (F#) at its base. This part of the cloud is followed by gradual reduction in the density of the texture. The strings move to a pizzicato version of the shimmering polyrhythm and the flutes, alto voices and bass voices exit.

Clarinets 2, 3 and 4 play a six-note repeated figure from bars 46-51 using quavers, quaver-quintuplets and a palindrome rhythmic ostinato of {crotchet, crotchet, quaver, quaver, crotchet, crotchet}. The same figure is heard in the horns section as semi-quavers on horns 1 and 3, quaver-triplets on horn 5, semi-quaver quintuplets on horn 4 and a series of non-repeating semi-quavers and quaver triplets on horn 2.

The strings continue to outline the A-lydian chord as a pizzicato polyrhythm passage that becomes progressively less dense.

Bar 46	Bar 47	Bar 48	Bar 49	Bar 50	Bar 51
Soprano	Tenor	Soprano	Tenor	Soprano	S & T
C# 6/4 add11	B 6/4 add11	C-major	Bb dorian	C#minor	Bb7

Fig. 6.9 : Bars 46-53, Chord progression, call and answer between the sopranos and the tenors

From bars 46 to 53, the sopranos and tenors sing a call-and-answer homophonic passage. As the passage builds tension, it leads into the lightning strike at bar 53, marked by the tubular bells.

6.2.2, Phase 2 analysis

Section D - 53-57

During the section, the centre of a small storm cloud passes through the zenith. It opens with a lightning bolt played by the tubular bells. Both of the lightning bolts during this section and all subsequent lightning bolts trigger a hive of rhythmic activity. The first, at bar 53, triggers the pizzicato on second violins and the violas.

Both of the contrabassoons enter with a chromatic six-note figure that rotates around a 'G'. Contrabassoon 1 plays this figure as semi-quavers while contrabassoon 2 plays quaver triplets.

Sopranos 1-4 and Alto 1 are in C#minor, while altos 2-4 sing a three-note cluster of G-G#-A. The pizzicato on the strings uses the interval of a perfect fifth with a D at its base.

This is followed by a second lightning strike that triggers the soprano 4 and alto 1 to 4 to sing a C# minor chord with the strings playing a pizzicato minor sixth with A at the base.

Section E – Bars 58-81

Section E is the calm before the big storm at sections F and G. The activity resulting from the lightning bolt at bar 58 dissipates, revealing a nine-note melodic ostinato on pitched percussion. It is played by the vibraphone and celesta and is interspersed with short vocal and woodwind clouds. The vibraphone replaces random notes with rests, continuing to play the ostinato but maintaining rhythmic interest.

Bar 55	Bar 56	Bar 57
C#minor	Eb major	B major
Bar 58	Bar 59	Bar 61
Bb7	Cluster with Db root	B major

Fig.6.10 : Choral chord progression from 55-62

Rainfall is described using random pizzicato passages across the whole string section. The pitches and rhythms of these passages were composed with the help of a computer algorithm developed in OpenMusic, an application from IRCAM that allows the composer to build algorithms for computer-aided-composition. The algorithms developed for this process output random pitches and rhythms based on the parameters that are inputted. It allows for an even distribution of pitches while maintaining the

randomised elements of rainfall. The rhythms were composed using a separate algorithm and, together with the data from the pitch algorithm, the pitches were placed on each of the instruments in the string section.

Bar 70	Bar 71	Bar 72a	Bar 72b
Bb Lydian	D major	Ab major	Bb major

Fig. 6.11 : Choral chord progression from 70-73

After the choral chord progression, the vibraphone continues interspersed with glockenspiel punctuations. The celesta continues to play phrases related to the ostinato from the vibraphone. As section E progresses, the pizzicato becomes more active, building tension and leading to the lightning bolt at bar 82, the start of section F and the large storm.

Section F – Bars 82-92

This section marks the arrival of the large storm. It starts with a lightning bolt that triggers a great degree of activity in the pizzicato strings. This activity quickly dissipates but the next lightning bolt at bar 85 results in more pizzicato activity plus a new polyrhythmic figure in the woodwind section.

The lightning bolt that follows, at bar 87 triggers a hive of activity as the four cellos enter with a polyrhythm presentation of a melodic figure in triplets, semiquavers, quintuplets and sextuplets.

The choir sings four chords that build in density, generating a great deal of tension.

Bar 88 | Bar 89 | Bar 90 | Bar 92
 Bb lydian + Ab lydian | C# locrian | Bb lydian + B lydian | C# lydian dominant with C lydian

Fig. 6.12 : Choral chord progression from 88-94

Section G – Bars 93-116

At section G, the centre of the large storm passes over the zenith point. The woodwind section creates a very dense polyrhythmic texture. The choir sings short, staccato phrases with one or two repeated pitches and rhythmic syllables borrow from Indian classical music from the Carnatic region.

The violins and violas return to arco playing with a large cluster with dovetailing dynamics while the cellos continue their dense, low range polyrhythm.

Bars	92	93	94	95	96	97
Flutes			<-Vib. poly	(E maj.)-----	----->	
Oboes						
Clarinets	<9-note Vib.	poly (AbMaj)	-----	----->		<-Vib. poly
Bassoons				<-Vib. poly	(Ab maj.)	----->
Horns				<-Vib. poly	(Ab maj.)	----->
T.Bells	X					
Pitch'd Perc.	<Vib.Pattern	-----	-----	----->		
SATB	Finishing	Previous	Chord----->	XX	<-cluster---	
Vln & Vla					<-cluster---	----->
Cellos	<---4 voice	poly 3:4:5:6	-----	-----	-----	-----

Fig. 6.13a : Bars 92-117, Chord progression for the centre of the storm showing the polytonality and the punctuated staccato rhythms in the voices.

Bars	98	99	100	101	102	103
Flutes		<-Vib. poly	(Ab maj.)	----->		<-Vib. poly
Oboes		<-Vib. poly	(E maj.)	----->	<-Vib. poly	(E maj.)
Clarinets	(C Maj.)----	----->	<-----	clusters----	-----	-----
Bassoons		<-Vib. poly	(Ab maj.)	----->	<-----	clusters----
Horns		<-Vib. poly	(Ab maj.)	----->	<-----	clusters----
T.Bells	X	X	<-----	Vib.Glock.&	Celesta----	Trill----->
Pitch'd Perc.						
SATB	XX X		X	XX	<-cluster-->	XXX XX
Vln & Vla	<-cluster----	----->	<-cluster----	-----	----->	<-pizzicato-
Cellos	-----	-----	-----	-----	-----	-----

Fig. 6.13b : Bars 92-117, Chord progression for the centre of the storm showing the polytonality and the punctuated staccato rhythms in the voices.

Bars	104	105	106	107	108	109	110
Flutes	(E maj.)-	----->	<-----	cluster----	-----	----->	
Oboes	----->	<-----	-----	cluster----	-----	-----	----->
Clarinets	-----	----->	<Vib. poly	(C Maj.)--	-----	-----	-----
Bassoons	-----	----->	<Vib. poly	(C Maj.)--	-----	-----	----->
Horns	-----	-----	-----	-----	----->	<Vib. poly	E&AbMaj
T.Bells			X				
Pitch'd Perc.		<Vib.Glk.	Celesta---	Trill----->			
SATB		XX	XXX XX	XX	XX XXX	XX X	XX XXX
Vln & Vla	-----	-----	-----	----->		<-pizz.--->	
Cellos	-----	-----	-----	-----	-----	-----	-----

Fig. 6.13c : Bars 92-117, Chord progression for the centre of the storm showing the polytonality and the punctuated staccato rhythms in the voices.

Bars	111	112	113	114	115	116	117
Flutes	<-chroma	tic 3:4:5-	----->				
Oboes				<-G-axis	Maj 2nd->	<-C w/tone	3:4:5:6--->
Clarinets	----->	<- 4-note	Pattern	3:4:5----->			
Bassoons		<- 4-note	Pattern	3:4:5----->			
Horns	-----	----->	<- 4-note	Pattern	3:4:5----->		
T.Bells						X	
Pitch'd Perc.							
SATB	XX	<-cluster>					<resolve>
Vln & Vla							<-pizz.--->
Cellos	-----	-----	-----	-----	-----	-----	----->

Fig. 6.13d : Bars 92-117, Chord progression for the centre of the storm showing the polytonality and the punctuated staccato rhythms in the voices.

The dense polyrhythm in the woodwind and horns is a repetition of a transposition of the nine-note ostinato that was heard first on the vibraphone. First it is transposed down a major 2nd by clarinets 1 to 3, who play it as a 2:3:4:5 polyrhythm from bar 93. At bar 94, the flutes enter with the same motif transposed a minor sixth higher than the clarinets. Clarinet 4 enters at bar 94 with a transposition up a major third with builds to a polyrhythm with the bassoons and the contrabassoon. At bar 95, flute 4 enter with the motif transposed an octave higher while horns 1 to 3 play in the original octave. The texture continues to thicken reaching its densest point at bar 98 with the original figure on flutes and transpositions of a major third, minor sixth and an octave heard.

As the woodwind, horns and pitched percussion continue to build tension, the choir further build tension by singing the short staccato rhythmic motifs, ascend to a climax.

At bar 100-101, the polyrhythm briefly dissipates, with the new rhythmic activity heard for the first time as trills on the pitched percussion. This texture remains dense with

large cluster chords played by the woodwind and horn section.

From 102-105, the flutes and oboes return with a dense polyrhythm supported by the continuation of the large cluster chords of the clarinet and horns. As this polyrhythm dissipates, at bars 104-105, the activity is taken over by the trills on vibraphone and celesta.

The tubular bells strike a lightning bolt at bar 106, marking the centre of the storm and the climax of the work. The woodwind and horns are engaged in a dense polyrhythm and the choir reaches its tense climax with a massive cluster chord sung by the choir at bar 112. The chord is a dense cloud with a great deal of tension and a strong perfect fifth at its base, with an A at the root.

The string section signals an end to the storm with an A-lydian chord. The activity continue for several more bars as the woodwind maintain the polyrhythmic activity, gradually vanishing as the work starts to resolve with the consonant chord progression at bar 117, heard sung by the SATB choir.

6.2.3, Phase 3 analysis

Section H – Bars 117-142

Bar 117		Bar 118		Bar 119		Bar 120
F-whole-tone		F# major + D major		B7 + A major		E major/G#

Fig. 6.14 : Bars 117-122, Consonant SATB chord progression

The final lightning bolt is heard at the start of section H. The choir sing a large, dense consonant chord progression from bars 117 to 122, relaxing a great deal of tension.

The upper voices sing short consonant cloud chords to calm the tension. Sopranos 1-4 and Altos 1 and 2 sing a small cloud chord in B major, using B-C#-D#-F#-G#, the pitches from the major pentatonic scale. This is answered by a second small cloud of consonance in F# minor.

At bar 122, the voices sing a large chord in C# minor followed by a large atonal chord with some tension. This second chord resolves to a less tense chromatic chord, outlining an A-lydian tonality with added tension notes of a b9 and b7.

The pizzicato continues, slowly vanishing.

Bar 123	Bar 126	Bar 130
B major	A major	A lydian

Fig. 6.15 : Bars 123-130, Short consonance SATB clouds

The final passage in section H is a tonal chord progression resolving all tension created throughout the work. The passage is a single cloud with a sparse polyrhythmic figure that spreads from the horns to the clarinets and bassoons and finishes on the flutes. This is coupled with the same tonal progression in the sopranos and altos.

Section I – Bars 143-148

The work ends with a final coda, heard played pizzicato on the violins. Having reached a clear tonal resolution at the end of section H, section I is a brief final series of raindrops with pitches derived from the atonal pitch-generating algorithm used earlier.

3. CONCLUSION

The work describes the complex, tumultuous nature of clouds of different densities. Some clouds are sparse and delicate while others are thick storm clouds carrying rain. This complexity is described by using polytonality and polyrhythms to give each instrument or group of instruments a role unto themselves that relates in some way to the whole, but has its own personal character. Tension and resolution is built by varying the density of the texture and by the use of modal harmony and polytonality. The work reaches a strong climax by the short staccato choral motifs, coupled with frenetic playing in the woodwind and brass sections.

Motifs are developed by incorporating them into dense polyrhythms. They can be transposed, or simply repeated in their original tonality. To generate the polyrhythmic activity, groups of instruments play the same motif using a different rhythmic subdivision. The resulting timbre is a hive of activity that almost never repeats. This maintains interest without the need for introducing new material.

6.4 LIST OF FIGURES AND DIAGRAMS

Fig. 6.1 : Bar 1-2, Cloud 1 chord progression

Fig.6.2 : Bars 4-6, Cloud 2 chord progression

Fig.6.3a&b : Bars 7-20, Cloud 3 chord progression

Fig. 6.4 : Bars 21-26, Cloud 4 chord progression

Fig. 6.5a,b&c : Bars 32-52, Schematic of the cloud 6 chord progression showing polytonality

Fig.6.7 : Bars 34-38, Micropolyphony in the string section. Outlining an A-lydian chord with the violins and violas each playing a different rhythmic ostinato

Fig. 6.8 : Bars 37-42, Woodwind chord progression

Fig. 6.9 : Bars 46-53, Chord progression, call and answer between the sopranos and the tenors

Fig.6.10 : Choral chord progression from 55-62

Fig. 6.11 : Choral chord progression from 70-73

Fig. 6.12 : Choral chord progression from 88-94

Fig. 6.13a,b,c&d : Bars 92-117, Chord progression for the centre of the storm showing the polytonality and the punctuated staccato rhythms in the voices.

Fig. 6.14 : Bars 117-122, Consonant SATB chord progression

Fig. 6.15 : Bars 123-130, Short consonance SATB clouds

7, GENERAL CONCLUSION

Although the compositional style of the author has clearly developed over the course of the portfolio, a core musical voice is apparent across all works.

The core features throughout the portfolio are the programmatic nature of the works, the use of polytonality, idiomatic approaches to rhythm and the composer's fascination with computers and sound analysis.

Programme music

The works are all programmatic, to greater or lesser extents, and relate to themes in science, mathematics and astronomy. *Jupiter Moons Suite* is a work composed with the intent of creating programmatic 12-tone music that describes various astrophysical atmospheres. *Aurora Borealis* is a setting of an extract from a short story of the same title. The text uses colours to describe the changes in the sky over the course of the northern lights. The composition uses this progressive change as a basis for the structural movement of the work, and each colour is represented by a particular chord structure. *If-Then* uses mathematical probability to allow the large-scale structure of the work to unfold using concepts of randomness. *Cumulus* describes an ascent into the clouds, using highly-pitched artificial harmonics representing rays of sunshine breaking through an overcast sky. *Elements* is a work composed using spectral sound analysis data attained from various water-features. Finally, *Zenith* describes the changes in the sky observed when a viewer focussing specifically on a tiny point overhead, known in astronomical terminology as the 'zenith'.

Polytonality

The familiar structure of the chord progressions used during the late Romantic period are often used as a departure point to let the composer balance the familiar with the unfamiliar. By implying tonal centres, and brief chord progressions leading to these, consonance and dissonance can be effectively balanced and the work can exhibit great degrees of complexity while still maintaining a sense of stability and predictability. This is used extensively in the overlapping tonalities in the thick storm clouds of *Zenith*.

Use of rhythm

The portfolio shows an idiomatic use of rhythm throughout. As a trained jazz musician, the composer has encountered many interesting approaches to rhythm, including the use of hemiolas, non-repeating rhythms, polyrhythm and asymmetric rhythms. The unique rhythms of Bulgarian folk music, the Carnatic traditions of South India and Ligeti's use of polyrhythms have all had a great influence on his compositional voice and this is apparent in many of the works.

Use of computers

In later works, the composer developed a strong interest in the use of computers in the compositional process, in the field of spectral sound analysis and in the generation of notation using computer processes. *Elements* is a work composed using the data from a series of spectral analyses conducted by field recordings of various water-related sources. All real-world sounds, other than simple sine waves such as tuning fork tones, are complex composites of many individual sine waves. By dismantling the real-world sounds into their composite wave forms, using a process called the Fast Fourier Transform, and then analysing the frequency and amplitude of each of its sine waves,

the pitches can be transcribed for ensemble. The synthesis heard on the tape part is used only to facilitate the representation of the frequencies in the range between that exist in the real-world sound but cannot be accurately reproduced on acoustic instruments. Computer-aided composition (CAC) is a field of work that, in many ways, is very much separate from spectral analysis, more concerned with the development of systems to aid the composer, rather than the analysis of real-world sounds. CAC uses computers to automate the process of note-selection. The reasons for choosing CAC techniques vary greatly depending on the individual composer. In the case of the author, a programme was developed to aid in the composition of pitches and rhythms in *Zenith* in order to generate stochastic material without any human bias. In particular, it is used to closely represent the stochastic sound of rainfall during large pizzicato sections of the work.

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Gyorgy Ligeti Lux Aeterna, Clocks and Clouds, Atmospheres
Bela Bartok string quartets and piano concertos
Maurice Ravel string quartet
Witold Lutoslawski selected works
John Cage selected works using chance music
Gerald Barry The Intelligence Park
Pierre Boulez selected electroacoustic works

APPENDICES

Appendix Item 1

The internal resolution of melodic phrases

Most of the melodies in the If-then suite are atonal, as are many throughout this portfolio. However, they have a melodic sense that guides them, using note targeting and intervallic displacement.

This approach is a natural progression from my development as a jazz musician and my study of bebop and the music of Charlie Parker. His music is densely chromatic but still contains a clear melodic line guided by an instinctive sense of intervallic side-stepping, note targeting and guide-tones.

For a further study of the improvisational style of Charlie Parker, refer to 'Charlie Parker and Thematic Improvisation' by Henry Martin. This text carries out a thorough Schenkerian analysis of many of his improvised solos.

Appendix Item 2

Technical details about the 64X subtractive synthesizer

The 64X is a large software programme developed to allow the user to extract harmony from any type of sound source. For the work 'Elements', the application extracted various timbres and tonalities from a recording of a water pump, a noise sound that has a very wide frequency range.

Being a noise sound, the recording of the water-pump contains many frequencies spanning a large cross-section of the audible range, from 15Hz to 22kHz. The application uses subtractive synthesis to pin-point up to 64 specific frequency ranges.

The programme was developed in Max/MSP, a commercial software application that allows the user to assemble software by linking or *patching* together objects. These objects are small units that serve specific functions. For example, there are objects that carry out mathematical calculation and others that create sound waves. By linking these objects together, the user can develop an application that works exactly to their specific needs.

The 64X takes a recorded noise sound and filters it to create various timbres and tonalities.

- 1, The user sets the duration of the tone, along with any other presets like timbre, amplitude, pitches and tonality required. The sound source is selected and then triggered.

- 2, Once triggered, the sound source is first sent through a high-pass filter to remove sounds that are below the audible range threshold of 15Hz.

- 3, Next, the filtered signal is passed to the main filter bank. Here it is sent to 64 different narrow band pass filters arranged in parallel. Each of these filters selects a frequency range small enough to be recognisable as a musical pitch. These pitches can be selected using a drop-down menu, by entering the frequency in hertz or by choosing one of the

presets to apply a particular spectrum to the overall filter-bank.

4, Now that the 64 different frequencies (pitches) have been selected, the 64 separate signals pass through individual amplitude filters that vary the volume of the pitch as the tone progresses. By varying the amplitude of each of the 64 signals, the tone develops many nuances and become far richer in character, more like the tone of a live acoustic instrument.

5, Once the individual amplitude envelopes have been applied to each of the 64 signals, they are merged to form a composite signal.

6, Each live instrument has a unique amplitude envelope. For example, the piano has a strong sudden attack and a long gradual decay. This differs from a violin, which has a strong attack but the note does not decay until the bowing is stopped, at which point the decay is sudden. This amplitude envelope is a feature that the 64X has to mimic the characteristic of live acoustic instruments. An amplitude envelope is applied to the composite signal to give it specific characteristics typical of the live instrument it aims to model.

7, Finally, once an overall amplitude envelope has been applied to the composite signal, the outputted signal is sent to a digital-to-audio converter which plays the sound back through the speakers. This signal can also be recorded to allow the sound to easily be triggered as a wav or aiff file, which uses less processing power.

Appendix Item 3

Technical details about the 64X adapted to incorporate live sound processing.

Following a study of frequency-domain sound manipulation, the 64X was adapted in July 2011 for a performance of 'Elements' for saxophone, piano and live sound processing. The new heavily adapted programme, titled the 'Elements live patch' could trigger sounds that had been created in the original 64X application.

Its main feature was the capacity to take two live audio signals, one from each of the live instruments, and record them to a buffer, process them and play the processed sounds back through speakers positioned beside the respective players.

The 'Elements live patch' could process live sounds in four ways.

- 1, Freezing
- 2, Melody to harmony
- 3, Speed change
- 4, Segmentation

Freezing

The programme could take snapshots of sound and repeat those short samples as if they were frozen in time. It could be configured to allow crossfading from one frozen sound to another at any rate, creating a sound transformation.

Melody to harmony

This feature is similar to the freezing in that it takes a snapshot of the live sound, stores

it and repeats it. However, it differs in that the user can take a series of snapshots and it amalgamates them to form a chord. In this way, a series of five solo saxophone pitches can each be 'captured' in the melody-to-harmony processor and can be replayed together as a five-note chord.

Speed change

The speed change processor takes a sound recording of a set duration and allows the users to replay it at any speed (from around million times slower up to a million times faster) without having a large impact on the quality of the sound.

Segmentation

Similar to the speed change, the segmentation processor takes a recording of a sound source for a predefined duration. It then detects how many individual pitches were played by recognising whenever the audio feed steps over a volume threshold. Once it has done this, it segments each note and gives the user a series of options regarding how they should be played back. For example, if the processor recognises that the saxophone recording is made up of five notes, the users can play them back in any order (5,4,3,2,1.....4,5,2,1,3), using a stutter feature (4,5,5,2,3,3,3,1,1) or a range of other options. Rather than reversing the actual sound, the processor plays each segmented soundbite in its original direction thereby preserving the sound of the live instrument and only re-organising the order of the notes played.

Each of the processing parts of the application were controlled by volume controls and an events sheet was created that triggered each event one by one, allowing the technician to simply click a button each time any event needed to be carried out.

Appendix Item 4

Further details concerning spectral analysis

Spectral music is an area that takes the developments in the field of scientific research into sound and applies them to composition. All sounds other than the pure sine wave are composite sounds made up of a range of different frequencies, each at a different volume (amplitude). The amplitude of each of these frequencies, known as partials, harmonics, overtones, determines the timbre of the sound. Each live acoustic instrument has its own spectral envelope which make the sound of a sustained note on a violin sound different to that of a sustained note on a clarinet.

The frequencies of the harmonics follow a mathematical pattern. The first is known as the fundamental. It is also the pitch that is heard clearest because the spectral envelope gives that partial the highest amplitude. The second harmonic is exactly twice the frequency, in hertz, of the fundamental, making it an octave higher. For example, if the fundamental is an A2 (110Hz), the second harmonic would be A3 (220Hz). The third is three times the first, making it an E4 (330Hz). The fourth is four times (A4 – 440Hz), the fifth is five times (C#5 550Hz) , the sixth six times (E5 660Hz) and so on. In theory, this progresses infinitely. Practically, the human ear cannot hear above 22,500 Hz so any harmonics above this are imperceptible.

The volume of each harmonic is determined by a range of different variables including the type of instrument, the shape of the instrument, the materials it is made from and the performer's style of play. Each instrument has an inherent spectral envelope that it applies to the sounds it produces and this creates the tone that makes it recognisable.

Any changes in the tone of the sound are actually changes in the volume of some of the harmonics. Nuanced sounds have subtle changes in the harmonics of the tone. When synthesising sounds, timbres of live acoustic instruments can be modeled by applying the spectral envelope of the instrument to the digital programme. In the 64X, discussed in appendix item 4, one of the presets is a multiplier that sets each of the 64 narrow band pass filters to the frequencies of the first 64 harmonics of a specified pitch. The user can then apply different volumes to each of these harmonics using a preset that models the timbre of a range of different acoustic instruments. Although the resultant sound is not the same as the live instrument, the timbre is similar and it therefore blends easily with the live acoustic sound, which is the intention of the work 'Elements'.

Appendix Item 5

Modal harmony and modal interchange.

Modal harmony is derived from the various modes of the major and minor scales.

The notes of the C Major scale are C D E F G A B. If this pitch row is started on D, the second degree of the scale, we get the scale D E F G A B C D, a modal scale named D dorian. Each degree of the scale has a related mode and a particular quality resulting from characteristic note alterations.

- 1, Ionian – the title of the major scale
- 2, Dorian – a minor scale with a b3 and b7
- 3, Phrygian – a scale often used in Spanish music. It has a b2, b3, b6 and b7
- 4, Lydian – very consonant because the tritone between the 4th and 7th degrees has been removed by raising the 4th by a semitone.
- 5, Mixolydian – a tense scale related to the dominant 7th chord. It has a b7
- 6, Aeolian – also called the natural minor. It has a b3, b6 and b7.
- 7, Locrian – a very tense scale with many alterations. It has a b2, b3, b5, b6 and b7

The characteristic qualities of these modal scales can be applied to chords by distributing the pitches of the scale across several instruments. This is a device used extensively in most of the works in this portfolio.

Modal interchange is a way of varying the tension in melodic and harmonic writing by changing the scale used. A passage can open with using a consonant F ionian scale and progress to a more tense F phrygian scale before resolving to an F lydian scale. The scales need not have the same starting note. The progression C mixolydian → G phrygian → F aeolian → F# lydian would also constitute modal interchange.