Abstractions from Spectral Sonorities

Composition Commentary

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Declaration

This dissertation is the result of my own work and includes nothing which is the outcome of work done in collaboration.

It is not substantially the same as any that I have submitted, or, is being concurrently submitted for a degree or diploma or other qualification at the University of Cambridge or any other University or similar institution.
I further state that no substantial part of my dissertation has already been submitted, or, is being concurrently submitted for any such degree, diploma or other qualification at the University of Cambridge or any other University or similar institution.

It does not exceed the prescribed word limit for the relevant Degree Committee.

Summary

In this analytical commentary and the accompanying portfolio of compositions, I deal primarily with issues relating to Spectral and Post-Spectral techniques in contemporary music.

Potential limitations of Spectralism (as a genre) are taken into consideration, and several philosophical underpinnings of this compositional style are called into question as I consider the possibility of a music which is enhanced, but not constricted, by its technical innovations.

Specifically, I examine various ways by which resonant harmonic colours of the natural overtone series might be abstracted from their Natural context(s), categorised, studied, understood, and finally deployed within a harmonic language which is to some extent musically functional rather than merely sonically colourful.

The seven compositions included in the portfolio approach the problem from a variety of methodological angles:

—Pitch structures, isolated from the world of acoustic phenomena, are studied and manipulated to create colourful musical objects with an inherent inner logic.

—In some instances Spectral concepts and techniques are integrated (or juxtaposed) with principles borrowed or adapted from tonal, post-tonal and serialist approaches to composition.

—Occasionally non-Spectral music is analysed from a Spectral perspective and repurposed within a hybridised harmonic language.

The commentary also records my artistic and technical development as a composer during my time at Cambridge. It charts my progress towards the attainment of a harmonic/musical grammar unique to myself, and the pursuit of a technical facility appropriate to this ambition.

Acknowledgements

This analytical commentary is dedicated to the memory of Oliver Knussen —a musician, mentor, and person like no other.

I wish to acknowledge my supervisor Richard Causton for his guidance, support, patience and general kindness; Julian Anderson for his friendship, advice and conversation; Stephen and Jackie Newbould for my fantastic experiences with BCMG; Julian Jacobson and Julia Lungu for the phone calls when I needed them most; and Laura Balboa for putting up with all my nonsense!

Financial acknowledgement is due to the Arts and Humanities Research Council and the Bliss Trust.

CONTENTS

List of Accompanying Scores and Recordings

A portfolio of the following scores is submitted:

Ballabile for Orchestra

Polly Roe for Ensemble

Cycling for Orchestra

Piano Juice for six pianos and three female voices

From the Lamentations of Jeremiah for choir

*Fantasia on Berio's Not*e for ensemble

Autres Vexations for two pianos

The following recordings are submitted on CD:

Track 1: *Ballabile*—6:57

Slovenian Philharmonic Orchestra/cond.Taejung Lee

Track 2: *Polly Roe*—4:01

Birmingham Contemporary Music Group/cond. Oliver Knussen

Track 3: *Cycling*—6:06

Orchestre Philharmonique de Radio France/cond. Pierre-André Valade

Track 4*: *From the Lamentations of Jeremiah*— 11:40

Zurich Chamber Singers/cond. Christian Erny

Track 5:** *Fantasia on Berio's note*—1:57

London Sinfonietta/cond. Vladimir Jurowski

Track 6: *Aquam nostram pecunia bibimus; ligna nostra pretio comparavimus*

(from *Autres Vexations*)

Patrick Brennan, piano

* Not including Movt. 5:3

** Original Purcell Hornpipe arranged by John Woolrich

Introduction — *Abstractions from Spectral Sonorities*

Over the years I have endeavoured to develop a natural instinct for resonant harmony into a solid compositional technique, the better to refine and manipulate those musical materials I find pleasing. My research at Cambridge University forms an important part of this enterprise.

Musical Magnetism

In a recently published conversation, the composer Thomas Adès explains his conviction that there exists in music a 'magnetism' between tones:

> 'The two notes in an interval, or any number of chords, have a magnetic relationship of attraction or repulsion which creates movement in one direction or another. A composer, whether of a symphony or a pop song, is arranging these magnetic objects in a certain disposition.'[1]

Having felt them keenly myself, I agree absolutely with Adès' characterisation of these forces as magnetic. In order to understand the forces of attraction and repulsion between tones, it would seem sensible to investigate the behaviour of sound itself. The extraordinary visual similarity between many well-known 'cymatic' phenomena and familiar childhood experiments with magnets and iron filings surely lends support to Ades' 'sonic magnetism' hypothesis.[2]

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[1] Tom Service, *Thomas Ades: Full of Noises: Conversations with Tom Service* (London: Faber and Faber, 2012), p.3.

[2] 'In attempting to observe the phenomena of vibration, one repeatedly feels a spontaneous urge to make the processes visible and to provide ocular evidence of their nature.'—Hans Jenny, *Cymatics-Volume 1: The Structure and Dynamics of Waves and Vibrations*, Third Edition (New Hampshire: MACROmedia Publishing, 2001), p.21.

Spectralism…

In 2006 I became acquainted with the music of Julian Anderson, and was immediately fascinated and beguiled by this composer's uniquely colourful harmony. It was through my subsequent exploration of Anderson's music and writing that I first encountered the concept of 'Spectralism'.

The term 'Spectral Music' (or Spectralism) was coined by the French composer and philosopher Hugues Dufourt to describe the work of several figures associated with Ensemble l'Itinéraire in the late 1970s—most notably Gérard Grisey and Tristan Murail. The label has since been flexibly and liberally applied to a variety of composers, many of whom reject it outright. Anderson describes Spectral music as that 'which uses the acoustic properties of sound itself (or sound spectra) as the basis of its compositional material'.[3] The finest précis of Spectral compositional procedures is still that by Joshua Fineberg.[4]

For the classically trained musician, considering pitches not as familiar divisions of scales and modes, but as points in a near-infinite variety of sonic spectra might be felt as a conceptual leap on par with the layperson's introduction to quantum theory—perhaps to be contrasted with the 'Newtonian' thinking of functional harmony or the relative arbitrariness of total serialism.
The harmonic implications of Spectral thinking are of particular importance to me; in this musical philosophy, microtones are no longer a colouristic curiosity or a novel extension of our Western tuning system(s), but an intrinsic part of a naturally occurring hybrid of timbre and harmony based firmly on mathematical and acoustical truths.[5]

…and its limitations

Given its revolutionary qualities, it is hardly surprising that composers who embrace Spectralism often do so with the zeal of the convert. However, the artist who maintains a degree of detachedness

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[3] Julian Anderson, 'Spectral Music', *Grove Music Online*, Article 50982, (2001), in *Oxford Music Online* <https://doi.org/10.1093/gmo/9781561592630.article.50982> [Accessed 12th Dec 2018].

[4] Joshua Fineberg, *'*Guide to the Basic Concepts and Techniques of Spectral Music*', Contemporary Music Review*, Vol. 19, Part 2 (2000), 81-113.

[5] 'Here, for the first time, there is no distinction between harmony and timbre. Harmony is timbre; timbre is harmony'—Jonathan Harvey, 'Spectralism 1', *Contemporary Music Review*, Vol. 19, Part 3 (2001), 11-14, (p.12).

from the genre cannot fail to notice certain stylistic limitations. I recall one prominent composer dismissing contemporary representatives of the Spectral style as purveyors of 'halo music'—a withering assessment to be sure, but not wholly without veracity. My own principal frustrations with the genre are these:

1: ***Vagueness/haziness***

Among the typical formal concepts outlined by Joshua Fineberg is 'smooth transformation from one state to another'.[6] Frequently, perceptible attacks and definite durations are traded in for dynamic envelopes from and to *niente,* and illusions of motion, momentum and direction are most often accomplished by arpeggiation within a harmonic area and/or fluctuations in harmonic/sonic density.

Naturally, the masterpieces of any genre cannot be reduced to a set of stylistic hallmarks, but it is nevertheless true that much Spectral and post-Spectral music is notable by its very vagueness; eschewing directness and definition, these pieces have a tendency to glide and slide airily from one hazy microtonal chord or gesture to another—with tasteful sonic shading accomplished through a now-familiar bevy of modish extended techniques and/or electronic enhancements.[7] Certainly, these stylistic attributes can be said to lend the music an elusive, intangible quality, but they might also be observed to mask a regrettable barrenness of musical thought.

2: ***Audiation and computer-assisted composition***

Armed with powerful analytical and generative tools courtesy of IRCAM,[8] Spectral (or Post-Spectral) composers are able, and encouraged, to work with harmonies and rhythms whose subtlety and complexity is far beyond their own powers of audiation. In and of itself, this might well be regarded as welcome progress, but I believe that too large a disconnect between a composer's musical ear and his/her material creates a situation where little can be accomplished beyond an uncritical regurgitation of that material without the possibility of creative

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[6] Fineberg (2000), p.108.

[7] A detailed argument about the relative (de)merits of *Tonkunst* and *Klangkunst* is far beyond the scope of my research, but on the subject of extended techniques I am in full agreement with Milton Babbitt who noted, quite sagely, that 'nothing gets old as quickly as a new sound'. *Milton Babbit: Portrait of a Serial Composer*, Robert Hilferty/Laura Karpman (NPR 2011).

[8] IRCAM (Institut de Recherche et Coordination Acoustique/Musique) is a facility for musical and sonic research set up by the late Pierre Boulez.

development; in permitting these tools to override rather than supplement their instinctive musicality, composers risk ceding control over the ultimate direction and substance of their art.

3: ***Naturalism vs artificiality (authorship)***

In *The World as Will and Representation* Arthur Schopenhauer writes:

> 'That the Idea comes to us more easily from the work of art than directly from nature and from reality, arises solely from the fact that the artist, who knew only the Idea and not reality, clearly repeated in his work only the Idea, separated it out from reality, and omitted all disturbing contingencies.' [9]

Notwithstanding his rather outmoded language in direct reference to music, I find much of Schopenhauer's thinking on aesthetics extremely persuasive—putting me at cross purposes with those Spectral composers who have a tendency to venerate (or perhaps fetishise) 'the Natural'. Artistically speaking, are we to regard arguments from authority as less fallacious if that authority is Mother Nature? I have always considered the act of composing to be a highly personal undertaking, and the music I value most—from Beethoven to Stravinsky to Early and Late Ligeti—always bears (unapologetically) the indelible stamp of its authorship. Artificiality, in this sense, is something I see as an artistic virtue, not a flaw.

4: ***Spectrograph mania***

Grisey famously said: 'we are musicians and our model is sound not literature, sound not mathematics, sound not theatre, visual arts, quantum physics, geology, astrology or acupuncture'.[10]

It is in no sense a disparagement of this composer's music (or his ideas about music) to observe that his many epigones have, in taking this dictum too literally, gone on to produce a great deal of eminently forgettable music. While the idealistic but impractical time-space notation of the early Spectralists has been almost totally abandoned, structural schemes derived from computer-

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[9] Arthur Schopenhauer, *The World as Will and Representation, Vol. 1* (USA: Dover, 1966), p.194.

[10] Gérard Grisey, 'La musique; le devenir des sons', *Darmstadter Beitrage zur Neuen Musik*, Vol. 19 (1984), p. 22.

aided sonic analyses persist in the Spectralism of today.[11] That Grisey's *Quatre chants pour franchir le seuil* (1998) derives its metric structure from a poem by Christian Guez-Ricord, clearly demonstrates his own willingness to look outside of sound for sources of musical inspiration.[12] Modelling musical forms on spectrograph data is no longer a bold new approach to composition; like many other established techniques, it can be used well or poorly. My preferred interpretation of Grisey's pronouncement is as a general call for composers to cultivate a deeper understanding of the 'sonic substances' with which we work every day.

The need for abstraction

Perhaps the finest composer associated (somewhat tangentially) with early Spectralism is Claude Vivier, who once remarked to Grisey: 'I also am writing spectra now. You've influenced me…Only I twist mine a little!'[13]

It is reductive to class Vivier as an authentic Spectralist since many interesting aspects of his harmonic language predate his discovery of this compositional method. Yet, were it not for his tragic and untimely death, I believe Vivier would have continued to twist his spectra into ever more interesting shapes. If we trace the composer's development in the final years of his life, it is clear that his innovations in this area are gathering steam: In *Lonely Child* (1980) and *Bouchara* (1981), Vivier makes use of sum tone frequencies (which he poetically christened 'Les Couleurs') to enhance his otherwise dyadic harmonies. By *Trois Airs Pour un Opéra Imaginaire* (1982) Les Couleurs have taken on a much more linear aspect, deployed as swirling figurations which—although not polyphonic in the truest sense, perhaps—can certainly be recognised as a step in that direction.

'Twisting the spectra' is as good a description as any for my own compositional preoccupations. My fascination with the harmonic possibilities offered by spectral processes combined with my aversion to the above-mentioned stylistic tropes has led me to consider various ways in which intervals or chords generated spectrally could be isolated, categorised, studied, understood and manipulated. To

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[11] Fineberg (2000), pp. 99-103.

[12] Jean-Luc Hervé, 'Quatre chants pour franchir le seuil', in *Contemporary Compositional Techniques and OpenMusic*, ed. by Rozalie Hirs and Bob Gilmore (Paris: Delatour, 2009), pp. 31-43.

[13] 'Autoportrait avec l'Itineraire' (1991), in Gérard Grisey, *Écrits*, (Paris, Éditions MF, 2008), p. 199.

achieve this, it seems necessary to abstract these harmonic materials from their existence in the physical world; to deal with them as ideas rather than events. This naturally requires us humbly to unmake, at least *pro tem*, some of the philosophical leaps that gave birth to Spectralism as a movement. Specifically, the artificial boundary between harmony and timbre must be restored, and pitch space must once more be conceptualised as a series of discrete increments (easily representable by symbols), rather than as a continuum. In my view this 'low-resolution' thinking is not a backward step, but one which is crucial for an understanding of the magnetic relationships between tones which will prove sufficiently meaningful for the extrapolation of fresh harmonic principles. The word 'abstraction' naturally suggests a clinical coldness which is quite at odds with my artistic goals. Perhaps counterintuitively, I regard this sort of abstraction—the disembodiment of certain musical/sonic materials—as a necessary interim step towards their re-embodiment in a much more potent form.

In summary

Morton Feldman remarked that his 'secret' was to avoid 'push[ing] the sounds around'.[14] As a former pianist, I am loath to abandon the hands-on relationship with sound which I find to be one of the great joys of music-making. Nevertheless, I fully accept the value of respectful and responsive engagement with 'musical matter'. Rather than pushing the sounds around, therefore, I have sought new ways in which one might guide and persuade them with sensitivity and craft; I have looked to the concepts and techniques of Spectral music for my answers to this conundrum.

The analytical commentary which follows will describe the conception and construction of seven compositions written during my time at Cambridge, each of which engages from a different angle with the issues outlined above.

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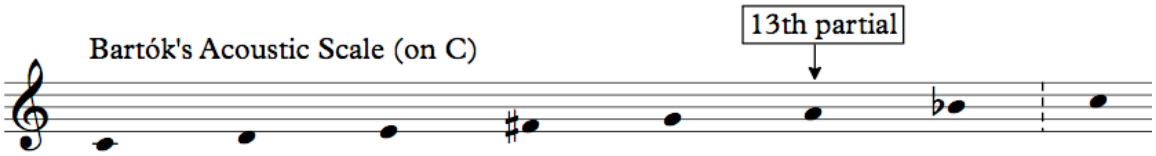
[14] 'Stockhausen asked for my secret. "What's your secret?" And I said, "I don't have a secret, but if I do have a point of view, it's that sounds are very much like people. And if you push them, they push you back. So, if I have a secret: don't push the sounds around." Karlheinz leans over to me and says: "Not even a little bit?".' —Morton Feldman, 'The Future of Local Music' in *Give My Regards to Eighth Street: Collected Writings of Morton Feldman*, ed. by B.H. Friedman (Cambridge: Exact Change, 2000), p. 158.

A note on the diagrams

Among the musical examples in this analytical commentary are diagrams in which partials from the harmonic series (natural overtone series) are labelled numerically. These are always within a box or bracket, with the alphabetic note name of the lowest partial (fundamental tone) indicated.
It is an elementary acoustical fact that every pitch (class), having once appeared in the harmonic series, will repeat thereafter in every octave; in my harmonic thinking, partials are considered to a large extent as pitch classes, rather than octave-specific notes or frequencies. For this reason, **except when a particular unbroken sequence of pitches from within the harmonic series is under consideration**, I assign each partial the lowest number possible—always an odd number—determined by the first appearance of its pitch class.

The thirteenth partial in equal temperament:
The thirteenth partial of the harmonic series is 41 cents (between a third-tone and a quarter-tone) sharp of a compound minor sixth above the fundamental. When representing this overtone in equal temperament, the most accurate interpretation is to 'round down' to an *actual* compound minor sixth. However in most harmonic circumstances, I favour the (less accurate) interpretation of a compound major sixth, inferable from Bartók's Acoustic Scale (shown). In those contexts where I do use the more literal interpretation—either alone or in combination with the other—it will be labelled within quotation marks.



1 — Ballabile

This piece was commissioned by the London Symphony Orchestra as part of their Panufnik Scheme. It was my first work on such a large scale and, presented with the opportunity to write for so many players at once, I wanted to create music which explores and celebrates the sound of a full symphony orchestra and the families of instruments within it.

In dance terminology, 'ballabile' describes a passage in which all members of the *corps de ballet* dance together. This piece was conceived as a series of such passages, fast and slow—although solo dances do also feature on occasion.

Formally, it can be regarded as having two principal sections; the first is a long, slow introduction, and the second is a series of dances—fast and slow—glimpsed only fleetingly before the music abruptly shifts gear. (Fig. 1.1)
The second half was composed first, and will be analysed first in order to present, as coherently as possible, the music which precedes it.

Fig. 1.1

FORM	Section I (Introduction)				Section II						
	Coda mate-rial	Triads	Slow, ascending modal material	Mendelssohn Paraphrase	Fast Dance 1	CLIMAX	Slow Dance	Fast Dance 2	Rhythmic Dance 1	Rhythmic Dance 2	Coda
Bar / Letter:	**Bar 1**	**A**	**B**	**I**	**J**	**M**	**J**	**O**	**P**	**Q**	**R**

Section II

Beginning at Letter J, there is a fast dance in compound quadruple metre. Harmonically, this passage makes use of an ambiguity between spectra on E♮ and C♮. The link is the A-1/4♯, heard in

the double basses as the 11th harmonic (partial) on an open E-string; the same flattened pitch (approximated to a quarter-tone) also functions as the 7th partial in a C spectrum. The dancing figurations in the violins and woodwinds, therefore, inhabit parallel but related spectral areas. (Fig. 1.2)

It is difficult to judge which, if either, is the dominant harmonic strand. However the strings, playing within a C spectrum, make use of every (odd-numbered) partial up to the 21st (inclusive), with the sole exception of the 19th—a pitch provided by the woodwinds.

This fast dance exploits various similar harmonic relationships over its short duration, with solo 'dancers' occasionally spinning off in a direction of their own before rejoining the others. (Fig. 1.3)

Fig. 1.2

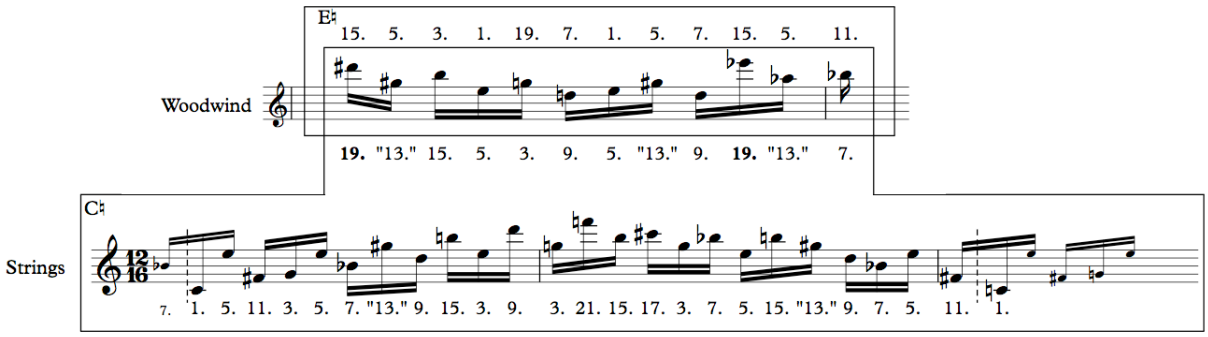
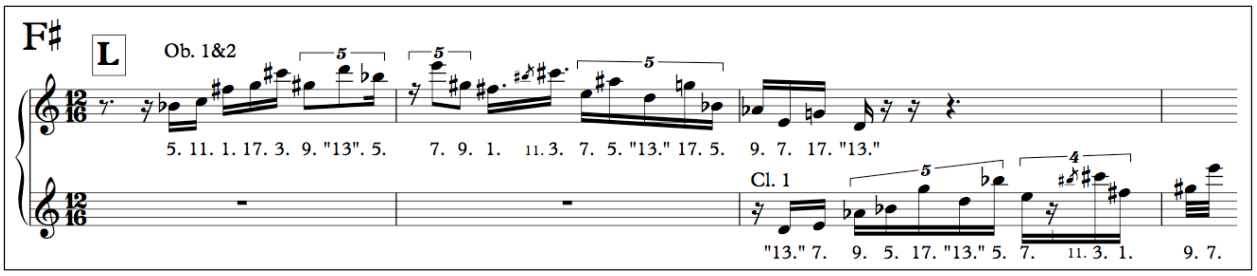


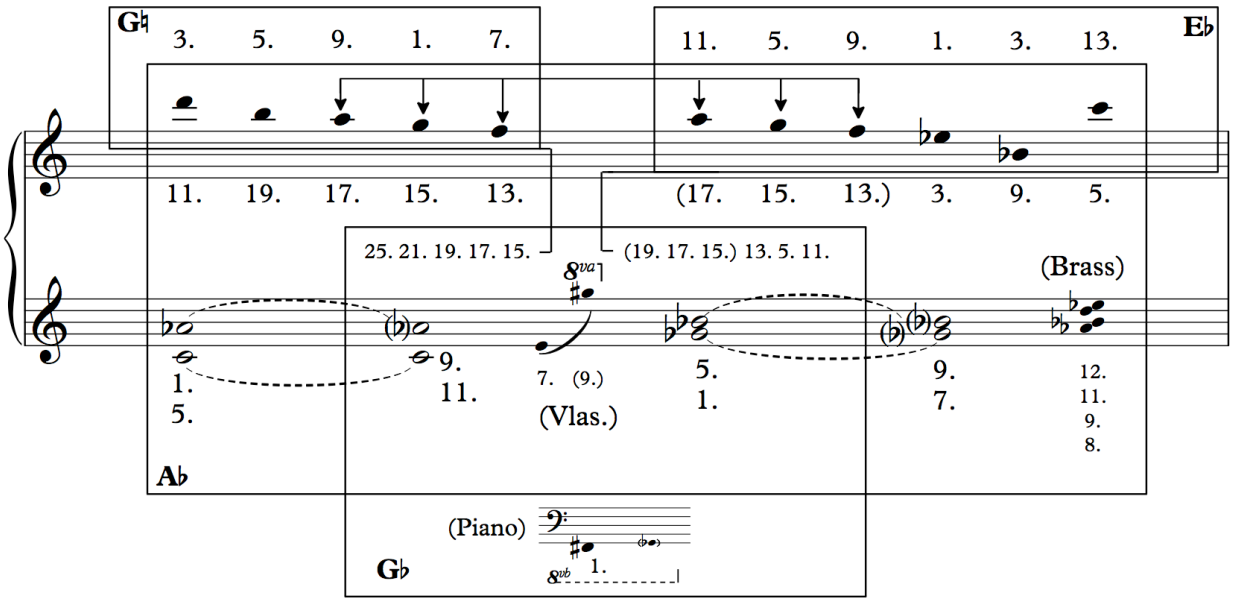
Fig. 1.3



Following the climactic moment, in which torrents of woodwinds flow down towards a B♭ spectrum, a dolorous contrabassoon solo heralds the arrival of the 'slow dance'. Here the harmony is made up of four interrelated spectral layers: a solo string quartet plays a hocket of overtones on G♮ and E♭, linked by three common tones, beneath which a pair of clarinets (plus sustained double

bass) inhabit G♭ and A♭ simultaneously. A more complete representation of the harmonic interaction between these layers can be seen in Fig. 1.4.

Fig. 1.4



This slow dance is interrupted after just a few measures by another fast dance in the woodwinds—again compound quadruple time, with a rhythmic counterpoint distributed amongst the rest of the orchestra.

The first of two 'Rhythmic Dances' begins at letter P. A sequence of notes (overtones on C♮) is passed between the strings, starting high and ending with a Bartók pizzicato on the lowest note of the double basses. Having reached the bottom, the sequence starts over, this time contracted by the removal of a rhythmic cell. (Fig. 1.5)

A further two contracted versions of the sequence may just be audible before it is entirely engulfed by the swirling mass of orchestral sound which builds towards Letter Q.

The second Rhythmic Dance is similar in conception to the first; again, overtones on C♮ comprise the melodic core, given to Violin I. (Fig. 1.6)

This longer sequence is expanded by the addition of a single semiquaver with each repetition. Only one and a half repetitions are allowed to occur, though, before the music is suddenly and abruptly cut off in Bar 135.

Fig. 1.5

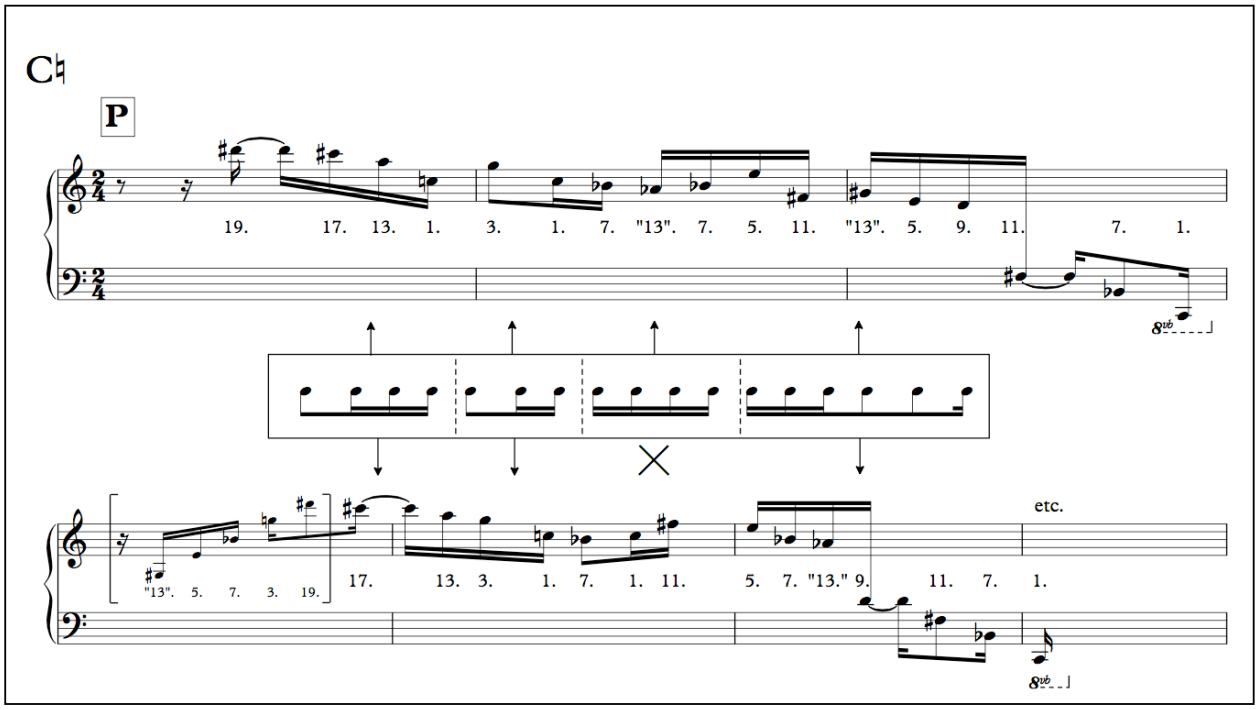
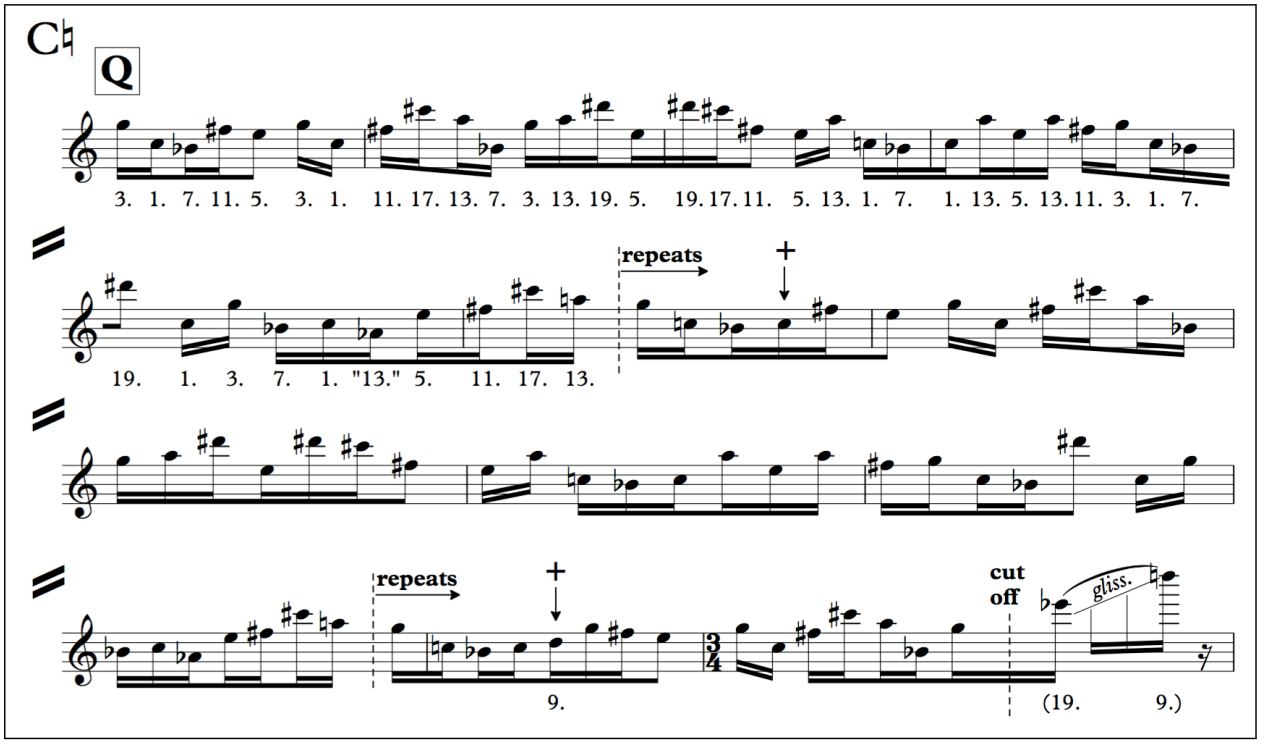


Fig. 1.6

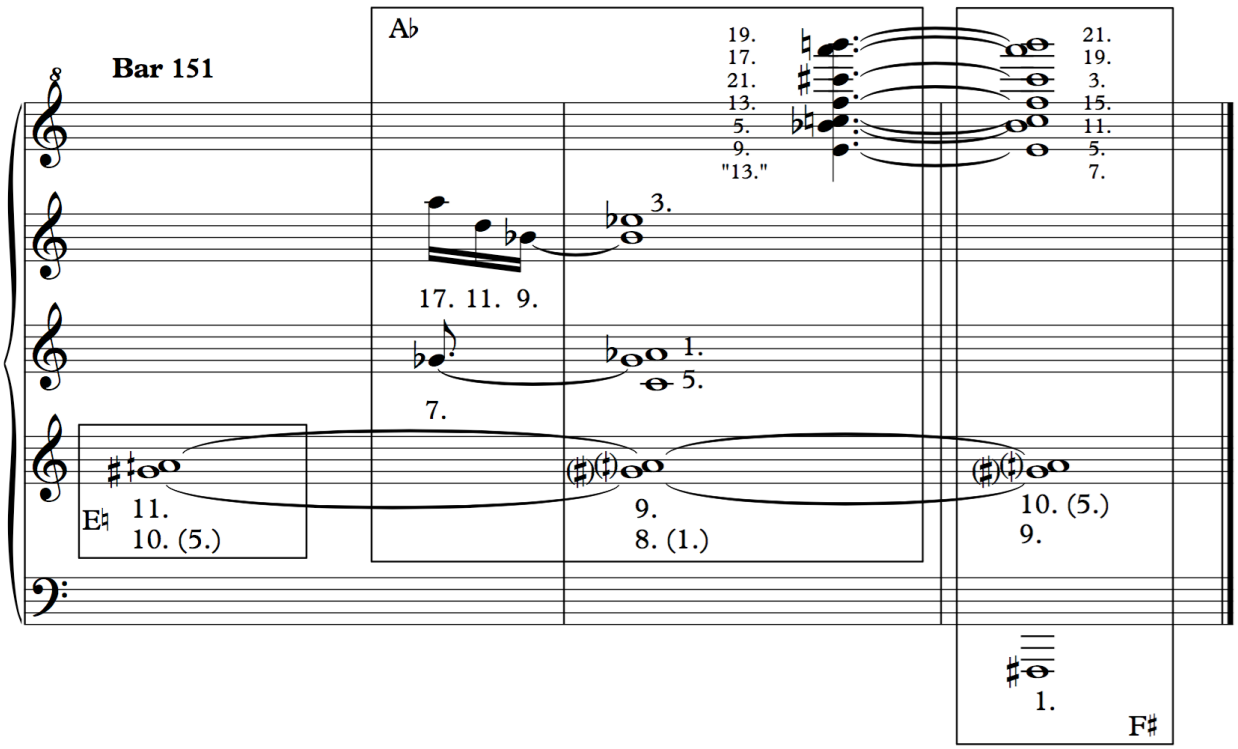


After a short pause of three crotchet beats, a large chord on a spectrum of E♮ announces the coda. The strings remain firmly in an E spectrum while the harmonic material of the woodwinds (from Letter S) is predominantly derived from the related G♯/A♭ spectrum—taking the 5th partial of E♮ as its first (fundamental).

A final cadence splits the difference, ending the piece on a spectrum of F♯. (Fig. 1.7)

The music dies away on a widely spaced dyad of F♯ (in the harp) and E♮ (in the clarinets, with timbral trills). This final dyad, in the same instrumentation, is 're-used' in Bar 1 of the introduction, hopefully lending some appreciable formal cohesion to a rather mercurial piece.

Fig. 1.7



Section I (Introduction)

As the F♯ of the Harp dies away, the E♮ of the timbral-trilling clarinets gradually germinates—with the help of canonic descending gestures in Vibraphone, Harp and Celesta— into a chord of C major in preparation for a passage which exploits another important spectral relationship.[15]

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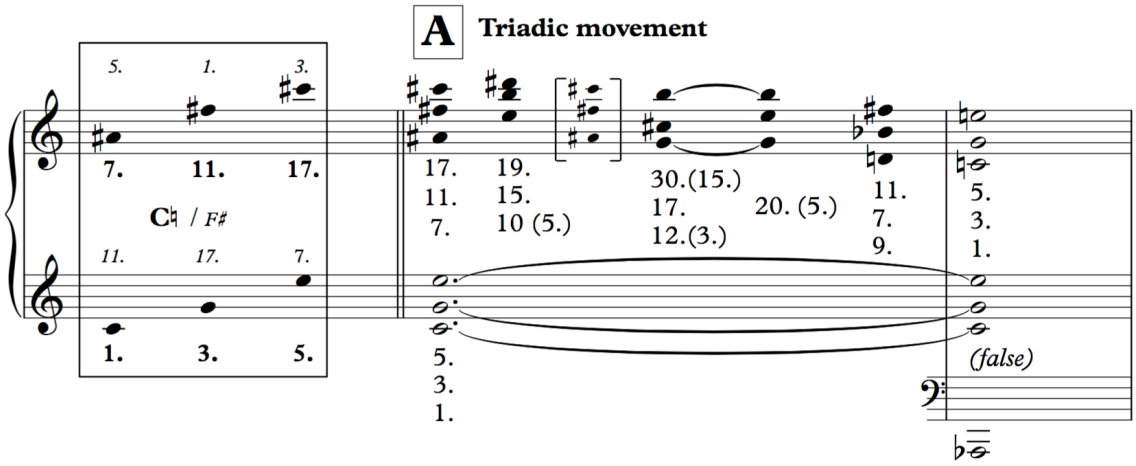
[15] '…a very fine ear clearly perceives an F sharp in the natural resonance of a low C'—Olivier Messiaen, *The Technique of my Musical Language*, Third Edition (Paris: Alphonse Leduc, 1966), p.32.

With tonics (fundamentals) a tritone apart, the superimposed triads of C♮ and F♯ Major have a perfectly reciprocal harmonic relationship; which of the two chords is dominant in their combined harmonic milieu depends largely on which tonic (fundamental) appears lower in pitch space—in this case, C.

At Letter A, I formulate a route by which the upper triad can manoeuvre (mostly) downwards—in triads taken from the harmonic series—to meet the lower. (Fig. 1.8)

The moment of their meeting, though, is subverted by the sudden introduction of a false fundamental: A♭.

Fig. 1.8



From this point (at Letter B) the music ascends slowly in whole tones, through a chain of interlocking spectral modes. (Fig.1.9)

A gradual accumulation of energy is facilitated by incremental increases in dynamic, circular bowing/irregular tremolos in the strings, and progressively more complex woodwind figurations. This energy begins to evaporate at Letter H, and the modal area is quickly thinned out to nothing more then the first five degrees of a C major scale.

At just the moment where the accumulated energy is totally depleted, the music takes one final whole-tone step into a spectrum on D♮, where I paraphrase the opening from Felix Mendelssohn's *Overture to a Midsummer Night's Dream*, Op.21. (Fig 1.10)

The principal reason for this almost-quotation was its fame and recognisability; the very fact that Mendelssohn's transition from A minor to E major is so familiar/inevitable/'right' intensifies, quite

dramatically, the sense of subversion when my harmony instead splits into two spectral strands on C♮ and E♮. A spectrally conceived paraphrase, rather than a literal quotation, allowed me substantially to preserve the character of the famous chords without a sudden, jarring departure from the harmonic syntax of the piece.

Fig. 1.9

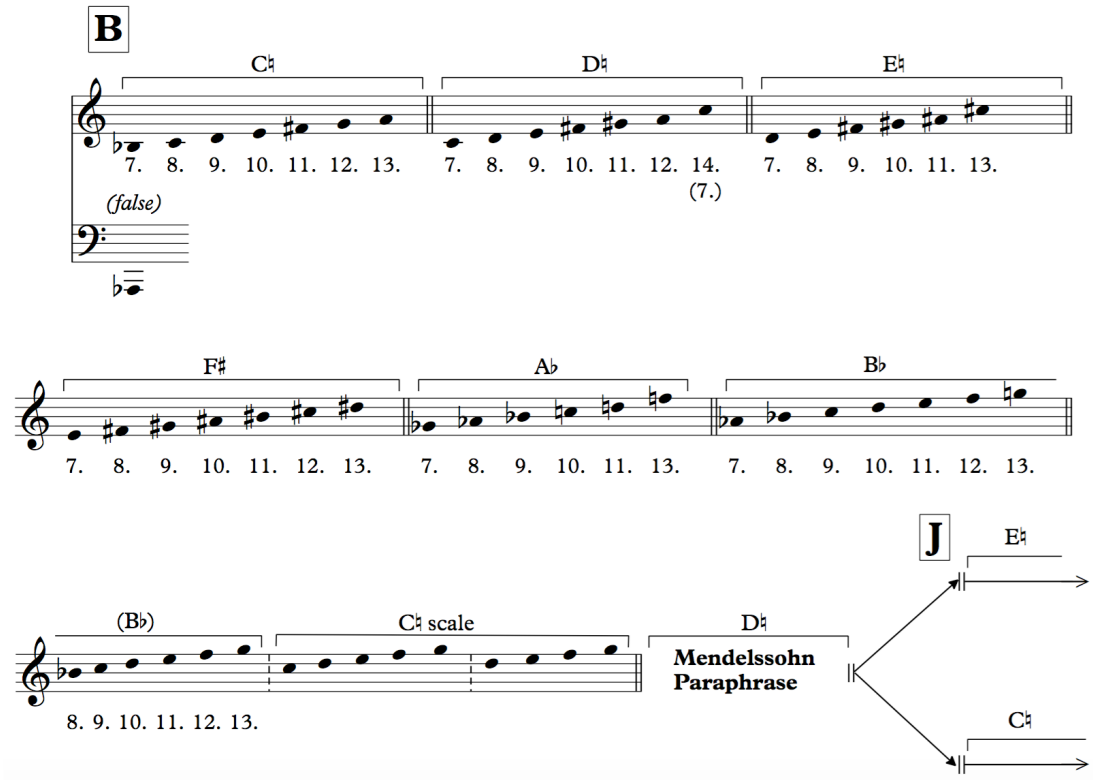
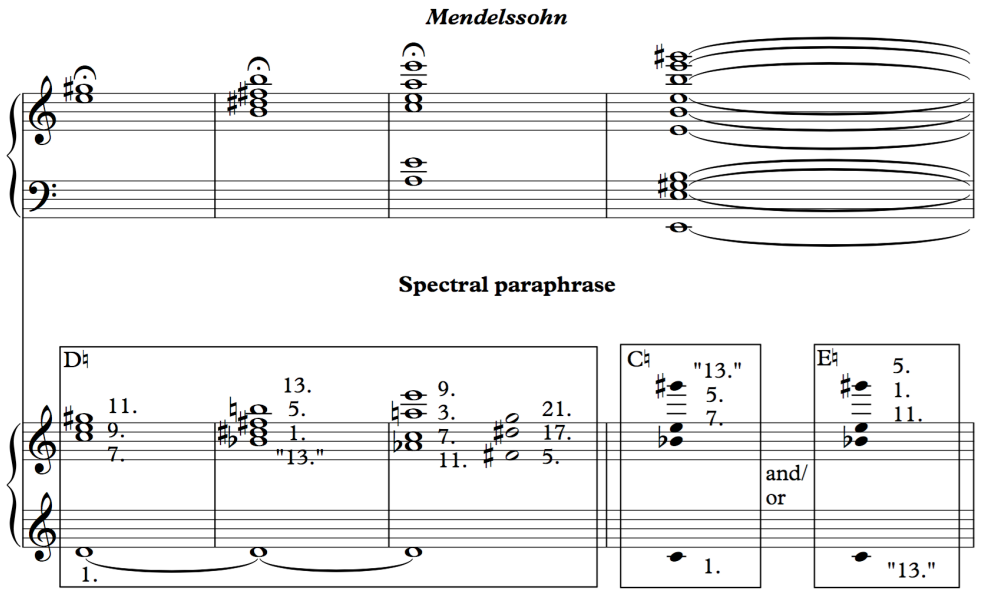


Fig. 1.10



2 — Polly Roe

This piece was written as an eightieth birthday tribute to Sir Harrison Birtwistle, whose music I have long admired for its mechanical energy and rhythmic vitality. I wanted to create a short piece which would unify my own (primarily pitch-based) musical concerns with the motoric, machine-like qualities characteristic of Birtwistle.

Polly Roe was the nickname of my oldest friend's grandmother. As a title, I found it pleasingly (and misleadingly) suggestive of Irish folk music. This piece being my first experiment with any kind of rhythmic serialisation, I was also attracted to the pun potential of the name: 'poly[metric] row'.

In Birtwistlian fashion, my starting point was a number system: a row of 62 durations, comprised of groups of short and long notes (semiquavers and quavers), which expand and contract independently of one another. (Fig. 2.1)

Fig. 2.1

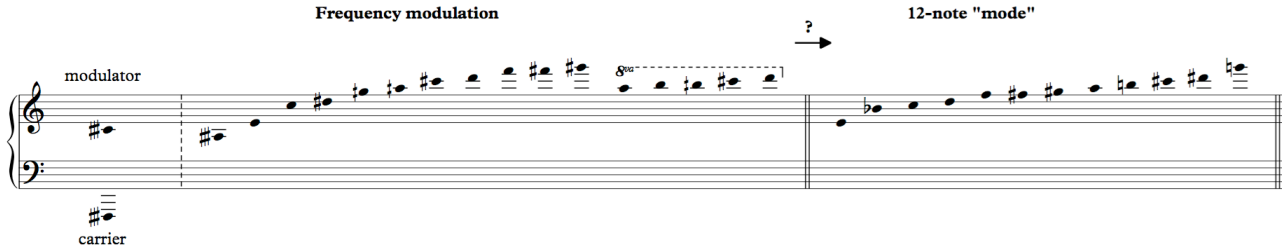
Complete Sequence

Short (semi-quaver)	**Long (quaver)**	S.	**L.**	S.	**L.**	S.	**L.**	S.	**L.**
5	**4**	4	**3**	3	**2**	4	**1**	5	**2**
6	**3**	5	**2**	4	**1**	5	**2**	6	**1**
7	**1**	6	**1**	5	**2**	6	**1**	7	**2**
8	**3**	7	**2**	6	**1**	7	**2**	8	**3**
9	**4**	8	**3**	7	**2**	8	**1**	9	**2**
10	**3**	9	**2**	8	**1**	9	**2**	10	**1**
11	**1**								

(Read from left to right; quavers in bold type)

The piece also makes extensive use of the pitch E4 in homage to Birtwistle, whose obsession with this particular note is well-documented.[16] As a starting point, it was considered within a spectrum on F-3/4♯, as the flat seventh partial—the first to go 'out of tune'. Due to a hard-drive failure in early 2015, the harmonic sketches for this piece have been lost—and it has proven highly resistant to my attempts at reverse engineering. Nevertheless, I can say with certainty that I used frequency modulation of F-3/4♯ with C-3/4♯—a compound fifth above—to generate a chord which was then, by a highly circuitous and ultimately unimportant method, converted/condensed into a twelve-note multi-octave 'mode'.[17] (Fig. 2.2)

Fig. 2.2



Following a short introductory passage, in which woodwinds gradually accumulate pitches above a sustained E♮ (sharpened and flattened somewhat by Violin I and Viola respectively), a musical mechanism begins at Letter C.

This mechanism superimposes the row of durations, divided into three periods along lines of local symmetry, on its retrograde—creating two rhythmic layers which interact in a variety of interesting ways. (Fig. 2.3)

Pitches from the multi-octave mode are assigned to the sequence of durations (up to the end of the first period in each layer). Quavers are freely harmonised to create four-note chords, and instances where quavers from both layers coincide are emphasised by secco chords in the harp—sometimes adding to the harmony. (Figs. 2.4 & 2.5; NB: the numerical groupings of quavers and semiquavers here should not be understood as irrationals).

---

[16] 'E [is] the note which has consistently formed the starting-point or focus for so many of [Birtwistle's] works throughout his composing career.' 'On a number of occasions when asked, "Why E?", he has wryly retorted, "Why not? It's as good a note as any other".'—Jonathan Cross, *Harrison Birtwistle: Man, Mind, Music* (London: Faber and Faber, 2000).

[17] Frequency Modulation (FM) modulates one frequency (a carrier) is with another (a modulator) to generate a series of 'sidebands', which appear symmetrically (in terms of frequency, not pitch) around the carrier. Because of phase inversion, frequencies with corresponding negative and positive values will produce the same pitch.

Fig. 2.3

Sequence plus retrograde

	Short.	**Long.**	S.	**L.**	S.	**L.**	S.	**L.**	S.	**L.**	
Layer 1:	5	**4**	4	**3**	3	**2**	4	**1**	5	**2**	etc.
Layer 2:	**1**	11	**1**	10	**2**	9	**1**	8	**2**	9	
	Long.	Short.	**L.**	S.	**L.**	S.	**L.**	S.	**L.**	S.	

Fig. 2.4

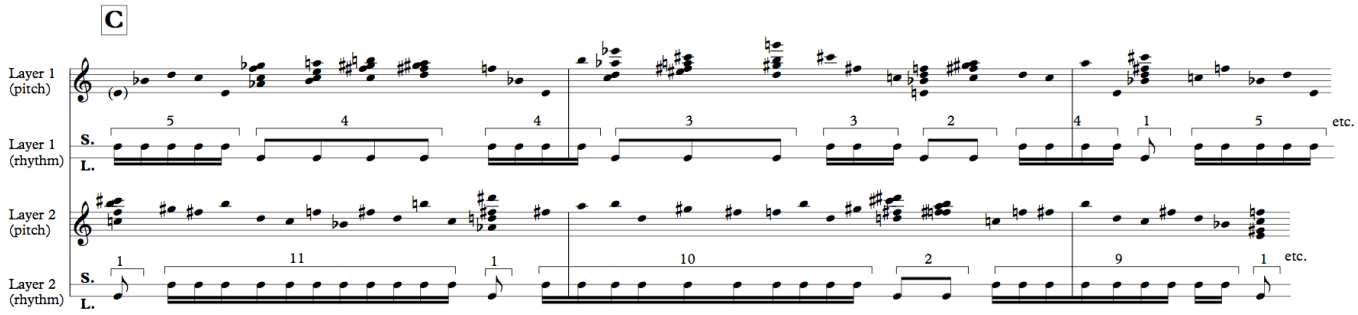
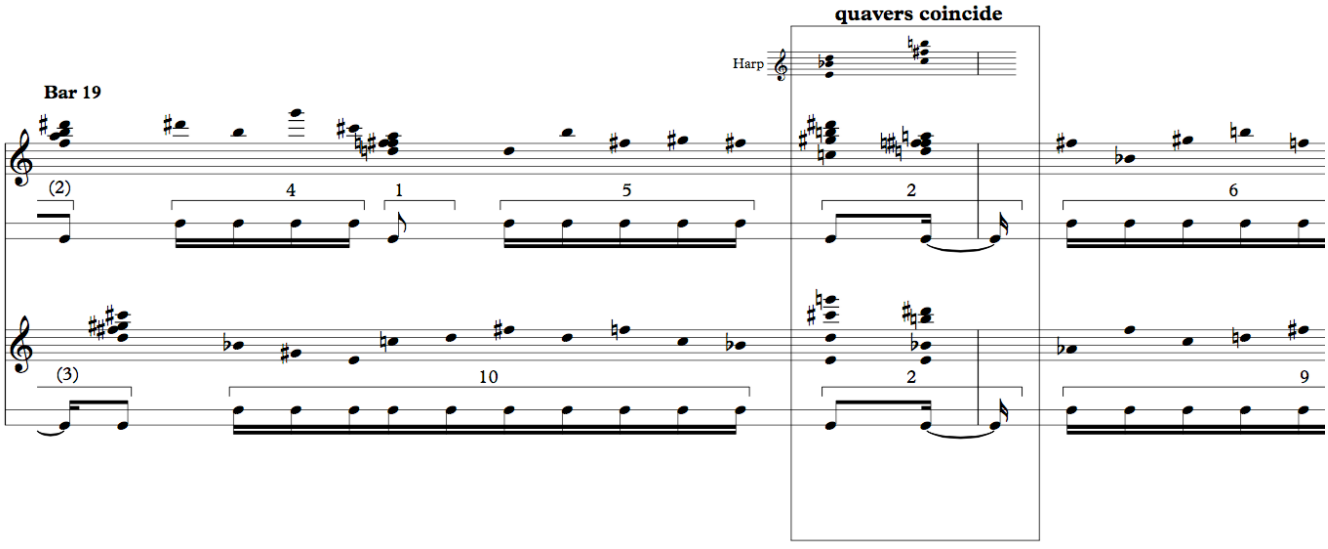


Fig. 2.5

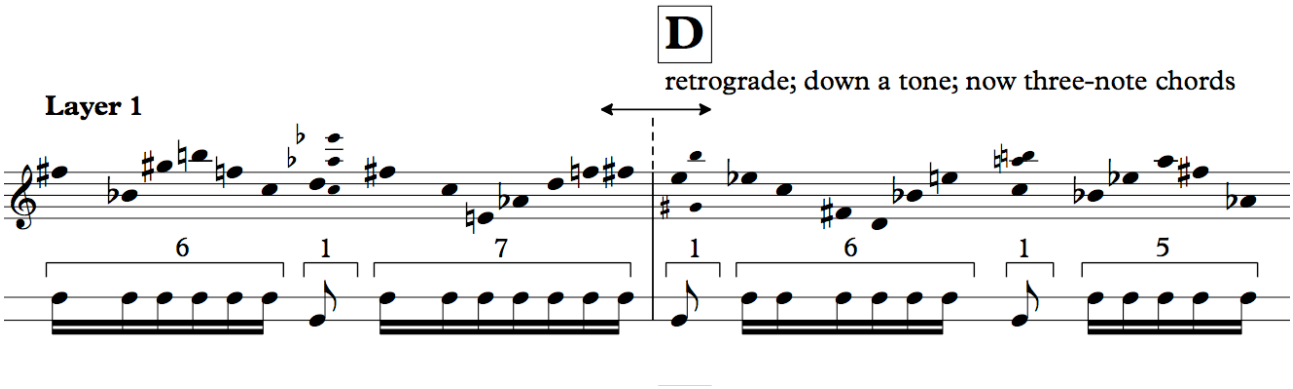


At the end of each period, the sequence is retrograded and transposed—down in Layer 1, up in Layer 2— and the quaver chords are thinned out by one note. (Fig. 2.6)

It is important to note that the periods are not of equal length, and therefore the points of transposition in Layers 1 and 2 do not align. Also, when a retrograded, transposed sequence

contains more notes than will fit in the new period, the end of the sequence is simply chopped off; when it contains less, the sequence is 'wrapped around' (i.e. it starts over).

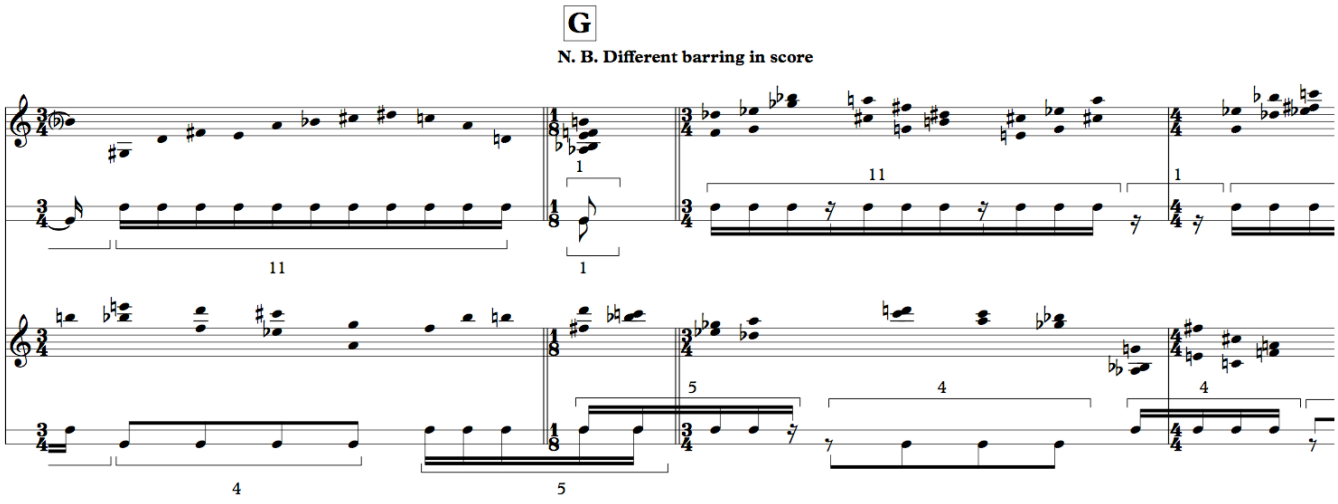
Fig. 2.6



At Letter G the row of durations has come to an end, and it begins to repeat; this time gaps (rests) are introduced, and the two rhythmic strands are unified harmonically—both freely taking single notes, dyads, and triads from a rotated version of the 12-note mode. (Fig. 2.7)

I abandoned this new mechanism after just a few measures, though, moving straight into the second main section of the piece.

Fig. 2.7



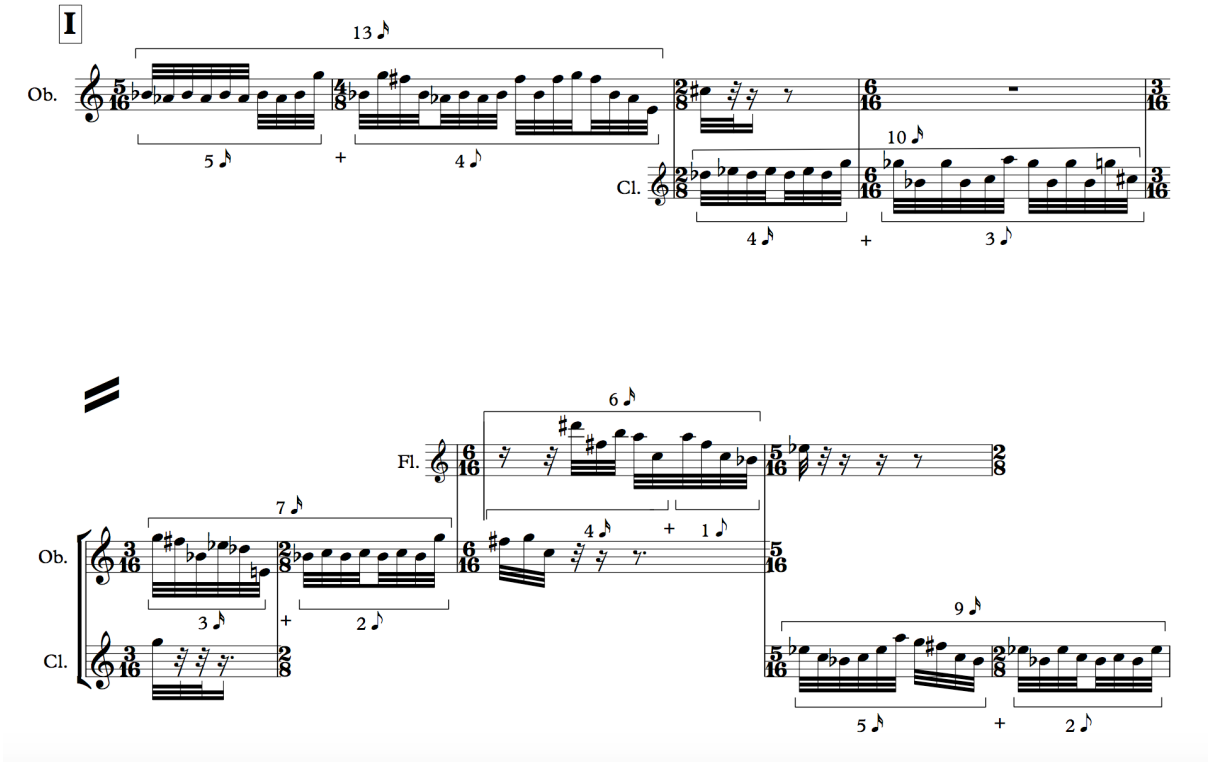
One useful by-product of the duration-row used in this piece is the the series of interesting temporal proportions which result when neighbouring collections of short and long notes are combined. (Fig. 2.8)

In the hyperactive flurry of demisemiquavers from Letter I, these proportions were used loosely to determine the length and shape of the lines, as well as the harmonic rhythm of the music, which was otherwise freely composed. (Fig. 2.9)

Fig. 2.8

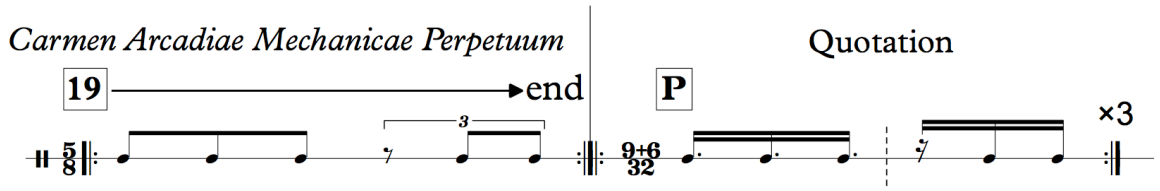
S	L	S	L	S	L	S	L	S	L
5	4	4	3	3	2	4	1	5	2
	*2=8		*2=6		*2=4		*2=2		*2=4
13		10		7		6		9	

Fig. 2.9



This passage of frenzied demisemiquavers suddenly breaks off, and is replaced by a largely homophonic texture which features a brief rhythmic quotation (at Letter P) from Birtwistle's *Carmen Arcadiae Mechanicae Perpetuum* (1977), notated using dots instead of triplets. (Fig. 2.10)

Fig. 2.10



A short climax at Letter Q returns us to the opening pitch of E4, in preparation for the coda. Here, the music alternates between two chords—one of my own invention, and one which was adapted from the original frequency modulation. (Fig. 2.11)

A slow variant of the duration-row was used to determine the lengths of each bar. (Fig. 2.12)

Where the coda of Birtwistle's *Carmen Arcadiae* puts one in mind of a lumbering mechanical giant, this passage is intended to evoke the pops, clicks and soft whirring of a smaller, more delicate piece of machinery—perhaps, ironically, a failing hard drive—which has become caught in a complicated loop.

Fig. 2.11

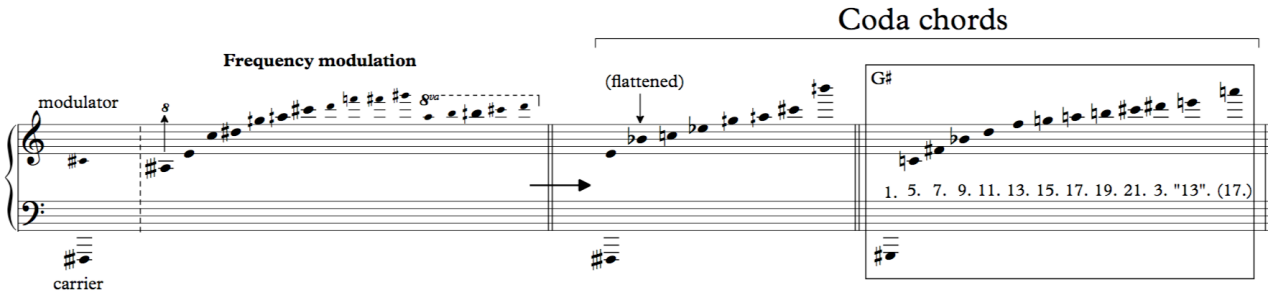


Fig. 2.12

Coda Sequence (bar lengths)

Long (crotchets):	**3**	**4**	**5**	**4**	**"3"**
	+1	+1	-1	-1	
Short (quavers):	5	7	9	11	__
	+2	+2	+2		

3 — Cycling

This piece was written for IRCAM's ManiFeste 2015. The title refers primarily to a particular interval cycle which I regard as the centrepiece of the composition; other types of musical cycle—canon, arpeggiation/permutation, incremental augmentation/diminution of pulse, etc.—were also employed in its construction. Structurally, the work is a diptych whose two main sections (roughly equal in length) are each comprised of five subsections (Fig 3.1).

The piece attempts, sonically, to recreate Ernst Ludwig Kirchner's experiments with simple, primitive forms and bold, bright primary and secondary colours;[18] *Sertig Weg im Sommer* was a particular inspiration. (Fig. 3.2)
Structurally and harmonically, everything is pared back to the barest essentials; simple melodic shapes and undiluted consonant harmonies predominate (with microtones used sparingly to enhance their vividness).

The two sections of the piece serve as musical foils for one another; the first focuses on motivic development within a largely static harmonic landscape, while the second juxtaposes sharply contrasting subsections,[19] derived from a continually transforming interval cycle.

Fig. 3.1

	Section I						Section II				
Form:	**A**	**B**	**C**	**Climax**	**A'** (Recap.)	**Link**	**A1**	**A1'**	**A1"**	**A2** (A→/←A) (Climax)	**Coda**
Bar:	1	16	23	32	33	44	49	55	64	70	94

[18] Editors of Encylopaedia Britannica, *Encyclopaedia Brittanica* (2019) <https://www.britannica.com/biography/Ernst-Ludwig-Kirchner> [accessed 9 June 2019]

[19] The white noise of the maracas which is used to separate each subsection in Part II is a (dis)respectful allusion to Tristan Murail's *Ethers* (1978).

Fig. 3.2

Sertig Weg im Sommer—E. L. Kirchner

(Gallery/owner unknown)

Section I

In the first subsection, melodic phrases—simple to the point of austerity—are made from a spectrally sourced 'pitch-triangle' which rotates clockwise and anticlockwise to create successive sequences of three, five and seven notes, played by the woodwinds. Additionally, from a starting point of complete rhythmic unison in the first three-note cell, each successive sequence is refracted by an additional heterophonic layer. (Fig. 3.3)

At Letter A, a new pitch triangle cycles clockwise, then anticlockwise, before being subsumed into a sequence of descending dyads. (Fig. 3.4)

At Letter B, two layers of triads interlock to create spectral harmonies. (Fig. 3.5) These harmonies are characterised by their magnetic pull towards one another; each combination chord lacks a specific (odd-numbered) partial within an otherwise 'complete' spectrum, creating an attraction to the subsequent chord—with a different lacking partial of its own.[20]

Following the 'expectant' passage in Bars 29-31, during which the music seems stuck on a single chord, the music climaxes suddenly and violently—for a bar—as the lacking partial is provided within a somewhat surprising harmonic context: a spectral chord on F♮, the core of which is comprised of three interlocking triads. By holding over the new fundamental (as well as two additional tones—C♯ and A♯—from one of these three interlocking triads), the recapitulation of the opening material (this time played by strings) is harmonically transformed—now heard as part of a spectrum on F♮.

This recapitulation brings the first section of the piece to a conclusion, and a short linking passage (at Letter D) is used to facilitate a modulation into a spectrum on C♯/D♭ by way of an ascending mode which is constructed from overlapping partials on three neighbouring fundamentals. (Fig. 3.6)

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[20] In two instances, partials (marked with an asterisk) are omitted for purposes of voice leading.

Fig. 3.3

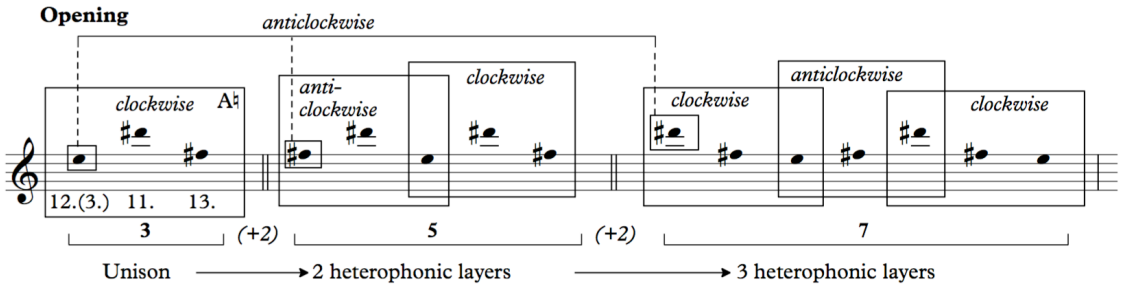


Fig. 3.4

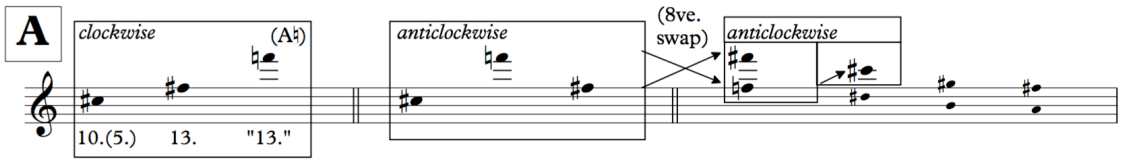


Fig. 3.5

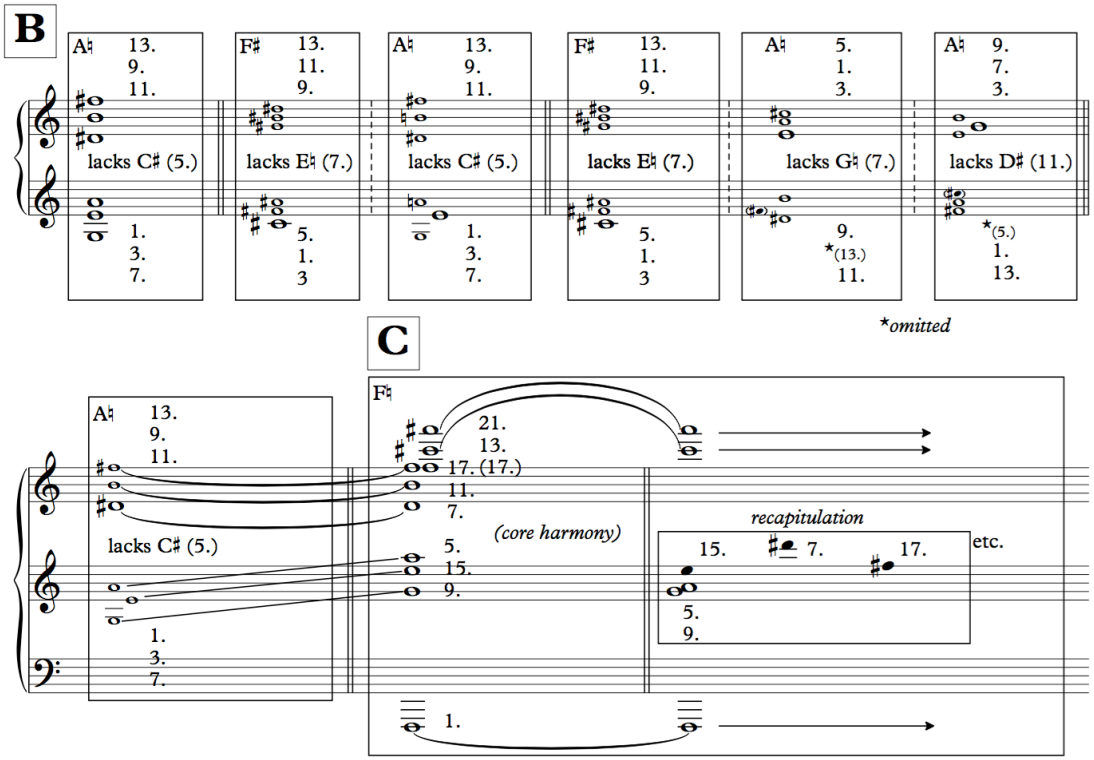
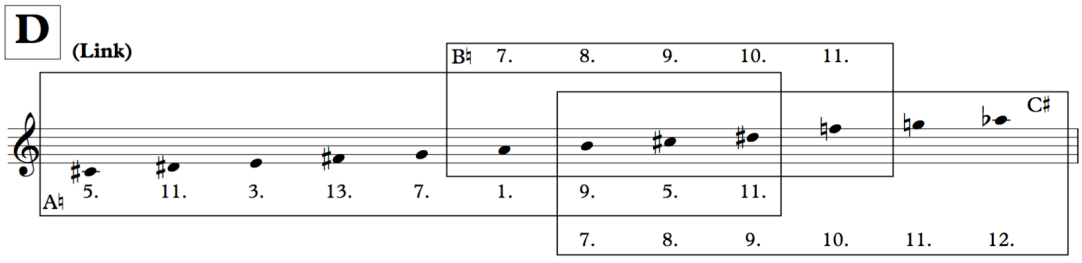


Fig. 3.6



Section II

Despite having been derived almost entirely from a single interval cycle, this section has remarkably little surface repetition. Rather, the subcutaneous cycle is concealed by a sound world of stark contrasts.

The interval cycle, from which the whole piece takes its name, was constructed by combining a five-note segment of the harmonic series (from the sixth to the tenth partial, inclusive) with a transposition of itself. (Fig. 3.7a) The resultant cell was expanded by further transposition into a complete interval cycle which repeats at the octave. (Fig. 3.7b)

The first subsection places this sequence in 'canon' with itself as continuous stream; the direction and order of each pair of pitches from the generative cycle are usually reversed to create a satisfying counterpoint. (Fig. 3.8)

Fig. 3.7a

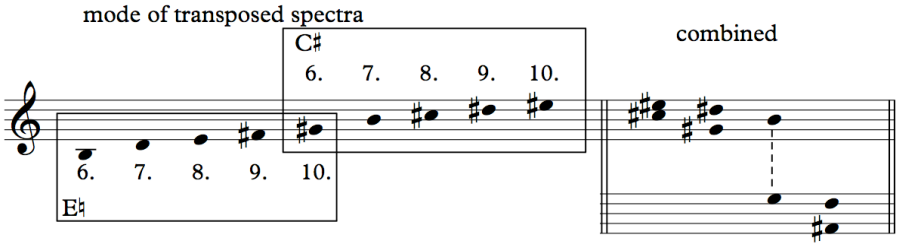


Fig. 3.7b

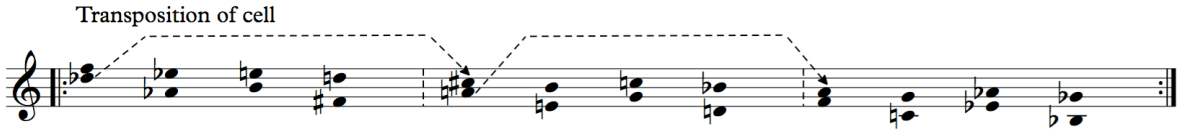
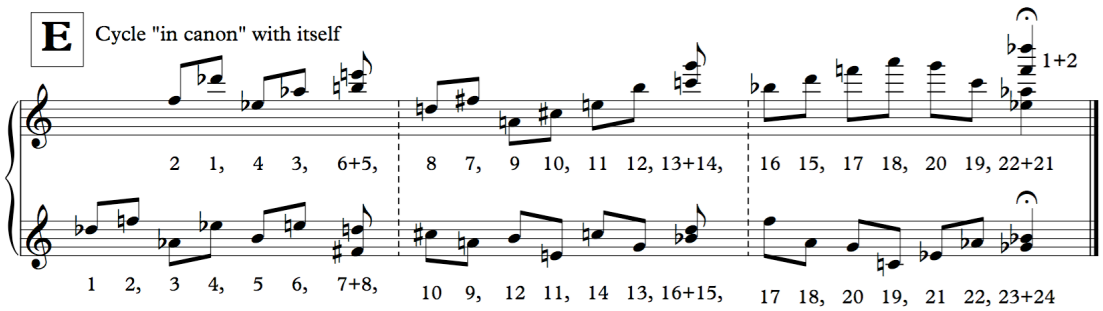


Fig. 3.8



The second subsection (at Letter F) combines the interval cycle with a transposition of itself—a semitone lower; one of four possible transpositions of the sequence. (Fig. 3.9a) (Fig. 3.9b)

The third (at Letter G) uses only a small fragment of the cycle in its original 'key(s)'. (Fig. 3.10)

Fig. 3.9a

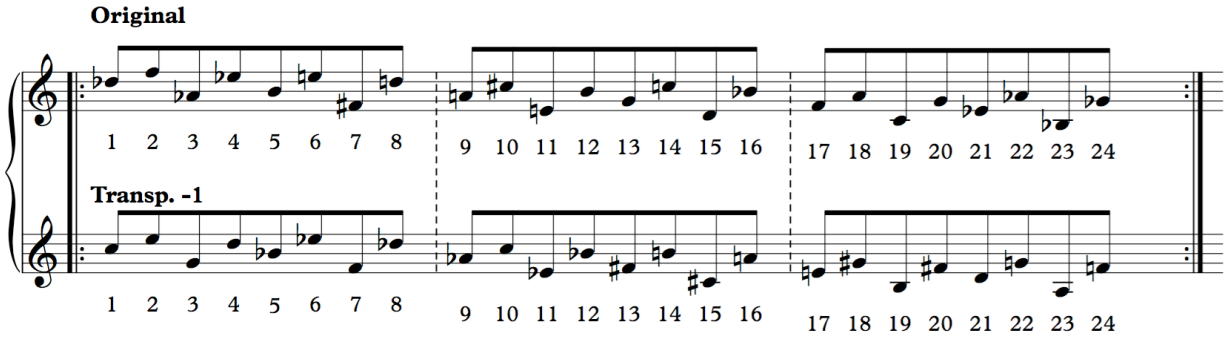


Fig. 3.9b

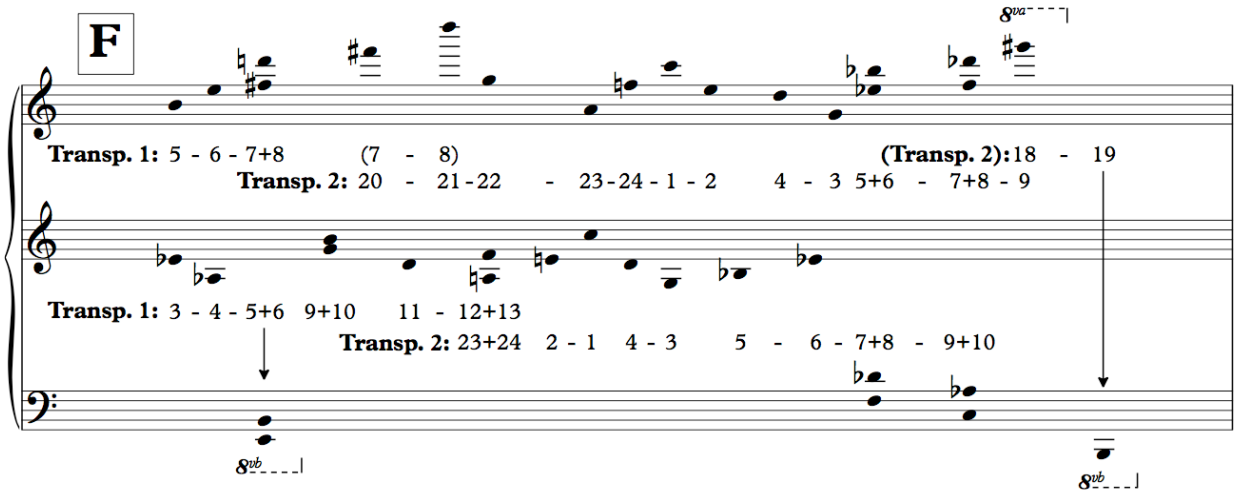
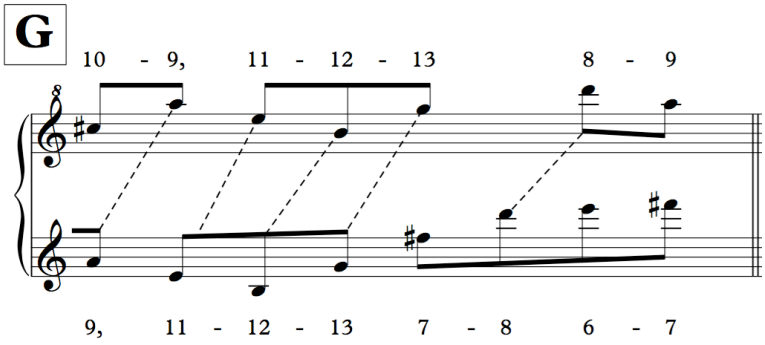


Fig. 3.10



The climactic fourth subsection splits another transposition of the generative cycle (this time up a semitone) into two layers,[21] which move in opposite directions. (Fig. 3.11)
A counterpoint is created in which the two layers proceed at considerably different speeds—slow in the bass; fast in the treble—towards the conclusive meeting of their shared dyads (of A♮ and E♮) at Letter J. At this meeting point, 'shining' microtones from a spectrum on A♮ create something evocative of the optical phenomenon known to photographers as 'lens flare'.[22]

The coda preserves the interval content (but not the pitch content) of the split cycle. (Fig. 3.12)
The cycle descends in a canon—this time in similar motion—from the starting point of a four-note spectral chord of C♯, before breaking off into a cycle of fourths (fifths); amongst the purest and most familiar of all interval cycles. The music lands decisively in a spectrum on C♮, before ending with a final canonic flourish.

Fig. 3.11

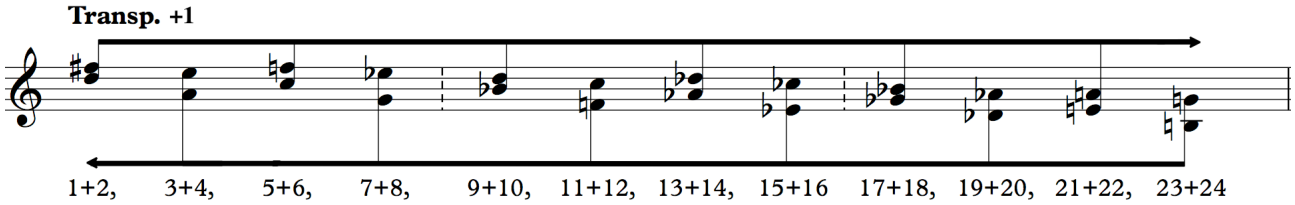
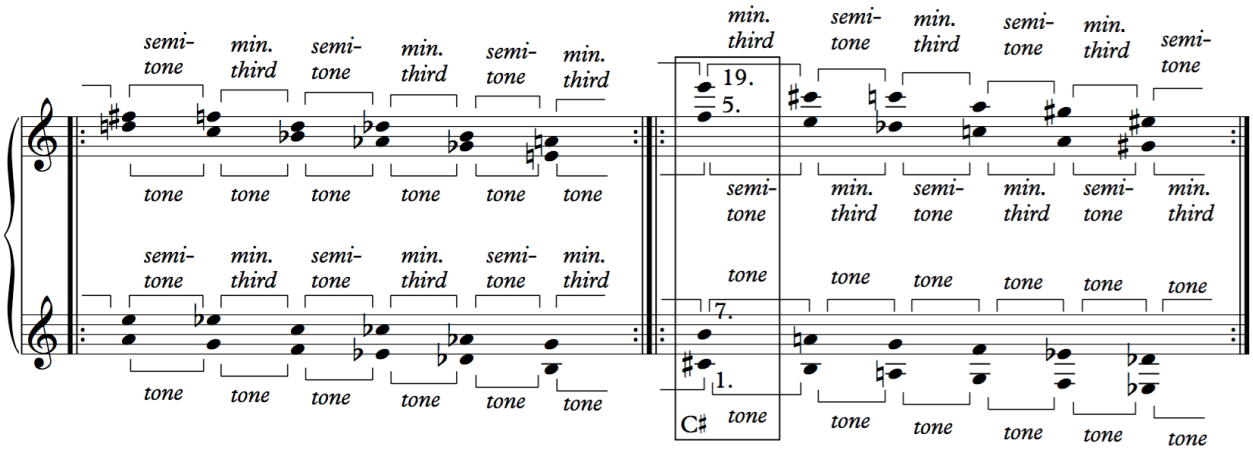


Fig. 3.12



[21] The first dyad of the top layer (played by the glockenspiel) is transposed down by a semitone for reasons of taste.

[22] *Cambridge in Colour* <https://www.cambridgeincolour.com/tutorials/lens-flare.htm> [accessed 9 June 2019]

4 — Piano Juice

This piece for six pianos and three female voices was titled after the two groups for whom it was written: Piano Circus and Juice Vocal Ensemble.

The text

The poet James Wilkes provided me with the following texts, written during his residency at the Wellcome Collection:

1.

You are the data, but also the instruments.

It looks ugly – so do all new births.

The rhythm of crystals; their perfect form

2.

The dead must bury the dead.

3.

axolotl with gills and fins | given ox thyroid amends form

ox glottal stops gills, axes fins | the caudal wastes its thighs wider

thickens thin skin, voids breath feathers | figure and ground salad hormones

flexing flesh through atmospherics | biology is dismantled

salamander salamander

The conceptual underpinnings of Wilkes' poetry are somewhat abstruse. In this (and a previous collaborative project), I have engaged less with his overlapping layers of meaning, and more with the vivid musical imagery strongly suggested by each aphoristic fragment.

Ensemble/Tuning

-Six pianos

The guaranteed accuracy of intonation provided by an ensemble of six (digital) pianos allowed me to make use of a very precise tuning system. Four normally tuned pianos comprise the core of the ensemble, whilst the remaining two (V and VI) are tuned a sixth-tone flat and sharp respectively.

Writing for an ensemble of this type occasioned a brief flirtation with the sort of 'Dutch Minimalism' so central to its repertoire; repetition and arpeggiation compensate for a general lack of sustained sounds.

-Three voices

The vocal writing was largely modelled on a particular kind of Lithuanian folk polyphony called sutartinės.[23] These are essentially bitonal; overlapping parts (usually consisting of oscillating major/minor thirds) are anchored to two 'tonics' a major second apart. Major seconds, in particular, predominate my vocal harmonies in this piece. A harsh, folk-like quality is required, and vibrato is strongly discouraged.

The music (machines and permutations)

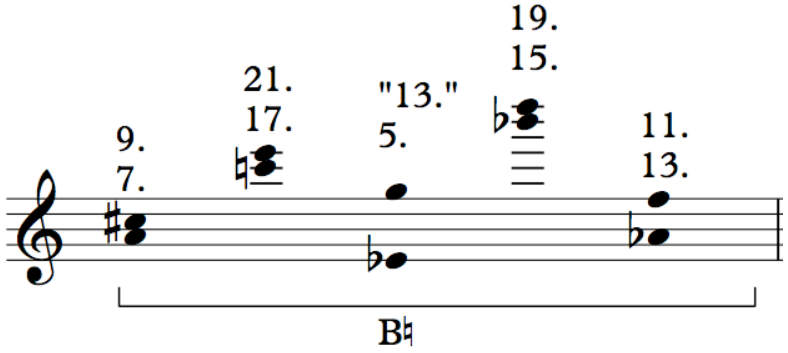
This analysis will focus primarily on several types of musical machine which are employed during the course of the piece; many of these are characterised by the permutation of pitch sequences.

In the short introductory passage, repeating dyads of thirds (and sixths)—intentionally evocative of Schoenberg Op. 19-II—suggest a vaguely polymetric rhythm scheme. The pitch material, at first quite inscrutable, comes gradually into focus with the introduction of each new dyad; in combination, the five pitch-pairs make up a ten-note chord consisting of odd-numbered partials on a spectrum of B♮, absent the first (fundamental) and third (Fig. 4.1).

---

[23] 'The polyphony of sutartinės is a unique phenomenon in the folk music of North-eastern Aukštaičiai [whose] originality is mostly decided by […] contrasting and imitative polyphony which has introduced parallel seconds…'— Genovaitė Četkauskaitė, *Lithuanian Folk Music II: Songs of Aukštaičiai* (Vilnius: Lietuvos Muzikos Akademija, 1998), p. 40.

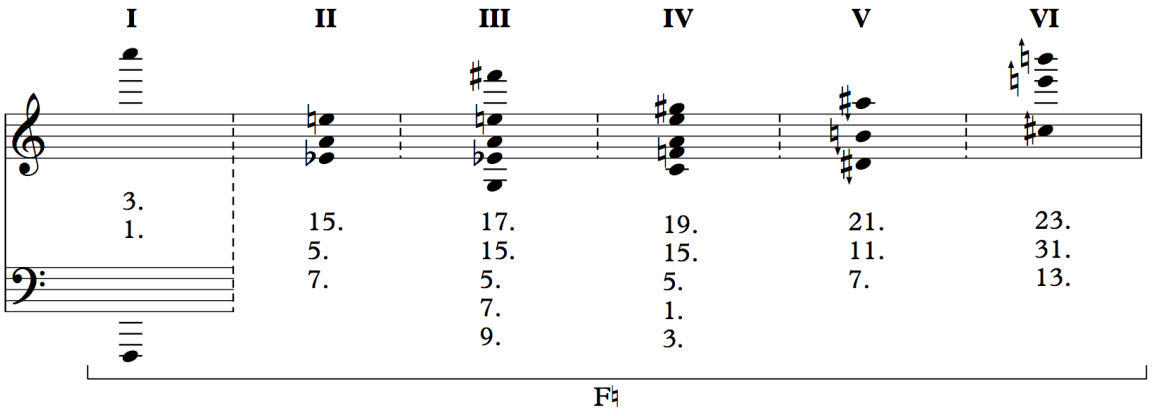
Fig. 4.1



As the spectrum is gradually filled in, the music seems to gather steam, only to stall suddenly in Bar 16. A nervous silence of ten crotchet beats prepares the way for the 'sudden burst of energy' at Letter A, where the full spectrum is revealed—this time including the first and third partials.

At Letter E, five layers of isorhythms and ostinati are combined to create a chaotic texture redolent of multiple windchimes heard simultaneously. The pitch material of each figure is taken from a complex spectral Mother Chord (Fig. 4.2) on F♮, with partials as high as 31. (in Piano VI).

Fig. 4.2



The quasi-modal vocal writing in this section (Fig. 4.3a) makes extensive use of the major second. It also exploits the common-tone connection of neighbouring spectra on F♮ and G♮ (Fig. 4.3b); heard on its own, the vocal mode is clearly derived from a spectrum on G♮, but when heard in combination with the pianos, it takes on a different harmonic identity. In two instances—first at

Letter F and again at Letter I—fast, oscillating figurations (on different spectra) suggest a sudden disturbance to the ‘windchimes’.

Fig. 4.3a

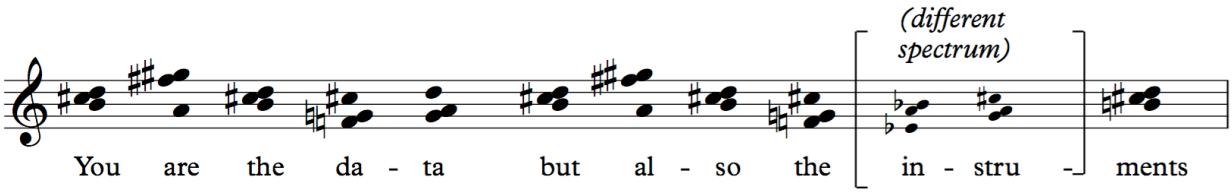
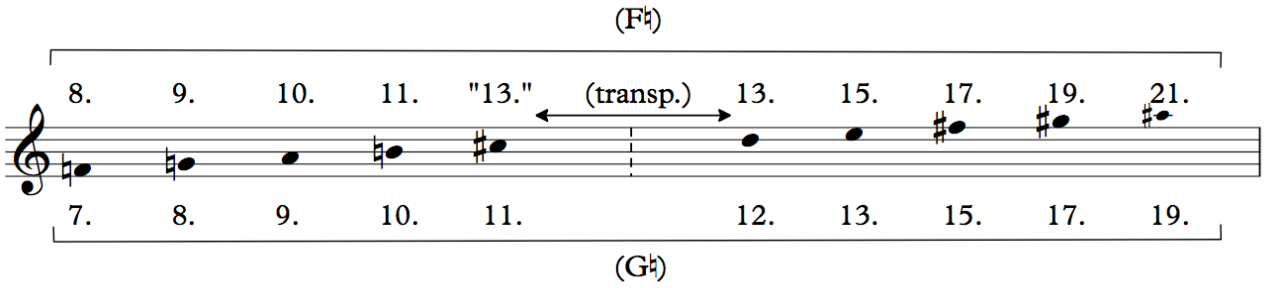


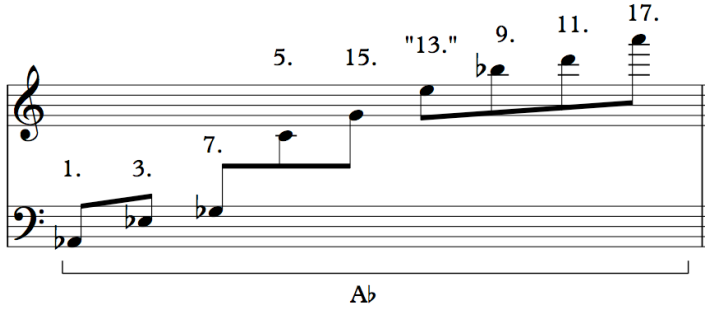
Fig. 4.3b



The material beginning at Letter N is my response to Wilkes’ ‘The rhythm of crystals, their perfect form’ (although the line itself is sung slightly earlier in the piece). Odd-numbered partials from a spectrum on A♭ are split into three groups/chords (Fig. 4.4a).The result is condensed into a mode in which the groups/chords interlock (Fig. 4.4b).

This basic cell is then expanded, as shown (Fig. 4.4c, Fig. 4.4d). Finally, the material is ‘fractalised’ according to a process, borrowed from Hans Abrahamsen (shown in Fig. 4.4e).[24] The result is a gradually unfolding note sequence whose structure is easily apprehensible without, I hope, being uninteresting.

Fig. 4.4a



[24] To be clear, my use of the term ‘fractal’ here is not literal, but rather describes a simple process that produces internal canons which run at different speeds (self-similarity at increasing levels of magnification).

Fig. 4.4b

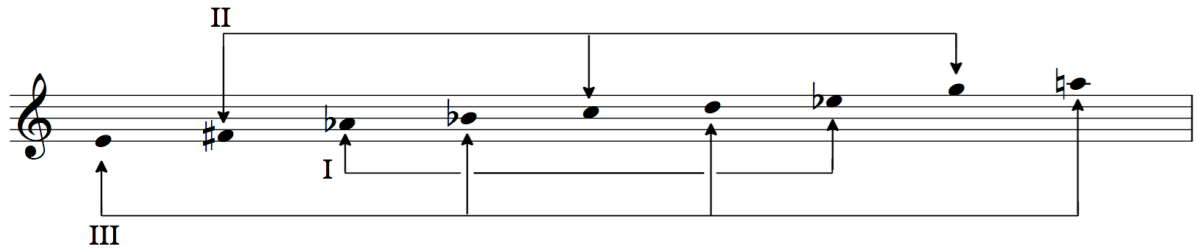


Fig. 4.4c

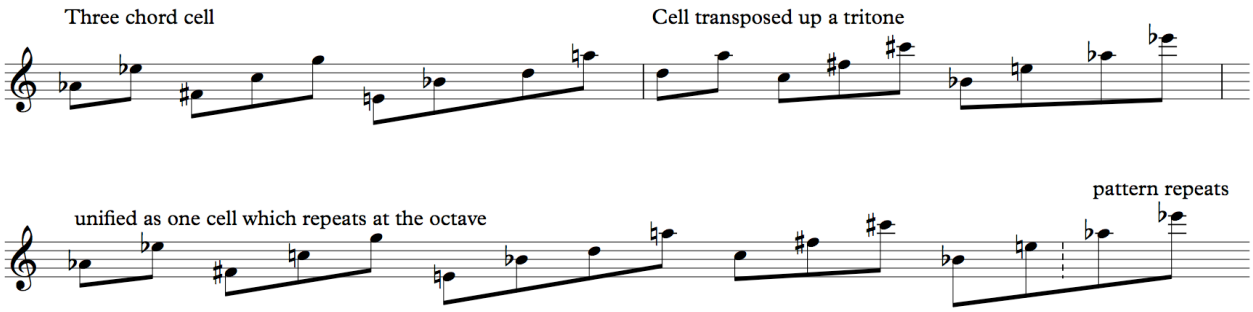


Fig. 4.4d

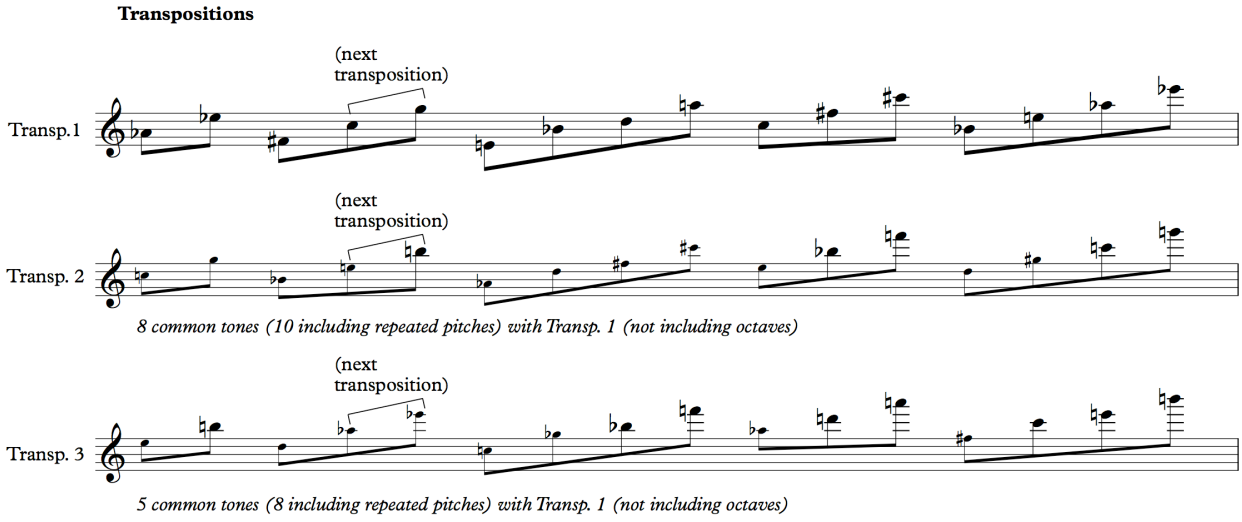
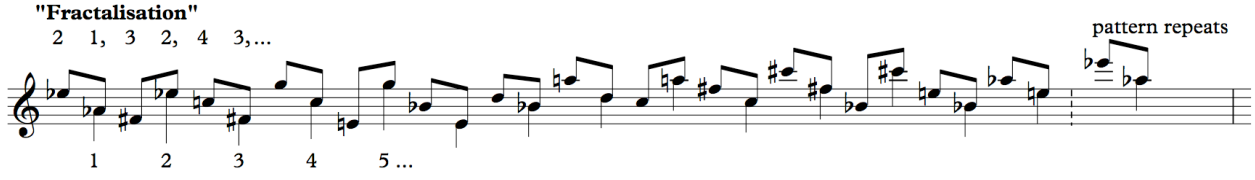


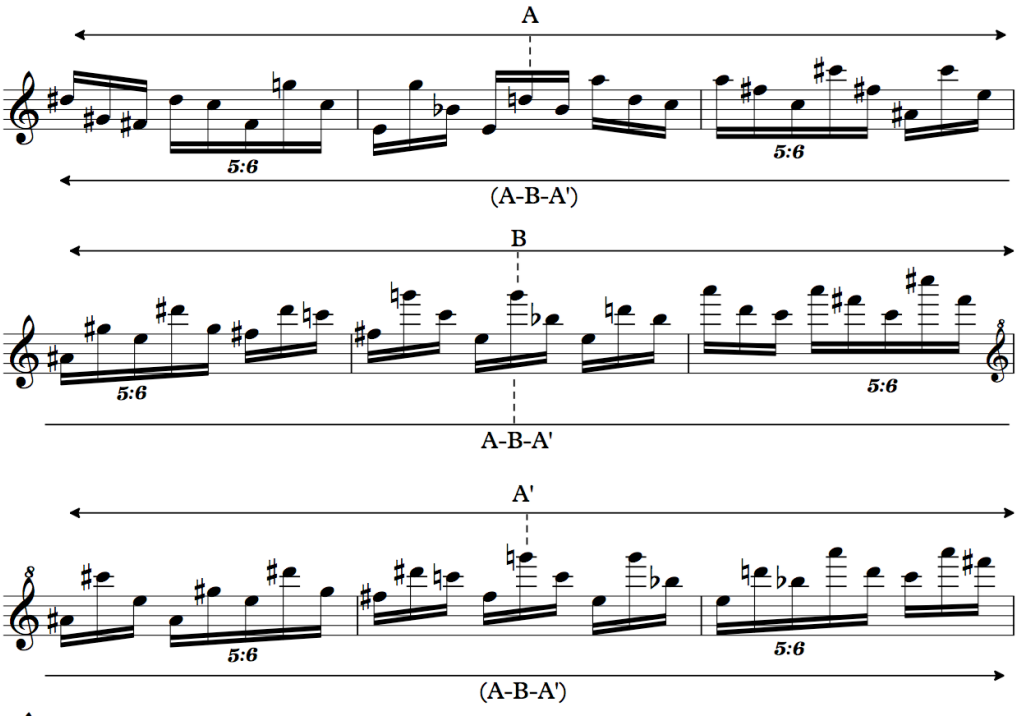
Fig. 4.4e



The sequence is placed within a rhythmic scheme which speeds up and slows down at regular intervals. This was accomplished by splitting the sequence into alternating bars of eight and nine notes; in those bars with only eight notes, a quintuplet is used to slow the pulse (at either the beginning or end of the bar), thereby avoiding gaps/rests. The resultant rhythmic sequence, itself symmetrical, is also comprised of three symmetrical subsequences (Fig. 4.4f).

A sparkling contrapuntal texture is created when the sequence is deployed in canon with itself. This forms a backdrop for the 'clangorous' material in Piano I. After the first three canonic entries, the intellectually satisfying rhythmic symmetry is abandoned in order to let the music speed up by degrees until an extremely fast tempo is reached (at Letter Q). At this point the sequence is reversed —now moving downwards—and is treated with a similar (although more complex) process of "fractalisation".

Fig. 4.4f



The ensuing music reaches a climax, beginning at Letter U, in which Pianos I-IV play furious streams of semiquavers while the voices repeat the second of Wilkes' fragments: 'The dead must bury the dead'. At Letter X, the final vocal chord (or, more accurately, two thirds of it) is taken as the starting point for an interval cycle, played by Piano I as a plodding dirge.

This interval cycle is formed of a descending three-dyad motif which, when connected to different transpositions of itself, creates a chromatic sequence with a strong spectral identity (Fig. 4.5a). The three-dyad cell goes through seven transpositions before getting stuck in a loop.

Superimposed on this backdrop is another musical object, itself a sort of interval cycle (Fig. 4.5b). This object was conceived as three chords, each comprised of three dyads (two descending and one ascending). The descending dyads do so chromatically, thereby preserving their intervallic relationships, while the top dyad widens by a semitone each time. This results in a sequence which shares the odd-numbered partials of the harmonic series (up to 19) between chromatically descending spectra on E♮, E♭ and D♮. The sequence is not deployed as three chords, but rather via a musical machine in which the dyads are introduced gradually (similar to that which opens the piece). In this case, instead of assigning each dyad to a particular player, the sequence is passed between pianos II-VI, such that the pitches are subject to changes in tuning.

Fig. 4.5a

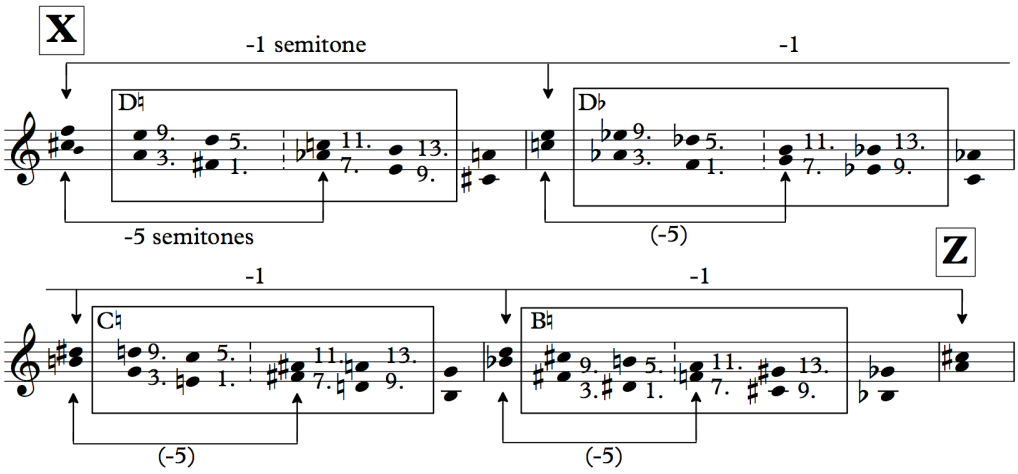
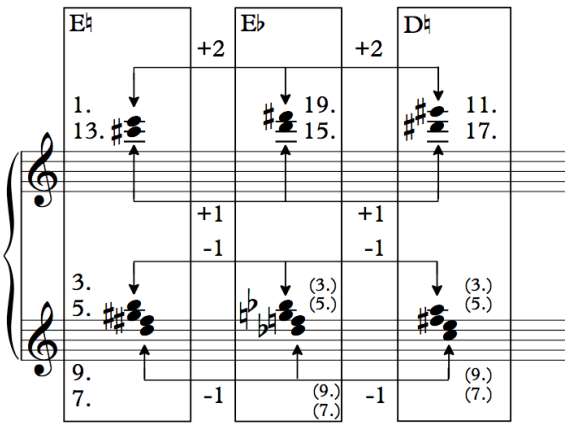


Fig. 4.5b.



At Letter Z, Piano I breaks out of its loop and the next dyad in its sequence (A♮, C♯) triggers the final section of the piece. Harmonically, the A♮ in the bass of Piano I functions here a false fundamental beneath the 7th-13th partials on a spectrum of E♭. These partials—condensed into a seven-note mode—are permuted according to a system inspired by, change ringing (Fig. 4.6a).[25] Dotted notes are intended to mimic the charming rhythmic irregularities which result from human error in bell-ringing reality.

At Letter AA, the same permuted sequence is repeated in what I would describe as a 'wraparound canon' across a span of three octaves (Fig. 4.6b) This is not a true canon, but an extension of the permutation process. Periodic octave shifts in the line of pitches played by each piano transform a pleasant, but monotonous texture into something with more musical identity. With each repetition, I slow the sequence down by inserting crotchets in the place of quavers (in one voice at a time); I chose this method of deceleration for its relative subtlety/imperceptibility, as well as the pleasing 'second-species counterpoint' it produced.

Fig. 4.6a

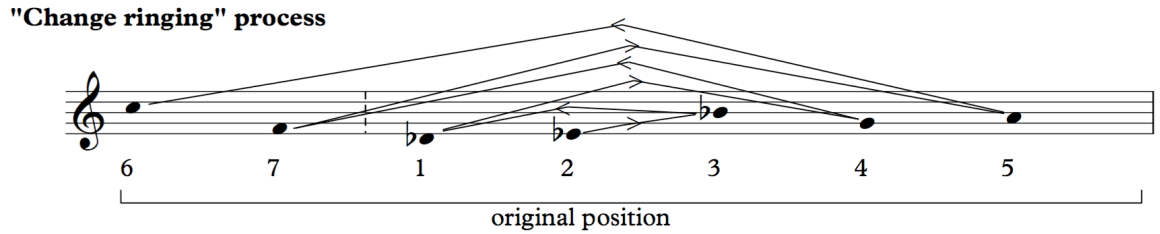
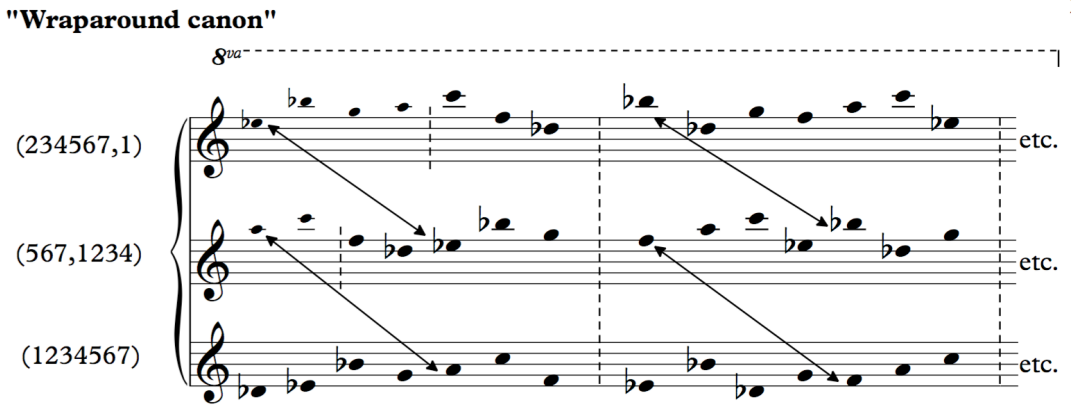


Fig. 4.6b



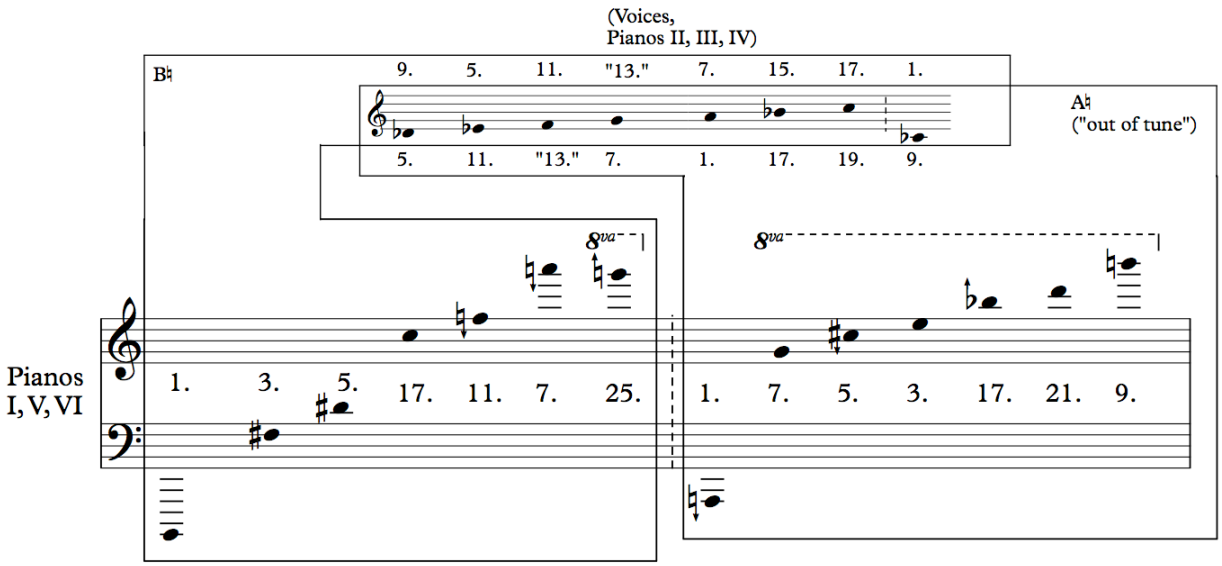
[25] Change ringing is the process by which campanologists determine the order of peals of bells. The system I use is one of my own devising, but the result is similar.

It is against this background that I set the third of Wilkes' texts. The short poem, in strict eight-syllable lines, was described to me by the poet as 'a story of mutation and transformation'. It is concerned with the axolotl, a kind of aquatic newt that will live all its life in a neotenic (un-metamorphosed) state. By feeding these animals ground ox thyroids, Julian Huxley (brother to Aldous) managed to change them into land-dwelling salamanders.[26]

The poem is set in three-voice polyphony, on the same mode as the piano material. The counterpoint is strongly influenced by sutartinės; major seconds predominate in terms of verticals, while thirds are more important within the linear movement of each voice. With each new line of poetry, a different member of the trio assumes the role of 'principal voice'.

At Letter BB, a new musical object is introduced to the texture: Pianos I, V & VI play two complex spectral chords on B♮ and A♮, both of which are missing a middle—filled out by the voices. These two chords dramatically and instantaneously recontextualise the vocal mode as part of their respective harmonic domains (Fig. 4.7a). The sudden introduction of these two chords could be, and was, considered a musical analogue of Huxley's ox thyroid. The vocal parts are now a literal sutartinė… if a non-Lithuanian can be said to have written such a thing. The word Salamander (with its four equally stressed syllables) and the fragment 'gills and fins' are now (with the poet's permission) permuted in a sort of tongue twister which continues to the end of the piece.

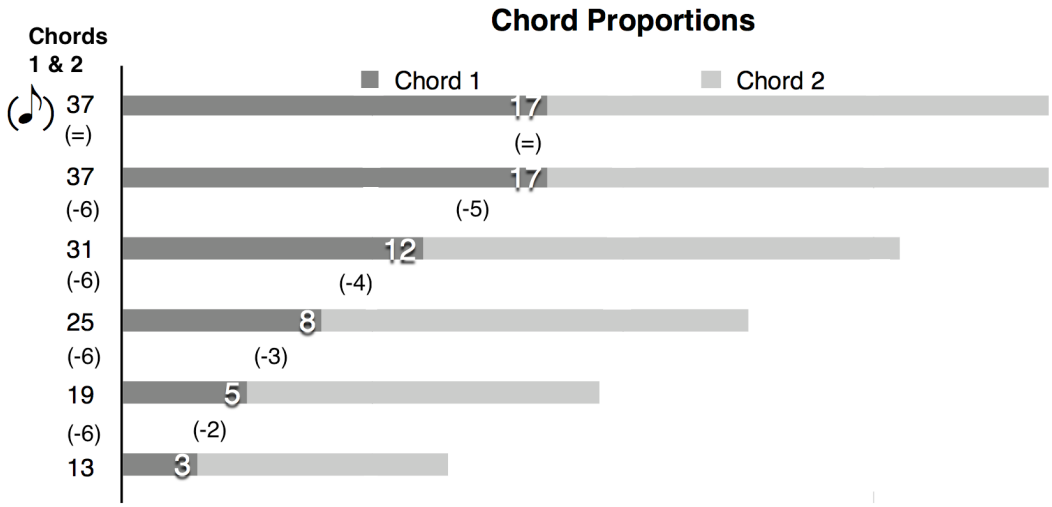
Fig. 4.7a



[26] Julian S. Huxley, 'Metamorphosis of Axolotl caused by Thyroid-feeding', *Nature*, 104, 435 (1920).

As the piece approaches its end, the two oscillating spectral chords played by Pianos I, V & VI move closer and closer together by way of the subtractive rhythmic device shown in Fig. 4.7b.

Fig. 4.7b



5 — From the Lamentations of Jeremiah

This piece was commissioned by the Zurich Chamber Singers for their 2017 *Passio* tour. The Book of Lamentations (famously set by Palestrina, Allegri, Tallis and Stravinsky) is a set of five poems which document the destruction of Jerusalem in 587-6 BC. For my own setting, I chose the fifth chapter which comprises five short statements of extraordinary bleakness:

5:1 Recordare, Domine, quid acciderit nobis; intuere et respice opprobrium nostrum.	5:1 Remember, O Lord, what has befallen us; behold, and see our disgrace.
5:2 Hæreditas nostra versa est ad alienos, domus nostræ ad extraneos.	5:2 Our inheritance has been turned over to strangers, our homes to aliens.
5:3 Pupilli facti sumus absque patre, matres nostræ quasi viduæ.	5:3 We have become orphans, fatherless; our mothers are like widows.
5:4 Aquam nostram pecunia bibimus; ligna nostra pretio comparavimus.	5:4 We must pay for the water we drink, the wood we get must be bought.
5:5 Cervicibus nostris minabamur, lassis non dabatur requies.	5:5 With a yoke on our necks we are hard driven; we are weary, we are given no rest.

In keeping with Tenebrae tradition, the text of my piece is bookended by the following statements (making a total of seven movements in all):[27]

I. De lamentatione Ieremiae prohetae	*I. From the lamentations of Jeremiah the prophet*
II. Ierusalem, Ierusalem, convertere ad Dominum Deum tuum	*II. Jerusalem, Jerusalem, return unto the Lord thy God.*

---

[27] Regrettably, due to limited rehearsal time 5:3 was not performed or recorded.

In 2015, I had the honour of entering into a brief correspondence with György Kurtág, a composer whose music I have always admired for its extraordinary concision and emotional depth. As the dedicatee of this piece, Kurtág's spirit permeates the music from start to finish. The bleakness of the text; the influence of Eastern European folk musics, Gregorian chant and Ars Nova; the allusions to Bartók; the presence of two different kinds of cipher—all of these elements were consciously included in tribute.

This was my first attempt at choral writing, and I was highly cognisant of the unique set of challenges presented by the medium; the human voice has a unique timbral richness, or perhaps 'thickness', which means that the composer who values harmonic clarity is faced with substantial limitations in terms of usable intervals/chords.[28]
Writing music which would be enhanced rather than encumbered by the timbral richness of the human voice meant finding a harmonic language whose potency and sophistication was not commensurate with extensive and persistent use of dissonant intervals. I have attempted to do this by considering carefully the spectral implications of even the most familiar consonant harmonies.

[28] A side-by-side comparison of Enno Poppe's *Gold* (2006) for choir with the opening paragraph of his orchestral work *Altbau* (2008) usefully demonstrates how certain complex harmonies, sharply defined when played by orchestral instruments, can be denatured into clouds of 'Sprechstimme' when scored for human voices. Undoubtedly this was Poppe's intention—and the effect is indeed striking—but it is something I wished to avoid in this particular work.

Introduction

The opening movement begins decisively: two successive melodic chains of interlocking spectra cover the full text before cadencing each time on the word ‘Prophetae’. (Fig. 5.1)

At Bar 16, the choir is divided between the high and low voices who are respectively designated the words ‘Prophetae’ and ‘Jeremiae’. This passage was conceived as a struggle for dominance between the implied fundamentals of E♭ and B♮. (Fig. 5.2)

This struggle results from the ambiguity produced by two four-note collections, both with a strong spectral identity and a viable claim to primacy within their combined harmonic field. A compromise is reached in Bar 22 when the opposing harmonic forces are unified in an F spectrum (labelled ‘C’).

Fig. 5.1

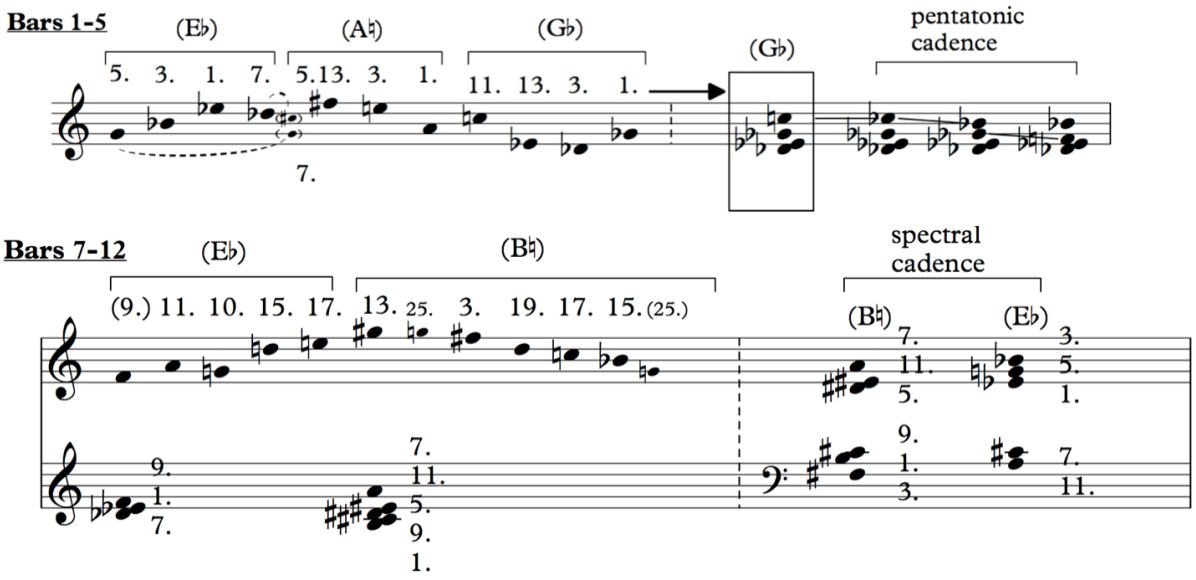
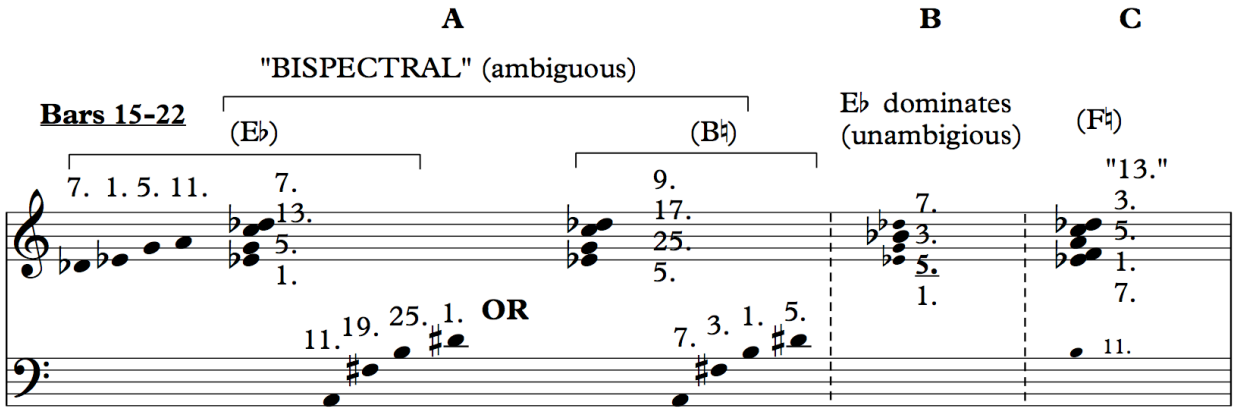


Fig. 5.2



In this moment of détente, the higher voices descend in canon through a symmetrical mode which repeats at the major sixth. (Fig. 5.3)
The pulse of the canon is slowed down every four notes by the addition of a semiquaver. Voices which sing notes that do not belong to the canon form part of a harmonic background.

In Bars 28-29 the voices move apart once more, landing in a C♮ spectrum by Bar 30, where a solo soprano, singing the words ‘Jeremiae Prophetae’, oscillates between major and minor thirds in a conscious imitation of the striking moment which concludes the second movement of Janáček’s Violin Sonata. (Fig. 5.4a) (Fig. 5.4b)

Fig. 5.3

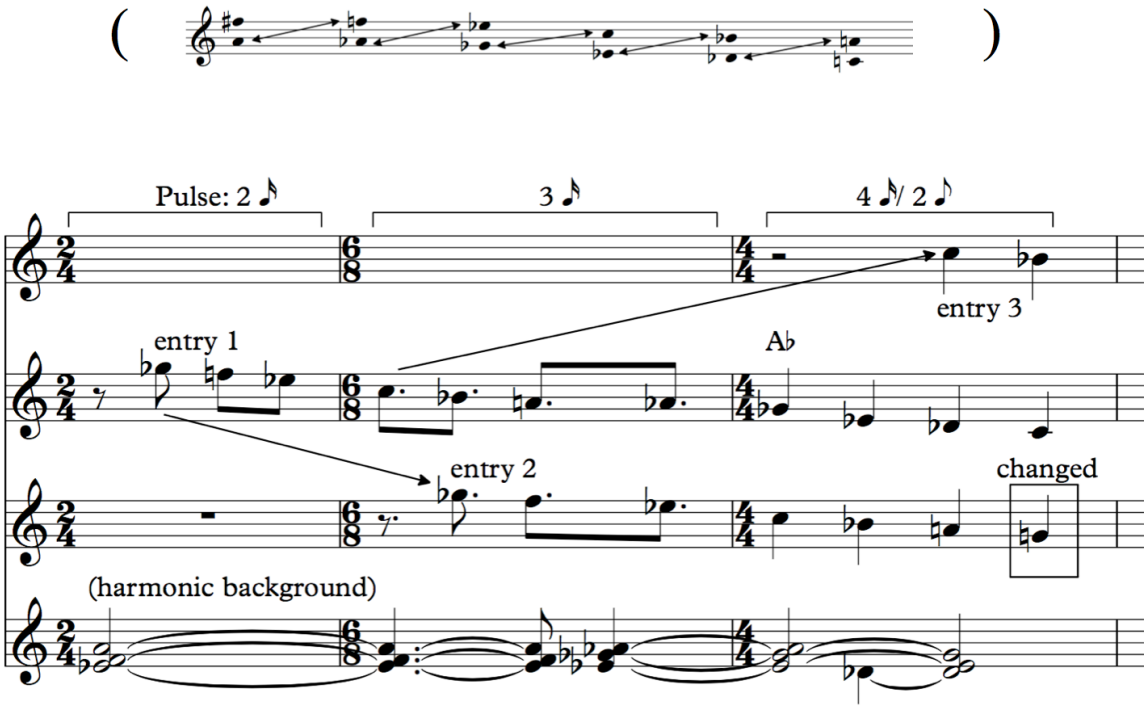


Fig. 5.4a

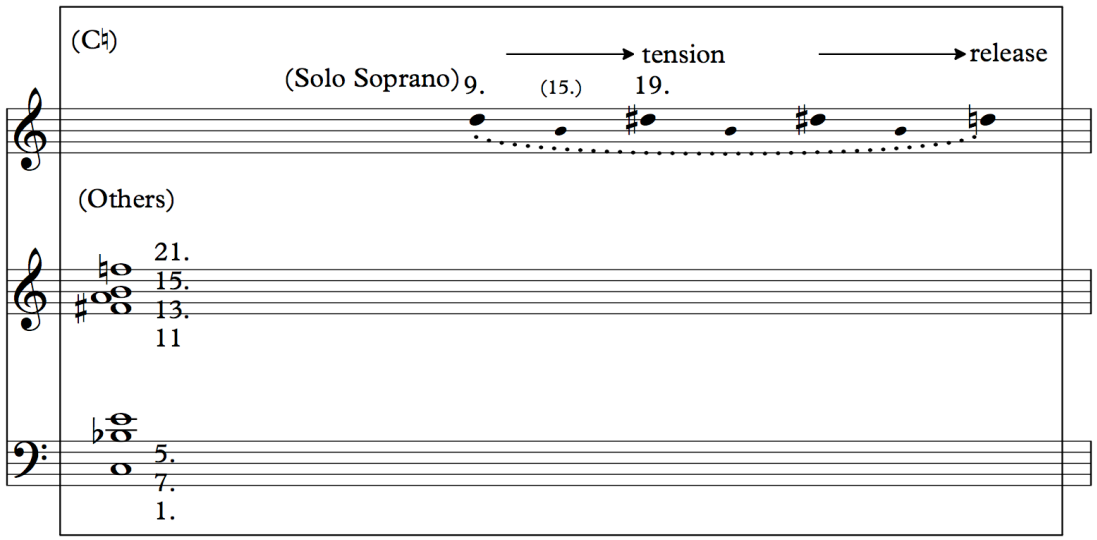
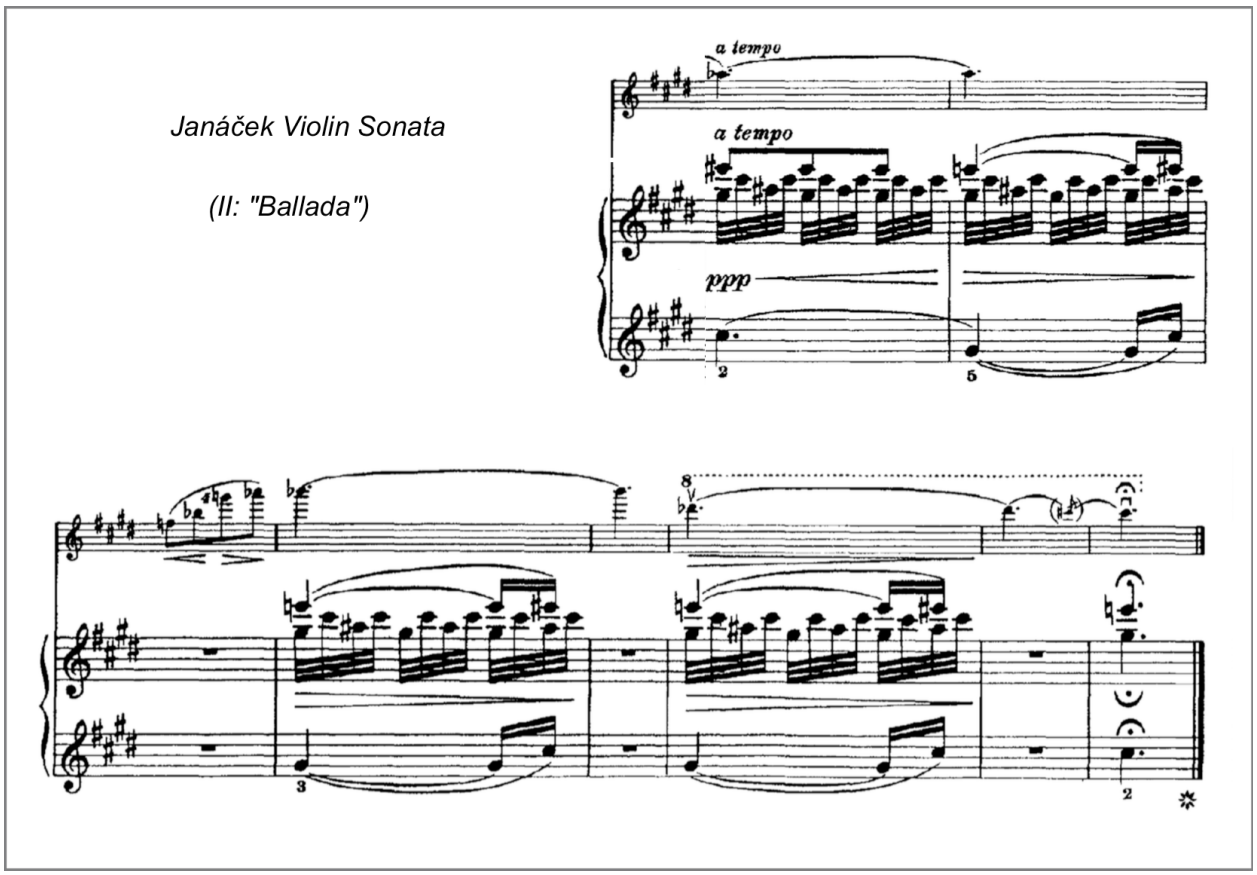


Fig. 5.4b



5:1

This movement makes use of two very simple and restrictive devices—one rhythmic, the other pitch-based.

Rhythm: In a process which recalls the Aksak rhythms of Bulgarian folk music,[29] the addition of a mobile dot to a bar of 4/4 creates a bulge in the rhythm which moves back and forth with each successive measure, as if bouncing off the barlines. (Fig. 5.5).

Pitch:

The perfect 5th between B♮ and F♯ functions as a framing device within which the full chromatic space is explored in a quasi-Bartókian fashion. The movement of pitches within the frame, though, is not chromatic but spectral in its behaviour, exploring overtones of B♮ and D♮—something more clearly audible when the principal melodic line strays onto an A♮ beneath the framing notes. (Fig. 5.6)

Fig. 5.5

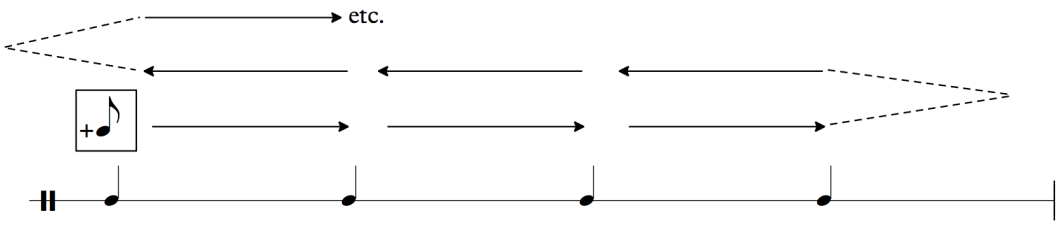
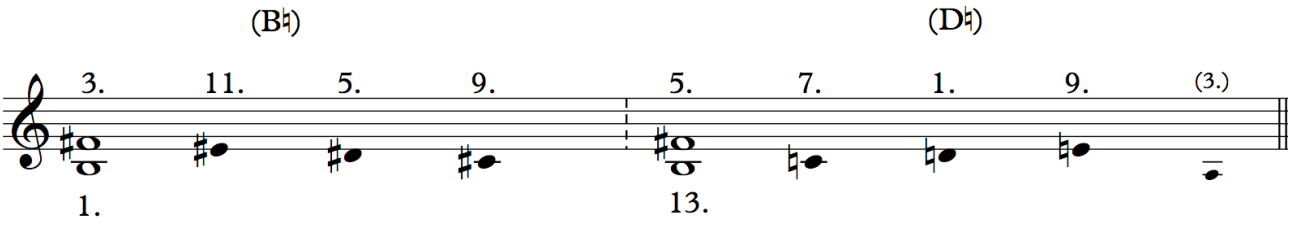


Fig. 5.6

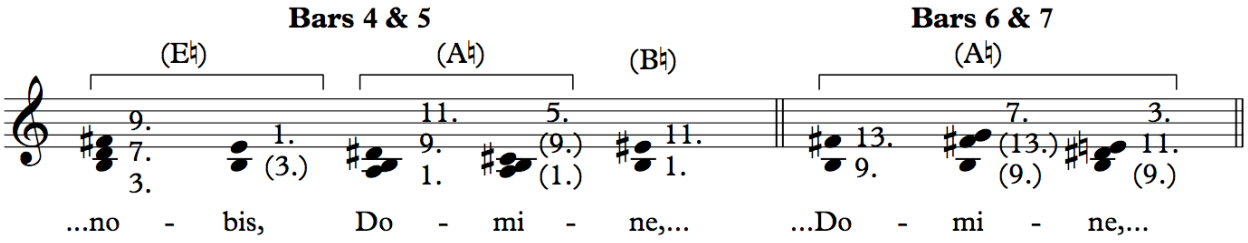


[29] Aksak rhythms (called 'Bulgarian Rhythms' by Bartók) combine unequal beats for a 'limping' effect—*Encyclopaedia Britannica* (2007) < https://www.britannica.com/art/aksak > [Accessed 9 June 2019].

This rhythmic and harmonic skeleton is superimposed by an additional layer of material—sung by sopranos 3-5, tenors 3&4, and basses 1&2—which alter its harmonic complexion by momentarily disrupting the consistent movement between spectra on B♮ and D♮. (Fig. 5.7)

The bass part, proper—which enters at Bar 9 and makes extensive use of the two framing pitches—sometimes reinforces the harmonic material above and sometimes transforms it.

Fig. 5.7

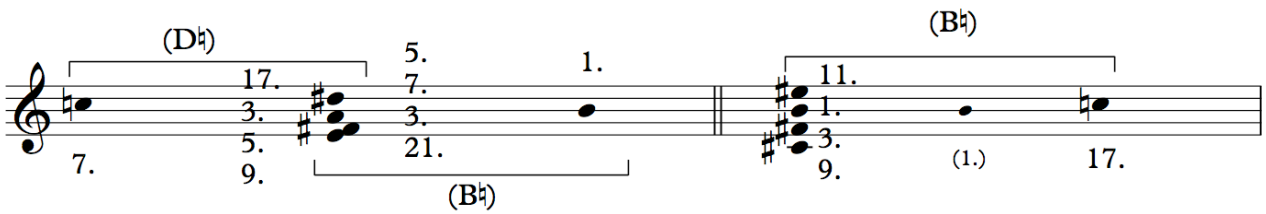


Following a partial repetition of the opening material—at Bar 16—the music transitions by a modal shift into the final paragraph of the movement, in which I set the second half of the text.

Here the mobile dot reverses its direction of travel, and the melodic framing device spans a single semitone, forcing the Hauptstimme simply to oscillate between the notes C♮ and B♮.

The surrounding voices move slowly back and forth between two chords on the word ‘Domine’, exploring higher overtones of B♮ and D♮. (Fig. 5.8)

Fig. 5.8



5:2/5:5

These two short intermezzi, (almost) symmetrically positioned within the piece, perform several structural functions—both in combination with one another and within the work as a whole.
The same form and pitch material is present in both movements: four soloists share a single line of pitches (derived from a cipher on the name of Kurtág) which leads towards a chord, or chords, sung by the full choir on the final word.

The four-note cipher—KRTG— is taken from a pitch-alphabet of my own construction. (Fig. 5.9)
By transposing the cipher and its (reordered) inversion onto themselves in a simple matrix, and travelling around the outermost squares, I created two symmetrical note sequences. (Fig. 5.10)
(Fig. 5.11)
Having located the syllabic midpoint of the text in both cases, I assigned the pitches from these matrices in a sort of mirror image—such that 5:2 begins with Sequence A and ends with Sequence B, while 5:5 does the opposite. (Fig. 5.12)

Fig. 5.9

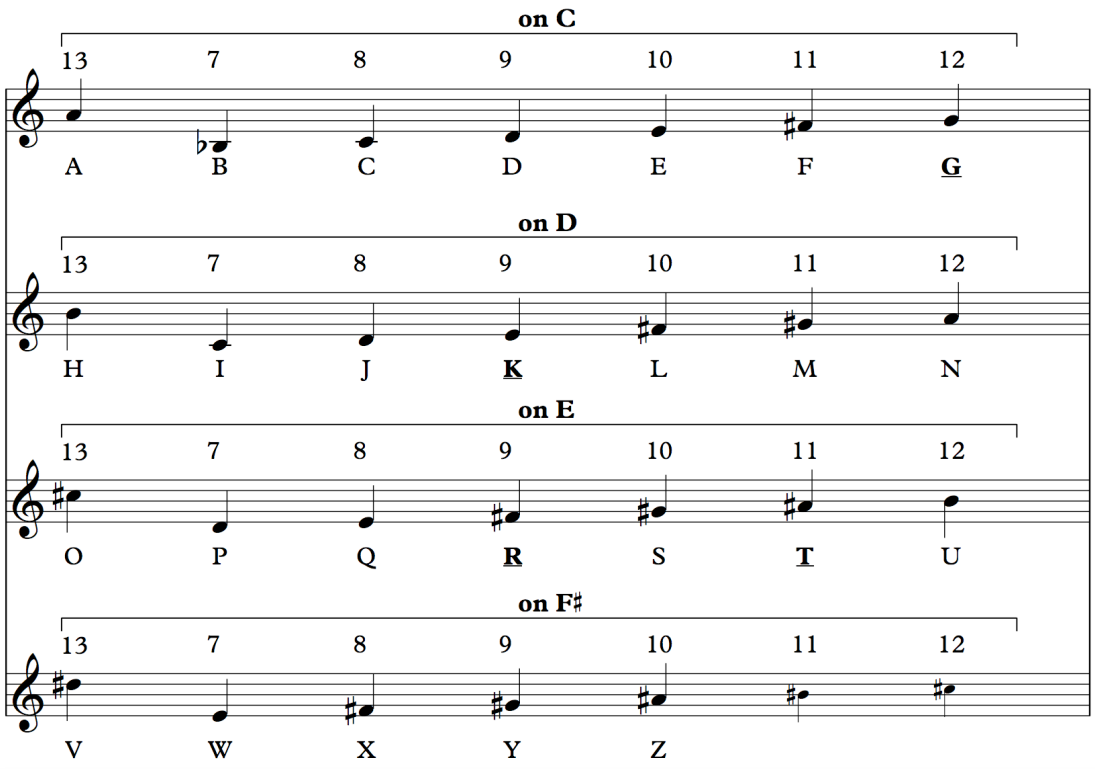
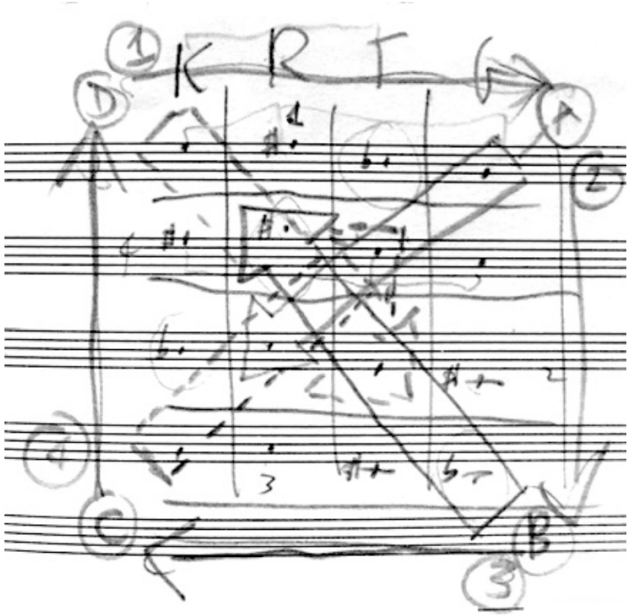


Fig. 5.10

KRTG matrix



reordered inversion

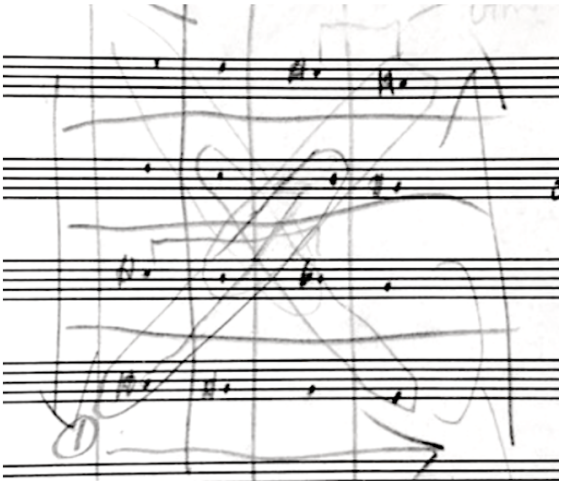


Fig. 5.11

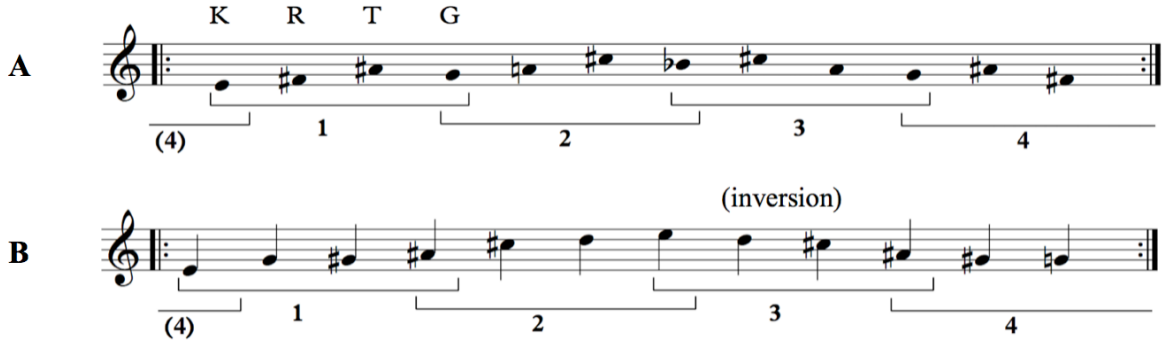
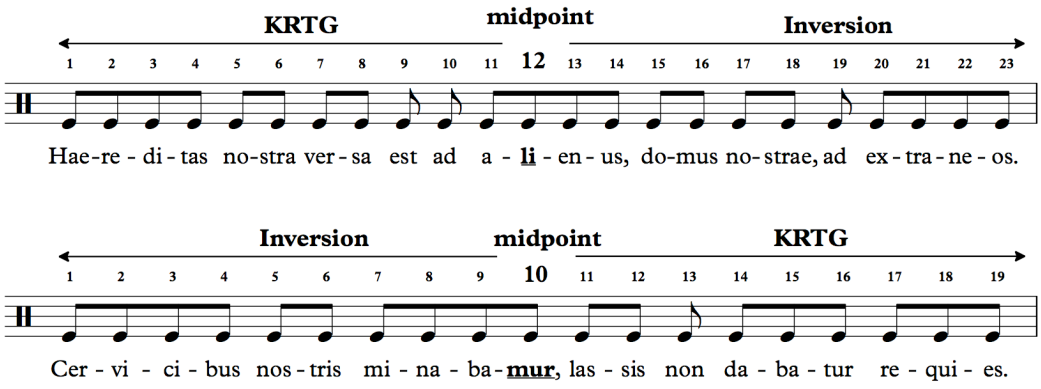


Fig. 5.12



The final chords in both movements are also made up of pitches from these matrices. (Fig. 5.13a, Fig. 5.13b)

In both movements, too, I make use of an extended technique known as 'hissing'—in one case (5:2) to thin out a chord, in the other (5:5) to simulate radio static. In the latter case, this sonic metaphor announces the intrusion of something from outside the piece; a sort of *Intermezzo Interrotto*.[30]

That which intrudes is a string of Hebrew letters—consonants from Kurtág's name (GYR KRTG) —sung (or rather, listed) in a dispassionate, mechanical manner suggestive of the radiotelephony alphabet commonly used for military communications.[31]

Fig. 5.13a

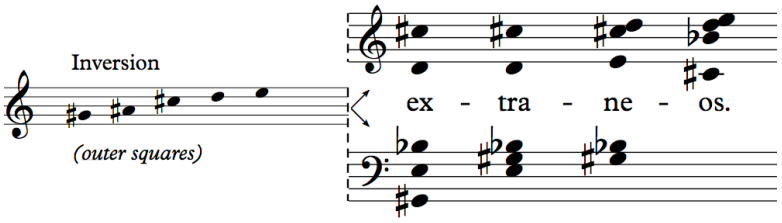
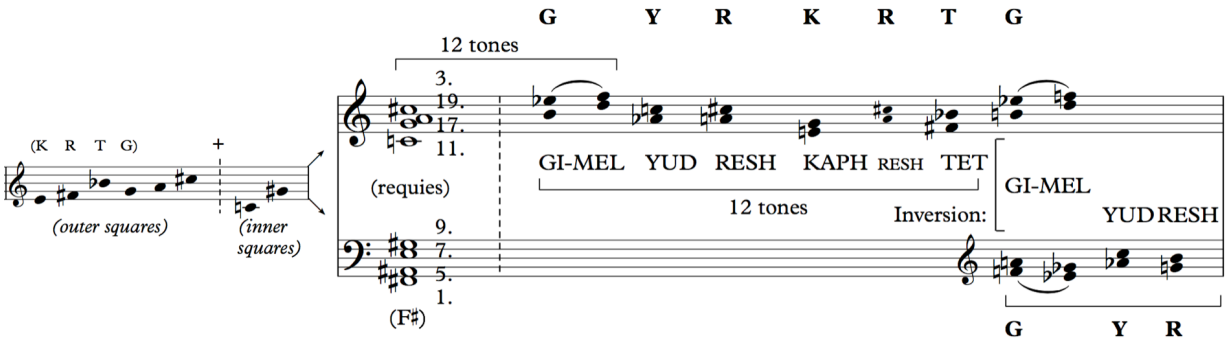


Fig.5.13b



To draw a firm structural boundary ahead of the final movement, the English translation of 5:5 is recited, unpitched and in close rhythmic canon—paraphrasing the unsynchronised mumbling of an entire congregation during the Responsorial Psalms; one abiding memory from my casually Catholic upbringing.

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[30] The title of the fourth movement from Bartók's *Concerto for Orchestra*, Sz. 116.

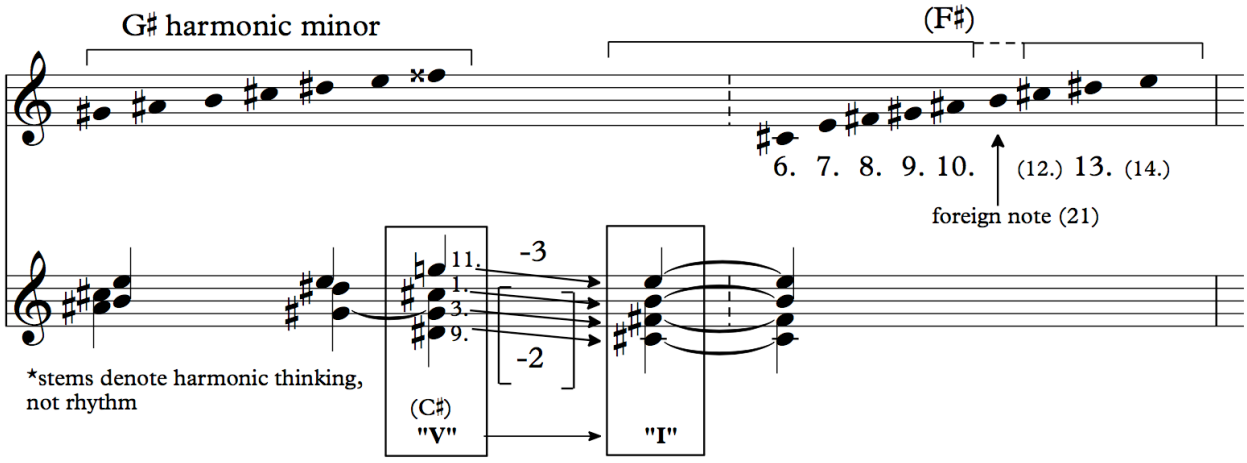
[31] Hebrew letters precede each line in the first four chapters (but not the fifth) in the Book of Lamentations; it seemed a great shame that this memorable acrostic feature should be missing from my own setting.

5:3

This movement opens with a 'raucous, folksy' modal duet between two sopranos. Harsh fourths, semitones, and tritones characterise the counterpoint. A warmer cadential moment in Bars 9-11—sung by all female voices for maximum timbral contrast with the soloists' raucous tone—expands the narrow harmonic area into the modally flavoured F♯ spectrum,[32] in preparation for a pair of solo altos to join the sopranos in (rhythmic and gestural) canon. (Fig. 5.14)

Bars 18-21 make a brief allusion to the parallel harmonic movement of Medieval organa before ending on a chord of stacked perfect fourths.

Fig. 5.14



In the following section, three pitches (E♮, B♮ and F♯) from chord of stacked fourths are respaced and combined with octave-displaced semitones (G♮ above, D♯ below) to create repeating two-chord figure which shifts from 'E minor' to 'B major'.

Set on the word 'matres', this figure is accompanied by falling glissandi, evoking the wailing of orphan children (apropos of the text). Beneath these wails, the basses sing a variant of the opening material—this time in parallel major sixths, rather than perfect fourths.

---

[32] A 'foreign note' (B♮) occupies the place of the 11th partial.

In Bar 29, the upper and lower harmonic layers are combined within a spectrum on A♮, from which the music manoeuvres towards a final chord made up of two interlocking spectral pentachords. This chord is split into four dyadic layers, each with its own unique rhythmic behaviour. (Fig. 5.15) (Fig. 5.16)

Fig. 5.15

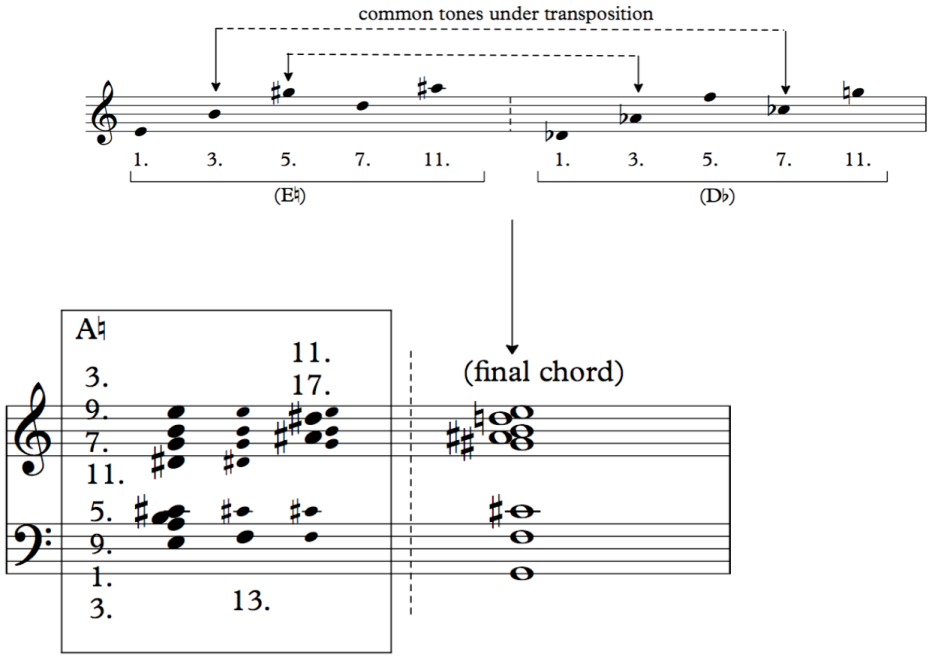
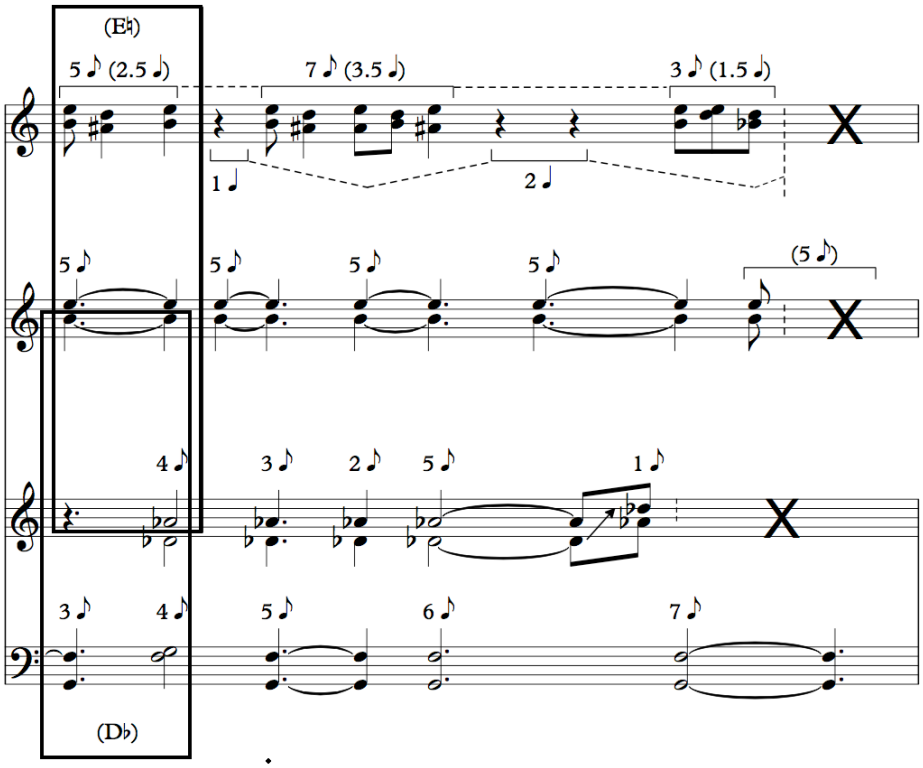


Fig. 5.16



5:4

This movement is the simplest and most succinct of the piece. It opens with octave-doubled dyads, moving slowly in rhythmic unison—an experiment with a particularly Vivierian sort of roving consonance.[33]

The first four dyads form a chromatic-yet-consonant descending motif, characterised principally by its harmonically ambiguous pairing of minor with major thirds—a feature also present in the subsequent four-dyad sequence which concludes the phrase. (Fig. 5.17)

On the word 'bibimus' (in Bar 7) we diverge from octave doublings into true four-part harmony, which integrates spectral considerations, the aforementioned major/minor ambiguity, and the swapping of registers between dyads. (Fig. 5.18)

Fig. 5.17

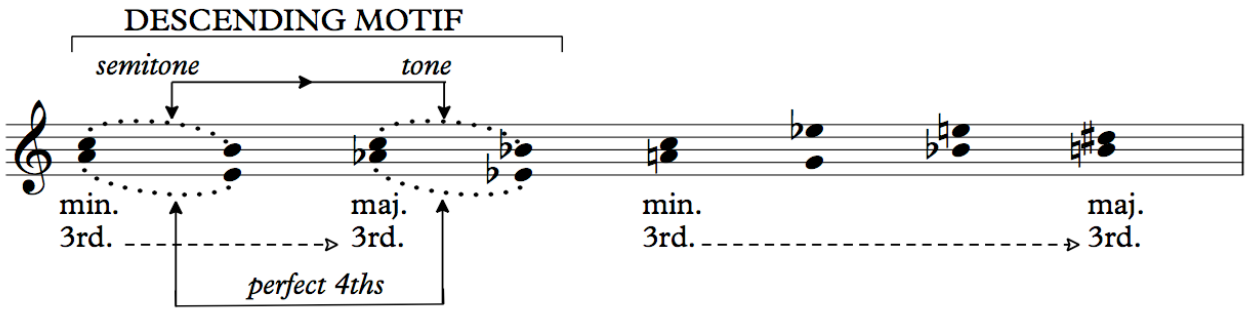
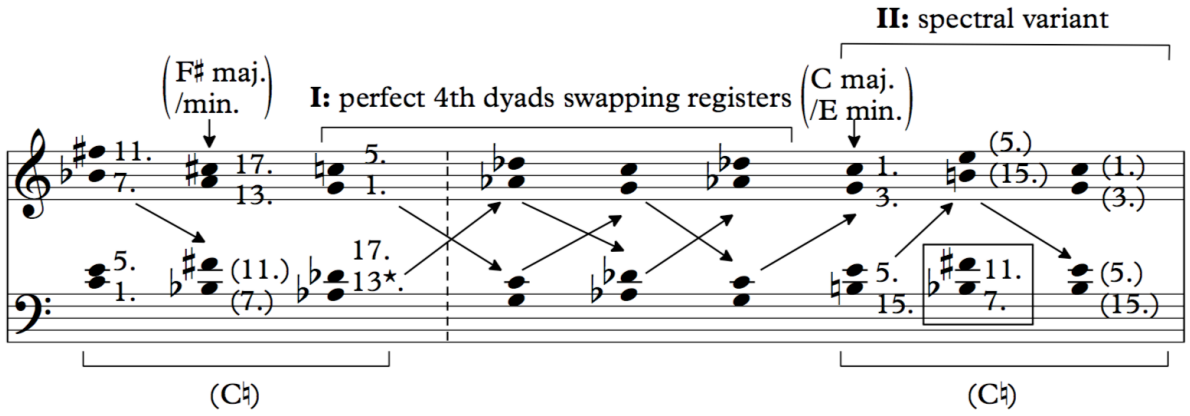


Fig. 5.18



[33] Bars 1-22 of Vivier's *Lonely Child* are good example of such roving consonance', as indeed is the rest of the piece and the vast majority of his mature output!

A more overt Spectralism occurs in Bar 13, where a chord of overtones on E♮ is sustained beneath a solo soprano oscillating in (major) thirds (Fig. 5.19).

A dyad from within the overtone chord (D♮ , F♯) is sustained to facilitate the return of the descending motif in the tenors—this time in a modified/augmented form, in which two variants of the original motif are presented in sequence, followed by a shortened, cadential variant. (Fig. 5.20)

In Bar 19, altos and basses rejoin the tenors on the word ‘comparavimus’. The pitch material here functions doubly as a spectrum on C♮ and a symmetrical interval sequence. (Fig. 5.21).

Fig. 5.19

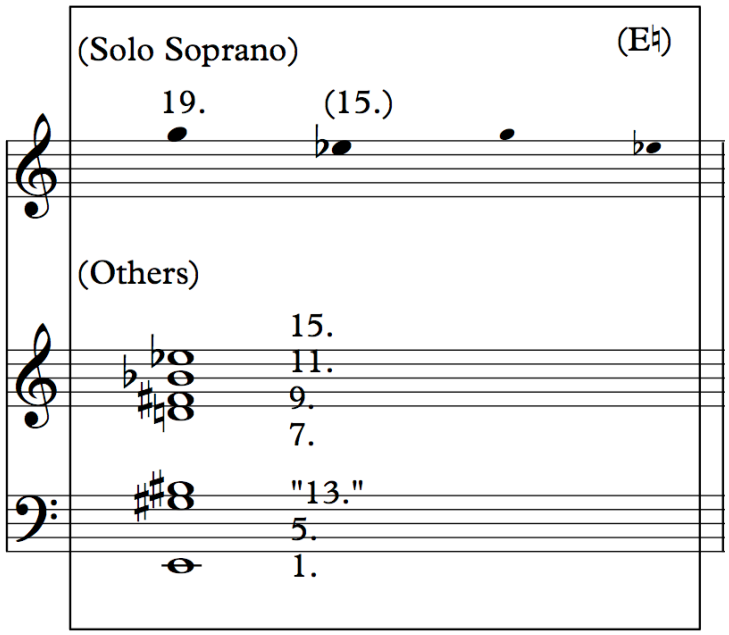


Fig. 5.20

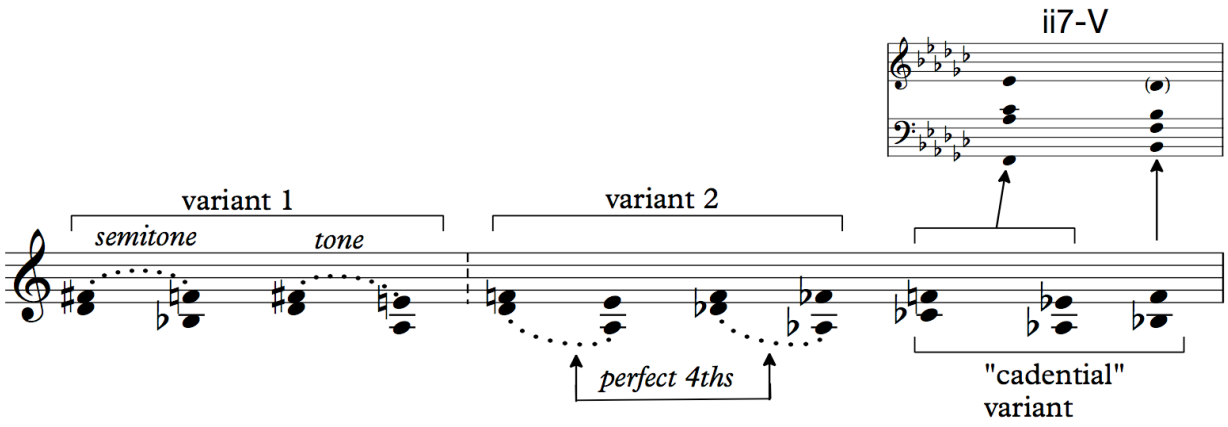
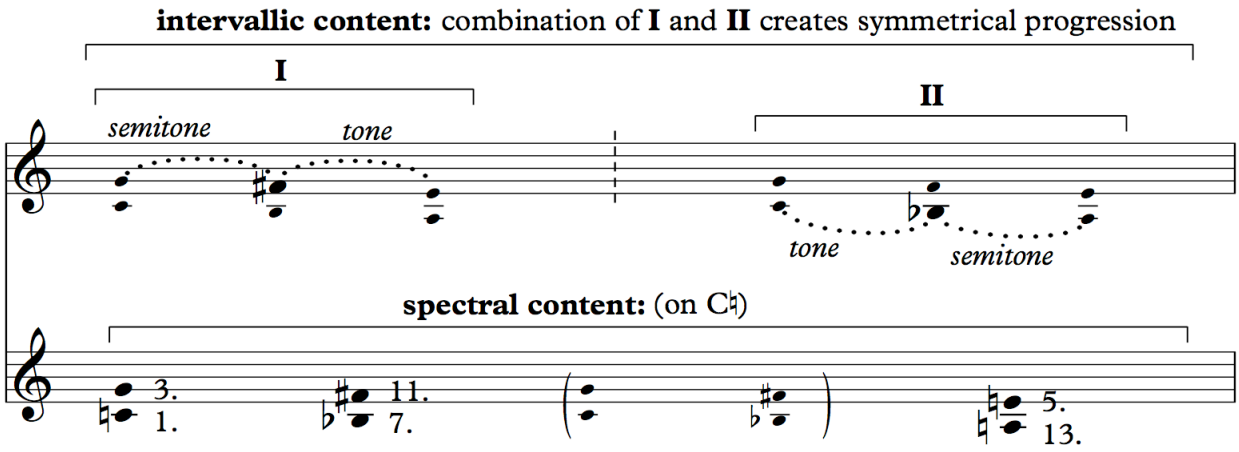


Fig. 5.21



This sequence brings us to the 'home key of A minor', and the recapitulation of the opening phrase —this time partly harmonised within a spectrum on A♭.

In the final cadence, a chord which unifies the major/minor third ambiguity of the opening theme is resolved by an unambiguous E♭ major. (Fig. 5.22) (Fig. 5.23)

Fig. 5.22

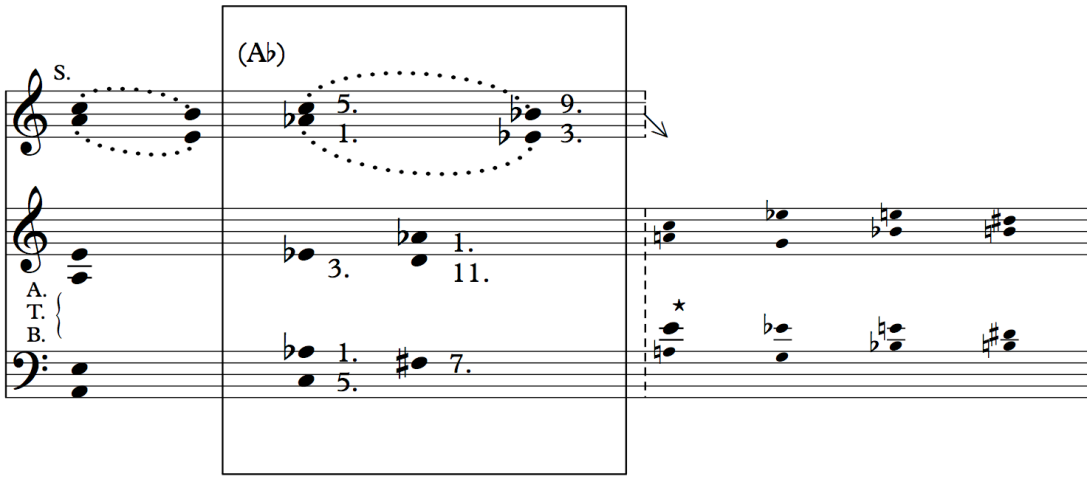
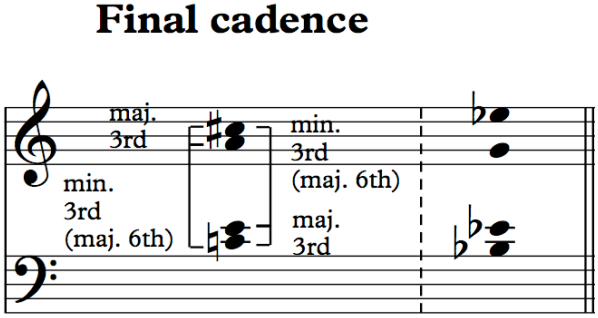


Fig. 5.23



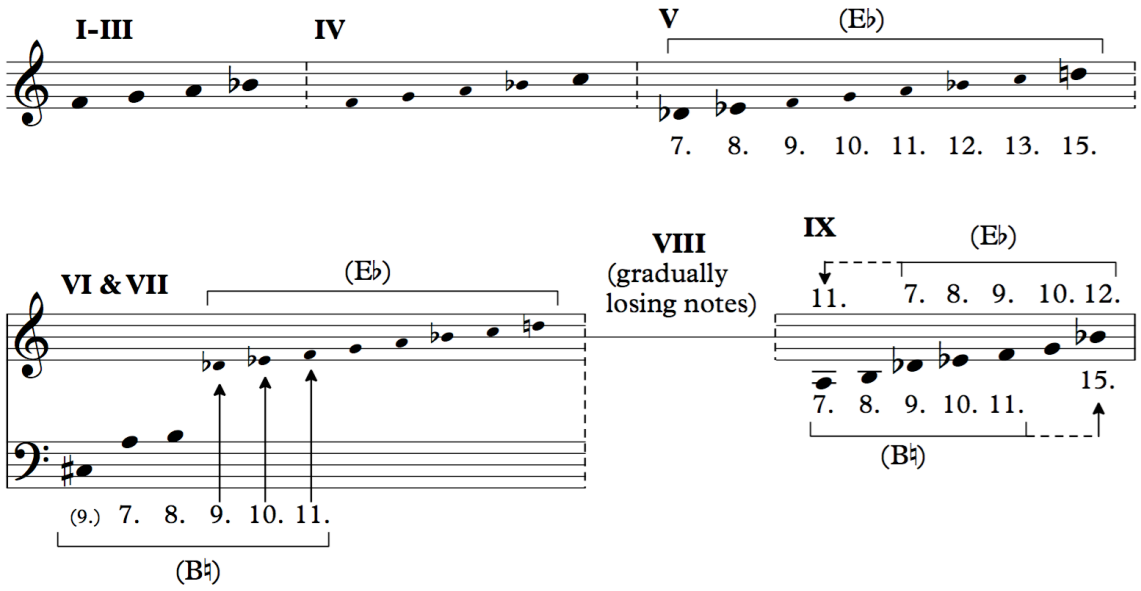
Coda: "IERUSALEM Bells"

In contrast to the other short, tightly constructed movements, this one is a vast expanse in which any sense of momentum and direction is maintained by the gradual addition/removal of harmonic and gestural material.

Each part is assigned a Roman numeral, dictating the order (but not the timing) of entries; the conductor intermittently cues singers to join in until we have seven layers—evocative of both bells and plainchant—each forming part of a full texture which, in harmonic terms, occupies overlapping spectra on B♮ and E♭. (Fig. 5.24)

At cue VIII the first three sopranos sing repeating figures of decreasing complexity, and the music begins to wind down towards cue IX—where the full choir arrives on a simplified chord of the same overlapping spectra (B♮ and E♭), sustained on a quiet hum.

Fig. 5.24



The final passage makes use of two superimposed isorhythms to paraphrase the loud clanging of two sets of bells. Two harmonic layers—one a spectrum on D♭, the other a four-note, 'pentatonic' collection—are linked by the note G♮. (Fig. 5.25)

The combination pattern is cut off at precisely the point where the layers interact to create a descending figure of C♮, B♮ (C♭) and A♮, facilitating a stepwise movement into the final harmonic sequence. (Fig. 5.26)

This sequence consists of three chords which move from a pentatonic collection to a spectrum on A♮. The top four voices expand outwards, while an additional voice—linearly suggestive of a spectrum on B♮—moves upwards in wide steps from the bass into the treble. Importantly, the transitional middle chord takes on the identity of a B spectrum due in part to the presence/influence of the bass line. Above this repeating harmonic sequence, two solo sopranos contribute a series of two-note gestures on the words 'Deum tuum'. These gestures function variously as simple appoggiaturas, and overtones on both B♮ and A♮, depending on the chord beneath.

Fig. 5.25

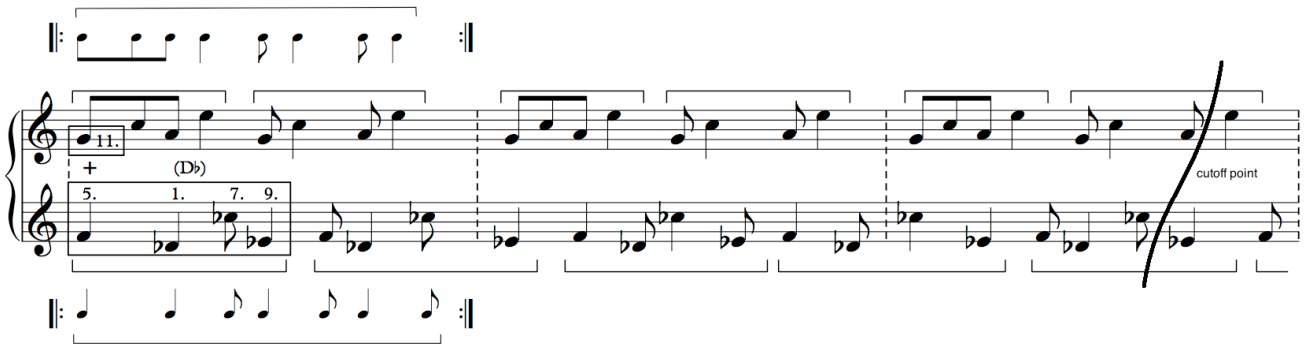
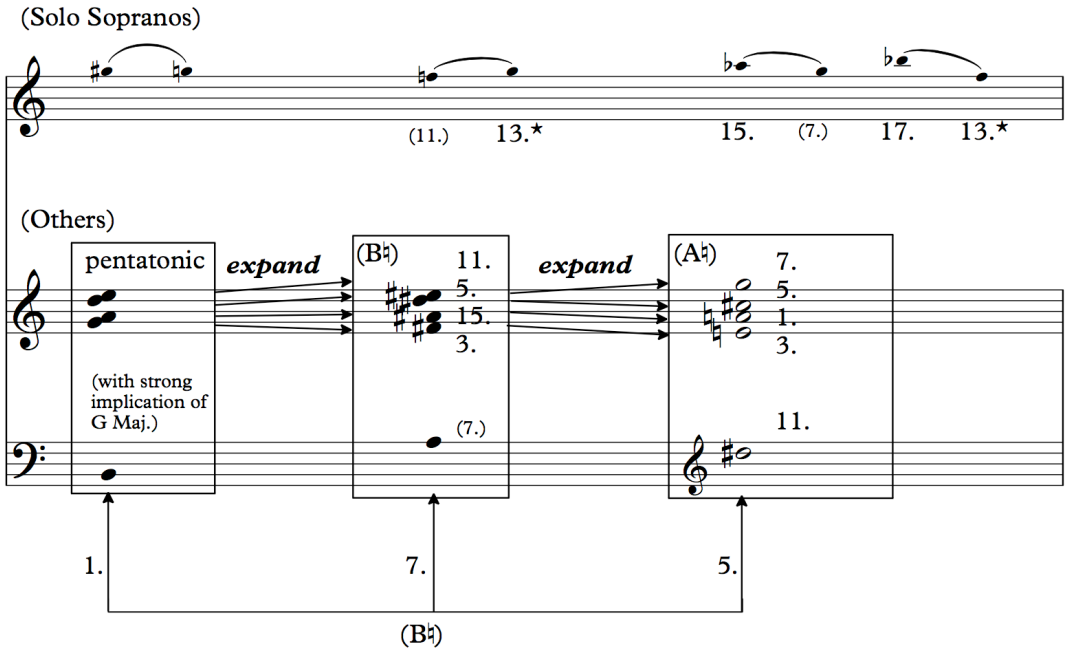


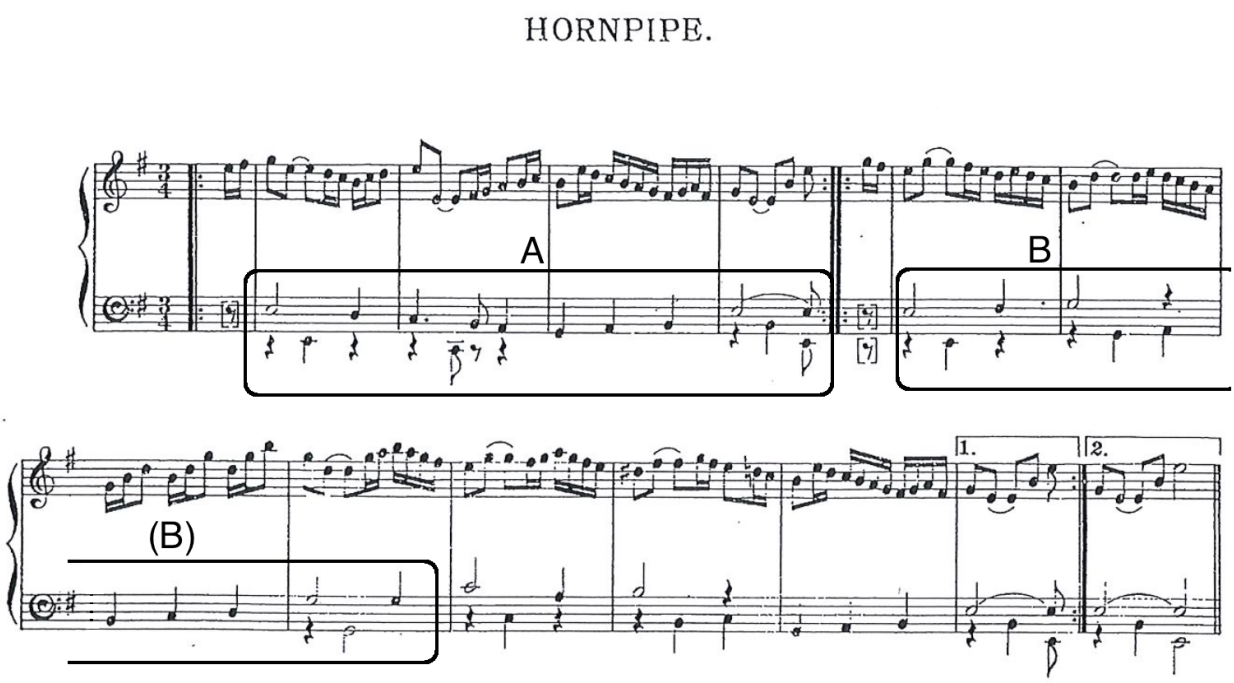
Fig. 5.26



6 — Fantasia on Berio's Note

This short variation on Purcell's E Minor Hornpipe (Fig. 6.1) was commissioned for the London Sinfonietta's 50th Birthday Concert.

Fig. 6.1



The brief was to create a short variation which would showcase a chosen instrument and 'demonstrate the brilliance of [the Ensemble's] individual players.' I chose the oboe because I intended to produce a work which refers both to Purcell's *Fantasia on One Note* and Luciano Berio's *Sequenza VII*. Rather than include a quotation, I instruct the soloist to improvise on a single note using the fingerings and techniques painstakingly worked out by Berio.

The stepwise movement of the bass in Purcell's Hornpipe was the basis of my variation. I initially extracted and simplified the bass in the first eight measures (Fig. 6.2). The contours of these two four-bar phrases, which I have labelled 'A' and 'B', are both simple and memorable—equally so in inversion (Fig. 6.3). By transposing Phrase B such that it ends on a leading tone (F♯), I was able to

create a ground bass pattern which could repeat in an endless cycle without ever reaching the tonic of E♮. (Fig. 6.4).

Fig. 6.2

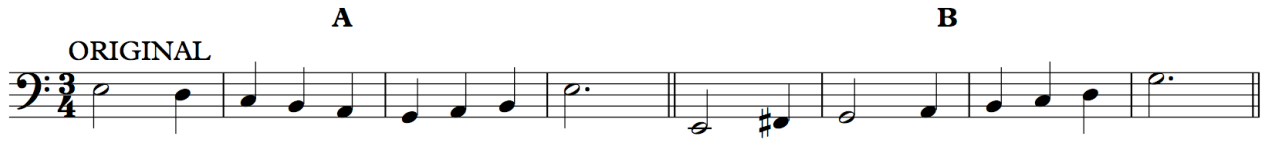


Fig. 6.3

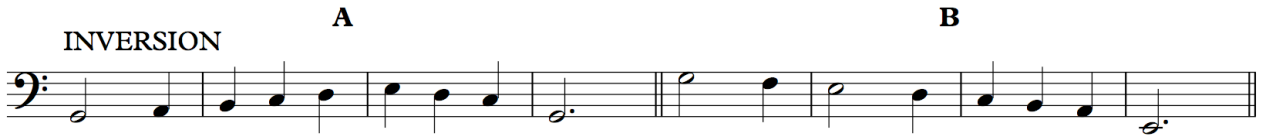
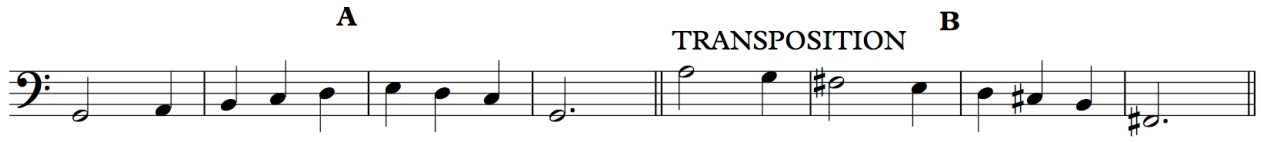
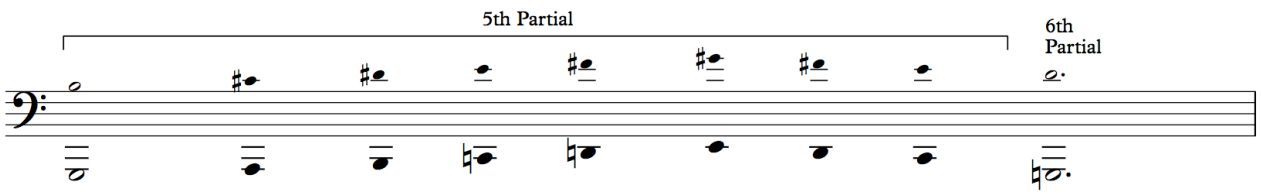


Fig. 6.4



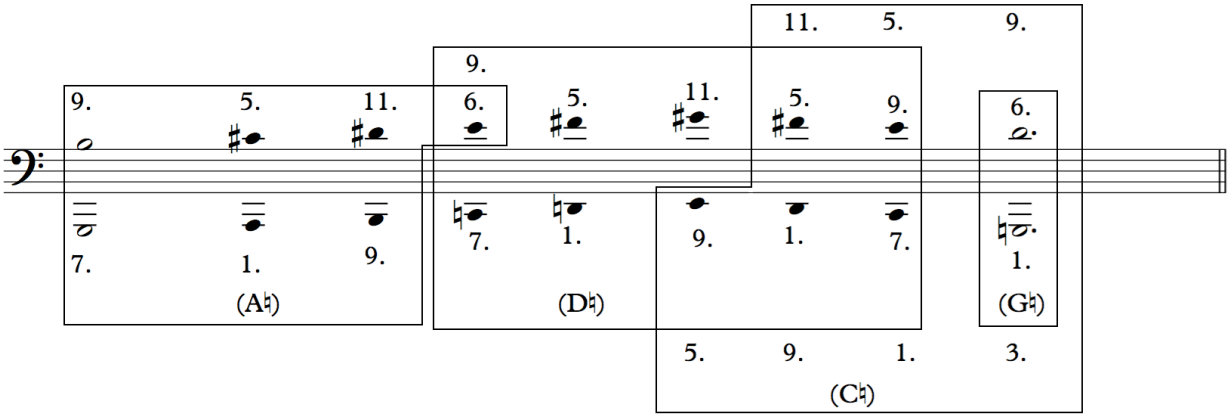
In Phrase A, the line is harmonised in parallel compound major thirds followed by a single compound perfect fifth. To my mind, this is in fact an example of the most rudimentary kind of Spectralism. (Fig. 6.5).[34] Of equal importance are the spectral relationships between neighbouring dyads (Fig. 6.6). The boundaries between these spectral areas are carefully delineated, even in the blurred scoring of the final piece.

Fig. 6.5



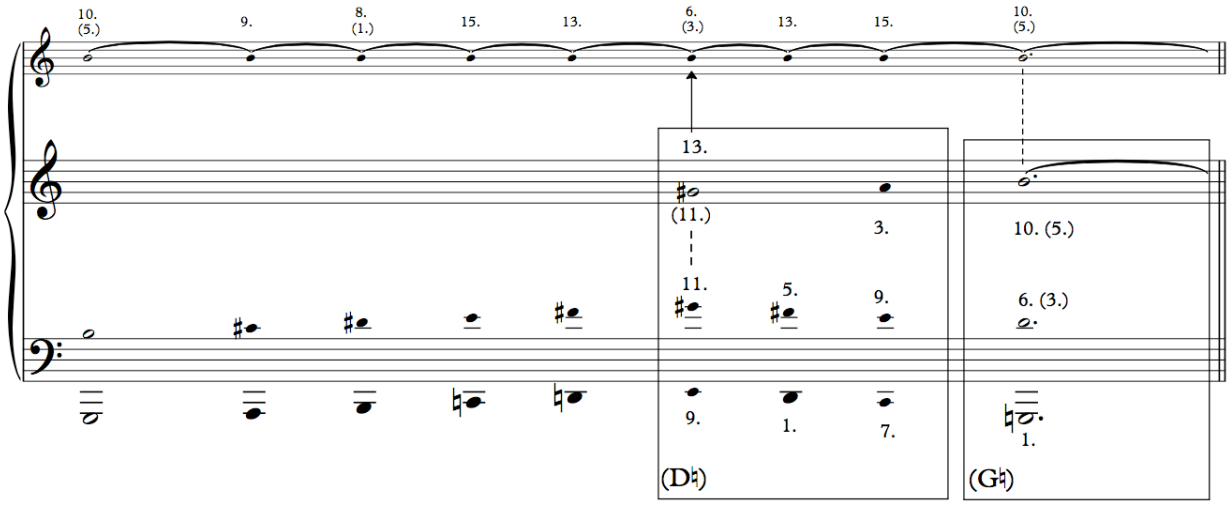
[34] Hans Abrahamsen applied a similar treatment to the opening notes of Bach's *Art of Fugue* to generate material for his seminal ensemble work *Schnee*.

Fig. 6.6



In *Sequenza VII,* Berio calls for a sustained B♮ to sound throughout the piece, functioning as a sort of drone, against which the notated music is heard. He specifies that it 'should give the impression of lending a slight resonance to the solo oboe'. Recommended sound sources are an oscillator, a clarinet and a prerecorded oboe; I have sustained the pitch on a viola harmonic. When combined with the dyads below (Fig. 6.7), this sustained note changes its spectral function with each chord.

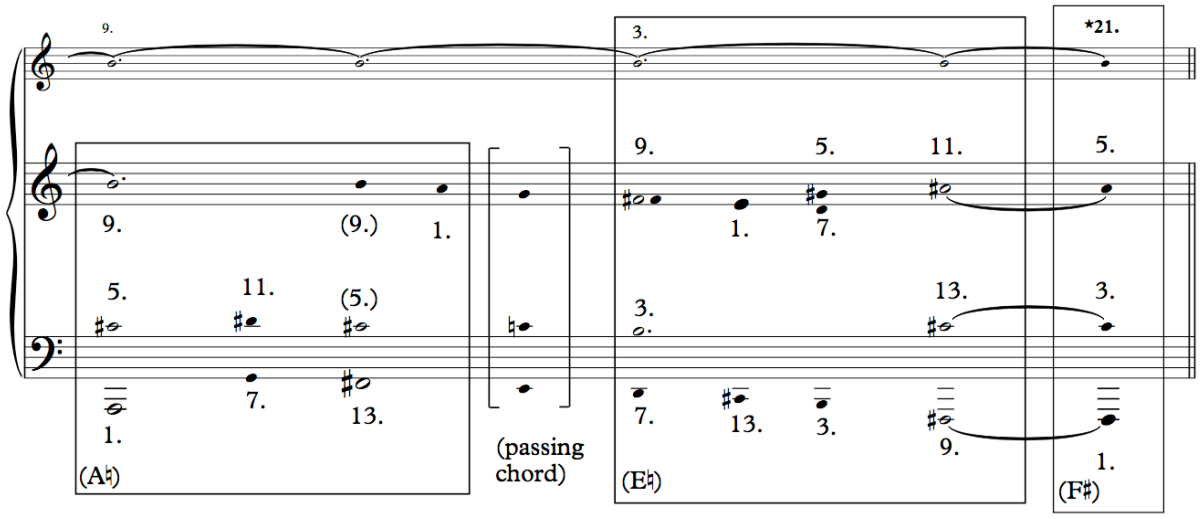
Fig. 6.7



In Phrase B, I abandon the parallel intervals entirely; the harmony is now considered wholly in terms of spectral areas, with the exception of one passing chord which serves as a linking device (Fig. 6.8). These spectral areas are highlighted by the only use of microtones in the variation; the

flattened D and A♯ in bars 7 and 8 are the 7th and 11th partials of a spectrum on E. The latter is deployed as a suspension which subsequently resolves to a normally tuned A♯.

Fig. 6.8



This is also an important moment in terms of the relationship between soloist and ensemble; in the context of the F♯ major chord beneath, the sustained B♮ is heard as the 21st partial. This is much higher up the spectrum than in any preceding instance, and I would therefore characterise the pitch as extremely unstable. This instability is heard as an intense need for the pitch to resolve to the nearest stable partial—an A♯ in this case. The soloist (and the viola) are instructed to play louder/ more aggressively, making a musical feature out of their stubborn refusal to budge from the 'one note'.

From the bare tenths of the opening, this piece evolves by a process of gradual elaboration into ‘Purcellian’ counterpoint; the desired effect is a music which self-assembles in the performance. In Bar 16 the oboe finally does resolve to A♯ and proceeds to play a short, highly stylised stream of semiquavers which seem to suggest the long-awaited beginning of a real solo… only to snap violently back to the 'one note', emphasised by Bartók pizzicato in the Double Bass. The brief for this commission requested music which was ‘extrovert, fun, virtuosic, witty and quirky’. It is my hope that, having failed on almost all of these counts, this moment at least might be considered witty.

7 — Autres Vexations

The piece is titled after Erik Satie's *Vexations* (1893/4), which I had the bizarre pleasure of performing as a piano student (naturally as part of a relay team). Having to satisfy the time requirements of this PhD has been a particular vexation of mine, especially in light of several abandoned commissions and scrapped pieces.

This, my solution, was written in less than 24 hours. It is an expansion of Movt. 5:4 in *From the Lamentations of Jeremiah* (discussed in Chapter 5) for two pianos. This piece has a vastly different character from its source material; like the Satie, it extraordinarily repetitious and makes a lot from very little… albeit in quite a different way. For all its rawness, it is a good reflection of my recent (and obsessive) style of motivic transformation, triggered by a shamefully belated first encounter with Schubert's *Death and the Maiden* quartet. The result is music which makes up for in vigour and recognisability what it lacks in subtlety. The compositional seams are intentionally left visible —indeed any sort of musical 'stitching' was purposefully avoided if at all possible! 'My Chief Vexation' does perhaps warrant some technical explanation, however: this is provided in Fig. 7.1.

The overwhelming violence of this music is contrasted sharply by another, much more respectful variation of the same choral material, included in this piece as a short addendum for solo piano. In this variation, dedicated to the memory of my late friend and mentor Oliver Knussen, the structural bones of the original material are left almost untouched. The material is expanded primarily by creative arpeggiation and an occasional colouring of the harmony, with melodic fragments traced through the original chorale. One notable structural change was the stretching of each phrase over a skeleton of Fibonacci numbers. (Fig. 7.2) In connection with Spectralism: the Fibonacci sequence —if considered as a list of frequencies (in Hz)—returns an endlessly repeating 'sacred' interval (between a minor and a major sixth). This fact was effectively exploited by Peter Eötvös in *Intervals intérieurs* (1981).[35]

[35] *IRCAM* (2014) <http://brahms.ircam.fr/works/work/20387/> [Accessed 10 June 2019]

Fig. 7.1

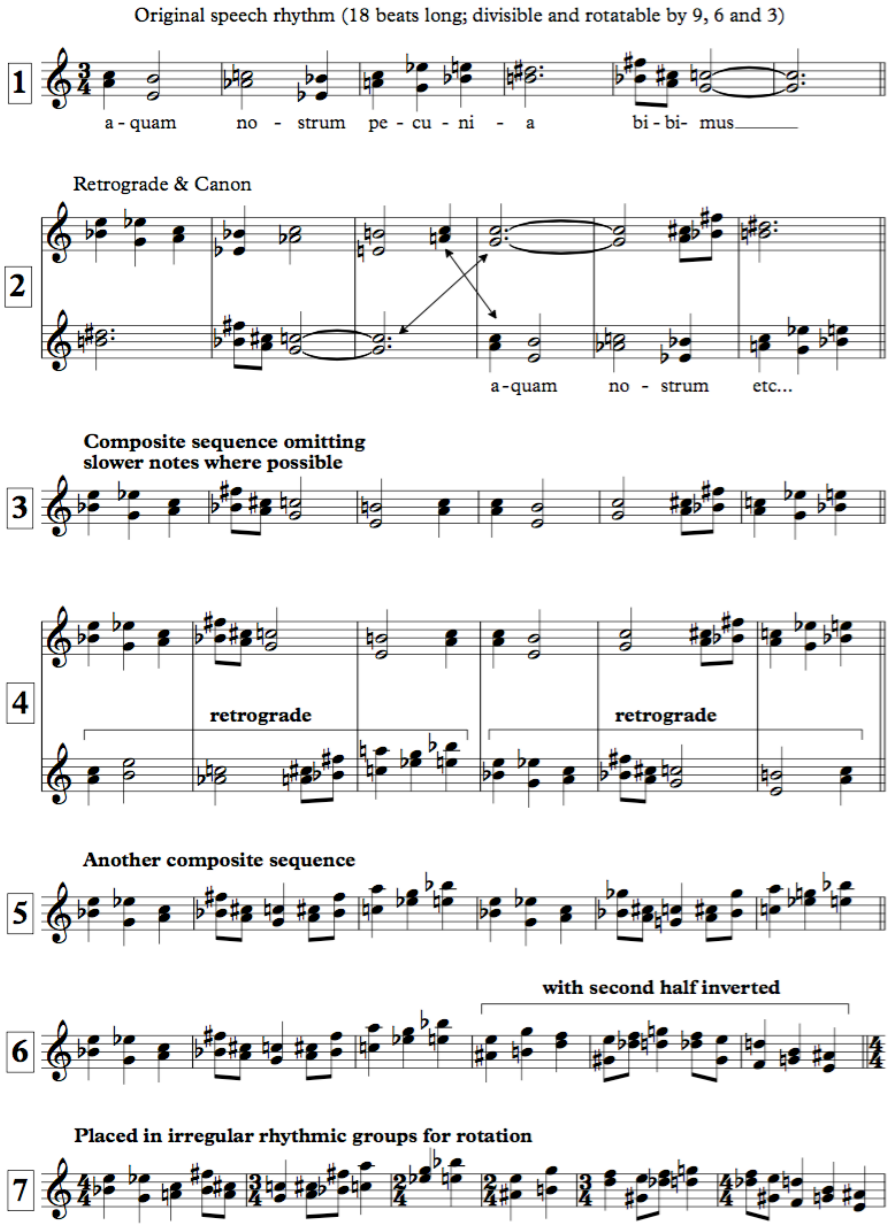
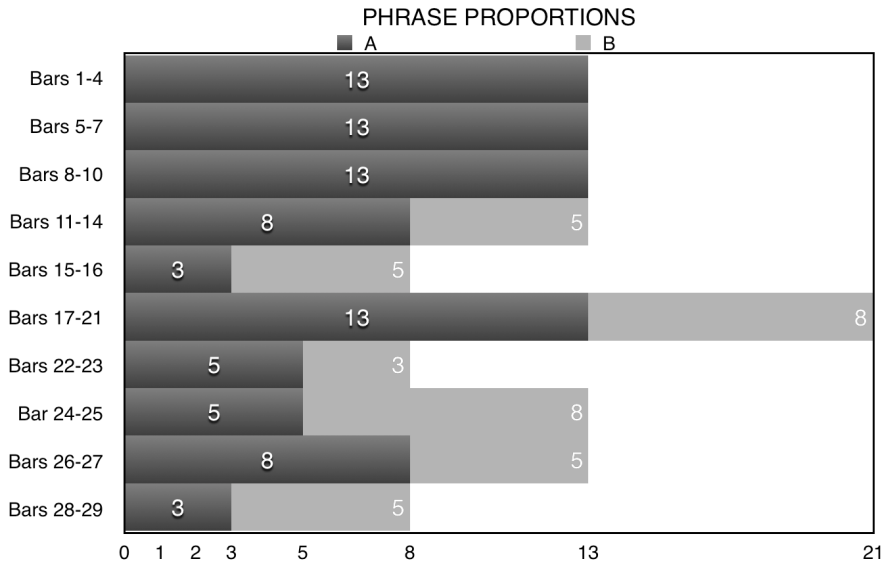

Original speech rhythm (18 beats long; divisible and rotatable by 9, 6 and 3)
1
a - quam no - strum pe - cu - ni - a bi - bi- mus
Retrograde & Canon
2
a-quam no - strum etc...
Composite sequence omitting slower notes where possible
3
4
retrograde
retrograde
Another composite sequence
5
with second half inverted
6
Placed in irregular rhythmic groups for rotation
7

Fig. 7.2


PHRASE PROPORTIONS
A
B
Bars 1-4
Bars 5-7
Bars 8-10
Bars 11-14
Bars 15-16
Bars 17-21
Bars 22-23
Bar 24-25
Bars 26-27
Bars 28-29
13
13
13
8
5
3
5
13
8
5
3
5
8
8
5
3
5
0 1 2 3 5 8 13 21

Conclusions and Reflections

Conclusions…

As a result of my PhD research, I have arrived at three principal conclusions:

- The first, and perhaps the most surprising to me, is that intervals smaller than a semitone are not themselves particularly desirable or useful—except as a colouristic device. Like the parallel fifths to be avoided in traditional counterpoint, the quarter-tone is usually—in the harmonic language I have developed during my time at Cambridge—a syntactic error. Rather, my current (and future) harmony exploits what Julian Anderson has called 'macrotones', i.e. larger detuned intervals such as 1.5 tones. I arrived at this conclusion having abandoned IRCAM's sophisticated software in favour of the simpler technological solution offered by two electronic keyboards tuned a quarter-tone apart—something which enabled me to listen to and 'touch' the microtones. This allowed me significantly to develop my aural familiarity with certain intervals, and to attain a firmer, more practical sense of what I did and did not want to hear in my music.

- Secondly, I have discovered that just a handful of overlapping pitch structures extrapolated from the natural overtone series more than meet my harmonic needs; additional techniques commonly used by Spectral and Post-Spectral composers are nonessential to my own musical aims, and may in fact serve to confuse further the idiosyncratic web of Spectral, quasi-tonal and serial procedures which characterise my current harmonic thinking. While it is true that Frequency Modulation and FFT analyses can produce an infinite variety of fascinating harmonic results, I have found that similar <u>musical</u> results may be obtained either by a numerical filtering of the harmonic series (naturally, considered as pitch <u>classes</u>) or by superimposing spectra on multiple fundamentals—with the inestimable benefit of greater creative control (or, at least the very specific type of control that I require).

- Finally, the establishment, at least to my own satisfaction, of a Spectral rationale for many aspects of tonal music has revealed the border between tonality and post-tonality to be quite illusory; in addition to recognising the potency and usefulness of consonant dyads and triads (especially in combination/juxtaposition with 'Spectral dissonance'), I now feel artistically justified in 'cannibalising' certain musical idioms of the past.

… and Reflections

Since I began writing music (at the rather late age of 23) I have had considerable trouble getting my ear and my brain to work co-operatively. An instinctive habit of saturating my harmonies with colourful pitches 'plucked from thin air' was, for the most part, prohibitive of the deeper conceptions of structure and function required to produce the sort of music demanded by my logic.

Over the course of my PhD, it became clear that I needed to set up 'lab conditions' if I was successfully to surmount this problem. In practical terms, this meant a ruthless pruning of my harmonic vocabulary, the better to understand my musical grammar—something particularly evident in the progression from *Ballabile*, with its many inexplicable details, to *Cycling*, in which the harmony is boiled down to its very essence and every note can be scrupulously accounted for.

This paring back of my compositional resources occasioned, for the first time, a deeper contemplation of other (non-harmonic) aspects of my music—and music generally: the interaction of rhythmic proportion with form; motivic development; (a)symmetry; permutation; and so on. Descent into stultifying formalistic pedantry and creative block was perhaps inevitable—on several occasions, labyrinthine Stockhausen-style form schemes were concocted without a note of real music being written, and several commissions were abandoned or shelved after abortive or inconclusive experiments with 24 and 36-note rows.

Nevertheless, I feel that linear progress was perhaps an unreasonable expectation and, a few dispiriting trips down conceptual blind alleys notwithstanding, my transition from confused intuition to a technical facility appropriate to my artistic ambitions has, in the main, proceeded according to plan. I look ahead with anticipation to the music I will write in the future based on the important discoveries I have made during this period of research.

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