

**PORTFOLIO OF ORIGINAL COMPOSITIONS :  
CRITICAL COMMENTARY**

**John Gormley**

**A Thesis Submitted for the Degree of PhD  
at the  
University of St Andrews**



**2015**

**Full metadata for this item is available in  
Research@StAndrews:FullText  
at:**

**<http://research-repository.st-andrews.ac.uk/>**

**Please use this identifier to cite or link to this item:**

**<http://hdl.handle.net/10023/7072>**

**This item is protected by original copyright**

**This item is licensed under a  
Creative Commons Licence**

Portfolio of Original Compositions

John Gormley

Critical Commentary

Degree of PhD

2015

## Declarations

- (i) I, John Gormley, hereby confirm that I am solely responsible for the production of this submission which consists of:

- 1) Critical Commentary
- 2) Dialogue
- 3) Discussion
- 4) Velocity
- 5) On G
- 6) Parallel Worlds
- 7) Compression
- 8) CD of recordings

and that it has not been submitted in any previous application for a higher degree.

Date ..... Signature of candidate .....

- (ii) I was admitted as a research student in September 2003 and as a candidate for the degree of PhD in June 2004; the higher study for which this is the outcome was carried out at the Royal Conservatoire of Scotland between 2003 and 2015.

Date ..... Signature of candidate .....

- (iii) I hereby certify that the candidate has fulfilled the conditions of the Resolution and Regulations appropriate for the degree of PhD in the University of St Andrews and any additional requirements of the regulations of the Royal Conservatoire of Scotland as approved by the University and that the candidate is qualified to make this submission application for that degree.

Date ..... Signature of supervisor .....

- (iv) In presenting this submission to the Royal Conservatoire of Scotland and to the University of St Andrews I understand that I am giving permission for it to be made available for use in accordance with the regulations of the Royal Conservatoire of Scotland Library and the University Library for the time being in force, subject to any copyright vested in the work not being affected thereby. I also understand that the title and abstract will be published, and that a copy of the work may be made and supplied to any *bona fide* library or research worker.

Date ..... Signature of candidate .....

# Abstract

This folio and accompanying commentary draw together my compositional work over the period of the PhD and plot the development and exploration of a number techniques which are to be found in varying degrees in each of the works but with different emphases. These techniques include the use of: parallel structures and metres to provide a sense of independence of compositional ideas; parallel tonal centres within overarching schema to control and draw thematic material together; the use of rhetorical musical gestures that seek to break free of their context; fragmentation and the accumulation of material in terms of quantity and density in order to facilitate a sense of change; the limitation of pitch material in order to create a sense of stasis; and the use of slow sustained melodies that lack a clear pulse in order to create a sense of musical events that are not bound by time.

# Contents

	Acknowledgements	i
	List of Illustrations	ii
1.	Introduction	1
2.	Dialogue	4
3.	Discussion	10
4.	Velocity	17
5.	On G	28
6.	Parallel Worlds	34
7.	Compression	38
8.	Conclusion	51
	Selected Bibliography	53
	Selected Scores	55

# Acknowledgements

I would like to thank the Royal Conservatoire of Scotland and St Andrews University for the support and assistance which they have given me over the past decade. In particular I am grateful to the Conservatoire for its financial support and its flexible approach to my studies which allowed me to continue working as I wrote this submission. I would like to recognise the direct and indirect contribution that my colleagues and fellow students have made to my thinking on compositional matters.

Grateful thanks must go to my supervisors over the years: Dr Gordon McPherson during the earlier phase of study; Dr Alistair MacDonald and Dr Martin Dixon (Glasgow University) during the later period; and to Dr Stephen Broad for his support in the final stages.

Finally, I would like to thank my family, and in particular my mum and my late father, and my brother and sister for their assistance and encouragement over the years of study. My deepest and most heartfelt thanks, however, go to my wife, who has supported me when I have had doubts, helped with proof-reading and lent a critical ear to my thoughts and ideas.

# List of Illustrations

## Chapter 2 Dialogue

Example 2.1	Theme A	4
Example 2.2	Phrase structure and intervals	5
Example 2.3	Personal interval categories	5
Example 2.4	Ascending motif	6
Example 2.5	Overarching structure	6
Example 2.6	Surface velocity for each section of the violin part	7
Example 2.7	Tetrachord from the piano part	8
Example 2.8	Violin harmony, bars 54-60	8

## Chapter 3 Discussion

Example 3.1	Theme A	11
Example 3.2	Scale used for Theme A	11
Example 3.3a	Theme B – basic pattern	12
Example 3.3b	Theme B <sup>1</sup> (first variant), viola, bars 10-11	12
Example 3.3c	Theme B <sup>2</sup> (second variant), viola, bars 29-30	12
Example 3.3d	Theme B <sup>3</sup> (first extended version), second violin, from bar 31	12
Example 3.3e	Theme B <sup>4</sup> (second extended version) viola, from bar 70	12
Example 3.4	Theme C, second violin, bars 18-20	13
Example 3.5a	Theme D, first violin, bars 58-62	13
Example 3.5b	Theme D scales	13
Example 3.6	The structure of <i>Discussion</i>	14

## Chapter 4 Velocity

Example 4.1	Cello theme (cello, desk 3, bar 1)	18
Example 4.2a	Fragmented cello theme with rests inserted (cello, desk four, bar 33)	18
Example 4.2b	Fragmented theme with notes omitted (cello, desks two and three, bars 17-20)	19
Example 4.3	Descending cello theme	19
Example 4.4a	Descending chromatic scales	20
Example 4.4b	Chord clusters at the of the outer sections	20
Example 4.4c	Violin and viola rhythmic patterns, outer sections	21
Example 4.5a	Main woodwind melody, cor anglais, bars 57-93	22
Example 4.5b	Counter melody, trumpet, bar 113	22
Example 4.5c	Concluding melody, bar 228 (piccolo and oboe)	22
Example 4.6a	The chorale	23
Example 4.6b	Resolution of the chorale and main woodwind melody	23
Example 4.7a	Irregular canon	24
Example 4.7b	Changing intervallic relationships, celesta, bars 119-124	24
Example 4.8	Overarching tonal structure	26

## Chapter 5 On G

Example 5.1a	Primary pitch material	28
Example 5.1b	Secondary pitch material	28
Example 5.2	The layout of the cimbalom	29
Example 5.3	Piccolo and clarinet thematic material	31
Example 5.4	Cello and violin harmony, bars 43-62 and bars 73-86	32
Example 5.5	Repeated piano pattern	32
Example 5.6	Section C chords	33

## Chapter 6 Parallel Worlds

Example 6.1	First clarinet, bar 67	35
Example 6.2	First flute, bars 90-91	35
Example 6.3	First flute, bars 73-75 and second flute, bars 78-81	35
Example 6.4	Second flute, bars 64-69	36
Example 6.5	The descending theme	36
Example 6.6	Harmonic progression, bars 108-125	37

## Chapter 7 Compression

Example 7.1	Classification of intervals over three octaves determined by their common harmonic series fundamental	39
Example 7.2	Vectors for two spacings of C major	40
Example 7.3a	Chords related to the C major chord with open spacing	40
Example 7.3b	Chords related to the C major chord with close spacing	40
Example 7.4	The four vector types	41
Example 7.5	The non-octave repeating scale	43
Example 7.6	Six note chords, vectors arranged on the basis of the eighth and ninth values	44
Example 7.7	The opening chords transposed according to the modified Fibonacci series	47
Example 7.8	Grouping of the chords and melodic contour	48
Example 7.9a	First group of wind chords	49
Example 7.9b	Second group of wind chords	49
Example 7.9c	Third group of wind chords	50



## 1 Introduction

If I were to describe my formative experiences in music then conservative is the first word that springs to mind. Piano lessons from the age of five led to a safe diet of Bach to Brahms with the occasional excursion to Bartók, Hindemith and their contemporaries in order to satisfy an exam syllabus. This, coupled with playing the organ in the local church from the age of nine and singing in its choir, led to an affinity with the organ works of Bach, Renaissance sacred polyphony, the Mozart *Requiem* and Brahms' *Ein deutsches Requiem*.

Musical life at secondary school was generally limited to the composers of the common practice era except for one brief encounter with the music of Messiaen. This came via a South Bank Show episode that featured the French composer being interviewed by George Benjamin. One particular scene from the video that struck me was the image of Messiaen playing the organ of L'Eglise de la Ste-Trinité. His voiceover describes how he hears harmonies like colours of a stained glass window whilst the shot pans to a glorious image of the church's rose window. This was my first encounter with alternative ways of thinking about harmony and music and it has stuck with me ever since.

Undergraduate studies continued largely along similar lines, with a focus on Baroque and Renaissance history, an honours dissertation on Spanish Baroque organ music, studies in harmony and counterpoint, and classes in tonal and atonal composition. It was in the composition classes, which I was not allowed to take until year three, that I once again became exposed to alternative ways of thinking, such as the second Viennese school and those who followed,<sup>1</sup> for example Boulez and Babbitt, as well as other twentieth century composers such as Bartók, Stravinsky, Xenakis, Messiaen, Carter,

---

<sup>1</sup> Serialism and atonality had, of course, been discussed at school but the discussion did not go far beyond describing a tone row.

Glass and Andriessen, to name but a few. Composition classes placed strong emphasis on different approaches to thinking about harmony (for example, Forte's set theory); metre and rhythm (such as metric modulation); and synthetic scales (particularly Messiaen's modes of limited transposition).

University life was, of course, more than just the formal classes and it was in other places that I was able to explore the music that resonated with me the most. Of these other places, it was the university chapel where I was organ scholar, and the sacred choral music that we sang there, that have had the biggest impact on me. In particular, I was drawn to the aesthetic purity of Renaissance polyphony (for example, Josquin *Ave Maria, virgo serena*; Tallis *Lamentations of Jeremiah*); the harmonic intrigue of Purcell (the *Voluntary for Double Organ* stands out); the rhetorical *stylus fantasticus* of the North German Baroque organ school (such as Buxtehude *Toccata in F*, BuxWV 157); the large scale tonal structures found in the organ works of Bach (exemplified by the *Prelude and Fugue in E minor*, BWV 548); the expressive qualities and orchestral colours in the French Romantic organ repertoire (beautifully demonstrated in Franck's *Pastorale in E major*, opus 19); the sustained harmonic trajectory in the works of Howells (the *Requiem* being a particularly good example); and Messiaen for the vibrancy of colour found in his late harmonic language (e.g. *Livre du Saint Sacrement*).

Since graduating, a large proportion of my professional life has been spent playing the organ and directing choirs, along with teaching. Unsurprisingly, most of my compositional output, prior to commencing my PhD, was sacred choral music. The PhD, however, has been a vehicle for the exploration of an altogether different territory which allows me different kinds of expression; access to different resources (in both instruments and musicians); and the opportunity to express a different side of my musical character whilst drawing on many of the influences and concepts that fertilise both fields.

The folio consists of six pieces each of which will be discussed in full in subsequent chapters:

*Dialogue* for violin and piano

*Discussion* for string quartet

*Velocity* for orchestra

*On G* for small chamber group

*Parallel Worlds* for small orchestra

*Compression* for chamber ensemble

## 2 Dialogue

...when anyone speaks to me, I listen more to the tonal modulation in his voice than to what he is actually saying, what he is like, what he feels, whether he is lying, whether he is agitated or is merely making conventional conversation. I can even feel, or rather hear, any hidden sorrow. Life is sound, the tonal modulation of the human speech. Every living being is filled with the deepest truth.<sup>1</sup>

*Dialogue*, for piano and violin, takes the idea of the ‘tonal modulation’ of the human voice as its starting point. It was my intention that the performers would evoke the idea of two characters engaged in an argument that becomes increasingly agitated as it progresses. The musical intention of the piece was therefore to portray a sense of division between the performers that deepens as the piece unfolds whilst still maintaining a sense of overall compositional cohesion. The title of the piece is meant to be ironic.

The work makes use of the same thematic material in both the violin and the piano parts, which goes some way to providing cohesion to the overall piece. However, the parts are structurally and metrically independent of one another and at no point do they share the same velocity.

The main theme of the piece is based on the following compound melody (Example 2.1) which is constructed from two chromatic scales that move in contrary motion. The widening wedge shape of the melody was chosen to symbolise the larger scale divisive intention of the piece.<sup>2</sup>

### *Example 2.1* Theme A



<sup>1</sup> L. Janáček, *Letters and Reminiscences*, ed. B. Štědroň, trans. G. Thomsen (Prague, 1955), p. 90.

<sup>2</sup> The wedge shape is similar to the subject of the ‘wedge’ *Fugue in E minor* by Bach, BWV 548/2.

Although the score is notated in  $\frac{3}{4}$  it is intended that each player will try to bring out the underlying  $\frac{1}{2}$  grouping of the theme as shown in Example 2.1. This grouping has been indicated by accents in both parts in the score. The accents should not be performed as syncopations but as if the parts had been notated in different time signatures.

The internal phrase structure of the melody and the melodic intervals are given below (Example 2.2). Each of the main phrases begins and ends with a semitone, a diminished fifth or a major seventh. This is important because I hear intervals in terms of one of four categories (Example 2.3) that conjure up particular feelings or moods. Each of the main phrases begins and ends with intervals from the fourth group that, for me, conjures up feelings of angst and uneasiness. The remaining intervals are from groups B and C which, by contrast, seem to be more settled in character.

*Example 2.2* Phrase structure and intervals<sup>3</sup>



*Example 2.3* Personal interval categories



In addition to Theme A, an ascending motif (Example 2.4) bridges each of the separate statements of Theme A and facilitates a change of tonal centre. The octatonic scale was chosen because its ambiguous tonality destabilises the original tonal centre.

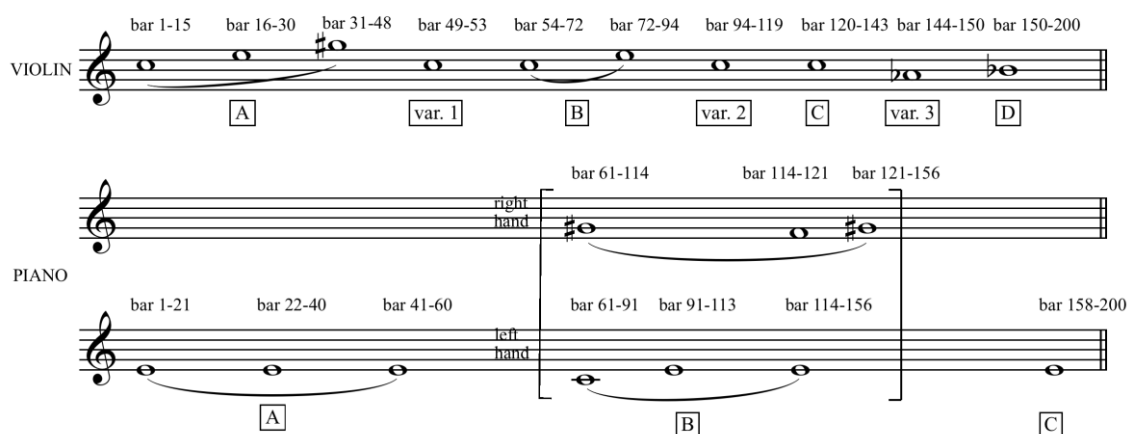
<sup>3</sup> The numbers below the staff represent the intervals counted in semitones.

#### Example 2.4 Ascending motif



The themes mentioned above are held together by the overall tonal structure of the piece (Example 2.5). The three staves of the diagram show the parallel tonal centres that are used in the violin part and the piano left and right hand parts, and which together produce a single overarching structural counterpoint. Although the violin and piano parts have independent structures, they are held together by the local tonal centres C, E and G<sup>#</sup>/A<sup>b</sup>, all of which are a major third apart. Only towards the end of the piece is there a break from these tonal centres, briefly to F (bars 114-121, piano right hand) and then to B<sup>b</sup> (bars 150-200, violin part). In terms of the overall tonal structure of the piece, therefore, there is a gradual shift from the tonal relationship of a major third moving to a diminished fifth, that is, the widening wedge shape of the Theme A is mirrored by the widening interval between the tonal centres of the piece at a structural level.

#### Example 2.5 Overarching structure

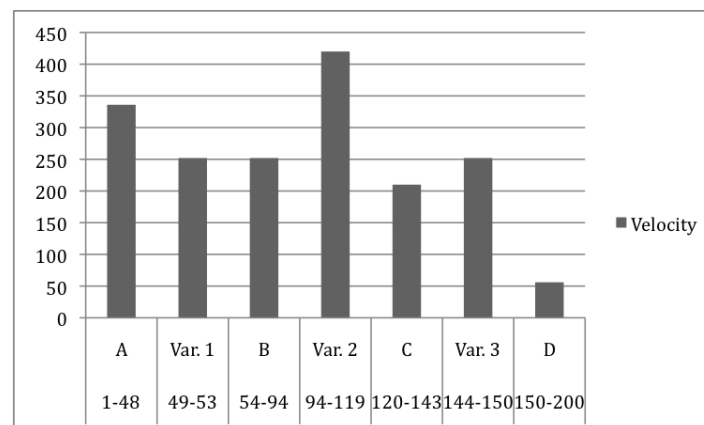


There are other structural aspects at play in the piece in terms of the surface velocity of the parts and in terms of the development of the thematic material. The violin part, for example, is structured in four large sections: section A, bars 1-48; section B, bars 54-94;

section C, Bars 120-143; and section D, bars 150-200, each section being a statement of Theme A. These statements are separated by three ‘variations’: variation 1, bars 49-53; variation 2, bars 94-119; and variation 3, bars 144-150. The variations fragment and merge the material of theme A and the ascending motif in a rhetorical manner in order to mirror the sense of extreme changes in the ‘tonal modulation of human speech’.<sup>4</sup>

Although there is symmetry in the overall geometric structure of the violin part, as the violin part progresses through its four main sections (A to D), the predominant velocity decreases (from 336 notes per minute to 56 notes per minute). Interlocking this general trend, however, are the three variations which are symmetrical in terms of surface velocity: the short outer variations at 152 notes per minute and the extended central variation at 420 notes per minute. Example 2.6 graphically represents these changes.

*Example 2.6* Surface velocity for each section of the violin part



The structure of the piano part, like that of the violin, is geometrically symmetrical. In the outer sections, the upper and lower parts progress homophonically, in crotchets, whereas the upper and lower parts, in the middle section, progress at a faster pace and independently of one another. The piano part, unlike that of the violin, even when it

<sup>4</sup> Janáček, *Letters and Reminiscences*, p. 90.

splits into two separate layers (bars 61-156), doggedly repeats statements of theme A without recourse to any variations.

The harmonic colour of the piano part changes gradually as the piece progresses. At the opening, the theme is presented in octaves but these change initially to major sevenths (at bar 21) and then to a tetrachord (Example 2.7) from bar 41. This particular chord is used in a number of places in the piano part: bars 41-60 (lower part); bars 114-135 (lower part); and in both parts in octaves in the final section (bars 158-200). This chord was chosen because it is dominated by group D intervals, the major seventh, the semitone and the augmented fourth.

*Example 2.7* Tetrachord from the piano part



From bar 54 to bar 94 of the violin part (also bars 61-113 of the piano part, left hand), the introduction of a perfect fourth on the first note of each rhythmic group results in the implied harmony shown at Example 2.8. The numbers beneath the stave represent all of the intervals contained within the harmony. The first and final chord of each phrase are now dominated by group D intervals, with the exception of the fourth last chord where the addition of the perfect fourth results in an additional group B interval.

*Example 2.8* Violin harmony, bars 54-60<sup>5</sup>



<sup>5</sup> The first pair of numbers under each chord represents the interval from the lowest notes to the upper notes. The second number represents the interval from the middle note to the top note (i.e. the same interval as found in Example 2.2).



While there is a sense of doggedness and antagonism between the parts of *Dialogue* as it progresses, this is not at the expense of a cohesive overall formal structure. The presence of the structural counterpoint in the background of the piece, and the sharing of the same thematic material, binds together parts that otherwise seem to be fundamentally in opposition.

### 3 Discussion

*Discussion*, for string quartet, is similar to *Dialogue* in that it is concerned with suggesting the tonal qualities of speech through music. In *Dialogue*, the performers (or ‘characters’) were engaged in an argument, permanently at loggerheads with one another. In *Discussion*, the performers are at times in opposition and at other times in agreement. The effect here is to create a sense of a chaotic discussion that progresses without resolution and with little respite.

The work is based on four pieces of thematic material. Theme A (Example 3.1), which is used repeatedly throughout the piece without transformation, was constructed to convey a sense of angularity and discomfort. The angularity is achieved through changes of register. The discomfort is produced by using two different modes depending on the direction of the theme (Example 3.2). The Phrygian mode, with its flattened second and third degrees which seem to lead downward to the tonic and its flattened sixth and seventh degrees which seem to lead downward to the dominant, is used when the theme rises thereby creating a tension between modal implication and the direction of the theme. The Dorian mode with an occasional sharpened fourth is used for descending material. The sharpened fourth feels like it leads upwards to the dominant. There is therefore a similar tension between the tendency of this note within the mode to rise and the direction of the theme.

The theme has a strong tonal centre that is set by the outer notes of the range of theme, D at the opening of the piece.

*Example 3.1 Theme A*



*Example 3.2 Scale used for Theme A*



Theme B appears in a number of variants (Examples 3.3a-e).<sup>1</sup> In contrast to Theme A, which is angular, Theme B remains confined to a small range of notes. Whereas Theme A seeks to exert itself outwardly, Theme B, by contrast, seems much more introverted, only bursting free of itself towards the conclusion of statements. This is most pronounced in Example 3.3e where the theme both rises up from the initial circling group of notes and accelerates against the contextual backdrop of semiquaver motion in the other parts.

The tonal centre of Theme B is less pronounced than in Theme A. Here, it seems to settle on the lowest sounding pitch within each variant of the theme rather than being set by the opening pitch.

<sup>1</sup> N.B. I have re-notated the figures in Example 3.3a-c to show the rhythmic units of the motives.

Example 3.3a Theme B - basic pattern



Example 3.3b Theme B<sup>1</sup> (first variant), viola, bars 10-11



Example 3.3c Theme B<sup>2</sup> (second variant), viola, bars 29-30



Example 3.3d Theme B<sup>3</sup> (first extended version), second violin, from bar 31



Example 3.3e Theme B<sup>4</sup> (second extended version), viola, from bar 70



Two other themes occur in the piece. Theme C (Example 3.4) appears in the violin part from bars 15–30. It is rhythmically similar to Theme B with its predominant  $\text{♩} \text{♩} \text{♩}$  grouping but has thematically more in common with Theme A in terms of its relationship to the Phrygian mode and its strong tonal centre which here is emphasised on the first note of each group of five notes. It fuses Theme A and Theme B.

*Example 3.4* Theme C, second violin, bars 18-20



Theme D (Example 3.5a) occurs in one place only, from bars 58-88 in the first violin part. Like Theme B, this theme contrasts with Theme A's angularity. Example 3.5b shows how the theme has been constructed from two versions of the octatonic scale and a chromatic scale. The combination of scales that are used here results in a theme that lacks a clear tonal centre, in contrast to the other themes, although there is a hint of a C# tonal centre recurring at the start of bars 58, 60, 63, 65 and 67, and from bar 74 there is similarly a suggestion of C as the tonal centre.

*Example 3.5a* Theme D, first violin, bars 58-62



*Example 3.5b* Theme D scales



The chart below (Example 3.6) shows the key structural points in the piece along with the tonal centres of each theme that are used at those points. The local tonal centres reveal at the macro level the harmonic field that governs the piece. Numbers beneath the notes indicate the bar numbers. Points of alignment are indicated by barlines although in performance, one section follows on from another without hesitation, with the exception of the final section.

Example 3.6 The structure of *Discussion*

The musical score for 'Discussion' is presented for four instruments: Violin 1 (Vln. 1), Violin 2 (Vln. 2), Viola (Vla.), and Violoncello (Vc.). The score is organized into measures, with measure numbers indicated below the notes. The key signature is one sharp (F#), and the time signature is 4/4.

**Violin 1 (Vln. 1):** Measures 19, 25, 31, 35, 58, 74, 90, 96, 115, 141.

**Violin 2 (Vln. 2):** Measures 15, 20, 31, 35, 39, 41, 43, 58, 62, 67, 71, 75, 77, 81, 88, 90, 92, 96, 101, 105, 112, 115, 120, 125, 130, 141, 153.

**Viola (Vla.):** Measures 7, 13, 21, 43, 47, 53, 58, 64, 71, 74, 84, 96, 102, 108, 115, 123, 130, 135, 144.

**Violoncello (Vc.):** Measures 1, 7, 13, 19, 31, 35, 43, 51, 58, 64, 71, 74, 90, 96, 115, 118, 135.

The local tonal centre of each part changes with greater frequency in *Discussion* compared with *Dialogue*. It was my intention that this piece would have a more frantic character than *Dialogue* with different parts jostling for prominence. The rapid turnover of tonal centres produce instability and constant change at the structural level.

On the chart above, tonal centres are indicated by semibreves. Small notes that are slurred to semibreves indicate the starting pitch of the theme. This is important because at a number of key places, for example bar 58, all of the parts arrive on C#. However, this is only a momentary point of convergence because, although violin two begins the bar on a C#, the tonal centre of the theme is B. A similar effect can also be found at bar 43 and bar 96, where the first violin momentarily passes through Gb and thereby aligns itself with the F# in the second violin and viola parts.

When the tonal centre of a part changes, it is often the case that it changes by a descending fourth or rising fifth. For example, the cello part opens with Theme A with tonal centre D and then moves down a fourth to A where Theme A is repeated. An important feature of Theme A is that although it opens with the tonal centre of D (Example 3.1 above), at the point where the theme inverts, the tonal centre switches to G, a perfect fourth higher. The rising of a fourth within the theme balances with the overall tonal structure of falling fourths.

The tonal changes in the fourth and fifth sections (bars 58-114) of the piece are less predictable than the falling fourth/rising fifth structure of the other sections. This was done in order to maximise the sense of chaos in the middle of the piece. The tension created during the fourth section reaches its climax at the beginning of section five (bar 96) that, thereafter, is gradually released through the falling tonal centres in the second violin and viola parts in section five (bars 96–114).

With *Discussion*, I set out to explore similar territory to *Dialogue*. Unlike *Dialogue*, however, where the underlying tonal structure is fairly static and slow changing, with *Discussion* the underlying tonal structure is much more active. Where the tonal structure of *Dialogue* allows the parts to be set doggedly against each other, the constantly changing tonal structure of *Discussion* contributes towards the unsettled character of the piece.



## 4 Velocity

*Velocity* develops, on a larger scale, the idea of parallel structures that I used in the first two pieces in the folio. Written for larger forces than *Dialogue* or *Discussion*, *Velocity* makes use of multiple layers of material, simultaneous tonal centres that control the structure of the piece, and simultaneous tempi. The piece is strongly influenced by Ives' Fourth Symphony in terms of the coexistence of separate materials that seem disconnected. Unlike the thematic material for *Dialogue* and *Discussion*, which had a high degree of consistency between parts, *Velocity* makes use of several distinguishable themes.

The way in which I control material in the piece has interesting parallels with the following way that Pierre Boulez characterises structure:

In the first place there are two kinds of local structures: what we call *static* structure and *dynamic* structure ... In what sense can a structure be called static? In the sense that it presents – statistically speaking – the same quality and the same quantity of events in its unfolding. This *static* quality is entirely independent of the *number* of events, whose constant density is their important feature. Static structure may admit of a large range of all kinds of note values, or a small range; it may be based on extreme, though constant, selectiveness or on a complete absence of selectiveness – but all these criteria must of course remain virtually constant. On the other hand *dynamic* structure presents an evolution, sufficiently large to be perceptible, in the density of events that succeed each other, and in their quality. This *dynamic* quality, like the static quality mentioned above, is entirely independent of the frequency, the number of these events; dynamic structure involves a selectiveness that may vary in strictness but is always evolving, i.e. the criteria of this selectiveness are perpetually changing.<sup>1</sup>

In this piece, I make use of Boulez's concept of *static* and *dynamic* form. However, my intention here was to create a sense of *dynamic* and *static* form simultaneously both in terms of the local structures and the overarching structure of the piece. The title of the piece, *Velocity*, refers not to changes in tempo but the "evolution ... in the density of events that succeed one another, and in their quantity" as described by Boulez above.

---

<sup>1</sup> P. Boulez *Orientations* (London; Boston: 1986), p. 91.

The piece, like *Discussion*, opens with and continues throughout with a *moto perpetuo* theme in the cellos. The theme (Example 4.1) provides, on the one hand, a sense of movement through the constant semiquavers but, on the other, expresses a feeling of stasis in that there is no change in tempo. The theme is built on a hexachord (Example 4.1, segment *a*) which is then repeated in retrograde inversion to complete the first half of the theme. The first twelve notes of the theme are then repeated in inversion. The cello theme, although chromatic, suggests D as a tonal centre because it is both the upper and lower limit of the phrase. It then works its way through the cycle of fourths (D, G, C, F, etc.) ultimately leading back to the tonal centre of D. The constant returning to the same tonal centre and the cycling through all twelve chromatic pitch classes reinforces the static nature of the cello layer.

*Example 4.1* Cello theme (cello, desk 3, bar 1)



As the cello layer progresses, it is gradually fragmented, either by inserting rests or by removing notes from it, as other desks of cellos begin to play (Example 4.2a and b). At other times, the theme is heard in canon, for example at bars 84 and 85 (cello, desks one, two and five). This initially gives the impression of change but only at a local level; it does not ultimately have an impact on the piece in terms of the large scale structure.

*Example 4.2a* Fragmented cello theme with rests inserted (cello, desk four, bar 33)



*Example 4.2b* Fragmented cello theme with notes omitted (cello, desks two and three, bars 17-20)



Growing out of the fragmented cello theme is a descending motif that is presented repeatedly in the cellos (Example 4.3). Unlike the main cello theme, which cycles through all twelve transpositions, this figure is fixed to a tonal centre of D. The descending figure often feels incomplete by stopping short on E $\flat$  rather than continuing to D to complete the octave. The final note of the descending figure, D, is only reached when a new cycle of the main cello theme begins (for example at bar 86, fourth desk).

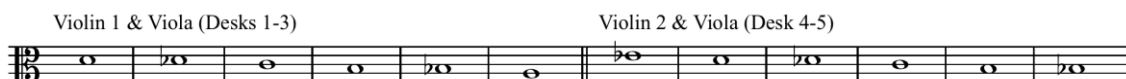
*Example 4.3* Descending cello theme



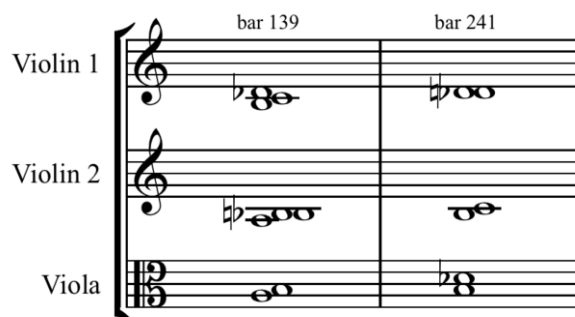
The material of the violin and viola lines can be split into three sections, section one (bars 1-151), section two which overlaps with section one (bars 143-183), and section three (bars 184-259). The main distinguishing feature of the upper string writing is the change from static writing in the outer sections to fragmented thematic material derived from the cello theme in the middle section. Here the idea of the change in the ‘density’ and ‘quantity’ of events through the split desks of instruments aims to provide a sense of the ‘evolution’ that Boulez talks about.

The outer sections (section one and section three) feature repetition of notes that enter one by one and gradually work their way down through two chromatic scales (Example 4.4a). There are staggered entries for each of the desks so that, by the end of the first section (bar 139) and by then end of the third section (bar 241), there are chromatic cluster chords (Example 4.4b). Each of the desks plays a slightly different rhythm (Example 4.4c) of repeated notes so as to create the sense of tiny irregular ripples on the surface of the collective texture.

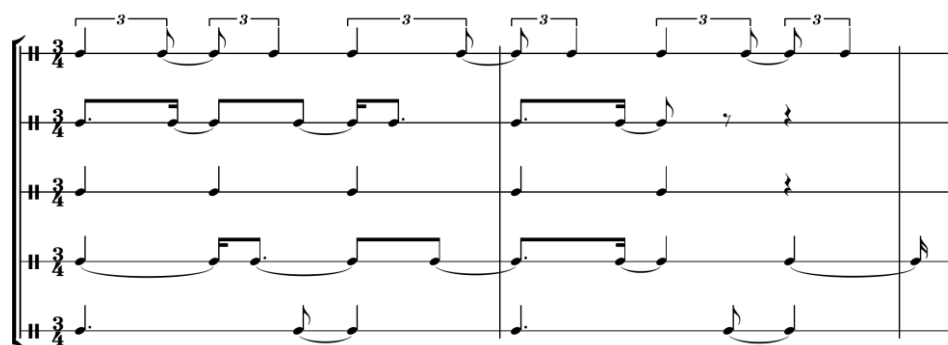
*Example 4.4a* Descending chromatic scales



*Example 4.4b* Chord clusters at the end of the outer sections



Example 4.4c Violin and viola rhythmic patterns, outer sections



Together the strings form an unusually large body of players compared to the number of wind players. The strings, excluding the double basses, for most of the piece, make up a separate layer that forms a weighty backdrop to the piece. Against this backdrop, all of the other instruments can be thought as a separate chamber group.<sup>2</sup>

At bar 57, the cor anglais enters with the main melodic theme of the piece (Example 4.5a). This is then repeated in the first clarinet part and partially as a mensural canon in the cor anglais, oboe and piccolo (bar 112/113).<sup>3</sup> Against the canon is a countermelody (Example 4.5b) in the first trumpet. The main theme occurs several times, but unchanged, throughout the piece at bars 170, bar 193/196 (first trumpet in canon with the cor anglais and piccolo), and at bar 211 (first clarinet and first bassoon in octaves).

At bar 170, the main melodic theme appears in the piccolo, second violin desks three and five, and viola desks three, four and five. The choice of these desks assumes that the strings are seated, from left to right, in the order first violins, second violins, violas and cellos. The result of this is that the string instruments that play this theme will be at the back and centre of the string section and in close proximity to the piccolo which colours

<sup>2</sup> The splitting of instruments in this way is also a feature of the final two pieces in the folio, *Parallel Worlds* and *Compression*.

<sup>3</sup> Using the material from Example 4.5a, first and second phrases and part of the third.

the melody. Here, the melody emerges from the more frantic fragmented material associated with the middle section of the upper strings.

At bar 228, one final descending theme appears (Example 4.5c) for the first and only time as a means to draw the piece to its final conclusion. This theme acts as the conclusive phrase for the main theme that has seemed to lack a sense of completeness. The completeness is undermined, however, by two final iterations of phrase one of the main theme (Example 4.5a), in the first clarinet and first bassoon at bar 228 in canon with the flute at bar 233.

*Example 4.5a* Main woodwind melody, cor anglais, bar 57-93 (notated here as crotchets and minims)



*Example 4.5b* Countermelody, trumpet, bar 113 (notated as crotchets and minims)



*Example 4.5c* Concluding melody, bar 228 (piccolo and oboe)



*Velocity* also makes use of a chorale-like piece of material which dominates the piece from bars 95. Example 4.6a shows this theme in its full four parts; however on a number of occasions this theme appears as a solo melody.<sup>4</sup> The chorale material and the main woodwind theme, although similar in shape and character, do not converge at any point

<sup>4</sup> In full four parts at: bar 95 (horns and second trumpet); bar 147 (piccolo, flute, clarinets and second violin desks three to six); bar 172 (first bassoon, horns and trombone); and bar 210 (horns, trombone and tuba). Examples as a solo melody can be found at bar 141 (oboe, horns, trumpets and bassoons) and bar 154 (tuba and double basses).

until the final iteration of the chorale theme, where from bar 223 the final phrase of the chorale and the main woodwind theme combine, leading to a final sense of resolution on a chord of E major at bar 228 (Example 4.6b), the same point where the concluding melody of the main woodwind theme (Example 4.5c) enters.

The main theme and the chorale melody seem to have separate identities throughout the piece and it is only at the end that they come together. Any sense of climax or resolution here is unexpected. The piece, up until this point, has exhibited change through the increasing in quantity and density of independent material. It was not intended that there should be any sense of leading towards a point of climax; dynamic form does not necessarily correlate with goal direction. Any sense that a goal is to be reached is not implied before bar 228. If this is a climax then it seems to come from nowhere.<sup>5</sup>

*Example 4.6a* The chorale



*Example 4.6b* Resolution of the chorale and main woodwind melody

<sup>5</sup> Compare this with *On G* and *Parallel Worlds* where the idea of static form is used but, by contrast, just before the point of climax is reached, there is a sense of the piece leading the listener towards it.

All of the remaining material in the piece is fragmentary in character and derived from the opening cello theme. The fragmentary material dominates the middle section of the piece (bars 143-183) bringing about an increase in textural density and activity. There are two techniques which I used to further the disintegration of the material: irregular canon (Example 4.7a) in which the note durations are not of the same length; and the sharing of thematic material between two parts where the interval between the parts gradually increases or decreases (Example 4.7b).

Example 4.7a Irregular canon

The musical score for Example 4.7a, 'Irregular canon', is written for Piccolo and Cor Anglais. The Piccolo part is in the upper staff, and the Cor Anglais part is in the lower staff. Both parts are in 3/4 time. The Piccolo part begins with a *p* (piano) dynamic and *molto legato* marking, followed by a *mf* (mezzo-forte) section. The Cor Anglais part also begins with a *p* dynamic and *molto legato* marking, followed by a *mf* section. The score shows a complex interplay of notes and rests, with some notes beamed together in groups of three, indicating a canon where note durations are not of the same length.

Example 4.7b Changing intervallic relationships, celesta, bars 119-124

The musical score for Example 4.7b, 'Changing intervallic relationships, celesta, bars 119-124', is written for celesta. The score is in 3/4 time and shows a sequence of notes and rests. The notes are grouped into measures, with some measures containing multiple notes. The score is labeled with bar numbers 1 through 11, and then 10 through 1, indicating a sequence of measures. The notes are written in a way that suggests changing intervallic relationships, with some notes beamed together in groups of three.

During this fragmentary middle section, there are many more layers of material occurring simultaneously, creating a much more dense texture. The velocity of the parts is also generally faster (e.g. celesta and upper strings from bar 131) but only slightly. The effect of change is more to do with changes in the quantity and density of material than the velocity of the parts.

Example 4.8 shows the harmonic structure that sits in the background of the piece. As with *Dialogue* and *Discussion*, there are multiple tonal centres sounding simultaneously creating a large-scale harmonic field. At the background level of the piece, there is a



three-part structure. This is most obvious in the upper strings where the outer sections have chord clusters and the middle section borrows and fragments material from the cello theme. The fragmented middle section begins at bar 143, fracturing further at bars 162-164 where it drifts into the woodwind as well. The fragments of material enter on different tonal centres. It is here, from bar 162 to bar 183, that the piece is at its most dense.

The tonal centres of the entries of the main theme are generally on E or on G but where the piece is at its most active (bar 170), the tonal centre shifts to B $\flat$  before a clear return to E at bar 184. There is therefore a hint of a three-part structure here too, although it is less well defined than it is with the texture of the upper strings.

The tonal centre of the various entries of the chorale melody can also be thought of as being in a three-part structure. However, where there is a sense of recapitulation at bar 184 in the main melody and the upper strings, the tonal centre of the chorale does not return to that of the opening. The transition here is from B at the opening to B $\flat$ /A $\sharp$  just before the most active part of the piece (bar 154). It thereafter remains fixed around A $\sharp$  which undermines the sense of recapitulation in the other layers.

Although there is a sense of resolution at bar 228 where both the chorale and the main melody finally agree on the same tonal centre of E, the cellos (particularly desks one, two and three), which persistently centre on D, and the chord clusters in the violins and violas, undermine any sense of complete resolution.

Example 4.8 Overarching tonal structure

Main theme

Upper strings

Chorale theme

Cellos

(57) (75) (93) (102) (170) (184) (196) (211) (228)

(56) (141) (143) (162) (163) (164) (187) (228)

(95) (116) (141) (147) (154) (172) (210) (228)

Expanding chord cluster

Expanding chord cluster

(strings & woodwind)

*Velocity* builds on the techniques that were used in *Dialogue* and *Discussion*. Unlike those pieces where one or a limited number of related themes coexisted in parallel tempi, with *Velocity*, there are a number of separate thematic ideas that coexist. Where the *moto perpetuo* of *Dialogue* and *Discussion* permeates all of the parts and seems to drive those pieces forward as a cohesive whole, in *Velocity* the *moto perpetuo* permeates only the cello parts. The other materials in the piece sit apart and are independent from the *moto perpetuo* and seem to possess their own independent sense of time. The different layers of material in *Dialogue* and *Discussion* are related but permanently made to sit apart. In *Velocity*, the material is unrelated, sits apart, and only at the end (bar 228) do some of the thematic ideas come together.

## 5 On G

Although *On G* seems to inhabit a different world from *Dialogue*, *Discussion* and *Velocity*, it has some aspects in common. With this composition, I wanted to create a sense of musical events occupying the space of the piece but which seem to exist outside of regular time; musical events occur without any sense of being functional, that is, there is no sense that one piece of material leads to another. In this respect, the piece has similarities to *Velocity*.

There are other underlying similarities with other pieces in the folio. Strictly speaking, *On G* does not make use of a *moto perpetuo*, however, the constantly repeating G in the piano part is similar in effect to the *moto perpetuo* in the first three pieces. Unlike these pieces, however, which use multiple tonal centres, this piece is only ever rooted on one tonal centre at any given time which is mostly G (hence the title of the piece).

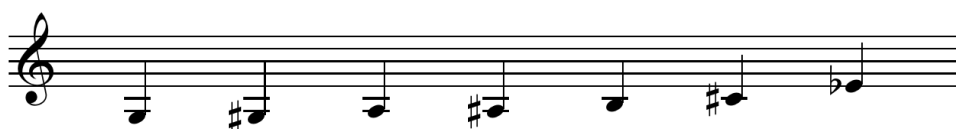
The musical material is drawn from two groups of notes (Examples 5.1a and 5.1b).

These notes are the pitches of consecutive groups of strings on the centre-left and right sides of the cimbalom respectively (Example 5.2), and using them as the core material of the piece gave me the opportunity to use finger-nail *glissando* which sounds effective on this instrument.

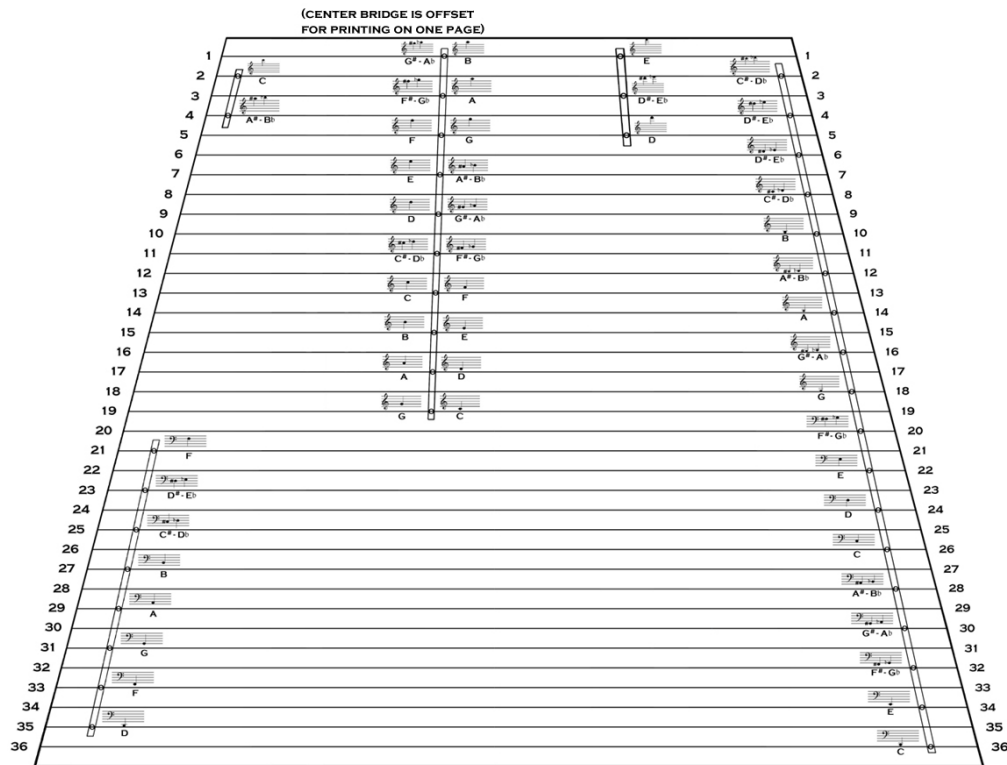
*Example 5.1a* Primary pitch material



*Example 5.1b* Secondary pitch material



## Example 5.2 The layout of the cimbalom<sup>1</sup>



The particular group of consecutive pitches for the primary pitch material was also chosen because it is bounded by the pitch classes G and A $\flat$ , which is a crucial interval in the piece. The secondary pitch material articulates the interval of a minor sixth between the outer notes, and this too gains significance. Where the A $\flat$  of the primary pitch material tends, throughout the piece, to gravitate towards G, the tonal centre of the piece, the E $\flat$  of the secondary pitch material, paralleling this, tends towards a D. The pitch D, is therefore of secondary importance, mirroring the historical dominant to tonic tonal relationship.

I thought of the form of the piece in geometric terms. For most of the composition, the range of notes is limited to middle G and above. At the point of climax (bars 87-95), however, this opens out to occupy the range from the low B $\flat$  of the piano to the G two octaves above middle C. The narrow horizontal static material that has dominated the

<sup>1</sup> M. Somsak, *Somsak Cimbaloms*. n.p. Web. 22 Sept. 2010.

piece seems at the point of climax to burst free from its constraints. All that remains after this momentary ‘big-bang’, however, are a few remnants of what went before.

With the exception of the climax, there are two other types of material that occur during the piece. Static material dominates bars 1-41, bars 62-71 and, following the climax, bars 96-108. These bars focus on the relationship between G and A<sub>b</sub>, sometimes via G one quarter-tone sharp. The melodic material during these sections seems trapped in a narrow range of pitches with the exception of occasional chord clusters in the piano, for example, bars 28 and 34. The chord clusters, particularly the low chord clusters (for example, in bar 34), provide a dark foreboding contrast to the thin, almost colourless, harmonic landscape that has been established from the outset of the piece. In addition, they hint at the possibility that there is potential for the piece to expand beyond the narrow confines of its otherwise limited range.

The cimbalom adds additional colour to this section with *glissandi* through both primary and secondary pitch material, for example bars 28 and 36. With the primary pitch material, however, the G to A<sub>b</sub> relationship which dominates the piece is emphasised. On most occasions, once the A<sub>b</sub> has been reached at the top of the *glissando*, it ‘resolves’ back towards the tonal centre of G. This happens on all occasions except bars 32 and 66 where the A<sub>b</sub> is left hanging, as if suspended in time. This rising figure on the cimbalom is echoed on the piano in the final section of the piece (bars 96-108). Here again, the A<sub>b</sub> does not resolve to the G but lingers on to the end of the piece, even after the repeated G in the piano has ceased, giving the sense that the piece has not really stopped.

One other feature of these static sections is the cello harmonics on the low G string at bars 26-30 and bars 64-72. The cello player is asked to play close to the bridge with little weight when the marking is *pp*, and over the fingerboard and with weight when the

marking is *mf*. The effect here is that we hear only the high, thin sounding harmonics of the string which gradually descend towards the warm fundamental low G as the dynamic increases. Where in the other parts, the A $\flat$  gravitates towards G, here it is all of the natural harmonics of the string (including the ‘just’ A $\flat$  in the fifth octave above the G) that gravitate towards the low fundamental G. The shape of the cold sounding high harmonics falling to the warm low fundamental mirrors the large scale form of the piece which, as stated earlier, predominantly inhabits the range of pitches above middle G, and only at bar 87 opens out to a warm and resonant wide range of pitches.

Melodic material in the piccolo and clarinet (Example 5.3, re-notated in minims), based on the primary and secondary pitch material, creeps into the piece against the static backdrop that has been established at bars 42 and 72. Although there is a sense of moving away from the G/A $\flat$  relationship, the melodic material does little to upset the static nature of the piece due to the long irregular note lengths, lack of regular pulse in both melodies and consistency of pitch material.

*Example 5.3* Piccolo and clarinet thematic material

The image displays two staves of musical notation. The top staff is labeled '(piccolo)' and the bottom staff is labeled '(clarinet)'. Both staves show two melodic lines: one for bars 42-60 and another for bars 71-85. The notation is in treble clef with a key signature of one flat (B-flat). The notes are mostly minims and crotchets, with some accidentals. The piccolo staff has a 'p' dynamic marking at the start of the first line. The clarinet staff has a 'p' dynamic marking at the start of the first line.

Accompanying the melodic material, is a passage of harmonic material in the cello and violin (Example 5.4), bars 43-63 and bars 73-86. Like much of the rest of the piece, this material suggests but, in this case, does not reach the tonal centre of G. The final chord of the passage can be thought of as a chord of perfect fourths, however, there is also a hint of the function of the historic augmented six chord in the chord's notation. The

A $\flat$ , as has been the case throughout the piece, tends downwards towards G whereas the F $\sharp$ , an augmented sixth above, tends upwards towards G.

*Example 5.4* Cello and violin harmony, bars 43-62 and bars 73-86



As stated earlier, most of the material in the piece feels static. However, the theme in the piano part at from bar 78 (Example 5.5) is intended to lead us towards the climax at bar 87. This pattern had occurred earlier in the piece from bars 48-59. Here, however, the pitches that are used are taken only from the first bar of Example 5.5. The lack of direction in the material at this point in the piece, along with the gradual slowing down of the pattern, serves to reinforce the lack of overall direction. By contrast, however, from bar 78, the intervals in the figure gradually widen giving the impression of a sense of direction that has hitherto been absent. Here, too, there is no slowing down of the material.

*Example 5.5* Repeated piano pattern



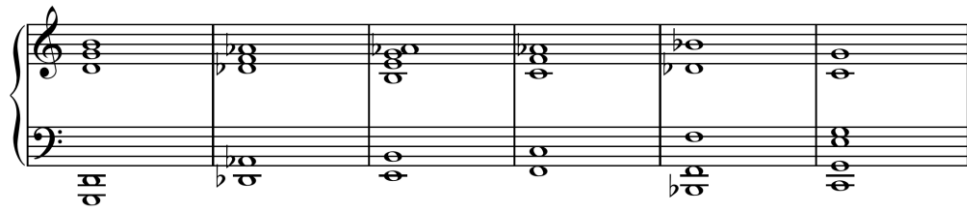
The climax, in contrast to the horizontal and static nature of the rest of the composition, occupies a greater range of notes, is homophonic, and is warmly resonant. This section progresses through the chords shown in Example 5.6, ending on a chord of C major that has been spaced in such a way as to produce a rich sonority built on the C below the bass stave. The tenth in the cello and the fifth in the piano together work to give the



impression of a resultant C one octave lower than the cello C string, which adds to the overall warmth and sonority of this moment.

The chords of this section lead the underlying tonal centre from G to C but the repeated G continues throughout the section and beyond into the coda, confirming G as the tonal centre of the piece. The G/A $\flat$  relationship is never far away. The note G is present in the first and fifth chords. The note A $\flat$  is present in the second and fourth chords. The middle chord has both the G and the A $\flat$  present which, in the context of a chord rooted on E, hints at the historic G/G $\sharp$  false relation if we were to respell the A $\flat$ .

*Example 5.6* Section C chords



*On G* owes much to *Velocity* in terms of how thematic material occupies moments of time without necessarily feeling bound to an overarching temporal structure. Unlike *Velocity*, however, at no point do the thematic ideas seem to come together. The moment of climax is not a culmination of thematic ideas but a moment of interruption where all that has gone before, except the repeated G on the piano, gives way to a completely contrasting piece of material.

## 6 *Parallel Worlds*

*Parallel Worlds* is similar to *On G* in that it was my intention to create a sense of timelessness. Against this backdrop, musical events seem to appear from out of nowhere only to vanish again. The following quotation, which describes how matter comes in and out of being in the void of space, vividly captures the idea behind this piece:

...[P]articles can come into being spontaneously out of the void, and vanish again into the void.<sup>1</sup>

The form of the piece has much in common with *On G* in that most of the piece occupies a narrow range of pitches which open out at a point of climax (bar 125) only for the range of notes to close up again.

In many respects, *Parallel Worlds* seems to emerge from silence rather than having a clearly defined starting point. During the first 26 bars, very little happens except to establish a still backdrop of a gentle *tremolando* in the violas and long sustained notes in the violins. The interplay between the A $\natural$ , A quarter-tone sharp, B $\flat$  and C $\sharp$  is reminiscent of the interplay between the G, A quarter-tone flat and A $\flat$  in *On G*. Where *On G* made use of the repeated G in the piano as a constant feature throughout the piece, *Parallel Worlds* similarly uses the *tremolando* in the violas.

Set against this background established in the strings are various fragments of material in the wind instruments. As in other pieces in the folio, these do not share a common tempo, which here, is intended to increase the sense that these fragments of material occupy space but are not bound by time. For further emphasis of this effect, there are a number of places where the players are instructed to play with their own localised *accelerandi* and *rallentandi*, for example, bars 70-72.

---

<sup>1</sup> A. Y. Mah, *Watching the Tree to Catch a Hare* (London, 2001), p. 233.

*Example 6.1* First clarinet, bar 67



*Example 6.3* First flute, bars 73-75 and second flute, bars 78-81



Example 6.4 Second flute, bars 64-69



The combination of the slow sustained notes in the strings, the *tremolando* in the violas and the fragments of material in the wind instruments all lead the piece towards a sense that time is not something fixed. There are, however, three places in the piece where a descending theme (Example 6.5) appears that does not seem to belong to either the sustained strings that persist throughout the piece or the transitory motifs of the wind instruments. The first statement of this theme at bar 48, and the second statement at bar 102, seem out of context, as if belonging in a different place. At bar 125, however, it becomes clear that this is the theme of the climax of the piece. This is different from *On G* in that the material of the climax had not been hinted at earlier in the piece. With *Parallel Worlds*, the main theme has already enigmatically presented itself twice before.

Example 6.5 The descending theme

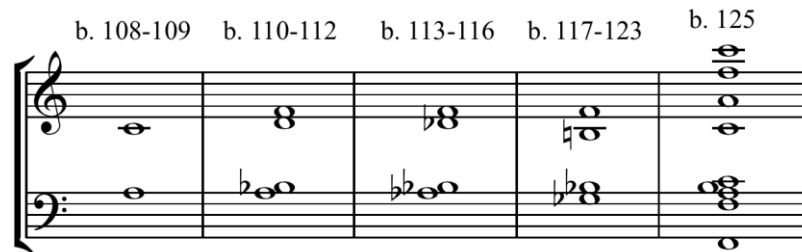


Like *On G*, much of this piece feels static but the climax is not entirely unexpected when it arrives. The range of the notes in the strings is mostly very narrow, only briefly going beyond the interval tenor A to middle E between bars 1 and 108 and tenor G $\flat$  to middle F between bars 109 and 123.<sup>2</sup> The gradual widening of the interval between the lowest and highest sounding string notes gives the piece direction through bars 108 to

<sup>2</sup> The range briefly moves to tenor E to middle C from bars 45 to 56. Note that these ranges take account of the general accompaniment figures in the strings and do not include the cellos which double the horns and belong more to the fragmentary wind motifs, nor the descending theme in the second violin theme at bars 48 and 102.

123 (Example 6.6). Bar 123 is followed by a bar of silence that seems to leave the chord in this bar suspended in time and feeling unresolved.

*Example 6.6* Harmonic progression, bars 108–125



Like *On G*, at the point of climax, bar 125, the piece opens out vertically with a rich sonorous chord. There is a sense that vertical harmony has been constrained or compressed in the strings up until this point and is finally released. The chords are scored so that the highest note is in the back desk of the second violins and the lowest note in the front desk of the first violins. This is not an attempt to undermine the established order of the orchestra but rather that, in performance, the effect is for the chord to creep into life from the back of the strings; the highest notes appear to come slightly after as if growing out of the lower notes. The open F major chord at the climax gradually collapses back to a closed perfect fifth (tenor F to middle C) from bar 133 to the end. The piece ends the way it began by seeming to disappear back to the silence from where it came.

## 7 Compression

*Compression* takes its inspiration from cosmology. The piece is intended to create the sense of the gravitational forces that draw both space and matter to the centre of a galaxy. As time progresses, the harmony of the piece becomes more and more compressed. The piece itself has some similarities to Arvo Pärt's *Cantus in Memoriam Benjamin Britten* both in terms of the unfolding of a system, a mensural canon in Pärt's case, and the overall descending trajectory. Here, however, the similarity ends.

Initial attempts at producing material for the piece were based around using chords where the intervals of the chords sequentially decreased. The problem with this approach was that the system which was unfolding was far too transparent. I wanted the piece to have the impression of the harmony becoming more dense without the sequence of notes being predictable. It was therefore necessary to find a different way of thinking about harmony in terms of chord consistency.

My first step in thinking about how to order the harmony was to look at how to order intervals. As I did this, I wanted to dispense with the notion of interval and octave inversion where, for example, a major seventh is considered to be equivalent to a minor second, and a major third is considered to be equivalent to a compound tenth. This seemed to me to be, historically, a theoretical convenience rather an aural reality.

After some experimenting, I developed an approach to categorising intervals that was based on the fundamental pitch of the harmonic series that is shared by both notes of a given interval. Example 7.1 shows the resulting interval classification. Each group of intervals seemed to share similar characteristics, for example intervals in class 1 sounded clean and pure, with each subsequent classes of intervals less so.

*Example 7.1* Classification of intervals over three octaves determined by their common harmonic series fundamental

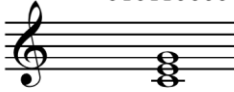
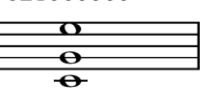
The image displays musical notation for interval classification. It consists of two systems of staves. The top system shows 'Interval' and 'Fundamental' staves. The 'Interval' staff has three measures labeled 'class 1', 'class 2', and 'class 3'. The 'Fundamental' staff shows the corresponding fundamental notes. The bottom system shows 'Interval' and 'Fundamental' staves for 'class 4' through 'class 9'. The 'Interval' staff shows the interval classes, and the 'Fundamental' staff shows the corresponding fundamental notes. A dashed line labeled '8vb' indicates an octave shift.

From this system of classification, I used a similar approach to that taken by Allen Forte in *The Structure of Atonal Music* to describe the interval content of chords. I borrowed the idea of using a vector to represent the nine interval classes.<sup>1</sup>

An example of how this system of classifying chords works in practice is given below where two different vectors describe two spacings of a C major chord (Example 7.2). The nine-digit array above the chords represents the classes of intervals (from above) that are present in those chords. The first chord contains one interval of class two (perfect fifth), one interval of class four (major third) and one interval of class five (minor third). The second version of the chord is more open and contains two intervals of class two (perfect fifth and major tenth) and one interval of class 3 (major sixth). Unlike most theoretical systems which would consider these two chords to be different versions of each other, because they share the same pitch classes, in this system, the chords are distinct.

<sup>1</sup> A. Forte, *The Structure of Atonal Music* (New Haven; London, 1973)

*Example 7.2* Vectors for two spacings of C major

010110000	021000000
	
Major 3rd Perfect 5th Minor 3rd	Perfect 5th Major 10th Major 6th

If these two spacings of C major have different vectors, then what group of chords share their vectors? Example 7.3a shows the chords that are related to the C major chord with open spacing and Example 7.3b, the C major with close spacing. Both examples are limited to a range of three octaves, with bass note middle C.

*Example 7.3a* Chords related to the C major chord with open spacing

021000000



*Example 7.3b* Chords related to the C major chord with close spacing

010110000





This approach to classifying harmony results in vast numbers of chords.<sup>2</sup> It was therefore necessary to find a way to order and filter chords so that the resulting piece would use a smaller number of chords whilst still having a smooth transition from a light to a dense consistency. While experimenting with a number of different methods for ordering the chords I considered four different types of vectors that might be used (Example 7.4). These were:

- the *Full vector* as used by Forte and others, i.e. a vector that represents all of the internal intervals within a chord,
- the *Bass vector*, which represents the intervals of the notes in the chord above the sounding bass note, i.e. a vector that is similar to figured bass,
- the *Proximity vector*, which represents the intervals between consecutive notes within a chord, and
- the *Half vector*, which combines the *bass vector* and the *proximity vector*. It is close to the *full vector* but it does not represent the intervals between the notes that are above the bass.

Of these four vectors, it was the *half vector* that I felt produced the smoothest harmonic transformations rather than the *full vector* demonstrated in Example 7.2. The movement from light to dense consistency is represented in terms of the vector by a gradual reduction in intervals of class 1, 2 and 3 and an increase in intervals of class 7, 8 and 9.

*Example 7.4* The four vector types



<sup>2</sup> Over three octaves (35 semitones) there are 6,545 four note chords; 52,360 five note chords; and 324,632 six note chords.

Written for piccolo, flute, clarinet in B $\flat$ , bass clarinet in B $\flat$ , bassoon, contrabassoon, two horns in F, piano, two violins, two violas and two cellos, *Compression* splits these groups of instruments into two layers. The six string instruments form one layer that use six note chords. The wind instruments and piano form a separate layer and make use of four note chords. Both layers, independently of one another, have the same common goal, that is, to move from chords with a light harmonic consistency to chords with a dark, dense harmonic consistency.

As previously mentioned, there are 324,632 six note chords over a range of three octaves which, for compositional purposes, is impractical. The process of writing the piece, therefore, involved sorting, sifting and filtering these chords repeatedly until I achieved the desired effect. I developed software to allow me to efficiently filter the list of chords by setting parameters for the minimum and maximum vectors as well as setting minimum and maximum proximity intervals, that is, the minimum and maximum size of intervals between consecutive notes of a chord. This allowed me to reduce the number of chords that I was working with to a manageable number whilst still maintaining the original concept of the piece.

The strings layer of material gradually progresses through a series of 1344 six note chords and gradually cycles through these from least to most dense in a steady *moto perpetuo*. The effect of this is a sense that the harmony in the strings gradually becomes more dense but without there appearing to be anything sequential in terms of the pitches.

I used the vectors from these chords as the basis of the structure of the piece (Example 7.6), grouping the vectors on the basis of their final two digits. To control the gradual descent of the pitches in the piece, I made use of a non-octave repeating scale (Example 7.5). The rationale for using a non-octave repeating scale was that I wanted to

avoid any sense of returning to a ‘home’ tonality. Each structural block shown in Example 7.6 gradually moves down the scale shown in Example 7.5.

Within each structural block, I used a subset of descending patterns based on the following modified Fibonacci series which allowed me to control the pacing of the descending patterns across the duration of the piece.

1 - 1 1 2 - 1 1 2 1 2 3 - 1 1 2 1 2 3 1 2 3 4 - 1 1 2 1 2 3 1 2 3 4 1 2 3 4 5.

Each group of chords with the same vector, within each section, gradually works its way down the non-octave repeating scale according to this pattern. Example 7.7 shows how this works for the first few bars. The result is that there is a sense that the harmony is becoming more dense and slipping downwards but the points at which this happens are not identifiable.

*Example 7.5* The non-octave repeating scale.



*Example 7.6* Six note chords, vectors arranged on the basis of the eighth and ninth values

E	D	C	B	A
222210000 - E	221210010 - D	222200001 - C	222100011 - G	122200002 - F
222111000 - E	122210010 - D	222110001 - C	122200011 - G	222010002 - F
221211000 - E	122200110 - D	221210001 - C	221110011 - G	221110002 - F
212211000 - D	212110110 - C	212210001 - B <sub>♭</sub>	212110011 - F	122110002 - E <sub>♭</sub>
122211000 - E	122110110 - D	122210001 - C	122110011 - G	211210002 - F
222200100 - E	121210110 - D	222101001 - C	121210011 - G	121210002 - F
222110100 - D	112210110 - C	221201001 - B <sub>♭</sub>	112210011 - F	112210002 - E <sub>♭</sub>
221210100 - E	121201110 - D	122201001 - C	212100111 - G	212101002 - F
212210100 - D	211111110 - C	212111001 - B <sub>♭</sub>	112200111 - F	121201002 - E <sub>♭</sub>
122210100 - C	112111110 - B <sub>♭</sub>	122111001 - A <sub>♭</sub>	212010111 - E	112201002 - D <sub>♭</sub>
122201100 - E	120211110 - D	220211001 - C	122010111 - G	212011002 - F
212111100 - E	111211110 - D	211211001 - C	121110111 - G	220111002 - F
122111100 - D	022210110 - C	121211001 - B <sub>♭</sub>	202110111 - F	211111002 - E <sub>♭</sub>
121211100 - E	022201110 - D	112211001 - C	112110111 - G	121111002 - F
112211100 - D	022111110 - C	222100101 - B <sub>♭</sub>	111210111 - F	112111002 - E <sub>♭</sub>
022211100 - C	021211110 - B <sub>♭</sub>	221200101 - A <sub>♭</sub>	111201111 - E	210211002 - D <sub>♭</sub>
	012211110 - A	212200101 - C	102111111 - G	120211002 - F
		122200101 - B <sub>♭</sub>		111211002 - E <sub>♭</sub>
		222010101 - A <sub>♭</sub>		102211002 - D <sub>♭</sub>
		221110101 - G <sub>♭</sub>		222000102 - C
		212110101 - C		122100102 - F
		122110101 - C		112200102 - F
		211210101 - B <sub>♭</sub>		221010102 - E <sub>♭</sub>
		121210101 - C		121110102 - F
		202210101 - B <sub>♭</sub>		112110102 - E <sub>♭</sub>
		112210101 - A <sub>♭</sub>		111210102 - D <sub>♭</sub>
		221101101 - C		102210102 - F
		212101101 - B <sub>♭</sub>		111201102 - E <sub>♭</sub>
		122101101 - A <sub>♭</sub>		102201102 - D <sub>♭</sub>
		211201101 - G <sub>♭</sub>		111111102 - C
		121201101 - C		102111102 - F
		112201101 - B <sub>♭</sub>		110211102 - E <sub>♭</sub>
		212011101 - A <sub>♭</sub>		101211102 - D <sub>♭</sub>
		211111101 - G <sub>♭</sub>		
		202111101 - F		
		112111101 - C		
		111211101 - C		
		102211101 - B <sub>♭</sub>		

A <sub>0</sub>	G <sub>0</sub>	F	E <sub>0</sub>	D <sub>0</sub>
212100012 - E	112110003 - D	112100013 - C <sub>#</sub>	022211001 - B	022210011 - A
122100012 - E	102201003 - D	111200013 - C <sub>#</sub>		022200111 - A
112200012 - E	111111003 - D	112010013 - C <sub>#</sub>	022210101 - B	022110111 - A
122010012 - D	102111003 - C	111110013 - B		021210111 - G
211110012 - E	101211003 - D	110210013 - C <sub>#</sub>	022201101 - B	012210111 - A
121110012 - E		102101013 - C <sub>#</sub>	022111101 - A	
112110012 - D	111110103 - D	110201013 - B	021211101 - B	021201111 - A
111210012 - E	111101103 - C	102011013 - C <sub>#</sub>	012211101 - B	021111111 - G
102210012 - D	111011103 - D	110111013 - B		012111111 - A
111201012 - C	110111103 - C	101111013 - A		011211111 - G
210111012 - E	101111103 - B	100211013 - C <sub>#</sub>		
120111012 - E		112000113 - C <sub>#</sub>		
102111012 - D		111010113 - B		
122000112 - E				
121100112 - D				
112100112 - C				
102200112 - E				
112010112 - D				
111110112 - C				
110210112 - B				
101210112 - E				
111101112 - E				
102101112 - D				
101111112 - E				

C	B <sub>0</sub>	A	G	F <sub>#</sub>
022210002 - G <sub>#</sub>	022110012 - F <sub>#</sub>	022110003 - F	021110013 - E <sub>0</sub>	002211111 - D
	012210012 - F <sub>#</sub>	021210003 - F	012110013 - E <sub>0</sub>	
022201002 - G <sub>#</sub>		011211003 - F	011210013 - E <sub>0</sub>	
022111002 - G <sub>#</sub>	012200112 - F <sub>#</sub>			
021211002 - F <sub>#</sub>	022010112 - E	022100103 - E <sub>0</sub>	011200113 - D <sub>0</sub>	
012211002 - G <sub>#</sub>	021110112 - F <sub>#</sub>	022010103 - F	012010113 - E <sub>0</sub>	
	012110112 - F <sub>#</sub>	021110103 - F	011110113 - E <sub>0</sub>	
022200102 - G <sub>#</sub>	011210112 - E	012110103 - E <sub>0</sub>	010210113 - E <sub>0</sub>	
022110102 - F <sub>#</sub>		020210103 - F		
021210102 - G <sub>#</sub>	011201112 - F <sub>#</sub>			
	011111112 - E	011111103 - E <sub>0</sub>		
	010211112 - D	010211103 - D <sub>0</sub>		
022101102 - F <sub>#</sub>				
021201102 - E				
012201102 - G <sub>#</sub>				
022011102 - G <sub>#</sub>				
021111102 - F <sub>#</sub>				
012111102 - G <sub>#</sub>				
020211102 - F <sub>#</sub>				
011211102 - E				

<b>E</b>	<b>D</b>	<b>C<sub>ff</sub></b>
0022111 <b>02</b> - C	0022101 <b>12</b> - B, 0022011 <b>12</b> - B, 0021111 <b>12</b> - B, 0012111 <b>12</b> - A,	0022110 <b>03</b> - A 0022101 <b>03</b> - A 0021111 <b>03</b> - A  <b>Addi t i onal  chor ds ( usi ng  maxi num vect or  000345678) :</b>  0002301 <b>03</b> - G 0003111 <b>03</b> - A 0002211 <b>03</b> - A 0002112 <b>03</b> - G 0001212 <b>03</b> - A  0002201 <b>04</b> - G 0001202 <b>04</b> - G

*Example 7.7* The opening chords transposed according to the modified Fibonacci series

The musical score consists of seven staves, each representing a different transposition of the opening chords. The transposition series are as follows:

- Staff 1: 2,2,2,2,1,0,0,0,0
- Staff 2: 2,2,2,1,1,1,0,0,0
- Staff 3: 2,2,1,2,1,1,0,0,0
- Staff 4: 2,1,2,2,1,1,0,0,0
- Staff 5: 1,2,2,2,1,1,0,0,0
- Staff 6: 2,2,2,2,0,0,1,0,0
- Staff 7: 2,2,2,1,1,0,1,0,0

Each staff contains a sequence of chords, with the notes of each chord corresponding to the transposition series indicated above it. The chords are written in a musical staff with a treble clef and a key signature of one sharp (F#).

I now had a set of chords that gradually progressed from a light harmonic consistency to a more dense harmonic consistency and that descended down through a non-octave repeating scale. I then re-notated the chords in quavers, grouped the chords in different time signatures with different rhythmic units based on the voicing of the chords, and, within each group, eliminated any repeated notes so that common notes between chords would be sustained in order to create a homogenous texture. This created the effect of blurring the edges of the transitions from one chord or group of chords to another thereby further hiding the systematic approach to the composition. Once I had done this, there were still passages that seemed to be too static so I used a basic Fibonacci series,

within the large scale Fibonacci series discussed above, to increase the melodic contour of the material (Example 7.8).

*Example 7.8* Grouping of the chords and melodic contour

The image displays a musical score for six string instruments: Violin 1, Violin 2, Viola 1, Viola 2, Violoncello 1, and Violoncello 2. The score is written in 4/4 time and consists of 12 measures. Above the staves, there are brackets indicating melodic contour groupings for each instrument. The groupings are as follows: Violin 1: [1 1 2 1], [1] [1 1 2 1 2 3 1], [1 1 2 1 2 3 1 2 3 4 1 2]; Violin 2: [1 1 2 1], [1] [1 1 2 1 2 3 1], [1 1 2 1 2 3 1 2 3 4 1 2]; Viola 1: [1 1 2 1], [1] [1 1 2 1 2 3 1], [1 1 2 1 2 3 1 2 3 4 1 2]; Viola 2: [1 1 2 1], [1] [1 1 2 1 2 3 1], [1 1 2 1 2 3 1 2 3 4 1 2]; Violoncello 1: [1 1 2 1], [1] [1 1 2 1 2 3 1], [1 1 2 1 2 3 1 2 3 4 1 2]; Violoncello 2: [1 1 2 1], [1] [1 1 2 1 2 3 1], [1 1 2 1 2 3 1 2 3 4 1 2]. The score shows a progression of chords and melodic lines across the measures, with the string parts generally moving in parallel motion.

The wind instruments form a separate layer of material consisting of four note chords that cycle through from least to most dense at a slower pace. They do not, however, play throughout. Instead, where the string layers might seem to symbolise the fabric of space itself being compressed, the wind instruments could be thought of as symbolising material objects that inhabit parts of that space.

Once again, I used the software which I developed to select a number of four note chords. Rather than filtering chords across the full range of four note chords, as I had done for the strings, I used a filter to take a sample of chords in three localised areas from the complete list of chords (Example 7.9a–c).



Example 7.9a First group of wind chords

1,1,0,1,0,1,0,0,1

0,2,0,1,0,1,0,0,1

0,1,1,0,1,0,0,1

0,1,0,2,0,1,0,0,1

0,1,0,1,1,1,0,0,1

0,1,0,1,0,2,0,0,1

Example 7.9b Second group of wind chords

0,1,1,0,1,0,1,0,1

0,0,2,0,1,0,1,0,1

0,0,1,1,1,0,1,0,1

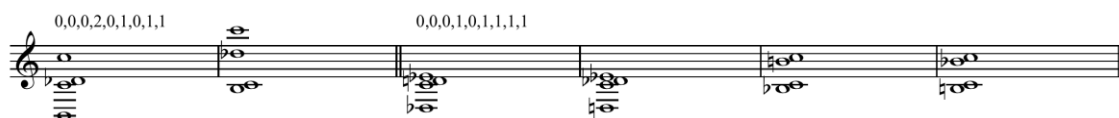
0,0,1,0,2,0,1,0,1

0,0,1,0,1,1,1,0,1

0,0,1,0,1,0,2,0,1

0,0,1,0,1,0,1,0,2

Example 7.9c Third group of wind chords



Above the string layer sit the four note chords of the wind layer. These particular wind instruments were chosen because of their colour. The piccolo, flute and clarinet sound well above the notes of the bass clarinet and the horns, as if to enhance the colour of those instruments. The bassoons were chosen because, together with the horns and bass clarinet, they produce a dark timbre when played in the lower register (which happens towards the end of the piece, in bars 201-220). The overall effect, as the chords become more dense, is for the timbre of the wind instruments to become darker.

The piano part decorates the wind layer. During the first and second set of chords, each note of the wind chords appears in the piano part in turn as a descending arpeggio. The descending trajectory here is a localised imitation of the overall descending trajectory of both the string and wind layers. The single notes also add a touch of colour during the first and second set of wind chords. Where the piece is at its most dense, however, the piano part reinforces that sense of density by doubling the wind parts with block chords.

*Compression* has many parallels with other pieces in the folio. In this piece there is, again, a *moto perpetuo*, and multiple layers of material that progress at different tempi. Here, however, unlike *Velocity*, *On G*, and *Parallel Worlds*, both layers of material seem to be independently moving towards the same goal. Turning the Boulez quotation from chapter four on its head, the changes in the material are small enough to be imperceptible, creating an evolving form that seems static rather than dynamic.<sup>3</sup>

---

<sup>3</sup> P. Boulez *Orientations*, p. 91.

## 8 Conclusion

The pieces in the folio, and accompanying commentary, articulate aspects of my compositional language in a number of different musical contexts. One key technical feature of my musical language that persists in all of the pieces is the use of layers of material that do not share the same underlying pulse. Points of alignment of the material define overarching structural points in the pieces; when the material persistently does not align, there is underlying tension between the layers.

This approach to layering is fundamental to the way that I think about music. As a composer brought up on a diet of Palestrina and Bach, contrapuntal thinking tends to dominate. For me, counterpoint does not grow out of harmony, nor do I consider harmony to be simply the result of horizontal writing but, rather, harmony in the pieces in the folio is a means by which I control seemingly disparate elements. For example, at times, the harmony that binds the pieces is the relationship between multiple simultaneous tonal centres. In other places, the material tends to gravitate towards one overarching tonal centre at any given moment. In *Compression*, the slow, shifting tonal centre is hidden beneath the surface of the harmony where it controls the gradual descent of the overall pitch material.

In many of the pieces, I use fragmentation and rhetorical gestural figures in order to set material aside from its context. In some places, the fragments and gestures seem to seek an escape from their surrounding context: in other places, they seem to be separate and oblivious to their context. The accumulation of multiple layers of fragments is, in some pieces, used as a means to establish the feeling of change in the music. By contrast, the use of a limited number of pitches in other places seeks to establish a sense of stasis in the music.

The pieces in the folio make use of similar composition techniques; however, they also exhibit different characters. These differences reveal the influence of several composers. The idea of using a *moto perpetuo* is borrowed from music of the Baroque period, but the idea is, of course, not exclusive to the Baroque period. There are several more recent composers, notably minimalist composers, such as Louis Andriessen (for example in *De Staat* and *Workers' Union*) who have made use of similar techniques. Other works in the folio exhibit a more spacious sense of time. The feeling that musical material seems, at times, to hang in the air is a feature of several pieces and it is this aspect of the works of Arvo Pärt (for example, “Silentium”, the second movement of *Tabula Rasa*), Kaija Saariaho (beautifully illustrated in *Lichtbogen*) and Pierre Boulez (exemplified by “Tombeau” from *Pli selon Pli*) that I have found arresting.

The folio, therefore, outlines a number of techniques that I use but within a range of different contexts. Even where individual works in the folio may seem to be starkly contrasting, there are, underpinning all of them, common techniques that draw these pieces together into a single body of work.

## Selected Bibliography

- S. Adler, *The Study of Orchestration*. 2nd ed. New York; London: W. W. Norton and Company, 1989. Print.
- P. Boulez, *Orientations*. Ed. J-J Nattiez. Trans. M. Cooper. London; Boston: Faber and Faber Limited, 1986. Print.
- A. Cadwallader and D. Gagné, *Analysis of Tonal Music: A Schenkerian Approach*. Oxford; New York: Oxford University Press, 1998. Print.
- R. Cohn, *Audacious Euphony*. Oxford; New York: Oxford University Press, 2012. Print.
- N. Cook and M. Everist, Eds, *Rethinking Music*. Oxford: Oxford University Press, 1999. Print.
- H. Cowell, *New Musical Resources*. New York: Something Else Press, 1969. Print.
- D. Cooke, *The Language of Music*. Oxford; New York: Oxford University Press, 1959. Print.
- C. Dalhaus, *The Idea of Absolute Music*. Trans. R. Lustig. Chicago; London: The University of Chicago Press, 1989. Print.
- M. Dupré, *Cours complet d'improvisation à l'orgue*. Trans. J. Fenstermaker. 2 vols. Paris, Alphonse Leduc, 1974. Print.
- A. Forte, *The Structure of Atonal Music*. New Haven; London: Yale University Press, 1973. Print.
- J. Harvey, *Music and Inspiration*. Ed. M. Downes. London: Faber and Faber, 1999. Print.
- P. Hill, ed., *The Messiaen Companion*. London: Faber and Faber, 1995. Print.
- L. Janáček, *Letters and Reminiscences*, Ed. B. Štědroň, Trans. G. Thomsen. Prague: Artia, 1955. Print.
- R. S. Johnson, *Messiaen*. London: J. M. Dent & Sons, 1975. Print.
- F. Lerdahl and R. Jackendoff, *A Generative Theory of Tonal Music*. Cambridge; London: The MIT Press, 1983. Print.
- A. Y. Mah, *Watching the Tree to Catch a Hare*. London: HarperCollins Publishers, 2001. Print.
- O. Messiaen, *The Technique of my Musical Language*. Trans. J. Satterfield. 2 vols. Paris: Alphonse Leduc, 1956. Print.
- V. Persichetti, *Twentieth-Century Harmony: Creative Aspects and Practice*. New York; London: W. W. Norton and Company, 1961. Print.
- J. Robinson, *Music and Meaning*. Ithaca: Cornell University Press, 1997. Print.
- J. Rufer, *Composition with Twelve Notes*. Trans. H. Searle. London: Barrie and Rockliff, 1961. Print.

- D. Schiff, *The Music of Elliott Carter*. 2nd ed. London: Faber and Faber, 1998. Print.
- N Slonimsky, *Thesaurus of Scales and Melodic Patterns*. New York: Charles Scribner's Sons, 1947. Print.
- M. Somsak, *Somsak Cimbals*. n.d. n.p. Web. 22 Sept. 2010.  
<<http://www.cimbals.com>>
- D. Tymoczko, *A Geometry of Music: Harmony and Counterpoint in the Extended Common Practice*. Oxford; New York: Oxford University Press, 2011. Print.

## Selected Scores

- L. Andriessen, *De Tijd*. 1981. London: Boosey & Hawkes, 1995. Print.
- L. Andriessen, *De Staat*. 1976. London: Boosey & Hawkes, 1991. Print.
- L. Andriessen, *De Stijl*. 1985. London: Boosey & Hawkes, 1996. Print.
- L. Andriessen, *Workers Union*. 1975. Amsterdam: Donemus, 1977. Print.
- J. S. Bach, "Praeludium et Fuga in e BWV 548". n.d. Johann Sebastian Bach: Neue Ausgabe Sämtlicher Werke. Serie IV: Orgelwerke, Band 5. Ed. D. Kilian. Kassel: Barenreiter-Verlag, 1972. Print.
- L. Berio, *Sinfonia*. 1968. London: Universal Edition, 1969. Print.
- P. Boulez, *Pli selon Pli, I. Don*. 1960. London: Universal Edition, 1967. Print.
- P. Boulez, *Pli selon Pli, V. Tombeau*. 1959-1962. Universal Edition, 1971. Print.
- J. Brahms, "Ein deutsches Requiem". 1865-1868. Johannes Brahms: Sämtliche Werke, Band 17. Ed. E. Mandyczewski. Leipzig: Breitkopf & Härtel, 1926-27. Print.
- D. Buxtehude, "Tocatta in F". n.d. Dietrich Buxtehude: Sämtliche Orgelwerke, Band I. Ed. J. Hedar. Copenhagen: Wilhelm Hansen, 1952. Print.
- E. Carter, *String Quartet No. 1*. 1951. New York: Associated Music Publishers, 1994. Print.
- E. Carter, *Night Fantasies*. 1980. New York; London: Associated Music Publishers, 1982. Print.
- C. Franck, *Pastorale en mi majeur*. 1868. Paris: Durand, n.d. Print.
- H. Howells, *Requiem*. 1936. Sevenoaks: Novello, 1981. Print.
- C. Ives, *The Unanswered Question*. 1906. New York: Southern Music Publishing, 1953. Print.
- C. Ives, *Central Park In The Dark*. 1906. Hillsdale: Boelke-Bomart, 1973. Print.
- C. Ives, *Symphony No. 4*. 1909-1916. New York: Associated Music Publishers, 1965. Print.
- J. Desprez, "Ave Maria". n.d. European Sacred Music. Ed. J. Rutter. Oxford: Oxford University Press, 1996. Print.
- G. Ligeti, *Chamber Concerto for 13 instruments*. 1969-1970. Mainz; London; New York: Edition Schott, 1974. Print.
- O. Messiaen, *Chronochromie*. 1959-1960. Paris: Alphonse Leduc, 1963. Print.
- O. Messiaen, *Des canyons aux étoiles....* 1971-1974. 3 vols. Paris: Alphonse Leduc, 1978. Print.
- O. Messiaen, *Livre du Saint Sacrement*. 1984. Paris: Leduc, 1989. Print.
- W. A. Mozart, *Requiem, K. 626*. 1791. Ed. F. Blume. Leipzig: Eulenberg, n.d. Print.

- A. Pärt, *Cantus in memoriam Benjamin Britten*. 1977. Vienna: Universal Edition, 1981. Print.
- A. Pärt, *Tabula Rasa*, 1977. Vienna: Universal Edition, 1981. Print.
- H. Purcell, “Voluntary for Double Organ”. n.d. Purcell Organ Works. Ed. H. McLean. Sevenoaks: Novello, 1957. Print.
- K. Saariaho, *Lichtbogen*. 1986. Helsinki: Edition Wilhelm Hansen, 1992. Print.
- D. Shostakovich, *String Quartet No. 7*. 1960. London: Musica Rara, 1961. Print.
- T. Tallis, *The lamentations of Jeremiah*. n.d. Ed. P. Brett. London: Oxford University Press, 1969. Print.
- M. Tippett, *The Rose Lake*. 1994. London: Schott, 1994. Print.
- I. Xenakis, *Jonchaies*. 1977. Paris: Editions Salabert, 1977. Print.
- I. Xenakis, *Embellie*. 1981. Paris: Editions Salabert, 1981. Print.